

A Directory of Wetlands of International Importance



Ramsar Convention Bureau

The Ramsar Convention

The Convention on Wetlands of International Importance especially as Waterfowl Habitat, sometimes known as the Ramsar Convention from its place of adoption in 1971 in Iran, is an intergovernmental treaty which provides the framework for international cooperation for the conservation of wetland habitats.

Because wetlands are very important for ecological processes as well as for their rich flora and fauna, the broad objectives of the Convention are to stem the loss of wetlands and to ensure their conservation. To meet these objectives the Convention places general obligations on Contracting Parties relating to the conservation of wetlands throughout their territory and special obligations pertaining to those wetlands which have been designated in a "List of Wetlands of International Importance".

The Convention entered into force in late 1975 following the accession of the seventh Party, Greece. It now has Contracting Parties from all regions throughout the world.

The United Nations educational, scientific and cultural organization (Unesco) serves as depositary for the Convention. The secretariat, or Bureau, is an independent body administered by the International Union for Conservation of Nature and Natural Resources (IUCN) and the International Waterfowl and Wetlands Research Bureau (IWRB). Its headquarters are located in Gland, Switzerland, with a branch at Slimbridge in the United Kingdom.

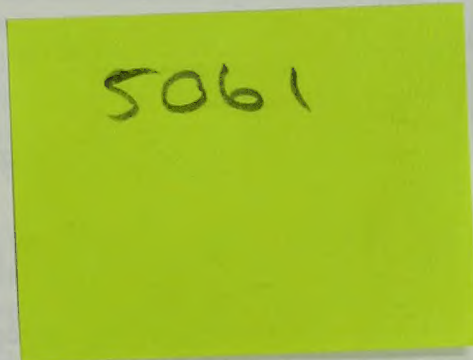
**Convention on Wetlands of International Importance
especially as Waterfowl Habitat**

Directory of Wetlands of International Importance

Sites Designated for the List of Wetlands of International Importance

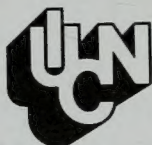
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**Fourth Meeting of the Conference of Contracting Parties to the
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INTRODUCTION

This directory has been prepared for the Fourth meeting of the Conference of the Contracting Parties to the Convention on Wetlands of International Importance especially as Waterfowl Habitat. This is the third successive meeting of the Conference at which such descriptions of listed sites have been made available. A draft directory was published in 1984, and made available to participants at the Groningen meeting (7-12 May 1984), and the first *Directory of Wetlands of International Importance* was published in 1987, and made available to participants at the Regina meeting (27 May-5 June 1987).

The present directory is a revision of the previous 1987 edition. Only where information has been communicated to the Bureau, or has arisen through other projects (such as preparation of the *Directory of Asian Wetlands* and *Important Bird Areas in Europe*), has the text been updated. Sites added to the list between publication of the previous edition and the end of March 1990 are also described. These descriptions are based on material provided by Contracting Parties, and other information available to the Bureau, and the World Conservation Monitoring Centre (WCMC).

Following the meeting of the Conference of the Contracting Parties held in Regina, the Ramsar Convention Bureau has worked closely with the WCMC, the International Waterfowl and Wetlands Research Bureau (IWRB), and others, to review its management of information on sites included on the List of Wetlands of International Importance. The Bureau has decided that in future it will be desirable to have available more detailed site descriptions, with a wider range of information grouped under more headings.

The present directory, which illustrates the type of information that the Bureau currently holds, is therefore likely to be the last produced in this format. At the meeting of the Conference in Montreux, the Contracting Parties will be requested to approve an information sheet on Ramsar sites, and a classification system for "wetland types". Contracting Parties will subsequently be invited to provide the Bureau with information in the new revised format, so that it can implement the convention more effectively.

The present directory has again been produced with a fairly limited budget, and as a result is only available in the English language, for which the Ramsar Convention Bureau apologises. Also, funds have been insufficient to allow for a thorough review, which is likely to result in a number of inconsistencies, and areas where information is out of date. It is hoped that in the future improved information management, with a more realistic budget, will lead to greater consistency and accuracy in the information held.

LAYOUT OF THE INFORMATION

Within each country section information is clearly laid out under a number of standard headings. First, there is a series of headings giving brief details about the country and its protected areas system. In developing these accounts, extensive use has been made of five books not otherwise credited in the text. These are: Poore and Gryn-Ambroes (1980) *Nature Conservation in Northern and Western Europe*, Carp (1980) *Directory of Wetlands of International Importance in the Western Palearctic*, Scott and Carbonell (1986) *A Directory of Neotropical Wetlands*, Scott (1989) *A Directory of Asian Wetlands*, and Grimmett and Jones (1989) *Important Bird Areas in Europe*.

The headings describing each country are as follows:

Summary of Wetland Situation Basic information is given on the wetlands of the country, indicating the topography and location of major areas of interest. The account is not intended to be comprehensive, but rather to provide a brief introductory overview of the types of wetlands to be found in the country, and the types of species associated with them.

Protected Areas Legislation The aim of both this and the next section is to provide background material on protected area conservation measures in general within each Contracting Party. In this section, information is provided to explain the processes by which protected areas are established and managed, and the range of protected areas identified within the national legislation.

Protected Areas Administration Includes brief information on the actual implementation of protected areas legislation, and who is responsible for administration and management.

Sites Designated under the Convention Indicates the date of signature and deposition of relevant instruments, and notes when sites were designated. This is followed by a list of the designated sites in their order of designation.

This is followed by the address of the government body responsible for administration of the Convention and then by a page or so describing each designated site in turn, in order of designation. Information is provided under the following headings:

Location Details such as latitude and longitude coordinates, and perhaps nearby features, settlements, and so on.

Area The total area of the designated site, including (where available and relevant) information on terrestrial and aquatic components, and on separate sections in sites that are split.

Degree of Protection Information on how the area is classified in terms of the national protected areas system, and activities which are controlled or prohibited in the area. Land ownership and the body responsible for local administration are also noted. Finally, if the site has been accorded any other international recognition, this is also mentioned.

Site Description Includes both a physical and biological description of the site. The physical description includes details of geomorphology, hydrology and climate, while the biological section includes a brief review of habitat types, with details of both typical and noteworthy fauna.

International and National Importance Underlines those factors for which the site is considered to be of particular importance, and which are presumably the main factors leading to its designation.

Changes in Ecological Character The Contracting Parties are obliged to inform the Bureau to the Convention of any change or likely change in the ecological character of designated sites (Article 3.2 of the Convention). This section provides the information available on threats and potential threats, as well as actual changes.

Management Practices The key management practices for each area are indicated. Traditional activities, such as reed cutting, are also noted here.

Scientific Research And Facilities The Convention encourages scientific research and training. The purpose of this section is to highlight such work already underway in each area, and to indicate facilities that might be available.

References This final section lists the key references referred to in compiling the information, and lists other major works. It is by no means intended to be comprehensive.

ACKNOWLEDGEMENTS

As with previous editions, the text of this directory has been drafted by staff of the Protected Areas Data Unit, World Conservation Monitoring Centre. The Ramsar Convention Bureau is especially grateful to Jeremy Harrison for coordinating this work.

Accounts for sites not described in the 1987 edition of the directory have been drafted by Robert Atkinson. Text has been reviewed by Tim Jones and Michael Smart of the Ramsar Convention Bureau, and subsequently edited by Jeremy Harrison and Alison Suter. Text for sites added to the list in the last few months has been drafted by Jeremy Harrison and Alison Suter from information available, and has not been reviewed by the Bureau.

Maps were prepared by Mike Adam of the Habitats Data Unit, World Conservation Monitoring Centre.

Copy has been prepared for publication by Jo Taylor and Richard Maling of IUCN Publication Services, who have completed this task within a remarkably short period of time.

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Algeria

Area 2,381,731 sq.km

Population 23,850,000 (1988)

Summary of Wetland Situation The varied group of fresh or brackish lakes and marshes situated in the extreme north-eastern corner of Algeria between 'Annaba and the Tunisian frontier, near the small coastal town of El Kala, are among the most interesting wetland areas of the Maghreb. The lakes are of exceptional value because of their rich and diverse flora and fauna, which includes several rare and threatened species. They also provide valuable habitat for large numbers of migratory and wintering waterfowl. Their conservation is vitally important in maintaining the existence of characteristic North African wetland ecosystems, most of which have been drained for agricultural purposes.

In Western Algeria, the only wetlands in the coastal region considered to be of international importance are the mainly brackish Marais de la Macta, south-west of Mostaganem, and the salt lake Grande Sebkha d'Oran. Marais de la Macta was drained in the 1960s, but became flooded again by 1972 and should certainly be kept in that condition as it serves a most useful purpose both for soil and general environmental protection and also as a refuge for wintering and migrating waterfowl.

The vast hinterland includes several large wetland areas of an ephemeral and usually very saline character. They depend for their existence on winter rainfall and may in favourable years offer excellent seasonal feeding grounds for flamingos and a great assortment of wintering and migrating waterfowl including waders or shore birds, herons and cranes.

Protected Areas Legislation Parks were previously governed by long-standing decrees, some of which went back more than half a century (1925). The Forest Code was utilised and hunting was regulated on an annual basis by application of the Hunting Laws. In 1979 a study was instigated to establish a new legal framework intended to cover all aspects of nature conservation and the creation of parks and reserves. In 1982-83 major changes became apparent with a proposal being put forward for three new laws. One on the protection of the environment passed on 5 February 1983, one on hunting passed on 21 August 1982 and one on the general management of forests passed on 23 June 1984. These would include new statutes for national park and nature reserve creation and management, pollution control, and the protection of non-domestic species. Simultaneously a new Council of Hunting is directed to create hunting reserves and construct a list of wild animals. These measures are intended to be part of a National Strategy for the Conservation of Fauna.

Protected Areas Administration In the 1970s the Ministère de l'Hydraulique, de la Mise en Valeur des Terres et de la Protection de l'Environnement was established. At one stage a separate Secretariat of State for "Forêts et Mise en Valeurs des Terres" was established but later was

re-incorporated into the renamed M.H.E.F. Overall responsibility rested with the Ministry. Below the Minister for H.E.F. there was a Vice-Minister with responsibility for the environment and forests. Under the Vice-Minister there were six 'directions', including the Direction de la Sauvegarde et de la Promotion de la Nature (DSPN), the Direction des Forêts, Mise en Valeur des Terres, and the office of Aménagement et Grands Projets (Reboisement) Etudes et Administration. In 1989 there was further reorganisation, and the forestry and conservation services once again come under the Ministry of Agriculture, within which there is a Direction of Forests and Soil Improvement. This includes a Sub-direction of National Parks.

Sites designated under the Convention Accession 4 November 1983, with 2 sites listed at accession

Lac Oubeïra

Lac Tonga

Government body responsible for administration of the Convention Ministère de l'Agriculture, Direction des Forêts et des Régions naturelles, Alger-Kouba

Lac Oubeïra

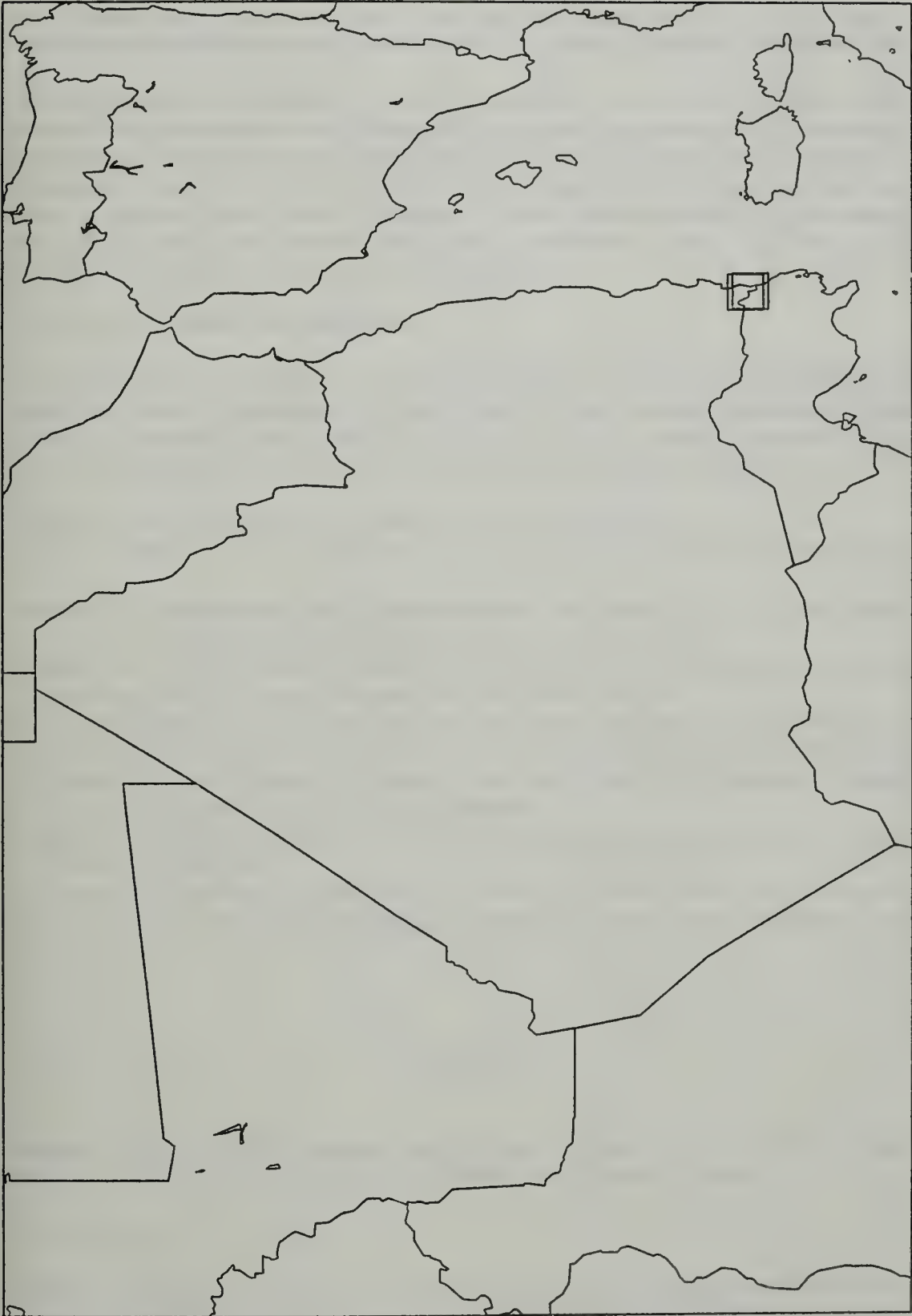
Location 36°50'N, 8°23'E. Situated about 50km east of Annaba and just west of Tonga Lake (Ramsar site) in Wilaya Et-Tarf on the north-east (Mediterranean) coast of Algeria.

Area 2,200ha

Degree of Protection State owned. The designated area is within El Kala National Park which also includes other lakes and associated marshes of the El Kala complex. Designated as a Ramsar site at the time of accession on 4 November 1983.

Site Description Oubeïra Lake is a closed permanent freshwater basin (2-3m depth) surrounded on three sides by wooded hills with the north side open to the dunelands on the coast. The lake is eutrophic with much of the surface overgrown by pondweed *Potamogeton* sp. and it is fringed by a narrow belt of reeds. The site is part of the extensive El Kala coastal wetland complex (flanked to the south by the Medjerda Mountains) which extends some 50km along the Mediterranean coast and includes Tonga Lake (Ramsar site), Mellah, Garaet Mekhada (flood-plain) and Cheffia dam. The lake supports an abundant fish fauna.

International and National Importance The lake is part of the extensive El Kala wetland complex (comparable in importance for waterfowl with Ichkeul Ramsar and World Heritage site in Tunisia). Lakes Oubeïra and Mellah constitute the main wintering sites in Africa for tufted duck *Aythya fuligula* (9,000 in 1982). In January 1984, 60,000 waterfowl were estimated here (Skinner and Smart, 1984). Other winter visitors include mallard *Anas platyrhynchos*, teal *A. crecca*, gadwall *A. strepera*, wigeon *A. penelope* (14,000 in 1982), pintail *A. acuta*, northern shoveler *A. clypeata*, common pochard *Aythya ferina* (26,700 in 1982), coot *Fulica atra*, lapwing *Vanellus vanellus*, great crested grebe *Podiceps cristatus*, black-necked grebe *P. nigricollis* (850 in 1982), little grebe *Tachybaptus ruficollis* (2,300 in 1982), cormorant *Phalacrocorax carbo*



Ramsar Sites in Algeria

spp., Sandwich tern *Sterna sandvicensis* and kingfisher *Alcedo atthis*. The small breeding population can include great crested grebe, little grebe, coot and moorhen *Gallinula chloropus*.

Changes in Ecological Character The lake is potentially threatened by a water resources scheme which proposes to use Lac Oubeïra as a balancing lake in providing water for two towns, Annaba and El Kala (M.Smart & G.E.Hollis *in litt.* 1984). Carp have been introduced for commercial fishing, and could destroy the aquatic vegetation and alter the invertebrate fauna (Algerian National Report, Regina Conference). Hunting pressure is described as moderate to heavy (IUCN, 1984). This site was listed in Regina Conference document C.3.6 as one of the 29 Ramsar sites likely to suffer major ecological change.

Management Practices No information

Scientific Research and Facilities Winter waterfowl counts have been carried out by visiting ornithologists and, in recent years, by Algerian teams. It has been recommended that a study be made to determine whether there are sufficient food supplies present or whether the large numbers of waterfowl that occur here are feeding elsewhere (Skinner and Smart, 1984).

Principal Reference Material The above information is taken from:

- Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.
- Ministère de l'Hydraulique, de l'Environnement et des Forêts (1987). Algérie: Rapport National. Proceedings of Regina Ramsar Conference. Pp. 411-412.
- Morgan, N.C. (1982). An ecological survey of standing waters in Northwest Africa: II. Site descriptions for Tunisia and Algeria. *Biol. Cons.* 24(2): 83-114.
- Scott, D.A. (1980). A preliminary inventory of wetlands of international importance for waterfowl in west Europe and northwest Africa. *IWRB Special Publication* No. 2. 127 pp.
- Sécretariat d'Etat aux Forêts et à la Mise en Valeur des Terres (1983). Document submitted at the time of accession to the Ramsar Convention.
- Skinner, J. and Smart, M. (1984). The El Kala wetlands of Algeria and their use by waterfowl. *Wildfowl* 35:106-118.
- Stevenson, A.C., Skinner, J., Hollis, G.E. and Smart, M. (1988). The El Kala National Park and Environs, Algeria: An Ecological Evaluation. *Environmental Conservation* 15(4): 335-348.

Lac Tonga

Location 36°51'N, 8°30'E. Situated about 60km east of Annaba and 5km west of the Tunisia frontier in Wilaya Et-Tarf on the north-east (Mediterranean) coast of Algeria.

Area 2,700ha

Degree of Protection State owned. The designated area is unprotected except for Ramsar status. A national park has been proposed which will include the lake and four other lakes and associated marshes of the El Kala complex. Designated as a Ramsar site at the time of accession on 4 November 1983.

Site Description Tonga Lake is a closed freshwater basin, which is dry between August and November (maximum 2.8m depth, average depth 0.5-1m) surrounded by wooded hills. It is part of the extensive El Kala coastal wetland complex (flanked to the south by the Medjerda Mountains) which extends some 50km along the Mediterranean coast and includes Oubeïra (Ramsar site), Mellah, Garaet Mekhada (floodplain) and Cheffia dam. The shallow lake is covered with dense aquatic vegetation (reeds, bulrushes, rushes) typical of Mediterranean coastal wetland and only a small area of open water remains. The invertebrate fauna is reported to be unusual.

International and National Importance The lake is part of the extensive El Kala wetland complex (comparable in importance for waterfowl with Ichkeul Ramsar World Heritage site in Tunisia) and there is considerable interchange of waterfowl between the five wetland areas in the complex. The site is of great importance to wintering, migrating and nesting waterfowl. Winter visitors include mallard *Anas platyrhynchos*, teal *A. crecca*, gadwall *A. strepera*, wigeon *A. penelope*, coot *Fulica atra*, black-winged stilt *Himantopus himantopus*, lapwing *Vanellus vanellus*, snipe *Gallinago gallinago*, little grebe *Tachybaptus ruficollis*, moorhen *Gallinula chloropus*, black-headed gull *Larus ridibundus* and kingfisher *Alcedo atthis*. Breeding species include night heron *Nycticorax nycticorax*, squacco heron *Ardeola ralloides*, purple heron *Ardea purpurea*, marbled teal *Anas angustirostris*, white-headed duck *Oxyura leucocephala* (uncommon), pochard *Aythya ferina* and purple gallinule *Porphyrio porphyrio*.

Changes in Ecological Character Shooting pressure is high.

Management Practices Hunting is prohibited except on certain days.

Scientific Research and Facilities The dune vegetation of the El Kala complex was studied in 1975. Waterfowl counts have been carried out each year since 1971. An ecomuseum has been constructed near Tonga.

Principal Reference Material The above information is taken from:

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

Ministère de l'Hydraulique, de l'Environnement et des Forêts (1987). Algérie: Rapport National. Proceedings of Regina Ramsar Conference. Pp. 411-412.

Morgan, N.C. (1982). An ecological survey of standing waters in Northwest Africa: II. Site descriptions for Tunisia and Algeria. *Biol. Cons.* 24(2): 83-114.

Scott, D.A. (1980). A preliminary inventory of wetlands of international importance for waterfowl in west Europe and northwest Africa. *IWRB Special Publication No. 2*. 127 pp.

Sécretariat d'Etat aux Forêts et à la Mise en Valeur des Terres (1983). Document submitted at the time of accession to the Ramsar Convention.

Skinner, J. and Smart, M. (1984). The El Kala wetlands of Algeria and their use by waterfowl. *Wildfowl* 35:106-118.

Stevenson, A.C., Skinner, J., Hollis, G.E. and Smart, M. (1988). The El Kala National Park and Environs, Algeria: An Ecological Evaluation. *Environmental Conservation* 15(4): 335-348.

Australia

Area 7,686,855 sq.km

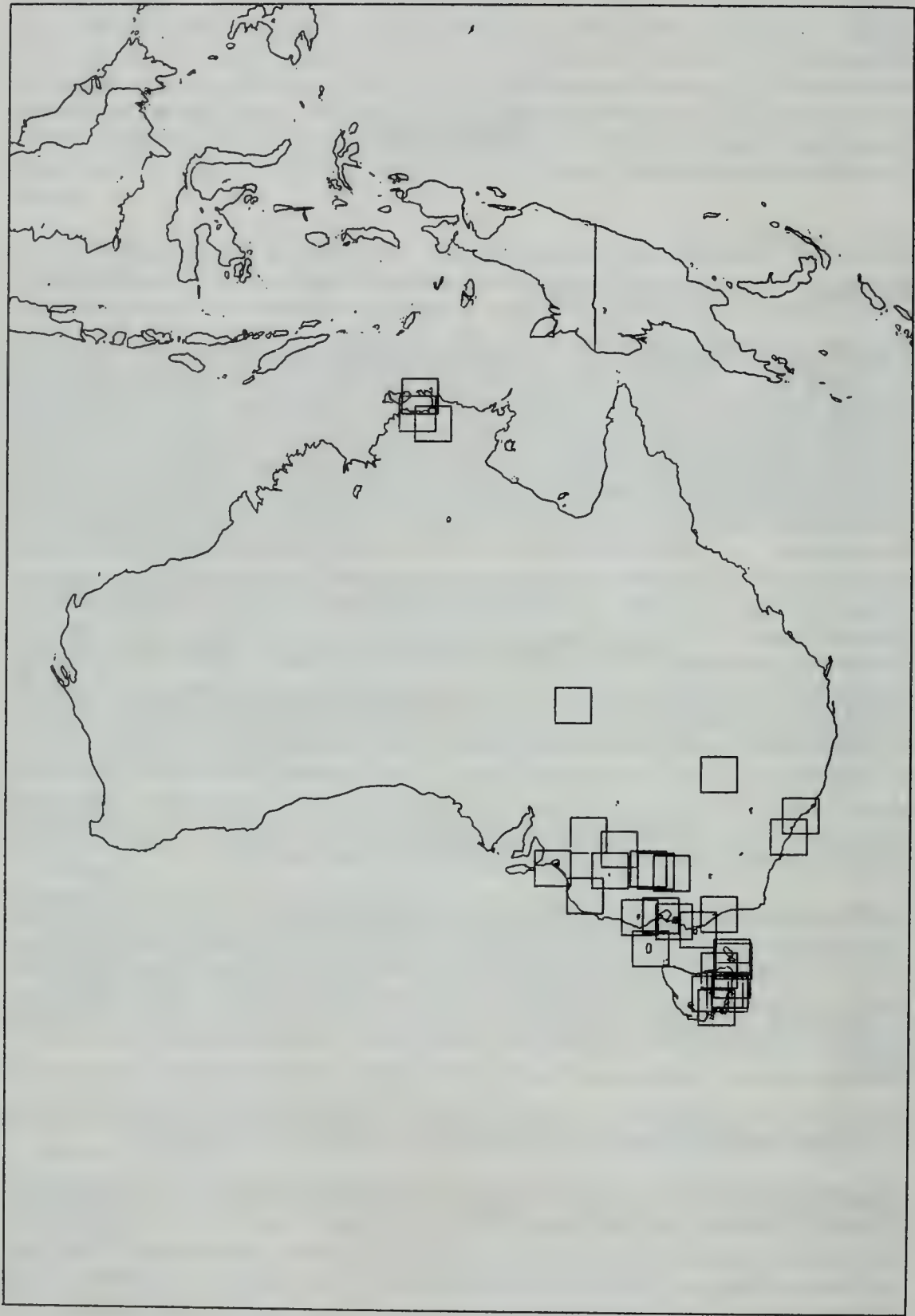
Population 15,763,000 (1986 census)

Summary of Wetland Situation The vast, dry Australian continent contains a wide variety of wetland types. Because of the climate, many of these areas are ephemeral, undergoing irregular sequences of flood and drought. This results in most of the waterfowl being highly nomadic, and boundaries of wetlands tend to fluctuate over time. For example, in north-eastern Australia monsoons, troughs, tropical cyclones and south-easterly air streams deposit more than 90% of the region's rainfall between November and April, and much of that falls on the coast. Queensland has many wetlands scattered throughout the state, but few of them have never been known to dry out. Inland swamps are vast in wet years, providing habitat for enormous populations of waterbirds, but can disappear completely during dry periods. In this part of the country the more predictable wetlands are the coastal swamps. Many of the rivers are also ephemeral in parts of the country, and where they are not, they tend to be fairly intensively used, particularly in the south. For example, in the whole of southern Australia there is only one undisturbed river remaining with no settlement on its banks and no damming. This is the Franklin River of western Tasmania. Over the country as a whole, the habitats range from the tropical freshwater swamps of north-east Queensland; the floodplains of inland eastern Australia; the limited but most reliable drought refuges in South Australia; the temperate lowland and upland wetlands of Tasmania; mangroves, estuaries, open tidal mud-flats and coastal lagoons such as those in the Northern Territory and NSW; permanent lakes as in NSW, Victoria, and Western Australia; and intermittent and dry lakes throughout the country.

The Commonwealth Scientific and Industrial Research Organisation, (CSIRO), institute of Earth Resources, Division of Land Use Research, has established a Wetland library and has produced a map (1: 2,500,000) to give an overview of the distribution of wetlands, nine categories of which are distinguished: permanent lake, intermittent lake, dry lake, permanent swamp, intermittent swamp, land subject to inundation, mangrove, open tidal flat, and tidal river and coastal lagoon.

Protected Areas Legislation Restricted to states and territories with designated sites. Information derived from Hinchey (1982) Nature Conservation Reserves in Australia.

Australian Government: The National Parks and Wildlife Conservation Act 1975 provides for the establishment of parks or reserves over land or sea areas where there is constitutionally a basis for Commonwealth action. These areas may be designated as national parks or some other designation and may only be revoked by a resolution of both Houses of Parliament. Kakadu National Park and Uluru National Park in the Northern Territory are proclaimed under the Act.



Ramsar Sites in Australia

Northern Territory: The Conservation Commission Act 1980 established the Conservation Commission of the Northern Territory to promote the conservation and protection of the natural environment and establish environmental conservation. Land is reserved under the provisions of the Territory Parks and Wildlife Conservation Act by the Administrator of the Northern Territory following receipt of a report from the Conservation Commission. This Act refers only to the creation of "parks and reserves", allowing considerable flexibility in the interpretation of these terms. Accordingly, areas declared may range from small sites of specific interest to major national parks. All land is held by the Conservation Land Corporation as constituted under the Conservation Commission Act. Revocation of reserved land is by declaration by the Administrator following a resolution by the Northern Territory Legislative Assembly. Wildlife sanctuaries may be declared under the Territory Parks and Wildlife Conservation Act for the conservation of wildlife and habitat. However, all sanctuaries previously declared under this Act have now been transferred to Aboriginal control and, with the exceptions of Cobourg Peninsula and Woolwonga, no longer have legal conservation status. The Cobourg Peninsula Aboriginal Land and Sanctuary Act passed in 1981 established a major Aboriginal controlled and owned national park on Cobourg Peninsula.

Tasmania: The National Parks and Wildlife Act 1970 provides for the establishment of conservation areas by Governor's proclamation. Conservation areas may include privately owned lands subject to the consent of the owners. Conservation areas that are Crown land may be declared State reserves by Governor's proclamation but may not be revoked unless the Governor's draft proclamation is first approved by each House of Parliament. Conservation areas may be named wildlife sanctuaries; wildlife is protected in such areas but its habitat is not, unless there is specific provision in a management plan. National parks are generally outstanding natural areas greater than 4,000ha area, whereas game reserves are managed to produce native or introduced game species. Crown land conservation areas may also be declared game reserves, in which areas the hunting of wildlife may be permitted in season.

Victoria: Under the National Parks Act 1975 provision is made for the establishment of national parks and other parks for the preservation and protection of the environment including indigenous flora and fauna and features of scenic, archaeological, geological, historical or scientific interest. National parks and other parks may be zoned by publication of the Governor's proclamation to that effect. New national parks and other parks may be established by parliamentary amendment of the appropriate schedules to the National Parks Act to include the name and description of the lands included in the park. Provision is also made in the Act for the National Parks Service to manage land not reserved under the Act. Under the Crown (Land) Reserves Act 1978, State wildlife reserves may be established for the preservation or management of wildlife or wildlife habitat. State wildlife reserves may be further classified as game reserves, State game refuges, State faunal reserves, game management stations, nature reserves and other classifications, such as State parks, by order of the Governor. Any proclamation or order made by the Governor may be similarly revoked or varied. State game reserves and State game refuges are specifically managed for waterbird conservation with State game refuges providing a refuge for birds during the open season and State game reserves catering for hunting. State faunal reserves are managed for non-game wildlife species and shooting is prohibited. As part of the reorganisation that has led to the establishment of the Department of Conservation, Forests and Lands a thorough review of relevant legislation, including that concerned with protected areas, is being conducted.

New South Wales: The National Parks and Wildlife Act 1974 provides for national parks and nature reserves to be created by proclamation. The Act establishes a National Parks and Wildlife Advisory Council to advise the Minister on the control and management of national parks and nature reserves. Advisory Committees may also be established for each national park to make recommendations to the above Council, the Director or Superintendent of the respective national park.

South Australia: The National Parks and Wildlife Act, 1972-81 provides for the establishment and management of reserves for public benefit and for the conservation of wildlife in a natural environment. The reserves comprise national parks, conservation parks, game reserves and recreation parks. They may be abolished or their boundaries altered by a proclamation of the Governor, subject to a resolution passed by both Houses of Parliament. Management plans for each reserve are prepared by the Minister in conjunction with comments and suggestions of the National Parks and Wildlife Reserves Advisory Committee and representations from the public. Objectives in the management of reserves include the preservation and management of wildlife, the preservation of features of geographical, natural or scenic interest and the encouragement of public use and enjoyment of reserves. The management plan may also provide for the division of a reserve into zones which shall be kept and maintained under the conditions declared by the plan. The National Parks and Wildlife Reserves Advisory Committee, at the request of the Minister, can investigate and advise the Minister upon any matter referred to the Committee for advice. The Committee may also refer any matter affecting the administration of the Act to the Minister for consideration. Five members are appointed to the Committee by the Governor.

Protected Areas Administration Restricted to states and territories with designated sites. Information derived from Hinchey (1982) Nature Conservation Reserves in Australia.

Australian Government: The Director of National Parks and Wildlife is responsible for the areas proclaimed under the National Parks and Wildlife Conservation Act 1975.

Northern Territory: A Director of Conservation, his Deputy and staff are public servants employed for the purposes of carrying out the functions of the Commission. The Commission administers the Territory Parks and Wildlife Conservation Act as well as legislation relating to forestry, bush fires and soil conservation.

Tasmania: State reserves, game reserves and conservation areas are administered by the Tasmanian National Parks and Wildlife Service established under the Act. Whereas some conservation areas are administered by the Service as wildlife sanctuaries, there are in addition approximately thirty-five conservation areas proclaimed where other government authorities or the owner of the lands are the managing authorities.

Victoria: Although the Directors of the National Parks Service and Fisheries and Wildlife Service are empowered by respective acts of parliament to manage national parks or wildlife reserves, the recent reorganisation of crownland management in Victoria has altered this role. The National Parks Service and Fisheries and Wildlife Service now have an advisory and management policy formulation role in the Department of Conservation, Forests and Lands. Management works on all parks, reserves, state forests and crownland are conducted by the Regional Management Division of the Department from 18 regional centres in the state.

New South Wales: Both national parks and nature reserves are managed by the National Parks and Wildlife Service established under the Act and responsible to the Minister for Planning and Environment.

South Australia: The Director of the National Parks and Wildlife Service is responsible to the Director General of the Department of Environment and Planning. Both are responsible to the Minister for the management of reserves. The National Parks and Wildlife Service constitutes a division of the Department of Environment and Planning. All staff, including the Director, are public servants employed to carry out the functions of the National Parks and Wildlife Act.

Sites designated under the Convention Signature without reservation as to ratification 8 May 1974. One site in the Northern Territory listed at signature, another added 12 June 1980 and a third on 15 September 1989. 10 sites in Tasmania added on 16 November 1982, 10 in Victoria on 15 December 1982, 2 in New South Wales on 21 February 1984 and 1 in August 1986, 2 in South Australia November 1985, another in June 1987 and a fourth in September 1987.

Northern Territory

- Cobourg Peninsula Aboriginal Land and Wildlife Sanctuary
- Kakadu National Park (Stage I)
- Kakadu National Park (Stage II)

Tasmania

- Moulting Lagoon
- Logan Lagoon Conservation Area
- Sea Elephant Conservation Area
- Pittwater-Orielton Lagoon
- Apsley Marshes
- East Coast Cape Barren Island Lagoons
- Flood Plain Lower Ringarooma River
- Jocks Lagoon
- Northwestern Corner of Lake Crescent
- Little Waterhouse Lake

Victoria

- Corner Inlet
- Barmah Forest
- Gunbower Forest
- Hattah-Kulkyne Lakes
- Kerang Wetlands
- Port Phillip Bay (western shoreline) & Bellarine Peninsula
- Western Port
- Western District Lakes
- Gippsland Lakes
- Lake Albacutya

New South Wales

- Towra Point Nature Reserve
- Kooragang Nature Reserve
- Macquarie Marshes Nature Reserve

South Australia

- The Coorong and Lakes Alexandrina and Albert
- Bool and Hacks Lagoons

Coongie Lakes
"Riverland"

Government body responsible for administration of the Convention Australian National Parks and Wildlife Service, GPO Box 636, Canberra ACT 2601

Cobourg Peninsula Aboriginal Land and Wildlife Sanctuary

Location 11°22'S, 131°46'-132°35'E. Situated about 200km north-east of Darwin in the Northern Territory.

Area 191,660ha

Degree of Protection Cobourg Peninsula Flora and Fauna Reserve was created in 1924 and designated as the world's first Ramsar site in 1974 as Cobourg Peninsula Wildlife Sanctuary and Flora and Fauna Reserve. The area has since been renamed as Cobourg Peninsula Aboriginal Land and Wildlife Sanctuary. The Cobourg Peninsula Aboriginal Land and Sanctuary Act of 1981 established the area as a major Aboriginal controlled and owned national park. Administered by the Conservation Commission of the Northern Territory (Gap Road, PO Box 1046, Alice Springs, Northern Territory 5750).

Site Description The site comprises a gently undulating peninsula about 80km long, joined to the mainland by a narrow neck of 10km width, which has a long indented coastline with large estuaries dominated by saltflats and mangroves. The area is characterised by a monsoonal climate with distinct dry season from April to October. A tall forest association of *Eucalyptus* sp. is the dominant vegetation type over much of the peninsula, replaced in some areas by the palm *Kentia ramsayi*. On sandier soils there are some pure stands of the northern cypress pine *Callitris collumellaris*. There are a few small areas of monsoon forests, principally as a thin fringe near freshwater streams and along lagoons, as well as behind beach dunes. The latter support prostrate spreading species. Dry stream courses and the sandy deltas of freshwater streams which do not flow throughout the year support *Pandanus* sp., *Melaleuca* sp., *Banksia dentata* and *Lophostemon lactifluus*. *Grevillea pteridifolia* is dominant as a dense tall shrub in swampy areas. On more open sandy sites associated with stream lines, sedge *Leptocarpus spathaceus* occurs in almost pure communities. Near the mouths of tidal rivers and on some protected areas of coastline, mangrove associations are common. Behind the mangroves are salt flats which are flooded at high tides.

There are not many species of native mammal fauna, with one monotreme, seven marsupials, thirteen bats and five rodents being recorded. The reason for the small number of species is probably a lack of habitat diversity. But there is usually a large number of individuals of each species, perhaps because of the absence of feral cat from the area. Among the most common species are agile wallaby *Macropus agilis agilis*, fawn antechinus *Antechinus bellus*, black flying fox *Pteropus alecto gouldii* and hoary bat *Chalinolobus nigrogriseus rogersi*.

International and National Importance Surveys have illustrated the great value of the area for birds, with over 164 recorded species. The tidal mudflats and mangrove swamps are breeding

and wintering sites for several migratory waterfowl species, and the site is a breeding and refuge ground for many indigenous waterfowl including the endemic magpie goose *Anseranas semi-palmata*. Known threatened fauna in the waters around the peninsula include dugong *Dugong dugon*, green turtle *Chelonia mydas*, leatherback turtle *Dermochelys coriacea*, olive ridley turtle *Lepidochelys olivacea*, hawksbill turtle *Eretmochelys imbricata* and estuarine crocodile *Crocodylus porosus*.

Changes in Ecological Character Some habitat degradation has been caused by feral animals descended from the livestock introduced by early settlers, including pigs, Timor ponies, Bali cattle, buffalo and Sambar deer. Generally though, the area has remained relatively unaffected by man due to the difficulty of access by land. A wilderness-style tourist resort is being developed at Coral Bay; strict environmental controls were applied to reduce the impacts.

Management Practices The area is actively managed for the conservation of wetlands and wildlife. A permit from the board of management is required for entry. Gurig National Park, embracing the Cobourg Peninsula wetlands, is managed in accordance with the Plan of Management gazetted in 1987. A draft management plan has also been prepared for the surrounding waters of Cobourg Marine Park. The traditional Aboriginal owners of Gurig are directly involved in park management through the Cobourg Peninsula Sanctuary board.

Scientific Research and Facilities The national park has seven resident rangers to implement the management plan. Visitor numbers are regulated by entry permits. An interpretive centre has been constructed at Black Point. Regional safari hunting operations have been renewed for a further five years (1990) on feral water buffalo and banteng. Wild banteng have been found free of tuberculosis and brucellosis.

Principal Reference Material The above information is taken from the documents supplied by the Government of the Northern Territory at the time of designation in 1974 and the Australian reports to the 1984 Groningen and 1990 Montreux conferences. Supplemented by: *International Waterfowl Research Bureau Bulletin* No. 47 1981. Slimbridge, Glos., England.

Additional reference:

Frith, H.J. and Calaby, J.H. (eds) (1974). Fauna survey of the Port Essington District, Cobourg Peninsula, Northern Territory of Australia. *C.S.I.R.O. Division of Wildlife Research Technical Paper* No. 28.

Higgs, H.J. (1975). Cobourg Peninsula Wildlife Sanctuary and Flora and Fauna Reserve. Unpublished report. 3 pp.

Ivanovici, A.M. (ed.) (1984). Inventory of declared marine and estuarine protected areas in Australian waters. Australian National Parks and Wildlife Service. *Special Publications* 12(2): 419-420.

Kakadu National Park (Stage I)

Location 12°05'-13°30'S, 132°22'-133°00'E. Situated about 220km east of Darwin in the Northern Territory.

Area 667,000ha

Degree of Protection Kakadu (Stage I) was declared a national park in April 1979 under the provisions of the National Parks and Wildlife Conservation Act 1975. Ownership of most of that stage of the park is vested in the Kakadu Aboriginal Land Trust (The Manager, Northern Land Council, P.O. Box 3046, Darwin, N.T. 5794) representing traditional Aboriginal land-owners. The land was leased in 1978 for 100 years to the Director of National Parks and Wildlife to be managed as a national park. The remaining park areas are vested in the Director of National Parks and Wildlife (PO Box 636, Canberra 2601). Accepted as a World Heritage site in May 1981. Designated as a Ramsar site in June 1980.

Site Description The designated site is Stage I of Kakadu National Park, which comprises a major area covering the catchments of the South and East Alligator rivers and a much smaller triangular area covering the East Alligator River up to and including its outlet into Van Diemen Gulf. The park contains a diversity of wetland habitats which are subject to wide seasonal and between-year variation. It is, therefore, impossible to provide a meaningful estimate for the area of wetlands and thus the whole park area has been designated. The area has a monsoon climate with wet season from December to April when intense rains flood the vast lowland plains of the park (sometimes up to 136,000ha are inundated). From April/May the area begins to dry out with the water retreating into the lagoons, billabongs and rivers. Mean rainfall of 338mm in January contrasts dramatically with only 2mm in June. The water resources of Kakadu are at their lowest in August through October. The vegetation of the tidal mudflats consists of a salt-tolerant association of samphire *Salicornia* spp., sedges and grasses with mangrove forest along the coast and estuarine banks. Vegetation on the floodplains consists of sedges and freshwater mangrove *Barringtonia acutangula* occurs in swampy areas along stream and lagoon edges and paperbark *Melaleuca* spp. elsewhere. Plants such as lilies and fern *Azolla* sp. occur in deep more permanent waters. The remaining area comprises forest, woodland, savanna grassland or heath-scrubland communities and there is some scattered monsoon rain forest. The fauna is varied with at least 50 native mammal, 275 bird, 75 reptile, 25 frog, 55 fish and 4,500 insect species recorded. Most important areas to waterfowl are the eastern bank of the South Alligator River and its tributaries, particularly Nourlangie Creek and the west bank of the East Alligator River and its tributary Magela Creek.

International and National Importance One third of Australia's waterfowl species occurs in the park. During the wet season Magela floodplain supports large concentrations of waterfowl including magpie goose *Anseranas semipalmata*, jabiru *Xenorhynchus asiaticus*, whistling tree-duck *Dendrocygna arcuata*, green pygmy goose *Nettapus pulchellus*, Burdekin duck *Tadorna radjah* and pied heron *Ardea pictata*. During the wet season Nourlangie Creek provides ideal resting, feeding and breeding grounds for waterfowl particularly magpie geese. 35 species of wader have been recorded, including many winter migrants from the sub-Arctic, whose first contact with the Australian Continent is in the Kakadu area. The wetlands of the park also contain one quarter of all recorded Australian freshwater fish species and provide habitat for the vulnerable estuarine crocodile *Crocodylus porosus*.

Changes in Ecological Character One of the major threats to the park environment is the large number of feral animals particularly buffalo *Bubalus bubalis*, pig *Sus scrofa* and cattle *Bos taurus*. Buffalo have damaged the natural levees by wallowing near tidal rivers and creeks thereby allowing saltwater into freshwater swamps. They have also increased the turbidity of many billabongs and damaged vegetation by trampling and selective grazing. Pigs also cause

extensive damage in parts and in some rainforest patches few regrowth shoots survive to maturity. Major uranium deposits are being exploited in areas close to the park and other mineral deposits such as gold, tin and copper are or could become economically viable for exploitation.

Management Practices Control measures are implemented to eradicate or reduce the numbers of feral animals. Recovery of wetland vegetation has been dramatic following substantial reduction in buffalo populations. Hunting is prohibited except by Aborigines and park staff and there are strict controls on the introduction of exotic animals and plants. Recreational fishing is by permit only. The current management plan has closed part of the park to recreational fishing in order to protect dry season refuges of many fish species, particularly the clear pools of the escarpment. Controlled burning is practised to maintain the diversity of the grasslands. Comprehensive measures are taken by the government to minimise the environmental damage caused by mining.

Scientific Research and Facilities Many papers were written on the area before it became a national park. A continuing research programme is being carried out to assess the environmental impact of human activities including traditional Aboriginal activities, past introduction of domestic and feral animals and exotic plants, mining activities and visitor use. Fundamental ecological research on the relationship between living organisms and their relationship with their environments is encouraged.

Principal Reference Material The above information is taken from the documents supplied by the Government of Australia at the time of designation in 1980. Supplemented by:

Australian National Parks and Wildlife Service (1980). *Kakadu National Park Plan of Management* (contains an extensive reference section). Canberra.

Australian National Parks and Wildlife Service (May 1980). *Nomination of Kakadu National Park for inclusion in the World Heritage List*. Canberra. Additional references:

Barnett, L. (1980). A checklist of the birds of Kakadu National Park and the Alligator River region of the Northern Territory. Unpublished manuscript.

Ivanovici, A.M. (ed.) (1984). Inventory of declared marine and estuarine protected areas in Australian waters. Australian National Parks and Wildlife Service. *Special Publications* 12(2): 421-423.

Ovington, J.D. (1986). *Kakadu: A World Heritage of Unsurpassed Beauty*. Australian Government Publishing Service, Canberra.

Moulting Lagoon

Location 42°05'S, 148°10'E. Situated on the east coast of Tasmania. Contiguous with Apsley Marshes (Ramsar site).

Area 3,930ha

Degree of Protection 511ha of the area is a wildlife sanctuary administered since April 1959 by the Tasmanian National Parks and Wildlife Service (P.O. Box 210, Sandy Bay, Tasmania 7005). The remainder of the lagoon is crown land administered by the Tasmanian Lands

Department. Upgraded from conservation area to state reserve covering 4,760ha. Designated as a Ramsar site on 16 November 1982.

Site Description Moulting Lagoon is a large sanctuary dividing the Apsley and Swan Rivers. Waterfowl include coots, black swan *Cygnus atratus*, five species of duck and nine wader species. Seasonal fluctuation of numbers depending on the rainfall.

International and National Importance 80% of the black swan breeding population in Tasmania occurs in Moulting Lagoon. The lagoon regularly supports 10,000 black swan and the largest known Tasmanian flocks of greenshank *Tringa nebularia* and sharp-tailed sandpiper *Calidris acuminata*.

Changes in Ecological Character None reported

Management Practices Now being actively managed as a game reserve under the Tasmanian National Parks and Wildlife Act 1970.

Scientific Research and Facilities No information

Principal Reference Material The above information is taken from the document 'Tasmanian wetlands nominated for inclusion on the List of Wetlands of International Importance' (April 1983), the Revised Draft Plan for Moulting Lagoon by S.A. Blackhall (August 1986), and from the Australian report to the Regina Conference.

Logan Lagoon Conservation Area

Location 40°10'S, 148°17'E. Situated in the south-eastern corner of Flinders Island which lies off the north-eastern coast of Tasmania in the Bass Strait.

Area 2,320ha

Degree of Protection The area has been administered since 6 August 1968 by the Tasmanian National Parks and Wildlife Service (P.O.Box 210, Sandy Bay, Tasmania 7005). Small areas previously under private ownership were recently purchased by the government preparatory to upgrading the status of the wetland to nature reserve. Designated as a Ramsar site on 16 November 1982.

Site Description The site comprises a landlocked system of coastal lagoons enclosed within the Logan Lagoon Wildlife Sanctuary. Waterfowl include coot, waders, ducks and black swan *Cygnus Atratus*.

International and National Importance The lagoon is an important resource for waterfowl migrating between the Australian mainland and Tasmania and regularly supports some 10,000 black swan, 5 duck species, 2,000 coots and 2,000 waders.

Changes in Ecological Character None reported

Management Practices No information

Scientific Research and Facilities No information

Principal Reference Material The above information is taken from the document 'Tasmanian wetlands nominated for inclusion on the List of Wetlands of International Importance' April 1983, and from the Australian report to the Montreux Conference 1990.

Sea Elephant Conservation Area

Location 39°45'S, 144°05'E. Situated on the east coast of King Island which lies to the north-west of Tasmania in the Bass Strait.

Area 1,730ha

Degree of Protection Small areas previously under private ownership have been purchased by the government and the status of the wetland has been upgraded to state reserve. The site is administered by the Tasmanian National Parks and Wildlife Service (P.O.Box 210, Sandy Bay, Tasmania 7005). Designated as a Ramsar site on 16 November 1982.

Site Description The area consists of a small estuary and associated samphire mud flats.

International and National Importance The area is a critical feeding ground for orange-bellied parrot *Neophema chrysogaster* during its annual migration between south-east Australia and Tasmania. Orange-bellied parrot is an endangered species whose total population is 100-200 individuals. Flocks of up to 40 juveniles are entirely dependent on samphire plants for food during migration and they roost in the trees surrounding the estuary.

Changes in Ecological Character None reported

Management Practices No information

Scientific Research and Facilities No information

Principal Reference Material The above information is taken from the document 'Tasmanian wetlands nominated for inclusion on the List of Wetlands of International Importance' April 1983, and the Australian report to the Montreux Conference 1990.

Additional reference:

Ivanovici, A.M. (ed.) (1984). Inventory of declared marine and estuarine protected areas in Australian waters. Australian National Parks and Wildlife Service. *Special Publications* 12(2): 320-321.

Pittwater-Orielton Lagoon

Location 42°47'S, 147°30'E. Situated at the mouth of the River Coal near the city of Hobart, Tasmania.

Area 2,920ha

Degree of Protection The area is at present crown land under the jurisdiction of the Lands Department. Under consideration for upgrading to a state reserve by the Tasmanian National Parks and Wildlife Service (P.O.Box 210, Sandy Bay, Tasmania 7005). Designated as a Ramsar site in November 1982.

Site Description The lagoon comprises an estuarine system with a larger area of saltmarsh and is an extensive and diverse wetland with abundant birdlife. The area often contains large populations of waterfowl and is considered to be a significant refuge in time of drought. The proposed nature reserve will greatly improve the protection of the saltmarsh plants and the communities in which they live.

International and National Importance The area is of world importance being the major summer feeding ground in Tasmania for migratory birds from as far as the Arctic Tundra. The area is one of the most important wader habitats in Tasmania particularly for eastern curlew *Numenius madagascariensis* and Pacific golden plover *Pluvialis fulva*. It has been estimated that the proposed reserve area holds about 15% of the non-breeding wading birds that spend the north hemisphere winter in Tasmania. Grey teal *Anas gibberifrons* and hoary-headed grebe *Podiceps poliocephalus* are nomadic species which are sometimes almost absent from Tasmania but following periods of mainland drought subsequent to good breeding seasons, hundreds of both species have been noted on Orielton Lagoon. The lagoon is also the only location in the Hobart area where mountain duck *Tadorna tadornoides* and great crested grebe *Podiceps cristatus* are regularly seen. Other fauna in the area include the largest concentration of the small endemic sea star *Patiriella vivipara*, one of the few viviparous sea stars known. Important plants include the beautiful silky wilsonia *Wilsonia humilis* which is not reserved elsewhere in Tasmania and is uncommon except near the mouth of the Coal River.

Changes in Ecological Character None reported

Management Practices No information

Scientific Research and Facilities No information

Principal Reference Material The above information is taken from the document 'Tasmanian wetlands nominated for inclusion on the List of Wetlands of International Importance' April 1983, and the Australian report to the Montreux Conference 1990.

Apsley Marshes

Location 41°56'S, 148°12'E. Situated in the east coast of Tasmania at the mouth of the Apsley River. Contiguous with Moulting Lagoon (Ramsar site).

Area 940ha

Degree of Protection Apsley Marshes are privately owned. Designated as a Ramsar site on 16 November 1982.

Site Description The marsh is one of the most floristically rich in Tasmania. Water from the marsh drains into the Wildlife Sanctuary area of Moulting Lagoon.

International and National Importance The marsh is an important feeding and nesting area for black swan *Cygnus atratus*. It also contains four plant species not yet reserved in Tasmania: *Glyceria australis*, *Junais holoschoenus*, *Lythrum salicaria* and *Polygonum strigosum*.

Changes in Ecological Character Drainage ditches constructed throughout the marsh have not been successful in preventing accumulation of standing water.

Management Practices No information

Scientific Research and Facilities No information

Principal Reference Material The above information is taken from the document 'Tasmanian wetlands nominated for inclusion on the List of Wetlands of International Importance' April 1983.

Additional References:

Blackhall, S.A. (1986). A survey to determine waterbird usage and conservation significance of selected Tasmanian wetlands. National Parks and Wildlife Service Tasmania, Occasional Paper No.14.

East Coast Cape Barren Island Lagoons

Location 40°22'S, 148°23'E. Situated on the east coast of Cape Barren Island which is in the Bass Strait off the north-east coast of Tasmania.

Area The 37 lagoons lie within an area of approximately 4,230ha.

Degree of Protection The area is owned by the Crown. Designated as a Ramsar site on 16 November 1982.

Site Description The site comprises mainly shallow saline lagoons in a sand dune system. The lagoons are free from invasion by exotic species and are in an area which has been described as a wilderness.

International and National Importance The lagoons are largely undisturbed and contain populations of *Centrolepis puluinata*, *C. aristata*, *Scirpus pungens*, *Myriophyllum muelleri*, *Wilsonia rotundifolia* and *Aphelia* sp. Some of these plant species do not occur in any other Tasmanian state reserve. Large numbers of ducks Anatidae have been recorded.

Changes in Ecological Character None reported

Management Practices No information

Scientific Research and Facilities Preliminary surveys of waterbirds have been carried out.

Principal Reference Material The above information is taken from the document 'Tasmanian wetlands nominated for inclusion on the List of Wetlands of International Importance' April 1983, and from the Australian report to the Montreux Conference 1990. Supplemented by:

Blackhall, S.A. (1986). A survey to determine waterbird usage and conservation significance of selected Tasmanian wetlands. National Parks and Wildlife Service, Tasmania. Occasional Paper No. 14.

Kirkpatrick, J.B. and Harwood, C.E. (1983). Conservation of Tasmanian macrophytic wetland vegetation. *Papers and proceedings of the Royal Society of Tasmania* 117: 5-20.

Flood Plain Lower Ringarooma River

Location 41°54'S, 147°56'E. Situated in the north-eastern corner of Tasmania.

Area 1,650ha

Degree of Protection The area is privately owned. Designated as a Ramsar site on 16 November 1982.

Site Description The wetland area is situated on the sandy flood plain of the Lower Ringarooma River and is surrounded by woodland used for rough grazing.

International and National Importance The flood plain contains populations of the plant species *Centipeda minima*, *Polygonum strigosum*, *Lythrum salicaria* and *Villarsia exaltata*.

Changes in Ecological Character None reported

Management Practices No information

Scientific Research and Facilities No information

Principal Reference Material The above information is taken from the document 'Tasmanian wetlands nominated for inclusion on the List of Wetlands of International Importance' April 1983.

Jocks Lagoon

Location 41°21'S, 148°18'E. Situated on the east coast of Tasmania near St Helens.

Area 70ha

Degree of Protection Part of the lagoon lies within a state Recreation Area and part is private freehold. Designated as a Ramsar site on 16 November 1982.

Site Description The wetland has developed in a swale behind coastal dunes. The catchment and wetland are unmodified.

International and National Importance Jocks Lagoon is one of the few wetlands in Tasmania containing the spectacular sedge *Baumea articulata*.

Changes in Ecological Character None reported

Management Practices No information

Scientific Research and Facilities No information

Principal Reference Material The above information is taken from the document 'Tasmanian wetlands nominated for inclusion on the List of Wetlands of International Importance' April 1983.

Northwestern corner of Lake Crescent

Location 42°09'S, 147°10'E. Tasmania.

Area 270ha

Degree of Protection The area is privately owned. Designated as a Ramsar site on 16 November 1982.

Site Description The wetland comprises a *Triglochin procera* - *Baumera arthrophylla* marsh.

International and National Importance The area is one of the three known localities of *Scirpus montiuagus* in Tasmania. Also present is *Amphibromus neesii* which is known from only three wetlands in the centre of the state. The area is also an important feeding and roosting area for waterfowl.

Changes in Ecological Character The water level is to be increased by 0.6m to increase water storage for irrigation. An environmental impact statement predicts minor changes to ecological succession, but important values will not be diminished (Report to 1990 Montreux Conference).

Management Practices When the edges of the marsh are dry they are used for grazing.

Scientific Research and Facilities A preliminary survey of waterbird usage has been carried out.

Principal Reference Material The above information is taken from the document 'Tasmanian wetlands nominated for inclusion on the List of Wetlands of International Importance' April 1983, from A Survey to Determine Waterbird Usage and Conservation Significance of Selected Tasmanian Wetlands by S.A. Blackhall, August 1986, and from the Australian report to the Montreux Conference 1990.

Little Waterhouse Lake

Location 40°52'S, 147°37'E. Situated in the north-eastern corner of Tasmania.

Area 90ha

Degree of Protection The lake is on Crown Land administered by the National Parks and Wildlife Service (P.O.Box 210, Sandy Bay, Tasmania 7005). Designated as a Ramsar site on 16 November 1982.

Site Description The wetland is a result of blocked drainage caused by the development of still mobile coastal dunes.

International and National Importance The lake has dense aquatic growth and a high species diversity.

Changes in Ecological Character None reported

Management Practices No information

Scientific Research and Facilities No information

Principal Reference Material The above information is taken from the document 'Tasmanian wetlands nominated for inclusion on the List of Wetlands of International Importance' April 1983.

Corner Inlet

Location 38°36'-38°55'S, 146°11'-146°53'E. Situated in southern Victoria between Wilsons Promontory and Yarram.

Area 51,500ha

Degree of Protection Most of the site is in either Corner Inlet Marine and Coastal Park or in Nooramunga Marine and Coastal Park. Both are managed by the Department of Conservation, Forests and Lands, primarily for wildlife conservation. The area between these two parks (13,500ha), which provides access to port facilities, is to be managed cooperatively by the Department and the Ports and Harbours Division so that wildlife values are considered. Designated as a Ramsar site on 15 December 1982.

Site Description The inlet is bounded to the west and north by saltmarsh, farmland, mangrove, native woodland and heathland and to the south by a chain of barrier islands and the northern shores of Wilsons Promontory National Park. At low tide, extensive areas of intertidal mudflats are exposed.

International and National Importance Corner Inlet regularly supports an estimated 29,000 waders (migratory and non-migratory) which represents 21.5% of the total wader population of Victoria and includes the majority of Victoria's population of less abundant wader species. The inlet's population of grey plover *Pluvialis squatarola*, bar-tailed godwit *Limosa lapponica*, red knot *Calidris canutus* and great knot *C. tenuirostris* represents the largest in southern Australia (greater than 1% of the flyway or biogeographical region according to the Royal Australasian Ornithologists Union (RAOU)). The inlet also supports an estimated 50% of the overwintering migratory waders in Victoria, breeding colonies of fairy tern *Sterna nereis*, crested tern *S. bergii*, caspian tern *S. caspia* and short-tailed shearwaters *Puffinus tenuirostris* and the largest populations yet found in Australia of eastern curlew *Numenius madagascariensis*. The southern area periodically supports up to 2,000 chestnut teal *Anas castanea* estimated by RAOU to be 12-15% of Victoria's population. The area is an important part of the flyway for birds moving between the mainland and Tasmania.

Changes in Ecological Character Part of the inlet is currently used as a port and servicing facility for offshore oil and natural gas exploration. The nearby Gelliondale Brown coal deposit may also require port facilities although the future utilisation of this coal resource has not been determined.

Management Practices The Conservation Authority of Victoria is currently preparing a management plan covering coastal public land, marine areas and islands. Recreation, amateur and professional fishing and conservation requirements are being considered. Studies are being made of geomorphic and geological significance, and of the role of seagrass beds as fish nursery areas. Commercial mariculture is to be permitted.

Scientific Research and Facilities A study of the roost sites and feeding areas for migratory waders has been completed. There is a laboratory in Wilsons Promontory National Park.

Principal Reference Material The above information is taken from the document 'Wetlands nominated by the State of Victoria, Australia for inclusion on the List of Wetlands of International Importance' April 1983, and the Australian report to the Montreux Conference 1990.

Barmah Forest

Location 35°50'-36°07'S, 144°56'-145°20'E. On the Murray River flood plain between Barmah and Tocumwal in northern Victoria.

Area 28,500ha

Degree of Protection Reserved as state forest and managed by the Department of Conservation, Forests and Lands. In December 1987, 7,000ha became a state park. Designated as a Ramsar site on 15 December 1982.

Site Description Barmah Forest has evolved on lands which were flooded under natural conditions in the spring months of most years but rarely flooded in the summer months. The dominant woodland is red gum *Eucalyptus camaldulensis*, and giant rush *Juncus ingens* and moira grass *Pseudoraphis spinescens* are dominant in untimbered areas.

International and National Importance After flood periods the forest is one of Victoria's largest waterfowl breeding areas. Sections of the area periodically support large breeding colonies of sacred ibis *Threskiornis aethiopica* and straw-necked ibis *T. spinicollis* and smaller breeding colonies of white egret *Egretta alba* and yellow spoonbill *Platalea flavipes*.

Changes in Ecological Character Since the construction of the first major upstream storage on the Murray River in 1934 (Hume Reservoir) the river flow has been increasingly regulated for water supply purposes. Consequently there has been a reduction in the frequency of spring flooding due to the retention of natural flow in storage and an increase in summer flooding due to the release of stored water for supply to river off-takes downstream of the forest. With the completion in 1983 of another major storage scheme (Dartmouth Reservoir) it is expected that effective spring flooding of Barmah Forest will occur on average about two years in five as against four years in five under natural conditions, meaning a 50% reduction in flooding frequency. More importantly, the intervals between successive forest floodings could be as long as ten years during severe protracted droughts. Grazing by stock and rabbits combined with changes in water regime have considerably altered the extent and species composition of reedbeds since settlement. The draft management plan (see below) attempts to address these issues.

Management Practices The forest is managed for timber production. Shooting of waterfowl is permitted during hunting seasons. Following designation as a state park, nature conservation and recreation have been given higher priority. A draft management plan has recently (1990) been prepared, addressing recreation, timber harvesting and conservation issues. A more

complete understanding of watering requirements has made it possible to maintain flooding around ibis breeding colonies. Barmah Forest will be included in a study to develop an integrated water supply strategy for the Murray River wetlands.

Scientific Research and Facilities No information

Principal Reference Material The above information is taken from the document 'Wetlands nominated by the State of Victoria, Australia for inclusion on the List of Wetlands of International Importance' April 1983, and the Australian report to the Montreux Conference 1990.

Additional reference:

Chesterfield, E.A. (1986). Changes in the vegetation of the river red gum forest at Barmah, Victoria. *Aust. For.* 49: 4-15.

Gunbower Forest

Location 35°39'-36°00'S, 144°08'-144°30'E. Situated in northern Victoria on the Murray River flood plain between Torrumbarry and Koondrook.

Area 19,450ha

Degree of Protection Currently reserved as state forest and managed by the Department of Conservation, Forests and Lands. The eastern area (9,712ha) is a proclaimed wildlife sanctuary. Designated as a Ramsar site on 15 December 1982.

Site Description Gunbower Forest is dominated by red gum *Eucalyptus camaldulensis* with mainly grassy understorey, and contains some small creeks and swamps mainly associated with old courses of the Murray River. Flood waters of the Murray River extend through almost the entire forest.

International and National Importance After flood periods the forest becomes a large waterfowl breeding area. Sections of the forest support breeding colonies of rufous night heron *Nycticorax caledonicus* and plumed egret *Egretta intermedia*.

Changes in Ecological Character Since the construction of the first major upstream storage on the Murray River in 1934 (Hume Reservoir), the river flow has been increasingly regulated for water supply purposes. Consequently, there has been a reduction in the frequency of spring flooding due to the retention of natural flow in storage and an increase in summer flooding due to the release of stored water for supply to river off-takes downstream of the forest. Thus this area is subject to the same hydrological interference as Barmah Forest but the degree of interference is less well known.

Management Practices The forest is managed for timber production and grazing is allowed. In the hunting season shooting is permitted. The area will benefit from the development of an integrated water strategy for high value wetlands along the Murray River. Before a hydrological

management plan can be completed, monitoring of flow rates and extent of flooding must be undertaken.

Scientific Research and Facilities No information

Principal Reference Material The above information is taken from the document 'Wetlands nominated by the State of Victoria, Australia for inclusion on the List of Wetlands of International Importance' April 1983, and the Australian report to the Montreux Conference 1990.

Hattah-Kulkyne Lakes

Location 34°38'-34°45'S, 142°23'-142°29'E. A system of lakes on the Chalka Creek system, an anabranch of the Murray River in the Hattah-Kulkyne National Park, north-western Victoria.

Area 1,018ha

Degree of Protection The lakes are in Hattah-Kulkyne National Park, managed by the Department of Conservation, Forests and Lands (240 Victoria Parade, East Melbourne, Victoria 3002). Designated as a Ramsar site on 15 December 1982.

Site Description The lakes are freshwater lakes linked to the Murray River by Chalka Creek. The system comprises: Lake Arawak 40ha, Lake Bitterang 73ha, Lake Brockie 28ha, Lake Bulla 40ha, Lake Cantala 101ha, Lake Hattah 61ha, Lake Konardin 121ha, Lake Kramen 24ha, Lake Lockie 141ha, Lake Moynpall 243ha, Lake Yelwell 81ha and Lake Yerang 65ha. Mean annual temperature is 23.5°C maximum and 9.6°C minimum. Mean annual rainfall 300mm. The riparian woodland surrounding the lakes is periodically flooded and is dominated by *Eucalyptus camaldulensis* or *E. largiflorens*.

International and National Importance After a flood period the lake system becomes a large breeding area for waterfowl including herons, egrets and spoonbills.

Changes in Ecological Character The flooding frequency along the Murray River has been reduced as a result of water regulation for irrigation. In the past the area was heavily grazed by sheep and cattle and is still grazed by rabbits. Feral cats and foxes are present and troublesome. Considerable timber extraction has occurred. Between December 1988 and March 1989, most of the lakes dried out for the first time in many years, but have since been refilled by extensive flooding of the Murray River.

Management Practices All livestock are now excluded from the area. It will benefit from the integrated watering strategy for the Murray River wetlands being developed in 1990.

Scientific Research and Facilities Current research includes projects on effects of feral cats on wildlife, effects of rabbits and kangaroos on vegetation regeneration, and a recent study of the effects of fire.

Principal Reference Material The above information is taken from the document 'Wetlands nominated by the State of Victoria, Australia for inclusion on the List of Wetlands of International Importance' April 1983, and the Australian report to the Montreux Conference 1990.

Kerang Wetlands

Location 35°30'-35°50'S, 143°42'-144°10'E. Situated in northern Victoria on the lower reaches of the Avoca River, Loddon River and Pyramid Creek near Kerang.

Area 9,172ha

Degree of Protection Some sections are reserved (or awaiting reservation) as state wildlife reserves, water supply reserves or salinity disposal reserves. The remaining area is Crown Land without specific reservation. Designated as a Ramsar site on 15 December 1982.

Site Description Kerang Wetlands form a system of lakes and swamps ranging in salinity from freshwater marshes to highly saline lakes. They, therefore, support varied vegetation associations on the margins and beds from river red gum and black box woodlands to canegrass, reedbeds and saltmarshes. The wetlands are adjacent to Gunbower Ramsar site. The system consists of: on the Lower Avoca River four state wildlife reserves: First Marsh, Second Marsh and Third Marsh with a total area of 2,405ha, and Lake Bael Bael 435ha; on the Lower Loddon River, Town Swamp 294ha, Back Swamp 21ha, eight water supply reserves, Kangaroo Lake Racecourse Lake 1,140ha, Lake Cullen 760ha, Middle Lake, Reedy Lake and Third Lake 680ha, Lake Charm 545ha, Little Lake Charm 160ha, salinity disposal reserves, Lake Tutchewop 920ha, Lake Kelly 142ha and Lake William 120ha, and one state wildlife reserve, Stevenson Swamp 90ha; and on Lower Pyramid Creek four state wildlife reserves, Johnson Swamp 485ha, Hird Swamp 405ha, Cemetery Swamp 300ha and Foster Swamp 270ha.

International and National Importance When most of the swamps and lakes are carrying water, the wetland system supports extremely large numbers of waterfowl, estimates ranging from 'hundreds of thousands' to 'in excess of 1 million' birds. Lake Cullen and Lake Tutchewop periodically support large numbers of freckled duck *Stictonetta naevosa* and, together with Kangaroo Lake, regularly support large numbers of blue-billed duck *Oxyura australis* with recorded flocks of up to 1,000. The largest colonies in Victoria of sacred ibis *Threskiornis aethiopica* and straw-necked ibis *T. spinicollis* currently occur in Kerang Wetlands, with Hird Swamp supporting an estimated 10,000 sacred ibis and 20,000 straw-necked ibis in 1979-80 and Middle Lake supporting an estimated 15,000 sacred ibis and 15,000 straw-necked ibis. These accounted for 73% of the breeding sacred ibis and 45% of the breeding straw-necked ibis in Victoria. Kerang Wetlands are an important wader habitat with an estimated population in 1982 of 11,000 comprising 9% of Victoria's estimated total, with over 9,000 occurring at Lake Tutchewop.

Changes in Ecological Character The lakes have been affected to varying degrees by the development of extensive water supply and drainage disposal systems which have generally resulted in more stable water levels than would occur under natural conditions. The effect on water quality has been beneficial for the lakes that are incorporated into water systems with

continual through flow (e.g. Kangaroo and Racecourse) but adverse for lakes used for drainage disposal (e.g. Lake Tutchewop) or now isolated from flushing by natural flood flows (e.g. Cullen). Adjacent irrigation development has raised saline water tables on some wetlands (e.g. Second Marsh) causing the death of trees. The modification of natural water courses for irrigation and drainage has interfered with some of the wetlands (e.g. Hird and Johnson Swamps) and created the management problem of achieving an alternative water supply to this wetland site. In the light of this situation, a sub-regional salinity plan has been completed for the lakes, and other sub-regions within the lakes' catchment have been investigated (1990). Ramsar nomination has helped in establishing recognition of conservation values.

Management Practices Resulting from the sub-regional salinity plan, a number of options are being considered to improve management of particular lakes, e.g. management of duration and frequency of flooding or mechanisms to reduce upward salinity trends.

Scientific Research and Facilities Studies have been carried out of tree death (due to prolonged flooding or salting), and a programme to monitor tree health has been set up.

Principal Reference Material The above information is taken from the document 'Wetlands nominated by the State of Victoria, Australia for inclusion on the List of Wetlands of International Importance' April 1983, and the Australian report to the Montreux Conference 1990.

Port Phillip Bay (western shoreline) and Bellarine Peninsula

Location 37°53'-38°15'S, 144°24'-144°48'E. Situated to the south-west of Melbourne, southern Victoria.

Area 7,000ha (minimum)

Degree of Protection The site includes over 18km of the western shoreline of Port Phillip Bay. The Melbourne Metropolitan Board of Works (MMBW) Werribee Sewage Farm is a proclaimed wildlife sanctuary, and part of the Point Cook coastline is managed by the MMBW as a metropolitan park. The Spit is a state wildlife reserve. Most of the remaining western shoreline of Port Phillip Bay is coastal reserve administered by the Department of Conservation, Forests and Lands. On the Bellarine Peninsula, Lake Connemara and Mud Islands are state wildlife reserves, and Swan Bay and an area of water surrounding Mud Islands are marine reserves. Designated as a Ramsar site on 15 December 1982.

Site Description The Ramsar site includes two areas: Port Phillip Bay (western shoreline) with coastline from Point Wilson to Lime Burners Bay (13km), coastline from Skeleton Creek to Point Cook (5km), The Spit State Wildlife Reserve (380ha) and Sewage Farm (retention ponds including Lake Borrie); and Bellarine Peninsula with Lake Connemara State Wildlife Reserve (3,100ha), Swan Bay Marine Reserve (2,800ha) and Mud Island Marine Reserve and State Wildlife Reserve (656ha).

International and National Importance Werribee Sewage Farm has a complex of sewage lagoons and irrigated paddocks adjoined by areas of intertidal mudflats, and periodically

supports tens of thousands of ducks, coots and swans. In 1982 the number of pink-eared duck *Malacorhynchus membranaceus* on the farm was estimated at over 15,000. Surveys of wader populations indicate that the western portion of Port Phillip Bay and Bellarine Peninsula support about 47% (approximately 38,500) of Victoria's wader population. The dead trees in Lake Borrie are important as nocturnal roosting sites for a large number of straw-necked ibis *Threskiornis spinicollis* and sacred ibis *T. aethiopica*, and also support the largest known breeding colony of pied cormorant *Phalacrocorax varius* (260 active nests). In winter the Spit and Swan Island support over 75% of the known world population of orange-bellied parrot *Neophema chrysogaster*.

Changes in Ecological Character Some adjacent areas are used for recreation and industry including an oil refinery.

Management Practices Hunting is permitted during open seasons in Lake Connevarre reserve. Amateur fishing and other water-based recreation occurs along suitable and accessible shorelines. A review of development options for Werribee has been undertaken (1990) and Ramsar listing has been important in gaining recognition of the conservation value of the sewage treatment lagoons. The need to manage both natural and artificial values has been recognised. Conservation management objectives for the overall development strategy have been established. At the Spit, access is regulated to reduce disturbance.

Scientific Research and Facilities Several studies commissioned (1990) in connection with measures to manage habitat for orange-bellied parrot.

Principal Reference Material The above information is taken from the document 'Wetlands nominated by the State of Victoria, Australia for inclusion on the List of Wetlands of International Importance' April 1983, and the Australian report to the Montreux Conference 1990.

Supplemented by:

Corrick, A.H. (1981). Wetlands of Victoria III; wetlands and waterbirds between Port Phillip Bay and Mount Emu Creek. *Proc. Roy. Soc. Vict.* 94(2): 69-87.

Lane, B.A., Schulz, M. and Wood, K.L. (1984). Birds of Port Phillip Bay. Coastal Unit Technical Report No.1. Ministry for planning and Environment.

Western Port

Location 38°12'-38°31'S, 145°02'-145°32'E. Southern Victoria, east of Port Phillip Bay Ramsar site.

Area 52,325ha

Degree of Protection An area of approximately 31,600ha has been recommended by the government as a wildlife management co-operative area under the Wildlife Act 1975 and this is awaiting proclamation. This will be jointly managed by the Ports and Harbours Division and the Department of Conservation, Forests and Lands (250 Victoria Parade, P.O.Box 41, East

Melbourne, Victoria 3002). A further 2,050ha of shoreline and small islands are reserved as a state wildlife reserve. Designated as a Ramsar site on 15 December 1982.

Site Description Western Port is a coastal bay.

International and National Importance Wader surveys indicate that Western Port supports about 10,000 waders, some 12% of Victoria's wader population. It is also estimated that Western Port periodically supports over 10,000 ducks and black swan *Cygnus atratus*.

Changes in Ecological Character Changes in the catchments inland, particularly associated with the drainage of extensive swamps immediately to the north of the bay have increased sedimentation in the bay.

Management Practices The western channel of Western Port is the major shipping channel servicing the port development in the Hastings-Crib Point area. The bay and many sections of the coastline are popular for water-sports. Commercial and amateur fishing are allowed. Major initiatives have been taken (1990) towards preparation of an area management plan, addressing recreation, tourism, coastal development and environmental issues.

Scientific Research and Facilities A study has been conducted (1990) into the management of rivers flowing into Western Port. As a result, an integrated management authority has been established and funds provided to meet the cost of some of the works required to improve catchment management.

Principal Reference Material The above information is taken from the document 'Wetlands nominated by the State of Victoria, Australia for inclusion on the List of Wetlands of International Importance' April 1983, and the Australian report to the Montreux Conference 1990.

Additional reference:

Ivanovici, A.M. (ed.) (1984). Inventory of declared marine and estuarine protected areas in Australian waters. Australian National Parks and Wildlife Service. *Special Publications* 12(2): 304.

Western District Lakes

Location 38°00'-38°20'S, 143°07'-143°55'E. Situated on the basalt plains of Western Victoria between Wichelsea and Camperdown.

Area 30,182ha

Degree of Protection Six of the lakes are state wildlife reserves (or awaiting proclamation as such) and are managed by the Department of Conservation, Forests and Lands (250 Victoria Parade, P.O.Box 41, East Melbourne, Victoria 3002). These are Lake Beeac (647ha), Lake Bookar (490ha), Lake Cundare (395ha), Lake Malingil (125ha), Lake Murdeduke (1500ha) and Lake Terangpom (275ha). The other three lakes, Lake Colongulac (1400ha), Lake Corangamite (23,000ha) and Lake Gnarpurt (2,350ha), are awaiting proclamation as lake reserves and are

managed by the Department of Crown Lands and Survey. Designated as a Ramsar site on 15 December 1982.

Site Description The lakes range from fresh (Terangpom and Colongulac) to highly saline (Beeac and Cundare). Although generally shallow (5m) they have little emergent vegetation but submerged aquatic vegetation is often abundant. They show considerable annual and seasonal changes in extent because of limited catchment areas and natural rainfall variation.

International and National Importance The lake system periodically supports tens of thousands of ducks, swans and coots, and is considered to be an important drought refuge for waterfowl. Lakes Beeac and Cundare support large numbers of banded stilt *Cladorhynchus leucocephalus*. Lake Murdeduke supports large numbers of migratory waders and several lakes are used by flocks of blue-billed duck *Oxyura australis*, musk duck *Biziura lobata* and grebe during winter. Lake Corangamite has an island used by breeding ibis, pelican and cormorant.

Changes in Ecological Character The land adjacent to the lakes is used for grazing and cropping. Inflows to Lake Corangamite have been limited by a diversion system.

Management Practices Hunting of game during open season is permitted on all but lakes Terangpom and Malingil. Commercial put and take eel fisheries operate on Lakes Murdeduke, Gnarpurt and Colongulac. Water-based recreation including fishing takes place at certain sites. A Landcare Group, comprising land holders from adjoining properties, has been established to fence Lake Bookar and to exclude grazing, thus allowig more rational management without additional land purchases.

Scientific Research and Facilities Regular monitoring of water bird populations, in particular pelican and ibis colonies, is conducted on lakes Corangamite, Murdeduke and Malingil.

Principal Reference Material The above information is taken from the document 'Wetlands nominated by the State of Victoria, Australia for inclusion on the List of Wetlands of International Importance' April 1983.

Supplemented by:

Corrick, A.H. (1981). Wetlands of Victoria III; wetlands and waterbirds between Port Phillip Bay and Mount Emu Creek. *Proc. Roy. Soc. Vict.* 94(2): 69-87.

Gippsland Lakes

Location 37°49'-38°12'S, 147°04'-148°08'E. Located in eastern Victoria, extending from the town of Sale eastwards to their sea outlet.

Area 43,046ha

Degree of Protection The entire site is at present under some sort of protection (as defined in /Site Description'). About 10,200ha have been recommended to be jointly managed by the Department of Conservation, Forests and Lands as a conservation area (exact nomenclature not

yet clarified) which will include all existing state wildlife reserves and several additional areas of Crown Land wetlands and foreshore. The Victorian Government has accepted and commenced implementation of this recommendation, although permanent reservation may take some time to be enacted. The remaining 32,800ha (approximately), although part of the Wetland of International Importance, will not be specifically reserved primarily for nature conservation. Cooperative management between the Department of Conservation and Lands and the Ports and Harbours Division will continue to promote conservation and protection of the aquatic ecosystems in this portion of the site. Designated as a Ramsar site on 15 December 1982.

Site Description Gippsland Lakes, with their associated swamps and morasses, are in contact with the sea and are bordered on the landward side by areas of National and Coastal Park, agricultural land, military firing range and urban areas. The site includes seven state wildlife reserves: Blond Bay 812ha, Clydebank Morass 640ha, Dowd Morass 1,500ha, Heart Morass 300ha, Jones Bay 110ha, Macleod Morass 520ha and Sale Common 308ha; five Crown Land reserves: Lake Bunga, Lake King, Lake Tyers, Lake Victoria and Lake Wellington: (total area 34,000ha), and Lake Reeve 4,856ha (part of Gippsland Lakes Coastal Park).

International and National Importance The site supports an estimated 40-50,000 waterfowl including ducks, swans and coots. Tucker Swamp on the edge of Lake Wellington supports one of only two regular breeding colonies in Victoria of pied cormorant *Phalacrocorax varius*. The lakes support an estimated 4% of Victoria's wader population. The permanence of the main lakes and the relatively regular flooding of the adjacent wetlands mean that this system is an important drought refuge.

Changes in Ecological Character Major man-made changes to this wetland system include: alteration to the ocean outlet (in 1899) with considerable alteration of the salinity regime and gradient of the lakes; reduction of flood frequencies and flooding duration of the major tributary rivers through water storage developments and water extraction; changes to water quality by pollution and catchment erosion; grazing; land drainage; and residential development and recreational pressures.

Management Practices Commercial and amateur fishing, power boating and sailing and hunting of game during open seasons are permitted although restrictions on power boating and hunting apply only in some areas. A strategy document has been developed (1990) outlining the type of development permitted in various locations. A paper has been published to develop the more specific issues which arise from the strategy. Public input will be sought before a proposed management plan is prepared. In the catchment, groups of landowners have been established, land care incentives created and plans drawn up to address such problems as erosion and restoration of degraded stream frontages.

Scientific Research and Facilities An environment education officer has been appointed (1990) to introduce schoolchildren to the issues involved in conservation and management of the lakes and their catchment.

Principal Reference Material The above information is taken from the document 'Wetlands nominated by the State of Victoria, Australia for inclusion on the List of Wetlands of International Importance' April 1983, and Australian report to the Groningen 1984 and Montreux 1990 conferences.

Supplemented by:

Corrick, A.H. and Norman, F.I. (1980). Wetlands of Victoria I; wetlands and waterbirds of the Snowy River and Gippsland Lakes catchment. *Proc. Roy. Soc. Vict.* 91(1): 1-15.

Corrick, A.H. (1981). Wetlands of Victoria II; wetlands and waterbirds of South Gippsland. *Proc. Roy. Soc. Vict.* 92(2): 187-200.

Ivanovici, A.M. (ed.) (1984). Inventory of declared marine and estuarine protected areas in Australian waters. Australian National Parks and Wildlife Service. *Special Publications* 12(2): 267-268.

Kinhill Stearns (1984). Gippsland Regional Environmental Study Overview report. *Environmental Studies Series* 407. Ministry for Conservation, Victoria.

Poore, C.C.B., Corrick, A.H. and Norman, F.I. (1979). Food of three waders in Lake Reeve, Victoria. *Emu*

Lake Albacutya

Location 35°46'S, 141°58'E. On the Wimmera River near Rainbow in north-west Victoria.

Area 10,700ha

Degree of Protection Reserved as a regional park and managed by the Department of Conservation, Forests and Lands (240 Victoria Parade, East Melbourne, Victoria 3002). Designated as a Ramsar site on 15 December 1982.

Site Description Intermittently filled by extreme floods of the Wimmera River. The lake had been dry for some time in 1990. Once filled, water remains for several years. The lake bed is fringed by red gum *Eucalyptus camaldulensis* and areas of the bed are colonised by *Acacia* spp. which are killed on reflooding. Wyperfeld National Park is adjacent to the north-west boundary.

International and National Importance Periodically supports over 10,000 ducks and swans and 10,000 coots. The lake has supported over 10% (300-400) of Victoria's population of freckled duck *Stictonetta naevosa* during the migration of this species into Victoria.

Changes in Ecological Character Long-term reduction in flooding frequency has been caused by water storage development and water extraction along the Wimmera River and tributaries.

Management Practices Hunting of legal game species during open seasons and fishing are permitted.

Scientific Research and Facilities A study of regional ground water has been undertaken (1990) as part of the Salt Action/Joint Action Programme, and will contribute to better understanding of ground water and salinity processes affecting the lake.

Principal Reference Material The above information is taken from the document 'Wetlands nominated by the State of Victoria, Australia for inclusion on the List of Wetlands of International Importance' April 1983, and the Australian report to the Montreux Conference 1990.

Towra Point Nature Reserve

Location 34°00'S, 151°10'E. Situated about 17km south of Sydney in New South Wales.

Area 281ha

Degree of Protection Towra Point Nature Reserve was established in 1982 under the New South Wales National Parks and Wildlife Act 1974. It is owned by the Crown and administered by the National Parks and Wildlife Service of New South Wales (PO Box N189, Grosvenor Street, Sydney NSW 2000). The marine habitat and tidal areas adjacent to the nature reserve are currently being considered for proclamation as an aquatic reserve by the Department of Agriculture, Division of Fisheries. Close collaboration has been established between the two authorities responsible for the nature reserve and aquatic reserve to ensure a uniform management approach. Designated as a Ramsar site on 21 February 1984.

Site Description The site comprises a low-lying promontory of Holocene sandy sediments on the northern side of Kurnell Peninsula in Botany Bay, and contains sandspits, sandbars, dunes, beaches and mudflats. It has a variety of habitats from seagrass beds, mangroves and saltmarshes to dune woodlands, *Casuarina* forest, small patches of littoral rainforest and sand dune grasslands. The wetland supports many invertebrates and birds and is a source of nutrients for fish nurseries.

International and National Importance The site is one of the few remaining areas of estuarine wetland in the Sydney region and is important for the survival of many bird species in this area. Particularly significant is the occurrence of 31 of the 66 species presently listed in the Japan-Australia Migratory Birds Agreement including 6.1% of the total population of the Pacific golden plover *Pluvialis fulva* and 1.1% of the total population of ruddy turnstone *Arenaria interpres*. Large populations of migratory waders stop to feed and rest here on their way to large summer feeding grounds in the south.

Changes in Ecological Character Present problems are litter, introduced animal and plant species, and open access to the reserve for trail bike riders, horseback riders and day visitors from boats. Some of the mangroves are dying back because of oil pollution. Future possible threats are proposed sandmining and marina construction adjacent to the reserve, and dredging and revetment wall construction which may alter wave movement in the bay (thus affecting the seagrass meadows adjacent to the reserve). An oil spill in Botany Bay (1987) was likely to have long-term effects on mangroves in part of the reserve.

Management Practices Efforts are being made to reduce the chance of further oil spills.

Scientific Research and Facilities Periodic counts of waterfowl by the National Parks and Wildlife Service.

Principal Reference Material The above information is taken from the document 'Wetlands nominated by the State of New South Wales, Australia for inclusion on the List of Wetlands of

International Importance' and from the national reports of Australia to the Groningen 1984 and Regina 1987 conferences. Supplemented by:

Australian Littoral Society (1977). *An investigation of management options for Towra Point, Botany Bay.* Australian National Parks and Wildlife Service, Canberra.

National Parks and Wildlife Service (1983). Results of the 1983 Summer National Wader Counts. Internal report.

Wetlands (1983). *Journal of the Coast and Wetlands Society* 3(1).

Ivanovici, A.M. (ed.) (1984). Inventory of declared marine and estuarine protected areas in Australian waters. Australian National Parks and Wildlife Service. *Special Publications* 12(2): 255-256.

Kooragang Nature Reserve

Location 32°51'S, 151°46'E. Situated in the Hunter River catchment area about 7km north of Stockton in New South Wales.

Area 2,206ha

Degree of Protection Kooragang Nature Reserve was established in 1983 under the New South Wales National Parks and Wildlife Act 1974. It is owned by the Crown and administered by the National Parks and Wildlife Service of New South Wales (PO Box N189, Grosvenor Street, Sydney NSW 2000). Designated as a Ramsar site on 21 February 1984.

Site Description The site comprises Fullerton Cove, the lower part of the Hunter River (North Channel) and part of the Hunter River Estuary including some surrounding land. The area is essentially a delta with islands and creeks. The vegetation consists of estuarine wetland communities including mangroves, saltmarshes, brackish and freshwater swamps and tidal mudflats.

International and National Importance 190 bird species have been recorded in the site area, representing 25% of the known species for Australia. The site is particularly important for migratory waders with 86% (5,020) of the total waders in the entire Hunter River wetland (5,816) counted here in 1983. 38 of the 66 species of migratory waders presently listed in the Japan-Australia Migratory Birds Agreement occur in the wetland including 14.6% of the total observed population of Pacific golden plover *Pluvialis fulva* and 5.9% of the eastern curlew *Numenius madagascariensis* population. Several uncommon waders have been recorded here including ringed plover *Charadrius hiaticula*, greater sand plover *Charadrius leschenaultii*, little curlew *Numenius minutus*, pectoral sandpiper *Calidris melanotos* and ruff *Philomachus pugnax*. The site is a productive estuarine wetland which represents a significant genetic pool for wetland species in the region and is also an important contributor of nutrients to the lower Hunter estuarine system.

Changes in Ecological Character The delta has already been extensively modified in parts by man. Present problems are introduced plants and animals and rubbish dumping. Future problems may arise if the water levels in the area west of Fullerton Cove are not actively

managed. Dieback of mangroves was reported in Fullerton Cove (1987), perhaps due to industrial activity and reclamation of saltmarshes outside the reserve.

Management Practices No information

Scientific Research and Facilities Periodic counts of waterfowl are undertaken by the National Parks and Wildlife Service.

Principal Reference Material The above information is taken from the document 'Wetlands nominated by the State of New South Wales, Australia for inclusion on the List of Wetlands of International Importance' and from the National Report of Australia to the Groningen 1984 and Regina 1987 conferences.

Additional references:

Hodges, S.L. (1980). *Kooragang Island/Fullerton Cove Proposed Nature Reserve Investigation Report*. Australian National Parks and Wildlife Service, Canberra.

National Parks and Wildlife Service (1983). Results of the 1983 Summer National Wader Counts. Internal report.

Ivanovici, A.M. (ed.) (1984). Inventory of declared marine and estuarine protected areas in Australian waters. Australian National Parks and Wildlife Service. *Special Publications* 12(2): 255-256.

The Coorong and Lakes Alexandrina and Albert Wetland

Location 35°18'-36°33'S, 138°46'-139°50'E. Situated in upper south-east South Australia, near the Murray River Mouth.

Area 140,500ha

Degree of Protection The area covers mostly Crown lands (water), a national park, and game reserves. Lakes Alexandrina and Albert are surrounded mainly by private property. The Coorong is surrounded mainly by a national park and game reserve established in 1966. Wetlands specifically included in the Ramsar site are: Lake Alexandrina including Tolderol, Mud Islands and Currensey Creek game reserves, otherwise mainly Crown lands (76,000ha); Lake Albert - mainly Crown lands (16,800ha); and Coorong - mainly covering Coorong National Park and Game Reserve, otherwise mainly Crown lands (47,700ha). Designated as a Ramsar site in November 1985.

Site Description The wetland consists of ocean beach with a spectacular coastal dune complex (Younghusband Peninsula), together with the mouth of the River Murray and associated lakes and estuaries. This combination provides a wide range of habitats from freshwater to hypersaline. Dunes east of the lagoons are covered by Mallee open-scrub/tall shrublands while Chenopod low shrubland, paperbark teatree open-scrub and herbland (sedges and rushes) occupy the mudflats ringing the Coorong. Mobile dunes and open scrub/heath are the principal features of Younghusband Peninsula. Several rare plants have been recorded including *Helichrysum*

paralium, *Hydrocotyle medicaginoides*, *H. pterocarpa*, *Melaleuca oraria*, *Sebaea albidiflora* and *Wilsonia backhousei*.

International and National Importance There is a diversity of species with waders and waterfowl predominating. The 1981 count of the Australasian Wader Studies Group of the Royal Australasian Ornithologists Union estimated the summer population of waders for the area at 122,000, compared with a South Australian population of 200,000 and an Australian population of 403,000. In 1982 it was estimated that there were 45,000 ducks in the area. Spectacular numbers of black swan *Cygnus atratus* are present at times and H.J. Frith estimated 50,000 in the Coorong in 1957. Typical numbers for the whole wetland would be in excess of 5,000. Approximately 2,000 Cape barren geese *Cereopsis novaehollandiae* normally summer within 1km of the wetland. The area also supports large numbers of grey teal *Anas gibberifrons*, Pacific black duck *A. superciliosa*, Australian shelduck *Tadorna tadornoides* and many other common species. Four species rare to South Australia have been recorded in the park: orange-bellied parrot *Neophema chrysogaster*, painted snipe *Rostratula benghalensis*, Terek sandpiper *Tringa terek* and grey-crowned babbler *Pomatostomus temporalis*. The Coorong is an important breeding area for pelican *Pelecanus conspicillatus*, crested tern *Sterna bergii* and fairy tern *S. nereis*, and Lake Alexandrina for egrets *Egretta* spp., ibises (Threskiornithinae), cormorants (Phalacrocoracidae) and rufous night heron *Nycticorax caledonicus*. It is also important as a feeding, breeding, spawning and nursery area for fish species of recreational and commercial interest. Whales have been sighted offshore from Younghusband Peninsula.

Changes in Ecological Character Most of the edge of lakes Alexandrina and Albert is used for farming, with tourist development in several areas. Development is otherwise restricted under the State Planning and other Acts, and most of the area is in its natural state. The natural water flow of the Coorong has been altered by drainage channels in the south-east of South Australia and by barrages on the Murray River.

Management Practices Recreational line and net fishing and boating are permitted activities; commercial net fishing under licence from the South Australia Department of Fisheries. A draft management plan has been released (1990). Its proposals will enhance management and retention of conservation values.

Scientific Research and Facilities In 1981 the Australasian Wader Studies Group of the Royal Australasian Ornithologists Union carried out a bird count for the area.

Principal Reference Material The above information is taken from the document 'Wetlands nominated by the State of South Australia, Australia for inclusion on the List of Wetlands of International Importance' November 1984, and the Australian report to the Montreux Conference 1990. Supplemented by:

Ivanovici, A.M. (ed.) (1984). Inventory of Declared Marine and Estuarine Protected Areas in Australian Waters. Australian National Parks and Wildlife Service *Special Publication* 12(2): 382-382.

Additional references:

CSIRO Division of Land Use Research (1977). Environments of South Australia, Province 1, South East. Canberra. Pp. 28-31.

CSIRO Division of Land Use Research (1977). Environments of South Australia, Province 2, Murray Mallee. Canberra. Pp. 24-27.

- Gilbertson, D.D, and Foale, M.R. (Eds) (1977).** The Southern Coorong and lower Younghusband Peninsula of South Australia. Nature Conservation Society of South Australia Report, Adelaide, SA.
- Nature Conservation Society of S.A. Inc. (1977).** The Southern Coorong and Lower Younghusband Peninsula of South Australia. N.C.S., South Australia.
- Noye, J. (Ed.) (1975).** The Coorong. Dept. of Adult Education, University of Adelaide Publication No. 39.
- Paton, P. (1982).** Biota of the Coorong - a Study for the Cardwell Buckingham Committee. SA Dept. Environment and Planning Publ. No. 55. 68 pp

Bool and Hacks Lagoon

Location 37°06'-37°10'S, 140°39'-140°44'E. Situated in lower south-east South Australia

Area 3,200ha

Degree of Protection The area is a permanent reserve within Bool Lagoon Game Reserve (3,022ha) and Hacks Lagoon Conservation Park (249ha). Designated as a Ramsar site in November 1985.

Site Description No information

International and National Importance The lagoons are an outstanding area for a wide range of waterbirds. 79 species of waterbirds have been recorded, with 48 of these known to have bred there. It is particularly important for waterfowl, and common species include Pacific black duck *Anas superciliosa* and grey teal *A. gibberifrons*. Population counts have proven difficult because of vegetation cover. However, typical duck numbers are believed to vary between 15,000 and 50,000, and black swan numbers between 1,000 and 5,000. Straw-necked ibis *Threskiornis spinicollis* and sacred ibis *T. aethiopicus* are common in the nesting season and numbers often exceed 50,000. A wide range of waders and nine rare species, including egret *Egretta intermedia* and little bittern *Ixobrychus minutus*, also occurs in the area.

Changes in Ecological Character The land immediately surrounding the lagoons is permanent reserve, and this in turn is bordered by sheep and cereal growing areas. Bool Lagoon Game Reserve is usually opened for duck hunting on several mornings each year, but this is dependent upon suitable seasonal conditions. The presence of rare or nesting birds may also affect the decision to open the reserve to hunters.

Management Practices The wetland is artificially manipulated to act as an equalisation basin for the control of flood waters draining off surrounding farmland. A management plan has been prepared (1990) for Bool Lagoon.

Scientific Research and Facilities No information

Principal Reference Material The above information is taken from the document 'Wetlands nominated by the state of South Australia, Australia for inclusion on the List of Wetlands of

International Importance' November 1984, and the Australian report to the Montreux Conference 1990.

Macquarie Marshes Nature Reserve

Location 30°45'S, 147°33'E. On the lower Macquarie River between 85km and 125km north of Warren, New South Wales.

Area 18,200ha

Degree of Protection The marshes have long been recognised as a major wildlife habitat and designated a bird and animal sanctuary before 1955 when they became a faunal reserve. An area of 18,000ha was established as a nature reserve on 22 January 1971 and dedicated under the New South Wales National Parks and Wildlife Act 1974 with by-laws under section 155. It is government owned and managed by the National Parks and Wildlife Service of New South Wales. Designated a Ramsar site in August 1986.

Site Description Macquarie Marshes as a whole cover 148,000ha and consist of two areas of wetland. The part within the Ramsar site is a shallow wetland seasonally inundated by flood flows in the Macquarie River, which are now artificially controlled. Wetland habitat types include red gum woodland, lignum shrubland, reedswamp and meadow grassland typical of wetlands of the semi-arid zone of Australia.

International and National Importance The area contains a large sample of wetland types of the semi-arid zone of Australia and is the largest reserved area of this type in New South Wales. It is particularly important as a breeding site for colonially nesting herons, egrets, ibises and spoonbills, and is notable for large numbers of breeding straw-necked ibis *Threskiornis spinicollis* and significant numbers of breeding plumed egret *Egretta intermedia*, rufous night heron *Nycticorax caledonicus* and glossy ibis *Plegadis falcinellus*. Other species occurring include pacific heron *Ardea pacifica*, white-faced heron *A. novaehollandiae*, great white egret *Egretta alba*, little egret *E. garzetta*, sacred ibis *Threskiornis aethiopicus*, royal spoonbill *Platalea regia*, yellow-billed spoonbill *P. flavipes*, black swan *Cygnus atratus*, black duck *Anas superciliosa*, grey teal *A. gibberifrons*, shoveler *A. rhynchotis* and whiskered tern *Chlidonias hybrida*.

Changes in Ecological Character None reported

Management Practices Management of flows into the Macquarie River, a regulated stream, ensures that the area receives an adequate and appropriate water regime. This is now satisfactorily set out in a water regulation plan. An irrigation area, supplied by Burrendong Dam, extends almost to the marshes and there are individual irrigation blocks near and downstream of the reserve. Because of potential conflict between agriculture and nature conservation, in 1983 the Water Resources Commission and National Parks and Wildlife Service jointly prepared a draft plan of management for works in the marshes. Public submissions on the plan were considered by a review committee representing both irrigation and conservation interests as well as the Service and the Commission. The New South Wales government subsequently decided

not to proceed with proposed irrigation works which may have had a deleterious effect on the wetland habitat and wildlife. Work was proceeding in 1984 towards the final Plan of Management. There is also control of feral pigs, noxious plants and of agricultural development, particularly irrigation, on surrounding lands. Cattle grazing is presently permitted on the reserve, the surrounding areas being used for cattle and sheep grazing and cropping.

Scientific Research and Facilities No information

Principal Reference Material Documents supplied by the Government of New South Wales at the time of designation.

Coongie Lakes

Location 26°18'-28°36'S, 139°00'-141°00'E. Situated in north-east South Australia, near the New South Wales and Queensland borders, 600km south-east of Port Augusta.

Area 1,980,000ha (approximately)

Degree of Protection The area covers Crown lands (Pastoral Lease) over which licences to drill for gas and oil have been issued. All of the Coongie Lakes complex and a major segment of Cooper Creek were placed under national park and wildlife reserve status as of December 1989. This allows for multiple use and contains a significant portion of the Ramsar site which was added to the Ramsar List on 15 June 1987.

Site Description The site includes a large area of Strzelecki Desert, lakes Coongie, Marroocoolcannie, Marrooculchanie, Tontoowaranie, Goyder, Marra Dibba Dibba, Apanburra, Hope, and others. A section of Cooper Creek and its branches are also included. Cooper Creek has a large catchment in the high rainfall region of central Queensland and carries water into the wetland during winter. Water rarely moves further south to reach Lake Eyre except during major floods when the creek and its tributaries may spread across the floodplain to a width of 30km. Many lakes and waterholes rarely fill, others hold water for a limited period following flooding and others, such as Lake Coongie, are almost permanent. A major flood heralds a period of flourishing plant growth and an influx of wildlife to the wetland. A characteristic feature of this area are the gibber plains, consisting of a thin layer of pebbles on about 1m of pebble-free desert soil, which in turn lies on pebbles similar to those on the surface. The plains are thought to be formed by sands and clays being washed down by rainwater and gradually forcing the pebbles to the surface. The tightly-packed pebbles, or gibbers, provide a protective cover for the soft desert soils.

One-third of all plants in the Cooper Basin are perennials, such as red gum *Eucalyptus camaldulensis* and coolibahs. The remaining two-thirds are ephemerals lasting from a few weeks to several months.

The wetland contains an undescribed and probably endemic species of freshwater tortoise *Emydura* sp. Little is known about this tortoise but it appears to be confined to the Coongie

Lakes area. During drought large numbers are concentrated in the permanent water holes and during floods they spread widely through the wetland.

International and National Importance Large numbers of waterfowl congregate to feed and many to breed during major flood periods. When floodwaters retreat, waterfowl such as freckled duck *Stictonetta naevosa*, pink-eared duck *Malacorhynchus membranaceus* and black-tailed native-hen *Gallinula ventralis* disperse widely through southern and eastern Australia. The range of water conditions affects the numbers of birds throughout the site. Frog *Litoria latopalmata*, a rare species in South Australia, has also been recorded in the wetland.

Changes in Ecological Character The area is affected primarily by cattle grazing and oil and gas production. Even with an average of only one per sq.km, cattle destroy the dune-stabilising vegetation around waterholes. Seismic surveying crews damage the protective surface of the land by cutting 8m-wide paths for vibroseis and recording trucks. These "shot-lines" can result in increased erosion. Rabbits are a major problem and can badly damage arid zone vegetation.

Management Practices There is some coverage of the area by National Park and Wildlife Service rangers. However, the site is so large that control is difficult. The area is becoming increasingly important for recreation and tourism as access roads are upgraded. A draft management plan has been released (1990). Its proposals will enhance management and retention of conservation values.

Scientific Research and Facilities A biological survey of the Cooper Creek Environmental Association was carried out by the Department of Environment and Planning in 1984 and the Australian Geographic is sponsoring a 12-month study of the Coongie Lakes.

Principal Reference Material The above information was supplied by the South Australian government at the time of designation, and in the Australian report for the Montreux Conference 1990.

"Riverland"

Location 33°53'-34°11'SS, 140°42'-141°00'E. Situated adjacent to the Murray River between Renmark and the Victoria and New South Wales borders.

Area 30,600ha (approximately)

Degree of Protection The area consists largely of government land held by various departments, mainly the Engineering and Water Supply Department and Woods and Forests Department. Some of this land is leased for pastoral and other purposes, while a small area is private property. Negotiations are underway to dedicate much of the Ramsar site as a national park. The site was added to the Ramsar List on 23 September 1987.

Site Description The wetland consists of swamp surrounding a stretch of the Murray River, specifically Coombool Swamp, Lake Limbra, Lake Nerreti, Ral Ral Creek, Woolenook Bends, Horseshoe Lagoon and Murray River backwaters. The area is well-known for the magnificent

red gum *Eucalyptus camaldulensis* forest which borders the creeks and backwaters. The red gums are a unique eucalypt specifically adapted to inland riparian habitats where regular flooding occurs. The red gum forest reduces soil erosion, reduces evaporation rates and provides abundant nesting, feeding and sheltering habitat for a range of waterbirds and other native fauna.

International and National Importance These wetlands are part of the Lower Murray River system, which is one of the major centres for breeding waterfowl in south-eastern Australia. The site is internationally important for its population of freckled duck *Stictonetta naevosa* and darter *Anhinga novaehollandiae*.

Changes in Ecological Character The Chowilla anabranch area of the wetland complex has been investigated by the Engineering and Water Supply Department and is found to be the largest single contributor of salt to the Murray River in South Australia. A project has been proposed to regulate the flows in the eastern anabranch creeks (Salt, Hypuma and Punkah creeks), to control saline water flow into the Murray River.

Management Practices The area is used for grazing. However, tourism is the most important industry using the wetland. Small boats are used for fishing, touring and camping, and large numbers of house-boats ply the river. Four-wheel drive and conventional vehicles are widely used for fishing and camping along the river. The South Australian Engineering and Water Supply Department has the right to manage salinity and water levels in the Murray River.

Scientific Research and Facilities No information

Principal Reference Material The above information was supplied by the South Australian government at the time of designation, and in the Australian report to the Montreux Conference 1990.

Kakadu National Park (Stage II)

Location 12°04'-12°55'S, 131°52'-132°56'E. Situated about 220km east of Darwin, Northern Territory.

Area 692,940ha (approx.)

Degree of Protection Proclaimed as national park under Section 7 of the National Parks and Wildlife Conservation Act 1975. The area was incorporated within Kakadu National Park on 20 December 1985. Approximately 93% of the land is vested in the Director of National Parks and Wildlife, under Section 7 of the 1975 Act. Approximately 7% of Stage 2 is Aboriginal land currently managed by the Director for continued use as a national park. Designated as a Ramsar site on 15 September 1989. Stage II immediately adjoins Stage I of Kakadu National Park which was designated as a Ramsar site in June 1980 and as a World Heritage site in October 1981. Stage II was included on the World Heritage list in December 1987.

Site Description In many ways Stage II complements Stage I by containing features not represented, or poorly represented in Stage I, including two offshore islands, Barron and Field.

Stage II contains the downstream sections of important catchments which make up Stage I and has much more extensive areas of wetlands. Stage II includes most of the catchments of the Wildman and West Alligator rivers, and the downstream sections of the important catchments of the South Alligator River and Magela Creek (a major tributary of the East Alligator River). Stage II is drained by a vast network of creeks which in the monsoon season carry huge volumes of water, combining with the outflow from Stage I to inundate extensive subcoastal flood plains and swamps. Five of the eight major categories of Australian wetlands identified by Briggs (1981) are represented in Stage II and comprise swamp forest, swamp woodlands, sedge lands, swamp grasslands and swamp herblands. While these types represent broad ecosystems, they each contain a diverse array of habitats.

Four major landscape categories are found in Stage II, namely coastal swamps, tidal flats, flood plains and lowland hills. A variety of habitat types occurs within these landscape categories, ranging from tidal flats, subcoastal flood plains and backwater swamps to woodlands, open forest and isolated pockets of coastal rain forest. *Coastal swamps*: the coastal downstream tidal estuarine landscapes are generally flat, with fringing mangrove vegetation and extensive mudbanks offshore. A significant feature of this coastal environment is the occurrence of old beach dune ridges covered by semi-deciduous monsoon rain forest. Mangroves play an important role in stabilising the coastline and as a fauna feeding and breeding ground. Of the 29 species of mangrove in the Australian region, there are as many as 22 in these mangrove forests. The Wildman and West Alligator rivers support extensive, wide bands of mangroves, while the South and East Alligator rivers support generally narrow bands. Extensive stands of mangroves occur on Field Island (Heatwole and Saenger, 1983). Stage II contains 23 times the area of mangrove contained in Stage I. The coastal habitats in Stage II provide an important habitat for a diverse range of marine animals including many species of fish and crustaceans. These habitats also provide important nesting sites for birds and provide habitat for several species of turtle, flatback *Chelonia depressa*, green turtle *C. mydas*, hawksbill turtle *Eretmochelys imbricata* and Pacific Ridley *Lepidochelys olivacea* (Ovington, 1986). *Tidal flats*: inland are extensive tidal flats formed of sea and river deposited alluvial mud. Few plants can withstand the tidal flat combination of high salinity and extremes of dryness and flooding. A distinct vegetation zonation is associated with the decrease in salinity and flooding away from the coast and estuaries. Low vegetation characterised by samphire *Arthrocnemum leiostachyum* occurs in the innermost inland zone. Stage II contains 13 times the area of samphire contained in Stage I. *Flood plains*: landward of the tidal flats the landscape merges into broad freshwater flood plains with a complex network of billabongs (ox-bow lakes), creeks and rivers and associated paperbark *Melaleuca* spp. forest associated with swamps, rivers and billabongs on the flood plain. The largest flood plains occur in Stage II along the South Alligator River in Kakadu National Park and Magela Creek, which are fed by large catchment areas draining the lowland hill country in Stage I and the Arnhem Land Plateau to the south and east. Stage II contains four times the area of flood plain sedgeland contained in Stage I. Those areas are also an important dry season refuge for many birds. The extensive paperbark forests of Stage II are important wet season habitat for many woodland and open forest birds. *Lowlands*: consist mainly of undulating plains with some laterite hills and ridges. This landscape is largely free of flooding, and acts as the catchment for the vast wetlands downstream and extends southwards from the sea and the flood plains of the major rivers. In places, where fire rarely penetrates, pockets of dense monsoon rain forest persist.

International and National Importance The avifauna is rich and varied, comprising an estimated one-third of Australia's bird species. There is a wide diversity of mammals, reptiles,

amphibians and invertebrates. It provides suitable habitat for some of Australia's endangered animals, such as false water rat *Xeromys myiodes*. It provides habitat for a wide range of rare or endemic species of flora and fauna. Skink *Ctenotus kurnbudj*, gecko *Diplodactylus occultus* and an undescribed species of marsupial mouse *Sminthopsis* sp. are restricted to the western part of Stage II. The flora and fauna have scientifically important affinities with those of South-east Asia and Papua New Guinea.

The wetlands form the most important part of one of Australia's major wetland regions and are frequented by very large numbers of a wide variety of waterfowl. At certain times, the wetlands are an important wintering habitat for non-breeding Asiatic waders and dry season refuge for many local species. The wetlands support a wide variety and large number of bird species. Ducks, geese and waders all occur in profusion. Thirty-five species of waders have been recorded in the area, many of these being winter migrants from the northern hemisphere. Many migrating birds first contact the Australian continent in the Stage II area. In 1984, estimated numbers of individual waterfowl populating Boggy Plains of Stage II were in excess of 2 million, of which 85% were magpie geese *Anseranas semipalmata*. Kakadu National Park (Stage II) contains important dry season refuge habitats in the Northern Territory for magpie geese.

Changes in Ecological Character Feral Asian water buffalo *Bubalus bubalis* and pig *Sus scrofa* are the greatest threats to the natural environment. The weed *Mimosa pigra* has invaded and substantially colonised flood plains throughout the whole region. The Ranger Uranium Mine in the Magela Creek catchment is a potential threat to areas downstream.

Management Practices Buffalo numbers have already been substantially reduced and further reduction of numbers will result from continued management. The environmental responses to buffalo control in Stage II, proclaimed five years earlier, provide evidence that once buffalo numbers are reduced sufficiently, natural regeneration of vegetation is spectacular. Intensive eradication of *Mimosa pigra* and surveillance measures have kept the park virtually free of this menace. Intensive efforts are needed to destroy any regeneration from seed or new infestation, but the flood plains of Kakadu National Park may soon become the only ones free of the weed between Darwin and Arnhem Land. Stringent environmental controls on Ranger Uranium Mine have prevented adverse effects to the park.

Scientific Research and Facilities No information

Principal Reference Material The above information is taken from documents supplied by the Government of Australia at the time of designation.

Austria

Area 83,855 sq.km

Population 7,575,732 (1987 estimate)

Summary of Wetland Situation Much of Austria is mountainous, the Alps gradually getting lower to the east until they meet the Pannonian plains south of Vienna, where one of the most interesting wetlands of Central Europe is located, comprising the Neusiedler See and the adjacent pond area of Seewinkel. The waters of both are alkaline and extremely rich in animal and plant species. The wetlands form one of the most important breeding and moulting areas for waterfowl in Central Europe, while huge concentrations of ducks and waders can be encountered during the migration season. Both the Neusiedler See and the Seewinkel lakes have been the subject of a considerable number of limnological studies.

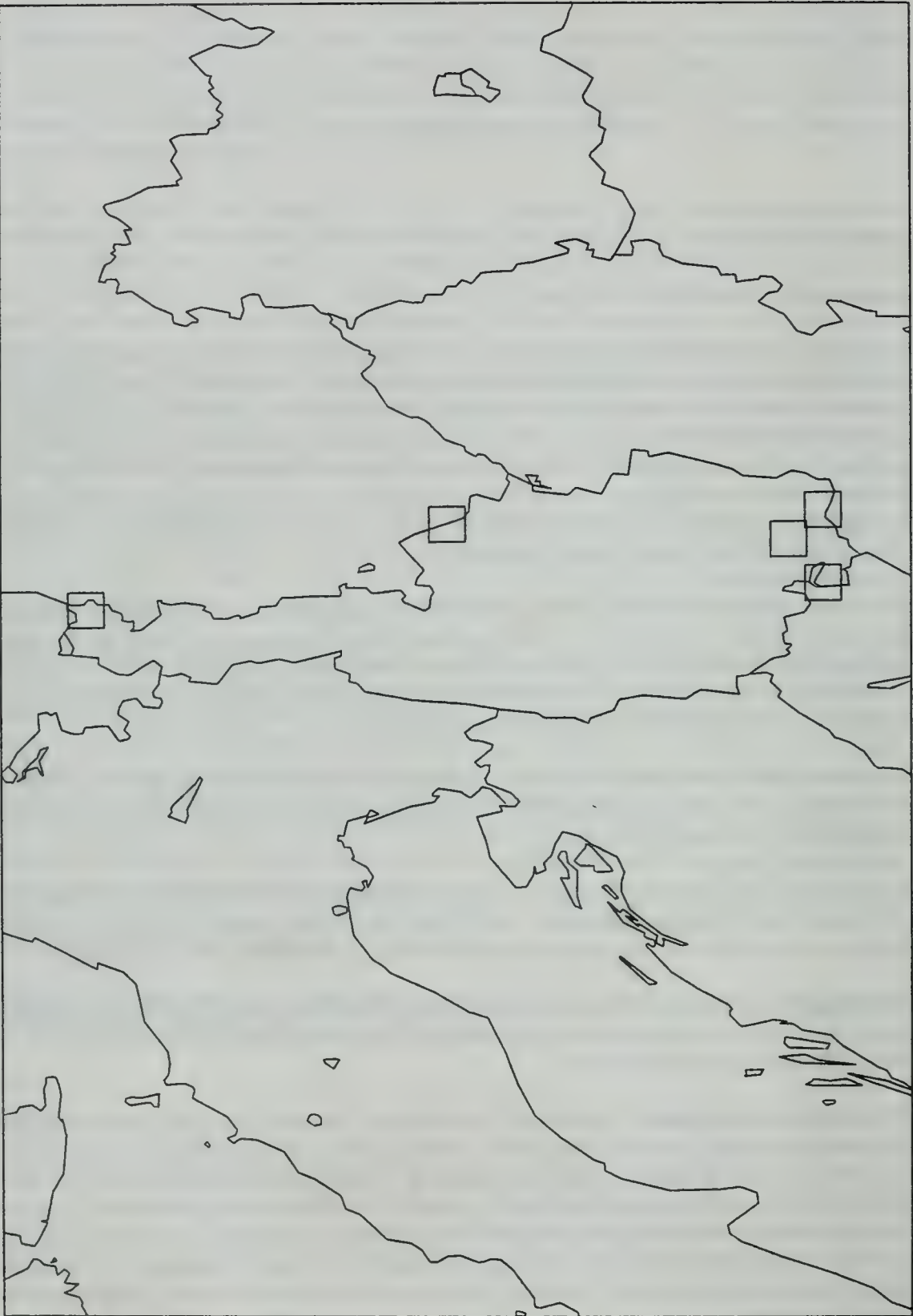
The river March along the border with Czechoslovakia has large stretches of intact riverine forest and wet meadows. A large WWF reserve is situated near Marchegg, protecting the breeding colony of the eastern race of cormorant *Phalacrocorax carbo*, and night heron *Nycticorax nycticorax*. Conservation measures should maintain the original character of this unique area although they do not exclude limited hunting and fishing.

A small reserve, the Hagenauer Bucht, now extended, is situated in the valley of the Lower Inn, on the border with the Federal Republic of Germany. It forms an entity with the reservoirs protected by West German territory.

A fourth site of international importance is situated in the Rhine Delta near Bregenz, where the river enters Lake Constanx. An area of 1,400ha was set aside as a reserve as long ago as 1942. It has now been given the status of a nature reserve and it is hoped that it will be enlarged.

A number of mountain lakes and peat-bogs are clearly of more than national interest while several others are of major limnological interest and in several cases provide excellent examples of successive stages of eutrophication.

Protected Areas Legislation The Federal Parliament and Federal Government are responsible for water and forestry but the governments of the Länder (states) are responsible for nature conservation, hunting, fishing and physical planning. A special ordinance is issued by the state governments for the establishment of each protected area which designates boundaries and restrictions on the use of the area. Nature conservation in Austria is very similar to that in Germany, and the principal legal categories of protected area include landscape protection areas, national parks and nature parks. However, there are wide differences in the way different states use the categories.



Ramsar Sites in Austria

Protected Areas Administration The state governments are responsible for protected area administration but expert advice and assistance is available from government funded institutes and museums. The Austrian Association for Nature Conservation (Österreichischer Naturschutzbund) also forms a vital national link and has an important role in the 'well-being' of reserves. WWF-Austria also owns reserves, some in the Neusiedlersee area.

Sites designated under the Convention Accession 16 December 1982, with five sites listed at accession.

The Neusiedlersee region, including the lakes in Seewinkel
 Donau-March-Auen
 Untere Lobau
 Stauseen am Unteren Inn
 Rheindelta, Bodensee

Government body responsible for administration of the Convention Bundesministerium für Umwelt, Jugend und Familie, Stubenring 1, Regierungsgebäude 1010 Wien; Department for Conservation of Nature, Amt der Stmk. Landesregierung, Rechtsabteilung 6, Karmeliterplatz 2, 8010 Graz.

The Neusiedlersee region, including the lakes in Seewinkel

Location 47°45'N, 16°50'E. Situated about 50km south-east of Vienna in the state of Burgenland.

Area 57,000-62,500ha. The area can be divided as follows: Neusiedlersee (Austrian part) about 25,000-30,000ha; Seewinkel about 30,000ha (including: Unterer Stinkersee, Illmitzer Kirchsee, Oberer Stinkersee and Illmitzer Zicksee 447ha, Lange Lacke 312ha, Wörthen Lacke 150ha, Fuchslotlacke 82ha and Neubruchlacke 47ha; and Hansag about 2,500ha).

Degree of Protection Most of the site is privately owned. The whole area is a landscape protection area and includes a number of nature reserves (1,000ha). The Austrian part of the site was accepted as a biosphere reserve (25,000ha) in January 1977. Designated as a Ramsar site in December 1982.

Site Description Neusiedlersee is the largest salt lake in Europe and the most western of a series of lakes extending through Hungary to the Soviet Union. It is alkaline and mesotrophic with an average depth of 1m and low transparency. About half the lake is covered by reedbeds of *Phragmites australis* extending 6km in places into the lake. Vegetation of the open water includes spiked water milfoil *Myriophyllum spicatum* and fennel pondweed *Potamogeton pectinatus*. Much of surrounding land is cultivated. The adjacent area of Seewinkel contains several smaller mostly alkaline lakes which lie in the western extremity of the puszta - dry grasslands thought to have evolved from the original forest cover subsequently destroyed by grazing. Alkalinity in the area is due to carbonates and sulphates in the groundwater which rises to the surface through fissures. The smaller lakes frequently dry out in summer (Neusiedlersee dried out in 1865 and 1872). The water table still fluctuates but levels are now regulated by

sluices in the Einser Canal. The area is limited in the north-west by the Leitha Mountains with broadleaf forest and in the south-east by the boggy 'hansag' with acid meadows. The site contains a mosaic of many of the typical habitats of south-east Europe.

International and National Importance The site has a rich birdlife with 300 recorded species including 130 nesting. Species nesting in the reedbeds of Neusiedlersee are purple heron *Ardea purpurea*, great white egret *Egretta alba*, spoonbill *Platalea leucorodia*, bittern *Botaurus stellaris*, little bittern *Ixobrychus minutus*, marsh harrier *Circus aeruginosus* (130 pairs), water rail *Rallus aquaticus* (10,000 pairs), bluethroat *Luscinia svecica*, bearded tit *Panurus biarmicus* and penduline tit *Remiz pendulinus*. Breeding species in the Seewinkel area include white stork *Ciconia ciconia*, great bustard *Otis tarda*, avocet *Recurvirostrata avosetta*, curlew *Numenius arquata*, stone curlew *Burhinus oedipnemos*, black-tailed godwit *Limosa limosa*, greylag goose *Anser anser*, garganey *Anas querquedula* and ferruginous duck *Aythya nyroca*. It is an important moulting ground for greylag goose and some duck species, including gadwall *Anas strepera*, teal *A. crecca* and shoveler *A. clypeata*. Large numbers of visiting migrant waterfowl in autumn and spring include 10,000 bean goose *Anser fabalis*, up to 30,000 white-fronted goose *A. albi-frons*, 60,000 greylag goose and 10,000 ducks. Birds of prey such as white-tailed eagle *Haliaeetus albicilla*, Imperial eagle *Aquila heliaca* and lesser spotted eagle *A. pomarina* occur here more regularly than elsewhere in Europe.

Changes in Ecological Character There is increasing disturbance from agriculture, hunting and tourism. In the Seewinkel area there is some ploughing and establishment of vineyards with extension of some existing vineyards to the edge of the ponds, and intensive use of pesticides on the vineyards. An intensive carp breeding enterprise in the reserve is disturbing the ecological balance of the pools. In only two relatively small areas is there no shooting - a small area on the Neusiedlersee and the water area of Lange Lacke with buffer zone. Many areas have been developed for tourism and the area of buildings in and near the reedbeds has doubled in the last decade. The population of great bustard is decreasing.

Management Practices Hunting is permitted over much of the area and where prohibited, compensation is paid to owners. A subsidy from WWF Austria has recently been introduced to encourage maintenance of cattle on the puszta grasslands as the ecology of this area is dependent on grazing.

Scientific Research and Facilities Ecological and systematic research in Neusiedlersee and Seewinkel have included studies of the macrophytes, plankton and bottom fauna. There is a biological station near Illmitz.

Principal Reference Material The above information is taken from documents supplied by the Government of Austria at the time of designation in 1982. Supplemented by:

- Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland.
- Duffey, E. (1982). *National Parks and Reserves of Western Europe*. Macdonald and Co., London.
- Scott, D.A. (1980). A preliminary inventory of wetlands of international importance for waterfowl in west Europe and northwest Africa. *IWRB Special Publication No. 2*.
- Additional references:
- Festetics, A. and Leisler, B. (1970). *Ökologische Probleme der Vögel des Neusiedlerseegebietes, besonders des WWF Reservates Seewinkel*. (III Teil: *Möwen und Watvogel* IV. Teil Sumpf- und Feldvogel).

- Guglia, O. and Festetics, A. (1969).** *Pflanzen und Tiere des Burgenlandes*. Österreichischer Bundesverlag, Wien.
- Koenig, O. (1961).** *Das Buch von Neusiedlersee*. Vienna.
- Löffler, H. (1974).** *Der Neusiedlersee, Naturgeschichte eines Steppensees*. Verlag Fritz Wolden, Wien. (Includes large bibliography)
- Löffler, H. (1959).** Zur Limnologie des Seewinkelgebietes. *Sitz. ber. Öster. Ak. Wiss. math. nat.* Kl(1) 168: 315-362.
- Zimmerman, R. (1944).** *Beiträge zur Kenntnis der Vogelwelt des Neusiedlergebiet*. (Sonderdruck aus dem I. teil des Bd. 54 der Annalen der Naturhistorischen Museum in Wien, 1943.) Selbstverlag der Wiss. Staatmuseen.

Donau-March-Auen

Location 48°27'N, 16°50'E. Situated east of Vienna on the Austrian/Czechoslovakian border in the state of Niederösterreich.

Area 38,500ha

Degree of Protection The site is partly protected within an area of six nature reserves, totalling 2213ha, including Marchauen-Marchegg Nature Reserve (1,150ha) with 50% WWF Austria ownership and 50% private ownership. Designated as a Ramsar site in December 1982.

Site Description The site comprises a strip of land either side of the River Danube between the state of Vienna and the Czechoslovakian border; a strip of land along the River March from its confluence with the Danube to south of the Czechoslovakian town of Breclav; and a strip along the Thaya from Bernhardsthal to its confluence with the March. It contains riverine marshes, ponds, oxbow lakes and meadows with vegetation including alder *Alnus* sp. and original woodland. These areas comprise the largest remaining tract of semi-natural riverine floodplain forest in central Europe.

International and National Importance The site supports about 245 vertebrate species and at least another 100 non-breeding or wintering bird species. There are important breeding colonies of cormorant *Phalacrocorax carbo sinensis*, grey heron *Ardea cinerea* and night heron *Nycticorax nycticorax*. Other breeding birds include six pairs of black stork *Ciconia nigra*, 30 pairs of white stork *Ciconia ciconia*, greylag goose *Anser anser*, several duck species, marsh harrier *Circus aeruginosus* and corncrake *Crex crex*. The site is also important for migrant ducks and geese.

Changes in Ecological Character Artificial drainage has damaged some important feeding grounds and the proposed Danube-Oder canal may threaten the area. There were plans for the construction of an hydroelectric power station at Hainburg, which faced strong opposition - particularly from national and international conservation bodies. This resulted in an injunction on 3 January 1985, preventing construction for a one year period. In early 1986 a decision was taken to abandon the project. The scheme essentially consisted of an hydroelectric dam (the tenth in a series along the Austrian section of the Danube), positioned at the eastern end of two retaining walls which were to have extended some 20km upstream - effectively creating a funnel

some 16m high into which the waters of the Danube would have flowed. The Austria Danube Power Corporation (DOWK), partly owned by the Federal Government, put in successfully for planning permission. The diversion of the Danube into this concrete funnel would have directly destroyed some 800ha of prime riverine forest (out of a total of some 8,000ha) and would have prevented the forests from being flooded. It is likely that this would have caused irreparable ecological damage both downstream and upstream, affecting the contiguous forest areas of the Untere Lobau in Vienna and the March/Thaya system to the north.

Management Practices No information

Scientific Research and Facilities No information

Principal Reference Material The above information is taken from documents supplied by the Government of Austria at the time of designation in 1982. Supplemented by:

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

Duffey, E. (1982). *National Parks and Reserves of Western Europe*. Macdonald and Co., London.

IWRB Bulletin No. 47 (1981). Slimbridge, Glos., England.

Scott, D.A. (1980). A preliminary inventory of wetlands of international importance for waterfowl in west Europe and northwest Africa. *IWRB Special Publication* No. 2.

Untere Lobau

Location 48°10'N, 16°30'E. Situated in the south-east of the state of Vienna.

Area 1,039ha

Degree of Protection The site is owned by the state of Vienna and is part of a nature reserve and landscape protection area (2,000ha), protected by Lobauverordnung LGB1 für Wien Nr. 32/1978. The Ramsar site has full nature reserve status on the basis of legislation LGB1 für Wien Nr. 6/1985. Accepted as a Biosphere Reserve in October 1977. Designated as a Ramsar site in December 1982.

Site Description The site is an alluvial riverside landscape with a wide range of habitats including original woodland, thorn-scrub, reedswamp, pools, oxbow lakes, gravel deposits and dry grassland. It is bounded to the west by the Donau-Oder canals and to the south by Hubertus dam. The eastern edge is contiguous with Donau-March-Auen (Ramsar site).

International and National Importance The site combines with the adjoining Danube water meadows to the east to constitute the largest surviving area of its type in Europe. Birds include kingfisher *Alcedo atthis*, herons *Ardea* sp., storks *Ciconia* sp., penduline tit *Remiz pendulinus*, black woodpecker *Dryocopus martius* and white-tailed eagle *Haliaeetus albicilla*.

Changes in Ecological Character There were plans for the construction of an hydroelectric power station scheme at Hainburg, which could have had serious affects on the riverine habitats

both upstream and downstream of the dam site. This is discussed further in the description of the site Donau-March-Auen. A dam on the Danube within Vienna has been suggested as an alternative to Hainburg which may affect this site.

Management Practices There are two core zones surrounded by a buffer zone. Some agriculture and logging is allowed in the buffer zone.

Scientific Research and Facilities Research includes vegetation mapping including investigation of aquatic and semiaquatic communities and limnological studies of the backwaters and oxbow lakes. It is planned to establish a research centre near the buffer zone in the near future.

Principal Reference Material The above information is taken from documents supplied by the Government of Austria at the time of designation in 1982. Supplemented by: Documents submitted to the Man and Biosphere Bureau by the Government of Austria.

Duffey, E. (1982). *National Parks and Reserves of Western Europe*. Macdonald and Co., London.

Additional reference:

Naturgeschichte (1972). Verlag Jugend u Volk. Wien

Stauseen am Unteren Inn

Location 48°16'-22'N, 13°04'-23'E. Situated on the border with the Federal Republic of Germany, west of the city of Linz in the state of Oberösterreich.

Area 870ha

Degree of Protection The site includes Hagenauer Bucht Nature Reserve (166ha). Designated as a Ramsar site in December 1982.

Site Description The site comprises three sections of the River Inn: from Braunau to Frauenstein including the nature reserve at Hagenau; from Obersunzing to Obernberg; and from Reichersberg to just before Gerau. These sections are contiguous with parts of the Unterer Inn zwischen Haiming und Neuhaus Ramsar site in the Federal Republic of Germany. The site includes sandbanks, mudbanks, shallow bays and meadow woodland at the river edge.

International and National Importance The habitat of the site provides a breeding area for little bittern *Ixobrychus minutus*, night heron *Nycticorax nycticorax* and marsh harrier *Circus aeroginosus*, black-tailed godwit *Limosa limosa* and bluethroat *Luscinia svecica*. The site is also important for large numbers of migrant and wintering waterfowl. There are an estimated 40,000 waterfowl at the site in autumn, including large numbers of mute swan *Cygnus olor*, mallard *Anas platyrhynchos*, pochard *Aythya ferina*, tufted duck *A. fuligula*, coot *Fulica atra* and ruff *Philomachus pugnax*.

Changes in Ecological Character None reported

Management Practices No information

Scientific Research and Facilities No information

Principal Reference Material The above information is taken from documents supplied by the government of Austria at the time of designation in 1982. Supplemented by:

Duffey, E. (1982). *National Parks and Reserves of Western Europe*. Macdonald and Co., London.

Scott, D.A. (1980). A preliminary inventory of wetlands of international importance for waterfowl in west Europe and northwest Africa. *IWRB Special Publication* No. 2.

Rheindelta Bodensee

Location 47°30'N, 9°45'E. Situated near the border with Switzerland and the Federal Republic of Germany in the state of Vorarlberg.

Area 1,960ha

Degree of Protection Most of the site is protected in a nature reserve established in 1942 (1400ha) and renewed in 1976. Designated as a Ramsar site in December 1982.

Site Description The site comprises the freshwater delta marshes of the Rhine River where it enters the Bodensee; the adjacent lake area; and about 250ha landward of the nature reserve in the area of the Fussach pumpworks. The landward boundary of the nature reserve runs 8km eastwards from the old mouth of the Rhine along embankments to just beyond the present river mouth. The boundary is about 1km into the lake. There are reedbeds, water meadows and alluvial sand islands at the mouth of the river.

International and National Importance The site is one of the most important areas in central Europe for migrant waders and is also important for breeding and passage waterfowl including great crested grebe *Podiceps cristatus*, little bittern *Ixobrychus minutus*, garganey *Anas querquedula*, shoveler *A. clypeata* and red-crested pochard *Netta rufina*.

Changes in Ecological Character None reported

Management Practices No information

Scientific Research and Facilities No information

Principal Reference Material The above information is taken from documents supplied by the Government of Austria at the time of designation in 1982. Supplemented by:

Scott, D.A. (1980). A preliminary inventory of wetlands of international importance for waterfowl in west Europe and northwest Africa. *IWRB Special Publication* No. 2.

Belgium

Area 30,512 sq.km

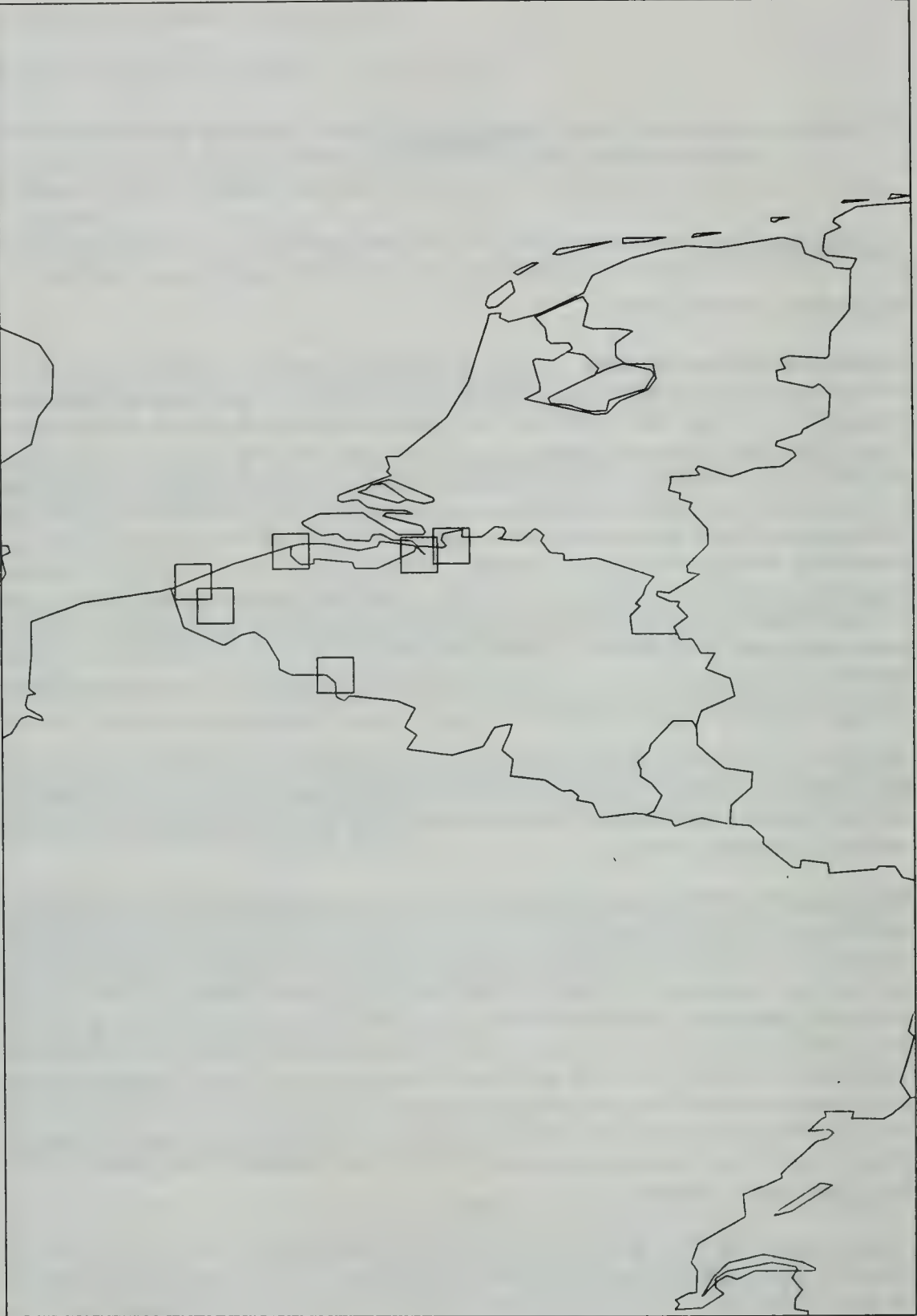
Population 9,875,716 (1987)

Summary of Wetland Situation Most of the wetlands of international importance to waterfowl are situated in the flat low-lying coastlands, along the north-western borders of the country. Thousands of sea-duck also winter in off-shore territorial waters (for example, 8,500 common scoters *Melanitta nigra* were observed on the Vlaamse Banken in February 1972). Zwin Reserve, located in dunes just south of the Dutch border, includes a brackish lake complex that is a habitat for many species of Anatidae, as well as large numbers of Laridae and Limicolae. The reserve is of special educational value and has up to 400,000 visitors a year. The Yser Estuary has been given 'classified landscape' status and is the site of various field courses organized annually by the University of Ghent. Traditional goose wintering grounds near Damme harboured up to 8,750 white-fronted geese *Anser albifrons* and a maximum of 1,500 pink-footed goose *A. brachyrhynchus* in the winter of 1973/74. Buffer zones and secondary reserves in the polders north and west of Bruges (Moene in Meetkerke) seem essential for the effective protection of these wintering flocks.

Blankaart Lake and the Broeken grasslands are situated in a distinctive wetland area formed by the floodplain of the Yser. Despite construction of a large reservoir in the area, since when the Broeken polder has been less often flooded in recent years, the total numbers of waterfowl have not declined, although there has been some loss of breeding habitat.

The polders on the left bank of the River Schelde, which include amongst others the Doel, Kallo and Verrebroek, form a wetland unit with the Verdrongen Land of Saeftinge beyond the Netherlands border downstream, many duck such as teal *Anas crecca* and wigeon *A. penelope* moving freely between the two sites. The area is also an important wintering ground for geese, numbers of bean goose *Anser fabalis* and white-fronted goose *A. albifrons* being up to 4,000 and 2,500, respectively. Kalmthout Heath and the associated heathland of Brecht and Wuustwezel, 30km north-east of Antwerp are a classified landscape part of which has been made into a state reserve (850ha). There are several oligotrophic fens of scientific interest in the area, such as Putse Moer and Stappens Ven, although they have to some extent been adversely affected by pumping for the local drinking water supplies. Up to 3,500 whimbrel *Numenius phaeopus* have their winter roost in the area.

Apart from the flat low-lying coastlands, the Harchies marshes 70km south-west of Brussels are a part of a wetland unit that extends beyond the French border. This area is an important habitat for many reedbed birds, including bluethroat *Luscinia svecica* and bittern *Botaurus stellaris*, and is of value as a wintering ground for a wide variety of waterfowl. Not far from there, the lake of Virelles, now a private protected area, displays similar characteristics.



Ramsar Sites in Belgium

Located 50km south-east of Liege within the Ardennes mountains, the nature park of Hautes-Fagnes and its nature reserve contain extensive areas of peatlands that are of special interest for their flora and fauna. In the southernmost part of the country the marshes of the upper Semois river are also of considerable interest. Near St. Lenaarts some abandoned clay-pits have recently become of considerable value for waterfowl.

Protected Areas Legislation According to the law of institutional reforms of 8 August 1980, the Belgian regions are now individually vested with responsibility for nature conservation. However, the principal act remains the law on nature conservation of 12 July 1973. Another important act for the Walloon region is the decree related to nature parks of 16 July 1985. The nature conservation act provides for the creation of nature reserves forest reserves and nature parks. Nature reserves are either state-owned or privately-owned approved reserves, the latter subject to an agreement between the regional Minister responsible for nature conservation and the landowner. In the Walloon region, nature parks are multiple use areas, which may include villages and local industries; human activities are allowed to continue with some restrictions. Their main objectives are the conservation of the character, diversity and scientific values of the environment and of the natural flora and fauna without forgetting their importance for recreation and tourism.

Protected Areas Administration Responsibility for administering the Nature Conservation Act is vested in the regional authorities. In the Flemish region the Directorate for Nature Conservation is part of the Administration for Land Management and Environment. The "Institut voor Natuurbehoud" (Nature Conservation Institute) has been created within this administration to undertake special research and give scientific advice. In the Walloon region the Directorate for Nature Conservation is a part of the Administration of Natural Resources and Environment. These authorities are responsible for all matters of nature conservation including drafting new decrees, coordination of the advisory committees and the Regional Nature Conservation Councils, all matters relating to purchase of reserves and public relations. A number of private conservation organisations also own nature reserves or have taken over the management of reserves.

Sites designated under the Convention Signature without reservation as to ratification 4 March 1986, with six sites listed.

Les Vlaamse Banken dans les eaux côtières
 Les Schorren de l'Escaut à Doel et à Zandvliet
 Le Zwin
 Le Blankaart
 Kalmthoutse Heide
 Le Marais d'Harchies

Government body responsible for administration of the Convention Ministère de l'Agriculture, Administration de la Recherche Agronomique, Manhattan Center - 7ème étage, Avenue du Boulevard 21, B 1210 Brussels

Les Vlaamse Banken dans les eaux côtières

Location 51°20'N, 3°00'E. Parts of the North Sea within Belgian territorial waters between Dunkerque and Ostend, where depth is less than 6m.

Area 1,900ha

Degree of Protection Designated as a Ramsar site on 27 September 1984, although Belgium did not actually ratify until March 1986. 1,415ha have also been designated as an EC special protection area (SPA).

Site Description The site includes the lowest zone of the beach, extending up to several kilometres offshore and including a series of shallows. Some parts have a rich benthic fauna.

International and National Importance The site is on part of the Belgian coast which is of international importance for migratory waterbirds in particular. Passage birds include Mediterranean gull *Larus melanocephalus*, little gull *L. minutus*, sandwich tern *Sterna sandvicensis*, common tern *S. hirundo* and little tern *S. albifrons*. Birds wintering in the area include sanderling *Calidris alba* (450 January average), common scoter *Melanitta nigra* (4,000 January average, maximum 8,500), turnstone *Arenaria interpres* (maximum 400), great crested grebe *Podiceps cristatus* and eider *Somateria mollissima*.

Changes in Ecological Character Sand extraction occurs at sea with consequent lowering of the water-table. Extraction of drinking water. An atomic power station is also apparently planned for the area.

Management Practices All hunting is prohibited along the beach and up to 1,852m off shore.

Scientific Research and Facilities No information

Principal Reference Material

Kuikjen, E. (1972). Belgian wetlands of international importance for waterfowl. *Proc. Int. Cong. Conserv. of Wetlands and Waterfowl, Ramsar 1971*: 179-188.

Kuijken, E. (1976). Belgium national report on wetlands. *Proc. Int Congr. Conserv. of Wetlands and Waterfowl, Heiligenhafen, 1974*: 81-83.

Scott, D.A. (1980). A preliminary inventory of wetlands of international importance for waterfowl in West Europe and Northwest Africa. *IWRB Special Publication No. 2*. 127 pp.

Les Schorren de l'Escaut à Doel et à Zandvliet

Location 51°19'N, 4°15'E. Along the lower Scheldt river, north of Antwerp. The site includes Schorren at Doel (Beveren), Galgenschoor at Lillo (Anvers) and Groot Buitenschoor at Zandvliet (Anvers)

Area Total 417ha; Schorren at Doel 115ha; Galgenschoor 117ha; Groot Buitenschoor 175ha. Originally 445ha; 28ha deleted in Belgium's "urgent national interest" (Article 4.2 of Convention text). Le Blankaart Ramsar site was extended in compensation (also following Article 4.2).

Degree of Protection All three sites are classified as protected landscapes on rural planning maps and proposed as nature reserves. Groot Buitenschoor and Galgenschoor are defined as private nature reserves, as officially agreed by the Flemish government. They are now state-owned and managed by De Belgische Natuur- en Vogelreservaten. Designated a Ramsar site on 27 September 1984, although Belgium did not actually ratify until March 1986. The site is part of an EC special protection area (SPA).

Site Description These sites are the last brackish tidal marshes and mud flats along the lower Scheldt river. The marshes have characteristic plant species including *Scirpus maximus*, *Cochlearia officinalis*, *Aster tripolium*, *Atriplex hastata*, *Puccinellia* sp., *Elytrigia pungens*, *Triloglochin maritima* and *Glaux maritima*. The site is contiguous and ecologically inter-dependent with a larger area of such habitat on adjacent Dutch territory, covering 3,000ha.

International and National Importance This site is an important area for wintering and migratory water birds, particularly as feeding grounds. These include great crested grebe *Podiceps cristatus* (maximum 85), cormorant *Phalacrocorax carbo* (maximum 35), mute swan *Cygnus olor* (max 10), whistling swan *Cygnus columbianus* (maximum 30), bean goose *Anser fabalis* (maximum 800), white-fronted goose *A. albifrons* (maximum 2,000), greylag goose *A. anser* (maximum 270), common shelduck *Tadorna tadorna* (maximum 2860), wigeon *Anas penelope* (maximum 3,000), *A. strepera* (maximum 85), teal *A. crecca* (maximum 2,830), mallard *A. platyrhynchos* (maximum 6,230), pintail *A. acuta* (maximum 200), shoveler *A. clypeata* (maximum 1,080), pochard *Aythya ferina* (maximum 165), tufted duck *A. fuligula* (maximum 830), eider *Somateria mollissima* (maximum 45), avocet *Recurvirostra avosetta* (maximum 1,800), golden plover *Pluvialis apricaria* (maximum 2,000), dunlin *Calidris alpina* (maximum 2,900), black-tailed godwit *Limosa limosa* (maximum 800) and ruff *Philomachus pugnax* (maximum 1,400). It is also a breeding area for marsh harrier *Circus aeruginosus*.

Changes in Ecological Character As noted above, the Belgian authorities decided to reduce the Galgenschoor part of the site by approximately 28ha for the development of container terminal facilities. A decline in wintering wader populations may reflect a decrease in the numbers of invertebrates supported by the mudflat.

Management Practices Reed mowing is undertaken.

Scientific Research and Facilities There has been ornithological research including censuses, and guided educational visits are conducted.

Principal Reference Material

Kuijken, E. (1972). Belgian wetlands of international importance for waterfowl. *Proc. Int. Congr. Conserv. of Wetlands and Waterfowl, Ramsar, 1971*: 179-181.

Kuijken, E. (1976). Belgian national report on wetlands. *Proc. Int. Congr. Conserv. of Wetlands and Waterfowl, Heiligenhafen*: 81-83.

Scott, D.A. (1980). A Preliminary Inventory of Wetlands of International Importance for Waterfowl in West Europe and Northwest Africa. *IWRB Special Publication No. 2*. 127 pp.

Le Zwin

Location 51°21'N, 3°22'E. Located near Knokke-Heist, on the Netherlands border, 18km north-east of Bruges.

Area 550ha

Degree of Protection The site is designated a classified landscape and nature reserve on rural planning maps. It is privately-owned and managed by Réserves Naturelles et Ornithologiques de Belgique. 125ha of the nature reserve is in Belgium and it extends a further 25ha into the Netherlands, with a further 1,500ha of buffer zone. It was designated a Ramsar site on 27 September 1984, although Belgium did not actually ratify until March 1986. Also designated as an EC special protection area (SPA).

Site Description The reserve consists mainly of a tidal salt marsh including mudflats, creeks and ponds, in the area of the Schelde-Meuse-Rhine delta. The site is the southernmost remainder of a late mediaeval estuary. It is enclosed by 1.5km of dunes to the north and by dykes to the south and west. An open connection to the North Sea is formed by a shallow creek at the eastern end which feeds a system of four brackish lagoons, the whole area often flooding during winter and at spring tides. Lower areas have salt marsh vegetation in various stages of colonisation, including glasswort *Salicornia europaea*, seablite *Sueda maritima* and sea lavender *Limonium vulgare*. The variety in microrelief and variation in salinity between saltwater and fresh create a variety of habitats, particularly good for invertebrates. The buffer zone includes sandy grasslands on a former airfield, wet and dry dunes with shrubs and polder areas which have clay soils and consist of ploughed fields.

International and National Importance The site has large populations of migrant, wintering and breeding birds. Breeding birds include grey heron *Ardea cinerea* (70 pairs), shelduck *Tadorna tadorna* (60 pairs), avocet *Recurvirostra avosetta* (40-60 pairs), black-headed gull *Larus ridibundus* (3,400 pairs), common tern *Sterna hirundo* (370 pairs), mallard *Anas platyrhynchos*, garganey *A. querquedula*, oystercatcher *Haematopus ostralegus*, Kentish plover *Charadrius alexandrinus* and, rarely, ringed plover *C. hiaticula* and Mediterranean gull *Larus melanocephalus* (1-6 pairs). Migrant and wintering birds include little grebe *Tachybaptus ruficollis* (maximum 20), avocet (maximum 540), bean goose *Anser fabalis* (average 1,000). Large numbers of waders include curlew *Numenius arquata* (January average 1,200, maximum 1,700) and whimbrel *N. phaeopus* (maximum 950). There are thousands of migrant and wintering ducks Anatidae and more than 20,000 gulls *Larus* spp. roost.

Changes in Ecological Character There is some grazing and shooting in the buffer zone where there are also plans to develop recreation.

Management Practices In 1960, three large lagoons connected with tidal creeks were created, as part of works meant to improve the dykes, and have encouraged waterfowl to remain and breed. There is some feeding of birds to attract them for educational and ringing purposes and some are kept in aviaries or semi-confined in enclosures. In the wildlife park, adjacent to the

reserve, feral populations of greylag geese *Anser anser*, night heron *Nycticorax nycticorax* and white stork *Ciconia ciconia* have been built up, starting with wounded birds which could not fly, which are not confined. The water level in one of the salt marsh ponds can be regulated. Some of the saltings are grazed by sheep. The influx of over 300,000 visitors a year is properly controlled.

Scientific Research and Facilities Experimental reintroduction of geese, night heron and white stork has occurred. The Zwin is important for ornithological and botanical studies and is well-established as an educational centre.

Principal Reference Material

- Carp, E. (Ed.) (1980).** *A Directory of Palearctic Wetlands*. IUCN, Gland, Switzerland.
- Duffey, E. (1982).** *National Parks and Reserves of Western Europe*. Macdonald and Co., London.
- Kuijken, E. (1972).** Belgian wetlands of international importance. In *Proc. Internat. Conf. on Conservation of Wetlands and Waterfowl*, Ramsar, Iran, 1971, Slimbridge. IWRB publication. Pp. 179-188.
- Kuijken, E. (1976).** Belgian wetlands of international importance for waterfowl. *Proc. Int. Congr. Conserv. of Wetlands and Waterfowl, Ramsar, 1971*: 179-188.
- Kuijken, E. (1980).** Belgium national report on wetlands. *Proc. Int. Congr. Conserv. of Wetlands and Waterfowl, Heiligenhafen, 1974*: 81-83.
- Noirfalise, A., Huble, J. and Delvingt, W. (1970).** *Les Réserves Naturelles de la Belgique*. Ministère de l'Agriculture, Bruxelles, Belgium.
- Scott, D.A. (1980).** A preliminary inventory of wetlands of international importance for waterfowl in West Europe and Northwest Africa. *IWRB Special Publication No. 2*. 127 pp.

Le Blankkaart

Location 50°59'N, 02°51'E. Located in the municipality of Woumen (Dixmude), to the south-east of the River Yser.

Area 2,160ha. Originally 160ha, the Ramsar site was extended by approximately 2,000ha in 1988 as compensation for the reduction of Galgenschoor "in the urgent national interest" (Article 4.2 of Convention text).

Degree of Protection 81ha are protected as a reserve, included in a non-shooting area of 400ha; 71ha are owned by Réserves Naturelles et Ornithologiques de Belgique and 10ha by the state. On rural planning maps the reserve proper is designated a nature reserve and the buffer zone an ecologically important agricultural landscape. Designated as a Ramsar site on 27 September 1984, although Belgium did not ratify until March 1986. Also designated as an EC special protection area (SPA).

Site Description The site includes a shallow freshwater lake of about 70ha with about 50ha of open water lying on the edge of a sandy-loam region in the plain of the River Yser. The lake originated from earlier exploitation of peat in the valley of the Yzer river and has gradually been silting up, resulting in wide expanses of reedbeds *Phragmites australis* and fringing willow *Salix*

sp. Other typical plants include marsh vetches *Lathyrus palustris*, sea milkwort *Glaux maritima* and marsh marigold *Caltha palustris*. The surrounding areas include hay fields and grasslands with a network of ditches supporting a variety of plants. Within the reserve is an abandoned duck decoy.

International and National Importance The lake is an important breeding site for little grebe *Tachybaptus ruficollis* and great crested grebe *Podiceps cristatus* (maximum 20), reintroduced grey heron *Ardea cinerea* (maximum 30), bittern *Botaurus stellaris*, little bittern *Ixobrychus minutus*, water rail *Rallus aquaticus*, mallard *Anas platyrhynchos*, shoveler *A. clypeata*, pintail *A. acuta*, garganey *A. querquedula*, Cetti's warbler *Cettia cetti* and marsh harrier *Circus aeruginosus*. It is also of great importance for the overwintering of some 20,000 Anatidae, 20-30,000 Limicolae and an increasing number of swans. Cormorant *Phalacrocorax carbo* and white stork *Ciconia ciconia* have been reintroduced. Otter *Lutra lutra* also breed in the reserve and ermine *Mustela erminea* is abundant. The site is also of botanical value with rare species such as *Lathyrus palustris* and *Ranunculus lingua*.

Changes in Ecological Character The lowering of the watertable for agricultural development, which is part of the policy of the polder authorities, could seriously affect the reserve. Natural silting up and eutrophication is causing extension of the *Phragmites* beds which are subsequently colonised by willow. Peat extraction occurs in part of the buffer zone.

Management Practices Shooting is now prohibited over the whole reserve. Access is restricted to guided visits except to the adjacent park and no fishing is allowed. A number of new nesting-places have been created and a breeding colony of 90 pairs of grey heron established. Efforts are being made to encourage cormorant to breed although so far only wintering flocks are present. Reed mowing is allowed.

Scientific Research and Facilities Several thousand birds are ringed annually. Intensive botanical and entomological research is continuing. In general the scientific and educational value of the site is well recognized.

Principal Reference Material

- Carp, E. (Ed.) (1980). *A Directory of Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.
- Duffey, E. (1982). *National Parks and Reserves of Western Europe*. Macdonald and Co., London.
- Kuijken, E. (1972). Belgian wetlands of international importance. In *Proc. Internat. Conf. on Conservation of Wetlands and Waterfowl, Ramsar, 1971*. pp. 179-188.
- Noirfalise, A., Huble, J. and Delvingt, W. (1970). *Les Réserves Naturelles de la Belgique*. Ministère de l'Agriculture, Bruxelles, Belgium.
- Scott, D.A. (1980). A preliminary inventory of wetlands of international importance for waterfowl in West Europe and Northwest Africa. *IWRB Special Publication No. 2*. 127 pp.

Kalmthoutse Heide

Location 51°23'N, 4°28'E. Located north-east of Antwerp in the municipalities of Kalmthout and Essen in the Province of Anvers.

Area 4,045ha

Degree of Protection An area of wetlands covering 850ha has had the status of a state nature reserve since 24 September 1968 but the area as a whole has the status of a landscape reserve. 80ha are state owned and 732ha municipal territory. Designated as a Ramsar site on 27 September 1984, although Belgium did not ratify until March 1986. Also designated as an EC special protection area (SPA).

Site Description An area of marsh, heath, old dunes and woodlands, partly bordering the delta of the river Schelde. Vegetation includes dune grasslands of marram *Ammophila arenaria*, dry heath dominated by ling *Calluna vulgaris*, and wet heath with bog heather *Erica tetralix* and willows *Salix* sp. The oligotrophic marshes are of great interest, being the southernmost examples of the type and the only examples in Belgium. The scattered tree cover includes stands of oak *Quercus*, birch *Betula* and fir *Abies* species. The reserve has great entomological interest and over 90% of the dragonflies (Odonata) known in Belgium can be found there.

International and National Importance The Kalmthout wetlands are important for breeding and wintering water birds. Breeding birds include mallard *Anas platyrhynchos*, gadwall *A. strepera*, pochard *Aythya ferina* and common shelduck *Tadorna tadorna*. Wintering and migrant birds include black-necked grebe *Podiceps nigricollis*, pintail *Anas acuta* (maximum 170), shoveler *A. clypeata* (maximum 300), tufted duck *Aythya fuligula* (maximum 110), pochard *A. ferina* (maximum 130), spotted crane *Porzana porzana* and curlew *Numenius arquata* (over 3000). It is also an important roosting area for large numbers of other waders like whimbrel *N. phaeopus* (3,000-6,000) and black-tailed godwit *Limosa limosa* (maximum 900). The rare bog orchid *Hammarbya paludosa* occurs in the marshes.

Changes in Ecological Character None reported in the reserve itself but the surrounding buffer areas are affected adversely by pumping of groundwater for drinking and increasing agricultural demands.

Management Practices Private properties within the area are fenced and closed and the nature reserve is generally inaccessible to the public, particularly in the breeding season. Authorised visitors, several tens of thousands each year, are encouraged to keep strictly to paths. Prohibitions on human activities include habitation, cultivation, hunting, fishing, pasturing and wood-cutting (except from limited forestry permitted on private holdings). Rabbits are limited and some gull colonies on oligotrophic fens are controlled to minimise guano accumulation. The heathland is grazed by a local breed of sheep, which prevent trees from becoming established. An important part of the wet heathland is managed in order to maintain optimal water level by small dams.

Scientific Research and Facilities There is a well-established centre for research and education set up by the University of Antwerp. Its Department of Biology has carried out research on terrestrial ecology and published a number of reports between 1977 and 1980.

Principal Reference Material

- Carp, E. (Ed.) (1980). *A Directory of Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.
- Duffey, E. (1982). *National Parks and Reserves of Western Europe*. Macdonald and Co., London.
- Kuijken, E. (1972). Belgian wetlands of international importance. In *Proc. Internat. Conf. on Conservation of Wetlands and Waterfowl*, Ramsar, Iran, 1971, Slimbridge. IWRB publication. Pp. 179-188.
- Noirfalise, A., Huble, J. and Delvingt, W. (1970). *Les Réserves Naturelles de la Belgique*. Ministère de l'Agriculture, Bruxelles, Belgium.

Le Marais d'Harchies

Location 50°30'N, 3°40'E. Between Mons and Tournai in the municipalities of Bernissart and Hensies.

Area 535ha

Degree of Protection An important part of the site (385ha) is protected as a strict nature reserve, owned by the Institut Royal des Sciences Naturelles de Belgique, les Réserves Naturelles et Ornithologiques de Belgique. Designated a Ramsar site on 27 September 1984, although Belgium did not actually ratify until March 1986. Also designated as an EC special protection area (SPA).

Site Description It includes 90ha of open fresh-water pools and ponds with reedbeds of *Phragmites australis*, *Typha latifolia*, *T. angustifolia* and areas of sedges *Carex* spp., rushes *Juncus* spp., willows *Salix* spp. and wet meadows.

International and National Importance This site contains significant areas of reedbeds (which are becoming rare in Belgium), and is an important area for birds associated with them, as well as being used by many wintering and migrant waterbirds. More than 90 bird species nest in the area, the most notable being bittern *Botaurus stellaris*, little bittern *Ixobrychus minutus*, night heron *Nycticorax nycticorax*, bluethroat *Luscinia svecica*, great reed warbler *Acrocephalus arundinaceus* and marsh harrier *Circus aeruginosus*. The main wintering birds include teal *Anas crecca*, tufted duck *Aythya fuligula*, pochard *A. ferina* and migrants include gadwall *Anas strepera* and waders. Rare plants include *Thelypteris palustris*, *Dryopteris cristata*, *Dactylorhiza incarnata*, *Epipactis palustris*, *Utricularia vulgaris*, *Samolus valerandi*, *Cyperus fuscus* and *Scirpus tabernaemontani*.

Changes in Ecological Character Water quality has been improved recently and the area of reedbeds increased.

Management Practices Water quality has been improved by not using fertiliser on the meadows. Water level stabilisation and the harvesting and burning of old reedbeds has allowed their area to extend. Fishing and hunting are prohibited.

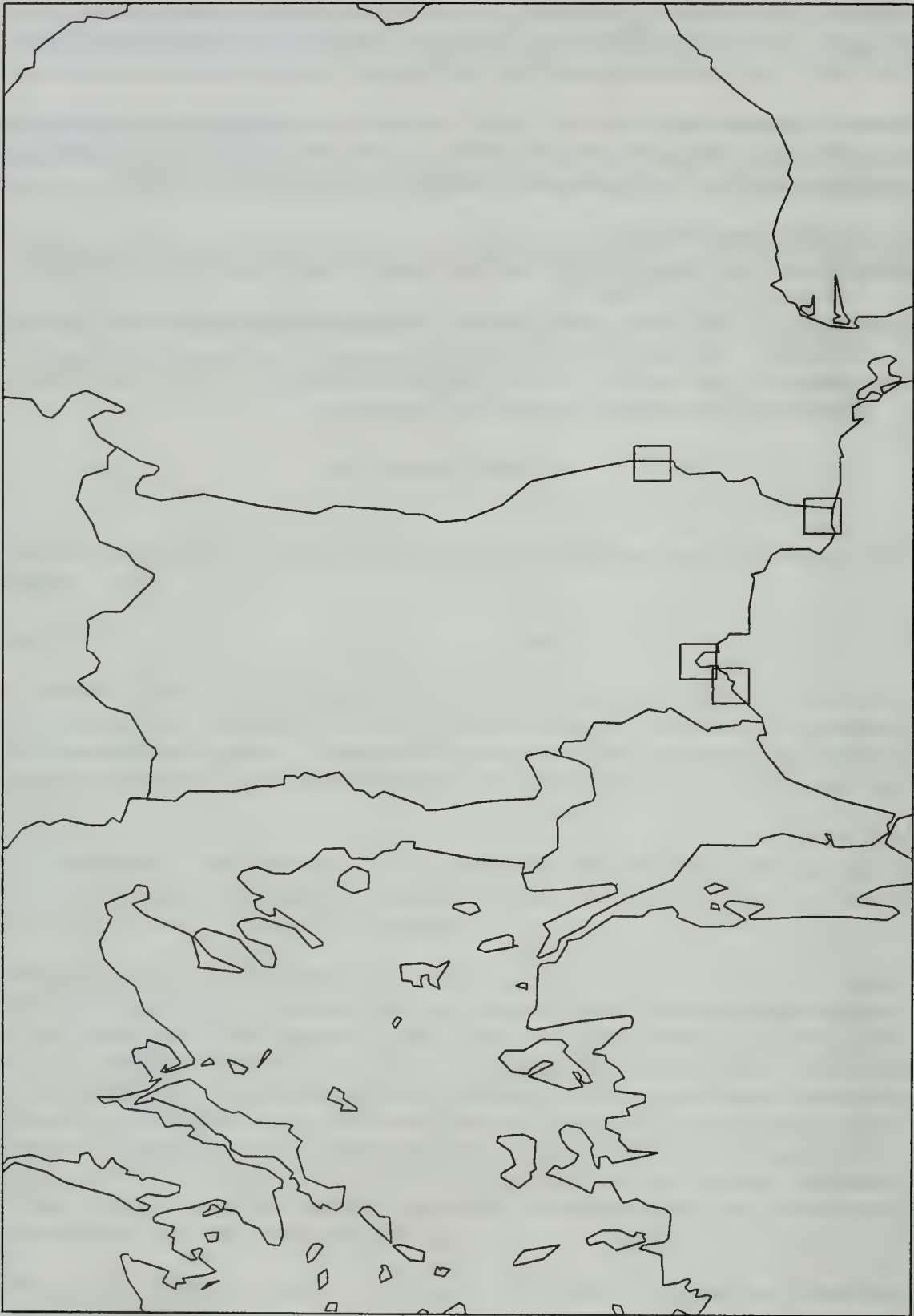
Scientific Research and Facilities Research is carried out on water chemistry, macrophyte productivity, and reedbed structures; and bird populations are censused regularly. There is an educational centre for visitors, and accommodation for scientists may be available.

Principal Reference Material

Dendal, A. and Verhaegen, J.P. (1985). Quelques observations d'orchidées dans le bassin de la Haine. *Nat. belg.* 66: 163-172.

Verhaegen, J.P. (1981). Deux ans de gestion au Centre de Recherches biologiques d'Harchies. *Bull. Inst. roy. Sciences nat. Belgique* 53:1-14.

Verhaegen, J.P. and Anrys, P. (1984). Rapport ornithologique du Centre de Recherches biologiques d'Harchies pour l'année 1983. *Gerfaut* 74



Ramsar Sites in Bulgaria

Bulgaria

Area 110,911 sq. km

Population 8,973,600 (1988)

Summary of Wetland Situation Many Bulgarian coastal lakes and marshlands have been drained or modified since 1944, to an extent that the area has become notably less attractive as habitat for breeding and migratory waterfowl. Recently there have been reports of a number of measures being taken to conserve what remains of a once very rich waterfowl habitat.

Lake Srébarina is one of the most important inland lakes in the country and notable amongst other things as a traditional breeding site of Dalmatian pelican *Pelecanus crispus*, a species which has declined seriously in recent years and now rates as 'vulnerable' in the Red Data Book. A number of recent changes affecting the fauna and flora of Srébarina have followed the separation of the lake from the Danube by the construction of a dam. The pelicans now do most of their feeding in the nearby Romanian marshes.

The former nesting place of white pelican *Pelecanus onocrotalus* in the marshes of Lake Mandra near Burgas has become so altered as to make it unsuitable, but four reserves have been established which may encourage it to breed again in Bulgaria. Precise information is lacking about what are probably still important wetland sites in the Black Sea coastlands near Shabla and Varna, as well as in the Burgas-Pomorie complex. The same applies to a number of other Bulgarian wetlands, including Lake Zrebcevo near Stara Zagora, the Danube islands of Wardim and Belene, where breeding colonies of herons and cormorants have been recorded, the Balabana swamp forest near Elcheve, and the mouths of the rivers Kamchiya and Batova, south of Varna.

In 1978 the Committee for Preservation of Natural Environment (KOPS) developed a programme to reduce and remove pollution, and to close water consumption cycles. Much of the programme has been successfully completed.

Protected Areas Legislation Preservation of nature is an integral part of the Unified Plan for social and economic development, and is covered by a number of legislative and government acts. Particularly important are the law for Protection of the Air, Waters and Soil from Pollution (1963), the Law on Nature Protection (1967), the Law on Water Resources (1969) and the Law on Conservation of Arable land and Pastures (1973). The Guidelines for the Protection and Reproduction of the Natural Environment in Bulgaria were approved by State Council in 1977. Reserves are by definition strict nature reserves. This law is regulated by the 1969 Code of Application. Proposals for new sites can be submitted by any interested party, and may be declared by the Committee for Preservation of Natural Environment after consultation with the Academy of Sciences and other interested departments.

Protected Areas Administration The Ministry of Forests and Environmental Protection was set up in 1971, and has concentrated its attention on the protection (KOPS) of natural sites. The Committee for Preservation of Natural Environment at the Council of Ministers (set up in 1967) controls, coordinates and implements the policy and decisions of the national government and legislature on questions of environmental protection and reclamation, and the comprehensive utilisation of water resources. Detailed checks were made in 1977 of the state of the reserves, and statements of violation drawn up. This led to improvements in the network over the following years, and the checks have continued.

Sites designated under the Convention Signature without reservation as to ratification 24 September 1975, with two sites listed at signature, and another two added 28 November 1984

Srebarna Waterfowl Reserve
Arkoutino Waterfowl Reserve
Atanassovo Lake Nature Reserve
Durankulak Lake Natural Landmark

Government body responsible for administration of the Convention Ministry of the Environment, 67 Vladimir Poptomov Street, 1000 Sofia

Srébarna Waterfowl Reserve

Location 44°05'N, 27°07'E. Srébarna Lake is 19km west of the town of Silistra and 1km south of the Danube (which forms the border with Romania) in Silistra province, north-east Bulgaria.

Area 600ha

Degree of Protection State owned. The Committee for Preservation of Natural Environment at the Council of Ministers of Bulgaria is responsible for the implementation of the Ramsar Convention. The reserve is administered in collaboration with the Research and Coordination Centre for the Protection and Restoration of the Environment. The lake area was declared a wildfowl refuge in 1942 and upgraded to a nature reserve by the Ministry of Agriculture and Foods on 20 September 1948 by Decree No. 2-11-931. The area is the only sizeable natural area protected in north-east Bulgaria. All economic and tourist activities are prohibited under the Law for the Protection of Nature of 1967. Access only by scientific staff with research permits (obtainable from the Committee for Preservation of Natural Environment). Shooting and the disturbance of nesting birds is strictly prohibited. The area was approved as a biosphere reserve in January 1977, and accepted as a World Heritage site in 1983. Designated as a Ramsar site at the time of signature in September 1975.

Site Description Srébarna is a typical freshwater Danubian lake on the river flood terrace formed after the drainage of the marshland along the Danube. The marshes are overlooked by hills which lie just outside the reserve boundary. Until 1949, when a dam was built, the lake was linked with the Danube, but since then its open water area has decreased with reedbeds invading the shallows (maximum depth 2.5m). For some years the dam prevented annual flooding of the area by the river but the lake was reconnected to the river in 1978. The reserve

is in the Ukraine-Kazakh floristic region but the marsh vegetation is dominated by reed *Phragmites australis* (occupying two thirds of the reserve) with some *Typha* sp. Other species include pondweed *Potamogeton pectinatus*, water lily *Nymphaea alba*, duckweed *Lemna* sp. and some uncommon marsh plants. The reserve is well fenced and surrounded by forests, vineyards, arable lands and stretches of steppe (to be included into the reserve).

International and National Importance The site supports a very rich birdlife of some 180 species (half the Bulgarian avifauna). There are 80 migratory and 99 breeding species recorded including the only Bulgarian colony of Dalmatian pelican *Pelecanus crispus* (29-127 pairs), white-tailed eagle *Haliaeetus albicilla* (1 pair), glossy ibis *Plegadis falcinellus* (50-5,000 pairs), spoonbill *Platalea leucorodia* (3-10 pairs) and pygmy cormorant *Phalacrocorax pygmeus* (20 pairs). The site is the only nesting place in Bulgaria for great white egret *Egretta alba* (10-15 pairs) and there are five other species of heron with some 1,000 nests. Other species recorded at the lake include mute swan *Cygnus olor*, greylag goose *Anser anser*, lesser white-fronted goose *A. erythropus*, red-breasted goose *Branta ruficollis*, gadwall *Anas strepera*, mallard *A. platyrhynchos*, ruddy shelduck *Tadorna ferruginea*, ferruginous duck *Aythya nyroca*, red-crested pochard *Netta rufina*, red-necked grebe *Podiceps grisegena*, bluethroat *Luscinia svecica*, bearded tit *Panurus biarmicus*, coot *Fulica atra*, moorhen *Gallinula chloropus*, grey heron *Ardea cinerea*, purple heron *A. purpurea*, squacco heron *Ardeola ralloides*, little egret *Egretta garzetta*, night-heron *Nycticorax nycticorax*, little bittern *Ixobrychus minutus*, great reed warbler *Acrocephalus arundinaceus*, common kingfisher *Alcedo atthis*, marsh harrier *Circus aeruginosus* and two of the three European species of marsh tern: black tern *Chlidonias nigra* and whiskered tern *C. hybrida*. Otter *Lutra lutra* occasionally occurs.

Changes in Ecological Character Muskrat *Ondatra zibethica* introduced from central Europe became naturalised in the lake area in 1956. Economic activities around the reserve do not disturb the wildlife within it.

Management Practices A decree for Management of Srébarna Reserve was issued in 1962 concerning the preservation of nature in the wetland zone. A project has been discussed regarding the establishment of a joint nature reserve with Romania to incorporate both banks and the islands of the Danube. A buffer zone is being developed around the reserve. Reserve staff include two biologists, technical staff and two guards.

Scientific Research and Facilities Only carefully controlled scientific research is allowed. There is continuous research mainly to establish numbers of the different species and the ecological conditions necessary for their long-term preservation. The site contains a natural history museum and the Bulgarian Academy of Sciences field ecological station.

Principal Reference Material The above information is taken from the document submitted by the Government of Bulgaria at the time of designation in 1975, supplemented by the documents submitted to the Man and Biosphere Bureau, and to the World Heritage Secretariat, and by the National Report of the Peoples Republic of Bulgaria prepared for the Conference on the Conservation of Wetlands of International Importance especially as Waterfowl Habitat held in Cagliari, Italy (November 1980).

Additional information:

Bulgurkov, K. (1958). Particularités hydrologiques de la réserve - le lac Srébarna et la composition de sa faune piscicole. *Izvestija na Zoologischeskija institut s musej pri BAN*. Vol. VII. Bulgarian Academy of Sciences.

Hodek, R. (1982). Der Wanderer Heim. *Mitt. Orn. Ver. Wien.* 6.

Micev, T. (1958). La réserve Srébarna. *Nachi rezervati i prirodni zabeležitelnosti.* Vol. I.

Paspaleva-Antonova, M. (1961). Contribution à l'ornithofaune de la réserve Srébarna, région de Silistra. *Izvestija na Zoologischeskija institut s musej pri ban.* Vol. XV. Bulgarian Academy of Sciences.

Arkoutino Waterfowl Reserve

Location 42°18'N, 27°45'E. Situated to the south of Burgas on the shore of the Black Sea in south-east Bulgaria. Near the Turkish border.

Area 97ha (within Ropotamo Park 850ha)

Degree of Protection State owned. The Committee for Preservation of Natural Environment at the Council of Ministers of Bulgaria is responsible for the implementation of the Ramsar Convention and the administration of the park. The site is within Ropotamo Park protected under the Law for the Protection of Nature (1967). All hunting, tourist and economic activities are prohibited in the wetland area. Designated as a Ramsar site at the time of signature in September 1975.

Site Description The site comprises a small freshwater lagoon and associated marshlands situated among the dunes to the northeast of the Ropotamo river mouth. The shallow lagoon (0.5m) is fed mainly by rainfall. It is fringed with reedbeds of *Phragmites australis* and *Typha* sp. with patches of undisturbed woodland. The open water is covered by floating waterlily *Nymphaea alba*. A road runs along the east side of the lagoon separating it from the Black Sea shoreline.

International and National Importance The lagoon is an important resting station for migratory waterfowl including coot *Fulica atra* and great crested grebe *Podiceps cristatus*. Other recorded species include black-winged stilt *Himantopus himantopus*, glossy ibis *Plegadis falcinellus*, night heron *Nycticorax nycticorax*, white stork *Ciconia ciconia*, mallard *Anas platyrhynchos* and marsh harrier *Circus aeruginosus*.

Changes in Ecological Character None reported

Management Practices Tourism in some popular areas near the wetland has been stopped by the Committee for Preservation of Natural Environment to minimise water pollution and improve the ecological conditions for waterfowl and other game species.

Scientific Research and Facilities None reported

Principal Reference Material The above information is taken from the document submitted by the Government of Bulgaria at the time of designation in 1975, supplemented by the National Report of the Peoples Republic of Bulgaria prepared for the Conference on the Conservation of Wetlands of International Importance especially as Waterfowl Habitat held in Cagliari, Italy (November 1980).

Atanassovo Lake Natural Reserve

Location 42°30'N, 27°29'E. Situated 5km north of Burgas

Area 1,050ha.

Degree of Protection The northern part of the lake has been designated a nature reserve (Order No 601, of 12 July 1980). All human activities in it - fishing, dumping of industrial waste and effluent - is banned. Not included in recultivation plans. Designated as a Ramsar site in November 1984.

Site Description A hypersaline lake which is cut by the Burgas-Varna road into a southern part, 6 sq.km and a northern part 10.9 sq.km. It is the habitat for 14 species of algae and *Phragmites australis*, *Typha latifolia*, *Artemisia maritima* are the predominant macrophytes. A large population of invertebrates (15 principal species) forms a reliable food base for the abundant and varied bird fauna, with over 202 bird species. Owing to the high salinity of the lake (50-60%) it rarely freezes and hence is an important stopping point for birds on their migration in particular wintering waterfowl.

International and National Importance The lake is the only breeding ground in Bulgaria of gull-billed tern *Gelochelidon nilotica*, and one of the few locations of avocet *Recurvirostra avosetta* (1,000 pairs), black-winged stilt *Himantopus himantopus* (100 pairs), shelduck *Tadorna tadorna* (30 pairs), stone curlew *Burhinus oedicnemus*, pratincole *Glareola pratincola*; oystercatcher *Haematopus ostralegus*, common tern *Sterna hirundo* and little tern *S. albifrons*. Also listed as breeding are teal *Anas crecca*, mallard *Anas platyrhynchos*, ferruginous duck *Aythya nyroca*, purple heron *Ardea purpurea*, lapwing *Vanellus vanellus*, redshank *Tringa totanus*, Kentish plover *Charadrius alexandrinus*, little ringed plover *C. dubius*, moorhen *Gallinula chloropus* and coot *Fulica atra*. Migratory birds include Dalmatian pelican *Pelecanus crispus*, (an average of 189 individuals for the autumn period of 1979-1981), white pelican *P. onocrotalus*, white stork *Ciconia ciconia*, black stork *C. nigra*, spoonbill *Platalea leucorodia*, grey heron *Ardea cinerea*, marsh harrier *Circus aeruginosus*, Montagu's harrier *C. pygarrus*, hen harrier *C. cyaneus*, pallid harrier *C. macrourus* and osprey *Pandion haliaetus*. Total average mid-winter numbers of waterfowl 9,700 individuals of 24 species (minimum 6,071 of 21 species; maximum 18,182 of 29 species).

Changes in Ecological Character Salt and lye have been produced in the vicinity for pharmaceutical purposes since 1922. Illegal small holdings have been set up within the reserve boundary, prior to the declaration of the site and these are now being moved. Illegal trespass and grazing takes place.

Management Practices No information

Scientific Research and Facilities No information

Principal Reference Material The above information is taken from the document submitted by the Government of Bulgaria at the time of designation in 1984.

Durankulak Lake Natural Landmark

Location 43°42'N, 28°30'E. The most northern of Bulgarian coastal lakes, situated north-east of Vakkino, Tolbouhin District.

Area 350ha

Degree of Protection State owned. The Committee for Preservation of Natural Environment at the Council of Ministers of Bulgaria is responsible for the implementation of the Ramsar Convention and the administration of the park. Designated as a protected territory (protected landscape) by Order No. 123 of 21 February 1980 (State Gazette No. 23/1980). Designated as a Ramsar site on the 28 November 1984.

Site Description Average depth 1.4m, maximum depth 4m. Brackish coastal lake, with low salinity, freezing below 0°C. Fed by two springs at its south-west bank. Over 20 species of plants have been established including *Phragmites communis*, *Iris pseudocoris*, *Ranunculus aquatilis*, the pteridophyte *Equisetum palustris*, Cyanophyta (17 species), Euglenophyta (10 species), Chlorophyta (47 species). It is the habitat of 4 species of Crustacea, 20 species Insecta, rare and endemic species of Gobiidae, Clupeidae, and Gasterosteidae.

International and National Importance It is the habitat of rare and endangered breeding and migratory wintering waterfowl species. Known breeding species include: great crested grebe *Podiceps cristatus*, little bittern *Ixobrychus minutus*, bittern *Botaurus stellaris*, mute swan *Cygnus olor*, greylag goose *Anser anser*, mallard *Anas platyrhynchos*, marsh harrier *Circus aeruginosus*, coot *Fulica atra* and pratincole *Glareola pratincola*. The wintering waterfowl include white-fronted goose *Anser albifrons* (average 17,000), red-breasted goose *Branta ruficollis*, curlew sandpiper *Calidris ferruginea*, black-throated diver *Gavia arctica*, black-necked grebe *Podiceps nigricollis*, red-necked grebe *P. grisegena*, cormorant *Phalacrocorax carbo* and pygmy cormorant *P. pygmeus*. Average winter numbers 32,600 individuals of 19 species (minimum 14,300 of 13 species, maximum 71,000 of 24 species).

Changes in Ecological Character Anthropogenic activity limited, no industrial or other pollution, not included in reclamation plans, no hunting.

Management Practices A 500m buffer zone has been established where hunting and the application of pesticides is banned. Fishing is allowed only when the bird colony is not disturbed.

Scientific Research and Facilities No information

Principal Reference Material The above information is taken from the document submitted by the Government of Bulgaria at the time of designation in 1984.

Canada

Area 9,976,147 sq.km

Population 25,354,064 (1986)

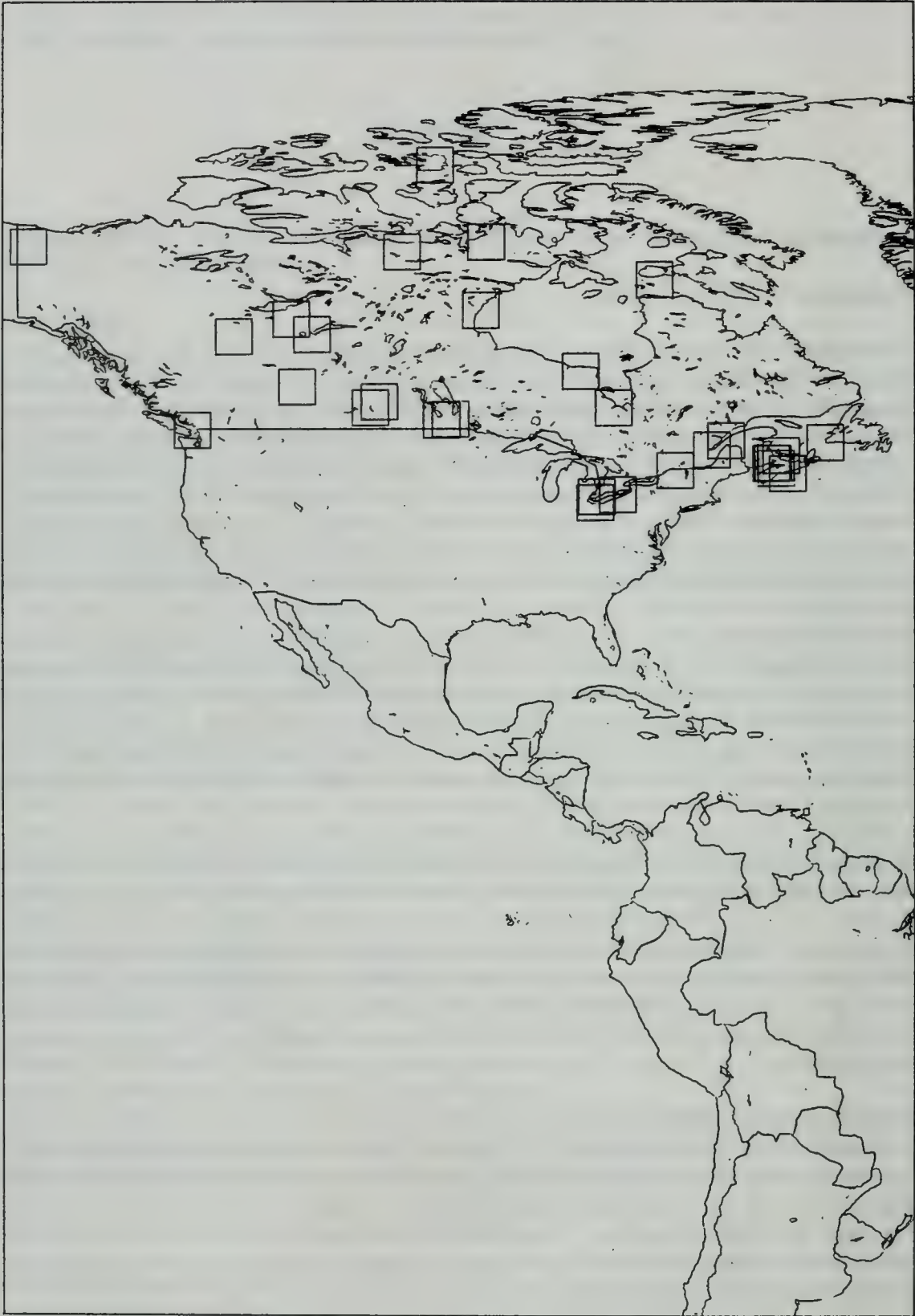
Summary of Wetland Situation Canada has the largest area of land that was covered by glaciers during the last ice age of any country in the world. This has led to the creation of hundreds of thousands of lakes, and the changing of the water flow pattern of a number of major rivers. The Canadian Shield, a nucleus of ancient Pre-cambrian rocks which covers some 2 million sq. miles, was particularly affected by this glaciation which led to considerable erosion of the surface and the subsequent development of an area with thousands of lakes, and a fairly irregular drainage pattern. The edge of the shield is marked by a series of large lakes from Athabasca, Winnipeg, Great Slave and Bear in the west, to the Great Lakes of Superior and Huron (North Channel and Georgia Bay) in the south, with the St Lawrence to the south east.

Several major rivers drain the country, from the St Lawrence in the south-east to the Mackenzie in the north-west. The St Lawrence ends in a wide estuary on the Gulf of St Lawrence, the Mackenzie in a large delta. The Peace-Athabasca delta in northern Alberta, one of the largest inland freshwater deltas in the world, is relatively little disturbed by man. In British Columbia sea fiords and many small islands line the coast. The Bay of Fundy on the Atlantic coast has a large tidal range; at Mary's Point the area is shallow and much of the bottom is uncovered at low tide.

With the largest coastline of any country in the world (243,000km excluding the Great Lakes) and 15% of the world's freshwater, Canada has a massive heritage of wetlands.

The rarest bird using the wetlands of Canada is the endangered whooping crane *Grus americana*, which breeds only in and around the northern edge of Wood Buffalo National Park. Protection of the area is therefore vital to the survival of the crane. Over 80 million waterbirds use the wetlands of Canada, particularly for breeding and on migration, and many Nearctic waders breed in the north.

Protected Areas Legislation National (federal) parks are set up and maintained under the National Parks Act as amended in 1974, migratory bird sanctuaries under the Migratory Birds Convention Act, 1917, and national wildlife areas under the Canada Wildlife Act, 1973. Each province also has its own protected areas legislation. In general, natural resources in Canada are under provincial jurisdiction. As a result, provincial governments have a key role in conservation. Federal parks, reserves and sanctuaries have been established on federal lands or through negotiation with provinces.



Ramsar Sites in Canada

Protected Areas Administration Responsibility for the Migratory Birds Conservation Act and the Canada Wildlife Act is vested in the Minister of the Environment and undertaken by the Canadian Wildlife Service, which manages national wildlife areas (on federal crown land) and supervises migratory bird sanctuaries (some of which are on provincial crown land or land in private ownership) in accordance with the legislation and relevant regulations. Public access to national wildlife areas and migratory bird sanctuaries is generally permitted though some areas may be closed to the public seasonally or throughout the year to reduce risks of damage. Scientific collecting of specimens is allowed only by permit. Research in national wildlife areas and migratory bird sanctuaries is conducted by the Canadian Wildlife Service, by universities or by other organisations under contract. Where appropriate, the Canadian Wildlife Service provides facilities for the public on national wildlife areas, including interpretation programmes.

Responsibility for the National Parks Act is vested in the Minister of the Environment and undertaken by the Canadian Parks Service, which is headed by an Assistant Deputy Minister. The Canadian Parks Service headquarters is responsible for policy direction while five regional offices direct the operations of the 28 national parks. The Canadian Parks Service's objective is the protection and management, for all time, of representative natural areas of Canadian significance in a system of national parks. Scientific research in national parks, related primarily to the study of natural resources and their management, is conducted by scientists of the Canadian Wildlife Service; other resource studies, inventory programmes and recreational research are carried out by the Canadian Parks Service staff. Research is also undertaken by the universities, subject to the Director General's approval. Special licensing is required for any collecting necessary for scientific purposes. Facilities for park visitors are rated second in administration priority after protection of outstanding natural landscapes. Public use is encouraged (over 19 million park visitors in 1978/79) through interpretative programmes, personal experience, and publications for developing an understanding and knowledge of the values of natural communities and landscapes while enjoying outdoor recreation in natural surroundings. The "Federal-Provincial Parks Conference" (FPPC) coordinates activities related to national and provincial parks, and a classification system has been devised for the 2,442 parks listed by the FPPC.

Canadian governments are (in 1990) negotiating with their indigenous populations for large transfer of land ownership and control. In most cases, the actual boundaries of the lands to be transferred are still undetermined. In some instances, Ramsar sites may be involved and care is being taken by all parties to ensure continued management, should such sites be transferred.

Sites designated under the Convention Accession 15 January 1981 with one site listed at accession, 14 sites added 24 May 1982, another 2 on 16 October 1985, another 11 on 27 May 1989, another 1 on 5 November 1987 and one more on 28 April 1988.

Cap Tourmente National Wildlife Area (Quebec)
 Mary's Point National Wildlife Area (New Brunswick)
 Long Point National Wildlife Area (Ontario)
 Delta Marsh (Manitoba)
 Last Mountain Lake (northern part) (Saskatchewan)
 Whooping Crane Summer Range (Alberta and Northwest Territories)
 Peace-Athabasca Delta (Alberta)
 Hay-Zama Lakes (Alberta)
 Alaksen National Wildlife Area (British Columbia)

Old Crow Flats (Yukon Territory)
Polar Bear Pass National Wildlife Area (NW Territories)
Queen Maud Gulf Migratory Bird Sanctuary (NW Territories)
Rasmussen Lowlands (NW Territories)
McConnell River Migratory Bird Sanctuary (NW Territories)
Dewey Soper Migratory Bird Sanctuary (NW Territories)
St. Clair National Wildlife Area (Ontario)
Chignecto National Wildlife Area (Nova Scotia)
Polar Bear Provincial Park (Ontario)
Lac Saint-François National Wildlife Area (Quebec)
Baie de l'Île Verte National Wildlife Area (Quebec)
Shepody National Wildlife Area (New Brunswick)
Codroy Marsh (Newfoundland)
Quill Lakes (Saskatchewan)
Oak-Hammock Marsh Wildlife Management Area (Manitoba)
Southern James Bay Migratory Bird Sanctuaries (Ontario)
Point Pelee National Park (Ontario)
Musquodoboit Harbour Outer Estuary (Nova Scotia)
Beaverhill Lake (Alberta)
Southern Bight-Minas Basin (Nova Scotia)
Malpeque Bay (Prince Edward Island)

Government body responsible for administration of the Convention Canadian Wildlife Service, Environment Canada, Ottawa, Ontario, K1A 0E7

Cap Tourmente National Wildlife Area

Location 47°05'N, 70°45'W. Situated on the north shore of the St Lawrence River, Montmorency county, Province of Quebec, 50km north-east of Quebec city.

Area 2,200ha

Degree of Protection Cap Tourmente is owned by the government of Canada and was established as a national wildlife area under the Canada Wildlife Act of 1973. It is administered by the Quebec Region, Canadian Wildlife Service. Designated as a Ramsar site in January 1981 when Canada acceded to the Ramsar Convention.

Site Description The site has a wide range of habitats from the summit of Cap Tourmente at 600m to the tidal flats of the St Lawrence at 2.5m to 5.0m and comprises 400ha tidal marsh, 100ha coastal meadow, 500ha agricultural land and 1,200ha forest. Habitats include coniferous and deciduous forests, ponds and ditches, coastal meadows and tidal marsh. The Cap Tourmente marshes are situated on broad tidal flats subjected to heavy tidal flooding by fresh waters. The tidal amplitude is 4.1m at mean tides and 5.8m at large tides. The dominant plant is *Scirpus americanus* and secondary species include *Zizania palustris*, *Sagittaria cuneata* and *S. latifolia*. The *Scirpus americanus* marshes of the St Lawrence are natural wetlands restricted to the freshwater tidal portion of the river with under 4,000ha remaining, of which only 1,200ha are

situated on the deep 13m sediments capable of supporting dense luxuriant plant growth. The coastal meadow which forms the inland border of the tidal marsh is a broad expanse of land flooded only by extreme tides greater than 5.5m. Extensive mowing and grazing of these meadows in the past has ceased and various stages of plant succession are now present with various sedges and shrubs dominating in many areas. Management of drainage ditches, the construction of artificial ponds and protection of beaver *Caster canadensis* has improved the area for breeding ducks over the past decade.

International and National Importance The area includes one third (400ha) of high quality *Scirpus americanus* marsh remaining in the St Lawrence. These marshes are vital to greater snow geese *Anser caerulescens atlanticus* which stage in the St Lawrence in spring and fall. About 30% of the goose usage by the entire world's stock of greater snow geese during migration occurs at this site. Their diet here is composed mainly of underground parts of *Scirpus americanus* although in recent years other marsh plants and agricultural grasses have been consumed. These marshes also serve as important staging areas for large numbers of surface feeding ducks, mainly black duck *Anas rubripes*, green-winged teal *Anas crecca carolinensis*, blue-winged teal *Anas discors* and pintail *Anas acuta*. Small numbers of these species breed locally, raising their young in the tidal marsh. Common snipe *Capella gallinago* is common on the coastal meadow and this area is also used by nesting dabbling ducks and moulting green-winged teal. On the ponds and ditches increased numbers of black duck, green-winged and blue-winged teal and pintail have made use of the new habitats and shoveler *Anas clypeata* and wood duck *Aix sponsa*, which did not previously breed in the area, are now present.

Changes in Ecological Character The site is situated just downstream from the heavily industrialised portion of the St Lawrence (extending from Quebec city to the Great Lakes) and therefore remains vulnerable to the effects of toxic substances. Pollution from oil spills would be difficult to control due to the high tides. Increasing numbers of greater snow geese have led to a depletion of *Scirpus* rhizomes which may eventually cause a deterioration of the marsh at Cap Tourmente.

Management Practices Attempts to alleviate overgrazing of the marsh by greater snow geese are aimed mainly at encouraging use of nearby tidal marshes by larger numbers of geese. Plans are presently being made to manage portions of the coastal meadow to provide supplementary feeding sites within the national wildlife area. Maintenance of the existing managed areas - the ponds and ditches - will be required to maintain the attraction of those areas to breeding ducks. Some hunting is allowed based on certain traditional methods such as the use of pit-blinds and horse-drawn mud sleds.

Scientific Research and Facilities Research has been carried out on the greater snow geese and its habitats at Cap Tourmente since the mid 1950s. There is a museum illustrating the interactions of man the hunter and his environment and a reference library.

Principal Reference Material The above information is taken from the list of Canadian Wetlands Designated as of International Importance, May 1982.

Additional information:

Bouchard, L. (1976). *Le Cap Tourmente et la chasse aux oies blanches* Fides, Montreal. 160 pp.

- Bourget, A. (1974).** Migrations de la sauvagine dans la région de Quebec. In Boyd, H. (Ed.) Waterfowl studies. *Canadian Wildlife Service Report Series* 29. Ottawa.
- Doran, Marie-Andrée (1977).** Etude sur la régénération de *Scirpus americanus* sur les battures de la Réserve Nationale de la Faune à Cap Tormente. Unpublished report to the Canadian Wildlife Service, Quebec.
- Lemieux, L. (1959).** Histoire naturelle et aménagement de la Grande Oie blanche, *Chen hyperborea atlantica*. *Naturaliste Canadien* 86: 133-192.
- Lemieux, S. (1978).** Les oiseaux de la Réserve nationale de faune du cap Tourmente. *Naturaliste Canadien* 105: 177-193.
- Reed, A. (1978/79).** The feeding ecology of the greater snow goose on a staging haunt in the St. Lawrence estuary: a progress report. *Verh. Orn. Ges. Bayern* 23: 201-202.
- Reed, A. (1980).** A greater snow goose management plan: A Canadian perspective. Canadian Wildlife Service. Unpublished draft.
- Scherrer, B. (1975).** Enquête sur la chasse à la Grande Oie blanche, les aspects bio-socio-économiques. Unpublished report. University of Quebec, Montreal. 187 pp.
- Serodes, J. (1978).** Qualité des sédiments fins de l'estuaire moyen supérieur. Environment Canada, Inland Waters Directorate. Unpublished report. 8 pp.

Mary's Point

Location 45°44'N, 64°45'W. Situated at the head of the Bay of Fundy, 40km south of the city of Moncton in the Province of New Brunswick.

Area 1,200ha

Degree of Protection The government of Canada owns 107ha which includes the most critical sites used by the large roosting flocks of shorebirds during high tide and is administered by the Canadian Wildlife Service (Atlantic Region, P.O. Box 1550, Sackville, New Brunswick E0A 3C0). Most of the 150ha of saltmarsh remain under private ownership as poor land titles have prevented purchase by the federal government. The remaining 940ha+ of mudflats are intertidal land with no known ownership. The area is a unit of Shepody National Wildlife Area, and is scheduled under and controlled by the Wildlife Area Regulations. Designated as a Ramsar site in May 1982.

Site Description The area encompasses a large tidal *Spartina* marsh, expanses of intertidal mudflats and a peninsula protruding into Shepody Bay. The peninsula was formed from glacial outwash gravel overlying sandstone bedrock and consists of 2 forested 'islands' joined by salt marsh, rock cliffs and intertidal ledges, gravel beaches and a small ridge of sand dunes. The extensive intertidal mudflats are over 1.5km wide in places and occur to the north and south of the point. They consist of fine marine silts built up over time through deposition from muddy tidal waters. Altitude is -2m to 10m.

International and National Importance The intertidal mudflats support *Corophium volutator*, an amphipod which in North America occurs only in the Bay of Fundy in recorded densities exceeding 60,000 per sq m which are the highest densities in the world. It is the principal forage species of shorebirds. The wetland supports the largest numbers of mixed species of shoreline

birds during fall migration in all of North America. Several million semi-palmated sandpipers *Calidris pusilla*, thousands of least sandpipers *Calidris minutilla*, short-billed dowitcher *Limnodromus griseus*, white-rumped sandpiper *Calidris fuscicollis*, semi-palmated plover *Charadrius semipalmatus*, black-bellied plover *Pluvialis squatarola* and red knot *Calidris canutus* feed and roost at the site from late July to September. Small numbers of black duck *Anas rubripes*, blue-winged teal *Anas discors* and ring-necked duck *Aythya collaris* breed in a 20ha freshwater impoundment adjacent to the 150ha salt marsh.

Changes in Ecological Character The possibility of a major alteration at the site due to the installation of a tidal barrage for power generation is potentially a grave threat. The Mary's Point area is considered the least economic of the three prime sites being studied for tidal power installation in the Bay of Fundy. Development may still go ahead though probably not in the next decade. Recreational use of all-terrain vehicles along the beach occasionally causes disturbance to the roosting flocks and the number of visitors needs to be regulated to keep disturbance to a minimum.

Management Practices A 20ha controlled waterfowl impoundment was constructed by Ducks Unlimited Canada in 1979 at a site adjacent to the salt marsh. Future management of the impoundment may involve vegetation control via tidal flooding and possible maintenance of slightly brackish conditions within the impoundment. The portion of the site presently designated as a national wildlife area is posted with identification signs and there is an observation deck overlooking the beach. A seasonal naturalist is needed to advise visitors on the biological values of the area and its sensitivity.

Scientific Research and Facilities Research activities have been aimed at understanding the upper Bay of Fundy in general. In particular, shorebird research programmes conducted from 1974-1981 documented the feeding ecology of the birds and illustrated the importance of the Mary's Point site for feeding and roosting.

Principal Reference Material The above information is taken from the list of Canadian Wetlands Designated as of International Importance May 1982.

Additional information:

- Harrington, B.A. and Morrison, R.I.G. (1979).** Semipalmated sandpiper migration in North America. *Studies in Avian Biology* 2: 83-100. Cooper Ornithological Society, Los Angeles, California.
- Majka, M. (1978).** Wings over Fundy. *Nature Canada* 7(3). Canada.
- Morrison, R.I.G. (1974 to 1978).** Annual reports of the Maritime Shorebird Survey, Canadian Wildlife Service, Ottawa.
- Morrison, R.I.G. (1976).** Use of the Bay of Fundy by shorebirds. In Daborn, G.R. (Ed.) *Proceedings of a workshop of Fundy Tidal Power and the Environment*. Acadia University, Wolfville, Nova Scotia.

Long Point National Wildlife Area

Location 42°35'N, 80°15'W. Situated on the north shore of Lake Erie in the regional municipality of Haldimand-Norfolk near the town of Port Rowan, Ontario.

Area 13,730ha

Degree of Protection Ownership is divided between a number of organisations and the government. Federal Government - Ontario Region: Canadian Wildlife Service (1725 Woodward Drive, Ottawa, Ontario K1A 0E7) 2,440ha and Department of Transport 30ha. Provincial Government: Ontario Ministry of Natural Resources 820ha and Long Point Region Conservation Authority 220ha. Navigable water inner bay 7,280ha, private waterfowl hunt clubs 2,900ha and other private ownership 40ha. Lands administered by the Canadian Wildlife Service have been designated as national wildlife areas under the Canada Wildlife Act 1973. Lands administered by the Ontario Ministry of Natural Resources are designated either as provincial park or controlled through the Public Lands Act. The Long Point Region Conservation Authority owns and administers its property under the Conservation Authorities Act. The lands owned by the private waterfowl clubs are managed for waterfowl hunting and are not at present considered in danger of loss. Escalating land costs, however, could materially affect their status. The Canadian Wildlife Service and Nature Conservancy have the right of first refusal to those lands still owned by the Long Point Company. The marshlands and Long Point are zoned as environmental protection areas under the official plan for the Regional Municipality of Haldimand-Norfolk but this does not assure perpetual protection.

Site Description Long Point is a long slender sandspit extending 32km into the deepest part of Lake Erie. The peninsula was formed primarily by easterly longshore currents transporting sand from the eroding cliffs further west. Along the north shore of Long Point, erosion and deposition occur in a westerly direction. Average altitude is 174m rising to 183m in the sand dunes. The climate of Long Point is influenced by the moderating effects of Lake Erie, meaning that spring and summer temperatures are lower than the adjacent mainland, and fall and winter temperatures higher. Mean summer temperature is 22°C and winter 1°C. Annual precipitation is 860mm. The thermal moderation caused by the lake, combined with the southern geographic location of the point, allows a number of plants and animals to survive at the northern fringe of their range. The wetlands at the base of the point represent an older more stable successional stage compared to those on the peninsula and include wooded swamp, shrub carr, grassy and cattail marsh. The peninsula is a series of alternating ridges separated by ponds and swales. Water depth between the ridges is greatly influenced by lake levels. Long Point is thus a unique combination of habitats: beach, sand dunes, grass-covered ridges, savannas, woodlands, wet meadows, rush swales, wooded swamp, tamarack-cedar ponds and deep shallow marshes.

International and National Importance The wetlands and associated sand dune ecosystems of Long Point are the best remaining examples of their type in the Great Lakes basin. The whole spectrum of dune and wetland succession is easily discernible along the region's length. The area is renowned as a staging area for waterfowl in spring and fall and is one of the most important areas of waterfowl concentration in Ontario. The marshes and adjacent waters of Long Point

Bay can contain at one time during peak migration 100,000 or 11% of the total population of redheads *Aythya americana* and at least 43,000 or 14% of all canvasback *Aythya valisineria*. Tundra swan *Cygnus c. columbianus* traditionally uses the marshes extensively during spring migration with about 50% of the population east of the Rocky Mountains passing through the area in spring and a lesser number in autumn. Puddle ducks and other species of diving ducks use the region in large numbers. The area is of national significance to many other migrating birds and since the establishment of Long Point Bird Observatory in 1960, 237 species or 75% of all species recorded for Ontario have been observed. A total of 115 bird species are believed to have nested on Long Point including bald eagle *Haliaeetus leucocephalus* and piping plover *Charadrius melodus* (both endangered in Ontario), king rail *Rallus elegans*, Forster's tern *Sterna forsteri* and the rare prothonotary warbler *Protonotaria citrea*. There are 31 recorded species of mammal, 26 species of reptiles and amphibians including five species considered threatened in Canada and 114 species of fish native to Lake Erie, many utilising the waters in and around Long Point at some time in their life-cycle. At least 60 species have been recorded on Canadian Wildlife Service property alone. A variety of invertebrates occurs, including meadow crayfish *Cambarus diogenes* which is one of Canada's rarest invertebrates. The area is also on a migration route for bats and monarch butterflies *Danaus plexippus*.

Changes in Ecological Character Long Point receives a high degree of acid precipitation and a pH of around 4.0 is common in places. Environmental pollution from industry is a constant concern. Direct threats to the unprotected wetlands are primarily proposals to convert the marshes to agriculture or recreation. Marina developments to service the large boating public are a constant threat and the construction of channels to service private cottages requires rigid control. Fertiliser and herbicide runoff from increased agricultural use of the marshes could affect water quality. The water of the inner bay already tends towards a eutrophic state. Other threats include possible off-site developments which could interfere with the littoral drift and transport of sand that forms Long Point or by artificial manipulation of the water level of the Great Lakes. Severe storms can overwash the barrier beach damaging the wetland, and high water levels accelerate erosion.

Management Practices The area administered by the Canadian Wildlife Service (CWS) is managed as a wilderness area with little interference in the dynamic forces of nature and limited public use. Some restorative measures may be undertaken to rectify adverse impacts caused by past human activities. The Big Creek Marsh has been historically managed to facilitate waterfowl hunting and muskrat harvesting. Permitted management activities include water level control and creation of channels to facilitate waterfowl brood movement and waterflows. Muskrat harvesting is permitted under a CWS permit and waterfowl hunting is permitted in certain areas. Sport fishing, canoeing and wildlife viewing are also permitted. A management plan for Big Creek complex has been agreed to by the government agencies and private owners involved. The marsh areas owned by other government agencies and private owners are generally managed for waterfowl hunting purposes.

Scientific Research and Facilities A permanent research station has been operated by the Long Point Bird Observatory to monitor migratory birds since 1960 and the Canadian Wildlife Service surveys waterfowl populations annually. A number of graduate theses and other studies have been undertaken on a variety of biological topics.

Principal Reference Material The above information is taken from the list of Canadian Wetlands Designated as of International Importance May 1982.

Additional information:

- Barrett, H.B. (1977).** *Lore and legends of Long Point*. Burns and MacEachern Ltd., Don Mills, Ontario. 240 pp.
- Bradstreet, M.S.W. (1977).** The biological environment of Long Point, Lake Erie: an overview. Unpubl. report for The Nature Conservancy of Canada.
- Bradstreet, M.S.W., McKeating, G. and Parsons, J. (Eds) (1980).** *Seasons* (special issue on Long Point) 21(1). Federation of Ontario Naturalists, Don Mills, Ontario. 63 pp.
- Campbell, C.A. (1979).** Preliminary herpetological survey and evaluation of proposed habitat alterations at Big Creek National Wildlife Area, Port Rowan, Ontario. Unpubl. report to CWS.
- Catling, P.M. and Reznicek, A. (1979).** A list of plants from Long Point. Unpubl. report to CWS. 30 pp.
- Deyne, G.A. (1977).** Summer resources inventory of the Lee Brown Waterfowl Management Area. Report for the L.P.R.C.A. 102 pp.
- Nelson, J.G. and Needham, R.D. (1979).** The Lake Erie peninsulas: management issues and directions. *Contact* 11(1). Faculty of Environmental Studies, University of Waterloo, Ontario.
- Nelson, J.G. and Jessen, S. (Eds) (1980).** Coastal resources and environmental management: the case of the Long Point area, Lake Erie, Ontario. *Contact* 12(3). Faculty of Environmental Studies, University of Waterloo, Ontario.

Delta Marsh

Location 50°05'N, 98°00'W. Situated in the Lake Agassiz Basin at the southern edge of Lake Manitoba in the Province of Manitoba, 22km north of Portage la Prairie.

Area 23,000ha

Degree of Protection About 16,600ha are in public ownership as provincial Crown land administered by the Wildlife Branch of the Manitoba Department of Natural Resources (P.O. Box 24, 1495 St James Street, Winnipeg, Manitoba). 2,000ha of this area are protected as a game bird refuge and 7,700ha as public shooting grounds. Delta Waterfowl Research Station controls a further 1,600ha of the marsh. The remaining land is under private ownership. Designated as a Ramsar site in May 1982.

Site Description Delta Marsh consists of large basins and small sloughs connected to Lake Manitoba by several natural beaches. The area is subject to low level natural fluctuations caused by wind tides from Lake Manitoba. Average water depth is 1.2m and maximum depth 4m. The altitude of the area is 248m. Vegetation consists of *Phragmites communis* and *Scolochloa festuacea* meadows which grade into wet prairie vegetation at slightly higher elevations. Sand ridges extending into the marsh contain considerable areas of mossy-cup oak *Quercus macrocarpa*. The beach ridge is dominated by box-elder *Acer negundo* and red alder *Fraxinus pennsylvanica*.

International and National Importance The area is particularly important as a staging marsh for waterfowl now averaging over 50,000 Anatidae during the fall, with past peak populations

of ducks and geese over 2 million. Some 285 species of birds have been recorded of which 37 are of accidental occurrence and 1 has been extirpated.

Changes in Ecological Character There is pressure to develop additional cottage sites and recreational facilities on Lake Manitoba beach. The privately owned west portion of the marsh is periodically flooded by the Portage Floodway, causing excessive siltation and vegetational growth.

Management Practices Parts of the area are cut annually for hay and the marsh provides valuable fur and fish harvests. Hay and waterfowl harvests are regulated and the use of motorised boats is restricted. Management plans have been proposed by the province in the Delta Marsh Plan 1978 and by Ducks Unlimited Canada. These include water level control and development of a public-private cooperative marsh management district.

Scientific Research and Facilities Permanent research programmes have been conducted since 1938 by the Delta Waterfowl Research Station, dealing mainly with waterfowl ecology and behaviour. Over 100 publications in journals have resulted. The University of Manitoba opened a field station in the western portion of the marsh in 1967 where research has concentrated on plant ecology, hydrology and local history.

Principal Reference Material The above information is taken from the list of Canadian Wetlands Designated as of International Importance May 1982.

Additional information:

- Bailey, R.O. (1979).** Wild mallard stocking in a large marsh habitat. *Canadian Field-Naturalist* 93: 55-62.
- Bartonek, J.C. and Hickey, J.J. (1969).** Selective feeding by juvenile diving ducks in summer. *Auk* 86: 443-457.
- Batt, B.D.J. (1979).** Individual variation and the analysis of mallard populations. In Bookhout, T.A. (ed.) *Waterfowl and Wetlands: an integrated review*. La Crosse Printing Co. Inc. Pp. 95-102.
- Bergman, R.D. (1973).** Use of southern boreal lakes by postbreeding canvasbacks and redheads. *J. Wildl. Manage.* 37: 160-170.
- Bossenmaier, E.F. and Marshall, W.H. (1958).** Field-feeding by waterfowl in southwestern Manitoba. *Wild. Monog.* 1. 32 pp.
- Bossenmaier, E.F. Cober, W.G., Leitch, W.G., MacKay, G.H., Miller, W.R., Moore, D.D., Walker, J.M. and Ward, P. (1968).** *The Delta Marsh: its values, problems and potentialities*. Tech. Commit. for Develop. of the Delta Marsh, Man. Dept. of Mines and Nat. Res. 75 pp.
- Brakhage, G.K. (1953).** Migration and mortality of ducks hand-reared and wild-trapped at Delta Manitoba. *J. Wild. Manage.* 17: 465-477.
- Cooper, J.A. (1977).** The history and breeding biology of the Canada geese of Marshy Point, Manitoba. *Wildl. Manage* 61. 87 pp.
- Hochbaum, H.A. (1967).** Contemporary drainage within the true prairies of the Glacial Lake Agassiz Basin. Life, Land and Water. *Proc. 1966 Conference on Environmental Studies, Glacial Lake Agassiz Region*. University of Manitoba Press, Winnipeg. Pp. 197-204.
- Hochbaum, P.W. (1970).** *The Delta Marsh*. Dept. of Mines, Resources and Environmental Management, Conservation Extension Branch, Winnipeg. 52 pp.

- Kaminski, R.M. and Prince, H.H. (1981). Dabbling duck and aquatic macro- invertebrate responses to manipulated wetland habitat. *J. Wildl. Management* 45: 1-15.
- Kiel, W.H. Jr, Hawkins, A.S. and Perret, N.G. (1972). Waterfowl habitat trends in the aspen parkland of Manitoba. *Canadian Wild. Serv. Report Series* 18. 61 pp.
- Ward, P. (1968). Fire in relation to waterfowl habitat of the Delta Marshes. *Proc. Ann. Tall Timbers Fire Ecology Conf.* 8: 243-267.
- Ward, P. and Batt, B.D.J. (1973). *Propagation of captive waterfowl - the Delta Waterfowl Research Station system*. Delta Waterfowl Research Station and Wildlife Management Institute, Washington. 64 pp.

Last Mountain Lake (northern part)

Location 51°20'N, 105°15'W. Last Mountain Lake is part of the Upper Qu'Appelle River system in south central Saskatchewan, 150km south-east of Saskatoon.

Area 15,600ha

Degree of Protection 7,039ha are owned by the federal government and 8,563ha by the provincial government. The area has been protected and administered cooperatively since 1968 and the governments are now seeking an agreement for long-term uniform management and administration. The federal area is protected under the Migratory Bird Sanctuary Regulations which stem from the Migratory Birds Convention Act. Designated as a Ramsar site in May 1982.

Site Description The sanctuary is situated at the northern end of Last Mountain Lake and comprises shallow marshy bays and inlets separated by points and numerous islands. The lake within the sanctuary has a maximum depth of 6.3m and average depth of 0.5-4m depending on seasonal variations. The surrounding uplands contain potholes and other fresh and saline wetlands, some with water levels held artificially high by low dams. Soils are light in texture with sandy saline loams near the lake. Altitude is about 425m. A wide variety of native grasses *Agropyron*, *Distichlis*, *Stipa* and *Hordeum*, forbs *Astragalus*, *Aster*, *Thermopsis* and *Solidago* and shrubs *Rosa*, *Symphoricarpos* and *Elaeagnus* occur in complex patterns in the Aspen parkland transition zone between grassland and forest.

International and National Importance The area is an important breeding and staging area for waterfowl and large numbers of other migratory birds. More than 220 species have been recorded including 90 breeding ducks, geese and sandhill crane *Grus canadensis*. Waterfowl concentrations are greatest from mid-August to November. The endangered whooping crane *Grus americana* occurs in the area during spring and fall migration.

Changes in Ecological Character A steady rise in public use in the surrounding area and on Last Mountain Lake is causing increasing disturbance to wildlife throughout the year. Breeding success of double-crested cormorant *Phalacrocorax auritus*, and perhaps other birds, has declined, and white pelican *Pelecanus erythrorhynchos* only breeds here irregularly. Increasing amounts of toxic chemicals from surrounding agricultural land are carried into the area by runoff

water. Natural fluctuations of the lake level have been controlled, thereby reducing return of nutrients to some marshlands.

Management Practices The area is managed for the conservation of migratory birds, their habitats, and for other wildlife species, and to help reduce crop damage of cereal grain by influencing the local distribution of waterfowl. Economic activities such as hay cutting and grazing are normally restricted to lands outside the sanctuary. Boating and recreational fishing are permitted with public access restricted in August and September to minimise disturbance of birds feeding on lure crops.

Scientific Research and Facilities Intensive research programmes have been conducted since 1959 by the Canadian Wildlife Service, and in cooperation with the universities of Saskatchewan and Regina and the province. The Saskatchewan Wildlife and Fisheries Division has conducted studies since the 1950s. There is much interest in continuing research programmes on the area.

Principal Reference Material The above information is taken from the list of Canadian Wetlands Designated as of International Importance May 1982.

Additional information:

Fawson, D.S. and Moore, J.E. (1944). The saline lakes of Saskatchewan. *Canadian Journal Research D.22*: 141-201.

Johnson, R.P. (1963). Studies on the life history and ecology of the bigmouth buffalo *Ictiobus cyprinellus*. *Journal Fish. Res. Bd. Canada* 20(b): 1397-1429.

Stephen, W.J.D. (1967). Bionomics of the sandhill crane. *Canadian Wildlife Service Report Series* 2. 46 pp.

Whooping Crane Summer Range

Location 60°15'N, 113°15'W. Situated in north-eastern Alberta and in the adjoining southern portion of the district of MacKenzie, Northwest Territories. The town of Fort Smith in NWT lies 80km south-east of the area.

Area 1,689,500ha

Degree of Protection Most of Whooping Crane Summer Range lies within the Crown-owned Wood Buffalo National Park, which is protected under the National Parks Act and administered by the Canadian Parks Service (Prairie Region, 391 York Avenue, Winnipeg, Manitoba). Wood Buffalo Park is a World Heritage site. Some 230,000ha of the range lie outside the park in the Northwest Territories. The range includes the International Biological Programme (IBP) sites 12 and 13, and Whooping Crane Nesting Area. Designated as a Ramsar site in May 1982.

Site Description Whooping Crane Summer Range is a natural area comprising a complex of marshes, shallow ponds, streams, lakes and bogs located near the northern extent of the Boreal Forest Region and west of the Canadian Shield. The thousands of water bodies in the area vary in depth from several centimetres to about a metre, with the average depth of the nesting ponds of the whooping crane 26cm. The area has a boreal continental climate characterised by long

cold winters and short warm summers. Mean daily temperatures are 17.8°C-23.3°C in January and 15.6°C-18.3°C in July. Annual precipitation is about 310mm but annual evaporation is 410mm. This moisture deficit together with some 40 thunderstorms per season creates an extreme forest-fire weather zone in the area. Seasonal drought in some years also greatly affects water levels in the nesting ponds. The brief frost-free period extends from early June to early September, but much of the area is permanently underlain with discontinuous permafrost. Daylight period is short in winter but in mid-summer is over 20 hours. Most of the bedrock in the area is Devonian or Cretaceous limestones, sandstones, shales, and evaporites such as gypsum and halite which were deposited during many periods of marine inundation of the region throughout the past 400 million years. The area is therefore influenced by saline groundwater. Altitude is 150m-250m. The marshland vegetation is dominated by bulrush *Scirpus validus*, sedge *Carex aquatilis* and cattail *Typha latifolia*. Dominant coniferous species include white spruce *Picea glauca*, black spruce *P. mariana*, tamarack *Larix laricina* and jack pine *Pinus banksiana*. Deciduous species include white birch *Betula papyrifera*, quaking aspen *Populus tremuloides* and balsam poplar *P. balsamifera*. Understorey species include dwarf birch *Betula glandulosa*, buffalo berry *Shepherdia canadensis*, willows *Salix* spp., Labrador tea *Ledum groenlandicum* and sphagnum moss. The area contains 47 species of mammal including wolf *Canis lupus*, moose *Alces alces*, lynx *Lynx canadensis*, snowshoe hare *Lepus americanus*, black bear *Ursus americanus*, muskrat *Ondatra zibethica*, beaver *Castor canadensis*, mink *Mustela vison*, woodland caribou *Rangifer tarandus caribou* and wood and plains buffalo *Bison bison athabasca* and *B. bison bison*. Reptiles and amphibians, which are limited in number by the boreal climate, include boreal chorus frog and wood frog, and at the northern limit of their ranges, Canadian toad, leopard frog *Rana pipiens* and red-sided garter snake. The fish of the area are not well known but preliminary information suggests that pearl dace, fathead minnow and Iowa darter are at their northern limit. A circumpolar species, the inconnu, spawns in Buffalo Lake at the western edge of the Whooping Crane Summer Range. Bird species include those characteristic of all boreal forest habitats and less common birds include whooping crane *Grus americana*, peregrine falcon *Falco peregrinus* and bald eagle *Haliaeetus leucocephalus*.

International and National Importance The wetland contains the only known nesting locality of the endangered whooping crane. In 1982 there were 19 breeding pairs and this area is critical to its survival. The vulnerable peregrine falcon also occurs in the region.

Changes in Ecological Character Current feasibility study to examine positive and negative aspects of a proposed hydro-electric dam across the Slave River near Fort Smith. It is possible that a dam could change or disrupt water levels and/or drainage patterns in Whooping Crane Summer Range. An extra-heavy voltage powerline running parallel to Highway 5 is a constant danger to low flying birds and electrical power transmission lines from the dam site to the Fort Murray area would pose a serious hazard to migratory birds including whooping crane. It is likely that traffic along Highway 5 north and west of Fort Smith will increase, particularly if there is large-scale industrial development near Fort Smith. Highway 5 is the only road access from the west to Whooping Crane Summer Range. It bisects the whooping crane nesting area and runs within 5km of a known nesting site.

Management Practices The area is in the management scheme of the Canadian Parks Service, which is currently evaluating and planning future management requirements. Recreational activities are minimal due to the remoteness and limited access. All fires in the area are acted on, with Whooping Crane nesting area one of the main priorities. Hunting and trapping of fur bearers by native inhabitants is permitted. Ground access and aerial traffic under 600m is

prohibited in the whooping crane nesting area. Excess whooping crane eggs are removed by the Canadian Wildlife Service for a 'foster parent' programme in Idaho conducted as part of a whooping crane recovery plan. A long range management plan for Wood Buffalo National Park has been produced by the Canadian Parks Service.

Scientific Research and Facilities The Canadian Wildlife Service carries out aerial whooping crane breeding pair and production surveys annually.

Principal Reference Material The above information is taken from the List of Canadian Wetlands Designated as of International Importance (May 1982).

Additional references:

Airphoto Analysis Associate Consultants Ltd. (1979). *The biophysical resource inventory, Wood Buffalo National Park.* Volume I-IV.

Beckel, D.K.B. (Ed.). IBP Ecological sites in subarctic Canada. Contribution of the Canadian Committee of the Int. Biol. Programme, Region 10 Panel. University of Lethbridge Production Services, Alberta.

Kienzle, B. (1972). *The Wood Buffalo National Park area: a bibliography.* Calgary, Alberta.

Scace, R.A. (1974). *An initial bibliography of Wood Buffalo National Park.* Scace and Associates, Calgary, Alberta.

Scace and Associates (1974). *Wood Buffalo National Park: a literature review.* Ottawa Parks Canada.

Peace-Athabasca Delta

Location 58°42'N, 111°08'W. Situated in the south-east corner of Wood Buffalo National Park in north-east Alberta. The town of Fort Chipewyan is about 20km to the east.

Area 321,300ha

Degree of Protection This site comprises about 80% of the total area of the delta. It is owned by the Government of Canada and managed and protected under the regulations of the National Parks Act and National Parks Policy by the Canadian Parks Service (Prairie Region, 391 York Avenue, Winnipeg, Manitoba). Wood Buffalo National Park is a World Heritage site. Designated as a Ramsar site in May 1982.

Site Description Peace-Athabasca Delta is one of the largest freshwater deltas in the world comprising 3 deltas: Athabasca 1,970 sq.km, Peace 1,684 sq.km and Birch 168 sq.km. The major lakes Claire, Baril, Mamawi and Richardson are very shallow (0.6-3.0m); and are characterised by a thick growth of submerged and emergent vegetation. The area has a dry continental climate with long cold winters and short warm summers. Mean temperatures are about 16°C in July and -25°C in January. The brief frost-free period extends from early June to early September but much of the area is permanently underlain with discontinuous permafrost. Daylight period is short in winter but in midsummer is over 20 hours. The area has much sunshine because of its northern latitude. Altitude is 204m-210m. The topography of the delta consists of very large flat areas of sediment with outcropping islands of Canadian Shield scattered

in the north-east region. Active and inactive river channels meander across the delta joining major lakes to Lake Athabasca and draining upland areas around the delta. Large open grasslands are interspersed with hundreds of shallow perched basins which are filled with water only during spring floods. The site contains 11 major habitat types: Aspen Water (130,630ha); emergents - inundated area with erect living vegetation rooted to the substrata (779ha); mud flats - above water level with little or no vegetation (13,593ha); immature fen (meadow) - the community occurring on a mud flat after one year exposure, and represented by seedling stages of *Carex* spp., *Calamagrostis* spp. or shrubs (18,478ha); sedge meadow-area dominated by sedge (18,813ha); grass meadow dominated by *Calamagrostis canadensis* (12,186ha); tall shrub - woody shrub vegetation over 6 feet tall (26,809ha); deciduous - mainly Balsam poplar *Populus balsamifera* and birch *Betula* spp. (7,372ha); coniferous - mainly white and black spruce *Picea glauca* and *P. mariana* (13,157ha); and rock outcrop (23,473ha). These habitats contain over 250 species of vascular plants, 215 species of birds, 44 species of mammals, 18 species of fish and thousands of species of insects and invertebrates. Reptiles and amphibians include Canadian toad, leopard frog *Rana pipiens*, boreal chorus frog, wood frog and red-sided garter snake.

International and National Importance Peace-Athabasca Delta is the largest boreal delta in the world and is relatively undisturbed by civilisation. It is one of the most important waterfowl nesting and staging areas in North America and is the staging area for breeding duck and geese on their way to the MacKenzie River lowlands, Arctic river deltas and Arctic islands. Due to the shallow water, high fertility and relatively long growing season, the area is an abundant food source of particular importance during drought years on the prairies when a large proportion of the continental duck population is forced to spend the summer in northern habitats. This function will become increasingly important as continual attrition gradually decreases the potholes and marshes of the prairie habitat. All four major North American flyways cross the delta, though it is probably of most significance to the Mississippi and Central flyways. Species recorded in the delta area include lesser snow goose *Anser c. caerulescens*, white-fronted goose *A. albifrons*, Canada goose *Branta canadensis*, tundra swan *Cygnus c. columbianus*, all 4 species of loon *Gavia*, all 7 species of North American grebe (Podicipedidae) and 25 species of duck (Anatidae). The world's entire population of the endangered whooping crane *Grus americana* (100+) which nests in the northern part of the park, is known to migrate through the site. The only known breeding population in central Canada of the vulnerable peregrine falcon *Falco peregrinus* nests in the delta area. The site also contains the largest undisturbed grass and sedge meadows in North America which are the prime range in the park for an estimated 10,000 wood and plains buffalo *Bison bison athabasca* and *B. bison bison* constituting 71% of the park's population. The delta is an important fish spawning area for regional populations of goldeneye and walleye.

Changes in Ecological Character At present the only major threat to the delta is the Bennett Dam located upstream on the Peace River in British Columbia which was constructed in 1967. The dam caused a significant drop in water flow to the delta resulting in insufficient water levels to fill the numerous perched basins in the area. Any further dam construction or river diversion on the Peace River could result in more damage to the delta.

Management Practices Studies in the early 1970s identified that water levels on the delta required regulating to mitigate the effects of the Bennett Dam, and weirs were subsequently constructed at Rivière des Rochers and Revillon Coupé. There is careful monitoring and management of the hunting and trapping activities of the native Indian population. Bison are specifically protected from native domestic hunting under park game regulations. It is possible, however, that some form of intensive manipulation of the bison herd may be required in the

future due to the presence of anthrax, brucellosis and bovine tuberculosis on the bison range. Outbreak control measures for anthrax are carried out and will be continued. A long range management plan for Wood Buffalo National Park has been produced by the Canadian Parks Service.

Scientific Research and Facilities The governments of Canada, Alberta and Saskatchewan established the Peace-Athabasca Delta Project Group in January 1971 to conduct a detailed investigation into the problem of low water levels in Lake Athabasca and their cause and effect on the delta flora, fauna and local people. The investigation followed three consecutive years of low water levels in the delta after the construction of Bennett Dam.

Principal Reference Material The above information is taken from the List of Canadian Wetlands Designated as of International Importance in May 1982, supplemented by information from the World Heritage Nomination. The findings of the Peace-Athabasca Delta Project project were published as a summary report and technical report. The summary report, based on the technical report, is aimed for general public readership and was issued in January 1973 as 'The Peace-Athabasca: A Canadian Resource.' The technical report was published in 1973 as 'Peace-Athabasca Delta Project - Technical Report.'

Hay-Zama Lakes

Location 58°30'N, 119°00'W. Located in north-eastern Alberta, 100km west-north-west of High Level.

Area 50,000ha

Degree of Protection Hay-Zama Lakes are an Alberta Fish and Wildlife Crown Reservation owned by the government of Alberta and administered by the Alberta Fish and Wildlife Division. Designated as a Ramsar site in May 1982.

Site Description The wetland comprises freshwater eutrophic lakes and the floodplains and interior deltas of a lowland river. The area is about 320m above sea level.

International and National Importance The wetland is of continental importance to spring and fall migrating ducks and geese. Waterfowl from three of the four North American flyways (Pacific, Central and Mississippi) utilise the complex. Up to 130,000 lesser snow geese *Anser c. caerulescens*, 47,000 Canada geese *Branta canadensis* and over 200,000 ducks (up to 90% dabblers) have been known to use this wetland in the fall.

Changes in Ecological Character The wetland is somewhat isolated from major developments, but a potential threat is future expansion of oil and gas activity.

Management Practices There is no active management practised specifically for waterfowl at present but future management may include the control of water levels. Fluctuations in levels and resultant goose behaviour seem to determine the degree of waterfowl use in the fall. Existing

oil and gas activity on the wetland is strictly controlled by 'shut down' dates in spring and fall, and any further expansion will be restricted.

Scientific Research and Facilities None

Principal Reference Material The above information is taken from the list of Canadian Wetlands Designated as of International Importance May 1982.

Additional information:

Hennan E. and A.J. Macaulay (1974). Hay-Zama Lakes Project, waterfowl habitat assessment. Ducks Unlimited (Canada), *Special Report* No. 1503, 55pp.

Kelland C.D. (1967). Summarization of goose, vegetation and water level data collected during the summer of 1967 for Hay-Zama Lakes Goose Project. Unpublished progress report, Project 82-4-5-27, Canadian Wildlife Service, Edmonton. 70 pp.

Environmental Research Associates (1979). *Waterfowl use of the Hay Zama Lakes in relation to oil pumping operations.* LGL Ltd., Edmonton, Alberta

Macaulay A.J. (1969). Job completion report, Hay-Zama Lakes Goose Project. Project No. 82-4-5-78. Unpublished report to Canadian Wildlife Service, Edmonton. 30 pp.

Macaulay A.J. (1969). Hay-Zama Lakes Project, summer 1969. Unpublished report of Ducks Unlimited (Canada), Winnipeg. 34 pp + plates.

Alaksen National Wildlife Area

Location 49°05'N, 123°15'W. Located in the Municipality of Delta, British Columbia, 40km south of Vancouver.

Area 520ha

Degree of Protection Owned by the Government of Canada and protected under the Canada Wildlife and Migratory Birds Convention Acts. Administered by the Canadian Wildlife Service (P.O. Box 340, Delta, British Columbia V4K 3Y3). Designated as a Ramsar site in May 1982.

Site Description The site lies at -1m to 5m altitude, and comprises 280ha of freshwater and farmland, and 240ha of tidal zone wetlands which include brackish and freshwater marsh and intertidal sand and mudflats. The salinity of the intertidal zone is low owing to the influence of the freshwaters of the Fraser River which flows into the area. The three main vegetational types on the intertidal zone are the cattail, sedge and bulrush communities. The cattail community comprises cattail *Typha* spp., Lyngbye's sedge *Carex lyngbyei* and water plantain *Alisma plantago-agriatica*. The sedge community comprises Lyngbye's sedge in association with reed fescue *Festuca anindinaceae*, bent grasses *Agrostis* spp. and round-stemmed bulrush *Scirpus americanus valious*. The bulrush community which is completely submerged at high tide is dominated by three-square bulrush *Scirpus americanus* with some round-stem bulrush. The farmland portion is protected by dykes and produces crops of potatoes, 'Indian' corn, peas, beans, cabbage and turnips. The soils are saline gleysols which have developed from the medium deltaic deposits. In addition to the commerical crops there are grasses such as bent grasses *Agrostis* spp., velvet grass *Holcus lanatus*, Canada blue grass *Poa compressa* and smart weeds

Polygonum spp. These grasslands and the crop remnants provide food for waterfowl especially in winter when the fields are semi-flooded. On higher and well-drained sites are red alder *Alnus rubra*, willow *Salix* spp. and black cottonwood, with shrub communities of snowberry *Symphoricarpos albus*, salmon berry *Rubus spectabilis* and blackberry *Rubus ursinus*. These thickets provide good habitat for pheasants and passerines. The freshwater bodies in the farmland are about 2-3m deep and are valuable wintering areas which seldom freeze over for more than three weeks

International and National Importance The area provides winter staging, feeding and breeding habitat for many species of western North American waterfowl, and supports one of the largest wintering waterfowl populations in Canada comprising 40 species of ducks, geese and swans. The most common species are Canada goose *Branta canadensis*, mallard *Anas platyrhynchos* and American wigeon *Anas americana*. About 25,000 ducks, 25,000 geese (15,000 Canada geese and 10,000 lesser snow geese *Anser c. caerulescens* that breed on Wrangel Island, USSR) and 100,000 shorebirds winter in the delta.

Changes in Ecological Character The ownership by the federal government removes the threat of landfill, but pollution by toxic substances from adjacent areas is a potential threat.

Management Practices Control of water levels, agricultural practices, public access and hunting is carried out by Alaksen National Wildlife Area staff. Crops are grown for waterfowl use.

Scientific Research and Facilities Studies are in progress of the use birds make of different parts of the site.

Principal Reference Material The above information is taken from the list of Canadian Wetlands Designated as of International Importance May 1982.

Additional information:

The Habitat Group (1978). Fraser River Estuary Study - Habitat report. Prepared for the Fraser River Estuary Study steering committee of the Government of Canada and the province of British Columbia. 181 pp.

Hoos, L.M. and G.A. Packman (1974). The Fraser River Estuary - status of environmental knowledge to 1974. Estuary working group Rep. Brd. Pac. Reg. Canada Dept. Environ., Spec. Est. Ser. Rept.(1). 518 pp.

Ministry of Environment (1982). A living river by the door; a proposed management program for the Fraser River Sanctuary. Ministry of Environment, Surrey, British Columbia. 62 pp.

Old Crow Flats

Location 67°34'N, 139°50'W. Part of a plain bordered in the north by the British Mountains, in the east by the Driftwood Hills of the Richardson Mountains and in the south by Old Crow and Keele Ranges. About 60km north of Old Crow in Yukon Territory, 110km south of the Beaufort Sea (Arctic Ocean) and 120km north of the Arctic Circle.

Area 617,000ha

Degree of Protection Federal Crown land administered by the Department of Indian and Northern Affairs subject to the Territorial Lands Act and Territorial Land Use Regulations. Current protection for wildlife species is under the Yukon Wildlife Ordinance and Migratory Birds Convention Act. Designated as a Ramsar site in May 1982.

Site Description Old Crow Flats is a lacustrine plain pocked by over 2,000 shallow freshwater lakes which were presumably formed by the melting of ice blocks in the substrate. The lakes vary in size from 0.5ha to 4,700ha with average depth of 0.5m to 1m and maximum depth 4.0m. Permafrost underlies the area and forms the lake margins. The area is traversed by the meandering Old Crow River valley, which is down-cut well below the plain leaving most of the lakes 'hanging.' Altitude of the area is 260m-300m. Several species of *Potamogeton* dominate the aquatic systems, and the associated invertebrate fauna is unusually varied and productive. When ice-rich margins erode causing sudden changes in water level, a marsh habitat dominated by sedge develops. The sedge first forms floating mats and then eventually shore-fast wet sedge beach, and provides nesting habitat for waterfowl. The dynamics of this process are poorly understood. Scattered stunted black spruce *Picea mariana* dominate the areas between the lakes, poorly drained sites develop peatlands, and better drained sites develop scattered forest stands with an understorey of dwarf birch *Betula* spp. and willow *Salix* spp. Mammals include muskrat *Ondatra zibethicus* and a relatively dense population of moose *Alces alces*. The deep alluvial substrate underlying the area has been identified as an extremely important palaeontological and archaeological study area containing a rich assortment of pleistocene material.

International and National Importance The highly productive lakes and marshes are exceptional at such a high latitude. The area is important to some 500,000 waterbirds including 60,000 scoter *Melanitta* spp., 30,000 common goldeneye *Bucephala clangula*, 150,000 pintail *Anas acuta* and 75,000 American wigeon *Anas americana*, and also supports tundra swan *Cygnus c. columbianus*, sea ducks, loons and grebes. The primary function of the area is seen as a safe moulting and pre-migrational staging area. It is also a haven in years when there is drought in the prairies for ducks that move north after abandoning any attempt at breeding. It provides a nesting and hunting habitat for an important population of peregrine *Falco peregrinus*.

Changes in Ecological Character Oil exploration is pending for the area, and some seismic line construction has occurred. Heavy machinery would possibly damage the ice-retention properties of the shoreline and could lead to draining of the lakes. There are also proposals for the construction of roads and at least one gas pipeline near the area. Disturbance to wildlife may also be caused by the major archaeological and palaeontological field programmes being carried out or planned. The future security of the area figures highly in native land claim negotiations between Canada and the native people of Old Crow Band.

Management Practices Issue of permits to regulate access for exploration and development under Territorial Land Use Regulations.

Scientific Research and Facilities Surveys of waterfowl were conducted by the Canadian Wildlife Service in the 1950s and aerial surveys of breeding ducks in early May have been made annually by the US Fish and Wildlife Service since 1957. The Yukon Wildlife Branch began a long-term study in 1974 of the wetland ecology of the flats. The initial phase addressing waterbird use is complete but unpublished. Additional work on fur bearers and large mammals

is planned. Archaeological and palaeontological research has been conducted in the area for several decades, and major programmes are planned. This work has produced many scientific and popular publications. Leading agencies are the National Museums of Canada in Ottawa and the University of Toronto.

Principal Reference Material The above information is taken from the list of Canadian Wetlands Designated as of International Importance, May 1982.

Additional information:

Publications of the Gas Arctic Consortium contain several papers on birds and furbearers.

Government reports primarily those of Yukon Territory contain the majority of material available on the biological systems of the area.

Wiken, E.B., Welch, D.M., Ironside, G.R. and Taylor, D.G. (1981). The northern Yukon: an ecological land survey. *Ecological Land Classification Series 6*. Lands Directorate, Canada. 147 pp.

Polar Bear Pass National Wildlife Area

Location 75°45'N, 98°40'W. Situated on Bathurst Island, Queen Elizabeth Islands, Northwest Territories.

Area 262,400ha

Degree of Protection The area is federal Crown land administered by the federal Department of Indian and Northern Affairs under the territorial and land use regulations. Designated as a Ramsar site in May 1982.

Site Description Wetland habitats in the site are small inlets, lowland rivers, brooks, fresh oligotrophic lakes, peat bogs and temporary waters from snowmelt. Maximum water depth is 2.0m. Marshes, meadows and adjacent slopes provide feeding sites for at least 53 species of birds, 30 nesting in the region. The area contains eight species of mammals, the most numerous being lemming *Lemmus* and *Synaptomys* spp., Arctic fox *Alopex lagopus*, musk-ox *Oxibos moschatus* and Peary caribou *Rangifer pearyi*. Polar bear *Ursus maritimus* regularly use the area in the spring and summer, and occasionally dens there. Altitudinal range is from sea level to 60m.

International and National Importance Important populations of king eider *Somateria spectabilis*, greater snow goose *Anser caerulescens atlanticus*, gulls, jaegers and shorebirds, particularly sanderlings *Crocethia alba*. Atlantic brent *Branta bernicla hrota* that breed here, winter in Ireland after staging in Iceland.

Changes in Ecological Character Mining, oil exploration and drilling permits were issued many years ago. Surface and subsurface rights to exploration and development were withdrawn prior to the area being created a national wildlife area.

Management Practices A management plan is being developed for the area.

Scientific Research and Facilities The National Museum of Natural Science in Ottawa, with the assistance of the Polar Continental Shelf Project, has operated a research station in the area since 1968 to study the life histories and behavioural adaptations of Arctic animals. Over 100 publications on the research of the area have been published.

Principal Reference Material The above information is taken from the list of Canadian Wetlands Designated as of International Importance, May 1982.

Additional information:

Nettleship, D.H. and Smith, P.A. (1975). *Ecological sites in Northern Canada*. Canadian Committee for the International Biological Programme, Conservation Terrestrial Panels. 330 pp.

Sutton, G.M. (1971). *High Arctic*. Fitzhenry and Whiteside, Don Mills, Ontario. 119 pp.

Queen Maud Gulf Bird Sanctuary

Location 67°00'N, 102°00'W. Situated on the south coast of Queen Maud Gulf, Northwest Territories.

Area 6,200,000ha

Degree of Protection Established as a bird sanctuary in 1961 and protected under the Migratory Bird Sanctuary Regulations which stem from the Migratory Birds Convention Act. The sanctuary is federal Crown land. Designated as a Ramsar site in May 1982.

Site Description The sanctuary contains a wide range of wetland habitats including permanent shallow waters in open sea and bays, intertidal zones, tidal estuaries, deltas, lowland rivers and fresh oligotrophic lakes. Maximum altitude 100m. The vegetation is marsh tundra and consists of well vegetated hummocky tussocks, many of which flood during the spring. Mosses *Aulacomnium turgidum*, *Drepanocladus revolvens*, *Meesea triataria* and *Tetraplodon urceolatus* occur on the wet ground between hummocks. The hummocks support cotton grass *Eriophorum vaginatum* and sedge *Carex chordorrhiza*. Emergent species include sedge *Carex stans* and mare's tail *Hippuris vulgaris*. 46 species of bird and six species of mammal have been recorded in the sanctuary.

International and National Importance The sanctuary contains the largest variety of geese of any nesting area in North America, and is one of the few nesting areas with both the Atlantic and Pacific brent *Brant bernicla hrota* and *B. bernicla nigricans*. Almost the entire population of Ross' goose *Anser rossii* nest here. Its population has increased 10-fold in 35 years to at least 125,000 in 1981. Lesser snow goose *Anser c. caerulescens* has recently moved westward into the area, with about 80,000 in the summer of 1982. There are at least two nesting groups of Canada goose *Branta canadensis*, known as the tall grass prairie and short grass prairie populations. The latter is further west than the former at all times of the year.

Changes in Ecological Character None

Management Practices Issue of restrictive permits to explore or develop other renewable and non-renewable resources.

Scientific Research and Facilities The numbers and distribution of waterfowl are recorded at intervals of no more than 5 years. Research has included a study of the breeding biology of Ross' goose.

Principal Reference Material The above information is taken from the list of Canadian Wetlands Designated as of International Importance, May 1982.

Additional information:

Barry, T.W. (1958). Waterfowl investigations and wildlife surveys of the western arctic and some of the central arctic islands. Unpublished report of the CWS. Pp. 42-58.

Hanson, H.C., Queneau, P. and Scott, P. (1956). The geography, birds and mammals of the Perry River region. *Arctic Institute of North America Special Publication* 1. 96 pp.

Kerbes, R.H. (1975). The nesting population of lesser snow geese in the eastern Canadian Arctic: a photographic inventory of June 1973. *Can. Wild. Serv. Rep. Ser.* 35. 47 pp.

Nettleship, D.N. and Smith, P. (1975). *Ecological sites in northern Canada*. Canadian Committee for the International Biological Programme Conservation Terrestrial Panel 9. 330 pp.

Ryder, J.P. (1967). The breeding biology of Ross' goose in the Perry River region, Northwest Territories. *CWS Report Series* 3. 56 pp.

Ryder, J.P. (1969). Nesting colonies of Ross' goose. *Auk*. 82(2): 282-292.

Ryder, J.P. (1969). Timing and spacing of nests and breeding biology of Ross' goose. Unpub. PhD Thesis, University of Saskatchewan, Saskatoon. 239 pp.

Rasmussen Lowlands

Location 68°00'N, 93°30'W. East of Rasmussen Basin about 100km south of Spence Bay in Northwest Territories.

Area 300,000ha

Degree of Protection The area is federal Crown land administered by the federal Department of Indian and Northern Affairs under Territorial Land Use Regulations. Designated as a Ramsar site in May 1982.

Site Description The southern area of the lowland is flat, poorly-drained, and covered in marine silts and sands with occasional esker or rock outcrops. About 10km north of Inglis River, glacial moraine outcrops through the marine sediments forming the gently rolling Ross Hills. Numerous fresh oligotrophic lakes, peat bogs and temporary waters from snow melt are scattered throughout the lowlands. The escarpment of Wager Highlands is on the eastern border of the area. Maximum altitude is 50m.

International and National Importance About 6,000 tundra swans *Cygnus c. columbianus* summered in the Rasmussen lowlands in 1976. About 90% of the population is known to nest

in the eastern Arctic. An estimated 13,000 white-fronted geese *Anser albifrons*, comprising 6.5% of the total North American population, summered in the area during 1977. The area also contains three small lesser snow goose *Anser c. caerulescens* nesting colonies totalling 4-6,000 birds, 10-15,000 old squaw *Clangula hyemalis*, 30-35,000 king eider *Somateria spectabilis*, raptors nesting along the eastern escarpment, and some 500,000 shorebirds.

Changes in Ecological Character A polar gas pipeline could cross the area.

Management Practices Land use permits are issued under the Territorial Land Use Regulations limiting human activity on certain areas and at certain times of the year.

Scientific Research and Facilities See references.

Principal Reference Material The above information is taken from the List of Canadian Wetlands Designated as of International Importance in May 1982.

Additional references:

Adan, R.W. and Brackett, D.B. (1976). Migratory bird populations survey in the district of Keewatin and Somerset Island. Environmental Social Program, Northern Pipelines, *Escom Report No.A: 1-18*.

Allen, D.L. and Hogg, T.H. (1978). Bird studies in the district of Keewatin: patterns of distribution, habitat preferences and potential impact of a pipeline. *Final report*, Arctic Islands Pipeline Project.

McLaren M.A., McLaren, P.L. and Alliston, W.G. (1977). *Bird populations in the Rasmussen Basin lowlands, NWT*. June-September 1976. L.G.L. Environmental Research Associates for Polar Gas Project.

McConnell River Bird Sanctuary

Location 61°07'N, 94°03'W. Located about 27km south of Eskimo Point on the west coast at Hudson Bay in the district of Keewatin, Northwest Territories.

Area 32,800ha

Degree of Protection The sanctuary was established in 1960 and is federally owned. Protected under the Migratory Bird Sanctuary Regulations which stem from the Migratory Birds Convention Act. Designated as a Ramsar site in May 1982.

Site Description The area consists primarily of coastal marsh flats which extend 3-8km inland. The flat, low-lying poorly-drained plain is dotted with shallow ponds and lakes with an average depth of 1m and is typical of much of the west Hudson Bay coastline. Maximum altitude 20m.

International and National Importance The colony of lesser snow goose *Anser c. caerulescens* in the area has undergone rapid growth. The first report of nesting in the area was in 1941 and by 1973 the number had increased to over 163,000 nesting pairs. The colony has now spread

beyond the boundaries of the sanctuary. Substantial numbers of the tall grass prairie population of Canada goose *Branta canadensis* also nest in the sanctuary.

Changes in Ecological Character There are no immediate threats from development, but ownership, land use and hunting rights may be affected by the outcome of land claim negotiations between the Inuit Tapirisat and the Government of Canada.

Management Practices Issue of permits under the Migratory Bird Sanctuary Regulations and the Territorial Land Use Regulations.

Scientific Research and Facilities McConnell River was the site of extensive studies on the biology of geese and other Arctic species in the 1960s and 1970s. Population levels of breeding lesser snow geese are regularly monitored.

Principal Reference Material The above information is taken from the list of Canadian Wetlands Designated as of International Importance in May 1982.

Additional references:

- Ankney, C.D. (1974).** The importance of nutrient reserves to breeding blue geese *Anser caerulescens*. Unpublished Ph.D Thesis, University of Western Ontario. 213 pp.
- Cooch, F.G. (1958).** The breeding biology and management of the blue goose *Chen caerulescens*. Unpublished Ph.D Thesis, Cornell University. 235 pp.
- Davis, R.A. (1972).** A comparative study of the use of habitat by Arctic loons and red-throated loons. Unpublished Ph.D Thesis, University of Western Ontario. 290 pp.
- Harwood, J. (1974).** The grazing strategies of blue geese *Anser caerulescens*. Unpublished Ph.D Thesis, University of Western Ontario. 186 pp.
- Kerbes R.A. (1975).** The nesting population of lesser snow geese in the eastern Canadian Arctic: A photographic inventory of June 1983. *Can. Wild. Serv. Rep. Ser.* 35. 46 pp.
- Lieff B.C. (1973).** The summer feeding ecology of blue and Canada geese at the McConnell River, NWT. Unpublished Ph.D Thesis, University of Western Ontario. 203 pp.

Dewey Soper Bird Sanctuary

Location 64°14'N, 76°32'W. Located on Baffin Island about 275km north-east of Cape Dorset in the district of Franklin, Northwest Territories.

Area 815,900ha

Degree of Protection The sanctuary was established in 1957 and is federally owned and controlled. Protected under the Migratory Bird Sanctuary Regulation which stems from the Migratory Birds Convention Act. Designated as a Ramsar site in May 1982.

Site Description The sanctuary includes about 250km of the coastal section of the Great Plain of the Koukdjuak. Much of the area is covered with a mat of mosses and sedge *Carex stans*. Other common plants include *Alopecurus alpinus*, *Salix* spp., *Cochlearia officinalis* and *Saxifraga caespitosa*. Lack of relief on the plain, and high tides in Foxe Basin, combine to form a

tidal zone which may extend up to 15km inland. The wide marshy plain is dotted with shallow round lakes and circular swamps, and is drained by innumerable small sluggish streams. Maximum altitude 60m.

International and National Importance The most abundant waterfowl in the sanctuary is lesser snow goose *Anser c. caerulescens*, with about 450,000 nesting individuals in three major colonies recorded in 1973 and 1979 (though distribution differed). Other numerous species are small Canada goose *Branta canadensis* of the tall grass prairie population, Atlantic brent *Branta bernicla hrota*, old squaw *Clangula hyemalis*, eiders *Somateria mollissima borealis* and King eider *S. spectabilis* and several species of shore birds. Cape Dominion seems to be the most important nesting area in the eastern Arctic for Atlantic brent.

Changes in Ecological Character There are no imminent threats.

Management Practices Issue of Migratory Birds Sanctuary Permits and Territorial Land Use Permits to control access to the area.

Scientific Research and Facilities Population levels of breeding lesser snow goose are regularly monitored.

Principal Reference Material The above information is taken from the List of Canadian Wetlands Designated as of International Importance in May 1982.

Additional references:

Kerbes, R.H. (1969). Biology and distribution of nesting blue geese on Koukdjuak Plain, NWT. Unpublished M.Sc. Thesis. University of Western Ontario.

Kerbes, R.H. (1975). The nesting population of lesser snow geese in the eastern Canadian Arctic: A photographic inventory of June 1983. *Can. Wild. Serv. Rep. Ser.* 35. 47 pp.

Soper, J.D. (1946). Ornithological results of the Baffin Island expeditions of 1928-29 and 1930-31; together with more recent records. *Auk.* 63: 1-24, 224-239 and 418-427.

St Clair National Wildlife Area

Location 42°22'N, 82°22'W. On the east shore of Lake St Clair in Dover Township, County Kent. Chatham city is 30km to the east.

Area 244ha

Degree of Protection Federal Crown land. Administered by the Canadian Wildlife Service and designated as a National Wildlife Area under the Canada Wildlife Act. Designated as a Ramsar site in October 1985.

Site Description A shallow, mesotrophic link in the Great Lakes system. Waters from Lake Huron flow in via the St Clair River and out via the Detroit River to Lake Erie. The shallow channel of the Thames River (a major tributary) has been extensively dyked to control the frequent spring flood waters, and little natural wetland habitat remains along the river flood

plain. The lakeshore marshes lie on stratified clay plains which are among the most fertile in Canada. St Clair NWA contains examples of the three major habitat types: i) continuous emergent marsh, predominantly stands of cattail *Typha* sp., with rare plants found on the wet meadows occurring on slightly higher ground such as freshwater cord grass *Spartina pectinata*, yellow star grass *Hypoxis hirsuta*, Culver's root *Veronicastrum virginicum*, tickseed sunflower *Bidens coronata* and tall ironweed *Veronica altissima*; ii) emergent marshes interspersed with small ponds which cover about 40% of St Clair NWA., the principal elements being pickerelweed *Pontederia cordata*, hardstem bulrush *Scirpus acutus*, softstem bulrush *Scirpus validus*, burreed *Sparganium* spp. and tuberous water lily *Nymphaea tuberosa* (the rare species green water arum *Peltandra virginica*, cow lily *Nuphar advena* and American lotus *Nelumbo lutea* are also found here); iii) marsh zones that are open to Lake St Clair vary in character as lake levels change. In some areas, large increases in the amount of quality waterfowl foods such as sago pondweed *Potamogeton pectinatus* and wild celery occurred when high lake levels killed extensive beds of emergent vegetation, largely cattails. Some extensive submerged beds of muskgrass occur and some small areas of open water marsh.

Muskrats *Ondatra zibethicus* play a major ecological role in the marsh. Other mammals of importance in the marshes are raccoons *Procyon lotor*, striped skunks *Mephitis mephitis* and mink *Mustela vison*. The reptiles and amphibians of the area include several species that have not been officially designated but that are considered by experts to be rare or threatened in Canada. Eastern fox snake *Elaphe vulpina gloydi*, considered threatened in Canada, is abundant in St Clair marsh edges. Among the five species of turtles that have been found are spotted turtle *Clemmys guttata*, Blanding's turtle *Emydoidea blandingi* and eastern spiny softshell *Trionyx s. spiniferus*, all considered rare in Canada.

International and National Importance Large numbers of waterfowl use Lake St Clair and adjacent wetlands, which constitute one of the most important staging regions for waterfowl in Ontario south of James Bay. At the height of migrations in spring and fall, tens of thousands of ducks, geese and swans congregate in the marshes and shallow waters of the east shore of the lake.

During spring and fall migrations, there are frequent periods when more than 100,000 waterfowl are present in the lake and adjacent region. In spring, peak numbers have been as high as 60,000 birds. In autumn, nearly 150,000 ducks, geese and swans have been present at one time. Over half the eastern population of tundra swan *Cygnus c. columbianus* passes through the region in early spring; this is 23% of the entire North American population. In autumn the region supports significant proportions of waterfowl populations: 15% of the Tennessee Valley population of Canada goose *Branta canadensis*; 18% of world populations of canvasback *Aythya valisineria*, 8% of world populations of redhead *A. americana* and 4% of world populations of ring-necked duck *A. collaris* and 3% of North American populations of ruddy duck *Oxyura jamaicensis*.

Other marsh-dependent birds found include: grebes, herons, rails and waders. Feeding shore-birds are especially abundant when mud flats are exposed. Among the more uncommon species recorded are king rail *Rallus elegans*, glossy ibis *Plegadis falcinellus* and snowy egret *Egretta thula*. Breeding waterfowl include: pied-billed grebe *Podilymbus podiceps*, least bittern *Ixobrychus exilis*, American bittern *Botaurus lentiginosus*, mallard, American coot *Fulica americana* and black tern *Chlidonias niger*. Other nesters are blue-winged teal *Anas discors*, redhead, virginia rail *Rallus limicola*, sora *Porzana carolina*, common moorhen *Gallinula chloropus*, killdeer *Charadrius vociferus*, spotted sandpiper *Actitis macularia*, and snipe *Gallinago galli-*

nago. In addition, many species use the area for feeding or loafing; great blue herons *Ardea herodias*, great egrets *Casmerodius albus*, night herons *Nycticorax nycticorax* and tern *Sterna hirundo* feed in the marsh.

Changes in Ecological Character Of the marshes remaining along Lake St Clair's east shore, only St Clair NWA is protected against development. There has been major wetland loss of privately owned wetlands due to drainage for agriculture, development for recreational uses and cottage development. The lakeshore marshes are vulnerable to impacts from off-site development. Spills of oil or other toxic chemicals from Great Lakes shipping are a constant threat. Manipulations of lake levels or impacts of an extended navigation season on the Great Lakes could cause wetland losses and detrimental changes. St Clair NWA is dyked and somewhat protected from, but not invulnerable to, such impacts. The recently increased dense concentrations of mallards and black ducks tend to discourage the use of the area by other dabblers.

Management Practices In 1940 the area was dyked, strips ploughed to encourage establishment of marsh plants, and flooded. Water levels were kept low in summer to encourage aquatic plant growth and some species were introduced. Water levels were raised in fall to attract ducks and were kept high during muskrat trapping seasons. Since its acquisition by CWS, a variety of wildlife management techniques have been employed. Constructed nesting islands and existing dykes, spoil piles, and meadow areas provide nest sites. Cut channels provide brood habitat and loafing or resting areas. Water circulation throughout the marsh has been improved by pumping; water level manipulations and cattail control measures have improved interspersion of open water and emergent vegetation. These measures have improved growth of submergent aquatic plants and the associated invertebrates that provide food for waterfowl species. Muskrat harvesting has taken place under CWS permits, and minimises damage to dykes from muskrat tunnels. Moreover, trapping encourages maintenance of healthy populations of muskrats which, by using cattails as a major food source and for lodge-building materials, limit the encroachment of cattail in the marsh ponds and channels.

Scientific Research and Facilities CSW has monitored waterfowl numbers and wetland habitats at Lake St Clair for many years. Waterfowl surveys during migration, censuses of wintering waterfowl, and brood surveys are aspects of ongoing programmes. Research on cattail control, waterfowl ecology, breeding bird surveys, weekly bird censuses, vegetation monitoring and a variety of other baseline biological data collections are conducted by CWS staff and other researchers. Water quality is monitored on a regular basis.

Principal Reference Material The above information is taken from the document submitted at the designation of St. Clair National Wildlife Area to the List of Wetlands of International Importance October 1985.

Additional references:

Dennis, D.G. and North, N.R. (1981). Waterfowl use of the Lake St. Clair marshes during migration in 1976-77 versus 1968-69. Can. Wildl. Serv. Rep.

Dennis, D.G., McCullough, G.B., North, N.R., and Ross, R.K. (1983). An updated assessment of migrant waterfowl use of the Ontario shorelines of the southern Great Lakes. Can. Wildl. Serv. Rep.

McCullough, G.B. (1981). Wetland loss in Lake St. Clair and Lake Ontario. *Ontario Wetlands Conf. Proc.* 18-19: 81-89.

McKeating, G., Gow, D. and Madore, P. (1982). Management plan: St. Clair National Wildlife Area. Can. Wildl. Serv. Rep. London, Ontario.

Chignecto National Wildlife Area

Location 45°47'N, 64°20'W. Located on Cumberland Basin at the head of the Bay of Fundy, 5km south-west of the town of Amherst, Cumberland County, Nova Scotia.

Area 1,020ha

Degree of Protection Federal Crown land. Designated as a national wildlife area under the Wildlife Area Regulations of the Canada Wildlife Act. Additionally, the Amherst Point section is scheduled as a migratory bird sanctuary under the Sanctuary Regulations of the Migratory Birds Convention Act. Designated as a Ramsar site on 16 October 1985.

Site Description The wildlife area consists of John Lusby Salt Marsh and Amherst Point Bird Sanctuary, two very different wetlands, and separated by a narrow (1km) upland ridge. The 600ha John Lusby section is principally a *Spartina*-dominated intertidal salt marsh (tide range up to 12m) built up on alluvial silt and intersected by numerous tidal creeks and channels. Small saline ponds (with depths from 15-30cm) are interspersed throughout the marsh, and two brackish impoundments (20ha with average depths of 45cm) have been developed along the upland edge. Amherst Point Sanctuary section is a mosaic of freshwater wetlands of several natural types ranging from sink hole ponds to small lakes (with average depths of 60cm, with the exception of a sink hole depression in one of the lakes that descends to 11m), bogs and cattail *Typha* marshes. However, shallow controlled water level impoundments (with depths from 30-60cm) comprise nearly half of the wetland area. Wetlands at the site are the most productive in the province, and derive this fertility from the gypsum-limestone bedrock and from marine silt deposits. Cattails and burreeds *Sparganium* are the most common emergent plants, with water milfoil *Myriophyllum* and pondweeds *Potamogeton* common throughout.

International and National Importance The salt marsh supports flocks of up to 6,000 Canada geese *Branta canadensis* during spring migration and lesser numbers of black duck *Anas rubripes*, green-winged teal *A. crecca carolinensis* and northern pintail *A. acuta*. In summer broods of black duck are common on the impoundments and salt marsh ponds, where greater yellowlegs *Tringa melanoleuca* are frequently observed. Throughout fall the wetland supports flocks of mixed waterfowl species (numbering in the hundreds). Waterfowl and other marsh birds are abundant in the freshwater wetlands and include most species commonly found in the region, along with the regular occurrence of regionally rare species such as gadwall *Anas strepera*, redhead *Aythya americana*, ruddy duck *Oxyura jamaicensis*, virginia rail *Rallus limicola*, common moorhen *Gallinula chloropus*, American coot *Fulica americana* and black tern *Chlidonias niger*. Over 200 species of birds have been recorded at the sanctuary.

Changes in Ecological Character Urban expansion around the town of Amherst will increase recreational use pressures on the site, but should not cause serious damage if it is properly regulated and enforced by CWS. The possibility of eventually developing a major tidal power installation on Cumberland Basin is potentially a serious threat to the salt marsh section of the

wildlife area. Should a tidal barrage ever be developed across Cumberland Basin, tidal amplitudes will be reduced greatly changing the ecology of John Lusby Salt Marsh.

Management Practices The site is managed by the CWS in cooperation with the province of Nova Scotia (and with development assistance from Ducks Unlimited Canada). Ongoing management is designed to protect the unique ecological and aesthetic features of the area, and to maintain habitat diversity. Nature trails and interpretation signs and facilities are presently being installed and may be gradually more fully developed as the area becomes better known to the public in the region.

Scientific Research and Facilities Research studies have been conducted on the ecology and productivity of John Lusby Salt Marsh and on a unique limnological phenomenon that occurs at Layton's Lake within the Amherst Point Bird Sanctuary. A recent study on pied-billed grebes at one of the artificial impoundments has revealed nesting densities unparalleled elsewhere in North America.

Principal Reference Material The above information is taken from the document submitted at the designation of the Chignecto National Wildlife Area to the List of Wetlands of International Importance October 1985.

Additional references:

Forbes, M.R.L. (1982). The Nesting Ecology and Breeding Behaviour of the Pied-billed Grebe (*Podilymbus podiceps*) at a National Wildlife Area in Nova Scotia. Honours Thesis, Acadia Univ., Wolfville, N.S.

Foshay, G.M. (1974). The Limnology of Layton's Lake, N.S. B.Sc. Thesis, Mount Allison Univ., Sackville, N.B.

Monartz, D.L. (1976). Productivity and export from a marsh with 15m tidal range, and the effects of impoundment of selected areas. M.Sc. Thesis, Dalhousie Univ., Halifax, N.S.

Van Zoost, J.R. (1970). The ecology and waterfowl utilization of the John Lusby National Wildlife Area. M.Sc. Thesis, Acadia Univ., Wolfville, N.S.

Polar Bear Provincial Park

Location 54°00'-55°55'N, 82°15'-87°00'W. The site lies on the north-west coast of James Bay and the southern coast of Hudson Bay, in the Ontario Ministry of Natural Resources Northern Region, Moosonee District. The community of Winisk is outside the park but near its geographical centre. Moosonee, the nearest urban area, is 547km south of Winisk.

Area 2,408,700ha

Degree of Protection Polar Bear Provincial Park was established as a wilderness park under the Ontario Provincial Parks classification by Order-in-Council on 30 April 1970. The land is owned by the Government of Ontario and the park is administered by the Ontario Ministry of Natural Resources. The area is set aside as a wilderness area, protected from development and from exploitation of natural resources. The park was designated a Ramsar site on 27 May 1987.

Site Description The site is dominated by extensive areas of peat-based wetlands. Inland areas of the park are made up of swamps and small lakes, and show the typical flat, wet physiography of the Hudson-James Bay lowlands. The surface area of the park is almost 75% wet to saturated organic terrain or open water. Poor surface drainage, climate, rainfall, periods of frost and permafrost, and flooding of rivers and streams in spring all combine to create the waterlogged conditions. There are various forms of lake in the park: between beach ridges lie slot lakes, typically at right angles to the direction of drainage. Kettle lakes and lakes formed by glacial erosion are found in upland areas. These sometimes coalesce to form larger lakes due to wave and ice erosion. The largest lake in the park is 13km by 5km and the deepest is probably only 3m in depth. Many of the lakes are filling with vegetation. Numerous rivers and streams are augmented in spring by snow melt and precipitation, and silt-laden waters of larger rivers form fertile delta areas. The coastal areas are very flat, generally treeless, and extend from the tidal flats to over 8km inland. Water is added to marshes and lagoons along coastal areas at high tides. Tidal range is small. However, the low gradient of land allows much tidal inundation. Tidal flooding is especially intensive when augmented by onshore winds. The tidal flats vary from 1-5km in width. "Low energy" coasts, with wide coastal marshes, occur in southern James Bay at the south-eastern coastline of the park, whereas "high energy" coast segments with intertidal expanses and sandflats and sand beaches are found along the rest of the park's coastline.

Polar Bear Provincial Park includes portions of two wetland regions, High Subarctic and Low Subarctic. Within these regions the wetland habitats that are distributed across the landscape include thicket swamp, treed bog, treed peat plateau, open peat plateau, open bog, treed fen, open fen and marsh.

The High Subarctic Wetland Region corresponds closely to the Maritime Tundra floristic zone. Species typical of more northern High Arctic regions include sedge *Carex subspathacea*, goose grass *Puccinellia phryganodes*, and pale yellow flowering saxifrage *Saxifraga hirculus*. The maritime tundra zone is dominated by sedges *Carex* spp. and cotton grasses *Eriophorum* spp. and clumps of birches *Betula* spp. Vegetation on drier sites is usually a tundra heath, with Low Arctic elements such as Lapland rosebay *Rhododendron lapponicum*, crowberry *Empetrum nigrum*, blueberry *Vaccinium uliginosum* and mountain cranberry *V. vitis-idaea*. Cloudberry *Rubus chamaemorus* grows in most areas along beach ridges. Tundra herbs along drier sites include Arctic areas *Dryas integrifolia*, several pea family species including *Hedysarum mackenzii*, saxifrages *Saxifraga aizoides*, *S. oppositifolia*, *S. tricuspidata*, louseworts *Pedicularis labradorica* and *P. sudetica*. In emergent coasts, lagoons, salt marshes and brackish lake edges, aquatic grasses such as *Arctophila fulva* grow with sedges, cotton grasses and marsh herbs, including *Ranunculus pallarii* occur. The youngest beaches have little vegetation, with a few species such as sea-lungwort *Mertensia maritima*, lyme grass *Elymus arenarius* and sea-beach sandwort *Arenarium peploides*. On the second or third beach ridge, at least 70 years after formation, lichens appear. Further inland, the more varied flora described above develops. The tundra area of the High Subarctic wetland region is the most southerly example of that type on a mainland site anywhere in the world.

The Low Subarctic wetland region of the park lies within a Tundra/Open Wetland vegetation zone. Many low, open bogs, sedge-shrub fens, moist sedge-covered depressions, and open pools and small lakes are separated by ridges of peat, lichen-peat capped hummocks, raised bogs and beach ridges. Common aquatic plants include tundra buttercup *Ranunculus hyperboreus* and aquatic mare's tail *Hippuris vulgaris*. Sedges *Carex* spp., pondweeds *Potamogeton* spp. and milfoils *Myriophyllum* spp. are common. In many bogs, stunted black spruce *Picea mariana*

grows with heath plants, sedges, cottongrasses and sphagnum moss species *Sphagnum* spp., fens generally have a richer flora.

On well-drained stream banks, lake edges, and raised ridges, a transition forest develops. Components are typically boreal, but tree species tend to be stunted. Black spruce, white spruce *Picea glauca*, tamarack *Larix laricina*, balsam poplar *Populus balsamifera*, dwarf birch *Betula glandulosa*, and willows *Salix* spp. are the common tree species. On better-drained sites, typically older beach ridges, a mature spruce forest exists with a heath understorey containing crowberry, mountain cranberry, occasionally blueberry. Openings covered with caribou lichen and reindeer moss *Cladonia* spp. become more frequent in northern portions of this transition forest area.

Much of the park is underlain by Palaeozoic bedrock of limestone, dolomite, shale and sandstone, with a few small areas of Precambrian rock outcrops. The Palaeozoic sedimentary rocks are nearly horizontal with only a slight surface gradient. The area is a compact geological province that is close to probable centres of the Laurentide Ice Sheet and areas of the latent stand of the continental glacier. The isostatic rebound following glacial retreat has resulted in emergence of land from the ocean. Land near Cape Henrietta Maria in the north-eastern section of the park has been emerging at a rate of 1.2m per century for 1,000 years. This is the greatest rate of rebound in North America. As glaciers melted, the Tyrell Sea invaded the lowlands and deposited marine silt and clay sediments, often in a layer nearly impervious to water. As the sea receded, extensive beach ridges were formed. These flat-topped ridges are the park's most noteworthy landform. Being parallel to the coast they impede surface drainage.

Polar bears *Thalarctos maritimus* rely on the area as a breeding habitat. Data through 1980 indicate that approximately 200, or 48% of Ontario's total population of polar bears, spend the summer months in the park. Two members of the deer family inhabit the park: woodland caribou *Rangifer tarandus*, which spends summer in the tundra region and moves south of the treeline to winter, and moose *Alces alces*, which occupies wooded habitats and willow-fringed creeks. Coastal and estuarine areas are visited by walrus *Odobenus rosmarus*, bearded seal *Erignathus barbatus*, white whale or beluga *Delphinapterus leucas* and, probably, harbour seal *Phoca vitulina*, ringed seal *P. hispida*, and on occasion, narwhal *Monodon monoceros*. Other mammalian residents of the park include beaver *Castor canadensis*, muskrat *Ondatra zibethicus*, otter *Lutra canadensis*, ermine *Mustela vison*, least weasel *M. nivalis*, mink *M. vison*, martin *Martes americana*, fisher *M. pennanti*, wolverine *Gulo gulo*, striped skunk *Mephitis mephitis*, lynx *Lynx lynx*, Arctic fox *Alopex lagopus*, red fox *Vulpes vulpes*, black bear *Ursus americanus* and wolf *Canis lupus*. Small mammals include four shrews *Sorex cinereus*, *S. arcticus*, *S. palustris* and *Murosorex hogs*, varying hare *Lepus americanus*, red squirrel *Tamiasciurus hudsonicus*, northern flying squirrel *Glaucomys sabrinus*, porcupine *Erethizon dorsatum* and several small rodents *Synaptomys borealis*, *Clethrionomys gapperi*, *Phenacomys intermedius*, *Microtus pennsylvanicus* and *Zapus hudsonius*. Amphibians of the park include *Bufo americanus copei*, *Pseudacris triseriata maculata*, *Rana sylvatica*, *R. pipiens* and possibly *Hyla crucifer crucifer* and *R. septentrionalis*. One reptile, *Thamnophis sirtalis sirtalis*, may also be present. Stream and estuarine habitats of the park are important spawning habitat for sport fish such as brook trout *Salvelinus fontinalis*, Arctic char *S. alpinus*, northern pike *Esox lucius* and walleye or yellow pickerel *Stizostedion vitreum*.

International and National Importance A variety of waterfowl species, whose main breeding grounds are much further north, rests in Cape Henrietta Maria and surrounding tundra areas of

the park. During summer these birds are joined by substantial numbers of moulting waterfowl from both more northerly and more southerly breeding ranges. More importantly, in both spring and autumn, the coastal marshes, intertidal sandflats, and river mouths, support vast numbers of waterfowl during migration to and from High Arctic breeding ranges. Hudson and James bay lowlands support, overall, more than 4.5 million geese, and are of major importance to the lesser snow goose *Anser c. caerulescens*, several races and populations of Canada goose *Branta canadensis* and brent goose *Branta bernicula hrota*. Lesser snow geese nesting in the lowlands comprise approximately 10% of the Hudson Bay population and the majority of these are in the Cape Henrietta Maria colony. This colony had only 100 nests when discovered in 1944, but grew rapidly to more than 55,000 breeding pairs in 1979. More important than its role as a breeding habitat is that the site serves as a staging area for two to four million lesser snow geese during both spring and autumn migrations.

Canada geese from six major populations and several other stocks utilise the lowland areas. Large-bodied Canada geese *Branta canadensis interior* of the Mississippi Valley population nest throughout the fens and ponds of the park. Ten per cent of this population nests in the park itself. Small-bodied Canada geese *Branta canadensis hutchinsoni* pass through the lowland *en route* to more northern breeding areas. An area of large concentration is to the west of the Winisk River, including park coastline along the Hudson Bay. Ross' geese *Anser rossii* and greater white-fronted geese *Anser albifrons frontalis* have been among geese shot by hunters in the area. Black duck *Anas rubripes* is one of the first species to arrive in spring, staging at the mouths of major rivers in the park. Most move on to more northern breeding grounds, although some move to inland locations in the park to nest. In 1978 autumn surveys, counts of 65,000 black duck were recorded for the lowlands. Of these, 12% were in the park and exceed 1% of the continental population. Pintail *Anas acuta* generally occupies salt water habitats. Moulters concentrated in flocks are notable along the shore west of Winisk and at the mouth of River Shagarmu. Green-winged teal *Anas crecca carolensis* and mallard *Anas platyrhynchos* have similar distributions, being found on mud flats beside stream and river mouths or brackish inland ponds. Numbers are greatest during autumn and several thousand mallard have been counted at one time in the park. American wigeon *Anas americana* is present in large numbers only in autumn, and are found in brackish habitats associated with stream mouths. Shoveler *Anas clypeata* is widespread in low numbers in ponds between beach ridges or at the back of the coastal marsh. Small flocks are seen in spring with only occasional individuals in summer and autumn. Blue-winged teal *Anas discors* is more abundant, also in coastal marsh ponds, and is seen most often during migration.

The western and south-western coasts of Hudson and James bays form a major migration pathway for many shorebird species. During aerial surveys in 1974, 76,624 shorebirds were counted, principally including red knot *Calidris canutus rufa*, short-billed dowitcher *Limnodromus griseus*, dunlin *Calidris alpina*, greater yellowleg *Tringa melanoleuca* and lesser yellowleg *Tringa flavipes*, as well as ruddy turnstone *Arenaria interpres*, black-bellied plover *Pluvialis dominica*. Large species consisted principally of Hudsonian godwit *Limosa haemastica*, with smaller numbers of marbled godwit *Limosa fedoa* and whimbrel *Numenius phaeopus*. Small species consisted predominantly of semipalmated sandpiper *Calidris pusilla*, with smaller numbers of white-rumped sandpiper *Calidris fuscicollis*, sanderling *C. alba* and spotted sandpiper *Actitis macularis*. Of these, 27.5% or 21,063 shorebirds were counted within park borders. A number of species also breed within the park, as the lowlands provide some of the more southerly breeding habitat for semipalmated plover, pectoral sandpiper *Calidris melanotos*, white-rumped sandpiper, dunlin, and semipalmated sandpiper.

The wetlands of Polar Bear Provincial Park provide nesting habitat for red-throated, Arctic and common loons (*Gavia stellata*, *G. arctica* and *G. immer*, respectively), American bittern *Botaurus lentiginosus*, common and red-breasted merganser *Mergus merganser* and *M. serrator*, yellow rail *Coturnicops noveboracensis*, sora *Porzana carolina*, sandhill crane *Grus canadensis*, red-necked phalarope *Phalaropus lobatus*, parasite jaeger *Stercorarius parasiticus*, Bonaparte's and herring gulls *Larus philadelphia* and *L. argentatus*, and Arctic tern *Sterna paradisaea*. A small breeding population of 20 tundra swans *Cygnus c. columbianus* is found in the park. This species had disappeared as a breeding bird along the Hudson Bay in the mid to late 1800s. Moreover, the park supports migrants from more northern areas, such as snowy owl *Nyctea scandiaca* and snow bunting *Plectrophenax nivalis*.

Polar Bear Provincial Park is of special value for maintaining genetic and ecological diversity because of its highly varied combination of plant and animal species at the extremes of their ranges and its unique expanse of temperately-located tundra.

Changes in Ecological Character None known

Management Practices A majority of the area has been designated as wilderness zones, nature reserves, or historical zones, providing protection against disturbance of wildlife or deterioration of the environment. There are five access zones where aircraft may land and where camping is encouraged. Non-native use of access zones, trails and campsites is monitored for deterioration. The indigenous Cree Indians, as residents of the coastal communities, will continue to be permitted to hunt, fish and trap for subsistence and gather wild commodities for non-commercial purposes. There are two native-owned and operated hunting and fishing camps, one at Shagamu River and the other at Sutton River access zone. Registered guests of these camps are the only non-native hunters of waterfowl, grouse and snipe permitted in the park.

Scientific Research and Facilities Starting in the early 1900s, scientific surveys pertaining to geology, mapping, flora and fauna have been undertaken sporadically. Recently, man's increasing activity in tundra regions, hydroelectric development in Quebec, and offshore exploration for hydrocarbons have stimulated sustained research in the area. Over the past decade, a number of scientific publications have been produced. Wildlife and fisheries surveys and research continue to be undertaken by the Ministry of Natural Resources and the Canadian Wildlife Service, so that wildlife population changes can be monitored and acted upon, if necessary. Research by non-governmental organisations on natural resources of the park also occurs and is encouraged.

Principal Reference Material The above information was supplied at the time of designation.

Lac Saint-François National Wildlife Area

Location 45°02'N, 74°29'W. Situated on the south bank of Lake Saint-François, Huntingdon County, Dundee State, 50km south-west of the town of Salaberry-de-Valleyfield.

Area 2,214ha

Degree of Protection The site is Federal government property: 1,450ha owned by the Canadian Wildlife Service; 764ha undeeded. The area administered by the CWS was designated a national wildlife area on 27 April 1978 under the National Wildlife Area Regulations (CP 1978-1439) and Canadian Wildlife Law. The site was added to the Ramsar list on 27 May 1987.

Site Description The lake lies at an altitude of 46m, and averages 0.4-0.6m in depth (maximum 3m). Moraine rises reach 5m-6m. The reserve comprises mostly freshwater marsh and flooded woodland (swamps). Vegetation communities are in no way related to soil types, but their distribution within the marsh is influenced by species propagation, at the level of phreatic cover, and by various disturbances, principally fire. The reserve represents an assembly of diverse habitats; mature forest on elevated land, flooded woodland, peaty marsh, *Carex* or sedge marsh, flooded shrub, ponds, cedar grove, larch, submerged and emergent plants, water courses. This mosaic provides habitat for an exuberant flora and fauna, including species which are rare and threatened both provincially and nationally. The marshes and swamps represent the last and finest examples of this type of wetland in the St Lawrence Valley (Quebec). Vegetation succession from wet to dry land can be observed here. The reserve represents the last remaining wild land of this type in the highly industrial Montreal Triangle.

The climate is influenced in part by the moderating effects of the lake and is characterised by an average annual temperature of 5.7°C, monthly average temperature being -9.8°C in January and 19.8°C in July. Average annual precipitation is 900mm. This climatic situation permits the growth of numerous plants at the northern limit of their range.

In the zones of fresh water, ponds, streams, rivers and the lake floating and submerged plants dominate, such as reed grasses *Potamogeton* spp., wild celery *Vallisneria americana*, water lilies *Nuphar* and *Nymphaea* spp.. Arrowheads *Sagittaria* spp., pickerelweed/arrow arm *Pontederia cordata* and threesquare *Scirpus fluviatilis* grow in shallow water. In the marshes (690ha) are found principally cattails *Typha* spp., aquatic sedge *Carex aquatilis* and lake sedge *Carex lacustris*. Flooded woodlands (540ha) are dominated by red maple *Acer rubrum*, willows *Salix* spp. and wrinkled alder *Alnus rugosa*, as well as larch *Larix laricina*. Dry elevations are partly covered by sugar maple *Acer saccharum* and *Carya cordiformis* and various forest groups in different stages of evolution. Several clearings and fallow fields are evident. The aquatic and terrestrial vegetation of the area comprises more than 40 plants considered rare in Quebec and in Canada, such as great swallow-wort *Asclepias exaltata*, which is present at one other site only in Quebec (Mt Saint-Hilaire), watermilfoil *Myriophyllum heterophyllum* (known from only two other sites near Montreal), *Wolffia arhiza* (known only from the upper basin of the River Richelieu), as well as numerous *Rhus vernix*, *Cornus racemosa*, *Ranunculus longirostris*, *Panax quinquefolius*, *Elymus riparia*, rostrate violet *Viola rostrate* and sedge *Carex laxiflore* var. *gracile*, amongst others.

Amongst reptiles and amphibians, three species of snake have been observed, notably water snake *Nerodia sipedon*, three species of tortoise, including geographical tortoise *Graptemys geographica*, and numerous freshwater turtles including common snapping turtle *Chelydra serpentina*. Despite the lack of research, more than twelve species of amphibians have been recorded. More than 30 terrestrial mammals use the area and several breed, including white-tailed deer *Odocoileus virginianus* and a large population of eastern cottontail rabbit *Sylvilagus floridanus*. There are more than 75 species of fish in the lake and its tributaries, and several of them use the ponds and water courses of the reserve at specific times during their life cycles.

International and National Importance The reserve is important for its population of redhead *Aythya americana*, the largest and most important in Quebec, as well as for the variety of other ducks nesting there. Twelve species breed, including gadwall *Anas strepera*. Canada goose *Branta canadensis* has only recently begun breeding at the site, one of the rare nesting sites in southern Canada. Thousands of dabbling and diving ducks use the surface waters and lake during migration. At this time, 7,000 dabbling ducks have been recorded, the highest number in spring along the entire St-Lawrence system, as well as up to 25,000 tufted ducks *Aythya fuligula*. Numerous raptors fly over the area in autumn and spring, the river banks creating a migratory corridor. In spring the lake hosts 70,000 ducks and geese and the same number in autumn, but with a higher percentage of tufted ducks. Habitat diversity produces a wide range of bird species; the list for the area and the immediate surrounding region comprises more than 270 bird species, or 69% of all species recorded in Quebec. Of this number, 220 have been observed in the reserve itself and 110 nest, such as the uncommon least bittern *Ixobrychus exilis*, yellow rail *Coturnicops noveboracensis*, red-headed woodpecker *Melanerpes erythrocephalus*, pileated puffback *Dryoscopus pileatus*, yellow-bellied flycatcher *Empidonax traillii*, and the largest population in Quebec, probably in Canada, of short-billed wren *Cistothorus platensis*. Large egrets *Casmerodius albus* from a neighbouring colony feed in swamps on the reserve.

Changes in Ecological Character Fertilisers and herbicides carried from agricultural land through the drainage network could alter the water quality. Little is known of the impact on flora and fauna from acid precipitation, of which the average pH balance in the region is 4.2. Furthermore, it used to be common practice to burn dry grass in the swamps in spring. However, this activity is no longer permitted.

Management Practices The reserve is managed according to Canadian wildlife law for the protection of wildlife and habitats. Only activities compatible with these objectives are permitted. All other negative land use is rigorously controlled. Important improvements have increased the area of free water in marshes and their use by wildfowl during migration and the nesting season. Populations of visiting bird species are studied. Access by the public is limited but hides and wildlife observation are permitted.

Scientific Research and Facilities Numerous studies have been undertaken by employees of the Canadian Wildlife Service, by independent groups working on government programmes and by scientists concerned with the biotic and abiotic aspects of the area.

Principal Reference Material The above information was supplied at the time of designation.

Baie de l'Isle Verte National Wildlife Area

Location 48°01'N, 69°20'W. Situated on the south bank of the St Lawrence River, 30km downstream from Riviere-du-Loup municipality, Riviere-du-Loup county.

Area 1,927ha

Degree of Protection The site is Federal government property: 427ha is owned by the Canadian Wildlife Service and 1,500ha is owned by the provincial government (however, the CWS has

most of the hunting, fishing and hay harvesting rights in this sector). The land administered by the CWS was designated a national wildlife area on 5 June 1980 under the National Wildlife Area Regulations (CP 1980-1949) and Canadian Wildlife Law. In 1986 the migratory bird sanctuary was established on the banks of the River Verte. The site was added to the Ramsar List on 27 May 1987.

Site Description The site lies at 15m above sea level. The reserve comprises mostly *Spartina* swamp, humid woodland and boreal forest on rocky outcrops reaching 16-17m. In the middle estuary of the St Lawrence near L'Isle Verte, can be found the most important *Spartina* swamp of southern Quebec. This swamp, which stretches from either side of the bay of l'Isle Verte, constitutes the last vestiges of the great *Spartina* swamps of the St Lawrence estuary, all those further upstream having been destroyed, diked or reclaimed for agricultural or other purposes (port developments, roads). It appears essential to protect this natural environment which has become unique through development pressures. The area is partly influenced by the maritime/river-edge climate and so the climate is cold and damp with an attenuated maritime influence. Average annual temperature is 3.6°C, the hottest months being July and August with averages of 17.6°C and 16.2°C, respectively. January and February are the coldest months with average temperatures of -11.4°C and -10.2°C, respectively. Average annual precipitation is 943mm. Average tidal range is 3.5m; it reaches 4.7m during spring tides and is only 1.5m during neaps. Maxima recorded are 5m. During July, water salinity reaches 26.8‰ in L'Isle Verte.

At the level of the lowest tides, *Laminaria saccharina* and *L. longicruris* are present, and *Fucus* spp. and *Ascophyllum nodosum* higher up. Eelgrass *Zostera marina* succeeds the fucacias. Communities of smooth cordgrass *Spartina alterniflora* characterise the middle and high areas, where the flat surface is dominated by this one species. It is replaced above the level of medium tides by meadow cordgrass *S. patens*. Depending on the environment, this community can be found on the entire shoreline, accompanied by a number of important species. Terrestrial meadows are characterised by colonies of *Phleum pratense* and *Agropyron repens*. Wrinkled alder *Alnus rugosa* forms fairly extensive shrubs between the Vases and Verte rivers. The *Carex paleacea*/*Festuca rubra* community is the primary plant community to make the transition between the intertidal area and land. It succeeds either the *Salicornia europaea*/*Spergularia marina* community, or the sub-community of *Hierochloe odorata* in *Spartina patens* along the upper shoreline. Several hygrophilic species are found, witnessing the intermediary stage between intertidal and terrestrial environments. A little higher up the slope a community of *Spartina pectinata*/*Hierochloe odorante* is present. The *Calamagrostis canadensis*/*Sanguisorba canadensis* community on the shoreline follows the preceding community as the drainage gets better. It is present either in its original form (sub-group of *Myrica gale*) or in its form derived from ancient formations (sub-group of *Phleum pratense*). It has a much wider distribution than the preceding communities and constitutes the last herbaceous community of the swamp toposquence at the limit of the sea's influence. The only forest communities in the reserve are to be found on the rocky elevations between the Vases and Verte rivers. The islets are, from south-west to north-east, leafy, *Corydalis*, *Habenaria*, *Chasseur* and juniper. Conifer forest, typical of the forest cover colonising the rocky elevations of the St Lawrence estuarine lowlands, is dominated by *Picea mariana*. A magnificent pine forest of *Pinus divaricata* is to be found on the top of *Habenaria* islet, often mixed with *Picea mariana*. On *Chasseur* islet *Picea mariana* and 'baumier' pine dominate. Amongst marine mammals, common seal *Phoca vitulina* and grey seal *Halichoerus grypus* can be seen in the intertidal swamp between the Verte River and Loupe Point. Twenty five years ago common seal bred on the reserve's coastline. In deep estuarine waters white whale (beluga) *Delphinapterus leucas* can be encountered, the population

of which has seriously diminished over the past few years. In forests, terrestrial mammals are represented by American hare *Lepus americanus*, American porcupine *Erethizon dorsatum* and red squirrel *Tamiasciurus hudsonicus*, which are common in the reserve; south of the islets moose *Alces alces* has been observed. Fox *Vulpes vulpes*, common raccoon *Procyon lotor*, striped skunk *Mephitis mephitis*, American mink *Mustela vison*, long-tailed weasel, and ermine *Mustela erminea* have also been recorded. Fox and common raccoon search for eggs and chicks in the swamps. American mink, weasel and skunk are also potential predators of birds in the swamps. Eastern chipmunk *Tamias striatus* occurs in mixed forests, woodchuck *Marmota monax* in fields near Loupe Point and masked shrew in fields. The Bufonidae are represented in the reserve only by American toad *Bufo americanus* ssp. *americanus* which is abundant in northern and humid deciduous forests. The Hylidae family includes tree-frog *Hyla crucifer* which makes a very strident call early in spring, most often in the wooded or shrubby sectors of the reserve. The Ranidae family comprises wood frog *Rana sylvatica* which returns to the humid forests after reproduction in the ponds and pools, and common leopard frog *Rana pipiens*. Reptiles can be observed in the reserve, on occasion striped snake *Thamnophis sirtalis* ssp. *pallidula*. Capelin *Mallotus villosus*, rainbow smelt *Osmerus mordax*, herring *Clupea harengus*, American shad *Alosa sapidissima*, Atlantic tomcod *Microgadus tomcod*, Atlantic salmon *Salmo salar* and Atlantic sturgeon *Acipenser oxyrhynchus* are present in the sea. Large quantities of American eel *Anguilla rostrata* are caught in traps (fascines) and exported. To catch herring, capelin and shad the same method is used, but not the same trap, into which flat boats have access and the fish are caught by landing nets. Three species of stickleback live in the ponds and pools: speckled *Gasterosteus wheatlandi*, three-spined *G. aculeatus* and nine-spined *Pungitius pungitius*. These fish migrate from the estuarine waters of the St Lawrence to reproduce in the ponds and pools at the end of April and return to the river in July (for the first two species) and November (for the nine-spined stickleback). At least eight bird species feed on stickleback and three of these are responsible for 80% of the total fish capture: these are night heron *Nycticorax nycticorax*, ring-billed gull *Larus delawarensis* and common grackle *Quiscalus quiscula*. Around 30% of stickleback in the marshes were victims of predation by birds in 1982 and 1983. On sandy or muddy beaches fishermen collect *Nereis diversicolor* and *Arenicola marina* to use as bait. One mollusc, whelk *Buccinum undatum*, is found on sandy beaches as well as at depths of 100m; eelgrass *Zostera marina* communities are full of young whelk. Another mollusc, gaper-shell *Mya arenaria* which lives in sandy or muddy beaches, is also sought after as food. Several shore birds hunt sand-hopper *Orchestia gammarella* on the banks of the reserve. In puddles left by the receding tide and under stranded seaweed *Gammarus* sp. can be seen. Where pebbles replace the sand, blue mussel *Mytilus edulis* attach themselves to rocks or other mussels. *Cheironomus* sp. are dominant in pools and ponds. Also present are *Trichocorixa verticalis*, *Ephydra* sp. and *Culocoides* sp., *Oligochetae* and omnipresent gastropod *Hydrobia minuta*. Crustacean *Gammarus lawrencianus* are abundant in ponds.

International and National Importance The diversity of habitats present in the bay, from estuarine waters of intertidal swamps to forest islets, favours the presence all year of an important number of bird species. 130 species have been recorded from the reserve, viz. half the species recorded from the immediate region, including several uncommon species like wigeon *Anas penelope*, elegant rail *Rallus elegans*, laughing gull *Larus atricilla*, hawk owl *Surnia ulula*, marsh wren *Cistothorus palustris* and Wilson's phalarope *Phalaropus tricolor*. Between 10% and 25% of all birds in the maritime estuary are to be found at some time or other in the region of L'Isle Verte. Cooper's hawk *Accipiter cooperii*, hen harrier *Circus cyaneus*, great horned owl *Bubo virginianus*, belted kingfisher *Ceryle alcyon*, short-eared owl *Asio flammeus* and several species of thrushes are occasionally recorded. During the spring migration, large

populations can be observed of Canada goose *Branta canadensis*, greater snow goose *Chen caerulescens* and groups of brent goose *Branta bernicla*, an uncommon species the small population of which merits special attention. Several other species of wildfowl stopover during migration; ducks such as pintail *Anas acuta*, black duck *A. rubripes*, mallard *A. platyrhynchos*, gadwall *A. strepera*, common shoveler *A. clypeata* and American wigeon *A. americana*, as well as blue-winged teal *A. discors* and green-winged teal *A. crecca carolensis*. The number of spring migratory birds is estimated at 35,000, compared with 10,000 in the autumn. Of this number, anserines are dominant in spring with numbers recorded at 27,000 birds, of which 40% are white geese and 34% Canada goose. Other species such as black duck, blue-winged teal and pintail comprise 19% of migratory birds in spring. Eider duck *Somateria mollissima*, scoters, seagulls and cormorants comprise 8%. Of shorebirds, black-bellied plover *Pluvialis squatarola* dominates during the spring migration, followed in order of population size by semi-palmated plover *Charadrius semipalmatus*, greater yellowlegs *Tringa melanoleuca*, Killdeer plover *Charadrius vociferus*, least sandpiper *Calidris minutilla*, common snipe *Gallinago gallinago* and spotted sandpiper *Actitis macularia*. Anatidae form the largest migratory group in autumn, while 4,000 black duck have been recorded (CWS inventory 1976-77). Thousands of scoters and goldeneyes feed and rest in the estuary waters closest to the intertidal swamps. Other sea ducks, specifically eider and old squaw *Clangula hyemalis* are also amongst the autumn migrants but in less important numbers, in the same way as Canada goose. Other aquatic birds observed during migration include several hundred double-crested cormorant *Phalacrocorax auritus*, great blue heron *Ardea herodias* and night heron. Seagulls are common in the reserve. More than 60 potential nesting species have been recorded in the area, the most common being bobolink *Dolichonyx orzivorus*, red-winged blackbird *Agelaius phoeniceus*, common grackle and brown-headed cowbird *Molothrus ater*. Also recorded are two-coloured swallow *Iridoprocne bicolor*, sand martin *Riparia riparia*, American robin *Turdus migratorius*, 12 species of warbler and 8 finches. Savannah sparrow *Passerculus sandwichensis* dominates the coastal swamp and neighbouring fields, often accompanied by song sparrow *Melospiza melodia*. The reserve is one of the most important sites for black duck reproduction. Nesting takes place in the upper part of the swamp, shrub borders and in water courses, but it is during the breeding period that the reserve is all-important, because the swamps hide coveys in great numbers, small ponds abound with insects and isolate the coveys.

The North American wildfowl plan recognises the precarious position of the black duck population in east North-America and confirms the priority of protecting its habitats in the St Lawrence Valley. The presence of a large number of this species in L'Isle Verte, the relative rarity of the habitat chosen by the black duck, as well as the objectives of the plan confirm the cogency of protection of this area. Based on the results of duckling banding programmes undertaken at L'Isle Verte during several summers, estimates of 8.3 broods per km of river bank and 4.5 young per brood leaving the nest have been made. Over the reserve's 15km, therefore, 560 ducklings should reach that age.

Several species reside or are in passage during winter in the area which extends from L'Isle Verte to Matane; 41 regular visitors and 15 occasional have been recorded.

Changes in Ecological Character Fertilisers, herbicides and pesticides carried by streams from agricultural land through the drainage network could alter the quality of water courses in the area. The same goes for waste water from surrounding areas which is emptied into the river untreated or after partial treatment. Accidental spills of oil during transport by tanker pose a potential serious threat to riverine ecosystems.

Management Practices Under Canadian wildlife law, the reserve is managed for protection of the fauna and its habitats. Only those activities compatible with these objectives are permitted. All other uses which would have a negative effect are rigorously controlled. Public access is limited to certain sectors, although hiking and wildlife observation is permitted.

Scientific Research and Facilities Numerous studies have been undertaken by employees of the Canadian Wildlife Service, by independent groups working on government programmes and by scientists concerned with the biotic and abiotic aspects of the area.

Principal Reference Material The above information was supplied at the time of designation.

Shepody Bay

Location 45°47'N, 64°35'W. Shepody Bay is situated at the head of the Bay of Fundy, 30km south of the city of Moncton, New Brunswick.

Area 12,200ha (comprising 7,700ha of open water, 4,000ha of mud flats, 800ha of salt marsh and 100ha of beach)

Degree of Protection Shepody Bay, along with other sites (Mary's Point, Cumberland Basin, Cobequid Bay, Minas Basin) in the upper Fundy region collectively form the proposed Bay of Fundy Hemisphere Shorebird Reserve. The site is unprotected. However, it does abut the Mary's Point unit of Shepody National Wildlife Area. That site was listed as a wetland of international importance on 24 May 1982. The site is principally open water and exposed beach and is, thus, undeeded and under the jurisdiction of the Province of New Brunswick. The salt marshes were previously reclaimed and used for agriculture, but have been abandoned and present ownership is unknown. The area was listed as a Ramsar site on 27 May 1987.

Site Description Shepody Bay is a large tidal embayment surrounded by low, rolling upland. A narrow band of salt marsh occurs along the western shore, whereas the eastern side is characterised by a rocky, eroding coastline with sand-gravel beaches. The northern limit of the bay is at the confluence of the Petitcodiac and Memramcook rivers. The most striking feature of the wetland is the extensive intertidal mudflats on both sides of the Bay. At Grande Anse and at Daniel's Flats they extend seaward for over 2km at low tide. The flats consist of fine silts that have been built up over time through deposition from muddy tidal waters. These extensive areas and their associated invertebrate fauna are critical feeding grounds for migrant sandpipers and plovers during late summer and early autumn. Of particular importance to shorebirds is the occurrence of the mud-dwelling amphipod *Corophium volutator* which, in North America, occurs only in the Bay of Fundy and in the highest densities in the world.

International and National Importance The area is situated at the head of the Bay of Fundy, an area with the largest tidal range in the world (up to 14m in Shepody Bay). The bay is important for the large numbers of birds using the site. After Mary's Point, the Shepody Bay site hosts the largest numbers of semipalmated sandpiper *Calidris pusilla* with maximum numbers at roosting sites occasionally exceeding 100,000 birds. Smaller numbers of semipalmated plover *Charadrius semipalmatus*, black-bellied plover *Pluvialis squatarola*, short-billed dowitcher

Calidris minutilla, and a variety of other species, also use the site. In total, several million shorebirds use the wetland from mid-July to early November. The salt marshes support several hundred Canada geese *Branta canadensis* and black duck *Anas rubripes*, lesser numbers of green-winged teal *Anas crecca carolinensis* and pintail *Anas acuta* during spring and large numbers of common eider *Somateria mollissima*. Scoters move through the bay on route to more northerly breeding grounds.

Changes in Ecological Character There is a possibility of the establishment of a tidal power barrage at the mouth of Shepody Bay.

Management Practices There are no specific management practices carried on within this wetland, except for a shorebird banding station operated by the Canadian Wildlife Service. In 1986 over 2,500 shorebirds were banded at Grande Anse.

Scientific Research and Facilities Shorebird research projects conducted in the upper Bay of Fundy during the period 1974-1983 have documented the importance of Shepody Bay for shorebirds.

Principal Reference Material The above information was supplied at the time of designation.

Grand Codroy Estuary

Location 47°50'N, 59°18'W. Grand Codroy is located on the west coast of the island of Newfoundland approximately 30km north of Port aux Basques.

Area 925ha

Degree of Protection Since 1974 the entire site, including the surrounding upland, has been closed to hunting by a Provincial Order-in-Council known as the Hunting Prohibition Order. The site is entirely open water and intertidal flats to the mean high tide mark. The area is thus undeeded and under the jurisdiction of the Province of Newfoundland. It was designated as a Ramsar site on 27 May 1987.

Site Description The site is a large coastal estuary. The 7km long wetland varies in width from 1 to 1.5km and narrows to a 100m channel at the outlet to the ocean. The mouth of the estuary is separated from the waters of Searston Bay by a 1km long sand spit vegetated by dune grass *Ammophila* sp. The meandering river channel of the Grand Codroy occupies 15% of the area, while the remainder is a shallow, brackish wetland with flats and sand bars exposed at low tide. Portions of the intertidal area are heavily vegetated with eel grass *Zostera marina*. Four small islands occur within the wetland and the surrounding rolling upland is largely farm and open fields.

International and National Importance The estuary supports flocks of up to 3,000 Canada geese *Branta canadensis* during fall and early winter, and upwards of 1,000 black duck *Anas rubripes* in late September. Pintail *Anas acuta*, green-winged teal *A. crecca carolinensis*,

American wigeon *A. americana* and greater scaup *Aythya marila* also occur in lesser numbers. Small concentrations of shorebirds use its intertidal bars and flats in late summer.

Changes in Ecological Character Further human development of the upland fringe could alter patterns of waterfowl use.

Management Practices An annual waterfowl banding station is operated during September and early October. Upwards of 500 ducks are annually trapped and banded at this site.

Scientific Research and Facilities No major studies have been carried out at Grand Codroy. The Canadian Wildlife Service has banded waterfowl at this site annually since 1979, and the estuary is a favourite birding area and often frequented by naturalists.

Principal Reference Material The above information was supplied at the time of designation.

Quill Lakes

Location 51°55'N, 104°20'W. Situated in east-central Saskatchewan, approximately 150km east of Saskatoon and 150km north of Regina.

Area 63,500ha

Degree of Protection The lake complex is principally vacant Crown Land administered by the provincial government. Of this land, 18,000ha have been designated under the Saskatchewan Critical Wildlife Habitat Protection Act. Islands located in Middle Quill Lake are designated as provincial wildlife refuges to protect breeding colonies of white pelican *Pelicanus erythrorhynchos* and double-crested cormorant *Phalacrocorax auritus*. Designated a Ramsar site on 27 May 1987.

Site Description Quill Lakes are the repository for an internal drainage basin which contains three distinct wetlands; Big Quill, Middle Quill (Mud Lake) and Little Quill lakes. Big Quill is Canada's largest salt water lake. Salinity limits the floral diversity of Big Quill Lake, although submergent *Potamogeton* spp. are abundant over much of the lake complex and shoreline emergent plant communities dominated by *Typha* and *Scirpus* spp. fringe most of the lakes.

International and National Importance The Quill Lakes complex is recognised to be one of the most important waterfowl staging areas in the province. During the autumn, large numbers of geese (*Branta* spp., *Chen* spp., *Anser* spp.), ducks (principally Anatidae) and sandhill crane *Grus canadensis* utilise the three basins. Some 140 species of migratory birds have been recorded breeding in the area, of which four bird species have been classified as threatened by COSEWIC. These are: white pelican, American bittern *Botaurus lentiginosus*, ferruginous hawk *Buteo regalis* and burrowing owl *Speotyto cunicularia*. Big Quill Lake is one of the primary breeding sites in Saskatchewan for the endangered piping plover *Charadrius melodus*. Saline mud flats around the periphery of the lake basin support 19% of the provincial piping plover population and 9% of the North American population. Peregrine *Falco peregrinus* and

whooping crane *Grus americanus* are two other endangered species which are known to appear regularly in the Quill Lakes area during migration.

Changes in Ecological Character A potassium sulphate extraction plant is proposed for Big Quill Lake. Concern over resultant water chemistry changes to the lake and potential associated impacts on aquatic invertebrates and migratory birds has resulted in the recent preparation of an environmental impact assessment by Saskatchewan Province. This assessment concluded that the proposed development would not have a significant impact on the ecology of the lake. Based upon the assessment, the proposed development has been approved. The proponent (Potash Corporation of Saskatchewan) has not yet decided if it will proceed with the plant, but has been directed to monitor piping plover and other shorebird populations if it does so.

Management Practices Agricultural activities (cultivation, livestock grazing and haying) have been common for most of the past century throughout upland areas associated with the Quill Lakes complex, and grazing and haying also occur on the salt flats of Big Quill Lake. A programme was instituted in the late 1960s to compensate landowners for grain crops lost to field feeding waterfowl. An active Waterfowl Crop Damage Control programme now employs temporary lure crops (168ha) and four bait stations to reduce the incidence of crop depredation in the area. Field studies indicate a need to upgrade the local crop damage control programme.

The wetland complex is also a candidate for inclusion in the Saskatchewan Heritage Marsh programme. Designation as a premier provincial marsh under this programme would involve intensified management of existing Ducks Unlimited projects on tributary drainages, and the allocation of more resources to the waterfowl crop damage prevention programme.

Scientific Research and Facilities No information

Principal Reference Material The above information was supplied at the time of designation.

Oak Hammock Marsh Wildlife Management Area

Location 50°10'N, 97°06'W. Situated 32km north of the city of Winnipeg, Manitoba.

Area 3,600ha (comprising 1,400ha of marsh, 2,200ha of upland)

Degree of Protection The site is protected under Provincial legislation as a wildlife management area, owned by the Province of Manitoba. It was designated a Ramsar site on 27 May 1987.

Site Description The marsh is a remnant of a 47,000ha marsh located in the former prairie north of Winnipeg. Drainage for agricultural purposes of this larger marsh known as St Andrews Bog began in 1897. By the early 1960s, all but 250ha had been drained. Measures to restore a portion of the bog began in 1967 when the Provincial Government and the Canadian Government embarked on a cooperative programme with Ducks Unlimited (Canada) and wildlife conservation organisations. By 1974, 3,450ha of marshland and marginal agricultural land had been purchased and 22km of dykes built to trap and hold water in three separate

compartments. In addition, 58 nesting islands were constructed within the three compartments. In 1984, Manitoba signed a development agreement with Ducks Unlimited (Canada) to construct additional dykes, control structures, nesting islands and water supply works.

International and National Importance The area is an important breeding and staging area for waterfowl and large numbers of other migratory birds. Over 260 species of migratory birds have been recorded, with 71 confirmed and 46 suspected as breeding in the area. Waterfowl are the most numerous visitors. Canada goose *Branta canadensis* and lesser snow goose *Anser c. caerulescens* stage at Oak Hammock in large numbers. In certain years, Canada geese have numbered over 115,000 and snow geese over 200,000. Staging geese numbers usually peak in October. Eighteen species of duck are common migrants to Oak Hammock. Of these, nine have been found nesting in the area. *Anas* species utilise the uplands and nesting islands. *Aythya* species have been found in the emergent cover of the impoundments.

Changes in Ecological Character Urban encroachment, industrial development and over-use of the artesian water source are all potential threats to the viability of the wetlands.

Management Practices The wetland is divided into four impoundments with water control capabilities built into each major cell. Individual impoundments can be drawn down or reflooded to required levels in order to effect management objectives. The primary management objectives are to increase waterfowl populations through the provision of quality breeding habitat and to provide an outdoor educational experience for Manitoba residents. Uplands are managed as lure crops to control waterfowl depredation and as upland nesting cover for dabbling ducks. Interpretation facilities have been constructed along the western edge of the marsh.

Scientific Research and Facilities The relationship between waterfowl production and habitat quality has been the major area of study.

Principal Reference Material The above information was supplied at the time of designation.

Southern James Bay Migratory Bird Sanctuaries

Location Hannah Bay Bird Sanctuary 51° 20'N, 79° 31'W; Moose River Bird Sanctuary 51° 20'N, 80° 25'W. The two sanctuaries are located in southern James Bay. Hannah Bay Bird Sanctuary lies on the eastern side of Hannah Bay, the southernmost projection of James Bay, from the Little Mississicabi River to East Point. Moose River Bird Sanctuary lies at the mouth of the Moose River and comprises Ship Sands Island and a piece of land on the eastern flats of the river mouth. The first sanctuary is located 60km east of Moosonee and the second 18km to the north-east.

Area 25,290ha (Hannah Bay Bird Sanctuary 23,830ha; Moose River Bird Sanctuary 1,460ha)

Degree of Protection Both sanctuaries are protected under the Migratory Birds Convention Act, P.C. 1958-15 (23 November 1954) and P.C. 1174-1989 (10 September 1974). The land is owned by the Government of Ontario and was designated a Ramsar site on 27 May 1987.

Site Description The bay and its coast lie within the Hudson Bay Lowland, a flat sedimentary basin close to the radiative centre of the Laurentide ice sheet and subsequently submerged by the late glacial Tymel Sea. The area is currently undergoing isostatic rebound, creating new coastal habitats which evolve continually toward shallow interior peatland. Due to the flatness and low relief of the area, the interface between land and water is very gradual, producing extensive wetlands which are influenced by the semi-diurnal tides. Wetland formation processes are also favoured by the layer of silt and clays deposited over the land, which renders it impermeable and, in conjunction with the near zero slope, entails surface water retention. The southern James Bay coast is characterised by a sequence of mud flats, intertidal marshes and supertidal meadow-marshes, which grade through a willow-alder shrub area into a drier forest interspersed with ferns and bogs. Mudflats are generally extensive along southern James Bay. At both sanctuary locations they are a few kilometres in width. Little vegetation grows on the flats, but their invertebrate fauna constitute an important food source for wildlife.

The intertidal marshes extend into the regular zone of tidal influence. A variety of plant associations are found in this zone and species composition is related to the degree of estuarine influence. Truly coastal marshes are mainly dominated by the grass *Puccinellia phryganoides*, while in the estuarine marshes of the east side of Ship Sands Island sedge *Carex paleacea* is dominant. Marsh pools, where water remains through low tide, are often dominated by single species such as *Scirpus maritimus* var. *paludosus*, *Eleocharis palustris*, *Carex paleacea*, *Senecio congestus*, *Hippuris vulgaris* and *Zanichellia palustris*. In estuarine conditions, where the river mouth sedimentation overrides or prevents the formation of panne-sword pattern, the associations are gradually varying and broader. Commonly associated with sedge *Carex paleacea* (which can have cover values greater than 90%) are arrowgrass *Triglochin maritima*, gramineae *Festuca rubra*, *Potentilla anserina* var. *groenlandica*, and *Ranunculus cymbalarica*. *Eleocharis palustris* is often the first coloniser of the tidal flats and is found in pure growth or associated with *Scirpus validus*.

The supertidal meadow-marshes of the coastal and estuarine sites are less varied than the intertidal marshes. On the coast, graminoid meadows dominate all non-beach ridge areas, the major species being *Festuca rubra*. Plant growth in streams is sparse, but ponds can be congested. Pondweed *Potamogeton filiformis* is abundant and *Eleocharis palustris*, *Myriophyllum exalbescentis*, *Zanichellia palustris* and *Hippuris vulgaris* can also be found. In estuarine supertidal meadow-marshes, the *Festuca rubra* associations are as important, but are more variable in composition. Herbs are commonly associated, as are graminoids (*Carex paleacea*, *Agrostis gigantea*) or rushes (*Juncus balticus*, *Scirpus rufus* var. *neogaeus*). In wetter sites, behind the shallow ridges of Long Point, uncommon species are found including *Carex vecta*, *C. limosa-paupercula*, *C. aquatilis*, *Equisetum variegatum*, *Angelica atropurpurea* and *Rumex occidentalis*. *Elymus mollis*, a gramineae, is sparsely distributed on coastal low-raised beach ridges and becomes denser on older ridges. Exposed sides may be shrub-rich while interior ridges are thicketed or treed. Beyond the open coastal habitats, vegetation on the ridges reaches its full potential with Ericaceae shrubs, trees (*Picea glauca*, *Populus* sp. and *Larix laricina*) and lichens and mosses.

International and National Importance James Bay plays a significant role in the annual cycle of waterfowl. The funnel-shaped outline of Hudson and James bays causes birds migrating from the Arctic to concentrate at the southern end of James Bay each autumn, where the extensive coastal wetlands provide critical staging and moulting areas for migrating geese, ducks and shorebirds. Lesser snow geese *Anser c. caerulescens* stage in the Hudson Bay lowland coastal

marshes for extensive periods during spring and autumn. Several races and populations of Canada geese *Branta canadensis*, as well as Brent geese *Branta bernicla hrota* are also found. In years when spring break-up is rapid, geese move out quickly. In late springs, they may stay for up to three weeks. During the autumn, geese make use of the coastal marshes where a large variety of plants are grazed. The autumn staging period in James Bay is essential for continued growth of juvenile geese, as well as for building fat reserves necessary for the autumn migration to the American mid-west. The largest concentrations of lesser snow geese are found in late autumn in southern James Bay. In October 1971, over 150,000 lesser snow geese were located in southern James Bay, between the Eastmain River and Moosonee. The sanctuaries themselves support several tens of thousands of geese depending on the time. Over 5% of the total population of lesser snow geese can be present in the sanctuaries during one single period, a higher proportion of the total population is estimated to use the marshes during the critical autumn staging period. Canada geese *Branta canadensis interior* are generally encountered in southern James Bay. A few hundred are found in Moose River Bird Sanctuary during spring and fall migration feeding along the tideline. In the Hannah Bay area, 1,884 Canada geese were counted in 19-22 September 1972. In the autumn, Brent geese migrate through southern James Bay from their staging areas further north. The only geese remaining to nest in the southern James Bay area are the Canada geese. Breeding has been confirmed in Hannah Bay Migratory Bird Sanctuary.

The coastal wetlands of southern James Bay provide essential pre- and post-breeding staging habitats to a large number of dabbling ducks nesting in the lowlands and further north. The southern James Bay area from Nomansland Point to the Quebec border, supports 36% of the total in spring, 15% in summer and 23% in the autumn. Black duck *Anas rubripes* is the species most often encountered along the coast. It is one of the first to arrive in spring, staging primarily in southern James Bay. In autumn, at least 1% of the continental population use the sanctuaries, with numbers reaching 15,000 birds. Mallard *A. platyrhynchos* is less common than black duck. It is regularly found staging during spring and fall along the Hudson and James Bay coast primarily on freshwater habitats such as pools on the coastal marsh and creeks inland from their mouths. Close to 1% of the continental population of green-winged teal *A. crecca carolensis* and of pintail *A. acuta*, constituting up to 50% of their Atlantic Flyway populations, are found in the lowland during the autumn. Some 11% of the Atlantic Flyway populations of green-winged teal and 7% of northern pintail Atlantic Flyway populations are found in southern James Bay. Other regularly encountered dabbling ducks are American wigeon *A. americana*, shoveler *A. clypeata* and blue-winged teal *A. discors*. Green-winged teal and American black duck are confirmed breeders in the sanctuaries. Black scoters *Melanitta nigra* constitute the majority of the diving ducks. However, scaup *Aythya* spp., common goldeneye *Bucephala clangula* and mergansers *Mergus* spp. are regularly noted. Both common and red-breasted mergansers, as well as common goldeneye, have been recorded as probable breeders in the sanctuaries. Oldsquaw *Clangula hyemalis* has been seen offshore from Hannah Bay. The south-western coasts of James and Hudson bays form a major migration pathway for many shorebird species. The majority are medium-sized birds, including red knot *Calidris canutus rufa*, short-billed dowitcher *Limnodromus griseus*, dunlin *C. alpina*, greater yellowlegs *Tringa melanoleuca* and lesser yellowlegs *T. flavipes*, as well as ruddy turnstone *Arenaria interpres*, black-bellied plover *Pluvialis squatarola* and lesser golden plover *P. dominica*. Large species consist principally of Hudsonian godwit *Limosa haemastica*, with smaller numbers of marbled godwit *L. fedoa* and whimbrel *Numenius phaeopus*. Small species consist predominantly of semi-palmated sandpiper *Calidris pusilla*, with smaller numbers of white-rumped sandpiper *C. fuscicollis*, sanderling *C. alba* and spotted sandpiper *Actitis macularia*. In October 1985 there were 2,000 dunlins

at East Point in Hannah Bay Sanctuary. The two wetland sanctuaries provide nesting habitat for pied-billed grebe *Podilymbus podiceps*, American bittern *Botaurus lentiginosus*, belted kingfisher *Ceryle alcyon*, sora *Porzana carolina*, Bonaparte's gull *Larus philadelphia*, herring gull *L. argentatus*, common tern *Sterna hirundo* and for sandhill crane *Grus canadensis*.

Many warblers, sparrows and other passerine species also use various habitat types during the breeding season as well as on migration. At Hannah Bay some of the commonest are groups of horned lark *Eremophila alpestris*, Lapland longspur *Calcarius lapponicus*, snow bunting *Plectrophenax nivalis* and, notably, several thousand common redpolls *Carduelis flammea* seen in the East Point area.

Changes in Ecological Character None reported

Management Practices The sanctuaries have been designated in order to keep important staging habitats from hunting pressure and thus increase native harvest in the surrounding tidal marshes. Management implications are to clearly post the sanctuaries' boundaries and to enforce the no-hunting regulations. Management and enforcement activities generally take place as a cooperative effort by federal and provincial agencies.

Scientific Research and Facilities Surveys pertaining to geology, mapping, flora and fauna have taken place, with increasing emphasis as the eventuality arose of development activities, such as hydroelectric dams and petroleum exploration. Recently undertaken wildlife surveys include the Hudson Bay Lowland project (Environment Canada), the Ontario Breeding Bird Atlas and the on-going goose productivity surveys.

Principal Reference Material The above information was supplied at the time of designation.

Point Pelee National Park

Location 41°47'N, 82°31'W. The park is a sandspit formation which extends into the western basin of Lake Erie and is situated in Mersea Township, County of Essex. Leamington is 6km to the north.

Area 1,564ha, comprising 1,113ha of marsh and 451ha of dry land.

Degree of Protection Point Pelee is administered as a national park (declared in 1918) by Environment Canada. The site was added to the Ramsar list on 27 May 1987. It is state-owned.

Site Description The national park is located in the west St Lawrence lowlands, which includes the Carolinian zone of southern affiliated flora and fauna in Canada. These lowlands are dominated by till plains which were created as a result of the Wisconsinian ice advance and retreat. Point Pelee sandspit was formed as a direct result of glacial and fluvial forces. The terrestrial landscape combines till plains with shoreline landforms, while the aquatic substrate consists of clay and peat overlain by sand. The marsh has a closed drainage system which does not usually allow free water exchange with Lake Erie. However, if the barrier ridge has been breached allowing water exchange, the marsh water level fluctuates with that of the lake.

Both the southern Great Lakes marsh and the Carolinian forest ecosystem at Point Pelee are dynamic, as both ecosystem "seed bank" plant species are adapted to a range of conditions and shift their species composition according to changes in the moisture regime. The diversity of vegetation in the marsh is highest along the edge of marsh ponds and in the transitional zones between the marsh and the terrestrial environment. The marsh is dominated by four vegetation communities: shrub (woody emergents), herbaceous emergents, floating and submerged aquatics. Shrub communities are found in the marsh but usually on drier lands closer to the marsh-forest edges. Characteristic of this community are willow *Salix* spp., buttonbush *Cephalanthus occidentalis* and Drummond's dogwood *Cornus drummondii*. Herbaceous emergents are dominated by cattail *Typha* spp., giant reed *Phragmites communis*, Canada bluejoint *Calamagrostis canadensis*, wild rice *Zizania aquatica*, elodea *Elodea canadensis* and include two nationally rare species, American water willow *Justicia americana* and swamp rose mallow *Hibiscus palustris*. Floating communities are characterised by yellow spatterdock *Nuphar advena*, common bladderwort *Utricularia vulgaris* and white water lily *Nymphaea tuberosa*. The submerged aquatic beds, which play a significant role in food chains for many of the amphibians, reptiles and fish species in the park, are dominated by naiad *Najas guadalupensis*, pond weed *Potamogeton natans*, common bladderwort, swaying rush *Scirpus subterminalis* and elodea.

There is an even larger diversity of vegetation found in the trough section of the Point Pelee marsh, since it is in the southern part of the marsh, the major transitional zone, and is subject to seasonal flooding. This habitat contains rare species such as wild potato vine *Ipomea pandurata*, yellow giant hyssop *Agostache reptoides* and Florida lettuce *Lactuca floridana*. Along the eastern edge of the marsh lies the barrier ridge shoreline which represents critical habitat for many floral as well as amphibian and reptile species. The shoreline area is predominantly in early successional stages and is dominated by cedar-savannah communities in its drier portions, while the marsh edge is dominated by treed fen. The terrestrial land of the park is a dune system adjacent to the west side of the marsh. Forty percent of this area is early successional, resulting from agricultural abandonment since the park was established, while less than 10% is used for park interpretation and recreation. The remainder is composed of a variety of wet and dry forests.

Of the 42 species of mammal reported, muskrat *Ondatra zibethicus* is the most visible within the marsh. Mink *Mustela vison* and raccoon *Procyon lotor* are the major marsh predators. Other mammals include long-tailed weasel *Mustela frenata*, meadow vole *Microtus pennsylvanicus*, white-footed mouse *Peromyscus leucopus*, deer mouse *P. maniculatus*, jumping mouse *Zapus hudsonius* and, in winter, cottontail rabbit *Sylvilagus floridanus*, coyote *Canis latrans* and white-tailed deer *Odocoileus virginianus*. 28 species of reptiles and amphibians have been recorded. Common in the marsh are American toad *Bufo americanus*, green frog *Rana clamitans melanota*, northern leopard frog *Rana pipiens* and, becoming less common, bullfrog *Rana catesbeiana*. The eastern barrier ridge is a valuable turtle nesting habitat. The spiny softshell *Trionyx spiniferus*, a rare turtle, utilises this bench area for nesting, as do other species of turtle. The marsh area is also used. Thirty four species of fish inhabit the marsh, both sport and non-sport species.

International and National Importance The park's location and exposure to the moderating waters of Lake Erie produce a definite southern climate, and many Carolinian faunal and floral species which are rare in Canada occur here. Of note are over 70 species of vascular plants, 25 bird species, 8 butterfly, 7 fish, 2 amphibian and 3 turtle species that are rare in the Province of Ontario. Of these, 8 plant species, 8 bird species, 7 fish, 2 amphibian and 3 turtle, as well as 1

snake and 1 mammal species, are considered rare, threatened or endangered in Canada. The park's location along the Mississippi flyway makes this area a critical stop-over for 347 species of migratory birds. This total includes 102 waterfowl and shorebird species. Large waves of migrants often number in the tens of thousands as they descend onto Point Pelee for rest and feeding, especially during the spring and autumn migration periods.

At least 100 bird species are known to breed in the park, including American black duck *Anas rubripes*, blue-winged teal *A. discors*, mallard *A. platyrhynchos* and wood duck *Aix sponsa*, and rare species such as prothonotary warbler *Protonotaria citrea*, king rail *Rallus elegans*, sedge wren *Cistothorus platensis*, least bittern *Ixobrychus exilis* and American bittern *Botaurus lentiginosus*. The marsh habitat is used seasonally by many ducks, geese and other waterfowl. In the marsh itself, many species congregate in the shallow ponds, including double-crested cormorant *Phalacrocorax auritus*, American coot *Fulica americana*, herons *Ardea* spp., plovers *Charadrius* spp. and grebes *Podiceps* spp. Rafts of 10,000 or more common merganser *Mergus merganser* and up to 50,000 red-breasted mergansers *M. serrator* often gather during migration just to the east and west of the park's shoreline on Lake Erie. Seven of the recorded species have been designated as rare in Canada. These are bald eagle *Haliaeetus leucocephalus*, king rail, piping plover *Charadrius melodus*, loggerhead shrike *Lanius ludovicianus*, prothonotary warbler, red-shouldered hawk *Buteo lineatus*, and eastern bluebird *Sialia sialis*.

Point Pelee is also internationally recognised as a major staging area for migratory monarch butterflies (up to 20,000) and other invertebrates such as dragonflies.

The park is of particular value in maintaining the genetic and ecological diversity of the region. There are very few sizeable protected natural areas in the Carolinian zone of Canada and over 97% of the immediate region's wetlands have been lost. Therefore, the park's expanse of natural area with resident populations of significant species is of special value.

Changes in Ecological Character The threats to the park result from effects of human land use in southern Ontario and on Lake Erie. The park is close to major industrial centres such as Detroit, Toledo and Cleveland, and prevailing westerly winds constantly expose it to airborne pollution. Lake Erie, while improved in its water quality, is still subject to industrial, urban and agricultural pollution. This deteriorated water quality directly affects the ecology of Point Pelee National Park marsh. High Lake Erie water levels and the subsequent erosion and breaching of the eastern barrier ridge, have substantially altered the water quality, due to increased turbidity and direct mixing of Lake Erie with marsh water. The high water levels have increased wave action in the open ponds which has initiated break-up of the cattail mat and movement of floating sections. Structural shoreline protection, particularly north and east of the park, has interrupted the dynamics of the coastal sand budget. Point Pelee no longer receives sufficient sediment on its eastern barrier ridge to ensure its re-establishment after water levels in Lake Erie drop. In future this may lead to a marsh that is more open to Lake Erie. Faunal and floral composition has been altered with the introduction of Lake Erie species into the marsh and due to adjacent agricultural land use. Control of exotic species is ongoing in the park. Agriculture immediately north of the park poses a threat of additional eutrophication of the marsh due to fertiliser run-off. Chemical pesticide and herbicide residues may also enter the marsh ecosystem. The effects of chemicals have yet to be determined. The location along the major Great Lakes shipping channel poses the threat of oil and toxic chemical spills. Previous oil spills have washed up on the park shoreline and adversely affected the beach flora and fauna. However park contingency plans address these situations.

Management Practices Natural resources protection and appropriate visitor-related use and facilities are outlined by the Point Pelee National Park Management Plan, which is reviewed every five years. The park is zoned and follows the five zone national park zoning system, each zone differing with the intensity and type of visitor use, as well as the degree of natural resource protection desired. Zone 1 is the special preservation zone and is designed to preserve essentially unimproved and nationally unique, rare and endangered areas or features. This zone has the highest degree of resource protection and in the national park includes the eastern barrier ridge and several marsh areas important for rare plants and nesting birds. The purpose of Zone 2 (wilderness) is to protect areas which represent natural history themes, while allowing primitive low-intensity recreational activities. This zone includes the majority of the marsh area within the park. Zone 3 (natural environment) is designed so that there is maintenance of a natural environment setting, while allowing recreational opportunities which require a minimum of man-made facilities. East Beach, much of the sand plain area and beaches with few or no support facilities, fall within this zone at Point Pelee. Areas which are capable of withstanding a full range of visitor uses and support related facilities may be located in the outdoor recreation area, or Zone 4. Where concentrations of visitor services and support facilities are required to manage and operate the park, this is the park services zone, or Zone 5. In addition to the five basic management zones, there are other small areas containing significant natural or cultural features which are particularly sensitive to development and use. These Environmentally Sensitive Sites do not have the characteristics necessary to designate them as Zone 1 areas and need to be specially protected. The degree of protection required is determined on an assessment of the importance and sensitivity of the resource. There are three specific activities which attract the most use at Point Pelee; bird watching, smelt fishing and beach-related activities. Duck hunting within the park is considered an anomaly and will eventually be eliminated.

Scientific Research and Facilities The unique, diverse southern character of Point Pelee has encouraged much research, particularly in the floral aspects of the park. Its location as a bird-watching site on a major migratory route has also encouraged research. The park management plan and the resource management analysis are the cumulative result of years of research and study within the park. Numerous universities such as Windsor, Guelph, Waterloo and Western have utilised the park for research. Studies have covered a wide range of topics including shoreline erosion, various mammals, rare southern affiliated vegetation, fish, herptiles, invertebrates and geomorphology, as well as problems arising from protection and recreational use. Park staff have inventoried and monitored the fauna and flora of the marsh area throughout its history, from early muskrat-trapping surveys to present-day muskrat population status studies.

Principal Reference Material The above information, including the 1982 management plan summary, was supplied at the time of designation, supplemented by:

Bayly, I.L. and O'Neill, T.A. (n.d.). *An aquatic vegetation map and inventory of Point Pelee National Park marsh*. Carlton University, Ottawa, Ontario.

Musquodoboit Harbour Outer Estuary

Location 44°42'N, 63°06'W. The outer estuary of Musquodoboit Harbour is located approximately 50km north-east of the Halifax/Dartmouth Metropolitan area in Halifax County, Nova Scotia.

Area Approximately 1,925ha

Degree of Protection The Province of Nova Scotia owns the 60ha Martinique Beach Provincial Park. The backshore of the park abuts in part the provincially-declared Martinique Beach Game Sanctuary. The upland islands are largely in private ownership as is a small portion of the salt marsh. The remaining area is intertidal land with unknown ownership. Martinique Beach Provincial Park and Martinique Beach Game Sanctuary are administered by the Province of Nova Scotia. The site was added to the Ramsar list on 27 May 1987.

Site Description Musquodoboit Harbour Estuary is intertidal with several shallow saline ponds with depths from 15-30cm. The depth of water at the outlet of Musquodoboit River is 2.1m below mean sea level. The outer intertidal estuary has islands scattered throughout giving an altitudinal range of -2 to 40m from mean sea level. The inner tidal area is protected from the sea in part by the 5km-long Martinique Beach and Bayers Island. Rapid tidal flow into both the western arm behind the beach and into the eastern main Musquodoboit River portion maintain eel grass *Zostera marina* and sand flats free of ice for wintering waterfowl except under the most severe weather conditions. Broadly categorised, the site is composed of 648ha (30%) eel grass flats; 206ha (11%) salt marsh *Spartina* sp.; 327ha (17%) sand beach and sand and mud flats; 23ha (1%) beach grass *Ammophila breviligulata*; 404ha (21%) upland islands; and 317ha (17%) tidal river and creeks at low tide.

International and National Importance The area is a major maritime stop for American black duck *Anas rubripes* and Canada geese *Branta canadensis*, and supports the largest wintering population of those two species in eastern Canada (2-3,000 black ducks and 4-6,000 Canada geese). A variety of other waterfowl, including up to 3,000 green-winged teal *Anas crecca carolinensis*, use the area during fall migration. Shorebirds common to the area from late July to September are: common snipe *Gallinago gallinago*, short-billed dowitcher *Limnodromus griseus*, least sandpiper *Calidris minutilla*, semi-palmated sandpiper *C. pusilla*, greater yellowlegs *Tringa melanoleuca*, lesser yellowlegs *T. flavipes*, spotted sandpiper *Actitis macularia*, black-bellied plover *Pluvialis squatarola*, semi-palmated plover *Charadrius semipalmatus*, ruddy turnstone *Arenaria interpres* and purple sandpiper *Calidris maritima*, common in winter. Occasional visitors include: stilt sandpiper *Micropalama himantopus*, red knot *Calidris canutus*, pectoral sandpiper *C. melanotos*, white-rumped sandpiper *C. fuscicollis*, dunlin *C. alpina*, Hudsonian godwit *Limosa haemastica* and whimbrel *Numenius phaeopus*.

Changes in Ecological Character Recreational and regulated commercial clamming at present levels are compatible with the management of the area. However, recreational use is approaching the acceptable maximum and will have to be maintained at near present use levels.

The principal threat to the area is the erosion of the sand dune which protects the western arm from the open ocean.

Management Practices The park provides a controlled, maintained gravel road access to designated and controlled parking sites along the first half of the beach. A boat launch is maintained for use by clam diggers, hunters and bird watchers. Picknicking tables, toilet facilities, and a change house are provided. These facilities are managed by the Nova Scotia Department of Lands and Forests. The area is being planned as a visitor site on a Nova Scotia wildlife tour, with consideration being given to the construction of observation platforms to enhance viewing of the bird population.

Scientific Research and Facilities No major scientific research is being conducted at present. However, waterfowl population counts are undertaken annually, pre- and post-season black duck banding is conducted and eel grass density is monitored.

Principal Reference Material The above information was supplied at the time of designation.

Beaverhill Lake

Location 53°25'N, 112°35'W. The lake is situated 71km east of Edmonton.

Area 18,050ha, comprising 6,070ha of land and 11,980ha of water.

Degree of Protection The site is owned by the provincial government and was added to the Ramsar List on 27 May 1987.

Site Description The lake is located in Central Alberta, at the northern edge of the aspen parkland zone. It lies in a broad, shallow glacial basin covering approximately 13,000ha, with an average depth of 1.5 to 1.8m. The lake levels fluctuate on a long-term basis over a decade or more. This long-term decrease in water levels has exposed more than 6,070ha of previous lake bed. The area is flat to gently-rolling and includes an abundance of depressions, sloughs, and several artificial drainages. Vegetation is composed of aspen and willow, dry grassland, wetland, shoreline vegetation and cultivated farmland.

International and National Importance The lake has provincial, national and international importance as a staging, production and migratory area for waterfowl and shorebirds. The number of ducks, geese and swans staging on the lake during fall migration can exceed 200,000. The lake is one of two sites in Canada designated as a national viewpoint by the Canadian Naturalists Federation. The upland and wetland vegetation provides important nesting, brood rearing, moulting and staging habitat for waterfowl. An island in the lake provides breeding habitat for white pelican *Pelecanus erythrorhynchos* and double-crested cormorant *Phalacrocorax auritus*, great blue heron *Ardea herodias* and night heron *Nycticorax nycticorax*. Terns *Sterna* sp., avocet *Recurvirostra americana* and godwit *Limosa fedoa* inhabit the shorelands. Upland areas adjacent to the lake provide locally important habitat for white-tailed deer *Odocoileus virginianus* and mule deer *O. hemionus*, sharp-tailed grouse *Pediocetes phasianellus* and ruffed grouse *Bonasa umbellus* and other resident or transient species of wildlife.

Changes in Ecological Character Change in level and consequently size of lake.

Management Practices Exposed areas of the lake bed are owned and controlled by the State. Since the 1930s, much of this Crown land has been leased under a form of agricultural disposition to farmers owning adjacent patented lands. At present, over 90% (5,463ha) of land use is under agricultural dispositions, primarily for grazing with haying and cropping and cultivation secondary. The remaining land is disposed to resource development reservations (wildlife habitat, a recreation lease, natural gas well sites), or is undisposed. Habitat enhancement projects were initiated in 1972 by Ducks Unlimited (Canada) and Alberta Fish and Wildlife. A dam was constructed to provide optimum water levels for resident waterfowl, and nesting islands constructed. In 1973, the lake became a habitat improvement project under the Alberta Fish and Wildlife "Buck for Wildlife" Programme. During 1973 meetings were held with local groups and landowners to determine their response to potential habitat protection activities. From 1975 to 1981 a variety of habitat development activities were completed. These included tree planting, food and nest cover plots, pothole blasting, further construction of nesting islands, and fencing to control cattle grazing. In 1981, the Beaverhill Lake Integrated Resource Plan was prepared, to provide a policy that will guide the preparation and implementation of the local development plan on a disposition unit basis.

Scientific Research and Facilities None

Principal Reference Material The above information was supplied at the time of designation.

Southern Bight - Minas Basin

Location 45°13'N, 64°16'W. The wetland is in the southern extension of Minas Basin and immediately north of the town of Wolfville.

Area 26,800ha, comprising: 100ha of upland (Boot Island NWA); 1,400ha of salt marsh; 7,800ha of mud-sand flats; 100ha of beach and 15,700ha of open water.

Degree of Protection The majority of the site is inter- or sub-tidal and is thus undeeded. Boot Island (144ha) is owned by the federal government and established as a national wildlife area. Much of the salt marsh area is privately owned. The only portion of the site which has protected status is Boot Island NWA where activities are controlled by the Wildlife Area Regulations under the Canada Wildlife Act. The site was added to the Ramsar list on 5 November 1987.

Site Description The basin is a wide, open bay into which flows one major and several smaller river systems. The surrounding coast is low, rolling upland with salt marshes prevalent. One small island (Boot Island) occurs within the site. Altitude ranges from -20m to 20m. The site is subject to macro-tidal fluctuations (range of 14m) as it is associated with the Bay of Fundy. Extensive tidal flats occur along all sections of the coast and in places extend over 5km into the basin at low tide. The flats consist of fine marine silts that have been deposited by the silt-laden tidal waters. These extensive areas and their associated invertebrate fauna support extremely large numbers of migrant shorebirds. Minas Basin (Southern Bight) along with Mary's Point, Shepody Bay, Cumberland Basin and Cobequid Bay, all located in the Upper Fundy Region,

collectively form the proposed Bay of Fundy Hemisphere Shorebird Reserve. Of the five sites, Minas Basin and Mary's Point-Shepody Bay are the most critical habitats and support the highest densities of mud-dwelling marine amphipod *Corophium volutator*, the principal prey species for shorebirds.

International and National Importance At peak times, Minas Basin supports flocks of over 60,000 semi-palmated sandpiper *Calidris pusilla*, along with large numbers (thousands) of semi-palmated plover *Charadrius semipalmatus*, black-bellied plover *Pluvialis squatarola*, short-billed dowitcher *Limnodromus griseus* and very large numbers (nearly 10,000) of least sandpipers *Calidris minutilla*. Several pairs of eastern willet *Catoptrophorus semipalmatus* breed on the salt marshes and great blue heron *Ardea herodias*, double-crested cormorant *Phalacrocorax auritus* and gulls nest on Boot Island. Sizeable numbers of waterfowl (Canada goose *Branta canadensis*, black duck *Anas rubripes*, green-winged teal *A. crecca carolinensis*) use the salt marsh and associated wetlands during spring and fall.

Changes in Ecological Character No imminent threats are foreseen. The development of a Fundy Tidal Power barrage at Cobequid Bay would cause tidal changes at this site and possible alteration to siltation patterns.

Management Practices Little activity takes place that seriously impacts on the birds. Some recreational activity causes disturbance to roosting flocks on Evangeline Beach.

Scientific Research and Facilities Due to the close proximity of this site to Acadia University (Wolfville), shorebird distribution and feeding ecology have been extensively studied. Boot Island NWA is surveyed every second year and no activity other than research occurs on the site.

Principal Reference Material The above information was supplied at the time of designation.

Malpeque Bay

Location 46°32'N, 63°48'W. The bay is situated on the north coast of Prince Edward Island, 10km north of the town of Summerside, Prince County.

Area 24,400ha, comprising 700ha of salt marsh, 7,600ha of shallow estuarine water and flats, 80ha of saline ponds, 640ha of sand dunes, 260ha of sand beach, 2,200ha of islands and 12,960ha of open water.

Degree of Protection As the site is primarily open water and intertidal flats, a large area is undeeded. The coastal sandspit is Provincial Crown Land and a large portion is owned by Lennox Island Indian Reserve, while the islands and salt marshes are mostly privately owned. Courtin Island is partly owned by the Island Nature Trust. The bay is unprotected by any conservation legislation, except for the adjacent 316ha Indian River Wildlife Management Area, a provincially-designated waterfowl management site. Malpeque Bay was added to the Ramsar list on 28 April 1988.

Site Description Malpeque Bay is a coastal lagoon system protected from the open sea (Gulf of St Lawrence) by a 25km-long coastal sandspit and dune formation. A 1km-wide channel at the eastern tip of the sandspit provides for the main exchange of tidal waters between the bay and open ocean. Some 23 small rivers and creeks contribute fresh water to this wetland, thus producing principally an estuarine regime. Numerous small salt marshes (average size 5ha) are scattered along the coastline which is characterised by a band of intertidal sand-mud that varies in width from 0.5m to 1km. The majority of the bay is shallow (average depth 4m, maximum 13m) with numerous shoals. These shallow, productive, coastal waters account for 31% of the site area, and eel grass *Zostera marina* dominates half (3,800ha) of this area. The 25km protecting sandspit has wide sand beaches (260ha) and several small saline ponds. Areas of overwash occur at intervals, but an extensive dune system vegetated with marram grass *Ammophila breviliogulata* dominates. The bay contains nine islands, five wooded and four covered with grasses and shrubs.

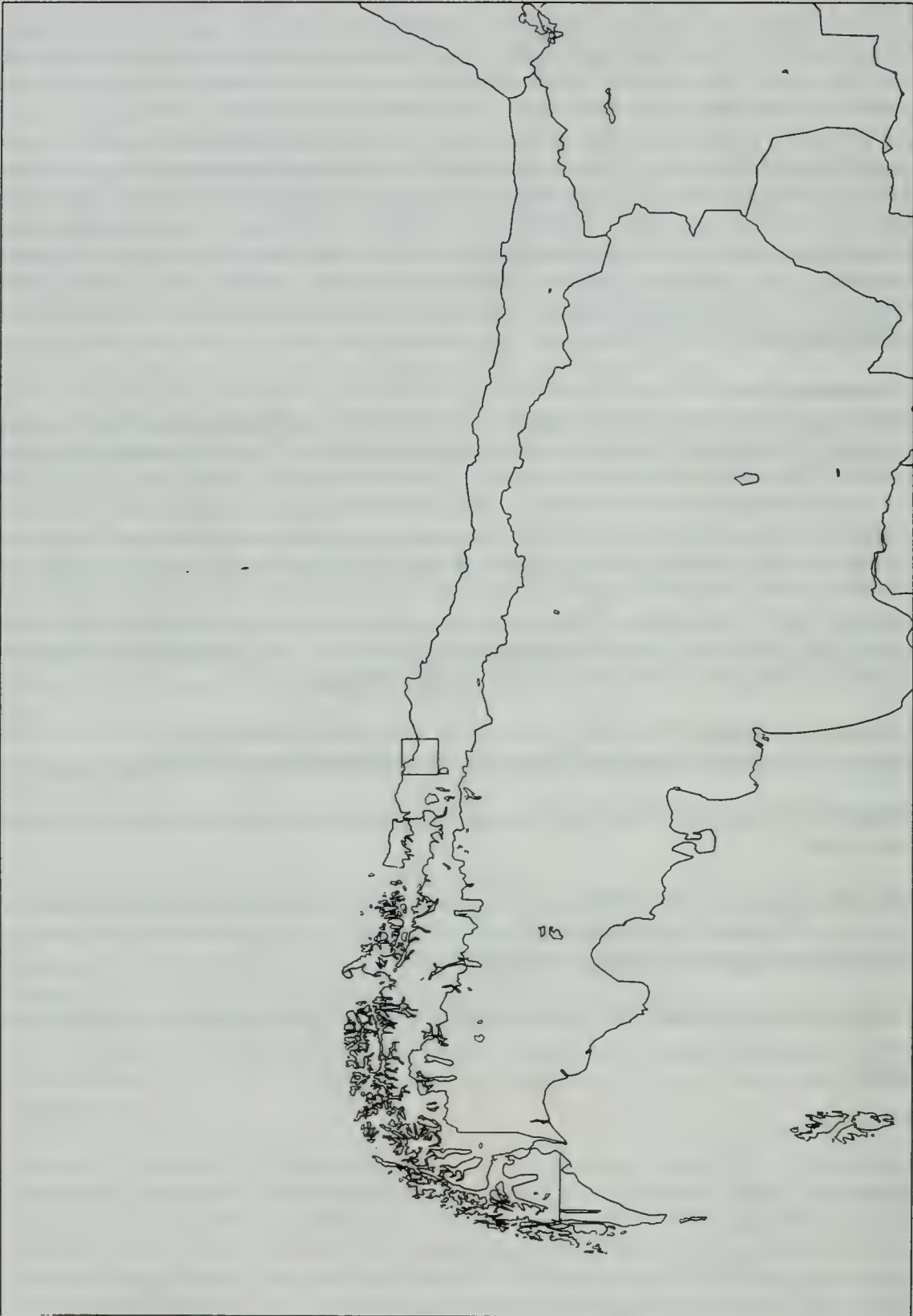
International and National Importance Wildlife use of the area is considerable. Peak numbers of Canada geese *Branta canadensis* reach 14,000 in spring and nearly 20,000 during autumn. Of particular importance to geese are the eel grass flats and intertidal areas near Bunbury Island, Courtin Island, at the mouth of Indian River and in Darnley Basin. Up to 3,000 red-breasted merganser *Mergus serrator*, 1,200 greater scaup *Aythya marila*, 1,500 black duck *Anas rubripes* and 750 green-winged teal *Anas crecca carolinensis* can be observed in the peak autumn periods. Smaller numbers of pintail *Anas acuta*, golden eye *Bucephala clangula* and scoter also occur. Shorebirds are abundant about the bay from mid-July to early autumn, and several pairs of nesting piping plover *Charadrius melodus* occur at overwash sites on the outer beach. Some of the islands are colonial nesting sites for seabirds, and Courtin Island is the largest (300) great blue heron *Ardea herodias* colony in the province.

Changes in Ecological Character There are no known threats to this area. However, further human development of the upland fringe could alter patterns of waterfowl use.

Management Practices There are no specific management practices being carried out within the wetland.

Scientific Research and Facilities No major studies of migratory birds have been carried out at the site. Waterfowl use has been documented by aerial surveys conducted by the Canadian Wildlife Service and the Provincial Wildlife Division.

Principal Reference Material The above information was supplied at the time of designation.



Ramsar Sites in Chile

Chile

Area 756,943 sq.km

Population 11,682,260 (1983)

Summary of Wetland Situation In Southern Chile there are countless fresh-water lakes, marshes, bogs, estuaries, fiords and offshore islands which are of prime importance for breeding Anatidae. Most species are to some extent migratory, but large numbers remain through the winter in sheltered fiords and bays. The most important sites of the region include freshwater marshes along the Rio Cruces north of Valdivia, where Carlos Anwandter Sanctuary has been established; freshwater lakes and marshes, and tidal estuaries and salt marshes around Ancud, Isla de Chiloé (particularly important for wintering Anatidae and shorebirds); and Torres del Paine National Park and Puerto Natales area (another important breeding and wintering area for Anatidae). In the north along the coast, conditions are extremely arid and there are few wetlands of any significance on the coastal plain. However, the coast itself, with its long sandy beaches and stretches of rocky shore, is of great importance for a variety of shorebirds, gulls and terns. There are many small estuaries with tidal mud-flats and permanent fresh-to-brackish marshes which are collectively fairly important, but there are few large areas which regularly contain high numbers of waterfowl. Further inland within the Andes there is a chain of freshwater lakes, salt lakes and highland bogs which present some of the finest waterfowl spectacles on the continent. Within Chile particular note should be taken of the marshes, lakes and salt lakes of Lauca National Park (an outstanding area with a wide variety of habitats and almost a full complement of Andean waterfowl); the Salar de Atacama, which is particularly important for flamingos; Maricunga Salt Lake and Santa Rose Lake.

Protected Areas Legislation Decree Law No. 656 of 1925 provided for the establishment of national parks and forest reserves, further developed by the Forestry Law (Decree 4363 of 1931) which provided for the establishment of "national tourism parks" and "forest reserves" to protect scenic beauty and certain tree species. This legislation was updated by Decree Law No. 1939 of 1977 under which national parks and forest reserves were established, and which also provided for the administration of state property (including parks and reserves). Current legislation providing for the establishment of the "National System of Protected Wildlands" (Sistema Nacional de Areas Silvestres Protegidas del Estado) was passed in 1984 (Law No. 18.362). This defines the primary objectives of the system as maintenance of representative areas of the natural diversity of the country; maintenance, improvement and ration use of natural resources; maintenance of the productive capacity of the soil; maintenance of natural hydraulic systems; and preservation of scenic and cultural resources.

National Parks (Parques Nacionales) are generally large areas of national importance which have not been significantly altered by human action, and in which animal and plant species, habitats and geomorphological formations are of special scientific, educational and recreational interest, or which include natural landscapes of great beauty. National Monuments (Monumentos

Naturales) are generally small areas (less than 1,000ha) where an ecosystem, or part of one, exists in a natural state, or where a geomorphological site or place of outstanding scenic, cultural, education or scientific value exists. National Reserves (Reservas Nacionales) are areas with natural resources in need of special conservation and careful utilisation, because of their susceptibility to degradation, or the need to safeguard the resource for the present and future well-being of the community. A number of sites designated as forest reserves under the early legislation have been reclassified, frequently as national reserves (Wetterberg *et al.*, 1985). The 1984 law also provides for the establishment of a fourth category, the Reservas de Regiones Virgines, although no areas have yet been created. This would be an area of original flora and fauna, unaffected and unexploited by man, managed as a strict nature reserve with limited access.

Protected Areas Administration Legal responsibility for protected areas is vested in the Ministerio de Agricultura, which delegates all aspects of administration and management to the Corporacion Nacional Forestal y de Recursos Naturales Renovables (CONAF). CONAF is divided into two major divisions, Forestry, and Administration and Finance. The Forestry Division has three departments (Protected Wildlands, Forest and Fire Control, and Forest Management), and thirteen regional offices. The regional offices carry out the day-to-day management of national parks, monuments and reserves.

Sites designated under the Convention Accession 27 July 1981, one site listed at accession.

Carlos Anwandter Nature and Scientific Investigation Sanctuary

Government body responsible for administration of the Convention

Ministerio de Relaciones Exteriores, Bandera 52, Santiago, Chile

Carlos Anwandter Nature and Scientific Investigation Sanctuary

Location 39°35'-39°47'S, 73°07'-73°16'W. Situated along the Rio Cruces to the north of Valdivia city and inland from the central west Chile coast in Valdivia Province.

Area 4,877ha including a 100m wide buffer strip around the entire sanctuary boundary.

Degree of Protection The sanctuary was established under Law 17.288 (National Monument) and is the responsibility of the state. It comprises numerous privately owned plots of land including some owned by the Southern University of Chile. The Servicio Agrícola y Ganadero (SAG) and Corporacion Nacional Forestal (CONAF) cooperate with the state in administration and there are strict regulations on hunting and trapping. Designated as a Ramsar site at the time of accession on 27 July 1981.

Site Description The designated site comprises the braided section of the Cruce River north of Valdivia with sandbars and river islands and associated marshlands and swampy ground where numerous tributaries join the Cruce. This part of the river is tidal, being near the Pacific Ocean. The freshwater wetland developed following earthquake subsidence in 1960 and the relatively young ecosystem supports a distinctive vegetation of rooted aquatic plants such as *Sagittaria chilensis*, *Scirpus californicus* and *Hydrocotyle volksmanni*, and a diversity of marsh plants such

as *Typha angustifolia*, *Senecio* spp., *Juncus* spp. and sedges (Cyperaceae) on the areas submerged only at high tide or in floods. The sanctuary is demarcated to the north by the swamps just east of the Cruce-San Jose river confluence and follows the course of the Cruce River south west to the edge of Valdivia city. It is flanked to the west by the coastal range of hills and to the east by the main road from Valdivia to Temuco.

International and National Importance The wetland attracts large numbers of nesting and migratory birds including black-necked swan *Cygnus melancoryphus* (threatened in Chile). A document on wetlands in Valdivia Province by Schlatter (1975) contains species lists of birds, mammals, amphibians and fish recorded in the region.

Changes in Ecological Character The soils covering 98% of the sanctuary are too poor to support commercial agriculture and the area is therefore unlikely to be developed in the near future. The run-off of pesticides from nearby agricultural land could be harmful. River traffic has increased in recent years. Clandestine hunting and nutria capture is undertaken periodically. Rialejo Island (private property) within the sanctuary has been logged of its older timber. Much of the property around the area has changed owners. Monterey pine plantations on surrounding hills which delimit the area have increased significantly and may adversely affect the site when the timber comes to be transported towards the sawmills at Valdivia.

Management Practices The wetland is managed as a field study area for the Southern University of Chile. Hunting and trapping are strictly controlled. To try and counter the threats from surrounding pine plantations, there have been plans to change the protective status of the area, mark the boundaries more clearly with signs, and locate high fire-watching posts which would also be used for observing animals and human activity within the sanctuary. From 1984 there has been a faunal guard equipped with binoculars and a rubber dinghy which makes regular surveys, and animal censuses which are reported to the local office of CONAF in Valdivia.

Scientific Research and Facilities The Southern University of Chile plans to survey the flora and fauna of this newly developed aquatic ecosystem. There are plans to investigate the potential rational and intensive agricultural use of the area through nutrient supplement experiments.

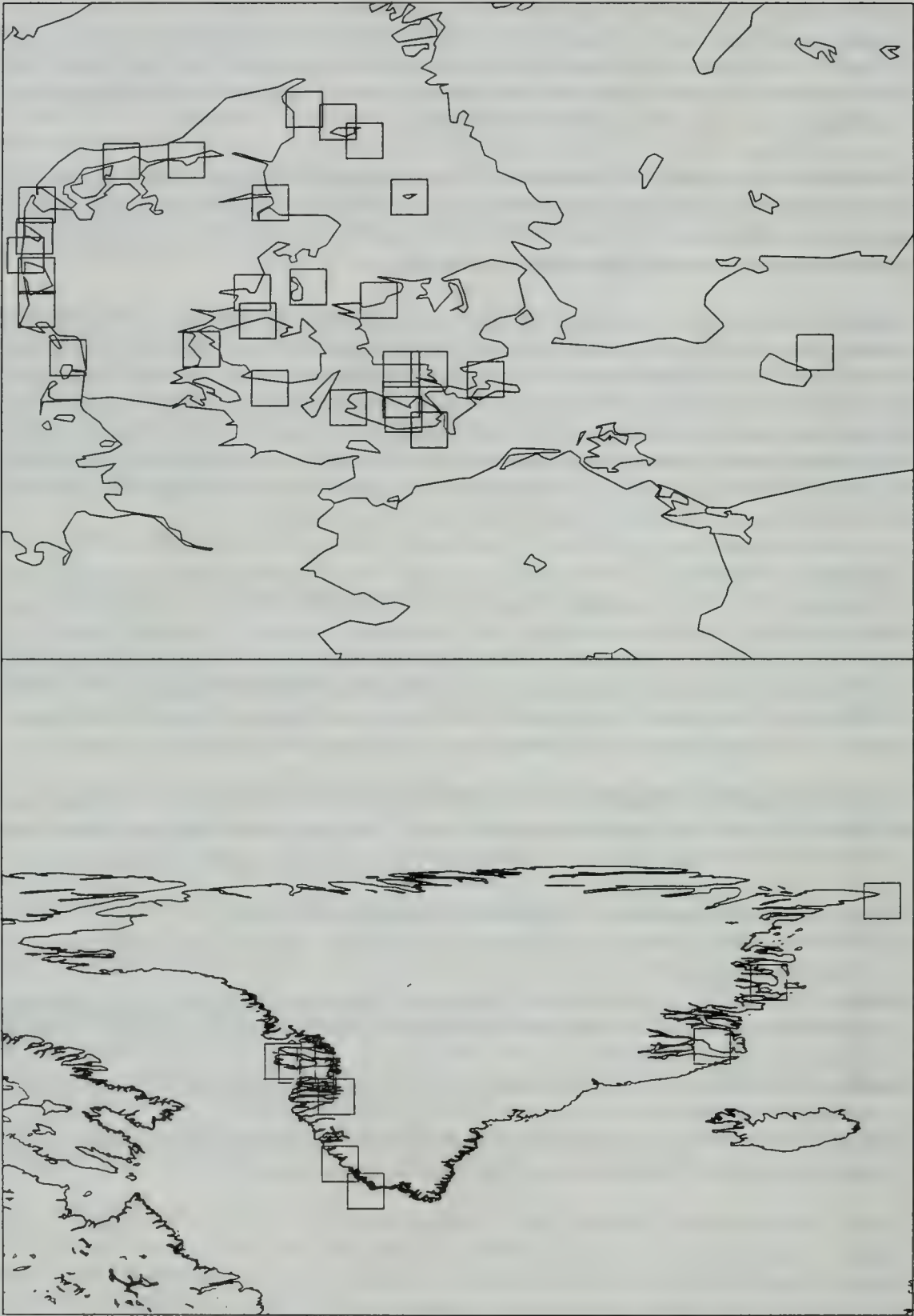
Principal Reference Material The above information is taken from:

IUCN/IWRB (1986). *Directory of Neotropical Wetlands*. IUCN, Gland, Switzerland and Cambridge, England.

Schlatter, R.P. (1975). Santuarios de la Naturaleza e Investigacion cientifica en las regiones pantanosas e inundadas de los alrededores de la Ciudad de Valdivia. Proyecto. Southern University of Chile, Valdivia.

Schlatter, R.P. (1987). Chile: National Report. Procs. Regina Conference. Ramsar Convention Bureau.

Scott, D.A. (1982). Wetlands and waterfowl in South America: a continental perspective. Paper prepared for the IWRB 28th Annual Meeting, Edmonton, Canada.



Ramsar Sites in Denmark

Denmark

Area 43,030 sq.km

Population 5,129,254 (1988)

Summary of Wetland Situation Denmark has a large number of wetlands of international importance thanks to a long and mostly flat coastline, with numerous fiord-like inlets and archipelagos. In the south-west it shares the biggest, and one of the most important wetlands in Europe, the Waddensea (Vadehavet), with the Federal Republic of Germany and the Netherlands. Sites with excellent habitat for breeding waterfowl are situated along the coast and in the interior of North Jutland, in particular the Lim fiord area which extends right across Northern Jutland from the North Sea to Kattegat. These sites are also of exceptional importance for wintering and migrating ducks and geese. Vast concentrations of diving ducks and sea ducks are found in the shallow waters of Kattegat, Lillebaelt, South Funen Archipelago, Storebaelt, Oresund, South Sealand, Lolland, Falster and Mon.

Conservation of the freshwater wetlands has improved since the 1969 Conservation Act was modified in 1972. It is no longer possible to reclaim fresh or saltwater wetlands without the permission of the Conservation Planning Committee, nor can changes be made affecting the flow of watercourses (unless they are wholly privately owned). The Ministry of the Environment, created in 1973, deals with conservation measures, physical planning and pollution control. The Nature Protection Council and the Natural History Museum in Aarhus have been very active in promoting public awareness of wetlands. A number of management projects for their improvement as breeding sites for waterfowl have been carried out by the Viltbiologisk Station (Game Biology Station) at Kalo. Wintering populations, together with the relative importance of individual wetlands, have been studied by the Viltbiologisk Station. General conservation of wetlands differs both practically and administratively depending on whether the areas are freshwater or salt. In most cases, salt and brackish areas are subject to state control administered by the Ministry of Public Works, while fresh waters are normally placed under local authorities (and are usually private property).

Protected Areas Legislation Conservation is based on a broad philosophy of long-term planning and protection with one of the earliest pieces of legislation being the Act concerning state parks (Lov af 12/3 om Statshaverne) passed in 1852. The principal laws are the Environmental Protection Act (Lov nr. 372 of 13/6 om Miljoebeskyttelse), 1973 (most recently amended 1985/85), the National and Regional Planning Act (Lov nr. 375 af 13/6 om Lands-og region-planlaegning), 1973 (amended 1982/735), the Urban and Rural Zones Act (Lov nr. 315 af 18/6 om By-og landzoner), 1969 (amended 1985/446) and a further act ordered for recreational, scientific, educational or historic reasons. The Conservation of Nature Act, 1917 (new law passed in 1969 and amended in 1975, 1979 and again in 1984/530), operates under two kinds of measures: individual conservation orders (covering 3.5% of the country, numbering several thousand sites with very stringent applications and few exceptions) and general conservation

measures (covering protective zones which may include a mosaic of habitats and land uses). The amendments in 1979 brought private watercourses, bogs and moors under protection and the further amendments added heaths, salt meadows and salt marshes. Each area is protected on a case-by-case basis, and the degree of protection varies widely, both between areas and within them. Regulations are drawn up specifically for each area but in general existing uses including farming, forestry and hunting may well continue. There are two defined types of reserve; nature reserves, and wildlife (game) reserves (although the latter does not imply biotope protection), while woodlands and forests are protected under the forest legislation. Larger landscapes of interest for conservation and recreation are safeguarded by a combined administration of the acts mentioned above.

Protected Areas Administration Since September 1973, all matters concerning nature conservation have come under the responsibility of the Ministry of the Environment (Miliøministeriet) and regional county and municipal councils (14 in total). After passage of the 1973 Environmental Protection Act, the Ministry was made responsible for national and regional planning, preservation of architecturally and/or historically important buildings, protection of natural and recreational areas and management of forests.

The Ministry has one department and five agencies: the National Agency for the Protection of Nature, Monuments and Sites (Fredningsstyrelsen); the National Agency for the Protection of the Environment (Miliøstyrelsen); the National Agency for Physical Planning (Plantestyrelsen); the National Forestry Service (Skovstyrelsen) and one other. In 1987 the Forestry Service and the National Agency for the Protection of Nature, Monuments and Sites were merged to form a new National Agency for Forests and Nature.

The nature conservation law is mainly administered by independent regional conservation boards with recourse to a central 'supreme conservation board', consisting of members of Parliament and judges of the Supreme Court. The local counties are responsible for regional conservation planning, for biotope protection and management of protected private land, while the National Agency for Forests and Nature is responsible for state-owned areas. The Agency is furthermore responsible for, amongst other things, monitoring work in areas of national and international importance (for instance, nature reserves, Ramsar sites, EEC important bird areas). The Wildlife Administration is responsible for the management of wildlife (game) reserves. Some 90 areas of national biological importance are designated by the National Agency. In wildlife (game) reserves only traffic and hunting are regulated. Within Ramsar and EEC IBA sites biotope protection is weak and agricultural use of the land is not restricted.

Sites designated under the Convention Accession 2 September 1977, with 26 sites listed at accession, and one further site added on 14 May 1987. Eleven sites in Greenland were added on 27 January 1988.

Fiilso
Ringkøbing Fiord
Stadil and Vestastadil Fiords
Nissum Fiord
Nissum Bredning with Harboore and Agger peninsulas
Vejlelme and Logstor Bredning
Ulvedybet and Nibe Bredning
Hirsholmene

Nordre Roonner

Laeso

Parts of Randers and Mariager Fiords, and the sea adjoining them

Sea area north of Anholt Island

Horsens Fiord and Endelave

Stavns Fiord and adjacent waters

Lillebaelt

Naereaa Coast and Aebelo area

South Funen Archipelago

Sejero Bugt

Waters off Skaelskor Nor and Glaeno

Karrebaek, Dybso and Avno Fiords

Waters south-east of Fejo and Femo Isles

Praesto Fiord, Jungshoved Nor, Ulfshale and Nyord

Nakskov Fiord and Inner Fiord

The Maribo Lakes

Waters between Lolland & Falster, including Rodsand, Guldborgsund, Boto Nor

Ertholmene Islands east of Bornholm

Vadehavet (The Waddensea)

Greenland

Aqajarua-Sullorsuag

Qinguata Marraa-Kuussuaq

Kuannersuit Kuussuat

Kitsissunnguit

Naternaq

Eqalummiut Nunaat-Nassuttuup Nunaa

Ikkatoq

Ydre Kitsissut

Heden

Hochstetter Forland

Kilen

Government body responsible for administration of the Convention

Ministry of the Environment, National Forest and Nature Agency, Slotsmarken 13, DK-2970 Horsholm; Greenland Home Rule, Direktoratet for Boliger, Teknik og Miljo, Dept. Fysisk Planlaegning & Naturforvaltning, Postbos 1070, 3900 Nuuk, Greenland.

Fiislø

Location 55°42'N, 8°15'E. Situated in the county of Ribe, north of Wadden Sea on the west coast.

Area 4,320ha

Degree of Protection The area is privately owned with the state represented by the Ministry of Defence and Ministry of the Environment. 400ha around Fiislo is a nature conservation area protected under the 1969 Nature Conservation Act (as amended 1972, 1975 and 1978). There are no wildlife reserves. Designated as a Ramsar site in September 1977. 400ha are designated as an EC special protection area (SPA).

Site Description The site comprises 96.9% (4,188ha) small plantations and agricultural land, with mainly large fields and few buildings, and 3.1% (132ha) consisting of two shallow freshwater lakes surrounded by marsh. The vegetation at Fiislo is of scientific interest. The site is a resting and feeding area for waterfowl.

International and National Importance Breeding species include marsh harrier *Circus aeruginosus*, Montagu's harrier *C. pygargus* and wood sandpiper *Tringa glareola*. This site is of international importance for 25,000 pink-footed geese *Anser brachyrhynchus*, 5,000 pintail *Anas acuta*, 500 Bewick's swan *Cygnus columbianus bewickii* and 300 whooper swan *C. cygnus*, and also supports 5,000 mallard *Anas platyrhynchos*. Fiislo and Vest Stadil Fiord (Ramsar site) are the most important areas in Denmark for pink-footed goose.

Changes in Ecological Character The area covered by tree plantations is increasing, and the marshes and lakes are becoming overgrown.

Management Practices Hunting of geese and other waterfowl is restricted. Management practices on the land include reduced ploughing of stubble fields and the maintenance of green fields.

Scientific Research and Facilities No information

Principal Reference Material The above information is taken from the Danish national reports to the Cagliari Conference in 1980 and the Groningen Conference in 1984. Supplemented by: Scott, D.A. (1980). A preliminary inventory of wetlands of international importance for waterfowl in west Europe and north-west Africa. *IWRB Special Publication* No. 2. 127 pp.

Ringkøbing Fiord

Location 56°00'N, 8°15'E. Located on the west coast in the counties of Ringkøbing and Ribe.

Area 27,240ha

Degree of Protection Ownership is part private and part state, with the state represented by the Ministry of the Environment. Areas protected for nature conservation include the Vaern Meadows, Nymindestrømmen, Tipperne and Klaegbanken totalling 6,000ha protected under the Conservation of Nature Act 1969 (as amended 1972, 1975 and 1978). Tipperne and Klaegbanken are scientific sanctuaries. 60ha, including the outlet of Skjerna stream, is a wildlife reserve protected under the Game Act 1967 (amended 1969 and 1972). Designated as a Ramsar site in September 1977. The area has also been designated as an EC special protection area (SPA).

Site Description The wetland consists of a shallow brackish-water fiord connected to the North Sea by sluices, and adjacent low-lying meadows and reed swamps in the south. The site includes some small islands. About 300 years ago Ringkobing Fiord was completely open to the sea, but a coastal sandbar has since formed, cutting off the entrance. Sand continuing to drift over the bar into the southern part of the fiord has formed the peninsulas of Tippersande and Vaernsande, which are now vegetated and valuable grazing meadows. The dominant vegetation on Tipperne, when Ringkobing was open to the sea, was saltmarsh with glasswort *Salicornia* spp., mud rush *Juncus gerardii*, sea aster *Aster tripolium* and sea milkwort *Glaux maritima*. After the formation of the sandbar Ringkobing Fiord became a freshwater lake, but an inlet has now been cut through the sandbar to allow passage of fishing boats. This has allowed small amounts of salt water into the fiord creating brackish conditions. However, the vegetation remains nearer to that of a freshwater marsh than a saltmarsh. The wetland comprises 82.7% salt and brackish water and 17.3% land. The site is used by waterfowl for resting, feeding, breeding and moulting. Also designated as an EC special protection area (SPA).

International and National Importance This site is of international importance as a resting and feeding ground for 22,000 mallard *Anas platyrhynchos*, 11,000 teal *A. crecca*, 18,000 pintail *A. acuta*, 30,000 wigeon *A. penelope*, 1,000 shoveler *A. clypeata*, 3,200 goldeneye *Bucephala clangula*, 7,000 goosander *Mergus merganser*, 4,000 dark-bellied brent goose *Branta bernicla bernicla*, 7,000 pink-footed goose *A. brachyrhynchus*, 500 greylag goose *A. anser*, 2,000 shelduck *Tadorna tadorna*, 4,300 mute swan *Cygnus olor*, 900 whooper swan *C. cygnus*, 1,100 Bewick's swan *C. columbianus bewickii*, 40,000 coot *Fulica atra*, 800 avocet *Recurvirostra avosetta*, 10,000 golden plover *Pluvialis apricaria* and 3,500 bar-tailed godwit *Limosa lapponica*. Dunlin *Calidris alpina* also feed and rest here. Waterfowl using the area as a moulting site are 500 mallard, 400 goldeneye and 3,000 mute swan. The site is a breeding area for mute swan, black-tailed godwit *Limosa limosa*, ruff *Philomachus pugnax*, avocet, sandwich tern *Sterna sandvicensis*, black-headed gull *Larus ridibundus* and the marsh harrier *Circus aeruginosus*. The site is the most important locality in Denmark for Bewick's swan and shoveler, and supports the biggest mute swan colony in the world. Excluding Vadehavet (the Danish Wadden Sea), the area is the most important locality in Denmark for surface feeding ducks.

Changes in Ecological Character The major cause for concern in Ringkobing Fiord has been the complete disappearance of submerged macrophytes. There have also been massive blooms of blue-green algae. As macrophytes are an important food resource for waterfowl, these changes, which have been linked with runoff of nutrient-laden water from agricultural land, are potentially disastrous. There is increased sedimentation in the southern part of the fiord since the regulation of Skjerna stream. In areas where hay was cut annually until 1950, much of the nutrient salts have been washed out and the soil has become acid so that cross-leaved heath *Erica tetralix*, crowberry *Empetrum nigrum*, common cotton-grass *Eriophorum angustifolium* and many sedges *Carex* spp. occur. Hay making had been abandoned on the scientific reserves, resulting in the disappearance of some colonial nesting birds such as avocet, but it was reintroduced in 1972. A common problem in dammed wetlands such as Ringkobing Fiord is declining salinity. The sluice between the fiord and the North Sea has been in operation since December 1979 and this experiment has already resulted in improvements to the flora and fauna of the wetland. A massive integrated restoration plan is underway to counteract the negative changes described.

Management Practices Klaegbanken and Tipperne are managed on experimental lines (including hay harvesting and grazing) to provide optimum conditions for waterfowl throughout

the year. Haymaking was reintroduced in 1972 and the shorter grass is encouraging some of the birds to return, particularly pink-footed goose. Planning permission for the establishment of an airport for commercial sight-seeing flights over the site area has been refused.

Scientific Research and Facilities The southern part of Ringkøbing Fjord, especially Tipperne and Klaegbanken is a scientific reference area which has been studied for over 50 years with particular reference to breeding and resting populations of waterfowl. There are current studies on the ecology of pink-footed goose and on the disturbance to waterfowl of different kinds of boats. A field station has been established on Tipperne.

Principal Reference Material The above information is taken from the Danish national reports to the Cagliari Conference in 1980, and the Groningen Conference in 1984. Supplemented by: Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

Duffey, E. (1982). *National Parks and Reserves of Western Europe*. Macdonald and Co., London.

IWRB Bulletin No. 47. Slimbridge, Glos, England.

Scott, D.A. (1980). A preliminary inventory of Wetlands of International Importance for waterfowl in west Europe and north-west Africa. *IWRB Special Publication* No. 2. 127 pp.

Additional references:

Joensen, A.H. (1974). Waterfowl populations in Denmark 1965-1973. A survey of the non-breeding populations of ducks, swans and coot and their shooting utilisation. *Communication* 20. Viltbiologisk Station, Denmark.

Johansen A.C. and Blegaud H. (1933-36). *Ringkøbing Fiords. Naturhistorie i Brakvandsperioden 1915-1931*. Copenhagen. 252 pp.

Stadil and Vest Stadil Fiords

Location 56°11'N, 8°09'E. Situated on the west coast of Denmark, north of Ringkøbing Fjord in the County of Ringkøbing.

Area 7,184ha

Degree of Protection Ownership is part state and part private. 1,300ha including Sonderdyb is protected for nature conservation under the 1969 Conservation of Nature Act (amended 1972, 1975 and 1978). There are no wildlife reserves. Designated as a Ramsar site in September 1977.

Site Description The site consists of shallow fiord areas with reed swamps, meadows and hinterland, comprising 32.3% (2,320ha) salt and brackish water, 1.2% (85ha) fresh water and 66.5% (4,779ha) land. The wetland is a feeding, resting and breeding site for waterfowl. Also designated as an EC special protection area (SPA).

International and National Importance Breeding species include marsh harrier *Circus aeruginosus*, black tern *Chlidonias niger* and surface feeding ducks. As a feeding and resting area it is internationally important for 20,000 pink-footed geese *Anser brachyrhynchus*, 500

Bewick's swan *Cygnus columbianus bewickii*, 300 whooper swan *C. cygnus* and 10,000 surface feeding ducks. Other species feeding and resting here include 300 goosander *Mergus merganser*, 5,000 teal *Anas crecca*, 11,000 mallard *A. platyrhynchos*, 1,000 pintail *A. acuta* and 300 shoveler *A. clypeata*. This site and Fiilso (Ramsar site) are the most important resting areas in Denmark for pink-footed goose.

Changes in Ecological Character None reported (November 1980)

Management Practices No information

Scientific Research and Facilities The situation of pink-footed goose is closely watched by the Game Biology Station, which acts in an advisory capacity on field damage and hunting. The station provides food for migrating pink-footed geese on their way to Svalbard in spring, to keep them away from agricultural crops.

Principal Reference Material The above information is taken from the Danish national reports to the Cagliari Conference in 1980 and the Groningen Conference in 1984. Supplemented by: **Scott, D.A. (1980).** A preliminary inventory of wetlands of international importance for waterfowl in west Europe and north-west Africa. *IWRB Special Publication No. 2.* 127 pp

Nissum Fiord

Location 56°21'N, 08°14'E. Situated on the west coast, north of Stadil and Veststadil fiords in the county of Ringkøbing.

Area 11,600ha

Degree of Protection Ownership is part private and part state, with the state represented by the Ministry of Agriculture and the Ministry of Public Works. Protected areas include 380ha at Bouling Fiord and Krogshede Enge for nature conservation, protected under the 1969 Conservation of Nature Act (amended in 1972, 1975 and 1978), and three wildlife reserves at Bouling Fiord, Fjando and Felsted Kog totalling 3,335ha, protected under the 1967 Game Act (amended 1969 and 1972). There was a proposal in 1981 for the nature conservation of a further 200ha of saltmarsh. Designated as a Ramsar site in September 1977. Also designated as an EC special protection area (SPA).

Site Description Shallow brackish-water fiord connected by sluices to the North Sea and including salt marshes, reed swamps and heathland vegetation on Fjando Island. The site comprises 59% (6,840ha) salt and brackish water, 0.6% (65ha) fresh water and 40.4% (4,695ha) land. Nissum Fiord is a breeding, resting and feeding area for waterfowl.

International and National Importance This site is of international importance as a resting and feeding ground for 6,000 pink-footed goose *Anser brachyrhynchus*, 1,600 pintail *Anas acuta*, 11,000 mallard *A. platyrhynchos*, 300 shoveler *A. clypeata*, 5,000 teal *A. crecca*, 200 Bewick's swan *Cygnus columbianus bewickii*, 1,200 mute swan *C. olor*, 2,500 light-bellied brent geese *Branta b. hrota*, 5,000 wigeon *Anas penelope*, 4,200 shelduck *Tadorna tadorna*, 1,500

goosander *Mergus merganser*, 1,000 red-breasted merganser *M. serrator*, 10,000 bar-tailed godwit *Limosa lapponica* and 3,000 goldeneye *Bucephala clangula*. The site is used as a breeding area for 300 pairs of avocet *Recurvirostra avosetta* and 1,230 pairs of sandwich tern *Sterna sandvicensis*. Other breeding species include cormorant *Phalacrocorax carbo sinensis*, dunlin *Calidris alpina*, ruff *Philomachus pugnax* and black-tailed godwit *Limosa limosa*. In the spring this site is the most important resting area in the country for Svalbard's population of light-bellied brent goose.

Changes in Ecological Character Marsh products are no longer harvested, resulting in some marsh areas becoming overgrown. An estimated 40-50% of the salt marshes of Bovling Kilt are being cultivated.

Management Practices In the wildlife reserves, 230ha are protected from hunting and there is restriction of public access on 1,400ha. Since 1972 various experiments have been carried out at Felsted Kog such as on agricultural methods and water levels to provide optimum conditions for breeding and resting waterfowl. The reed harvest in this wildlife reserve is planned in consultation with the Wildlife Administration of the Ministry of Agriculture, to cause minimum disturbance to waterfowl. Planning permission for the establishment of an airfield for commercial sight-seeing flights over the site area has been refused.

Scientific Research and Facilities No information

Principal Reference Material The above information is taken from the Danish national reports to the Cagliari Conference in 1980 and the Groningen Conference in 1984. Supplemented by: Scott, D.A. (1980). A preliminary inventory of wetlands of international importance for waterfowl in west Europe and north-west Africa. *IWRB Special Publication* No. 2. 127 pp.

Nissum Bredning with Harboore and Agger Peninsulas

Location 56°38'N, 8°15'E. Situated on the west coast, north of Nissum Fiord in the counties of Ringkøbing and Viborg.

Area 13,280ha

Degree of Protection Ownership is part private and part state with the state represented by the Ministry of Public Works. 90ha at Gjeller Odde is a nature conservation area, protected under the 1969 Conservation of Nature Act (amended in 1972, 1975 and 1978), and there are two wildlife reserves at Fiord Holmene and Ronland Sandoer totalling 28ha, protected under the 1967 Game Act (amended 1969 and 1972). There was a proposal in 1981 for the nature conservation of a further 200ha of saltmarsh. Designated as a Ramsar site in September 1977. The site is also designated as an EC special protection area (SPA).

Site Description The site includes a shallow fiord area with shoals and banks, a tidal area and saltmarshes, brackish lagoons with grazing meadows and high shore vegetation, a lake area with reed beds, and cultivated areas with scattered buildings. The site comprises 76.1% (10,110ha) salt and brackish water, 22.9% (3,040ha) land, and 1.0% (130ha) freshwater. Nissum Bredning

is in direct contact with the North Sea. The site is important for waterfowl and the fiord area is used as a breeding site by 40 common seal *Phoca vitulina*.

International and National Importance This site is of international importance as a resting and feeding ground for 3,000 pink-footed goose *Anser brachyrhynchus*, 1,200 pintail *Anas acuta*, 250 Bewick's swan *Cygnus columbianus bewickii*, 200 whooper swan *C. cygnus*, 1,300 light-bellied brent geese *Branta b. hrota*, 11,000 wigeon *Anas penelope*, 3,000 teal *A. crecca*, 2,200 shelduck *Tadorna tadorna*, 4,000 goosander *Mergus merganser*, 2,000 red-breasted merganser *M. serrator*, 20,000 goldeneye *Bucephala clangula*, 18,000 dunlin *Calidris alpina*, 3,800 bar-tailed godwit *Limosa lapponica* and 1,000 avocet *Recurvirostra avosetta*. The site is a feeding and resting area for 500 curlew *Numenius arquata* and some velvet scoter *Melanitta fusca* and is particularly important for the light-bellied brent goose. The site is a breeding area of international importance especially for waders and gulls. The vegetation of the Agger and Harboerge peninsulas is worthy of preservation.

Changes in Ecological Character The large lagoons of the Agger and Harboore peninsulas were isolated from Lim Fiord by a dam in the mid 1950s. As a result there has been gradual reduction in salinity and a change of the plant community in and around the lagoons. There has been some pollution by mercury and organic phosphorus compounds from a chemical factory.

Management Practices Advanced negotiations are being conducted about nature conservation in the Agger and Harboore peninsulas. The proposals include prohibition of recreational activities in the brackish-water lagoons, and possible preservation measures. Various agricultural methods and water level changes have been experimented with to find the best conditions for breeding and resting waterfowl. Public access to the wildlife reserves is controlled. Planning permission for a campsite at Agger Peninsula has been refused. More efficient sewage purification has been implemented at Harboore Peninsula, and a major dump has been abolished.

Scientific Research and Facilities No information

Principal Reference Material The above information is taken from the Danish national reports to the Cagliari Conference in 1980 and the Groningen Conference in 1984. Supplemented by: Scott, D.A. (1980). A preliminary inventory of wetlands of international importance for waterfowl in west Europe and north-west Africa. *IWRB Special Publication* No. 2. 127 pp.

Vejlerne and Logstor Bredning

Location 57°07'N, 9°00'E. Situated in the counties of Viborg and Northern Jutland.

Area 45,280ha

Degree of Protection Ownership is part state and part private. 6,800ha is protected for nature conservation (including Vejlerne, Skarup-Holm Fange, Feggeklit, Livo and Logstor) under the 1969 Nature Conservation Act and amendments. Vejlerne was established as a scientific sanctuary in 1958. Other protected sites include wildlife reserves at Lonnerup Fiord, Livo Bredning and Aggersborggard totalling 1,400ha, protected under the 1967 Game Act and

amendments. Designated as a Ramsar site in September 1977. It also includes two EC special protection areas (SPAs).

Site Description The wetland is the result of unsuccessful reclamation work in the late 1800s, and includes a shallow salt fiord area with shoals and islands in the central region of Lim fiord, coastal areas with saltmarshes and agricultural land, partly drained fiords with lakes, reed swamps and salt marshes and the Vejlerne area and Lonnerup fiord. The site comprises 82.0% brackish water, 17.9% land and 0.1% fresh water, and is a feeding, resting, breeding and moulting area for waterfowl. Seals are also found here.

International and National Importance This site is of international importance as a feeding and resting ground for 700 whooper swan *Cygnus cygnus*, 500 Bewick's swan *C. columbianus bewickii*, 1,000 greylag geese *Anser anser*, 900 bean geese *A. fabalis*, 500 pink-footed geese *A. brachyrhynchus*, 13,000 mallard *Anas platyrhynchos*, 9,000 wigeon *A. penelope*, 300 shoveler *A. clypeata*, 1,500 shelduck *Tadorna tadorna*, goldeneye *Bucephala clangula*, 18,000 scaup *Aythya marila*, velvet scoter *Melanitta fusca*, 10,000 golden plover *Pluvialis apricaria*, 18,000 dunlin *Calidris alpina* and 500 avocet *Recurvirostra avosetta*. Other species using the area for feeding and resting are mute swan *Cygnus olor*, 1,000 teal *Anas creca*, 2,000 red-breasted merganser *Mergus serrator*, ruff *Philomachus pugnax* and pochard *Anthya ferina*. Vejlerne and fiord areas are moulting refuges for greylag goose (400 pairs), teal, mallard, goldeneye, coot *Fulica atra*, velvet scoter and red-breasted merganser. This site is the best breeding area in Denmark for greylag goose, and the only permanent locality for little gull *Larus minutus*. Excluding Fondermarsken, it is the best Danish breeding area for bittern *Botaurus stellaris*, marsh harrier *Circus aeruginosus* and spotted crake *Porzana porzana*. Other breeding species include 250 pairs of avocet *Avosetta recurvirostra* and black tern *Chlidonias niger*.

Changes in Ecological Character As a result of lowered water levels and slower circulation of water, the vegetation and animal life of the Vejlerne area are gradually changing.

Management Practices Hunting is prohibited on 370ha of the wildlife reserves, and on 695ha (Bygholm Vejle) of the nature conservation areas. There are hunting restrictions on some 5,000ha of Vejlerne Scientific Sanctuary. The water level at Bygholm Vejle has been experimentally raised since 1979, and a working group is preparing a proposal for water level control in other parts of the wetland.

Scientific Research and Facilities The Ministry of the Environment is carrying out waterfowl counts in Vejlerne Scientific Sanctuary. There is a marine biology station at Lim fiorden (Livovej 141, Ronbjerg, DK 9681 Ranum) which is open all year. The laboratories are well equipped for terrestrial, freshwater and marine work.

Principal Reference Material The above information is taken from the Danish national reports to the Cagliari Conference in 1980 and the Groningen Conference in 1984. Supplemented by: Scott, D.A. (1980). A preliminary inventory of Wetlands of International Importance for waterfowl in west Europe and north-west Africa. *IWRB Special Publication* No. 2. 127 pp.

Ulvedybet and Nibe Bredning

Location 57°02'N, 9°35'E. Situated in the county of Northern Jutland.

Area 20,304ha

Degree of Protection Ownership is part state and part private. The state is represented by the Ministry of Agriculture. The protected sites include a nature conservation area of 23ha at Skt. Nikolaj Bjerg and three game reserves totalling 1,126ha at Ulvedybet, Nibe and Nibe Bredning. Protection is under the 1969 Nature Conservation Act and the 1967 Game Act and their amendments. Designated as a Ramsar site in September 1977. Also designated as an EC special protection area (SPA).

Site Description The site includes part of Lim Fiord and adjacent lakes, saltmarshes, reed swamps and agricultural land. The Ulvedybet area is isolated from the fiord by a dam, and contains a brackish-water lake. The area comprises 63.1% (12,815ha) salt and brackish water, 0.2% (35ha) freshwater and 36.7% (7,454ha) land. Ulvedybet and Nibe Bredning is used by waterfowl for resting, feeding, breeding and moulting.

International and National Importance This site is of international importance as a feeding and resting ground for 7,000 teal *Anas crecca*, 11,000 wigeon *A. penelope*, 5,000 pochard *Aythya ferina*, 1,500 goosander *Mergus merganser*, 2,000 red-breasted merganser *M. serrator*, 1,800 whooper swan *Cygnus cygnus*, 2,500 mute swan *C. olor*, 350 Bewick's swan *C. columbianus*, 18,000 golden plover *Pluvialis apricaria* and 10,000 coot *Fulica atra* and also supports mallard *A. platyrhynchos*, 1,100 pintail *A. acuta*, 500 shoveler *A. clypeata*, goldeneye *Bucephala clangula*, 9,000 tufted duck *Aythya fuligula*, 1,000 shelduck *Tadorna tadorna*, 450 pink-footed geese *Anser brachyrhynchus* and 1,000 greylag geese *A. anser*. Total population of surface feeding duck is 30,000 and of diving duck is 25,000. The site is the most important area in Northern Jutland for pochard and is the moulting refuge for goldeneye, mute swan and pochard. Breeding ducks, waders and gulls, including 100-170 pairs of avocet *Recurvirostra avosetta* use the site, especially the Ulvedybet area and the small islands. 100-400 pairs of Sandwich tern *Sterna sandvicensis* and 150 pairs of Arctic tern *S. paradisaea* also nest.

Changes in Ecological Character Marsh products are no longer being cropped, resulting in some marsh areas, such as the islands, becoming overgrown. The meadows along the fiords are being cultivated. An exemption, limited in time, has been granted for two experimental windmills (60m high) at Nibe for investigation into wind energy.

Management Practices Management practices in the Ulvedybet area specifically for waterfowl include the construction of islands, and cattle grazing to prevent marshes becoming overgrown. Public access is forbidden on some of the islands during the breeding season. Hunting is prohibited on 900ha of the game reserves.

Scientific Research and Facilities The Game Biology Station in Ulvedybet Game Reserve is carrying out experiments in wetland management including monitoring of water levels in the breeding season. Kliim field station (DK 9690 Fjerritslev) lies to the north-west of the site.

Principal Reference Material The above information is taken from the Danish national reports to the Cagliari Conference in 1980 and the Groningen Conference in 1984. Supplemented by: Scott, D.A. (1980). A preliminary inventory of wetlands of international importance for waterfowl in west Europe and north-west Africa. *IWRB Special Publication* No. 2. 127 pp.

Hirsholmene

Location 57°29'N, 10°38'E. Located off the north-east coast in Northern Jutland.

Area 480ha

Degree of Protection State ownership represented by the Ministry of Defence. Established as a protected area in 1938 and revised as a scientific reserve in 1948. Negotiations are advanced to renew and extend the current conservation regulations by way of a new Executive Order in accordance with the Conservation of Nature Act 1969 (amended 1972, 1975 and 1978). The Deget area will be included. Designated as a Ramsar site in September 1977. The site is also part of an EC special protection area (SPA).

Site Description The site is a sea area with stony banks and ten islands, only one being inhabited. The vegetation on the islands consists of salt and guano loving plants, and includes some interesting lichens. The site comprises 88.5% (425ha) salt and brackish water, and 11.5% (55ha) land. The site is a feeding, resting and breeding area for waterfowl.

International and National Importance The islands are a breeding area of international importance for 1,500 pairs of herring gull *Larus argentatus*, 25,000 pairs of black-headed gull *L. ridibundus*, 100 pairs of lesser black-backed gull *L. fuscus*, 1,100 pairs of sandwich tern *Sterna sandvicensis*, 100 pairs of black guillemot *Cephus grylle*, 230 pairs of kittiwake *Rissa tridactyla*. The site is also one of the most important breeding areas in Denmark for black guillemot and Scandinavian rock pipit *Anthus spinoletta littoralis*. The islands are a resting and feeding area for a number of waterfowl particularly diving ducks such as eider duck *Somateria mollissima*, common scoter *Melanitta nigra* and red-breasted merganser *Mergus serrator*. It is the most important resting site in Denmark for purple sandpiper *Calidris maritima*.

Changes in Ecological Character There has been a change in the vegetation and to some extent in the bird life as a result of three factors: the extermination of rats *Rattus norvegicus* which occurred on all the islands from 1949-1975; a drastic decline in 1978 of the numbers of introduced rabbits *Oryctolagus cuniculus*; and an experimental reduction since 1973 in the herring gull breeding population.

Management Practices Measures have been taken since 1973 to reduce the breeding population of herring gull and rats were exterminated on all the islands by 1975. Public access is permitted to all the site excluding 30ha. Hunting is prohibited over the entire area.

Scientific Research and Facilities Hirsholmene is a scientific sanctuary and has been an important research and reference area for over 50 years. There is a marine biology station on the mainland at Frederikshavn from which the sea area and reefs between Frederikshavn and Hirsholmene have been intensively studied.

Principal Reference Material The above information is taken from the Danish national reports to the Cagliari Conference in 1980 and the Groningen Conference in 1984. Supplemented by: **Scott, D.A. (1980).** A preliminary inventory of wetlands of international importance for waterfowl in west Europe and north-west Africa. *IWRB Special Publication* No. 2. 127 pp.

Nordre Ronner

Location 57°22'N, 10°56'E. Located off the north-east coast in Northern Jutland.

Area 2,923ha

Degree of Protection Nordre Ronner is in territorial waters in the Municipality of Laeso and is owned by the state represented by the Ministry of Defence. It is a nature conservation area currently protected by voluntary agreements with the Ministry of Defence and the Municipality of Laeso. Negotiations are being conducted with these parties on the future conservation of the area. Designated as a Ramsar site in September 1977. Also designated as an EC special protection area (SPA).

Site Description The site comprises 99.6% sea, which includes stony banks and stony uninhabited islands, and 0.4% land. Waterfowl use the area for resting, feeding and breeding. It is a breeding area and haunt for 50-100 common seal *Phoca vitulina*.

International and National Importance The islands are a breeding area of international importance for eider duck *Somateria mollissima*, great black-backed gull *Larus marinus*, lesser black-backed gull *L. fuscus*, 100 pairs of sandwich tern *Sterna sandvicensis*, 120 pairs of black guillemot *Cepphus grylle* and 100 pairs of kittiwake *Rissa tridactyla*. Also breeding here are 3,000 pairs of black-headed gull *Larus ridibundus*. The site is the most important breeding area in Denmark for black guillemot and kittiwake. Some 5,000 eider duck also use the area for resting and feeding.

Changes in Ecological Character Conditions for breeding birds have been changed by the gradual growth of bushes and grasses on the islands.

Management Practices There are voluntary agreements with the Ministry of Defence, and in some cases with the Laeso Municipality, on rules governing recreational activities and the gathering of eggs in the breeding season.

Scientific Research and Facilities The field station in the old lighthouse building is rented by the National Agency for the Protection of Nature, Monuments and Sites, and is used for observation and special studies. The islands have been a scientific sanctuary since 1965.

Principal Reference Material The above information is taken from the Danish national reports to the Cagliari Conference in 1980 and the Groningen Conference in 1984. Supplemented by: **Scott, D.A. (1980).** A preliminary inventory of wetlands of international importance for waterfowl in west Europe and north-west Africa. *IWRB Special Publication* No. 2. 127 pp.

Laeso

Location 57°12'N, 11°10'E. Located off the north-east coast in the county of Northern Jutland.

Area 67,840ha

Degree of Protection Ownership is part private and part state, with the state represented by the Ministry of the Environment. 2,000ha, including Vester and Sonder Nyland, Laesos Sydligge Ronner, Bovet and Syrodde-Knotterne is protected for nature conservation under the Conservation of Nature Act 1969 (amended 1972, 1975 and 1978). Conservation of the Ron areas was completed in 1980. There are no wildlife reserves. Designated as a Ramsar site in September 1977. Also designated an EC special protection area (SPA).

Site Description Laeso is mainly a sea area with banks, shallow shoals and tidal areas, and also includes small islands, inlets, salt marshes, near-shore heathland, and occasional cultivated land (including plantations) with some buildings. The land is gradually rising and this is influenced by the development of the vegetation. The area is of great botanical interest and is the largest Danish tidal and saltmarsh area outside the Vadehavet (Danish Wadden Sea). The site comprises 92.7% salt and brackish water, and 7.3% land. It is a resting, feeding, breeding and moulting area for waterfowl, and is a breeding area and haunt for 300 common seal *Phoca vitulina*.

International and National Importance This site is of international importance as a resting and feeding ground for 2,000 dark-bellied brent geese *Branta b. bernicla*, 11,000 velvet scoter *Melanitta fusca*, 38,000 common scoter *M. nigra*, 80,000 eider duck *Somateria mollissima*, 2,000 red-breasted merganser *Mergus serrator*, 45,000 dunlin *Calidris alpina* and 600 avocet *Recurvirostra avosetta*. Also resting and feeding here are bar-tailed godwit *Limosa lapponica*. The site is a moulting area for 50,000 diving ducks including eider duck and common scoter. It is also an internationally important breeding area for waterfowl with 170 pairs of avocet, 200 pairs of Arctic tern *Sterna paradisaea*, 15 pairs of turnstone *Arenaria interpres* and 1-2 pairs of golden plover *Pluvialis apricaria*.

Changes in Ecological Character Some areas are becoming overgrown with natural and introduced trees and bushes.

Management Practices The local conservation board has complied with a request from the National Agency for the Protection of Nature, Monuments and Sites that Knotten be closed to the public for an experimental period 1980-1983.

Scientific Research and Facilities There is a field station in the south-eastern part of the island. Current research is mainly ornithological, botanical and entomological. A laboratory is available.

Principal Reference Material The above information is taken from the Danish national reports to the Cagliari Conference in 1980 and the Groningen Conference in 1984. Supplemented by: **Scott, D.A. (1980).** A preliminary inventory of wetlands of international importance for waterfowl in west Europe and north-west Africa. *IWRB Special Publication* No. 2. 127 pp.

Parts of Randers and Mariager Fiords and the sea adjoining them

Location 56°39'N, 10°10'E. Located off the north-east coast in Northern Jutland and Aarhus.

Area 41,440ha

Degree of Protection Ownership is part state and part private. 76ha at Treskelbakkeholm is a wildlife reserve protected by the 1967 Game Act (amended 1967 and 1972). Designated as a Ramsar site in September 1977. Also designated as an EC special protection area (SPA).

Site Description Mainly shallow sea and fiord areas with small islands and also salt marshes, and cultivated land including large reclaimed areas near Overgard. The site comprises 84.9% (35,200ha) salt and brackish water and 15.1% (6,240ha) land. Resting, feeding and breeding area for waterfowl.

International and National Importance The site is of international importance as a resting and feeding area for 2,000 whooper swan *Cygnus cygnus*, 5,000 mute swan *C. olor*, 2,500 light-bellied brent geese *Brant b. hrota*, 12,000 mallard *Anas platyrhynchos*, 10,000 common scoter *Melanitta nigra*, 20,000 velvet scoter *M. fusca*, 47,000 eider duck *Somateria mollissima*, 1,000 goosander *Mergus merganser*, some red-breasted merganser *M. serrator*, 3,000 scaup *Aythya marila* and 4,000 shelduck *Tadorna tadorna*. Also resting and feeding here are wigeon *Anas penelope* and goldeneye *Bucephala clangula*. From November to February this is the only Danish locality where Svalbard's population of light-bellied brent goose occurs. Breeding waterfowl include 300-400 pairs of sandwich tern *Sterna sandvicensis*, 40 pairs of common tern *S. hirundo* and 400-600 pairs of black-headed gull *Larus ridibundus*.

Changes in Ecological Character Parts of the shallow tidal areas in the Mariager Fiord and Alborg Bay belonging to the Overgard Estate have been reclaimed and cultivated. This has resulted in a change in the hydrographic conditions. There may be further erosion as a result of the extraction of raw materials near the coast.

Management Practices Public access to the wildlife reserve at Treskelbakkeholm is prohibited during the breeding season. Planning permission for a major extension to an existing airfield in the area has been refused.

Scientific Research and Facilities No information

Principal Reference Material The above information is taken from the Danish national reports to the Cagliari Conference in 1980 and the Groningen Conference in 1984. Supplemented by: Scott, D.A. (1980). A preliminary inventory of wetlands of international importance for waterfowl in west Europe and north-west Africa. *IWRB Special Publication* No. 2. 127 pp.

Sea area north of Anholt Island

Location 56°42'N, 11°34'E. Located off the north-east coast in the county of Aarhus.

Area 12,720ha

Degree of Protection Ownership is part private and part state, with the state represented by the Ministry of Defence. The beaches and eastern point of Anholt Island (Totten) are a nature conservaion area of 100ha protected under the Conservation of Nature Act 1969 (amended 1972, 1975 and 1978). There are no wildlife reserves. Designated as a Ramsar site in September 1977. Also designated as an EC special protection area (SPA).

Site Description The site is mainly sea with shallow shoals and banks, but also includes the eastern point and the shores of the north coast of Anholt Island. The site comprises 99.3% salt and brackish water; and 0.7% land. It is a resting and feeding area for waterfowl, and a breeding site and haunt of both common seal *Phoca vitulina* and grey seal *Halichoerus grypus*.

International and National Importance This site is of international importance as a resting and feeding ground for 80,000 eider duck *Somateria mollissima* and 20,000 common scoter *Melanitta nigra*. Also resting and feeding here are razorbill *Alca torda* and black-throated diver *Gavia arctica*.

Changes in Ecological Character At Nordvestrevet and Osterrevet raw materials are being extracted on a large scale and this is thought to have contributed to the erosion of Anholt and in particular the eastern point at Totten.

Management Practices No information

Scientific Research and Facilities No information

Principal Reference Material The above information is taken from the Danish national reports to the Cagliari Conference in 1980 and the Groningen Conference in 1984.

Horsens Fiord and Endelave

Location 55°51'N, 10°10'E. Located on the east coast in the counties of Aarhus and Vejle.

Area 43,200ha

Degree of Protection Ownership is part private and part state, with the state represented by the Ministry of the Environment. Ownership of Vorso, a small island in the fiord, is by a foundation in association with the University of Copenhagen. Some 900ha including Vorso, Brigsted-Amstrup, Gesdorfslund and Endelave are protected for nature conservation under the Nature Act 1969 (amended 1972, 1975 and 1978). Areas near Lerdrup Bugt are proposed for nature conservation. Vorso was established as a scientific reserve in 1934. Wildlife areas include Alro Polder, Soby Reo and Mollegrunden totalling 210ha protected under the Game Act 1967 (amended 1969 and 1972). Designated as a Ramsar site in September 1977. Also designated as an EC special protection area (SPA).

Site Description The site consists of a shallow fiord and sea areas with shoals, banks, salt marshes and lagoons, and includes three fairly large islands with cultivated land and scattered buildings. It comprises 91.0% salt and brackish water, and 9.0% land. The island of Vorso is mainly farmland abandoned in the 1930s and gradually colonised by woody species to a kind of 'virgin forest'. The site is an important resting, feeding, breeding and moulting area for waterfowl. Mollegrunden is the most important locality for seals in the southern part of the Kattegat.

International and National Importance This site is of international importance as a resting and feeding ground for 5,000 scaup *Aythya marila*, 80,000 eider duck *Somateria mollissima*, 8,000 common scoter *Melanitta nigra*, 3,000 velvet scoter *M. fusca*, goldeneye *Bucephala clangula* and 1,000 goosander *Mergus merganser*, 1,000 red-breasted merganser *M. serrator* and waders including 3,000 bar-tailed godwit *Limosa lapponica*. Also resting and feeding here are 400 mute swan *Cygnus olor*, 300 dark-bellied brent goose *Branta bernicla* and 3,000 surface feeding duck including mallard *Anas platyrhynchos* and wigeon *A. penelope*. The islands and salt marshes are breeding areas of international importance for waterfowl including 3,000 pairs of cormorant *Phalacrocorax carbo sinensis*, 100 pairs of grey heron *Ardea cinerea*, 4,000 pairs of common gull *Larus canus*, oystercatcher *Haematopus ostralegus*, 80 pairs of avocet *Recurvirostra avosetta*, a few hundred pairs of sandwich tern *Sterna sandvicensis* and 450 pairs of Arctic tern *S. paradisaea*. Vorso has one of the biggest colonies of cormorant in Europe. The site is a moulting area for 20,000 diving ducks including eider duck, common scoter and velvet scoter.

Changes in Ecological Character There has been increased sedimentation around the islands since the 1930s due to the disappearance of grasswrack *Zostera* sp. Increased siltation north of Alro has resulted from a closed dam connecting the island with the mainland. Future potential disturbances to the area include the construction of a traffic link between Jutland and Zealand, and the construction of a nuclear power station at Gyllingnaes.

Management Practices Vorso and the surrounding area is totally protected against hunting, and access is by special permission only. Public access to the wildlife reserves is prohibited in the breeding season.

Scientific Research and Facilities The National Agency for the Protection of Nature, Monuments and Sites has a field station with a small laboratory on Vorso Island. The laboratory has electricity and running water but no equipment. The agency monitors waterfowl and environmental conditions.

Principal Reference Material The above information is taken from the Danish National Report to the Cagliari Conference in 1980 and the Groningen Conference. Supplemented by: **Jessen, Knud (1968)**. Flora og vegetation pa reservatet Vorso i Horsens Fiord (Flora and vegetation on the Vorso reserve in Horsens Fiord). Danish with English summary. *Botanisk Tidsskrift* 63: 1-2 (Kobenhavn).

Scott, D.A. (1980). A preliminary inventory of wetlands of international importance for waterfowl in west Europe and north-west Africa. *IWRB Special Publication* No. 2. 127 pp.

Stavns Fiord and adjacent waters

Location 55°54'N, 10°40'E. Located off the north-east coast of the island of Samsø in the county of Aarhus.

Area 16,320ha

Degree of Protection Ownership is part private and part state with the state represented by the Ministry of the Environment. Protected areas include a nature conservation area at Kanhave Kanal (30ha) protected under the Conservation of Nature Act 1969 (amended 1972, 1975 and 1978), and a wildlife reserve at Stavns Fiord (1,650ha), protected under the Game Act 1967 (amended 1969 and 1972). There are proposals for the conservation of areas of land around Stavns Fiord, and an amendment of the Executive Order on Reserves is being prepared. The Ramsar site is part of a larger area known as Nordsamsøg Stavns Fiord Nature Reserve and Bird Sanctuary. Designated as a Ramsar site in September 1977. Also designated as an EC special protection area (SPA).

Site Description Sea and fiord areas with shallow shoals, uninhabited islands, saltmarshes and grasslands. The fiord is brackish with an average depth of 1m. The many islands formed from the top of a drowned moraine have mainly low shrub thicket vegetation. There is some small scale farming on a few of the islands, primarily cattle grazing with some cultivation. The site comprises 94.6% salt and brackish water, and 5.4% land. It is a resting, feeding, moulting and breeding ground for waterfowl. Common seal *Phoca vitulina* also occurs here.

International and National Importance This site is of international importance as a resting and feeding ground for waterfowl including: 200 whooper swan *Cygnus cygnus*, 2,000 mute swan *C. olor*, 200 dark-bellied brent geese *Branta b. bernicla*, 9,000 velvet scoter *Melanitta fusca*, 9,000 common scoter *M. nigra*, scaup *Aythya marila*, 62,000 eider duck *Somateria mollissima*, 1,000 goosander *Mergus merganser* and 2,000 cormorant *Phalacrocorax carbo sinensis*. It is one of the most important breeding areas in Europe for eider duck with 2,000 pairs using this site. The site is internationally important as a breeding area for common gull *Larus canus* (450 pairs), herring gull *L. argentatus* (2,000 pairs), great black-backed gull *L. marinus*, little tern *Sterna albifrons* (10 pairs), Arctic tern *S. paradisaea*, avocet *Recurvirostra avosetta* (25-50 pairs), greylag goose *Anser anser*, mallard *Anas platyrhynchos*, shelduck *Tadorna tadorna*, oystercatcher *Haematopus ostralegus* and black guillemot *Cephus grylle*. The site is a moulting area for 10,000 duck, including eider duck and common scoter.

Changes in Ecological Character There has been improvement in the water quality after altering a sewage outflow in the south-east corner of the area. There is a potential risk of oil pollution at Hatter Rev.

Management Practices During the waterfowl breeding season in Stavns Fiord wildlife reserve there are hunting restrictions and public access is prohibited. The fox *Vulpes vulpes* population on the islands is regularly controlled.

Scientific Research and Facilities There is a field station with accommodation and some laboratory facilities at Hjortholm Reserve, a small island in Stavns Fiord. This island has been used for cattle grazing but has never been ploughed so the soil profile is intact. It is used mainly for archaeological, pedological and botanical research, but is available for ecological projects. The main species of waterfowl studied in the Ramsar site is the eider duck.

Principal Reference Material The above information is taken from the Danish National Report to the Cagliari Conference in 1980 and the Groningen Conference in 1984. Supplemented by:

Scott, D.A. (1980). A preliminary inventory of wetlands of international importance for waterfowl in west Europe and north-west Africa. *IWRB Special Publication* No. 2. 127 pp.

Lillebaelt

Location 55°21'N, 9°43'E. Located in the counties of Vejle, North Slesvig and Funen.

Area 37,344ha

Degree of Protection Ownership is part private and part state. Stenderup Hage (30ha) is a nature conservation area protected under the Conservation of Nature Act 1969 (amended 1972, 1975 and 1978). Gamborg Inddaemning (85ha) and Hejlsminde Nor (274ha) are wildlife reserves protected under the Game Act 1967 (amended 1969 and 1972). Designated as a Ramsar site in September 1977. Also designated as an EC special protection area (SPA).

Site Description Narrow sea area with islands, peninsulas, coves, lagoons, salt marshes and reed swamps. Two of the islands have some cultivated land and scattered habitation. The site comprises 76.2% (28,463ha) salt and brackish water, 0.2% (60ha) freshwater and 23.6% (8,821ha) land. It is a resting, feeding and breeding area for waterfowl.

International and National Importance This site is of international importance as a resting and feeding ground for 1,000 whooper swan *Cygnus cygnus*, 10,000 tufted duck *Aythya fuligula*, 40,000 scaup *A. marila*, 1,000 pintail *Anas acuta*, 40,000 eider duck *Somateria mollissima* and 5,000 velvet scoter *Melanitta fusca*. The site seems to be one of the most important localities in northern Europe for scaup. Also resting and feeding here are 100 bean goose *Anser fabalis*, 100 white-fronted goose *A. albifrons*, 1,000 wigeon *Anas penelope*, 5,000 goldeneye *Bucephala clangula*, 1,000 pochard *Aythya ferina* and 5,000 coot *Fulica atra*. The site is a breeding area 600 pairs of cormorant *Phalacrocorax carbo sinensis*, greylag goose *Anser anser*, red-breasted merganser *Mergus serrator*, avocet *Recurvirostra avosetta* (50 pairs), several species of gulls

Larus spp. and sandwich tern *Sterna sandvicensis* (400 pairs). It is also a moulting area for sea ducks, especially eider ducks.

Changes in Ecological Character The site receives effluent (calcium sulphate) which may increase in the future.

Management Practices Hunting is totally prohibited in the two wildlife reserves.

Scientific Research and Facilities No information

Principal Reference Material The above information is taken from the Danish national reports to the Cagliari Conference in 1980 and the Groningen Conference in 1984. Supplemented by: Scott, D.A. (1980). A preliminary inventory of wetlands of international importance for waterfowl in west Europe and north-west Africa. *IWRB Special Publication* No. 2. 127 pp

Naera Coast and Aebelo Area

Location 55°36'N, 10°13'E. Located in the county of Funen.

Area 13,800ha

Degree of Protection Ownership is part private and part state. Small areas on Aebelo, Kissebjerg-Norreby Hals and Flyvesandet-Fuglsanggard, totalling 100ha, are nature conservation areas protected under the Conservation of Nature Act 1969 (amended 1972, 1975 and 1978). The wildlife reserves of Fogense Enge (97ha) and Mageorne near Bogense are protected under the Game Act 1967 (amended 1969 and 1972). Designated as a Ramsar site in September 1977. Also designated as an EC special protection area (SPA).

Site Description Shallow coastal site with islets and islands, saltmarshes, and drained and cultivated areas. Aebelo Island is wooded and inhabited. The site comprises 73.6% salt and brackish water, and 26.4% land. It is a feeding, resting and breeding area for waterfowl.

International and National Importance This site is of international importance as a resting and feeding ground for 2,000 mute swan *Cygnus olor*, 2,000 bar-tailed godwit *Limosa lapponica*, 20,000 eider duck *Somateria mollissima*, 4,200 common scoter *Melanitta nigra* and 2,000 velvet scoter *M. fusca*. Also resting and feeding in the area are 100 bean goose *Anser fabalis*, 2,000 white-fronted goose *A. albifrons*, 300 dark-bellied brent goose *Branta b. bernicla*, 2,000 wigeon *Anas penelope*, 2,000 golden plover *Pluvialis apricaria* and 3,000 dunlin *Calidris alpina*. The only permanent resing area in Denmark for white-fronted goose is on Gyloenstein's Land. The site is a breeding area for 450 pairs of cormorant *Phalacrocorax carbo sinensis*, greylag goose *Anser anser*, red-breasted merganser *Mergus serrator*, eider duck, several species of gull *Larus* spp. and several species of tern including over 100 pairs of Arctic tern *Sterna paradisaea*, a few pairs of little tern *S. albifrons* and a few hundred pairs of sandwich tern *S. sandvicensis*. Other breeding species include marsh harrier *Circus aeruginosus*.

Changes in Ecological Character Population growth and increased planting are causing increasing disturbance to this wetland.

Management Practices Hunting is totally prohibited in the Fogense Enge wildlife reserve. Access to Mageoerne is prohibited in the breeding season.

Scientific Research and Facilities No information

Principal Reference Material The above information is taken from the Danish national reports to the Cagliari Conference in 1980 and the Groningen Conference in 1984. Supplemented by: **Scott, D.A. (1980).** A preliminary inventory of wetlands of international importance for waterfowl in west Europe and north-west Africa. *IWRB Special Publication* No. 2. 127 pp.

South Funen Archipelago

Location 55°00'N, 10°20'E. Situated in the county of Funen.

Area 39,200ha

Degree of Protection Ownership is part private and part state, with the state represented by the Ministry of the Environment. On Tasinge there is one established nature conservation area at Vejlen (50ha) protected under the Conservation of Nature Act 1969 (amended 1972, 1975 and 1978), and one proposed at Monnet. Hjaelmshoved, Aeroskobing, Bredholm and Storeholm are wildlife reserves totalling 161ha protected under the Game Act 1967 (amended 1969 and 1972). Designated as a Ramsar site in September 1977. Also designated as an EC special protection area (SPA).

Site Description The wetland habitats of this site include small lakes, reed swamps, and salt marshes, and sea areas with shallow shoals and many islands. Most of the islands are uninhabited, but some have a scattered population with some cultivated land. The site comprises 82.6% (37,378ha) salt and brackish water, and 17.4% (6,822ha) land. The archipelago is a resting, feeding, breeding and moulting area for waterfowl.

International and National Importance This site is of international importance as a resting and feeding ground for 2,000 dark-bellied brent geese *Branta b. bernicla*, 600 whooper swan *Cygnus cygnus*, 6,000 mute swan *C. olor*, 45,000 eider duck *Somateria mollissima*, 23,000 tufted duck *Aythya fuligula*, 19,000 scaup *A. marila*, 4,000 goldeneye *Bucephala clangula*, 6,000 long-tailed duck *Clangula hyemalis*, 1,000 red-breasted merganser *Mergus serrator* and 38,000 coot *Fulica atra*. Also resting and feeding at the site are 4,000 velvet scoter *Melanitta fusca*, oystercatcher *Haematopus ostralegus* and 15,000 surface feeding duck including mallard *Anas platyrhynchos*. The site is a breeding area of international importance for bittern *Botaurus stellaris*, greylag goose *Anser anser*, dunlin *Calidris alpina*, ruff *Philomachus pugnax*, 100 pairs avocet *Recurvirostra avosetta*, 1-2 pairs of turnstone *Arenaria interpres*, and several species of gull *Larus* spp. and tern *Sterna* spp. 5,000 mute swan use the archipelago for moulting, and this site is one of their most important moulting refuges in Denmark. The area is relatively unusual in Europe being drowned moraine country.

Changes in Ecological Character Since the turn of the century disturbances to the breeding waterfowl have included cattle grazing, land drainage and cultivation.

Management Practices Public access to the four wildlife reserves is prohibited during the waterfowl breeding season, and hunting is prohibited in Aeroskobing (61ha).

Scientific Research and Facilities No information

Principal Reference Material The above information is taken from the Danish national reports to the Cagliari Conference in 1980 and the Groningen Conference in 1984. Supplemented by: **Scott, D.A. (1980).** A preliminary inventory of wetlands of international importance for waterfowl in west Europe and north-west Africa. *IWRB Special Publication* No. 2. 127 pp.

Sejero Bugt, Nekselo Bugt and Saltbaek Vig

Location 55°47'N, 11°18'E. Situated in Western Zealand.

Area 42,560ha

Degree of Protection Ownership is part private and part state, with the state represented by the Ministry of Defence and the Ministry of the Environment. 600ha including Overby Lyng, Korevlen, Ordstrup Naes, Nekselo and Vesterling are protected for nature conservation under the 1969 Conservation of Nature Act (amended in 1972, 1975 and 1978), and Saltbaekvig is a proposed nature conservation area. There are no wildlife reserves. Designated as a Ramsar site in September 1977. Also designated as an EC special protection area (SPA).

Site Description The wetland comprises a sea area with shallow bays, cultivated islands with scattered buildings, peninsulas and coastal slopes with saltmarshes and lagoons, and a fiord area with meadows and reed swamps. 91% salt and brackish water and 9% island. Nekselo Island conservation area is a relic of a marginal glacial moraine. The site is a moulting, breeding, feeding and resting area for waterfowl.

International and National Importance This site is of international importance as a resting and feeding ground for 150 whooper swan *Cygnus cygnus*, 3,000 greylag goose *Anser anser*, 800 bean goose *A. fabalis*, 30,000 eider duck *Somateria mollissima*, 15,000 common scoter *Melanitta nigra*, 12,000 velvet scoter *M. fusca*, teal *Anas crecca* and ringed plover *Charadrius hiaticula*. Also resting and feeding here are 2,000 mallard *Anas platyrhynchos*, 3,000 wigeon *A. penelope*, 4,000 scaup *Aythya marila*, 3,000 golden plover *Pluvialis apricaria* and 300 pairs of greylag goose. Breeding species include 30 pairs of greylag goose, 15-25 pairs of avocet *Recurvirostra avosetta*, oystercatcher *Haematopus ostralegus*, 2,000-3,000 pairs of black-headed gull *Larus ridibundus* and 10-15 pairs of little tern *Sterna albifrons*. The site is used as a moulting area by scaup, eider, common scoter and velvet scoter, and is the most important moulting locality in Denmark for greylag goose (4,000). Nekselo Island has many plant species that are rare in Denmark and also has a rich insect fauna.

Changes in Ecological Character Increasing disturbance due to planting and building along the coast has made this area less suitable for breeding waterfowl.

Management Practices There is restricted public access to the area but a limited amount of hunting is allowed in Saltbaekvig and Store Vroj.

Scientific Research and Facilities No information

Principal Reference Material The above information is taken from the Danish national reports to the Cagliari Conference in 1980 and the Groningen Conference in 1984. Supplemented by: Duffey, E. (1982). *National Parks and Reserves of Western Europe*. Macdonald and Co., London.

Scott, D.A. (1980). A preliminary inventory of wetlands of international importance for waterfowl in west Europe and north-west Africa. *IWRB Special Publication* No. 2. 127 pp.

Waters off Skaelskor Nor and Glaeno, and adjacent wetlands

Location 55°10'N, 11°30'E. Located in Western Zealand.

Area 17,120ha

Degree of Protection Ownership is part private and part state with the state represented by the Ministry of the Environment. Protected sites include two nature conservation areas at Borreby Estate and Osterhovedgard totalling 2,000ha protected since 1978 under the Conservation of Nature Act 1969 (amended 1972, 1975 and 1978), and one wildlife reserve at Basnaes Nor of 1,055ha protected under the Game Act 1967 (amended 1969 and 1972). There are plans in preparation for the conservation of other areas. Designated as a Ramsar site in September 1977. Also designated as an EC special protection area (SPA).

Site Description The Ramsar site consists of a sea area with shallow shoals and coves, islands with cultivated land and scattered buildings, saltmarshes, uncultivated coastal slopes and grassland, lakes and marshes and reed swamps. Some areas are enclosed by dams. The site comprises 76.4% salt and brackish water, 23.4% land and 0.2% freshwater. The area is regarded as of considerable cultural and historical value. It supports many species of waterfowl.

International and National Importance This site is of international importance as a resting and feeding ground for 700 whooper swan *Cygnus cygnus*, 3,000 mute swan *C. olor*, 24,000 tufted duck *Aythya fuligula*, 11,000 coot *Fulica atra*, 1,000 bar-tailed godwit *Limosa lapponica*, 5,000 mallard *Anas platyrhynchos*, 650 shoveler *A. clypeata*, 1,500 pintail *A. acuta*, teal *A. crecca*, 10,000 eider duck *Somateria mollissima*, 9,000 common scoter *Melanitta nigra*, 3,000 velvet scoter *M. fusca*. The site is a breeding area of international importance for several species of waterfowl and for 2,500 pairs of cormorant *Phalacrocorax carbo sinensis*.

Changes in Ecological Character The increased planting and cultivation of grasslands and saltings has made these areas less suitable for breeding waterfowl. A potential threat is the

proposed expansion of the petro-chemical industry at Stignes which may increase pollution in the area.

Management Practices Public access to the wildlife reserve at Basnaes Nor is prohibited during the breeding season, and hunting of waterfowl in the reserve is prohibited.

Scientific Research and Facilities No information

Principal Reference Material The above information is taken from the Danish national reports to the Cagliari Conference in 1980 and the Groningen Conference in 1984. Supplemented by: Scott, D.A. (1980). A preliminary inventory of wetlands of international importance for waterfowl in west Europe and north-west Africa. *IWRB Special Publication* No. 2. 127 pp.

Karrebaek, Dybso and Avno Fiords

Location 55°10'N, 11°45'E. Located in the county of Storstrom.

Area 19,200ha

Degree of Protection Ownership is part private and part state, with the state represented by the Ministry of the Environment. Protected sites include four nature conservation areas at Eno, Dybso, Knudshoved and Stejlebanken totalling 300ha protected under the Conservation of Nature Act 1969 (amended 1972, 1975 and 1978). There are two wildlife reserves at Karrebaeksminde and Guano totalling 1,010ha protected under the Game Act 1967 (amended 1969 and 1972). Designated as a Ramsar site in September 1977. Also designated as an EC special protection area (SPA).

Site Description The wetland consists of a sea area with shallow shoals and banks, islands (several having cultivated land and scattered buildings), the peninsula of Knudshoved Odde which has cultivated land and buildings, commons saltmarshes and reed swamps. The site comprises 72.1% salt and brackish water, 27.7% land and 0.2% freshwater. Large tracts which were originally commons have rare plants and animals and the site is of considerable cultural and historical value. Many species of waterfowl use the area for feeding, resting and breeding. The common seal *Phoca vitulina* breeds in Avno Fiord.

International and National Importance This site is of international importance as a resting and feeding ground for 900 whooper swan *Cygnus cygnus*, 3,000 mute swan *C. olor*, 12,000 coot *Fulica atra* and 3,000 bar-tailed godwit *Limosa lapponica*. The site is one of the most important localities in Denmark for tufted duck *Aythya fuligula* (25,000). Other species resting and feeding at the site include 5,000 mallard *Anas platyrhynchos*, 300 shoveler *A. clypeata*, 1,000-2,500 pintail *A. acuta* and some overwintering white-tailed eagle *Haliaeetus albicilla*. The site is a breeding area for surface feeding ducks *Anas* spp., 50-100 pairs of avocet *Recurvirostra avosetta*, several species of gulls *Larus* spp., 100 pairs of Arctic tern *Sterna paradisaea* and 25-50 pairs of little tern *S. albigrons*.

Changes in Ecological Character The commons have become overgrown especially at Knudshoved and Dybso.

Management Practices Hunting is prohibited in the nature conservation area at Dybso (132ha) and in the wildlife reserve at Guano (343ha). Public access is prohibited to the wildlife reserves in the waterfowl breeding season.

Scientific Research and Facilities No information

Principal Reference Material The above information is taken from the Danish national reports to the Cagliari Conference in 1980 and the Groningen Conference in 1984. Supplemented by: **Scott, D.A. (1980).** A preliminary inventory of wetlands of international importance for waterfowl in west Europe and north-west Africa. *IWRB Special Publication* No. 2. 127 pp.

Waters south-east of Fejo and Femo Islands

Location 54°54'N, 11°30'E. Situated in the county of Storstrom.

Area 32,640ha

Degree of Protection Ownership is part private and part state. There is a wildlife reserve of 71ha at Fladet protected under the 1967 Game Act (amended 1969 and 1972). There are no nature conservation areas. Designated as a Ramsar site in September 1977.

Site Description The site consists of sea area with shallow shoals and banks, uninhabited islets, saltmarshes and reed swamps, and contains the shallowest area in Smalandshavet. One island has cultivated land and scattered habitation. The site comprises 89.5% salt and brackish water, and 10.5% land. It is a feeding, resting, breeding and moulting area for waterfowl.

International and National Importance This site is of international importance as a resting and feeding ground for 2,000 goosander *Mergus merganser*, 4,000 red-breasted merganser *M. serrator*, 700 whooper swan *Cygnus cygnus*, 6,000 mute swan *C. olor*, 20,000 coot *Fulica atra*, 5,000 goldeneye *Bucephala clangula*. Also resting and feeding here are 3,000 mallard *Anas platyrhynchos*, 1,500 teal *A. crecca* and 3,000 tufted duck *Aythya fuligula*. It is a breeding area for several species of surface feeding duck *Anas* spp. and waders and an important wintering and moulting area for mute swan.

Changes in Ecological Character Waterfowl breeding on uninhabited islets have been affected by the reduction in grazing of these areas. A proposed project to enclose the southern third of the area by a dam has been abandoned following analysis of the economic consequences.

Management Practices Hunting is prohibited in Fladet wildlife reserve.

Scientific Research and Facilities No information

Principal Reference Material The above information is taken from the Danish national reports to the Cagliari Conference in 1980 and the Groningen Conference in 1984. Supplemented by: **Scott, D.A. (1980).** A preliminary inventory of wetlands of international importance for waterfowl in west Europe and north-west Africa. *IWRB Special Publication* No. 2. 127 pp.

Praesto Fiord, Jungshoved Nor, Ulfshale and Nyord

Location 55°05'N, 12°15'E. Situated in the county of Storstrom.

Area 25,960ha

Degree of Protection Ownership is part private and part state, with the state represented by the Ministry of the Environment. The island of Aegholm is owned by the Danish Ornithologists Union. Six nature conservation areas were established prior to 1980 at Praestofed, Roneklint, Jungshoved, Aegholm, Nyord and Ulfshale, and a further 125ha of saltmarsh were protected for nature conservation in 1980. These areas are protected under the Conservation of Nature Act 1969 (amended 1972, 1975 and 1978). Designated as a Ramsar site in September 1977.

Site Description Most of the site is sea area with shallow shoals and banks, islets and small islands, but also includes saltmarshes, reed swamps and cultivated land with scattered buildings. The site comprises 85.5% (22,200ha) salt and brackish water, 0.2% (45ha) freshwater and 14.3% (3,715ha) land. It is a feeding, resting, breeding and moulting area for waterfowl.

International and National Importance This site is of international importance as a resting and feeding ground for 10,000 tufted duck *Aythya fuligula*, 2,000 goosander *Mergus merganser*, 500 red-breasted merganser *M. serrator*, 1,600 whooper swan *Cygnus cygnus*, 5,000 mute swan *C. olor*, 1,700 coot *Fulica atra*, 300 wigeon *Anas penelope*, 1,500 scaup *Aythya marila* and 2,000 goldeneye *Bucephala clangula*. Also resting and feeding here are mallard *Anas platyrhynchos*. The site is a breeding area for surface feeding duck *Anas* spp., 50 pairs of avocet *Recurvirostra avocetta* and 150 pairs of sandwich tern *Sterna sandvicensis*, and a moulting refuge for mute swan. It is one of the most important wintering areas in Denmark for whooper swan and the most important breeding locality in Denmark for goosander. The site contains the largest saltmarshes in south-east Denmark.

Changes in Ecological Character The traditional uses of the saltmarshes for grazing and hay harvesting were gradually abandoned during the 1950s and 1960s resulting in the marshes becoming overgrown. This has made the area less suitable for breeding waterfowl.

Management Practices Small areas are totally protected against hunting by the Foundation for the Protection of Danish Bird Localities .

Scientific Research and Facilities No information

Principal Reference Material The above information is taken from the Danish national reports to the Cagliari Conference in 1980 and the Groningen Conference in 1984. Supplemented by:

Scott, D.A. (1980). A preliminary inventory of wetlands of international importance for waterfowl in west Europe and north-west Africa. *IWRB Special Publication No. 2.* 127 pp

Nakskov Fiord and Inner Fiord

Location 54°50'N, 11°02'E. Located in the county of Storstrom.

Area 8,960ha

Degree of Protection Ownership is part private and part state. There are three wildlife reserves totalling 188ha at Nakskov Indrefjord, Dueholm and Smedeholm protected under the Game Act 1967 (amended 1969 and 1972), but no nature conservation areas. Designated as a Ramsar site in September 1977.

Site Description The site consists of a fiord area with shallow shoals and banks, islands (some inhabited), salt marshes and reed swamps. It comprises 87.2% salt and brackish water, and 12.8% land. The site is an important resting, feeding, breeding and moulting area for waterfowl.

International and National Importance This site is of international importance as a resting and feeding ground for 5,000 mute swan *Cygnus olor*, 200 whooper swan *C. cygnus*, 200 shoveler *Anas clypeata*, 5,000 tufted duck *Aythya fuligula*, 500 red-breasted merganser *Mergus serrator* and 200 cormorant *Phalacrocorax carbo sinensis*. Also resting and feeding here are 400 dark-bellied brent goose *Branta b. bernicla*, mallard *Anas platyrhynchos* and teal *A. crecca*. The site is a moulting refuge for mute swan and a breeding area for waterfowl including several species of surface feeding duck.

Changes in Ecological Character There is heavy pollution in Nakskov Indrefjord which has adversely affected the flora and fauna, and in certain years creates conditions for severe outbreaks of avian botulism.

Management Practices Public access to the islands is prohibited during the breeding season and hunting is prohibited at all times in the wildlife reserve at Nakskov Indrefjord.

Scientific Research and Facilities No information

Principal Reference Material The above information is taken from the Danish national reports to the Cagliari Conference in 1980 and the Groningen Conference in 1984. Supplemented by: **Scott, D.A. (1980).** A preliminary inventory of wetlands of international importance for waterfowl in west Europe and north-west Africa. *IWRB Special Publication No. 2.* 127 pp.

Maribo Lakes

Location 54°46'N, 11°31'E. Situated in the county of Storstrom.

Area 4,400ha

Degree of Protection Private ownership. Some 1,200ha, surrounding and including the lakes, is a nature conservation area protected under the Conservation of Nature Act 1969 (amended 1972, 1975 and 1978). There are no wildlife reserves. Designated as a Ramsar site in September 1977.

Site Description Maribo Lakes are freshwater lakes with wooded islands and peninsulas. Along the shores are parks, reed swamps, deciduous forests, meadows and fields with scattered buildings. The site comprises 29.1% (1,280ha) freshwater and 70.9% (3,120ha) land. It is a feeding, resting and breeding area for waterfowl.

International and National Importance This site is of international importance as a resting and feeding ground for 2,000 greylag goose *Anser anser*, 5,000 pochard *Aythya ferina* and 5,000 tufted duck *Atthya fuligula*. Also feeding and resting here are smew *Mergus albellus* and mallard *Anas platyrhynchos*. The site is a breeding area for 30-40 pairs of greylag goose, several species of surface feeding duck *Anas* spp. and marsh harrier *Circus aeruginosus*. The lakes are a regular locality for smew and white-tailed eagle *Haliaeetus albicilla*. The Maribo Lakes is one of the Danish Ramsar sites with a significant proportion of the site area protected for nature conservation.

Changes in Ecological Character The increased use of fertilisers in farming during the past decades has resulted in increased eutrophication of the lakes.

Management Practices No information

Scientific Research and Facilities No information

Principal Reference Material The above information is taken from the Danish national reports to the Cagliari Conference in 1980 and the Groningen Conference in 1984. Supplemented by: Scott, D.A. (1980). A preliminary inventory of wetlands of international importance for waterfowl in west Europe and north-west Africa. *IWRB Special Publication* No. 2.

The waters between Lolland and Falster, including Rodsand, Guldborgsund and Boto Nor

Location 54°14'N, 11°45'E. Situated in the county of Storstrom.

Area 36,800ha

Degree of Protection Ownership is part private and part state, with the state represented by the Ministry of the Environment. There are nature conservation areas at Hasselo-Kalvo, Skejten-Frejslev-Boget and Boto Nor totalling 363ha, protected under the Nature Act 1969 (amended 1972, 1975 and 1978), and wildlife reserves at Frejlev Vig, Nysted Nor, Tjorneholm, Hylleholm and Rodsand totalling 812ha, protected under the Game Act 1967 (amended 1969 and 1972). Designated as a Ramsar site in September 1977.

Site Description The site consists of a sea area with shallow shoals and banks, coastal slopes, salt marshes and reedswamps. Some areas are enclosed by dams. The site comprises 29,920ha salt and brackish water and 6,880ha land. The site supports a wide variety of waterfowl. Common seal *Phoca vitulina* breed at Rodsand.

International and National Importance This site is of international importance as a resting and feeding ground for 1,000 bean geese *Anser fabalis*, 2,000 dark-bellied brent geese *Branta b. bernicla*, 11,000 tufted duck *Aythya fuligula*, 2,000 goosander *Mergus merganser*, 1,500 whooper swan *Cygnus cygnus*, 2,000 mute swan *C. olor* and 15,000 coot *Fulica atra*, and is one of the few internationally important areas in Denmark for bean goose. Other species resting and feeding here include 300 greylag goose *Anser anser*, 200 Canada goose *Branta canadensis*, mallard *Anas platyrhynchos*, wigeon *A. penelope*, teal *A. crecca*, scaup *Aythya marila*, 2,000 goldeneye *Bucephala clangula*, bar-tailed godwit *Limosa lapponica*, dunlin *Calidris alpina*, knot *C. canutus*, ruff *Philomachus pugnax* and golden plover *Pluvialis apricaria*. The site is also a moulting area for mute swan and a breeding area of international importance for several species of waterfowl including 1-2 pairs of turnstone *Arenaria interpres* and 200-300 pairs Arctic tern *Sterna paradisaea*.

Changes in Ecological Character None reported

Management Practices Public access prohibited to the islands and Rodsand during the waterfowl breeding period. Hunting is prohibited in 174ha at Boto Nor and 178ha at Frejslev Vig. An application for a rifle range for the Home Guard at Hyllerrog has been refused.

Scientific Research and Facilities No information

Principal Reference Material The above information is taken from the Danish national reports to the Cagliari Conference in 1980 and the Groningen Conference in 1984. Supplemented by: Scott, D.A. (1980). A preliminary inventory of wetlands of international importance for waterfowl in west Europe and north-west Africa. *IWRB Special Publication* No. 2. 127 pp.

Ertholmene Islands east of Bornholm

Location 55°19'N, 15°11'E. Situated east of Bornholm Island.

Area 1,257ha

Degree of Protection State ownership with the state represented by the Ministry of Defence. 11ha at Graesholmene is a nature conservation area protected under the Nature Act 1969 (amended 1972, 1975 and 1978). There are no wildlife reserves. Designated as a Ramsar site in September 1977.

Site Description A sea area comprising islands with cliffs. Two islands are inhabited. The site comprises 97.1% salt and brackish water, and 2.9% land, and supports several species of waterfowl.

International and National Importance The site is a breeding area of international importance to 2,000 pairs of eider duck *Somateria mollissima*, 25 pairs of lesser black-backed gull *Larus fuscus*, 6,400 pairs of herring gull *L. argentatus*, 80 pairs of razorbill *Alca torda* and 1,100 pairs of guillemot *Uria aalge*. This is the only breeding locality in Denmark for razorbill and guillemot, and one of the most important sites for eider duck. This site is the type locality for the nominate form of lesser black-backed gull. Long-tailed duck *Clangula hyemalis* also occurs here.

Changes in Ecological Character There have been changes in the bird life and vegetation at Graesholmene since measures were introduced in 1974 to control the herring gull population.

Management Practices Herring gull numbers have been actively controlled since 1974 when the population reached 10,000 pairs. Hunting is prohibited in the conservation area at Graesholmene.

Scientific Research and Facilities There is a small station near Akirkeby on the island of Bornholm (Address: Vasegårdsvej, Akirkeby DK3720). Research includes the observation of bird migration and ringing.

Principal Reference Material The above information is taken from the Danish National Report to the Cagliari Conference in 1980 and the Groningen Conference in 1984.

Vadehavet (Waddensea)

Location 55°16'N, 8°32'E. The Danish sector of the Waddensea extends from the border with the Federal Republic of Germany northwards along the North Sea coast to Oksbol and lies within the counties of Ribe and Sønderjylland.

Area 140,830ha, comprising 106,480ha of salt and brackish water, 170ha of freshwater and 34,180ha of land.

Degree of Protection The area has three sets of protection. In 1982 a ministerial order on the protection of the natural status of the Danish Waddensea was issued and revised in 1985. Approximately 73,000ha of the area is wildlife reserve with a system of zonation in order to regulate shooting. In 1983, the Danish Waddensea area, the marshland and most parts of the islands were designated a bird protection area in accordance with Article 4 of the EEC Directive on the Protection of Wild Birds. Ownership includes private land, territorial waters, the State represented by the Ministries of the Environment, Agriculture, Public Affairs and Defence and by the counties of Ribe and Sønderjylland. Designated a Ramsar site on 14 May 1987.

Site Description The area is characterised by tidal mud and sand flats between the mainland and a protecting barrier of islands. Tidal amplitude varies from 1.5m in the northern port (Esbjerg) to approximately 2m in the south (River Vida). The region comprises six main waterfowl habitats: reclaimed marshland behind dykes, with a combination of arable land, permanent grassland and freshwater canals; coastal marshland with dominance of luxuriant salt marsh vegetation; tidal flats comprising about 60% of the Waddensea area; sandbanks, dry at

normal high tide; sloughs and deeps between the islands and the tidal flats, and open waters west of the islands with deeps and shallow areas (less than 10m in depth) extending 8-15km into the North Sea.

International and National Importance The site is the most important nesting locality in Denmark for surface-feeding ducks. It is a nesting and feeding area for approximately 740,000 waterfowl from 16 species, and is a breeding area of international importance for waterfowl, including shelduck *Tadorna tadorna*, shoveler *Anas clypeata*, eider *Somateria mollissima*, oystercatcher *Haematopus ostralegus*, lapwing *Vanellus vanellus*, black-tailed godwit *Limosa limosa*, avocet *Recurvirostra avosetta*, dunlin *Calidris alpina*, ruff *Philomachus pugnax*, black-headed gull *Larus ridibundus* and marsh harrier *Circus aeruginosus*.

The area is of major importance for visiting waterfowl such as bean goose *Anser fabalis* (16,000), barnacle goose *Branta leucopsis* (2,109), brent goose *B. bernicla* (12,510), shelduck (29,200), European wigeon *Anas penelope* (58,600), teal *A. crecca* (16,700), mallard *A. platyrhynchos* (26,350), pintail *A. acuta* (3,800), shoveler (2,010), eider (64,400), common scoter *Melanitta nigra* (46,300), oystercatcher (46,200), avocet (11,365), golden plover *Pluvialis apricaria* (31,500), grey plover *P. squatarola* (3,960), lapwing *Vanellus vanellus* (39,700), knot *Calidris canutus* (41,600), curlew *Numenius arquata* (3,800), redshank *Tringa totanus* (3,360), and greenshank *T. nebularia* (1,420).

The most important moulting areas for common scoter *Melanitta nigra* are found in the North Sea, just west of the islands and the peninsula of Skallingen.

Changes in Ecological Character Include increasing pollution of the Waddensea by outflow of nutrient water from rivers and smaller streams and by influence of polluted water from the North Sea. Potential threats include deposits of dredged material from Esbjerg, drainage and cultivation of permanent grassland areas behind the dykes, intensified recreational activities on the beaches and wetland areas, over-use of resources (mussels), disturbance by shooting on salt marshes (high-tide nesting areas for waterfowl) and in areas behind the dykes, and oil and gas exploration in the Waddensea and North Sea.

Management Practices Skallingen Peninsula is partly managed with short vegetation, by grazing to provide optimal conditions for waterfowl. The small island of Jorchand, in the southern part of the Danish Waddensea, is protected against erosion as an important high-tide nesting area for waterfowl.

Scientific Research and Facilities Research is undertaken on marshland and dune formations and on waterfowl, including a ringing programme.

Principal Reference Material

The above comes from information supplied by the Danish Government, supplemented by:
Carp, E. (1980). *A Directory of Western Palaearctic Wetlands.* IUCN, Gland, Switzerland.
 506 pp.

Aqajarua-Sullorsuaq

Location 69°42'N, 52°00'W. Situated on the eastern side of Disko Island in the municipality of Qeqertarsuaq.

Area 30,000ha

Degree of Protection Designated a Ramsar site on 27 January 1988.

Site Description Sullorsuaq is a large U-shaped valley with wide areas of meadow. There are also raised flats of heath and dwarf scrub with areas of freshwater marsh at low altitude. A large part of the Sermersuaq ice cap is drained by a meandering river which flows through the site. North of the river there is a eutrophic lake with a dense population of pond snails *Lymnea* which is an important foraging area for many waterfowl species. Aqajarua is a shallow offshore area with wide mudbanks which are revealed at low tide.

International and National Importance Birds in the area include internationally important populations of moulting king eider *Somateria spectabilis* (30,000) and breeding Greenland white-fronted geese *Anser albifrons flavirostris* (at least ten pairs), Canada geese *Branta canadensis*, Arctic skua *Stercorarius parasiticus* (large numbers), red-necked phalarope *Phalaropus lobatus*, mallard *Anas platyrhynchos*, pintail *Anas acuta*, long-tailed duck *Clangula hyemalis*, common eider *Somateria mollissima* and red-breasted merganser *Mergus serrator*.

Changes in Ecological Character No information

Management Practices No information

Scientific Research and Facilities No information

Principal Reference Material

The above information has been supplied by the Greenland Home Rule Government.

Qinguata marraa - Kuussuaq

Location 69°56'N, 54°17'W

Area 6,000ha

Degree of Protection Designated a Ramsar site on 27 January 1988.

Site Description The area consists of the inner part of a fjord and an adjoining valley with numerous freshwater lakes and ponds.

International and National Importance The site is internationally important for its populations of Greenland white-fronted goose. Breeding birds include white-fronted goose *Anser albifrons flavirostris*, Canada goose *Branta canadensis* and large numbers of red-throated diver *Gavia stellata*. Non-breeding birds include red-breasted merganser *Mergus serrator* (130), common eider *Somateria moltissima* (400) and king eider *Somateria spectabilis* (400).

Changes in Ecological Character No information

Management Practices No information

Scientific Research and Facilities No information

Principal Reference Material

The above information has been supplied by the Greenland Home Rule Government.

Kuannersuit Kuussuat

Location 69°40'N, 53°17'W. On the south-eastern side of Disko Island in the municipality of Qeqertarsuaq.

Area 4,500ha

Degree of Protection Designated a Ramsar site on 27 January 1988.

Site Description The area was covered by glaciers until recently so that the landscape is dominated by numerous, small barren moraines and lakes. The southern part of the site is bordered by Kuannersuit Fiord.

International and National Importance The site is internationally important for its large numbers of moulting Greenland white-fronted geese *Anser albifrons flavirostris*. Breeding bird species include long-tailed duck *Clangula hyemalis* (with a dense population), red-throated diver *Gavia stellata*, red-necked phalarope *Phalaropus lobatus* (very common), mallard *Anas platyrhynchos* (in large numbers), red-breasted merganser *Mergus serrator* and common eider *Somateria mollissima*, which does not usually nest in inland areas.

Changes in Ecological Character No information

Management Practices No information

Scientific Research and Facilities No information

Principal Reference Material

The above information has been supplied by the Greenland Home Rule Government.

Kitsissunnguit

Location 68°50'N, 51°50'W. A series of islands 23km west of Christianskab, in the municipalities of Qasigiannnguit and Asiaat.

Area 16,000ha

Degree of Protection The area was designated a Ramsar site on 27 January 1988 and is protected.

Site Description A group of flat, rocky islands with heaths, meadows and small lakes. There is a large, shallow area north of the islands, which is favoured as a staging area for shorebirds during migration and a foraging area for ducks outside the breeding season.

International and National Importance The site is internationally important for its populations of Arctic tern *Sterna paradisaea* and puffin *Fratercula arctica*. Breeding birds include Arctic tern (25,000 pairs), puffin (200 pairs), little auk *Alle alle* (400), black guillemot *Cepphus grylle* (400), red-necked phalarope *Phalaropus lobatus* (200) and small numbers of grey phalarope *Phalaropus fulicarius*. Large numbers of non-breeding shorebirds, ducks and Arctic skuas also occur.

Changes in Ecological Character No information

Management Practices Hunting is prohibited. All activities and disturbance are illegal during the breeding season.

Scientific Research and Facilities No information

Principal Reference Material

The above information has been supplied by the Greenland Home Rule Government.

Naternaqa

Location 68°20'N, 52°W. Lies in the municipalities of Qasigiannnguit and Kangaatsiaq.

Area 150,000ha

Degree of Protection Designated a Ramsar site on 27 January 1988.

Site Description An unique area consisting of a flat plain of former seabed which, for the last 8,000-10,000 years, has been raised above the existing sea level. This vast wetland has large expanses of grassland and numerous small, shallow lakes and meandering streams.

International and National Importance Botanically the area is of great interest and is certainly one of the most valuable waterfowl localities in west Greenland. There is an internationally important breeding population of white-fronted geese *Anser albifrons flavirostris*, at least 1% of the world breeding population nests and large numbers occur on passage.

Changes in Ecological Character No information

Management Practices No information

Scientific Research and Facilities Investigation of the area is fragmentary.

Principal Reference Material

The above information has been supplied by the Greenland Home Rule Government.

Egalummiut Nunaat - Nassuttuup Nunaa

Location 67°25'N, 50°30'W. Situated 20km north of Sondstrom Airbase in Kangaatsiaq and Sisimiut municipalities.

Area 500,000ha

Degree of Protection Designated a Ramsar site on 27 January 1988.

Site Description A plateau contiguous with the ice cap, dissected by two large glacial river valleys. The area is characterised by extensive grassy areas with Arctic willow and birch scrub and many meadow areas with limited distribution. There are several large lakes and numerous small ones.

International and National Importance This is the most important area in Greenland for Greenland white-fronted goose *Anser albifrons flavirostris*. 100 pairs nest and 2,500 (more than 10% of the world population) use the area for moulting during July and August. The site is one of Greenland's richest areas for waterfowl in terms of species and habitat diversity. Breeding birds include red-throated diver *Gavia stellata*, great northern diver *Gavia immer*, mallard *Anas platyrhynchos*, common eider *Somateria mollissima*, long-tailed duck *Clangula hyemalis*, red-breasted merganser *Mergus serrator*, white-tailed eagle *Haliaeetus albicilla*, gyr-falcon *Falco rusticolus*, purple sandpiper *Calidris maritima*, red-necked phalarope *Phalaropus lobatus* and ringer plover *Charadrius hiaticula*. Non-breeding birds include Canada goose *Branta canadensis*, teal *Anas crecca*, pintail *Anas crecca*, ringed plover, common snipe *Gallinago gallinago* and whooper swan *Cygnus cygnus* (5-10).

Changes in Ecological Character No information

Management Practices No information

Scientific Research and Facilities No information

Principal Reference Material

The above information has been supplied by the Greenland Home Rule Government.

Ikkattoq (and Archipelago westwards)

Location 62°35'-62°52'N, 49°50'-50°30'W. Situated in Nuuk municipality, 175km south-east of Godthab (Nuuk), near Frederikshabs Isblink.

Area 35,000ha

Degree of Protection Designated a Ramsar site on 27 January 1988.

Site Description A shallow fiord area with muddy, silty water, numerous small islands and large mudbanks which are exposed at low tide.

International and National Importance This is the largest known moulting area for the internationally important population of red-breasted merganser *Mergus serrator* in Greenland (up to 1,000). Breeding birds include some one hundred pairs of Arctic tern *Sterna paradisea*, Arctic skua *Stercorarius parasiticus* (10-20 pairs), long-tailed duck *Clangula hyemalis*, common eider *Somateria mollissima* and white-tailed eagle *Haliaeetus albicilla*. The area is a moulting place for 500 long-tailed duck and up to 500 common eider.

Changes in Ecological Character No information

Management Practices No information

Scientific Research and Facilities No information

Principal Reference Material

The above information has been supplied by the Greenland Home Rule Government.

Ydre Kitsissut

Location 60°45'N, 48°25'W. Situated in the municipality of Qaqortoq.

Area 8,000ha

Degree of Protection Breeding reserve for birds and designated a Ramsar site on 27 January 1988.

Site Description A group of rocky islands in the south-western-most archipelago of south Greenland. Except for the island of Uummannaq, all islands are low-lying and some are

submerged at spring tide. There is only a thin vegetation cover of graminoids, scurvy grass and other herbs.

International and National Importance The site is the largest breeding area for guillemot in Greenland, with an internationally important population of this bird. The archipelago holds the largest diversity of breeding waterfowl species in Greenland and is the southernmost breeding area for little auk. Breeding birds include Brünnick's guillemot *Uria lomvia* (11,000), common guillemot *Uria aalge* (2,000), black guillemot *Cephus grylle* (1,000), puffin *Fratercula arctica* (60), razorbill *Alca torda* (400), little auk *Alle alle*, fulmar *Fulmarus glacialis* (100-200 pairs), glaucous gull *Larus hyperboreus* (50), Icelandic gull *Larus glaucoides* (140), great black-backed gull *Larus marinus* (10-15 pairs), common eider *Somaeria mollissima* (1-5 pairs) and red-throated diver *Gavia stellata* (1 pair). Visiting birds include small numbers of cormorant *Phalacrocorax carbo*, mallard *Anas platyrhynchos* and purple sandpiper *Calidris maritima*.

Changes in Ecological Character No information

Management Practices No information

Scientific Research and Facilities No information

Principal Reference Material

The above information has been provided by the Greenland Home Rule Government.

Heden

Location 71°N, 24°W. Situated on western Jameson Land in the Ittoqqortoormiit Municipality.

Area 125,000ha

Degree of Protection Designated a Ramsar site on 27 January 1988.

Site Description The largest flat tundra area in high Arctic Greenland, with numerous shallow lakes, ponds, meadows and moist mountain moors traversed by thousands of small streams and numerous meandering rivers.

International and National Importance The area has internationally important populations of visiting barnacle and pink-footed geese and is the largest known moulting area in Greenland for these birds. Breeding birds include pink-footed goose *Anser brachyrhynchus* (50 pairs), barnacle goose *Branta leucopsis*, Sabine's gull *Larus sabini* (5 pairs), whimbrel *Numenius phaeopus* (30), red-throated diver *Gavia stellata*, long-tailed skua *Stercorarius longicaudis*, Arctic skua *S. parasiticus*, red-necked phalarope *Phalaropus lobatus*, grey phalarope *P. fulicarius*, dunlin *Calidris alpina* and turnstone *Arenaria interpres*. Non-breeding birds include 2,000-3,000 barnacle goose (the most important moulting area in Greenland), 4,000 pink-footed geese (the most important moulting area in Greenland), 35 Sabine's gull and knot *Calidris canutus*.

Changes in Ecological Character No information

Management Practices No information

Scientific Research and Facilities No information

Principal Reference Material

The above information has been supplied by the Greenland Home Rule Government.

Hochstetter Forland

Location 75°30'N, 20°W. Lies in North-east Greenland National Park, 400km south-south-west of Mestervig airfield.

Area 140,000ha

Degree of Protection The site is part of North-east Greenland National Park and Biosphere Reserve. The national park was established in 1974 and the biosphere reserve approved in January 1977. Designated a Ramsar site on 27 January 1988. The site is state-owned and has total protection.

Site Description The area is relatively flat, with extended, low-lying wetlands and numerous small lakes surrounded by moist tundra vegetation.

International and National Importance This is the second-most important moulting area for pink-footed goose in Greenland and has important breeding and visiting populations of barnacle goose. Breeding bird species include pink-footed goose *Anser brachyrhynchus* (50 pairs), barnacle goose *Branta leucopsis* (45 pairs), red-throated diver *Gavia stellata*, great northern diver *Gavia immer*, long-tailed duck *Clangula hyemalis*, common eider *Somateria mollissima*, king eider *Somateria spectabilis*, ringed plover *Charadrius hiaticula*, turnstone *Arenaria interpres*, knot *Calidris canutus*, dunlin *Calidris alpina*, sandwing *Calidris alba*, grey phalarope *Phalaropus fulicarius* and long-tailed skua *Stercorarius longicaudus*. Non-breeding birds include at least 3,000 pink-footed goose (second most important moulting site in Greenland) and over 400 barnacle goose.

Changes in Ecological Character No information

Management Practices The area is under the jurisdiction of the National Park Board. As a result, animals and birds are totally protected and the park can not be physically disturbed without prior permission.

Scientific Research and Facilities No information

Principal Reference Material The above information has been supplied by the Greenland Home Rule Government, supplemented by:

Anon., (1980). *Greenland Newsletter*. The Commission for Scientific Research in Greenland. Tusarliivik. Krokus Bogtrykkeri, Copenhagen. 32 pp.

Kilen

Location 81°15'N, 13°30'W. Lies within North-east Greenland National Park in the extreme north-eastern corner of Greenland.

Area 30,000ha

Degree of Protection The site is part of North-east Greenland National Park and Biosphere Reserve. The national park was established in 1974 and the biosphere reserve approved in January 1977. Designated a Ramsar site on 27 January 1988. The site is state-owned.

Site Description Kilen is an extreme, high Arctic area surrounded by glaciers and sea ice, and is the northernmost ice-free land in East Greenland. The valley is characterised by interglacial marine sediments, probably from the previous interglacial period.

International and National Importance Breeding birds include Brent goose *Branta bernicula hrota* (70 pairs), Kilen is the most important known site in Greenland, as well as in the breeding range of this special sub-species in general; snow goose *Anser caerulescens* (2-3 pairs); Sabine's gull *Larus sabini* (up to 60), the largest known breeding area; ivory gull *Pagophila eburnea* (35 pairs) and common eider *Somateria mollissima*, northernmost known breeding area. Over 500 hundred Brent geese spend the summer months here. Kilen is situated at the ecologically very important, but poorly examined, north-east water polynya.

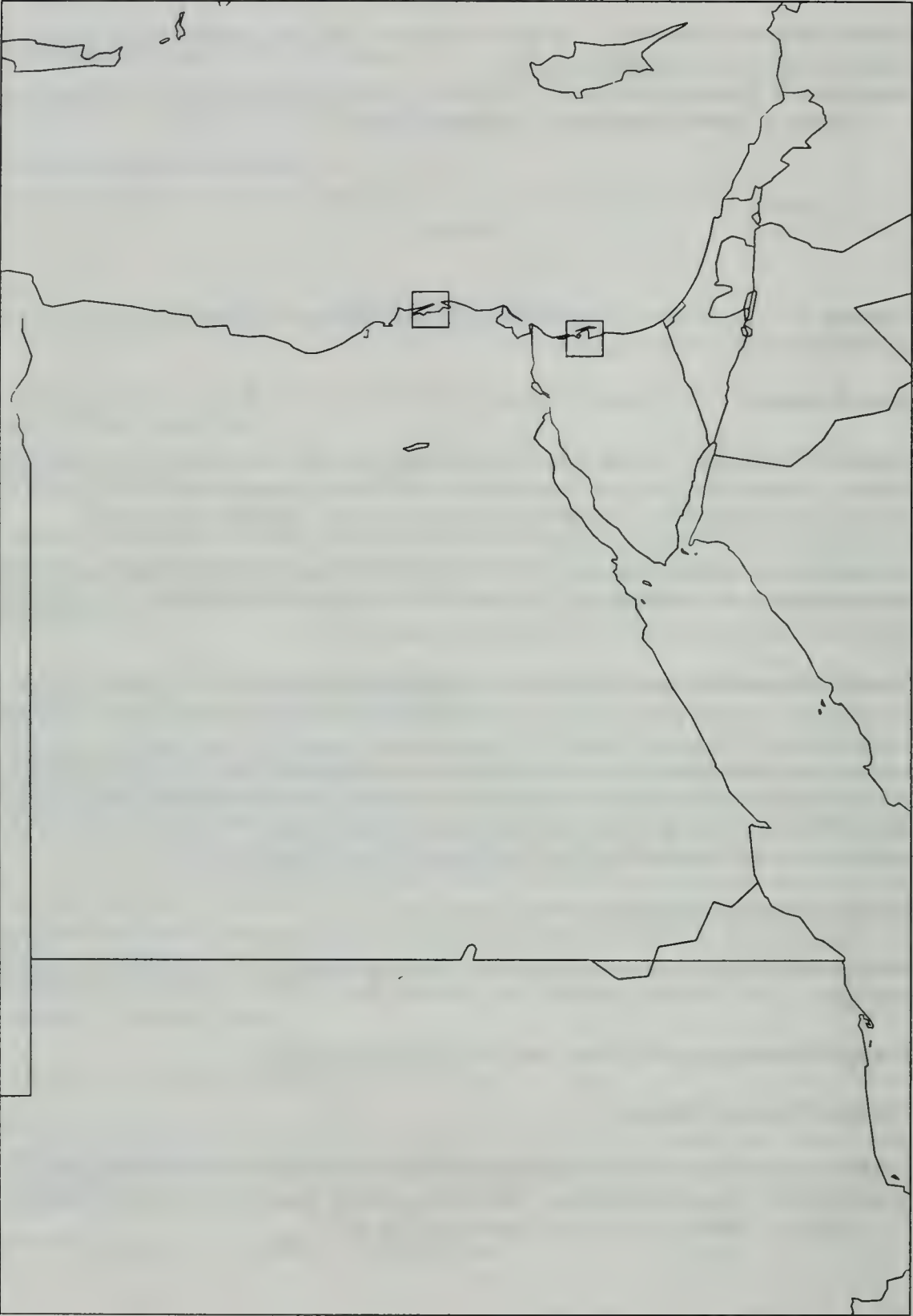
Changes in Ecological Character No information

Management Practices The area is under the control of the National Park Board and has total protection.

Scientific Research and Facilities The area is poorly investigated.

Principal Reference Material

The above information has been supplied by the Greenland Home Rule Government, and:
Anon., (1980). *Greenland Newsletter*. The Commission for Scientific Research in Greenland. Tusarliivik. Krokus Bogtrykkeri, Copenhagen. 32 pp.



Ramsar Sites in Egypt

Egypt

Area 1,002,270 sq.km

Population 53,300,000 (1988 estimate)

Summary of Wetland Situation Egypt's wetlands - and indeed Egypt itself - is dominated by the Nile, in the valley and delta of which the vast majority of the population lives. Control and management of the Nile flood was the basis for development of the great Egyptian civilisation. Rainfall is negligible (25mm per annum in Cairo, 147mm at Alexandria in the Delta) so Nile water supplies are crucial. The only other inland wetlands are the oases. The Red Sea coast is fringed by Quaternary coral reefs and there are extensive mangrove stands.

Over one quarter of all Mediterranean coastal wetlands are situated along the Mediterranean coast of Egypt, mainly in the Nile Delta. The four great delta lakes, Maryut, Idku, Burullus and Manzalah, have always been important for fisheries and agriculture, and were renowned for their wintering waterfowl populations. Over the years, however, there has been sustained contraction of wetland areas due to continuous land reclamation (thus, Lake Burullus, one of Egypt's two Ramsar sites, occupied an area of 58,800ha in 1913 and had decreased to 57,400ha by 1956 and to 46,100ha by 1974). The completion of the Aswan High Dam in 1964 terminated the traditional flood cycle. While the dam allowed Egypt to control water supplies and to produce electricity, some of the ecological effects in the delta, notably salinisation of the soil, coastal erosion and decrease in offshore fish production, have been severe. Other problems which have arisen are spread of the disease bilharzia and choking of waterways by water hyacinth *Eichhornia crassipes*. Although Egypt's wetlands are known to be of great importance for wintering waterfowl, little detailed information on species composition or numbers is available. Surveys are, therefore, being carried out at present, not only in the delta but also in Lake Qarun, where hunting pressure is heavy, and Lake Nasser, behind the Aswan Dam, the wildlife of which is little known. The results of these surveys will be important for management of established protected areas. One of these is Lake Bardawil, the second Ramsar site, in northern Sinai, reputed to be a major site for flamingos. This note is based on information supplied to the Ramsar Bureau by the Egyptian authorities and on the draft Directory of African Wetlands (Mephram, R.H. and J.S, in press).

Protected Areas Legislation The first modern legislative act was the creation of the desert hunting reserve at Wadi Rishrash in 1900 (founded by Prince Kemal el Din). Current interest by the Egyptian authorities in nature conservation was initiated when a delegation attended the 1955 Unesco meeting on nature protection in Beirut. The first protected site was established at El Omayed and was acquired by the University of Alexandria in 1974, although the Israeli authorities had already created a series of reserves in occupied Sinai by the late 1960s (the territory was returned to Egypt in 1979). The presidential decree of 5 March 1980, in expressing concern for environmental matters, established a mechanism for identifying and protecting threatened areas and species through co-operation between provincial governors, the Academy

of Scientific Research and the Ministry of Agriculture. Subsequently, Ministerial Decree No. 472 of 5 May 1982 ensured the prohibition of hunting of all birds and animals in a number of sites in the Sinai.

Law No. 102/83 passed by the People's Assembly on 20 July 1983 provides the legal framework for the establishment of protected areas throughout Egypt. Article 1 defines the natural protectorate, its designation and delineation by prime ministerial decrees upon recommendation of the Environmental Affairs Agency (EAA). Article 2 forbids the committing of actions which would lead to the destruction or deterioration of the natural environment (terrestrial, marine or freshwater), or which would detract from the aesthetic standards found within protected areas. the introduction of non-indigenous species is forbidden. Article 3 covers the activities forbidden in the surroundings of the natural protectorate. Article 4 relates to administrative bodies and the Prime Ministerial Order creating them. Article 5 permits non-governmental organisations and judicial bodies to implement the provision of the laws and decrees concerning the protection of natural resources. Article 6 provides for the establishment of a special fund for use in protected areas. Articles 7 and 8 deal with offences which elicit a fine of 500 to 5,000 LE (Egyptian pounds) and/or imprisonment for one year. Repeated offences are fined at 3,000 to 10,000 LE and the offender will bear the cost of removal or preparations specified by the administrative body. The first national park was established at Ras Mohammed by special Prime Ministerial Decrees Nos. 1067 and 1068 of 1983.

National park legislation allows the Environmental Affairs Agency to prohibit all activities which destroy, damage or in some way deteriorate the natural environment. This restriction covers hunting, fishing, transporting wildlife, killing and disturbance of the fauna and flora, although fishing or hunting may be authorised subject to the term of conditions set by the order). In addition to the national park, other designations are used. Chief amongst the reserve category is the Omayyed protected area which has fenced areas under strict management and control. There are also a number of managed nature reserve sites in the Sinai and on the Mediterranean coast, in areas where grazing and tourism pressure is high. Some protection is further afforded to a number of hunting preserves (cared for by the Shooting Club of Egypt) as well as breeding and re-introduction areas where hunting or fishing is forbidden. Presidential Law No. 101/1985, signed on 3 July 1985, provides financial assistance for pollution prevention and nature conservation in Egypt. Through this law a 10% tax will be levied on all tickets for travel around Egypt. This tax will be used to: 1) develop recreational tourist areas and hotels; 2) develop archaeological sites; and 3) finance pollution prevention and nature conservation projects.

Protected Areas Administration The main administrative body responsible for the enforcement of environmental protection and conservation is the Environmental Affairs Agency (EAA). The EAA was set up by Prime Ministerial decree to be the umbrella body to coordinate all governmental activities pertaining to the environment and conservation in Egypt. It is affiliated to the Council of Ministers and is the competent office for provisions of the law. In 1983 a presidential directive established Environmental Affairs offices in all Governorates of Egypt, following the creation and success of the independently established Wildlife Office in the Governorate of North Sinai in 1981. Each office is managed by an executive council, which meets at least once every six months, and are regulated by an order of the Prime Minister. The Branch Director is nominated by order of the Governor who undertakes the duties of the council's technical secretary.

In 1979, the Egyptian Wildlife Service (EWS) was established under the authority of the Ministry of Agriculture with responsibility for management of protected areas and wildlife research. It was initially staffed by 25 full-time scientists and over 20 rangers, but by 1985, there were less than ten full time staff. The Wildlife Service, operates from Giza Zoological Gardens, although in 1987 it was formally separated from the zoo and six departments created, including those of wildlife programmes and management, research and data, bird migration, wildlife experimentation, licensing and administration. Each protected area has a board which is responsible for managing the site, made up of representatives from the EAA, EWS, Governorate and other officials. Formerly, EWS officers were stationed in protected areas but lack of funds has led to inadequate law enforcement and a lack of surveillance, resulting in widespread illegal hunting and livestock grazing.

The Ministry of Tourism has, under Article 6 of Law 102, established a special fund entitled "the natural protectorate fund". This fund will be used for supplementing the budget of the administrative bodies responsible for implementing the provision of Law 102, for contributions to the improvement in the protection of the environment, for studies and research and finally also for law enforcement.

Sites designated under the Convention Accession on 9 September 1988 with 2 sites listed.

Lake Bardawil
Lake Burullus

Government body responsible for administration of the Convention

Egyptian Wildlife Service, Ministry of Agriculture, Giza Zoological Gardens, Giza

Lake Bardawil

Location 31°03'-31°14'N, 32°40'-33°28'E. Situated on the northern coast of the Sinai Peninsula, between Port Said and El Arish, occupying more than half the length of its Mediterranean coastline.

Area 59,500ha

Degree of Protection The nature reserve was initially founded in 1977 during the Israeli occupation. When the Sinai returned to Egyptian jurisdiction, the site became protected under Ministry of Agriculture Decrees 442 of 1980 and 472 of 1982. It was fully recognised as a protected area in October 1985 by Prime Ministerial Decree No. 1429. The site is state-owned and the hunting of all birds and animals in the area is prohibited. It was designated a Ramsar site on the accession of Egypt to the Convention on 9 September 1988.

Site Description The approximate length of the site is 85km, extending from El Zaranikh in the east to Romana Village in the west, and with a maximum width of 22km. Depth ranges from 30cm to 3m. The lagoon is hypersaline with salinities much higher than the adjacent Mediterranean Sea due to the lack of fresh water entering the system and to the high rate of evaporation. The lake is separated from the Mediterranean by a sand bar, 300m to 1km wide. This barrier

varies in height from a few metres to 60m. When there are strong westerly winds, large sea waves cover the lower parts of the sand causeway and flood the lagoon. The lagoon is connected to the sea by four channels (locally named *bughas*). Two of them (the western (I) and the middle-eastern (II)) are man-made, whilst the others (Bug haz Abu Salah and Bug haz El Zaranikh) are natural. Sea water enters mainly through Bug haz I while the others are mainly outlets. The lagoon contains many small islets, especially in the east at Zaranikh. Other topographical features include salt marshes and mixed dune and sandy seashore habitats. The bottom and the greater part of the shore is sandy. The climate is arid Mediterranean with winter temperatures ranging from 7°C to 20°C. Summer temperatures range from 18°C to 37°C. Annual rainfall averages 80-100mm.

Vegetation on the lake foreshore consists mainly of halophytes, a high number of species being Mediterranean in origin. The lagoon bed is dominated by sea grass *Ruppia spiralis* on which grows *Cladophora* spp. Phytoplankton diversity is poor and is mainly represented by *Synedra* spp. Marsh vegetation includes *Salicornia fruticosa*, *Atriplex halimus*, *Arthrocnemum glaucum* and *Zygophyllum album*. In deep water are also *Suaeda monoica* and *Atriplex halimus*. Fixed sand dune vegetation is represented by *Ammophila arenaria*, *Pancreatium maritimum* and *Crucianella maritima*. The vegetation on the mobile sand dunes is largely of Sahara-Sindic origin and includes *Euphorbia paralias*, *Cyperus conglomeralis*, *Ammophila arenaria*, *Cakile maritima*, *Moltkea callosa* and *Silene succulenta*, while *Juncus subulatus*, *Nitraria tridentata*, *Lycium arabicum*, *Phragmites australis* and *Cynodon dactylon* inhabit depressions between dunes.

The zooplankton of Bardawil is typified by Tinninnids and Copepods, *Acartia clausi*, *A. latisetosa* and *Euterpia acutifrons*. The more abundant fish recorded at Bardawil include gilthead sea-bream *Sparus aurata*, mullet *Mugil cephalus*, sea-bass *Dicentrarchus labrax*, meagre *Argyrosomus regius*, sole *Solea solea* and white grouper *Epinephalus aeneus*.

International and National Importance The site is particularly rich in migrating Palaearctic waterfowl, many of which nest here on passage during autumn and spring. Ducks form over 50% of the migratory birds found at the reserve, the most representative being garganey *Anas querquedula* (96,000 in 1973 to over 221,600 maximum). In autumn, there can be up to 61 species of migrating aquatic birds recorded at Bardawil. There are frequently total counts of up to 165,000 birds. Some of the more notable species include grey heron *Ardea cinerea* (4,300), purple heron *A. purpurea* (7,000) dunlin *Calidris alpina* (1,120), Kentish plover *Charadrius alexandrius* (5,500), little stint *Calidris minuta* (10,260), white pelican *Pelecanus onocrotalus* (550-1,460), white winged black tern *Chlidonias leucopterus* (1,200), great white egret *Egretta alba*, spoonbill *Platalea leucorodia*, glossy ibis *Plegadis falcinellus*, pallid harrier *Circus macrourus*, lanner falcon *Falco biarmicus*, peregrine falcon *F. peregrinus*, corncrake *Crex crex*, Egyptian nightjar *Caprimulgus aegyptius* and avocet *Recurvirostra avosetta* (5,500). Arctic skua *Stercorarius parasiticus* (400), slender-billed gull *Larus genei* (130) and the uncommon slender-billed curlew *Numenius tenuirostris* have also been recorded in some numbers. Greater flamingo *Phoenicopterus ruber* is found at Bardawil all year round (1,500 up to 8000 in 1973). Breeding birds include little tern *Sterna albifrons*, greater sandplover *Charadrius leschenaultii*, avocet, and spur-winged plover *Vanellus spinosus*. These birds breed on the sandy beaches of the lagoon and on the islands. Inland, nesting migratory species include large numbers of short-toed lark *Calandrella cinerea* and also quail *Coturnix coturnix*.

Changes in Ecological Character The most serious threat to Lake Bardawil comes from the construction of the Salam Canal; the area south of Lake Bardawil from Romana in the west to El Arish in the east will be irrigated. Irrigation water may be drained off to Lake Bardawil, but the impact of this on the ecosystem of the Lake is not known. A plan to develop tourist sites on the Mediterranean coast between El Arish and Lake Bardawil has also been worked out by the Governorate of Northern Sinai. Thirty kilometres of tourist villages, hotels and motels are to be built along this stretch of coast. These activities could increase the human disturbance on the lake. Increased fishing may increase disturbance. In autumn along the Mediterranean coast hundreds of thousands of quail and passerine birds are caught by local Bedouins. These traditional activities are of importance to the Bedouins and, although they are regulated by law, violations occur. It has been determined that some 80% of birds arriving from the sea are caught in the nets. Some parts of the lagoon are used for sand extraction which may be damaging to the site.

Management Practices The area is administered by an Executive Council which is charged with: 1) preparing programmes and studies to protect and develop the areas; 2) monitoring environments and their terrestrial and marine fauna and flora, including maintenance of species registers; 3) managing and co-ordinating activities; 4) informing and educating the general public on the views and objectives of establishing protected areas.

Scientific Research and Facilities Regular ornithological surveys were undertaken at the time of Israeli occupation, and there have been regular trips by the Egyptian Wildlife Service to study waterfowl in the Zavanikh area since the return to Egyptian rule. Conservation programmes have been arranged by the Holy Land Conservation Fund and Department of Geography, University of Aberdeen.

Principal Reference Material The above information has been supplied by the Egyptian Government, supplemented by:

- Baldwin, M.F., Ferguson, D., Saterson, K. and Wallen, I.G. (1988).** Draft. The biological resources of the Arab Republic of Egypt, status and recommended conservation needs. US-AID, Cairo, Egypt.
- Carp, E. (1980).** *Directory of wetlands of international importance in the Western Palaearctic.* UNEP/IUCN. 506 pp.
- Meininger, P.L. and Mullié, W.C. (1981).** *Significance of Egyptian wetlands for wintering waterbirds.* The Holy Land Conservation Fund, New York. 111 pp.
- UNEP (1988).** *Directory of marine and coastal protected areas of the Mediterranean region.* UNEP Regional Activity Centre for Specially Protected Areas and IUCN, Tunis.

Additional references:

- Ledant, J.P., Roux, F., Jarry, G., Gammell, A., Smit, C., Barlein, F. and Wille, H. (1985).** Aperçu des zones de grand intérêt pour la conservation des espèces d'oiseaux migrateurs de la communauté en Afrique. Rapport à la Direction Générale de l'Environnement, de la Protection des Consommateurs et de la Sécurité nucléaire de la Commission des Communautés européennes. Contrat U/84/129.
- Petersen, I.B. and Sorenson, U.G. (1980).** Migration studies from the eastern part of the lagoon "Sabkhet el Bardawil" on the north coast of the Sinai Peninsula. Second Danish Ornithological Expedition to Egypt. Report, June, 1980.
- Zu-aretz, S.H. and Paran, Y. (1978).** Autumn migration survey of water birds, Zavanikh, on the northern coast of Sinai. Nature Reserves Authority in Israel. Report.

Lake Burullus

Location 31°23'-31°35'N, 30°32'-31°07'E. Situated along the Mediterranean coast between the two main natural branches (Rosetta and Damietta) of the Nile.

Area 46,200ha

Degree of Protection The site has been proposed as a protected area by the Egyptian Wildlife Service. Burullus is state owned and became a listed Ramsar site on Egypt's accession 9 September 1988.

Site Description Lake Burullus is roughly oval in shape; it runs east-west for about 60km, and its maximum width is 16km. The lake receives water from various sources, and this conditions its chemico-physical characteristics which come from: 1) brackish waters discharged from reclaimed agricultural areas through numerous drains; 2) seawater, through a narrow inlet (Bughas) directly joining the lake and nearby sea; 3) brackish water, through the Birimbab Manial on the west coast, composed of mixed waters (Nile and Mediterranean) in the last stretch of the Rosetta Branch; and 4) rain water in winter. The lake is very different from what it was several decades ago before the construction of the Aswan High Dam, when it used to be subjected to the periodical Nile floods in late summer and autumn. Many factors have contributed to its evolution, the more important of which are: introduction of an irrigation system extended throughout the year; contemporary cessation of the periodical Nile floods; introduction into the lake of massive quantities of agricultural fertilisers and drainage water from vast areas nearby. As a result, the waters of Lake Burullus are at present characterised by decreasing salinity. The lake is separated from the sea by a strip of land covered with sandbars and dunes of varying widths and heights. The strip narrows until it opens into the lake-sea connections at the extreme north-eastern part of the lake. The north-east coast of the lake contains the two main towns of Baltim and El Burg. The bottom of the lake is sandy with silty material in the Bughas area, whereas elsewhere there are clay and mud deposits. At drain mouths there is predominantly black mud.

There are approximately 50 uninhabited islets in the lake, the shores of which are covered with dense vegetation of mainly *Phragmites australis* and *Juncus* spp. The lake-sea connection is sometimes closed in spring, due to the movement and accumulation of beach sands caused by the coastal circulation of seawater in the region of El Bughas under the effect of the prevailing west winds. Burullus is a shallow basin with depths which range from about 2cm along the shores to 1-1.50m in most of the area. Depth increases gradually from east to west and from south to north. Water temperature varies from 11.0°C in February to 29.5°C in August; pH is 8.08-8.72; oxygen content 2.7-11.8mg/l; salinity 0.36-13.5g/l. The Burullus area has the characteristic climate of Lower Egypt, which is mild winters with some rain showers, long hot and dry summers, and heat waves and dust storms in the spring. The annual mean minimum temperature in Rosetta and Baltim is 17°C, while the maximum is 24°C. In Sakha the annual mean minimum is 12.8°C and maximum 27.6°C. Absolute records of minimum temperatures are 0.8°C at Rosetta, 4.0°C at Baltim and 0.01°C at Sakha; while absolute records of maximum temperatures are 39°C at Rosetta, 42°C at Baltim and 46.2°C at Sakha. Annual rainfall is low

in the south of the lake area (Sakha 66mm). It increases in the north-western and north-eastern areas, reaching 160mm at Rosetta and 175mm at Baltim, mainly during winter.

Phytoplankton is dominated by diatoms, varying from 51% to 100% of the total number of organisms determined. Among the diatoms, the species found belong to 32 genera, the most common being *Nitzschia*, *Navicula*, *Melosira* and *Synedra*. Among green algae the most frequent genera were *Pediastrum* and *Scenedesmus*. Blue-green algae appear in greater frequency in the west of the lake. Dinoflagellates (5 genera) were represented in small numbers. Most of the taxa are freshwater forms, with some eurhyaline forms. Aquatic vegetation in the lake is characterised by a small number of abundant species. The main species are: common reed *Phragmites australis*, reed mace *Typha domingensis*, water hyacinth *Eichornia crassipes*, duckweed *Lemna* sp., pond weed *Potamogeton pectinatus* and hornwort *Ceratophyllum demersum*. The aquatic vegetation of Lake Burullus seems to be increasing almost everywhere. This is caused by the increase in nutrients and freshwater discharged into the lake.

The benthos shows a small number of species, as is typical of this type of environment. Twenty-eight species are found, including molluscs, crustaceans, annelids and insects. The most numerous group is that of molluscs (gastropods and bivalves) with 12 species, followed by crustaceans with eight species, annelids with five and insects with three. Approximately 30 species of fish are found in the lake. Species of fish fauna can be divided into four ecological categories: 1) "marine visitors", which include all fish going through their life cycle in the sea, capable of penetrating lake waters in search of food, and limited to the lake-sea connecting area. This category shows numerous families (*Sporidae*, *Sciaenidae*, *Triglidae* and *Soleidae*); 2) Eurhyaline permanent residents, including small fish capable of tolerating large variations of salinity; 3) freshwater "permanent residents", which include small freshwater fish living their biological cycle in lake waters; and 4) the migratory catadromous "transients" include fish that reproduce in the sea and develop in fresh or brackish waters of coastal basins, lagoons and estuaries.

International and National Importance Burullus has to be considered as a wintering area of international importance for wigeon *Anas penelope* (35,600), shoveler *A. clypeata*, pochard *Aythya ferina* (8,300), ferruginous duck *A. nyroca* (6,580), coot *Fulica atra* (153,000) and whiskered tern *Chlidonias hybrida* (17,500), one of the largest concentrations of this species in the world, which makes Lake Burullus one of the most important wintering areas for the whiskered tern breeding in Europe and Western Asia. Up to 42 marsh harrier *Circus aeruginosus* have been recorded and red-throated pipit *Anthus cervinus*, rock pipit *A. spinoletta* and yellow wagtail *Motacilla flava* are reported to be abundant in winter. The total number of waterbirds wintering in Lake Burullus and adjacent marshes may well exceed half a million.

Changes in Ecological Character Land reclamation, especially along the southern and south-eastern periphery of the lake, is the main threat. The area of the lake has been reduced from 58,800ha to 46,200ha and in the future new areas will be reclaimed. The lake is gradually becoming less brackish due to the construction of the Aswan Dam as the Nile flood has been replaced by a continuous supply of freshwater: this restricts the inflow of seawater, causing a change of species within the lake. The site appears not to have the waterbird hunting and catching problems experienced at other delta Lakes, such as Idku and Manzala.

Management Practices The southern shore is to a large extent dominated by commercial salt flats and shallow enclosed basins, which are seasonally opened and closed for the capture and

rearing of fish (hoshas). Fisheries law is enforced by the inland fisheries police force of the Water Area Police. This body is working to enforce the law by operating gradually and taking into account the social context in which it operates. Illegal hoshas, especially those situated on the islands, have been destroyed.

Scientific Research and Facilities A climatical analysis of the lake has been carried out by the state at three meteorological stations: Rasheed, Baltim and Sakha. Baltim is also the site of a hydrobiological research station and has the use of a large sailing boat. An environmental survey was made from May to December 1982 in 25 stations covering the lake. Counts of waterbirds at the lake were done in the winters of 1978/79 and 1979/80 by Meininger and Mullié.

Principal Reference Material The above information has been supplied by the Egyptian government, supplemented by:

Anon (1984). Lake Burullus Area Development Project (First Stage), final report. Arab Republic of Egypt, Ministry of Development, Governorate of Kafr el Sheikh. Ifagravia, Rome, Italy. 197 pp.

Burgis, M.J. and Symoens, J.J. (1987). *African wetlands and shallow water bodies*. Directory. Institut Français de recherche scientifique pour le développement en coopération. Paris. 650 pp.

Ledant, J.P., Roux, F., Jarry, G., Gammell, A., Smit, C., Barlein, F. and Wille, H. (1985). Aperçu des zones de grand intérêt pour la conservation des espèces d'oiseaux migrateurs de la communauté en Afrique. Rapport à la Direction Générale de l'Environnement, de la Protection des Consommateurs et de la Sécurité nucléaire de la Commission des Communautés européennes. Contrat U/84/129.

Finland

Area 360,317 sq.km

Population 4,938,602 (1987)

Summary of Wetland Situation Finland with its long irregular coastline, its archipelagos comprising over 30,000 islands and islets, and its lakes which number approximately 62,000, is extremely rich in waterfowl habitats. Most of them provide suitable breeding sites for Anatidae and waders but some are typical resting and feeding places during the autumn migration (for example the coastal marshes of Bölsvik, Preiviikki and the lake Höystiäinen). The density of breeding pairs of waterfowl is highest on or around small eutrophic lakes but rather lower over the vast peatland areas. It is, therefore, necessary for effective and successful conservation to protect enough of both kinds of wetland complex, those which consist of large numbers of small lakes, and some much larger ones typical of peatland areas.

The section dealing with the Finnish wetlands in the List of Wetlands of Nordic Importance published in 1973, included 42 sites. Of these, thirteen were designated by Finland for listing when it ratified the Ramsar Convention in 1974. They comprise eight sites in the archipelagos in the Gulf of Bothnia and Krunnit also in the Gulf of Bothnia; two coastal marshes (Ruskis and Viikki); and three peatland complexes (Suomijärvi-Patvinsuo, Martimoaapa-Lumiaapa and Loitilaiskaira).

An official working group on peatland preservation has published two reports, the first of which is being acted on by the government. A further working group has made proposals on nationally important eutrophic lakes and sea bays. The Bureau of Natural Resources (Ministry of Agriculture and Forestry) is responsible for making inventories of important wetlands.

Protected Areas Legislation The arrangement of nature reserves in Finland is based on the Nature Protection Act (Decree No. 71/23 February 1923) and its various amendments. This law allows establishment of general and special nature reserves on state-owned land, of which reserves greater than 50ha are established by law and smaller reserves by statute. Nature reserves can be established on private land subject to a decision by the provincial government. General nature reserves established by law are called strict reserves (*luonnonpuisto*), and have been reserved mainly for research work. These will be conserved in their virgin state, and public access is strictly limited. Special nature reserves established by law (national parks or *kansallispuisto*), have been reserved as public natural sites, and represent the most valuable and typical natural landscapes. National parks are for education and recreation, as well as research and nature protection, and the general public usually has free access. Regulations concerning protection in strict reserves and national parks have been given by the nature protection law, and by the statutes and rules and regulations of each park. Nature reserves established by a statute on state-owned or private land vary in size and in their aims of protection.



Ramsar Sites in Finland

Besides nature reserves established by the nature protection law, other protected areas on state-owned land are established by decisions taken by the National Board of Forestry and the Finnish Forest Research Institute. These reserves are: primeval forests (considered as representative examples of virgin nature); special conservation forests (established on grounds of social, scenic or biological values, and which may include fully protected parts, partially managed parts and normally managed parts); peatlands protected from drainage.

Protected Areas Administration Administration and management of parks and reserves is the responsibility of two departments, the National Board of Forestry (Metsähallitus), and the Finnish Forest Research Institute (Metsätutkimuslaitos). These two departments work under the Ministry of Agriculture and Forestry. Although the Forest Research Institute still administers a number of parks and reserves, the main chain of responsibility operates from the Ministry through the National Board of Forestry. The Environmental Protection and Nature Conservation Department within the Ministry of the Environment plays a key role in ensuring cooperation between the various bodies with responsibility for environment and land-use decisions.

Sites designated under the Convention Signature subject to ratification 19 April 1973 with ratification 28 May 1974. 11 sites were listed at ratification.

Aspskär Nature Reserve
 Söderskär Bird Sanctuary/Langoren Nature Reserve
 Björkör Nature Reserve/Lagskär Bird Sanctuary
 Signilskär Bird Sanctuary
 Valassaaret Bird Sanctuary/Björkögrunden Bird Sanctuary
 Krunnit Nature Reserve
 Ruskis Nature Reserve
 Viikki Nature Reserve
 Patvinsuo National Park
 Maartimoaapa - Lumiaapa
 Koitilaiskaira

Government body responsible for administration of the Convention

Ministry of the Environment, Environment Protection and Conservation Department, Ratakagu 3, PO Box 306, 00331 Helsinki

Aspskär Nature Reserve

Location 60°16'N, 26°25'E. Situated offshore in the Gulf of Finland (Baltic Sea), west of Helsinki in southern Finland.

Area 369ha, comprising 27ha land (islands) and 342ha water

Degree of Protection Privately owned and protected as a nature reserve. The Ministry of Agriculture and Forestry in Helsinki is the administrative authority responsible for the implementation of the Ramsar Convention. Designated as a Ramsar site at the time of ratification after 28 May 1974.

Site Description The site comprises a small offshore archipelago centred on Aspskar Island. The islands are mostly treeless with occasional stands of alder *Alnus glutinosa*.

International and National Importance The islands support a rich breeding population of birds including common eider *Somateria mollissima* (45 pairs), tufted duck *Aythya fuligula* (8 pairs), redshank *Tringa totanus* (9 pairs), turnstone *Arenaria interpres* (12 pairs), great black-backed gull *Larus marinus* (2 pairs), lesser black-backed gull *L. fuscus* (70 pairs), herring gull *L. argentatus* (294 pairs), common gull *L. canus* (370 pairs), Arctic tern *Sterna paridisaea* (62 pairs), razorbill *Alca torda* (350 pairs), guillemot *Uria aalge* (20 pairs) and black guillemot *Cephus grylle* (257 pairs) (1979 figures).

Changes in Ecological Character None reported

Management Practices No information

Scientific Research and Facilities No information

Principal Reference Material The above information is taken from:

Haapanen, A. and Rassi, P. (April 1980). Finland National Report. Prepared for the Conference on the conservation of wetlands of international importance especially as waterfowl habitat held at Cagliari, Italy in November 1980. Ministry of Agriculture and Forestry, Helsinki.

Söderskär Bird Sanctuary and Langoren Nature Reserve

Location Söderskär 60°07'N, 25°25'E. Langoren 60°08'N, 25°30'E. Situated offshore in the Gulf of Finland (Baltic Sea), west of Helsinki in southern Finland. Just east of Aspskär Nature Reserve (Ramsar site).

Area 9,632ha: Söderskär 1,382ha and Langoren 8,250ha

Degree of Protection Privately owned. The site comprises the protected sanctuary and nature reserve. Designated as a Ramsar site at the time of ratification after 28 May 1974.

Site Description The two disjunct but jointly designated areas comprise an outer archipelago of islets centred on Söderskär Island, and the Langoren archipelago of 62 islands and islets. The area freezes over in winter, but the Söderskär archipelago is one of the first areas to thaw, making it an important site for large numbers of early spring migrants.

International and National Importance Langoren is the only breeding site in the Gulf of Finland for scaup *Aythya marila*. Large numbers of migrants pass through Söderskär in early spring when the winter ice has thawed. Breeding birds recorded in the area in 1979 include common eider *Somateria mollissima* (1,592 pairs), tufted duck *Aythya fuligula* (17 pairs), red-breasted merganser *Mergus serrator* (19 pairs), other Anatidae (42 pairs), oystercatcher *Haematopus ostralegus* (5 pairs), turnstone *Arenaria interpres* (17 pairs), redshank *Tringa totanus* (6 pairs), ringed plover *Charadrius hiaticula* (2 pairs), great black-backed gull *Larus*

marinus (9 pairs), lesser black-backed gull *L. fuscus* (207 pairs), herring gull *L. argentatus* (394 pairs), common gull *L. canus* (204 pairs), Arctic tern *Sterna paradisaea* (88 pairs), common tern *S. hirundo* (9 pairs), Caspian tern *S. caspia* (1 pair), black guillemot *Cephus grylle* (231 pairs) and 8 species of Passeriformes (95 pairs).

Changes in Ecological Character None reported (1980)

Management Practices No information

Scientific Research and Facilities No information

Principal Reference Material The above information is taken from:

Haapanen, A. and Rassi, P. (1980). Finland National Report. Prepared for the Conference on the conservation of wetlands of international importance especially as waterfowl habitat held at Cagliari, Italy in November 1980. Ministry of Agriculture and Forestry, Helsinki.

Additional references:

Paavolainen, E.P. (1957). Die Vogelfauna des äusseren Scharenhofes im östlichen Teil des Finnischen Meerbusens. *Ann. Zool. Soc.* 18(5): 1-51.

Suomalainen, E. (1979). The Lepidopteran fauna of an isolated island in the outermost archipelago of the Gulf of Finland. *Notulae Entomologicae* 59: 79-88

Björkör Nature Reserve and Lagskär Bird Sanctuary

Location Björkör 59°56'N, 20°10'E. Lagskär 59°50'N, 19°50'E. Situated to the south of Åland Island archipelago in the Gulf of Bothnia (Baltic Sea) between Sweden and south-west Finland.

Area 5,760ha: Björkör 5,300ha and Lagskär 460ha. The designated site is 243ha land and 5,500ha sea.

Degree of Protection Privately owned. The site comprises the protected nature reserve and sanctuary. Designated as a Ramsar site at the time of ratification after 28 May 1974.

Site Description The two disjunct but jointly designated areas comprise two wooded islands with freshwater pools, over 150 islets (mostly treeless) and the surrounding sea area. The outer archipelago of Björkör Reserve supports a particularly rich fauna.

International and National Importance The islands (particularly the outer Björkör archipelago) are an important area for common eider *Somateria mollissima* (500-700 pairs). Other recorded waterfowl include mute swan *Cygnus olor*, greylag goose *Anser anser*, mallard *Anas platyrhynchos*, tufted duck *Aythya fuligula*, scaup *A. marila*, and gulls and terns (Laridae).

Changes in Ecological Character None reported

Management Practices No information

Scientific Research and Facilities There is a bird-ringing station and sanctuary within Lagskar Bird Sanctuary.

Principal Reference Material The above information is taken from:

Haapanen, A. and Rassi, P. (1980). Finland National Report. Prepared for the Conference on the conservation of wetlands of international importance especially as waterfowl habitat held at Cagliari, Italy in November 1980. Ministry of Agriculture and Forestry, Helsinki.

Signilskär Bird Sanctuary

Location 60°09'N, 19°20'-25'E. The archipelago is situated close to the international frontier between south-west Finland and Sweden in the Gulf of Bothnia.

Area 11,600ha

Degree of Protection Privately owned and protected as a reserve since 1927. Designated as a Ramsar site at the time of ratification after 28 May 1974.

Site Description The site comprises an offshore archipelago and surrounding sea centred on Signilskär Island (1.5km long). Most of the 50 islands and islets are treeless.

International and National Importance The islands support a rich waterfowl fauna, including large numbers of common eider *Somateria mollissima*, razorbill *Alca torda*, black guillemot *Cepphus grylle* and gulls (Laridae).

Changes in Ecological Character None reported

Management Practices Managed as a bird sanctuary.

Scientific Research and Facilities The most active bird ringing station in Finland is on Signilskar Island.

Principal Reference Material The above information is taken from:

Haapanen, A. and Rassi, P. (1980). Finland National Report. Prepared for the Conference on the conservation of wetlands of international importance especially as waterfowl habitat held at Cagliari, Italy in November 1980. Ministry of Agriculture and Forestry, Helsinki.

Valassaaret and Björkögrunden Bird Sanctuaries

Location Valassaaret 63°25'-28'N, 21°01'-08'E. Björkögrunden 63°21'-23'N, 21°02'-09'E. Situated in the Gulf of Bothnia (Baltic Sea) off the northwest coast of Vassa Province, western Finland. Near the international frontier with Sweden.

Area 17,700ha, comprising the adjacent sanctuaries of Valassaaret 11,800ha and Björkögrunden 5,900ha.

Degree of Protection Privately owned and protected as bird sanctuaries. Designated as a Ramsar site at the time of ratification after 28 May 1974.

Site Description The site comprises two adjacent island groups separated by shallow open sea. Storskär (the largest island) and numerous islets in the Valassaaret group are gradually increasing in size as the land in the shallow water rises. There are two small settlements on Storskär linked by a track. Björkögrunden comprises a group of small stony islands lying south of Valassaaret.

International and National Importance The sanctuaries are focal points on the migration route through the Gulf of Bothnia. They also support a large breeding population of birds with over 3,300 pairs of 30 species recorded in 1962 in Valassaaret sanctuary, including tufted duck *Aythya fuligula*, greater scaup *A. marila*, velvet scoter *Melanitta fusca*, red-breasted merganser *Mergus serrator*, ruddy turnstone *Arenaria interpres*, redshank *Tringa totanus*, lesser black-backed gull *Larus fuscus*, common gull *L. canus* and Caspian tern *Sterna caspia*. The area is also of important botanical interest.

Changes in Ecological Character None reported

Management Practices Managed as bird sanctuaries.

Scientific Research and Facilities There is a bird observatory.

Principal Reference Material The above information is taken from:

Haapanen, A. and Rassi, P. (1980). Finland National Report. Prepared for the Conference on the conservation of wetlands of international importance especially as waterfowl habitat held at Cagliari, Italy in November 1980. Ministry of Agriculture and Forestry, Helsinki.

Additional references:

Hildén, O. (1964). Ecology of duck populations in the island group of Valassaaret, Gulf of Bothnia. *Ann. Zool. Fenn.* 1: 153-277.

Hildén, O. (1966). Changes in bird fauna of Valassaaret, Gulf of Bothnia during recent decades. *Ann. Zool. Fenn.*

Krunnit Nature Reserve

Location 65°21'-26'N, 24°25'-25°09'E. Situated in the extreme northeast of the Gulf of Bothnia (Baltic Sea) off the north-west coast of Oulu Province, west central Finland.

Area 4,600ha, comprising four disjunct island groups

Degree of Protection Privately owned and protected as a nature reserve. Designated as a Ramsar site at the time of ratification after 28 May 1974.

Site Description The site comprises four disjunct offshore island groups with 7 large islands including Mcakrunni, Ristikori and Ulkokrunni and 15 small morainic islands.

International and National Importance The islands support an abundant population of breeding waterfowl with 1,100 pairs of 33 species in 1963 including greylag goose *Anser anser*, mallard *Anas platyrhynchos*, tufted duck *Aythya fuligula*, scaup *A. marila*, red-breasted merganser *Mergus serrator*, ringed plover *Charadrius hiaticula*, Temminck's stint *Calidris temminckii*, redshank *Tringa totanus*, lesser black-backed gull *Larus fuscus*, common gull *L. canus*, Caspian tern *Sterna caspia* (100 pairs), common tern *S. hirundo* and Arctic tern *S. paradisaea*. The islands also show important botanical successions.

Changes in Ecological Character None reported (1980)

Management Practices Managed as a nature reserve.

Scientific Research and Facilities Several research projects on the waterfowl population have been conducted in the reserve.

Principal Reference Material The above information is taken from:

Haapanen, A. and Rassi, P. (1980). Finland National Report. Prepared for the Conference on the conservation of wetlands of international importance especially as waterfowl habitat held at Cagliari, Italy in November 1980. Ministry of Agriculture and Forestry, Helsinki.

Additional references:

Vaisanen, R.A. and Jarvinen, O. (1977a). Quantitative structure and primary succession of bird communities in a Finnish archipelago. *Ornis Scand.* 8: 47-60.

Vaisanen, R.A. and Jarvinen, O. (1977b). Dynamics of protected bird communities in a Finnish archipelago. *J. Anim. Ecol.* 46: 891-908.

Ruskis Nature Reserve

Location 60°22'N, 25°40'E. Situated in a river estuary on the Gulf of Finland (Baltic Sea), east of Helsinki, in Uusimaa Province, southern Finland.

Area 235ha

Degree of Protection Privately owned and protected as a nature reserve. Designated as a Ramsar site at the time of ratification after 28 May 1974.

Site Description The site comprises the inshore island of Svino and surrounding marshlands in the mouth of the river. The coastal marsh is predominantly reedbeds of *Phragmites communis*. The island is linked by a road causeway to Borga and there are several settlements on the mainland estuary shore near the reserve.

International and National Importance The island and marshes are an important resting station for migrating waterfowl. Breeding birds include great-crested grebe *Podiceps cristatus*

(50 pairs), Eurasian bittern *Botaurus stellaris*, mallard *Anas platyrhynchos* (30-35 pairs), common pochard *Aythya ferina* (22-24 pairs), tufted duck *A. fuligula* (25 pairs), coot *Fulica atra* (30-35 pairs), black-headed gull *Larus ridibundus* and marsh harrier *Circus aeruginosus*.

Changes in Ecological Character None reported

Management Practices Managed as a nature reserve.

Scientific Research and Facilities No information

Principal Reference Material The above information is taken from:

Haapanen, A. and Rassi, P. (1980). Finland National Report. Prepared for the Conference on the conservation of wetlands of international importance especially as waterfowl habitat held at Cagliari, Italy in November 1980. Ministry of Agriculture and Forestry, Helsinki.

Viikki Nature Reserve

Location 60°13'N, 25°00'E. Situated just north-east of Helsinki in the Vantaa river mouth on the Gulf of Finland (Baltic Sea), southern Uusimma Province.

Area 247ha

Degree of Protection Privately owned and protected as a nature reserve. Designated as a Ramsar site at the time of ratification after 28 May 1974.

Site Description The site comprises a small island (Lammassaari Farholmen), associated marshlands, and the shallow estuarine waters of the coastal inlet. The marshlands are supplied with freshwater by the Vantaa and another river, and are dominated by *Phragmites communis* reedbeds. The north-west boundary is defined by a major motorway.

International and National Importance The coastal wetland supports a large population of breeding birds with 4,663 pairs of 21 species in 1964, including black-headed gull *Larus ridibundus* (4,200 pairs in 1964: the largest colony in Finland), great crested grebe *Podiceps cristatus*, mallard *Anas platyrhynchos* and sedge warbler *Acrocephalus schoenobaenus*.

Changes in Ecological Character The reserve is surrounded by the densely populated suburbs of Helsinki along the shoreline, and there is a possible threat of water pollution in the wetland resulting from inflow of polluted water from the two major rivers.

Management Practices Managed as a nature reserve.

Scientific Research and Facilities There is a scientific station on the island.

Principal Reference Material The above information is taken from:

Haapanen, A. and Rassi, P. (1980). Finland National Report. Prepared for the Conference on the conservation of wetlands of international importance especially as waterfowl habitat held at Cagliari, Italy in November 1980. Ministry of Agriculture and Forestry, Helsinki.

Additional references:

Eriksson, K. (1966). Gammelstadviken och des fagelfauna under den senaste tiden. *Nordenskioldsamfundets tidskrift* 26: 27-39.

Patvinsuo National Park

Location 63°05'N, 30°35'E. Situated on the north shore of Koitere Lake which is part of the inland lake complex in Pohjois-Karjala Province, south-west Finland, near the USSR frontier.

Area 9,400ha

Degree of Protection Privately owned. The designated site includes Patvinsuo State Nature Reserve (8,800ha) established in 1966. Designated as a Ramsar site at the time of ratification after 28 May 1974.

Site Description The site comprises a large peatland area with fenlands, raised bogs and small brackish pools, centred around the oligotrophic Suomujarvi Lake. A river runs through the area draining into the larger Koitere Lake.

International and National Importance The wetland is an important breeding site for waterfowl including whooper swan *Cygnus cygnus*, bean goose *Anser fabalis*, pintail *Anas acuta*, smew *Mergus albellus*, crane *Grus grus*, broad-billed sandpiper *Limicola falcinellus* and jack snipe *Lymanocryptes minimus*. Other breeding birds include osprey *Pandion haliaetus*, golden eagle *Aquila chrysaetos* and eagle owl *Bubo bubo*. Large numbers of stopover migrants include white-fronted goose *Anser albifrons*, barnacle goose *Branta leucopsis* and brent goose *B. bernicla*.

Changes in Ecological Character None reported (1980)

Management Practices 8,800ha managed as a nature reserve.

Scientific Research and Facilities No information

Principal Reference Material The above information is taken from:

Haapanen, A. and Rassi, P. (1980). Finland National Report. Prepared for the Conference on the conservation of wetlands of international importance especially as waterfowl habitat held at Cagliari, Italy in November 1980. Ministry of Agriculture and Forestry, Helsinki.

Martimoaapa-Lumiaapa

Location 65°49'N, 25°15'E. Situated north of the road from Alaniema to the coastal town of Simo in southern Lappi Province. Alaneima is located near the western boundary.

Area 7,400ha

Degree of Protection State owned and protected as a nature reserve. Designated as a Ramsar site at the time of ratification after 28 May 1974.

Site Description The site comprises fenland interspersed with small lakes, pools and streams.

International and National Importance The site is an important breeding site for birds with 500 pairs of 21 species recorded in 1977, including red-throated diver *Gavia stellata*, Arctic diver *G. arctica*, Slavonian grebe *Pociceps auritus*, bean goose *Anser fabalis* (10 pairs, pintail *Anas acuta*, garganey *A. querquedula*, crane *Grus grus*, broad-billed sandpiper *Limicola falcinellus*, spotted redshank *Tringa erythropus*, Jack snipe *Lymanocryptes minimus*, red-necked phalarope *Phalaropus lobatus*, herring gull *Larus argentatus* and great black-backed gull *L. marinus*. Peregrine falcon *Falco peregrinus* is also reported as breeding in the area.

Changes in Ecological Character None reported

Management Practices No information

Scientific Research and Facilities Population dynamics of breeding birds were studied in 1976/77.

Principal Reference Material The above information is taken from:

Haapanen, A. and Rassi, P. (1980). Finland National Report. Prepared for the Conference on the conservation of wetlands of international importance especially as waterfowl habitat held at Cagliari, Italy in November 1980. Ministry of Agriculture and Forestry, Helsinki.

Additional references:

Vaisanen, R.A. and Jarvinen, O. (1977). Structure and fluctuation of breeding fauna of a north Finnish peatland area. *Ornis Fennica* 54: 143-153.

Koiti-laiskaira

Location 67°40'-50'N, 26°50'-27°41'E. Situated southwest of Lake Tekojarvi in Lappi Province, north-east Finland, near the USSR frontier.

Area 34,400ha

Degree of Protection State owned. The wetland was defined in 1980 as a temporary reserve with plans to upgrade to strict nature reserve status. Designated as a Ramsar site at the time of ratification after 28 May 1974.

Site Description Over 60% of the site is covered with peatlands, interspersed with small streams and ponds. The remaining area is covered with developed forest with subalpine birch *Betula* sp. stands on higher ground. The site is drained by the LUIRO River to the south, tributaries of the Kemijoki to the west and numerous small channels flowing into nearby Tekojärvi Lake.

International and National Importance The site is an important breeding site for waterfowl with 5,000-6,000 pairs of 39 species recorded in 1979, including whooper swan *Cygnus cygnus*, bean goose *Anser fabalis*, common scoter *Melanitta nigra*, velvet scoter *M. fusca*, smew *Mergus albellus*, ruff *Philomachus pugnax*, spotted redshank *Tringa erythropus*, wood sandpiper *T. glareola*, Jack snipe *Lymnocyptes minimus*, red-necked phalarope *Phalaropus lobatus* and black-headed gull *Larus ridibundus* (perhaps the northern-most colony in Finland).

Changes in Ecological Character None reported

Management Practices Managed as a temporary reserve.

Scientific Research and Facilities Several bird population studies have been carried out in the wetland.

Principal Reference Material The above information is taken from:

Haapanen, A. and Rassi, P. (1980). Finland National Report. Prepared for the Conference on the conservation of wetlands of international importance especially as waterfowl habitat held at Cagliari, Italy in November 1980. Ministry of Agriculture and Forestry, Helsinki.

Additional references:

Haapanen, A., Ulmanen, I. and Valste, J. (1966). Observations on the bird fauna in Koitilaiskaira. *Ornis Fenn* 43: 45-54.

Haapanen, A. and Nilsson, L. (1977). Breeding waterfowl populations in northern Fennoscandia. *Ornis Scand.* 10: 145-219.

France

Area 543,965 sq.km

Population 55,854,000 (1988 estimate)

Summary of Wetland Situation The wetlands of the Atlantic coast are on one of the main migration routes of Palaearctic waterfowl. The shallow bays and estuaries, with extensive mudflats exposed at high tide, offer excellent feeding and roosting sites for large numbers of wildfowl and waders, and the marshes which often occur inland of these estuaries provide essential night feeding areas for surface feeding ducks which roost on the sea or mudflats during the day. Along the Pas de Calais and Normandy coasts the Baies de l'Authie, de la Canche and de Veys have lost much of their importance over recent decades as a result of dyke building, sand sedimentation and drainage of most of the inland marshes, as well as heavy hunting pressure. However, in the Baie de la Somme the creation of a reserve has caused the wintering population of several species to increase. The Baie de Mont St Michel supports substantial numbers of waders (January counts average about 140,000). The Baie de St Brieuc is also of international importance since at times it supports over 20,000 waders. Another site, the Rade de Brest, is apparently the major wintering area in France for red-breasted merganser *Mergus serrator* (500-900).

In the Bay of Biscay, the Golfe de Morbihan is of exceptional value as it harbours about 70% of the population of brent goose *Branta bernicla* wintering in France (about 25% of the world population). Most of the bays and estuaries in the north and west support flocks of brent geese in smaller numbers, and the total number wintering in France is estimated to be about 40,000. The Golfe de Morbihan is also of major importance for wintering wigeon *Anas penelope* (1,200-35,000) and pintail *A. acuta* (500-2,000), and in January the average number of waders is around 45,700. Several sites in the Loire estuary are important day roosting sites for ducks *Anas* and *Aythya* spp., and the Lac de Lieu at the upper end of the estuary, which is privately owned, contains the largest breeding colony in France of grey heron *Ardea cinerea* (although numbers were considerably reduced in 1974 to 300 pairs from a former total of about 1,000). This area is now under serious threat from plans for industrial and port development.

Further south the Marais d'Olonne has the only colony of avocet *Recurvirostra avosetta* in western France, and the Baie de l'Aiguillon and Marais de Vendée form one of the most important wintering areas on the Atlantic coast for several species of Anatidae. The associated mudflats offer excellent feeding grounds for thousands of waders including 3,000-4,000 avocet. The mudflats of the Fier d'Ars and the Anse de Fouras near the Ile de Ré are important for brent geese and several *Anas* species, but the large estuary of the Gironde provides little suitable wader habitat as there are no high tide roosting sites and hunting pressure is reported to be very high. Numbers of wintering waterfowl have increased considerably in the Bassin d'Arcachon with the creation of several reserves. Dunlin *Calidris alpina* occur in large numbers (up to 220,000)

and some 2500 brent geese winter. Since becoming a reserve, the Banc d'Arguin, at the mouth of the Bassin, has become the site of a colony of 3,000 pairs of sandwich tern *Sterna sandvicensis*.

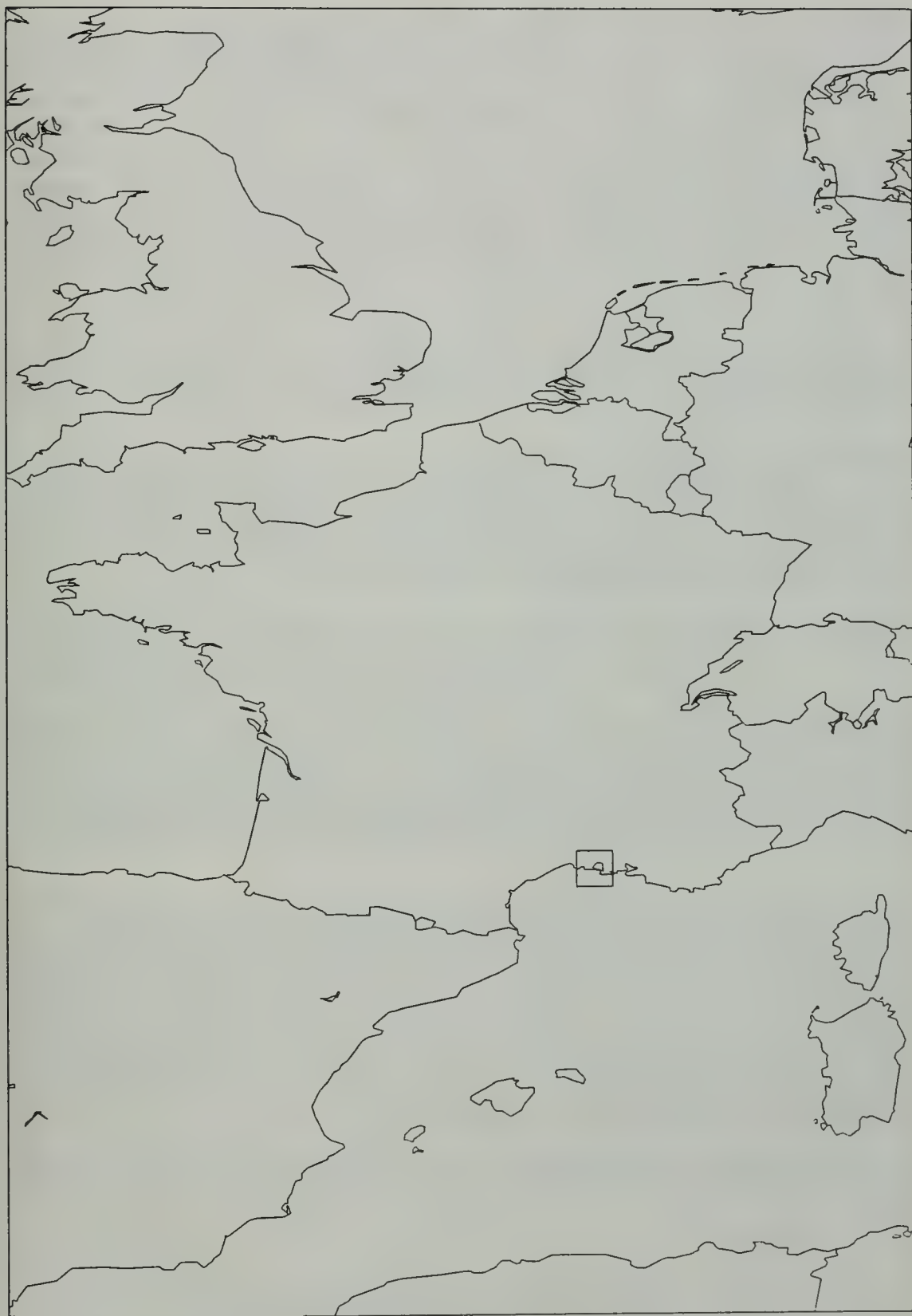
On the Mediterranean coast, the Camargue is of major importance for breeding, migrating and wintering waterfowl and waders, and is largely contained in a natural park with some areas included in nature reserves. Inland, the most important areas for waterfowl are in the Rhine valley, along the shores of Lake Geneva, in pond areas of the Sologne region, la Brenne and les Dombes, the latter being important for breeding Ardeidae and for migrating birds of many kinds. On Corsica, the Etang de Biguglia harbours internationally important numbers of waterfowl and waders in winter, and the rare Audouin's gull *Larus audouinii* nests on several islets off the coast.

Protected Areas Legislation The general framework for establishing national parks is provided by Act No. 60.708 of 22 July 1960 and its enforcement order, No. 61.1195 of 31 October 1961. Article 2 of the 1960 Law was vaguely worded which resulted in flexible application of its protective measures from one national park to another. Each national park is created by a special law which is a long and complex process. Protection is a priority criterion in the creation of national parks, which by definition "safeguard a finite part of the national territory from human interference, in order to preserve its original beauty and conserve its biological assets".

Numerous laws dating back a long time are applicable to the creation of nature reserves. The first text to provide a real definition of a nature reserve was the Nature Conservation Act of 10 July 1976 Act No. 76 629. The enabling decree followed on 25 November 1977. The 1976 law allowed the establishment of new categories of nature reserves (geological, minerological, marine and botanical gardens) and covered seven aspects of their application. Areas declared before 1976 are covered by the Act of 7 July 1957, and 'reserves' can also be created on orders of the Ministry of Transport, but these need renewing every two years. Voluntary nature reserves are covered by Article 24 of the 1976 law, and regulated by Articles 17-25 of the Decree No. 77-1298 of 25 November 1977. Nature reserves are sometimes established on local initiatives, with the Ministry of the Environment giving approval and thus creating an agreement of a contractual nature.

The idea of regional natural parks was advanced in the early 1960s by DATAR, an agency responsible for establishing regional planning policy. The criteria for establishment and designation of areas was set out in Decree No. 67-158 of 1 March 1967 and updated by Decree No. 75-983 of 24 October 1975. Since administrative 'regions' had not yet been set up between 1967 and 1975, regional natural park creation depended upon a ministerial decree, although the state assumed less than half of the operating and investment costs. Post 1975 they are created on the initiative of the local population, the local authorities, trade and industry, and regional associations.

Other protection types include hunting reserves, where shooting may or may not be permitted; game reserves, where hunting is considerably reduced; biogenetic reserves; buffer zones, existing around national parks, and a number of large towns and reserves to preserve terrains against building and exploitation; and scenic zones, where there are restrictions on buildings for aesthetic and architectural reasons. The Nature Conservation Act 1976 protects all rare, endangered, noteworthy or declining plant and animal species, and in addition all large game animals are also protected in national hunting reserves.



Ramsar Sites in France

Special and specific legislation governing marine reserves and parks does not exist. Marine environmental protection relies on a whole series of legal instruments governing the occupation and utilization of the maritime public domain (for fishing, mining, sea transport, industrial pollutant discharge, etc.). Protective fisheries can be set up by permit or lease of occupation of the marine public domain on the basis of Decrees of 9 January 1852 and 21 December 1915. They are renewable every 25 years (non-mobile establishment) and five years (mobile establishment); fishery preserves are governed by Ministerial Decree of 4 June 1963, and their establishment or abolition is decided by the Maritime Affairs Department, usually taking into account users' opinions. Marine nature parks may be created by a legal management body which can be a foundation, a departmental administration, a joint syndicate, or an association subject to the 1901 Act. The Decree of 24 October 1975 has no provision for including a marine element, and where this is included it is only covered by a general law. In such cases nature reserves have to be created under the 1976 Act. Coastland protection is possible under the Act of 10 July 1976, whilst the Coastland and Lake Shore Conservancy exist mainly for the purchase of natural coastland areas, whilst hunting in coastal zones is authorised by the Navy.

Protected Areas Administration Administrative responsibility for nature conservation rests with the Ministry of the Environment, in which there are a number of 'Directions' advised by a National Nature Conservation Council and by the Ministry's General Secretariat of the Environment Committee. The Direction of Nature Conservation is divided into three offices dealing with Hunting, Fisheries and Hydrobiology, and Parks and Reserves.

The office dealing with parks and reserves acts as a coordinating body for the establishment and management of national parks and nature reserves. It is responsible for all decisions not taken locally, for the supervision of reserves, for implementing agreements concluded between the Ministry and the managing body and for producing reports on new areas. By a Decree of 25 November 1977 concerning the National Council for the Protection of Nature, its powers were increased and its composition was modified to reflect its more important role. It is advised by the National Nature Conservation Council which meets four times a year on average at the request of the Direction of Nature Conservation. Each national park has a Board of Directors with the total membership fixed by decree.

Responsibility for administering Regional Nature Parks, and for other rural development issues, rests with another Direction at the Ministry, while the Ministry of Regional Planning has responsibility for land-use planning and is closely concerned in the elaboration of the 'zone périphérique' of national parks. In other areas, the 'Conservatoire du littoral français', a public institution, works to safeguard sea and lake shores from urbanisation through acquisition. The management of Coastland and Lakeshore Conservancy lands is mainly a prohibitive activity, whilst protective fisheries management is entrusted to a private body, such as a fisherman's guild or an association founded in accordance with the 1901 Act.

Sites designated under the Convention Entry into force (ratification) on 1 October 1986 with one site listed at ratification.

La Camargue

Government body responsible for administration of the Convention

Direction de la Protection de la Nature, Ministère de l'Environnement, 14 Bd du Général-Leclerc, F-92524 Neuilly-sur-Seine Cedex

La Camargue

Location 43°16'-43°44'N, 4°14'-4°50'E. In the delta of the river Rhône, which divides just north of Arles into the Grand Rhône and Petit Rhône, between which lies the Camargue; bounded to the south by the Mediterranean Sea, in the Department of Bouches-du-Rhône.

Area 85,000ha

Degree of Protection The Réserve Nationale de Camargue on the Etang de Vaccarès (13,117ha) was formed in 1928; it is state owned and financed but managed by a private organisation, the Société Nationale de Protection de la Nature. This reserve was accepted as a biosphere reserve in January 1977. The Réserve des Impériaux (2,777ha) is a departmental reserve, bought from the state in 1964 by the commune of Les Saintes-Maries-de-la-Mer. Tour du Valat (1,070ha) has been a private reserve since the early 1950s, managed since 1978 by the 'Fondation Sansouire', a public service foundation under French law. The Parc Naturel Régional (85,000ha) which was created in 1972 to preserve the equilibrium between human activities and the natural environment, includes the above three reserves. Much of the area outside the reserves is privately owned. The whole area was listed as a Ramsar site on ratification in October 1986. 13,702ha are designated as an EC special protection area (SPA). There is also a Mediterranean specially protected area under the terms of the Barcelona Convention.

Along the coastline of the Impériaux and Etang de Vaccarès reserves there is a hunting reserve including waters up to 2km from the shore, and the perimeter of the Parc Naturel Régional includes French territorial waters up to about 22km offshore. This area is not, however, included in the Ramsar site. There is integral protection for all native flora and fauna within the Etang de Vaccarès reserve and in two small areas adjoining it to the east.

Site Description The site includes an extensive area of delta between the two main distributaries of the Rhône, which is extremely flat and low-lying (0-4.5m), and includes a variety of natural and man-made habitats. Much of the delta is composed of very fine alluvial deposits, although there is a remnant of former coastal dunes of marine origin, the Bois de Rièges, just to the south of the Etang de Vaccarès. The whole coastline is lined by nearly 100km of sand dunes, broken only in a few places. The central part of the delta consists of a network of lagoons, the largest being the Etang de Vaccarès, which is only slightly brackish. Between these lagoons and the sea, the water is brackish, while the lagoons along the coastline are saltwater, becoming more saline than the Mediterranean itself in summer (or even drying out completely), due to high evaporation rates. In the south-east, about 10,000ha of pans have been turned to commercial salt production. Water levels in the lagoons vary considerably throughout the year and in winter about 95% of the Réserve Nationale is flooded but in summer this falls to 60% due to high evaporation rates and low summer rainfall. The mean monthly temperature varies from 23°C in July to 6°C in January, and average annual rainfall is only 500mm. Most months are very windy, and for six months of the year are dominated by the Mistral, a dry wind from the north-east which increases evaporation rates considerably.

Salt pans which dry out completely are unvegetated, but in other areas there is a complete range of plant successions with much of the vegetation in areas nearer the coast being salt tolerant to some degree. The dominant sand dune vegetation is marram grass *Ammophila arenaria* and sea medick *Medicago marina*. Behind these is low-lying salt steppe or 'sansouire' sparsely covered with glasswort *Arthrocnemum glaucum* interspersed with brackish lakes which, apart from algae, only support submerged tassel pondweed *Ruppia maritima*. Further inland the steppes have a denser cover of the glasswort *Salicornia fruticosa*, and these areas are often flooded in winter. This area is important for a variety of nesting birds including greater flamingo *Phoenicopterus ruber*. In the slightly saline waters of the northern part of the Etang de Vaccarès grow plants such as pondweeds *Potamogeton* spp., reeds *Phragmites communis*, bulrushes *Scirpus* spp. and water buttercups. On the Bois de Rièges juniper *Juniperus phoenicia* and *Pistacia lentiscus* predominate.

The upper sansouire is much dryer and has a dry grass community dominated by sea lavender *Limonium* spp., a false-brome grass *Brachypodium phoenicoides* and mock privet *Phillyrea angustifolia*. This is the chief area where cattle and semi-wild horses are grazed, plus sheep in winter on higher ground. Much of the land has been converted to rice-growing which involves flooding it in summer, and the area is covered with a dense network of canals. However, the habitat is of greatest importance for waterfowl as there are a number of freshwater lakes and marshes with submerged vegetation of water milfoil *Myriophyllum spicatum*, fennel pondweed *Potamogeton pectinatus* and tassel pondweed *Ruppia spiralis* in more brackish waters. Many of these are fringed with rushes *Scirpus* spp. and reeds *Phragmites* spp. which are important for a number of nesting birds. Along the banks of the Rhône there is a strip of luxuriant deciduous forest, frequently flooded, made up of species such as willows *Salix alba*, white poplar *Populus alba*, elm *Ulmus* sp., alder *Alnus glutinosa* and ash *Fraxinus oxycarpa*. Along some of the drainage canals, particularly those which follow former courses of the Rhône, are lesser strips of woodland. A number of interesting non-wetland species are also found here, including European bee-eater *Merops apiaster*, common roller *Coracias garrulus*, and great spotted cuckoo *Clamator glandarius*, all three of which breed and usually have a more southerly range in Europe; also breeding are penduline tit *Remiz pendulinus*, beaver *Castor fiber* and wild boar *Sus scrofa*.

International and National Importance The Camargue is important for thousands of wintering, breeding and migrating birds as it is on the migration route between Europe and North Africa of many species, and has a relatively mild climate due to its sotherly position. It is the only regular breeding place in Europe and North Africa for greater flamingo *Phoenicopterus ruber* (6,000-13,000 pairs), and the only breeding place in France for several other species: gull-billed tern *Gelochelidon nilotica* (250-300 pairs), pratincole *Glareola pratincola* (150-200 pairs), cattle egret *Bulbulcus ibis* (50-300 pairs) and squacco heron *Ardeola ralloides*. Other nesting birds include bittern *Botaurus stellaris* (50 pairs), night heron *Nycticorax nycticorax* (300 pairs), little egret *Egretta garzetta* (1,000 pairs), purple heron *Ardea purpurea* (400 pairs), red-crested pochard *Netta rufina* (200-300 pairs), marsh harrier *Circus aeruginosus* (50 pairs), black-winged stilt *Himantopus himantopus* (500+ pairs) and several hundred pairs of avocet *Recurvirostra avosetta*, of which a few overwinter. At least 30 species of Anatidae occur; about 200,000 ducks overwinter including over 50,000 mallard *Anas platyrhynchos* (of which some also breed), gadwall *A. strepera* (average 8,000), wigeon *A. penelope* (average 14,000), pintail *A. acuta* (average 3,300), teal *A. crecca* (average 45,000) and shoveler *A. clypeata* (average 12,000). Large numbers of waterfowl pass through on autumn and spring migration, including thousands of garganey *A. querquedula*, many ringed plover *Charadrius hiaticula*, little ringed

plover *C. dubius*, Kentish plover *C. alexandrinus*, little stint *Calidris minuta*, ruff *Philomachus pugnax* (a thousand on passage), black-tailed godwit *Limosa limosa* (thousands on passage) and wood sandpiper *Tringa glareola*. Eight species of gull occur, including thousands of pairs of breeding black-headed gull *Larus ridibundus* and hundreds of pairs of breeding herring gull *L. argentatus*. Ten species of tern include six which breed, particularly on islands in the lagoons. Black tern *Chlidonias niger* is especially numerous on passage. Common crane *Grus grus* visit occasionally in winter.

Changes in Ecological Character Changes to the natural and semi-natural environment are continuing, despite the policy to limit agricultural intensification and preserve traditional land uses. Traditional farming has become unprofitable, and alternative land uses do not often benefit wildlife; altering water levels has destroyed shoreline habitat and fish farming has made some pools too deep for many birds to feed in; shooting continues to be a problem and the closed season is not respected. Unexplained changes in bird numbers may be due to increases in pollution; although the waters of the Rhône do not directly enter the Camargue except through irrigation channels and the wild part of the Camargue is mainly rain-fed, some areas have high sulphate levels. Tourism is increasing and the coastal areas in particular are of concern.

Management Practices Access to Etang de Vaccarès Reserve is prohibited except by permit to persons proving membership of a scientific research or nature preservation body. The only habitations are the two wardens' lodges. Shooting, grazing and salt extraction are not allowed. In Impériaux Reserve access is generally prohibited and no hunting occurs. A few professional fishermen from Les-Saintes-Maries are allowed to fish. The 25,000ha surrounding these reserves is intended to be maintained, by agreements with landowners, as a buffer between the inner areas (which are most important for waterfowl breeding), and the peripheral agricultural lands. There is also emphasis on protecting the coastline. In the park as a whole policies include limiting the spread of commercial salt pans and rice-growing, subsidising traditional land uses such as horse and cattle open grazing, diverting drainage from agricultural lands into the Rhône rather than into the Etang de Vaccarès, controlling shooting (only allowed from 15 August to end February), and organising tourism so as to cause minimum damage to the environment. Special management has been necessary since a dry winter in North Africa (1977) caused many more flamingos to winter here; farmers at first shot them, but now bird scaring devices are set off throughout the evening to discourage night feeding in the ricefields (the main conflict). The carrying capacity for breeding flamingos has also been increased by creating artificial nesting islands from clay and mud; previously many nest-islands had suffered from erosion since the birds remove the vegetation before nesting. In the whole area covered by the park, as well as in an area to the north-west enclosed by the Canal du Rhône à Sète, four months' notification must be given to the administration of any modification to the landscape.

Scientific Research and Facilities Research has been carried out since 1954 by the Station Biologique de la Tour du Valat, at first privately, but now organised by the Centre Nationale de la Recherche Scientifique (CNRS) which has also run the Centre d'Ecologie de la Camargue since 1970. There are two main branches of research: pure analysis of the functioning of ecosystems; and applied studies, investigating the effects of human modification and comparing this with the most natural environments.

Principal Reference Material The above was taken from documents supplied by the French Government at the time of designation and the following:

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN: Gland, Switzerland. 506 pp.

IUCN (1984). Study and management in Camargue Nature Reserve. *Parks* 9(3/4):4-7.

Weber, K. and Hoffman, L. (1970). *Camargue*. Kümmerley and Frey, Berne.

Supplemented by:

Britton, R.H. and Podlejski, V.D. (1981). Inventory and classification of the Wetlands of the Camargue (France). *Aquatic Botany* 10:195-228.

Hoffmann, L. (1958). An ecological sketch of the Camargue. *British Birds* 51:321-349.

Gabon

Area 267,667 sq. km

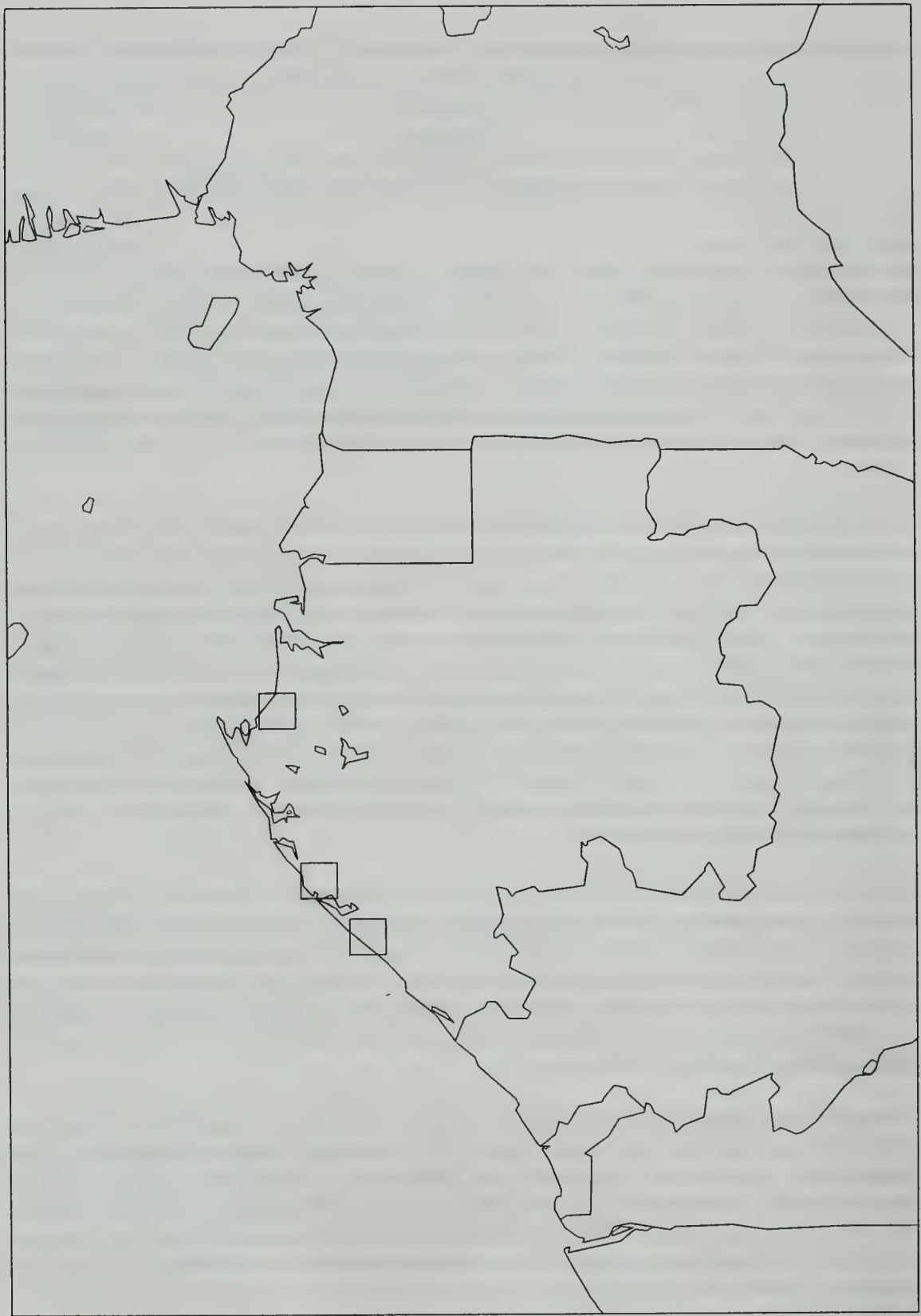
Population 1,226,000 (1988)

Summary of Wetland Situation The major wetlands of Gabon are coastal, where the climate is more humid (and rainfall varies between 3500mm in the north, and 1750mm in the south). Inland, three main river systems drain the country, the Ogooue, the N’Gounie and the Nyanga. Various wetland habitats are found along these rivers and their tributaries, in particular swamp forest.

The Mitemboni River marks the northern boundary of the country, and is joined just before its mouth by the Noya. Tidal swamps lie along the lower stretches of both rivers. South of here the coast is sandy, and many small streams arising in the low coastal hills flow across the narrow coastal plain, giving rise to a diffuse pattern of channels which support a tidal swamp some 1.5km wide. Some 17,400ha of mangrove forest occupy the shores of the Bay of Monda, in a wide belt that extends some 18-22km inland up the estuaries of rivers such as the Ayondo. Mangrove forests also fringe the entire shoreline of the Gabon estuary, forming a 1-2km belt on the northern shore, but reaching inland for up to 21km on the southern shore in areas watered by tributary streams. This tidal forest covers some 45,200ha, while the coastline between the estuary and Cape Lopez support a further 61,600ha of tidal forest. In this latter region (where the Wongha-Wonghé Reserve is to be found) the coastal plain is also dotted with little lakes enclosed by permanent swamplands.

Most of the central and southern coast is sandy, and river mouths have been deflected northwards behind long sandspits, each of which subtends a large sheltered lagoon, the principal ones being N’Komi, Iguela, N’Dogo and M’Banio. Down this coast there is an extensive area covered by tidal and freshwater swamps, and by lakes and lagoons (varying from fresh water to salt), and large areas are regularly flooded by a combination of tides and freshwater floods. Petit Loango and Setté Cama reserves are both located within this part of the coast, and include two of the largest lagoons, Iguela and N’Dogo.

Protected Areas Legislation Parks and reserves are declared by the President of the Republic, after a proposal has been made by the Ministry of Agriculture, Water and Forestry and Rural Development (Ministère de l’agriculture, de l’élevage et du développement rural). The Loi d’orientation en matière des Eaux et Forêts (No. 1 of 22 July 1982) is the principal legal measure for conservation of wildlife in Gabon, although not all of its measures have yet been implemented. Defined protected areas ("les aires d’exploitation rationnelle de la faune") are domaine de chasse, sanctuaire de faune, réserve de faune, réserve naturelle intégrale and parc national.



Ramsar Sites in Gabon

Protected Areas Administration This is now primarily the responsibility of the Department of Hunting and Fauna (Département de chasse et de la faune) within the Ministry of Agriculture, Water and Forestry and Rural Development (Ministère de l'agriculture, de l'élevage et du développement rural). Previously faunal reserves, hunting reserves and integral reserves were controlled by this department, while national parks come under the Ministry of Tourism. The tourist administration is still responsible for tourist development within the national parks. Forestry is the responsibility of the Département des eaux et forêts.

Sites designated under the Convention Signature without reservation as to ratification 30 December 1986, with three sites listed at ratification.

Réserve nationale de Wongha-Wonghé
Parc national du Petit Loango
Réserve de Setté Cama

Government body responsible for administration of the Convention

Direction de la Faune et de la Chasse, Ministère de l'Agriculture, de l'Élevage et du Développement Rural, BP 1128 Libreville

Réserve nationale de Wongha-Wonghé

Location 0°30'-1°00'S, 9°10'-9°40'E. In the coastal region of Gabon, between Libreville and Port Gentil, 99km south of the equator.

Area 380,000ha

Degree of Protection The area was designated a national park on 30 March 1967 by Order No. 362/MEF/DEF/CHPP (confirmed by Decree No. 172/PR/MEF title 1, article 5 of 13 April 1971). Earlier, Order No. 1488/SF-5225 of 17 November 1962 set up the Domaine de chasse of Wonga-Wongué (25,000ha), Grand Bam-Bam (20,000ha) and Petit Bam-Bam (35,000ha), and Decree No. 7329 of July 1966, and a provisional order of 30 November 1966 also dealt with protection of the area. The flora and fauna are totally protected, and cultivation prohibited. Access within the reserve is strictly limited to those invited by the president.

Site Description Much of the area is flat, comprising parts of the plains, gently rolling hills and plateaux of the coastal plain. Soils are principally pramitic and ferralitic. With the Atlantic coast to the west, the site is bounded by the Aouagne and Pambo-Nyango rivers to the north, by Lake Azingo to the south-east, and by the Gongoue, Oranga, Wanga, Bembelie and Mpogoue rivers, and the Inyongo and Nguelie lakes to the south. A number of small coastal rivers cross the area, some giving rise to erosion features such as the amphitheatre of the Cirque du Grand Bam-Bam. The coastline is flat and straight. Average temperature is 26°C, and annual rainfall varies between 2000mm and 2200mm, with two dry seasons each year. During the longer dry season (June-September) there is almost continuous cloud cover. The vegetation varies from humid tropical forest to stunted woodland savanna, covered in grass species during the rains, with thickets of stunted *Aucoumea klaineana* and other ligneous species.

International and National Importance The two most notable mammal species in the park are chimpanzee *Pan troglodytes*, and the western race of gorilla *Gorilla gorilla gorilla*, both threatened species. Elephant *Loxodonta africana* also occur. Birds include white pelican *Pelecanus onocrotalus*.

Changes in Ecological Character Intensive poaching has been reported in the past, though poaching control instigated by the present guide de chasse is apparently very effective. Forestry exploitation has occurred within the reserve. There have been a number of introductions of exotic species to the area, including Burchell's zebra *Equus burchelli*, black-tailed gnu *Connochaetus taurinus*, peccary *Tayassu* sp., wild boar *Sus scrofa*, and pony *Equus caballus*. All but zebra have established themselves within the park.

Management Practices There were three basic sections within the area now covered by the national park, but there is now no zoning. The area is essentially managed as a Presidential reserve, where hunting parties are organised for guests of the President. Access is therefore strictly limited (and only really possible by light aircraft from outside the area). Anti-poaching activity is undertaken.

Scientific Research and Facilities None reported

Principal Reference Material The material presented here has been adapted from the IUCN Directory of Afrotropical Protected Areas (IUCN/UNEP, 1987). Major references are:

Nicoll, M and Langrand, O. (1986). The Conservation of Forest Ecosystems in Gabon. IUCN/WWF Project 3247, Systems review of protected areas in Gabon.

Tutin, C. and Fernandez, M. (1983). Recensement des Gorilles et des Chimpanzés du Gabon. CIRMF, Gabon.

Parc national du Petit Loango/Réserve de Setté Cama

Location 2°15'S, 9°56'E. Coastal zone of south-west Gabon to the north and south of the lagoon behind Setté Cama and Gamba.

Area Total area of 700,000ha for two Ramsar sites. Petit Loango Ramsar site consists of the Réserve de faune Petit Loango of (80,000ha), Domaine de chasse d'Iguéla (150,000ha), and Domaine de chasse Ngoue-Ndogo (250,000ha). Setté Cama Ramsar site consists of the Réserve de faune de la plaine d'Ouanga (20,000ha), and the Domaine de chasse de Setté Cama (200,000ha)

Degree of Protection Decree No. 1571 of 29 December 1966 includes the domaine de chasse de Iguéla, the réserve de faune du Petit Louango, the domaine de chasse de Ngoue-Ndogo, and the domaine de chasse de Setté-Cama. Protection of the whole 'Aire d'exploitation rationnelle de faune de Setté Cama' dates from Arrêté 1487/SF-5225 of 17 November 1962.

Site Description The reserve is a weakly undulating, sandy plain penetrated by an extensive lagoon and several lakes. The small rivers that cross the area mainly spring from the low Mayombe hills to the east of the reserve. The soils are largely a mosaic of hydromorphic

clay-sand and sand-clay mixtures. Average temperature is 26°C, and rainfall varies between 2200mm and 2400mm. There are two dry seasons, although during the long dry season (July-September) there is persistent cloud cover. The vegetation consists largely of open savanna with thickets along the littoral zone, but with rain forest covering the majority of the reserve. Most of the forest was exploited some 20 years ago. Several of the forest areas are subject to regular flooding.

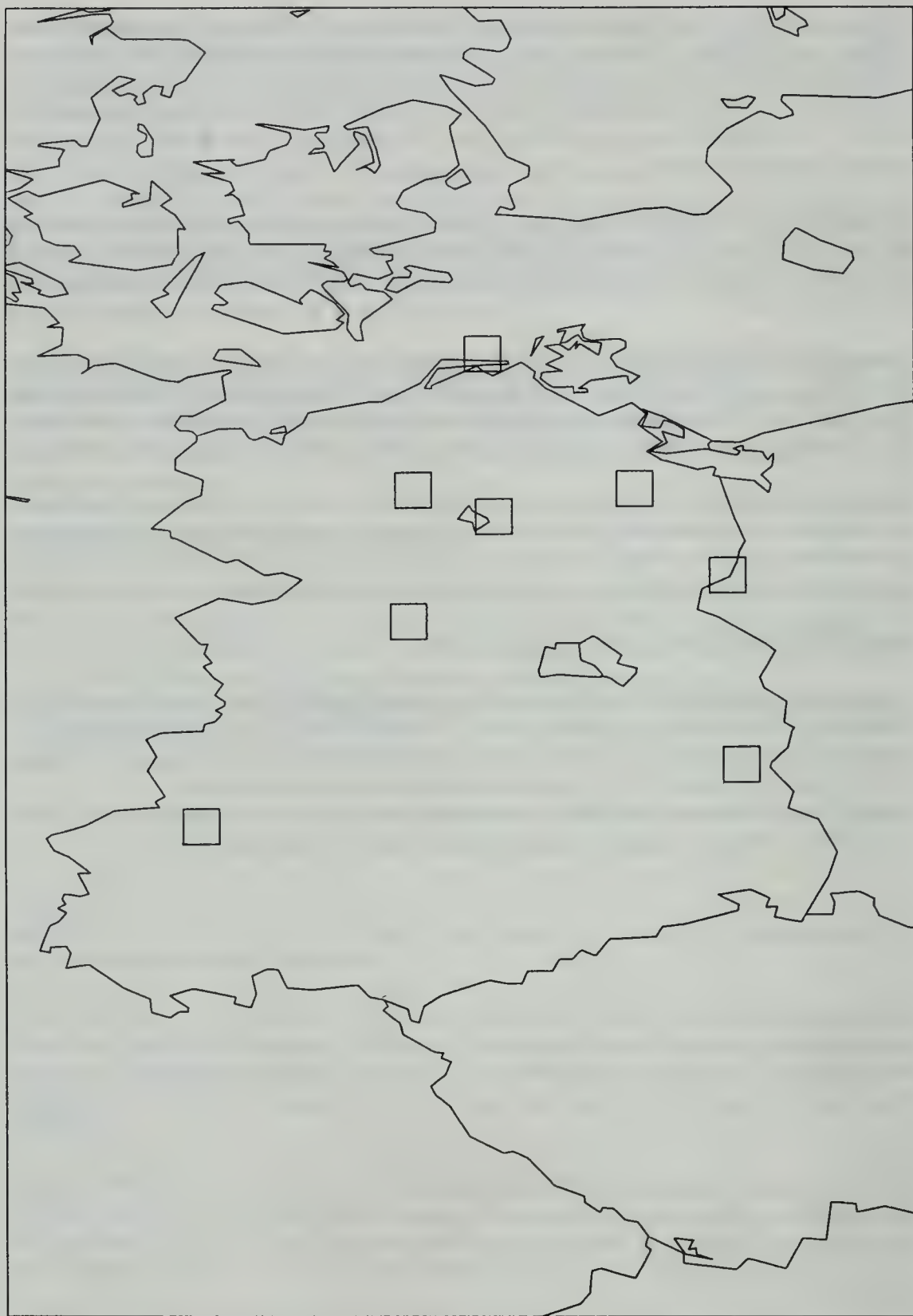
International and National Importance There are large populations of elephant *Loxodonta africana*, and the reserve is reported to be particularly important for African manatee *Trichechus senegalensis*. Chimpanzee *Pan troglodytes*, gorilla *Gorilla gorilla gorilla* and leopard *Panthera pardus* also occur.

Changes in Ecological Character There is oil exploration in the region, despite the fact that this is illegal, and this is causing a number of problems. There are guides de chasse in both the Iguela and Setté Cama areas, but otherwise there is no organised protection. There are no representatives of the Ministère des eaux et forêts at Gamba, the only town within the reserve.

Management Practices There is a permanent presence in both the Setté Cama and Iguela areas, but otherwise management and protection would appear to be minimal. Several recommendations on management are made by Nicoll and Langrand (1986). Although the area is remote, several safaris are organized each year for foreign non-resident clients.

Scientific Research and Facilities Virtually none

Principal Reference Material The material presented here has been adapted from the IUCN **Directory of Afrotropical Protected Areas (IUCN/UNEP, 1987)**. Major references are:
Nicoll, M and Langrand, O. (1986). The Conservation of Forest Ecosystems in Gabon. IUCN/WWF Project 3247, Systems review of protected areas in Gabon.
Tutin, C. and Fernandez, M. (1983). Recensement des Gorilles et des Chimpanzés du Gabon. CIRMF, Gabon.



Ramsar Sites in the GDR

German Democratic Republic

Area 107,860 sq.km

Population 16,639,877 (1986)

Summary of Wetland Situation The Baltic coast from the Wismarbucht to Stralsund and the island of Rügen is of great importance to breeding, migrating and wintering waterfowl. Apart from the Wismarbucht itself, the areas of special interest are the peninsula and islands of Dierhagen, Darss and Zingst, the bays of Saaler Bodden and Der Grabow which they enclose, the vicinity of Stralsund, and the waters around Rügen and Hiddensee islands, including parts of the Greifswalder Bodden to the south-east.

Inland, the many lake complexes in the Schwerin and Neubrandenburg districts have suitable breeding conditions for Anatidae, and also support considerable autumn and winter concentrations of white-fronted goose *Anser albifrons* and bean goose *A. fabalis*. Other outstanding wetlands in these districts include the Müritz-See, Lewitz Fishponds, the Krakower Obersee and Plauer See, Tollense See and the Galenbecker See.

The long and complex waterway of the Havel River and Lakes in the Potsdam district are important for wintering ducks, and are frequented by flocks of geese in autumn and later winter. On the western border of the district one of the main research centres of the Zentrale für Wasservogelforschung is the Niederung der Unteren Havel including Gülper See. To the east of Berlin the two most valuable wetlands of the Frankfurt district are the Untere Odertal and Odervorland, both of which have some excellent breeding habitat for waterfowl and provide wintering grounds for geese.

Of the more southerly districts, Halle is of importance for wintering geese and for mallard *Anas platyrhynchos*. The margins of the Berga-Kelbra reservoir, to the south of the Harz mountains, offer some suitable habitats for migrating waders. In the neighbouring Leipzig district, Wildenhainer Bruch and Zatlitzbruch support breeding populations of several species. Still further to the north-east, in the Cottbus district, the ponds known as the Peitzer Teiche are reported to be much used as staging posts by migrating waders.

Many of the inland wetlands of the German Democratic Republic are of economic importance for fish-culture. The consequent increased eutrophication of such sites and its ecological effects are currently under study.

Protected Areas Legislation The first Conservation of Nature Act was made law in 1935 followed the next year by the ordinance concerning species protection. In 1954 the Conservation and Care of Native Nature Law came into force and was replaced on 14 May 1970 when a new comprehensive environmental law - the *Landeskultugesetz* (Culture of Country Act, full title 'Planned Creation of the Socialist Country Culture in the German Democratic Republic') was

issued. As a consequence of this an ordinance covering species protection linked to habitat conservation (flora and fauna) was passed on 1 October 1984.

Three categories of protected area are defined. Natural Protected Areas or Nature Reserves (Naturschutzgebiet) are established for the protection of a wide variety of species and ecotypes throughout the country. Management practices are based on nature conservation, although some rural management policies and use occur in NSGs. Up to 6.7% of the total NSG area consists of strict reserves purely for nature conservation. Landscape Protected Areas or Reserves (Landschaftschutzgebiet) are areas of land established primarily for the protection of rural and scenic landscapes including geological features. Forest management and agricultural use occur throughout the designated LSGs. One of the largest landscape protection areas is the Sächsische Schweiz NSG established in 1956. Natural Monuments are natural elements, such as geological features, ancient trees, or natural objects often associated with historical events. They are classed as Naturdenkmäler (ND) if single natural objects or Flächennaturdenkmäler (FND) if a small area, maximum of 3ha.

Protected Areas Administration In 1904, the first set of objectives and tasks for the care of natural monuments was formulated and in 1906 the first government nature conservation authority, the Prussian (later Central German) Board for Care for Natural Monuments, was established in Berlin. The supreme authority for nature conservation is the Ministry of Agriculture, Forest Management and Food, with the regional authorities being the Regional Councils' Forest Management Departments in all 15 regions. Research and advice is provided by the Institut für Landschaftsforschung und Naturschutz (Institute for Landscape Survey and Nature Conservation of the Academy of Agricultural Sciences) created in 1953 which has five regional branches at Dresden, Greifswald, Halle, Jena and Potsdam. The state nature conservation bodies often actively cooperate with voluntary bodies in programmes of species protection.

Sites designated under the Convention Accession 31 July 1978 with 8 sites listed at accession

Baltic Sea lagoon waters of Rügen/Hiddensee & E part of Zingst Peninsula
Krakower Obersee
Eastern Shore of Müritz See
Lower Havel River and Gülper See
Oder Valley near Schwedt
Pond areas near Peitz
Berga-Kelbra Storage Lake
Galenbecker See

Government body responsible for administration of the Convention

Ministerium für Naturschutz, Umweltschutz und Wasserwirtschaft der DDR, 1040 Berlin,
Schiffbaurdamm 14

Baltic sea lagoon waters of Rügen/Hiddensee and eastern part of Zingst Peninsula

Location 54°23'-54°36'N, 12°54'-13°16'E. Situated on the Baltic Sea, north of Stralsund in the District of Rostock.

Area 25,800ha

Degree of Protection Some parts of the area, totalling 3,491ha, are nature reserves. Designated as a Ramsar site on 31 July 1978.

Site Description The site comprises an area of the Baltic Sea between the islands of Rügen and Hiddensee, the western part of Rügen and the whole of Hiddensee and the Isle of Ummanz; also, the sea between the west coast of Hiddensee (4km north of Neuendorf) and the Zingst Peninsula near Pramort including Wadden See, with the islands of Bock and Grosser Werder. The southern boundary follows the mainland coast from Kinnbackenhagen to the Parower Haken (near Prohn) and the southern coast of the Kubitzer Bodden.

International and National Importance The site is of great importance for breeding, migrating and wintering waterfowl. Breeding species include mute swan *Cygnus olor*, greylag goose *Anser anser*, shelduck *Tadorna tadorna*, gadwall *Anas strepera*, shoveler *A. clypeata*, red-breasted merganser *Mergus serrator*, marsh harrier *Circus aeruginosus*, avocet *Recurvirostra avosetta*, ruff *Philomachus pugnax*, black-tailed godwit *Limosa limosa*, redshank *Tringa totanus*, Sandwich tern *Sterna sandvicensis*, common tern *S. hirundo* and little tern *S. albifrons*. Wintering species include mallard *Anas platyrhynchos*, tufted duck *Aythya fuligula*, scaup *A. marila*, long-tailed duck *Clangula hyemalis*, goldeneye *Bucephala clangula*, red-breasted merganser *Mergus serrator*, coot *Fulica atra*, mute swan *Cygnus olor* and whooper swan *C. cygnus*. Large numbers of Anatidae occur on passage, including bean goose *Anser fabalis*, white-fronted goose *A. albifrons*, greylag goose *A. anser* and tufted duck. Up to 10,000 cranes *Grus grus* occur in spring with 25,000 in autumn.

Changes in Ecological Character None reported

Management Practices A management plan came into force in 1985.

Scientific Research and Facilities There is a bird observatory and ringing station at Hiddensee. A new biological station is planned.

Principal Reference Material The above information is taken from documents supplied by the Government of the German Democratic Republic for designation in 1978, for the Cagliari Conference in November 1980 and the Groningen Conference in 1984. Supplemented by: Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506/pp.

Rutschke, E. (1982). Die Feuchtgebiete von internationaler und nationaler Bedeutung in der DDR. *Beitr. Vogelkd.* 28: 2-15.

Weinitschke, H. (Ed.) (1980). *Handbuch der Naturschutzgebiete der Deutschen Demokratischen Republik*. Leipzig-Jena-Berlin, Vol.1.

Krakower Obersee

Location 53°37'N, 12°18'E. Situated south-east of the town of Krakow in the District of Schwerin.

Area 870ha

Degree of Protection The site is a nature reserve. Designated as a Ramsar site on 31 July 1978.

Site Description The site comprises the entire southern part of Krakower Lake (south of the Krakow-Linstow road) including the shoreline and eight islands. The lake is surrounded by woodland, pasture and cultivated land.

International and National Importance The site is of importance for breeding, moulting and migrating waterfowl, especially Anatidae. Breeding species include goldeneye *Bucephala clangula*, tufted duck *Aythya fuligula*, red-crested pochard *Netta rufina*, gadwall *Anas strepera* (40-60 pairs), garganey *A. querquedula*, bittern *Botaurus stellaris*, redshank *Tringa totanus* and common tern *Sterna hirundo* (120-200 pairs). The main species which stop over on migration are 6,000-9,000 tufted duck (which also use the area as a moulting refuge), goosander *Mergus merganser*, Bewick's swan *Cygnus columbianus bewickii* and various geese *Anser* spp. Small numbers of white-tailed eagle *Haliaeetus albicilla* occur in autumn and winter.

Changes in Ecological Character Increased eutrophication

Management Practices A management plan came into force in 1983.

Scientific Research and Facilities Studies have been made of population dynamics of gadwall and common tern, including ecological parameters for breeding populations.

Principal Reference Material The above information is taken from documents supplied by the Government of the German Democratic Republic for designation in 1978, for the Cagliari Conference in November 1980 and the Groningen Conference in 1984. Supplemented by:
Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

Neubauer, W. (1982). Wasservogelschutz, Landwirtschaft, Fischererei und Erholungswesen im NSG Krakower Obersee (Feuchtgebiet von internationaler Bedeutung). *Beitr. Vogelkd.* 28: 35-40.

Rutschke, E. (1982). Die Feuchtgebiete von internationaler und nationaler Bedeutung in der DDR. *Beitr. Vogelkd.* 28: 2-15.

Eastern shore of Müritz See

Location 53°27'N, 12°49'E. Situated immediately south of the town of Waren in the District of Neubrandenburg.

Area 4,830ha

Degree of Protection The site is a nature reserve and part of Müritzseen Park Landscape Protection Area. Designated as a Ramsar site on 31 July 1978. The site has also been designated as a wetland of national importance.

Site Description The site comprises a water area about 800m wide on the north-east shore of Lake Müritz and the adjacent strip of land, 2.5km wide (at Feisneck Lake) to 4km wide (at Speck) and includes a number of small lakes. Müritz See is the largest inland lake in northern Germany and occupies a glacial basin in ground moraine deposited during the Weichsel Period. It is a eutrophic lake with maximum depth 20m.

International and National Importance Breeding species include bittern *Botaurus stellaris*, greylag goose *Anser anser* (80-100 pairs), white-tailed eagle *Haliaeetus albicilla* (1-3 pairs), marsh harrier *Circus aeruginosus* (5 pairs), osprey *Pandion haliaetus*, spotted crane *Porzana porzana*, crane *Grus grus* and common tern *Sterna hirundo* (maximum 30 pairs). Also important for passage birds, including whooper swan *Cygnus cygnus*, up to 10,000 bean geese *Anser fabalis* and white-fronted geese *A. albifrons*, 2,000 greylag geese, 25,000 tufted duck *Aythya fuligula* and 500 cranes.

Changes in Ecological Character Eutrophication in Lake Müritz is increasing due to sewage effluent.

Management Practices A new management plan is being prepared.

Scientific Research and Facilities Research on crane migration has been carried out by several biological stations in the vicinity.

Principal Reference Material The above information is taken from documents supplied by the Government of the German Democratic Republic for designation in 1978, for the Cagliari Conference in November 1980 and the Groningen Conference in 1984. Supplemented by:

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

Rutschke, E. (1982). Die Feuchtgebiete von internationaler und nationaler Bedeutung in der DDR. *Beitr. Vogelkd.* 28: 2-15.

Weinitschke, H. (Ed.) (1980). *Handbuch der Naturschutzgebiete der Deutschen Demokratischen Republik*. Leipzig-Jena-Berlin, Vol.1.

Lower Havel River and Gülper See

Location 52°39'-52°49'N, 12°04'-12°20'E. Situated between Rathenow in the district of Potsdam, and Havelberg in the district of Magdeburg.

Area 5,792ha

Degree of Protection Two parts of the site are a nature reserve and there is also a landscape protection area. Designated as a Ramsar site on 31 July 1978.

Site Description The site includes a lake, the Gülpersee, and part of the Lower Havel River. Boundaries are marked by dykes along the valley edges between Hohennauen, Parey, Guelpe, Strodehne and Vehlgast on the right bank and Rehberg, Warnau, Kuhlhausen and Jederitz on the left bank. The Gülpersee is a eutrophic, shallow lake through which the Rhin river flows.

International and National Importance The area is important for breeding great crested grebe *Podiceps cristatus*, white stork *Ciconia ciconia*, greylag goose *Anser anser*, marsh harrier *Circus aeruginosus*, black-tailed godwit *Limosa limosa* and black tern *Chlidonias niger*. The site is one of the largest inland stopover places for geese *Anser* spp., with bean goose *Anser fabalis* (50,000 in autumn), white-fronted goose *A. albifrons* (30,000 in spring) and greylag goose *A. anser* (6,500 in autumn), dabbling ducks, whooper swan *Cygnus cygnus* (400 in spring) and crane *Grus grus* (5,000 in autumn).

Changes in Ecological Character Lake Gülpe had become eutrophic by 1980.

Management Practices Measures to prevent further eutrophication of Lake Gülpe were carried out from 1980-1983. A management plan is being prepared.

Scientific Research and Facilities Research on population dynamics and ecology of geese *Anser* spp. and the social structure and behaviour of the greylag goose *Anser anser* has been carried out, as well as ecological studies of birds other than waterfowl and other animals. There is a scientific station of the Zentrale für die Wasservogelforschung der DDR and the Teachers Training College at Potsdam.

Principal Reference Material The above information is taken from documents supplied by the Government of the German Democratic Republic for designation in 1978, for the Cagliari Conference in November 1980 and the Groningen Conference in 1984. Supplemented by:

Rutschke, E. (1981). Report from the German Democratic Republic, Debrecen. *IWRB Bulletin* 47: 41-42.

Rutschke, E. (1982). Die Feuchtgebiete von internationaler und nationaler Bedeutung in der DDR. *Beitr. Vogelkd.* 28: 2-15.

Rutschke, E. and Kalbe, L. (1978). Das Gewässergebiet Untere Havel - ein Wasservogelreservat von internationaler Bedeutung. *Arch. Naturschutz u. Landschaftsforsch.* Berlin 18: 1-18.

Weinitschke, H. (Ed.) (1982). *Handbuch der Naturschutzgebiete der Deutschen Demokratischen Republik.* Leipzig-Jena-Berlin. Vol.2.

Oder Valley near Schwedt

Location 52°59'-53°10'N, 14°20'E. Situated near the town of Schwedt in the Frankfurt/Oder District.

Area 5,400ha

Degree of Protection Part of the site (400ha) is a nature reserve. Designated as a Ramsar site on 31 July 1978.

Site Description The site comprises the Oder valley between the Oder River and the canal known as the 'Hohensaaten-Friedrichsthaler Wasserstrasse' from the village of Stützkow in the south to the village of Friedrichsthal in the north. There are two polders including numerous permanent pools and creeks and agricultural areas, seasonally influenced by floods in winter and spring.

International and National Importance The site is important for breeding cormorant *Phalacrocorax carbo sinensis*, white stork *Ciconia ciconia*, ducks including garganey *Anas querquedula*, shoveler *A. clypeata* and mallard *A. platyrhynchos*, white-tailed eagle *Haliaeetus albicilla* (1-2 pairs), marsh harrier *Circus aeruginosus* (3-5 pairs), spotted crake (5-15 pairs), little crake *Porzana porzana*, little crake *P. parva* (1-2 pairs), corncrake *Crex crex* (60 males), crane *Grus grus* (1-5 pairs), snipe *Gallinago gallinago* (100 pairs) and black tern *Chlidonias niger*, depending on the water level. Also very important for passage waterfowl with white stork *Ciconia ciconia*, Bewick's swan *Cygnus columbianus bewickii* (150 in spring), whooper swan *C. cygnus* (800 in spring), bean goose *Anser fabalis* (15,000 in spring; 10,000 in autumn), white-fronted goose *A. albifrons* (35,000 in spring; 4,000 in autumn), ducks *Anas* spp. and coot *Fulica atra* (11,000).

Changes in Ecological Character None reported

Management Practices A management plan entered into force in 1980.

Scientific Research and Facilities No information

Principal Reference Material The above information is taken from documents supplied by the Government of the German Democratic Republic for designation in 1978, for the Cagliari Conference in November 1980 and the Groningen Conference in 1984.

Dittberner, H.a.W. (1975). Die ornithologische Bedeutung der Oderauer bei Swedt (Bez. Frankfurt/O.). *Naturschutzarb. Berlin Brandenburg* 11: 45-47.

Rutscke, E. (1982). Die Feuchtgebiete von internationaler und nationaler Bedeutung in der Deutschen Demokratischen Republik. *Beitr. Vogelkd.* 28: 2-15.

Pond areas near Peitz

Location 51°51'N, 14°25'E. Situated to the north of the town of Cottbus in the District of Cottbus.

Area 1,060ha

Degree of Protection Designated as a Ramsar site on July 1978.

Site Description The site contains a number of fish ponds. The eastern boundary is the railway between Cottbus and Wilhelm-Pieck-Stadt-Guben (from Neuendorf to Peitz-Ost station). The northern boundary follows approximately the course of the Hammerstrom to the village of Maiberg. The western boundary is along the road between Peitz and Cottbus, and the southern boundary roughly follows a line between the villages of Maüst and Neuendorf.

International and National Importance The site is very important for breeding pochard *Aythya ferina* (450-650 pairs). Other breeding species include great crested grebe *Podiceps cristatus* (50-70 pairs), shoveler *Anas clypeata* (10-15 pairs) and tufted duck *Aythya fuligula* (350 pairs). In autumn and spring it is a stopover site for many waterfowl and waders, with up to 8,000 mallard *Anas platyrhynchos* and 2,000 pochard moulting in June.

Changes in Ecological Character

None reported

Management Practices A management plan came into force in 1984. The fish ponds are being restored.

Scientific Research and Facilities Ecological studies on breeding size of pochard *Aythya ferina* and other ducks have been made, and the nutrition of swans and waders investigated.

Principal Reference Material The above information is taken from documents supplied by the Government of the German Democratic Republic for designation in 1978, for the Cagliari Conference in November 1980 and the Groningen Conference in 1984. Supplemented by:
Rutschke, E. (1981). Report from the German Democratic Republic, Debrecen. *IWRB Bulletin* 47: 41-42.

Rutschke, E. (1981). Die Feuchtgebiete von internationaler und nationaler Bedeutung in der DDR. *Beitr. Vogelkd.* 28: 2-15.

Berga-Kelbra Storage Lake

Location 51°27'N, 10°56'E. Situated between the towns of Nordhausen in the district of Erfurt and Sangerhausen in the district of Halle.

Area 1,360ha

Degree of Protection Designated as a Ramsar site on 31 July 1978.

Site Description The site comprises a shallow flood protection reservoir at the foot of the western slope of the Kyffhäuser Range, bounded by the villages of Berga, Kelbra and Auleben.

International and National Importance Breeding species include small numbers of pochard *Aythya ferina*. The site is the largest water area in the Thuringian Plain. Its importance as a stopover for large numbers of migrating ducks, coots and waders has steadily increased in the last ten years.

Changes in Ecological Character None reported

Management Practices A management plan came into force in 1985.

Scientific Research and Facilities Studies have been made of the dependence of waterfowl populations on several ecological factors. There is an ornithological observation station.

Principal Reference Material The above information is taken from documents supplied by the Government of the German Democratic Republic for designation in 1978, for the Cagliari Conference in November 1980 and the Groningen Conference in 1984. Supplemented by:

Görner, M. *et al.* (1983). Das Feuchtgebiet von internationaler Bedeutung 'Stausee Berga-Kelbra' und seine Vogelwelt. *Landschafts-pflege Naturschutz Thuer. Jena* 20: 30-54.

Rutschke, E. (1982). Die Feuchtgebiete von internationaler und nationaler Bedeutung in der DDR. *Beitr. Vogelkd.* 28: 2-15.

Galenbecker See

Location 53°38'N, 13°44'E. Situated north-east of the town of Neubrandenburg in the district of Neubrandenburg.

Area 1,015ha

Degree of Protection The area is a nature reserve. Designated as a Ramsar site on 31 July 1978.

Site Description Galenbecker See lies south-west of Friedlaender marsh and is bounded by the villages of Kotelow, Galenbeck and Heinrichswalde. The lake waters are shallow (mean depth 1m) and eutrophic and the lake is being filled by natural succession. It contains carp *Cyprinus carpio*.

International and National Importance Breeding birds include bittern *Botaurus stellaris*, garganey *A. querquedula*, tufted duck *Aythya fuligula*, marsh harrier *Circus aeruginosus*, water rail *Rallus aquaticus*, spotted crake *Porzana porzana* and crane *Grus grus*. Passage species include Bewick's swan *Cygnus columbianus*, whooper swan *C. cygnus*, bean goose *Anser fabalis*, white-fronted goose *A. albifrons*, gadwall *Anas strepera* and pochard *Aythya ferina*.

Changes in Ecological Character Natural succession is leading to changes in biotic communities and there has been increased eutrophication since 1982.

Management Practices A new management plan was being prepared in 1986.

Scientific Research and Facilities Ornithological, limnological and vegetation studies are continuing. There are bird observation facilities, and a nature reserve station.

Principal Reference Material The above information is taken from documents supplied by the Government of the German Democratic Republic for designation in 1978, for the Cagliari Conference in November 1980 and the Groningen Conference in 1984. Supplemented by:
Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

Rutschke, E. (1982). Die Feuchtgebiete von internationaler und nationaler Bedeutung in der DDR. *Beitr. Vogelkd.* 28: 2-15.

Weinitschke, H. (Ed). (1980). *Handbuch der Naturschutzgebiete der Deutschen Demokratischen Republik*. Leipzig-Jena-Berlin, Vol.1

Federal Republic of Germany

Area 248,528 sq.km

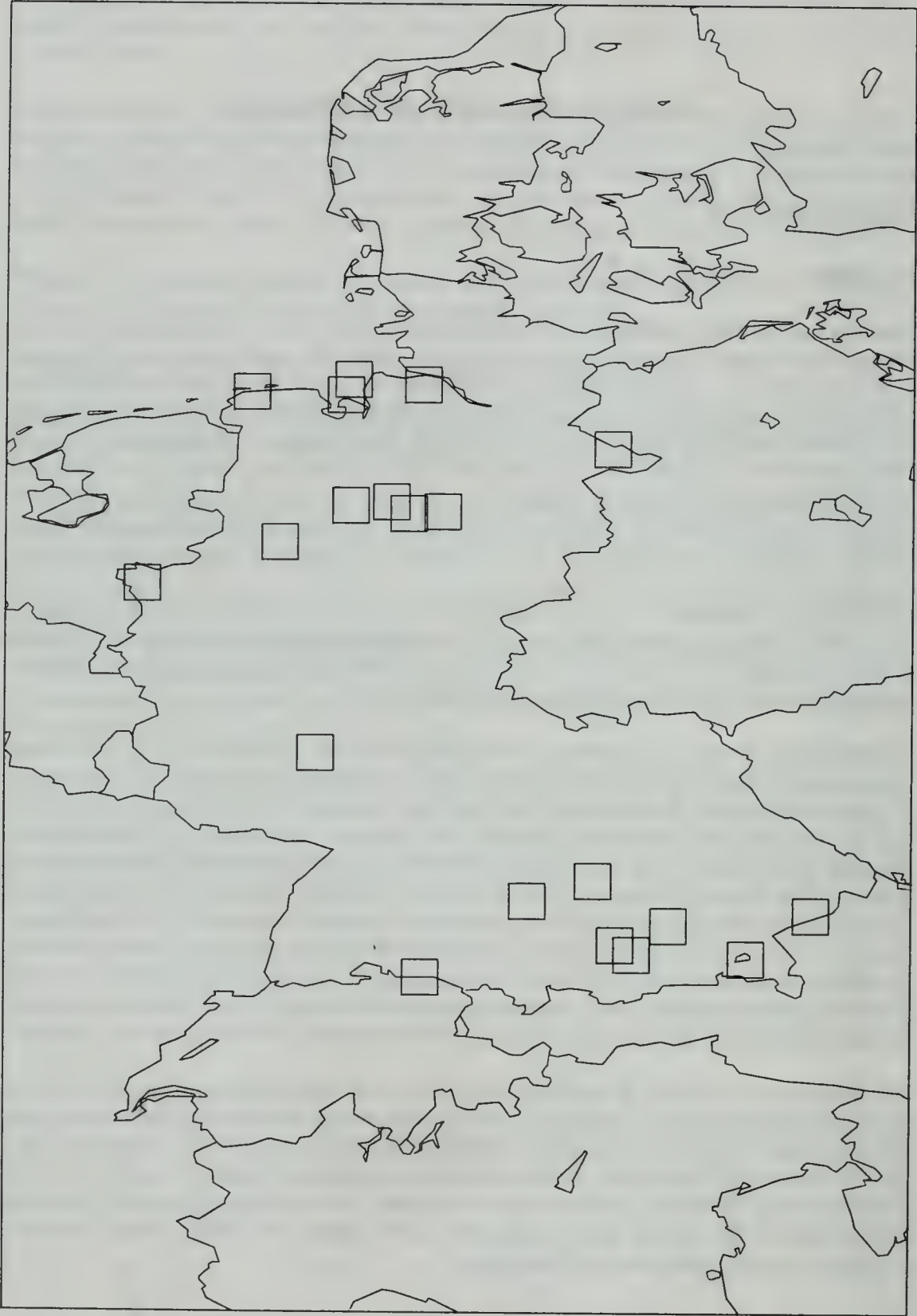
Population 61,170,000 (1987)

Summary of Wetland Situation More than 30 wetlands in the Federal Republic have been identified as being of international importance as waterfowl habitat, and a number of these sites are of great interest. This is particularly so in the northern part of the country along the shores of the North Sea and the Baltic, which are on the main migration route of waterfowl wintering in the Netherlands, the United Kingdom and Ireland. The Waddensea (Wattenmeer), which the FRG shares with the Netherlands and Denmark, is the biggest and probably the single most important wetland for migrating waterfowl in western Europe. In the FRG sector, fairly extensive areas have been set aside as nature reserves, including some small islands and parts of some larger ones. Parts of the area are now protected within two Wattenmeer national parks.

Along the lower course of the Elbe River (Niederelbe) several sites are of value to migrating and roosting Bewick's swans, barnacle geese and white-fronted geese which, in mild winters, often prolong their stay. These sites are greatly threatened by industrial development which is tending to spread along the river downstream from Hamburg.

Several sites in the north are important for moulting waterfowl. The best known is Knechtsand, where tens of thousands of shelduck *Tadorna tadorna* concentrate in August. The Selenter See on the Ostholsteinische Seenplatte is a traditional moulting area for tufted duck *Aythya fuligula* and great-crested grebe *Podiceps cristatus*. The Dümmer and Diepholzer Moorniederung, although greatly modified by peat digging and farming, are of considerable geological interest and still offer suitable nesting and feeding sites for waders and waterfowl. The Rieselfelder (sewage farms) near Munster attract large numbers of migrant waders, while the reservoirs on the rivers Rhur and Mohne provide winter quarters for diving ducks and coots. The Rhine Valley as a whole has favourable conditions in winter and spring for wintering and migrating waterfowl; flocks of bean geese *Anser fabalis* frequent areas near the border with the Netherlands and, in its upper reaches from Kehl south to Lörrach, great numbers of duck can be found wintering.

The Bodensee is not only of great limnological interest but also attracts huge numbers of wintering waterfowl, since it only partly freezes over in winter when up to 200,000 ducks alone can be present. The lake is also used extensively by moulting pochard *Aythya ferina* and red-crested pochard *Netta rufina*. Another important wintering and moulting area for waterfowl is the Ismaninger Reservoir just north-east of München. All the reservoirs along the Inn valley and the lakes to the east and south of München, to the border with Austria, attract increasing numbers of breeding and wintering waterfowl.



Ramsar Sites in the Federal Republic of Germany

A few other sites calling for special mention because of their combination of geological, botanical and waterfowl interest are NSG Heiliges Meer (Nordrhein-Westphalen), Mohrweiher am Moorhof (Bayern) and the Wurzacher Ried and Federsee (Baden-Württemberg). Finally, the Donauauen and Donaustauseen (Bayern and Baden-Württemberg), comprising the complex of Danubian reservoirs, provide many ducks, grebes and other waterfowl with suitable feeding grounds in winter.

Protected Areas Legislation All categories of protected areas and the procedure of setting them up are defined in the nature conservation legislation, but this is applied at state (Länder), not federal level as the eleven states are vested with responsibility for nature conservation under the constitution. However, under the general provisions of conservation law there are five main types of protected areas (although their implementation varies in detail): nature reserves, national parks, natural monuments/sites, protected landscapes, and nature parks. Creation of reserves under the Nature Conservation Laws does not exclude hunting, and separate declaration of controlled hunting areas or non-hunting areas must be made under the Hunting Laws. The authority responsible for the establishment or cancellation of reserves differs from state to state.

Protected Areas Administration Nearly all nature reserves are established on private land and in most some form of land use continues. Relatively few sites (mostly bird reserves) have staff specifically employed for nature conservation purposes. Expenses tend to be paid from a general budget. There is no one body entirely responsible for protected areas. At state level a ministry is responsible for administration of nature conservation, with a scientific and technical agency. Administration and management of nature reserves also has an important place in the work of the "councils for nature conservation and landscape management" which work at local, regional and state administrative levels, advising the governments concerned. The Federal Institute for Vegetation Research, Nature Conservation and Landscape Management, with its Department of Nature Conservation, is responsible for research, and provision of advice to federal bodies. Councils for Nature Conservation are established as consultative bodies at all four national administrative levels, federal, state, region and country. A number of private conservation organisations also own nature reserves, or parts of nature reserves, or have taken over management or wardening of reserves (especially bird reserves).

Sites designated under the Convention Seventeen sites were listed on accession on 26 February 1976, with a further three sites added on 28 October 1983.

Niedersachsen

- Wattenmeer, Elbe-Weser-Dreieck
- Wattenmeer, Jadebusen and Western Weser Mouth
- Ostfriesisches Wattenmeer & Dollart
- Lower Elbe, Barnkrug-Otterndorf
- Elbe water-meadows between Schnackenburg and Lauenburg
- Dümmersee
- Diepholzer Lowland Marsh and Peat Bogs
- Steinhuder Meer

Hessen and Rheinland-Pfalz

- Rhine between Eltville and Bingen

Baden-Württemberg

- Bodensee - Wollmatingen reed-bed with north-eastern part of Ermatingen Basin
- Giehren marsh with Bay of Hegne on the Gnadensee
- Mindelsee near Radolfzell

Bayern

- Water-meadows and peat-bogs of Donau
- Lech-Donau Winkel - Feldheim Reservoir on the Lech
- Bertoldsheim Reservoir on the Donau
- Ismaning Reservoir and fish-ponds
- Ammersee
- Starnberger See
- Chiemsee
- Lower Inn between Haiming and Neuhaus

Nordrhein-Westfalen

- Rieselfelder Münster
- Weserstaustufe Schlüsselburg
- Unterer Niederrhein

Government body responsible for administration of the Convention Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit, Postfach 12 06 29, D-5300 Bonn 1

Wattenmeer, Elbe-Weser-Dreieck

Location 53°50'N, 8°24'E. Situated on the North Sea coast between the estuaries of the Weser and Elbe rivers in the Federal State of Niedersachsen.

Area 38,460ha

Degree of Protection The site includes the Knechtsand-Eversand Nature Conservation Area (30,200ha). Designated as a Ramsar site in November 1974, with ratification after February 1976.

Site Description The site comprises a coastal area with extensive mudflats and salt marshes. Fauna includes mussels, crabs and numerous fish species.

International and National Importance The site is part of the Waddensee and is therefore part of the most important habitat for waterfowl in the Federal Republic of Germany. Passage and wintering waterfowl include 80,000-100,000 moulting shelduck *Tadorna tadorna* (majority of the European population), eider duck *Somateria mollissima* (average maximum 20,000), 14,000 oystercatcher *Haematopus ostralegus* (passage), 10,000-16,000 grey plover *Pluvialis squatarola* (passage), 50,000 knot *Calidris canutus* (passage), 1,000 sanderling *C. alba* (passage), 60,000 dunlin *C. alpina* (passage) and 10,000-30,000 bar-tailed godwit *Limosa lapponica* (passage). Breeding species include cormorant *Phalacrocorax carbo sinensis* (60 pairs), Sand-

wich tern *Sterna sandvicensis* (maximum 1,000 pairs) and common tern *Sterna hirundo* (390-470 pairs).

Changes in Ecological Character Since designation the site area has increased from 33,600ha involving some loss of designated area, but also inclusion of new areas. Knechtsand Island is being slowly eroded by the sea.

Management Practices Hunting is strictly controlled.

Scientific Research and Facilities Zoological, botanical, ecological, geographical, geological and hydrogeographical studies are being carried out by various institutes and universities.

Principal Reference Material The above information is taken from documents supplied by the Government of the Federal Republic of Germany for designation in 1978, and for the Cagliari Conference in November 1980.

Supplemented by:

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

Scott, D.A. (1980). A preliminary inventory of wetlands of international importance for waterfowl in west Europe and northwest Africa. *IWRB Special Publication* No. 2.

Additional references:

Haarmann, K. (1978). Erster Bericht über den Zustand der Feuchtgebiete internationaler Bedeutung in der Bundesrepublik Deutschland. *Biol. Abh.* Nr. 36, 28 pages.

Haarmann, K. and Pretscher, P. (1976). Die Feuchtgebiete internationaler Bedeutung in der Bundesrepublik Deutschland. *Vogelkdl. Bibliothek*. Band 4, Greven: Kilda-Verlag, 102 pages.

Haarmann, K. (1984). *Feuchtgebiete internationaler Bedeutung und Europareservate in der Bundesrepublik Deutschland*. Zweiter Zustandbericht (Stand: Januar 1983). Ottendorf: Niederelbe-Verlag, 12 pages. (Fordsand Buch No. 3.)

Wattenmeer, Jadebusen and Western Weser Mouth

Location 53°40'N, 8°19'E. Situated on the North Sea coast between the ports of Bremerhaven and Wilhelmshaven in the Federal State of Niedersachsen.

Area 49,490ha

Degree of Protection The site includes three Nature Conservation Areas: Jadebusen (16,600ha), Mellum (3,500ha) and Süderkleihörne (15.8ha) and a Game Protection Area (GPA): Jadebusen (2,000ha). The GPA has been extended and there is a new Landscape Protection Area for breeding birds. Designated as a Ramsar site in November 1974 with ratification after February 1976.

Site Description Jadebusen is a large sea bay south-east of the port of Wilhelmshaven. There is little water movement in the bay and much silt is therefore deposited, causing gradual reduction in the area of open water and increasing the extent of sand and mudflats. The remainder of the designated site comprises sand and mudflats, and the island of Mellum (35ha). The island has three zones: a dune complex in the north (near where sand is rapidly accreting by a sea wall) with sand couch *Agropyron junceiforme* and lyme grass *Elymus arenarius*; the central area with seablite *Suaeda* spp.; and the southern area of saltmarsh/grassland with sandwort *Minuartia* spp. and saltwort *Salsola kali*, and an increasing area of cord grass *Spartina townsendii*.

International and National Importance The site is part of the Waddensee and is therefore part of the most important habitat for waterfowl in the Federal Republic of Germany. Passage waterfowl include 2,000-3,000 pink-footed goose *Anser brachyrhynchus*, 3,000-3,500 Brent goose *Branta bernicla*, up to 14,000 shelduck *Tadorna tadorna*, 18,000 oystercatcher *Haematopus ostralegus*, 1,000-3,000 avocet *Recurvirostra avosetta*, 2,000 grey plover *Pluvialis squatarola*, 10,000-15,000 knot *Calidris canutus*, 1,000-8,000 sanderling *C. alba*, 20,000-50,000 dunlin *C. alpina*, 6,000 curlew *Numenius arquata*, 700 ringed plover *Charadrius hiaticula*, 1,500 bar-tailed godwit *Limosa lapponica* and 1,500 redshank *Tringa totanus*. Breeding species include avocet (60 pairs) and herring gull *Larus argentatus* (3,500 pairs).

Changes in Ecological Character Since designation, the site area has increased from 45,560ha involving some loss of designated area, but also inclusion of new areas. There is some industrial pollution from Wilhelmshaven.

Management Practices Shooting of waterfowl is limited or prohibited in the Game Protection Area. There is a summer bird warden.

Scientific Research and Facilities Zoological, botanical, ecological, geographical, geological and hydrographical studies are being carried out by various institutes and universities, some of which have field stations in the area.

Principal Reference Material The above information is taken from documents supplied by the Government of the Federal Republic of Germany for designation in 1978, and for the Cagliari Conference in November 1980.

Supplemented by:

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

Duffey, E. (1982). *National Parks and Reserves of Western Europe*. Macdonald and Co., London.

Scott, D.A. (1980). A preliminary inventory of wetlands of international importance for waterfowl in west Europe and northwest Africa. *IWRB Special Publication* No. 2.

Additional references:

Bloem, D. and Steffen, L. (1977). Vogelschutz am Jadebusen. *Orn. AG Oldenburg Jahresbericht* 1977: 20-22.

Haarmann, K. (1978). Erster Bericht über den Zustand der Feuchtgebiete internationaler Bedeutung in der Bundesrepublik Deutschland. *Biol. Abh.* Nr. 36, 28 pages.

- Haarmann, K. and Pretscher, P. (1976).** Die Feuchtgebiete internationaler Bedeutung in der Bundesrepublik Deutschland. *Vogelkdl. Bibliothek* Band 4, Greven: Kilda-Verlag, 102 pages.
- Haarmann, K. (1984).** *Feuchtgebiete internationaler Bedeutung und Europareservate in der Bundesrepublik Deutschland. Zweiter Zustandbericht (Stand: Januar 1983).* Ottendorf: Niederelbe-Verlag, 12 pages. (Fordsand Buch No. 3.)

Ostfriesisches Wattenmeer and Dollart

Location 53°42'N, 7°21'E. Situated on the North Sea coast between Jade Bay and the Netherlands border in the Federal State of Niedersachsen.

Area 121,620ha

Degree of Protection The site is partially protected containing 12 nature conservation areas totalling 10% of site area. It is within one of the new Wattenmeer national parks. Designated as a Ramsar site in November 1974 with ratification after February 1976.

Site Description The site comprises two sectors: 117,640ha including some areas of the East Frisian island and an area of saltmarsh, sand and mudflats separating the islands from the mainland; and the Dollart (3,980ha) separated from the islands and situated in the River Ems estuary where extensive banks of very fine mud have formed. The mudflats are rich feeding grounds for birds, and also provide a shelter, being separated from the mainland by a broad band of reeds *Phragmites* sp. and other plants.

International and National Importance The site is part of the Waddensee and is therefore part of the most important habitat for waterfowl in the Federal Republic of Germany. Passage waterfowl in the Dollart area are bean goose *Anser fabalis* (1,000-8,000), white-fronted goose *Anser albifrons* (5,000-8,000), greylag goose *Anser anser* (1,000-1,600), shelduck *Tadorna tadorna* (2,000-2,800), teal *Anas crecca* (5,000-20,000), avocet *Recurvirostra avosetta* (10,000-20,000), grey plover *Pluvialis squatarola* (1,000-7,000), dunlin *Calidris alpina* (50,000-100,000), black-tailed godwit *Limosa limosa* (2,500-4,600), bar-tailed godwit *L. lapponica* (5,000-9,000), spotted redshank *Tringa erythropus* (1,000-1,700), redshank *T. totanus* (2,000) and curlew *Numenius arquata* (1,200). Breeding species include black-tailed godwit (65 pairs) and redshank (250 pairs). Passage and wintering waterfowl in the East Frisian area are bean goose (1,000), pink-footed goose *Anser brachyrhynchus* (500), greylag goose (1,000-2,000), barnacle goose *Branta leucopsis* (2,000-6,000), brent goose *B. bernicla* (6,000-8,000), shelduck (5,000-20,000), wigeon *Anas penelope* (6,000), teal *A. crecca* (2,500), pintail *A. acuta* (5,000), eider duck *Somateria mollissima* (60,000), oystercatcher *Haematopus ostralegus* (10,000-60,000), avocet (10,000), ringed plover *Charadrius hiaticula* (2,500), Kentish plover *C. alexandrinus* (500), grey plover (5,000-9,000), knot *Calidris canutus* (25,000-80,000), dunlin (100,000-200,000), bar-tailed godwit (5,000-13,000), curlew (10,000-12,000), redshank (700) and turnstone *Arenaria interpres* (800). Breeding species are avocet (1,200 pairs), Kentish plover (185 pairs), Sandwich tern *Sterna sandvicensis* (1,500-1,600 pairs), common tern *S. hirundo* (1,000-1,300 pairs), little tern *S. albifrons* (75-100 pairs), oystercatcher (2,000 pairs), black-tailed godwit (100+ pairs), redshank (480 pairs) and shelduck (800+ pairs).

Changes in Ecological Character Since designation there have been some boundary changes with loss of some areas, but there has been a general increase in area from 96,500ha. 740ha of the Leybucht area are being affected by dyke construction to improve drainage for agriculture and to facilitate shipping. There are plans to construct a new harbour at Emden. There is considerable recreation pressure, and the waters are very vulnerable to possible oil spillage from tankers using the adjacent waters.

Management Practices In some parts hunting is strictly controlled. There are summer bird wardens.

Scientific Research and Facilities No information

Principal Reference Material The above information is taken from documents supplied by the Government of the Federal Republic of Germany for designation in 1978, and for the Cagliari Conference in November 1980.

Supplemented by:

Carp, E. (1980). *A Directory of Western Palearctic Wetlands.* IUCN, Gland, Switzerland. 506 pp.

Duffey, E. (1982). *National Parks and Reserves in Western Europe.* Macdonald, and Co., London.

Scott, D.A. (1980). A preliminary inventory of wetlands of international importance for waterfowl in west Europe and northwest Africa. *IWRB Special Publication* No. 2.

Additional references:

Haarmann, K. (1978). Erster Bericht über den Zustand der Feuchtgebiete internationaler Bedeutung in der Bundesrepublik Deutschland. *Biol. Abh.* Nr. 36, 28 pages.

Haarmann, K. and Pretscher, P. (1976). Die Feuchtgebiete internationaler Bedeutung in der Bundesrepublik Deutschland. *Vogelkdl. Bibliothek* Band 4, Greven: Kilda-Verlag, 102 pages.

Haarmann, K. (1984). *Feuchtgebiete internationaler Bedeutung und Europareservate in der Bundesrepublik Deutschland.* Zweiter Zustandbericht (Stand: Januar 1983). Ottendorf: Niederelbe-Verlag, 12 pages. (Fordsand Buch No. 3.)

Schoennagel, E. (1978). Naturschutzgebiet Lutje Horn. *Orn. Mitt.* 29(1): 22.

Lower Elbe, Barnkrug - Otterndorf

Location 53°47'N, 09°07'E. Situated on the left bank of the River Elbe between the towns of Barnkrug and Otterndorf in the Federal State of Niedersachsen.

Area 11,760ha

Degree of Protection Ownership is part state and part private. The site is partially protected in five nature conservation areas: Hullen (489ha), Aussendeich Nordkehdingen (900ha), Allwordener Aussendeich/ Brammer Sand (6,525ha), Ostemündung (160ha) and Asselersand (623ha), and also contains a game protection area. New nature conservation areas are planned.

Designated as a Ramsar site in November 1974 with ratification after February 1976. Partly designated as an EC special protection area (SPA).

Site Description The site comprises a narrow section of the left bank of the River Elbe, with conditions ranging from estuarine (17% salinity) at Otterndorf to freshwater at Barnkrug (although the river here is still tidal). There is a sharp change in salinity where the river flows between Glückstadt on the right bank and Wischhafen on the left. Habitats include sandbanks, islands and mudflats (up to 1km wide at low tide). The shores are fringed with rushes *Scirpus* spp., *Schoenoplectus* spp. and reeds *Phragmites* sp. Short grass meadows intersected by ditches lie behind the dykes and are used for grazing. The riverine marshes are gradually being reclaimed for crop growing. Aussendeich Nordkehdingen Reserve is an undyked marsh area with wet pastures, remnants of a saltmarsh plant community and river mudflats (approximately 400m wide). Extensive sedge and reedbeds occur in the transition area from marsh and meadow to mudflats.

International and National Importance Passage and wintering waterfowl include 1,000 Bewick's swan *Cygnus columbianus*, 4,000 white-fronted geese *Anser albifrons*, 2,500 greylag geese *A. anser*, 6,000 barnacle geese *Branta leucopsis*, 3,500 teal *Anas crecca*, 2,300 wigeon *A. penelope* and golden plover *Pluvialis apricaria* (maximum 4,000). Breeding species include avocet *Recurvirostra avosetta* (200 pairs), little tern *Sterna albifrons* (50 pairs), common tern *S. hirundo* (200-250), gull-billed tern *Gelochelidon nilotica* (5 pairs), black tern *Chlidonias niger* (10 pairs), black-headed gull *Larus ridibundus* (2,500 pairs), black-tailed godwit *Limosa limosa* (40 pairs) and ruff *Philomachus pugnax* (100 pairs).

Changes in Ecological Character Since designation the site area has increased by 2,600ha, despite the fact that there has been some loss of designated area. Threats include industrialisation, pollution, heavy boat traffic on the river, dyke building and dredging of the river. Some areas are particularly vulnerable to disturbance due to their small size.

Management Practices The area has a warden. Hunting regulations were changed to protect waterfowl during the breeding season and from 1 November to 15 January.

Scientific Research and Facilities Several institutes of the University of Hamburg have studied the hydrological, limnological and ecological problems of the wetland. Avifaunal studies are carried out mainly by private organisations. A nature education centre has been established.

Principal Reference Material The above information is taken from documents supplied by the Government of the Federal Republic of Germany for designation in 1978, and for the Cagliari Conference in November 1980.

Supplemented by:

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland.

Duffey, E. (1982). *National Parks and Reserves of Western Europe*. Macdonald and Co., London.

Scott, D.A. (1980). A preliminary inventory of wetlands of international importance for waterfowl in west Europe and northwest Africa. *IWRB Special Publication No. 2*.

Additional references:

- Haarmann, K. (1978).** Erster Bericht über den Zustand der Feuchtgebiete internationaler Bedeutung in der Bundesrepublik Deutschland. *Biol. Abh.* Nr. 36, 28 pages.
- Haarmann, K. and Pretscher, P. (1976).** Die Feuchtgebiete internationaler Bedeutung in der Bundesrepublik Deutschland. *Vogelkdl. Bibliothek* Band 4, Greven: Kilda-Verlag, 102 pages.
- Haarmann, K. (1984).** *Feuchtgebiete internationaler Bedeutung und Europareservate in der Bundesrepublik Deutschland.* Zweiter Zustandbericht (Stand: Januar 1983). Ottendorf: Niederelbe-Verlag, 12 pages. (Fordsand Buch No. 3.)

Elbe water-meadows between Schnackenburg and Lauenburg

Location 53°08'N, 11°05'E. Situated on the River Elbe in the north of the Federal State of Niedersachsen, between Schnackenburg and Lauenburg.

Area 7,560ha

Degree of Protection The site is partially protected in five nature conservation areas: Altwasser Bei Brackede (122ha), Penkefitzer See mit Umgebung (177ha), Bracks bei Predöhlau (64,7ha), Habekost (25ha) and Lower Seegenniederung. Designated as a Ramsar site in November 1974 with ratification after February 1976. 7,500ha are designated as an EC special protection area (SPA).

Site Description The site comprises a number of separate areas along the floodplain of the middle reaches of the River Elbe.

International and National Importance Passage waterfowl include 800-1,000 Bewick's swan *Cygnus columbianus bewickii*, 800 whooper swan *Cygnus cygnus*, 1,000 bean goose *Anser fabalis*, 2,000 white-fronted geese *A. albifrons*, 500 greylag goose *A. anser*, up to 100 smew *Mergus albellus* and up to 650 pintail *Anas acuta*. Crane *Grus grus* also occurs in large numbers on passage. Breeding species include crane *Grus grus* (3 pairs), black-tailed godwit *Limosa limosa* (60 pairs) and black tern *Chlidonias niger* (50 pairs).

Changes in Ecological Character Since designation there has been a change in area, with loss of some of the original designated site, but generally an increase in site area from 4,165ha. There are plans for a nuclear fuel processing plant at Gorleben nearby. Much of the wetland will probably be disturbed by drainage schemes and there is considerable recreation and hunting pressure.

Management Practices The Hamburg group of the German Bird Preservation Society is managing some areas to protect habitat for nesting cranes and amphibians.

Scientific Research and Facilities University of Hamburg

Principal Reference Material The above information is taken from documents supplied by the Government of the Federal Republic of Germany for designation in 1978 and for the Cagliari Conference in November 1980.

Supplemented by:

Scott, D.A. (1980). A preliminary inventory of wetlands of international importance for waterfowl in west Europe and northwest Africa. *IWRB Special Publication* No. 2. 127 pp.

Additional references include:

Haarmann, K. (1978). Erster Bericht über den Zustand der Feuchtgebiete internationaler Bedeutung in der Bundesrepublik Deutschland. *Biol. Abh.* Nr. 36, 28 pages.

Haarmann, K. and Pretscher, P. (1976). Die Feuchtgebiete internationaler Bedeutung in der Bundesrepublik Deutschland. *Vogelkdl. Bibliothek* Band 4, Greven: Kilda-Verlag, 102 pages.

Haarmann, K. (1984). *Feuchtgebiete internationaler Bedeutung und Europareservate in der Bundesrepublik Deutschland. Zweiter Zustandbericht* (Stand: Januar 1983). Ottendorf: Niederelbe-Verlag, 12 pages. (Fordsand Buch No. 3.)

Dümmersee

Location 52°32'N, 8°23'E. Situated about 65km south-south-west of Bremen and 85km due west of Hannover in the Federal State of Niedersachsen.

Area 3,600ha

Degree of Protection The lake is owned by the state and the surrounding area comprises private and state properties. The site is partly protected in three nature conservation areas including Dümmer (745ha) and Hohe Sieben (75ha). 1,778ha is included in Dümmer Game Protection Area. The site also contains two landscape protection areas. All are included in Dümmer Nature Park. Designated as a Ramsar site in November 1974 with ratification after February 1976. Also designated as an EC special protection area (SPA).

Site Description The site contains a large shallow eutrophic lake (1.5m depth) in a glaciated valley, with raised bogs, peatbogs, inland sand dunes and moraines. The original vegetation has been substantially modified by man; for example, the bogs which were once used intensively as farm land but have now been abandoned since the drainage failed. The original submerged plants of the lake including pondweed *Potamogeton* spp. and stoneworts *Chara* spp. have mostly disappeared. There are still some thick belts (up to 800m) of waterlily, reeds *Phragmites* sp. and reedmace *Typha* spp. on the lake shore, and some relict patches of alder bogs and sedge meadows.

International and National Importance Despite the considerable alteration of habitat Dümmer is still important for waterfowl. Passage and wintering species include greylag goose *Anser anser* (500 in winter), garganey *Anas querquedula* (2,000-3,000 passage), smew *Mergus albellus* (500 maximum), crane *Grus grus* (3,000 maximum), Bewick's swan *Cygnus columbianus bewickii* (100 maximum). Breeding species include bittern *Botaurus stellaris* (2 pairs), white

stork *Ciconia ciconia* (2 pairs), marsh harrier *Circus aeruginosus* (7 pairs), spotted crane *Porzana porzana* (20 pairs), black-headed gull *Larus ridibundus* (600 pairs) and black tern *Chlidonias niger* (30-50 pairs).

Changes in Ecological Character Problems include pollution from sewage causing eutrophication, fluctuating water levels due to use of the lake as a storage reservoir, disturbance by boats, overfishing and construction of weekend houses. Numbers of some bird species such as black tern and crane have declined considerably.

Management Practices A number of restoration measures are being implemented, including sediment removal from the lake, re-establishment of temporary flooding in the Dümmer Nature Conservation Area, and control of fishing and hunting.

Scientific Research and Facilities No information

Principal Reference Material The above information is taken from documents supplied by the Government of the Federal Republic of Germany for designation in 1978, and for the Cagliari Conference in November 1980.

Supplemented by:

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

Duffey, E. (1982). *National Parks and Reserves in Western Europe*. Macdonald and Co., London.

Scott, D.A. (1980). A preliminary inventory of wetlands of international importance for waterfowl in west Europe and northwest Africa. *IWRB Special Publication* No. 2.

Additional references:

Haarmann, K. (1978). Erster Bericht über den Zustand der Feuchtgebiete internationaler Bedeutung in der Bundesrepublik Deutschland. *Biol. Abh.* Nr. 36, 28 pages.

Haarmann, K. and Pretscher, P. (1976). Die Feuchtgebiete internationaler Bedeutung in der Bundesrepublik Deutschland. *Vogelkdl. Bibliothek* Band 4, Greven: Kilda-Verlag, 102 pages.

Haarmann, K. (1984). *Feuchtgebiete internationaler Bedeutung und Europareservate in der Bundesrepublik Deutschland*. Zweiter Zustandbericht (Stand: Januar 1983). Ottendorf: Niederelbe-Verlag, 12 pages. (Fordsand Buch No. 3.)

Diepholzer Lowland Marsh and Peat Bogs

Location 52°34'N, 8°48'E. Situated about 37km north-east of the town of Osnabrück in the Federal State of Niedersachsen.

Area 15,060ha

Degree of Protection Ownership is part state and part private. The site is partially protected in three nature conservation areas: Neustädter Moor (155ha), Grosses Renzeler Moor (45.8ha)

and Rehdener Geestmoor (1,195ha). WWF-Federal Republic of Germany owns part of the former reserve. A further 1,000ha have been purchased since 1979 for nature conservation and further reserves are planned. Designated as a Ramsar site in November 1974 with ratification after February 1976. Also designated as an EC special protection area (SPA).

Site Description The site is a region of moor and peat bog on the glacial sands of the north German plain, and comprises two sectors separated by the village of Wagenfeld: Geestmoor to the west and Neustädter Moor, Grosses Renzeler Moor, Hespelohmoor and Grosses Moor bei Uchte to the east. Over the centuries the peat deposits have been and are still exploited by man, causing considerable changes in vegetation. Current vegetation of the moors tends to be dominated by birch *Betula* sp., cross-leaved heath *Erica tetralix*, ling *Calluna vulgaris* and purple moor grass *Molina caerulea*. The original bog flora survives only in some pools or basins and includes sphagnum moss, sweet gale *Myrica gale* and cotton grass *Eriophorum* spp. The surrounding area contains low-lying meadowlands, cornfields and small patches of coniferous and deciduous woodland.

International and National Importance The raised bogs are a breeding area for several uncommon or threatened bird species, and the site is one of the few breeding areas in Niedersachsen for the southern race of golden plover *Pluvialis apricaria* (10 pairs). Other breeding species include teal *Anas crecca* (40 pairs), Montagu's harrier *Circus pygargus* (2 pairs), curlew *Numenius arquata* (80 pairs), redshank *Tringa totanus* (40 pairs) and black-tailed godwit *Limosa limosa* (80 pairs). Some 150 black grouse *Tetrao tetrix* also occur. Passage species include up to 500 crane *Grus grus*.

Changes in Ecological Character Since designation there has been a decrease in area from 17,850ha mainly affecting the larger sector of the site. Peat cutting is still allowed in the reserves, and some areas have been degraded by soil improvement measures such as drainage. There is some disturbance from low-flying helicopters and visiting birdwatchers.

Management Practices Management of water levels is undertaken in an attempt to restore the natural raised bogs in some areas. A flock of grazing sheep has been established to aid conservation of the moorland.

Scientific Research and Facilities No information

Principal Reference Material The above information is taken from documents supplied by the Government of the Federal Republic of Germany for designation in 1978, and for the Cagliari Conference in November 1980.

Supplemented by:

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

Duffey, E. (1982). *National Parks and Reserves in Western Europe*. Macdonald and Co., London.

Scott, D.A. (1980). A preliminary inventory of wetlands of international importance for waterfowl in west Europe and northwest Africa. *IWRB Special Publication No. 2*.

Additional references:

- Haarmann, K. (1978).** Erster Bericht über den Zustand der Feuchtgebiete internationaler Bedeutung in der Bundesrepublik Deutschland. *Biol. Abh.* Nr. 36, 28 pages.
- Haarmann, K. and Pretscher, P. (1976).** Die Feuchtgebiete internationaler Bedeutung in der Bundesrepublik Deutschland. *Vogelkdl. Bibliothek* Band 4, Greven: Kilda-Verlag, 102 pages.
- Haarmann, K. (1984).** *Feuchtgebiete internationaler Bedeutung und Europareservate in der Bundesrepublik Deutschland.* Zweiter Zustandbericht (Stand: Januar 1983). Ottendorf: Niederelbe-Verlag, 12 pages. (Fordsand Buch No. 3.)

Steinhuder Meer

Location 52°28'N, 9°20'E. Situated just west of the town of Neustadt am Rübenberge in the Federal State of Niedersachsen.

Area 5,730ha

Degree of Protection The designated site is partially protected in Hagenburger Moor Nature Conservation Area (200ha) and Ostufer Steinhuder Meer Nature Conservation Area (280ha). Part of the site is a Landscape Protection Area. Further nature conservation areas are planned. Designated as a Ramsar site in November 1974 with ratification after February 1976. Also designated as an EC special protection area (SPA).

Site Description The site comprises Steinhuder Meer (3,000ha), which is the largest inland lake in northern Germany, and includes remnants of moorland and raised bog. The lake lies in a glacial meltwater channel and is thought to be fed by springs in the lake bed despite there being no major inflows but the water level remains fairly constant. The east bank is the only part of the lake bordered by a broad belt of reed swamp and marsh vegetation, and has a greater area of original vegetation and raised bog than the west shore. These areas have been reduced by reclamation for grassland.

International and National Importance The site is important in winter for large numbers of migrating and wintering birds including 3,500 teal *Anas crecca* (passage), mallard *Anas platyrhynchos* (10,000 maximum), pochard *Aythya ferina* (5,800 maximum), 500 smew *Mergus albellus* (1,100 maximum), goosander *M. merganser* (4,000 maximum), 750 shoveler *Anas clypeata* (passage) and great crested grebe *Podiceps cristatus* (500 maximum). Breeding birds include great crested grebe (150-250 pairs), bittern *Botaurus stellaris* (1-2 pairs), grey heron *Ardea cinerea* (90 pairs), greylag goose *Anser anser* (16 pairs), garganey *Anas querquedula* (7 pairs), marsh harrier *Circus aeruginosus* (6-8 pairs), spotted crane *Porzana porzana* (17 pairs) and black-headed gull *Larus ridibundus* (600 pairs).

Changes in Ecological Character The site area has decreased by 45ha since designation. Water sports and the construction of weekend cottages have been reported as sources of disturbance. Peat extraction has damaged a number of areas.

Management Practices No information

Scientific Research and Facilities No information

Principal Reference Material The above information is taken from documents supplied by the Government of the Federal Republic of Germany for designation in 1978, and for the Cagliari Conference in November 1980.

Supplemented by:

Duffey, E. (1982). *National Parks and Reserves in Western Europe*. Macdonald and Co., London.

Scott, D.A. (1980). A preliminary inventory of wetlands of international importance for waterfowl in west Europe and northwest Africa. *IWRB Special Publication* No. 2. 127 pp.

Additional references:

Haarmann, K. (1978). Erster Bericht über den Zustand der Feuchtgebiete internationaler Bedeutung in der Bundesrepublik Deutschland. *Biol. Abh.* Nr. 36, 28 pages.

Haarmann, K. and Pretscher, P. (1976). Die Feuchtgebiete internationaler Bedeutung in der Bundesrepublik Deutschland. *Vogelkdl. Bibliothek* Band 4, Greven: Kilda-Verlag, 102 pages.

Haarmann, K. (1984). *Feuchtgebiete internationaler Bedeutung und Europareservate in der Bundesrepublik Deutschland*. Zweiter Zustandbericht (Stand: Januar 1983). Ottendorf: Niederelbe-Verlag, 12 pages. (Fordsand Buch No. 3.)

Rhein between Eltville and Bingen

Location 49°59'N, 8°02'E. Situated on the Rhine River near the city of Mainz between the towns of Bingen and Eltville in the Federal States of Hessen and Rheinland-Pfalz.

Area 475ha

Degree of Protection The designated site is protected in three nature conservation areas: Rudesheimer Aue (29ha); Fulder Aue-Ilmenaue (250ha) and Marianneae (196ha). Extensions to these areas are planned. Designated as a Ramsar site in November 1974 with ratification after February 1976.

Site Description The site comprises three nature conservation areas which include four islands in the Rhine: Ilmen, Fulder, Rudesheimer and Mariannen. The navigable channel of the river has been deepened and the water channeled by artificial banks which created shallow still waters between the river margins and channel banks near the islands. Some of these areas are included in the designated area.

International and National Importance This is the only wetland of international importance in central Germany. The site is very important for migrating birds as the nearest wetlands are some 300km north and 250km southeast. A maximum of 10,000 waterfowl have been counted at the site in winter including pochard *Aythya ferina* (maximum 7,500), tufted duck *A. fuligula*

(2,500 maximum), smew *Mergus albellus* (550 maximum) and goosander *M. merganser* (800 maximum). Most species of European waterfowl have been seen here including the less common ducks such as garganey *Anas querquedula* and gadwall *A. strepera*. The shallow water areas are important for migrating waders particularly lapwing *Vanellus vanellus*, godwits *Limosa* spp., redshank *Tringa totanus*, greenshank *T. nebularia*, common sandpiper *T. hypoleucos*, green sandpiper *T. ochropus* and ruff *Philomachus pugnax*. Breeding birds are few in number but include nightingale *Luscinia megarhynchos*, Icterine warbler *Hippolais icterina* and golden oriole *Oriolus oriolus*.

Changes in Ecological Character There is considerable tourist pressure from wind-surfers, boats and anglers which disturb the waterfowl. There were demands for a new bridge across the Rhine at Geisenheim, which would have affected the island of Fulder Aue, but these have now been dropped.

Management Practices Management practices include protection of the remaining natural water meadow forest and of waterfowl resting sites, and the prevention of the establishment of cultivated poplars. The local Association for Ornithology and Nature has proposed that winter closing time for the reserve be brought forward to lessen disturbance to resting birds, especially from hunting.

Scientific Research and Facilities No information

Principal Reference Material The above information is taken from documents supplied by the Government of the Federal Republic of Germany for designation in 1978, and for the Cagliari Conference in November 1980.

Supplemented by:

Duffey, E. (1982). *National Parks and Reserves in Western Europe*. Macdonald and Co., London.

Scott, D.A. (1980). A preliminary inventory of wetlands of international importance for waterfowl in west Europe and northwest Africa. *IWRB Special Publication* No. 2.

Additional references:

Haarmann, K. (1978). Erster Bericht über den Zustand der Feuchtgebiete internationaler Bedeutung in der Bundesrepublik Deutschland. *Biol. Abh.* Nr. 36, 28 pages.

Haarmann, K. and Pretscher, P. (1976). Die Feuchtgebiete internationaler Bedeutung in der Bundesrepublik Deutschland. *Vogelkdl. Bibliothek* Band 4, Greven: Kilda-Verlag, 102 pages.

Haarmann, K. (1984). *Feuchtgebiete internationaler Bedeutung und Europareservate in der Bundesrepublik Deutschland*. Zweiter Zustandbericht (Stand: Januar 1983). Ottendorf: Niederelbe-Verlag, 12 pages. (Fordsand Buch No. 3.)

Bodensee

Location In three sectors (see below): a) 47°41'N, 9°07'E; b) 47°42'N, 9°06'E; c) 47°45'N, 9°01'E. Situated west and north-west of Konstanz in the Federal State of Baden Württemberg.

Area 1,077ha

Degree of Protection Ownership is part state and part private. The designated site is totally protected as Wollmatinger Ried-Giehren Moos Dreifusswiesen Conservation Area (767ha) and Mindelsee Conservation Area (307ha). Designated as a Ramsar site in November 1974 with ratification after February 1976. Part is also designated as an EC special protection area (SPA).

Site Description The site comprises: a) Wollmatingen reedbed with north-eastern Ermatingen Basin; adjacent to b) Giehren marsh with Bay of Hegne on the Gnadensee; and c) Mindelsee near Radolfzell. These areas are on or adjacent to the part of the Bodensee (Lake Constance) known as Untersee. Bodensee was formed by a combination of earth movement (during uplifting of the Alps) and glacial action and was originally a typical subalpine waterbody, poor in nutrients. Due to industrial and domestic waste the waters have now become moderately nutrient-rich. The lake is partially bordered by reeds, marsh and meadows.

International and National Importance Moulting, passage and wintering waterfowl include whooper swan *Cygnus cygnus* (70 in spring), gadwall *Anas strepera* (1,750), red-crested pochard *Netta rufina* (1,000), pochard *Aythya ferina* (11,680), tufted duck *A. fuligula* (5,000), goldeneye *Bucephala clangula* (3,000), teal *Anas crecca* (2,000 maximum), 350 shoveler *A. clypeata* (800 maximum), coot *Fulica atra* (12,000), and black-necked grebe *Podiceps nigricollis* (500 maximum). The site is particularly important as a moulting refuge for the two species of pochard. Breeding waterfowl include great crested grebe *Podiceps cristatus* (300 pairs), 8 species of duck including red-crested pochard *Netta rufina* (40+ pairs), marsh harrier *Circus aeruginosus* (2 pairs) and common tern *Sterna hirundo* (40 pairs). Wollmatinger Ried Nature Conservation Area contains a number of plants considered threatened in the Federal Republic of Germany, such as Siberian iris *Iris sibirica*, bird's-eye primrose *Primula farinosa*, marsh gladiolus *Gladiolus palustris* and sweet-smelling garlic *Allium suaveolens* (vulnerable in Europe).

Changes in Ecological Character Problems include eutrophication and pressure from recreation requirements. In the lake, whitefish *Coregonus* spp. have been almost replaced by perch *Perca* sp. Area a) is disturbed by hunting on the Swiss shore. Areas a) and b) are disturbed by watersport and boat traffic.

Management Practices The meadows are mown to encourage Limicoline species, and the ponds have been dug to encourage nesting birds, insects and amphibians. The reeds are cut regularly. Expansion of silviculture on the south bank of the Mindelsee has provided cover for small fish in the submerged branches of fallen trees. This has improved the food supply for fish-eating waterfowl. Many *Dreissena polymorpha* also occur in such areas, providing good feeding for tufted duck.

Scientific Research and Facilities Several institutes carry out research in and around the Bodensee, particularly limnological studies. Research is also carried out by several private organisations and at least three major Swiss institutes. Research in Mindelsee on ecology and ethology of reed warblers *Acrocephalus scirpaceus*.

Principal Reference Material The above information is taken from documents supplied by the Government of the Federal Republic of Germany for designation in 1978, and for the Cagliari Conference in November 1980.

Supplemented by:

- Carp, E. (1980).** *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.
- Duffey, E. (1982).** *National Parks and Reserves in Western Europe*. Macdonald and Co., London.
- Scott, D.A. (1980).** A preliminary inventory of wetlands of international importance for waterfowl in west Europe and northwest Africa. *IWRB Special Publication* No. 2.

Additional references:

- Haarmann, K. (1978).** Erster Bericht über den Zustand der Feuchtgebiete internationaler Bedeutung in der Bundesrepublik Deutschland. *Biol. Abh.* Nr. 36, 28 pages.
- Haarmann, K. and Pretscher, P. (1976).** Die Feuchtgebiete internationaler Bedeutung in der Bundesrepublik Deutschland. *Vogelkdl. Bibliothek* Band 4, Greven: Kilda-Verlag, 102 pages.
- Haarmann, K. (1984).** *Feuchtgebiete internationaler Bedeutung und Europareservate in der Bundesrepublik Deutschland*. Zweiter Zustandbericht (Stand: Januar 1983). Ottendorf: Niederelbe-Verlag, 12 pages. (Fordsand Buch No. 3.)

Water-meadows and peat-bogs of Donau

Location 48°28'N, 10°13'E. Situated between the towns of Neu-Ulm and Lauingen on the Danube River in the Federal State of Bayern.

Area 8,000ha

Degree of Protection Ownership is part state and part private. The area contains a number of landscape protection areas and nature conservation areas, and further nature conservation areas are planned. Designated as a Ramsar site in November 1974 with ratification after February 1976.

Site Description The site comprises: the western part of the Danube peatbog from Riedheim in the west to Riedhausen in the east; the eastern part of the Danube peatbog from Riedhausen in the west to Unteren and Oberen Moosteile in the northeast, including some meadowland (combined area 2,000ha); and the Danube riverine forest in a band of varying width (2-3km) on either side of the Danube from Lauingen to Neu Ulm (4,000ha). This woodland is flooded in March and June by alpine meltwater, and it therefore cannot be cultivated. It contains marshes and gravel pits. In the past 50 years the river has been increasingly regulated by many dams, and there are six reservoirs (Oberelchingen, Leipheim, Günzburg, Offingen, Peterswörth and Faimingen) created primarily for hydroelectric power. These also attract waterfowl.

International and National Importance The reservoirs of Oberelchingen, Leipheim and Faimingen are of international importance and the reservoirs of Günzburg, Offingen and Peterswörth are of national importance for waterfowl. They attract numerous resting and overwintering birds including mallard *Anas platyrhynchos* (10,000 January average/15,000 maximum), tufted duck *A. fuligula* (several thousand), pochard *Aythya ferina* (7,800 January

average/10,000 maximum), little grebe *Tachybaptus ruficollis* (3,000 maximum), black-necked grebe *Podiceps nigricollis* (1,000 maximum), teal *Anas crecca* (1,400 January average/4,000 maximum) and coot *Fulica atra* (6,600 January average/11,000 maximum). The moorland areas are important for breeding and overwintering birds.

Changes in Ecological Character The area is in danger from gravel extraction, dumping of urban waste, reafforestation with conifers, industrial development, and disturbance from tourism and shooting. Water is extracted to supply Stuttgart and there has also been agricultural drainage.

Management Practices No information

Scientific Research and Facilities In 1988, parts of the site were subject to a study of hydrological and hydrobiological conditions.

Principal Reference Material The above information is taken from documents supplied by the Government of the Federal Republic of Germany for designation in 1978, and for the Cagliari Conference in November 1980.

Supplemented by:

Duffey, E. (1982). *National Parks and Reserves in Western Europe*. Macdonald and Co., London.

Scott, D.A. (1980). A preliminary inventory of wetlands of international importance for waterfowl in west Europe and northwest Africa. *IWRB Special Publication* No. 2.

Additional references:

Haarmann, K. (1978). Erster Bericht über den Zustand der Feuchtgebiete internationaler Bedeutung in der Bundesrepublik Deutschland. *Biol. Abh.* Nr. 36, 28 pages.

Haarmann, K. and Pretscher, P. (1976). Die Feuchtgebiete internationaler Bedeutung in der Bundesrepublik Deutschland. *Vogelkdl. Bibliothek* Band 4, Greven: Kilda-Verlag, 102 pages.

Haarmann, K. (1984). *Feuchtgebiete internationaler Bedeutung und Europareservate in der Bundesrepublik Deutschland*. Zweiter Zustandbericht (Stand: Januar 1983). Ottendorf: Niederelbe-Verlag, 12 pages. (Fordsand Buch No. 3.)

Lech Donau Winkel

Location In two parts (see below): a) 48°41'N, 10°54'E; b) 48°44'N, 11°03'E. Situated near the confluence of the River Lech and River Danube in the Federal State of Bayern.

Area 230ha

Degree of Protection The site contains Feldheim Reservoir, which is a proposed Nature Conservation Area. Designated as a Ramsar site in November 1974 with ratification after February 1976.

Site Description The site comprises two reservoirs built primarily to serve hydroelectric power stations: a) Feldheim Reservoir on the River Lech built in 1959, and b) Bertoldsheim Reservoir on the River Danube (Donau) built in 1967. Both have fluctuating water levels although vegetation has developed on some of the Feldheim shoreline. The reservoirs are surrounded by meadow woodland.

International and National Importance The reservoirs are internationally important as resting and overwintering areas for northern species of waterfowl, and Feldheim is important as a breeding and moulting ground. Passage and wintering waterfowl include pochard *Aythya ferina* (4,000 maximum), tufted duck *A. fuligula* (1,000 maximum), little grebe *Tachybaptus ruficollis* (700 maximum), gadwall *Anas strepera* (280 maximum), teal *A. crecca* (2,300 maximum) and goosander *Mergus merganser* (175 maximum).

Changes in Ecological Character Bertoldsheim Reservoir is intensively used for water sports in summer, and although peak use does not coincide with peak waterfowl numbers, this is a disturbance in autumn and spring. There is some disturbance from sport fishermen in boats in winter.

Management Practices Nature Conservation Area status at Feldheim will include controls on fishing and watersports and probable banning of hunting. Some restrictions are planned on boats in Bertoldsheim.

Scientific Research and Facilities No information

Principal Reference Material The above information is taken from documents supplied by the Government of the Federal Republic of Germany for designation in 1978, and for the Cagliari Conference in November 1980.

Supplemented by:

Scott, D.A. (1980). A preliminary inventory of wetlands of international importance for waterfowl in west Europe and northwest Africa. *IWRB Special Publication* No. 2.

Additional references:

Haarmann, K. (1978). Erster Bericht über den Zustand der Feuchtgebiete internationaler Bedeutung in der Bundesrepublik Deutschland. *Biol. Abh.* Nr. 36, 28 pages.

Haarmann, K. and Pretscher, P. (1976). Die Feuchtgebiete internationaler Bedeutung in der Bundesrepublik Deutschland. *Vogelkdl. Bibliothek* Band 4, Greven: Kilda-Verlag, 102 pages.

Haarmann, K. (1984). *Feuchtgebiete internationaler Bedeutung und Europareservate in der Bundesrepublik Deutschland*. Zweiter Zustandbericht (Stand: Januar 1983). Ottendorf: Niederelbe-Verlag, 12 pages. (Fordsand Buch No. 3.)

Ismaning Reservoir and fish-ponds

Location 48°13'N, 11°41'E. Situated about 5km north-east of Munich in the Federal State of Bayern.

Area 900ha

Degree of Protection The area is owned by an hydro-electrical firm (Bayernwerk AG). The area is recognised by the Council of Europe as an Europareservat. Designated as a Ramsar site in November 1974 with ratification after February 1976.

Site Description The site comprises Ismaning Storage Reservoir, which supplies drinking water to München, and over 30 fish ponds along the Mittlere Isar Canal. The reservoir (built in 1929) is 7km long and divided into two basins. A gentle current prevents it from completely freezing over in winter. The south shore has a number of plant communities varying from reed to woodland. The fishponds, which contain carp *Cyprinus carpio*, serve as a biological purification system for partially treated sewage from Munich. The waters are rich in nutrients and variations in water-level expose mudflats which attract many waders.

International and National Importance Passage moulting and wintering waterfowl include pochard *Aythya ferina* (20,000), tufted duck *A. fuligula* (13,000 maximum), coot *Fulica atra* (13,000 maximum), gadwall *Anas strepera* (3,660 maximum), red-crested pochard *Netta rufina* (1,690 maximum), black-necked grebe *Podiceps nigricollis* (480 maximum), mallard *Anas platyrhynchos* (8,200 maximum), shoveler *A. clypeata* (980 maximum) and goldeneye *Bucephala clangula* (570 maximum). Breeding waterfowl include black-necked grebe *Podiceps nigricollis* (100 pairs), cormorant *Phalacrocorax carbo sinensis* (65 pairs; increasing), night heron *Nycticorax nycticorax* (3 pairs), grey heron *Ardea cinerea* (65 pairs), red-crested pochard (10 pairs), pochard (225 pairs) and tufted duck (600 pairs) and 9 species threatened in the Federal Republic of Germany.

Changes in Ecological Character Outbreaks of avian botulism have occurred in several years. A road is planned through the area of the fish-ponds.

Management Practices There is an agreement between the Bavarian Ornithological Hunting Associations whereby hunting is restricted in two-thirds of the area. Fishing is only allowed from the dam in the east basin, the middle dam and the north dam of the west basin. Fishing from boats is prohibited. The Ornithological Association has built an artificial island for waterfowl.

Scientific Research and Facilities The Ornithological Association of Bavaria carries out midwinter waterfowl counts, faunal and ecological research.

Principal Reference Material The above information is taken from documents supplied by the Government of the Federal Republic of Germany for designation in 1978, and for the Cagliari Conference in November 1980.

Supplemented by:

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

Duffey, E. (1982). *National Parks and Reserves of Western Europe*. Macdonald and Co., London.

Scott, D.A. (1980). A preliminary inventory of wetlands of international importance for waterfowl in west Europe and northwest Africa. *IWRB Special Publication No. 2*. 127 pp.

Additional references:

Haarmann, K. (1978). Erster Bericht über den Zustand der Feuchtgebiete internationaler Bedeutung in der Bundesrepublik Deutschland. *Biol. Abh.* Nr. 36, 28 pages.

Haarmann, K. and Pretscher, P. (1976). Die Feuchtgebiete internationaler Bedeutung in der Bundesrepublik Deutschland. *Vogelkdl. Bibliothek* Band 4, Greven: Kilda-Verlag, 102 pages.

Haarmann, K. (1984). *Feuchtgebiete internationaler Bedeutung und Europareservate in der Bundesrepublik Deutschland*. Zweiter Zustandbericht (Stand: Januar 1983). Ottendorf: Niederelbe-Verlag, 12 pages. (Fordsand Buch No. 3.)

Ammersee

Location 48°01'N, 11°08'E. Situated west-south-west of Munich in the Federal State of Bayern.

Area 6,517ha

Degree of Protection The lake surface and small areas in the south are under state ownership. The site includes Ammersee Südufer Nature Reserve (500ha) in the south. Protection of 530ha in the north as a nature conservation area was recorded in 1980 as almost complete. The whole area was established as a Landscape Protection Area in 1972. Designated as a Ramsar site in November 1974 with ratification after February 1976.

Site Description Lake Ammer lies in a glaciated landscape bordered to the west and east by moraine material. The designated site boundary follows the lake shore in the east and west but in the north and south includes areas of flat moorland with some scattered meadowland. Deposition from the Ammer River in the southern end of the lake (about 163,000 tonnes per year) has formed several peninsulas extending into the lake, with shallow bays largely fringed by reeds. The lake outlet is the River Amper in the north which eventually joins the River Isar.

International and National Importance Passage and wintering waterfowl include tufted duck *Aythya fuligula* (17,000 maximum), coot *Fulica atra* (250 maximum), gadwall *Anas strepera* (250 maximum), mallard *Anas platyrhynchos* (4,600 maximum), pochard *Aythya ferina* (2,500 maximum) and goldeneye *Bucephala clangula* (900 maximum). The flat moorlands north and south of the lake support many breeding species including black-headed gull *Larus ridibundus* (480 pairs), snipe *Gallinago gallinago* (7-9 pairs) and red-crested pochard *Netta rufina* (2-3 pairs).

Changes in Ecological Character There is considerable disturbance of waterfowl from tourism and boats. Particularly affected are birds breeding close to the lake edge. The vegetation of the lake margin and wet grassland is increasingly damaged by recreational activities.

Management Practices The Nature Conservation Area is managed in cooperation with local naturalist associations. Steps have been taken to curb illegal boat mooring and around 80 launch stages have been cleared away.

Scientific Research and Facilities Past and current avifaunal studies.

Principal Reference Material The above information is taken from documents supplied by the Government of the Federal Republic of Germany for designation in 1978, and for the Cagliari Conference in November 1980.

Supplemented by:

Scott, D.A. (1980). A preliminary inventory of wetlands of international importance for waterfowl in west Europe and northwest Africa. *IWRB Special Publication* No. 2. 127 pp.

Additional references:

Haarmann, K. (1978). Erster Bericht über den Zustand der Feuchtgebiete internationaler Bedeutung in der Bundesrepublik Deutschland. *Biol. Abh.* Nr. 36, 28 pages.

Haarmann, K. and Pretscher, P. (1976). Die Feuchtgebiete internationaler Bedeutung in der Bundesrepublik Deutschland. *Vogelkdl. Bibliothek* Band 4, Greven: Kilda-Verlag, 102 pages.

Haarmann, K. (1984). *Feuchtgebiete internationaler Bedeutung und Europareservate in der Bundesrepublik Deutschland.* Zweiter Zustandbericht (Stand: Januar 1983). Ottendorf: Niederelbe-Verlag, 12 pages. (Fordsand Buch No. 3.)

Starnberger See

Location 47°55'N, 11°18'E. Situated south-west of Munich in the Federal State of Bayern.

Area 5,720ha

Degree of Protection Starnberger Lake was established as a landscape protection area in April 1967. There are no nature conservation areas within the designated site. Designated as a Ramsar site in November 1974 with ratification after February 1976.

Site Description The designated site boundary follows the lake shoreline, and includes the whole lake surface but excluding Rosen Island. The land to the west and east is of moraine material. The site contains some areas still in relatively undisturbed state including the Karpfenwinkel area on the west shore and an area near St Heinrich.

International and National Importance The lake is important for overwintering waterfowl with a maximum of 24,390 recorded birds including tufted duck *Aythya fuligula* (5,370 maximum), coot *Fulica atra* (17,200 maximum), great crested grebe *Podiceps cristatus* (1,400

maximum) and goldeneye *Bucephala clangula* (650 maximum). Breeding species include black-headed gull *Larus ridibundus* (300-400 pairs). The lake does not freeze over completely in winter, and is therefore an important refuge for waterfowl from other areas during periods of severe frost.

Changes in Ecological Character The lake is near Munich, and is intensively used for recreation (particularly sailing). Consequently, only a few small areas remain in an undisturbed and natural state. Breeding numbers of birds are small due to this disturbance and destruction of habitat. Recent changes in waste water disposal have resulted in a distinct improvement in the water quality of the lake.

Management Practices No information

Scientific Research and Facilities No information

Principal Reference Material The above information is taken from documents supplied by the Government of the Federal Republic of Germany for designation in 1978, and for the Cagliari Conference in November 1980.

Supplemented by:

Scott, D.A. (1980). A preliminary inventory of wetlands of international importance for waterfowl in west Europe and northwest Africa. *IWRB Special Publication* No. 2. 127 pp.

Additional references:

Haarmann, K. (1978). Erster Bericht über den Zustand der Feuchtgebiete internationaler Bedeutung in der Bundesrepublik Deutschland. *Biol. Abh.* 36. 28 pp.

Haarmann, K. and Pretscher, P. (1976). Die Feuchtgebiete internationaler Bedeutung in der Bundesrepublik Deutschland. *Vogelkdl. Bibliothek* Band 4, Greven: Kilda-Verlag. 102 pp.

Haarmann, K. (1984). *Feuchtgebiete internationaler Bedeutung und Europareservate in der Bundesrepublik Deutschland. Zweiter Zustandbericht (Stand: Januar 1983).* Ottendorf: Niederelbe-Verlag. 12 pp. (Fordsand Buch No. 3.)

Chiemsee

Location 47°53'N, 12°29'E. Situated southeast of Munich in the Federal State of Bayern.

Area 8,660ha

Degree of Protection The area was established as a landscape protection area in 1967. Tiroler Achen was established as a nature conservation area in 1954, and was subsequently extended to 730ha. A further nature reserve is planned. Designated as a Ramsar site in November 1974 with ratification after February 1976.

Site Description Lake Chiem lies in a hilly landscape, and is surrounded to the east, west and north by moraine material. The site includes the entire lake surface and three islands, and a land area around the Achen river mouth in the south-east (Tiroler Achen). The river falls some

5,290m in 73km, and carries large quantities of gravel, silt and mud (430,000 metric tonnes annually) from the Alps. The deposition has formed a large area of shallow water, sandbars and mudflats extending into the south-east corner of the lake. The lake drains to the north by the River Alz. The surrounding land is mainly meadows, fields and some woodland. Parts of the lake have extensive reedbeds of *Phragmites* sp.

International and National Importance During winter the site has many thousands of resting and over-wintering waterfowl which concentrate in Tiroler Ache including tufted duck *Aythya fuligula* (16,600 maximum), coot *Fulica atra* (16,000 maximum), pochard *Aythya ferina* (4,000 maximum), goldeneye *Bucephala clangula* (900 maximum) and red-crested pochard *Netta rufina* (30 maximum). Breeding birds include great crested grebe *Podiceps cristatus*, black-necked grebe *Podiceps nigricollis* (15-20 pairs), gadwall *Anas strepera*, teal *A. crecca*, red-crested pochard, water rail *Rallus aquaticus*, snipe *Gallinago gallinago* and curlew *Numenius arquata*.

Changes in Ecological Character Few areas of the wetland have not been subject to activities by man. The whole area is extensively used for recreation, especially sailing with 5,000 licensed sailing boats. The lake suffers from pollution with waste water.

Management Practices Progress has been made in limiting hunting.

Scientific Research and Facilities The area was surveyed in 1979 to define those parts needing protection as nature conservation areas.

Principal Reference Material The above information is taken from documents supplied by the Government of the Federal Republic of Germany for designation in 1978, and for the Cagliari Conference in November 1980.

Supplemented by:

Duffey, E. (1982). *National Parks and Reserves of Western Europe*. Macdonald and Co., London.

Scott, D.A. (1980). A preliminary inventory of wetlands of international importance for waterfowl in west Europe and northwest Africa. *IWRB Special Publication* No. 2. 127 pp.

Additional references:

Haarmann, K. (1978). Erster Bericht über den Zustand der Feuchtgebiete internationaler Bedeutung in der Bundesrepublik Deutschland. *Biol. Abh.* Nr. 36, 28 pages.

Haarmann, K. and Pretscher, P. (1976). Die Feuchtgebiete internationaler Bedeutung in der Bundesrepublik Deutschland. *Vogelkdl. Bibliothek* Band 4, Greven: Kilda-Verlag, 102 pages.

Haarmann, K. (1984). *Feuchtgebiete internationaler Bedeutung und Europareservate in der Bundesrepublik Deutschland*. Zweiter Zustandbericht (Stand: Januar 1983). Ottendorf: Niederelbe-Verlag, 12 pages. (Fordsand Buch No. 3.)

Lower Inn between Haiming and Neuhaus

Location 48°20'N, 13°09'E. Situated on the Austrian border on the River Inn between the towns of Neuhaus and Haiming in the Federal State of Bayern.

Area 1,955ha

Degree of Protection Ownership is part state and part private. The designated site includes Egglfing and Ering reservoirs, which form a Nature Conservation Area (729ha) established in 1972. Ering is contiguous with the Austrian Hagenauer Bucht Nature Reserve. The whole area is an Europareservat. Designated as a Ramsar site in November 1974 with ratification after February 1976.

Site Description The site comprises four reservoirs on the River Inn: Egglfing, Ering, Scharding and Simbach. The larger reservoirs can be considered as sections of the river but with a slower current. Average water depth is 1-2m with maximum of 5-7m. The River Inn carries a large load of suspended material including much organic detritus which, together with abundant plant nutrients, has resulted in the area having a very rich biological productivity.

International and National Importance The wide range of habitats for waterfowl, and abundant food supply, have attracted many bird species to the site. Waterfowl numbers have further increased due to destruction of other wetlands in the Alpine region. 25% of the total waterfowl midwinter count in Bavaria and Austria occur in this area. Passage and wintering waterfowl include gadwall *Anas strepera* (1,900 maximum), mallard *A. platyrhynchos* (10,500 maximum), pochard *Aythya ferina* (13,000), tufted duck *Aythya fuligula* (15,000-20,000), goldeneye *Bucephala clangula* (3,000-4,000), coot *Fulica atra* (8,000-15,000), ruff *Philomachus pugnax* (13,400 maximum), cormorant *Phalacrocorax carbo sinensis* (80-100), mute swan *Cygnus olor* (500 maximum), teal *Anas crecca* (4,200 maximum), red-crested pochard *Netta rufina* (120 maximum), lapwing *Vanellus vanellus* (8,000 maximum) and black-headed gull *Larus ridibundus* (30,000 maximum). Breeding species include great crested grebe *Podiceps cristatus* (100 pairs), little bittern *Ixobrychus minutus* (10+ pairs), night heron *Nycticorax nycticorax* (40 pairs), purple heron *Ardea purpurea* (3 pairs), marsh harrier *Circus aeruginosus* (6 pairs), black-headed gull (1,670 pairs) and common tern *Sterna hirundo* (49 pairs). Beaver *Caster fiber* is present.

Changes in Ecological Character There is disturbance from fishing, hunting, recreation and forest clearance for agriculture.

Management Practices Some progress has been made towards benning waterfowl hunting.

Scientific Research and Facilities Mainly avifaunal research. The ecological relationship of the four reservoirs has been studied since 1961.

Principal Reference Material The above information is taken from documents supplied by the Government of the Federal Republic of Germany for designation in 1978, and for the Cagliari Conference in November 1980.

Supplemented by:

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

Scott, D.A. (1980). A preliminary inventory of wetlands of international importance for waterfowl in west Europe and northwest Africa. *IWRB Special Publication* No. 2. 127 pp.

Additional references:

Haarmann, K. (1978). Erster Bericht über den Zustand der Feuchtgebiete internationaler Bedeutung in der Bundesrepublik Deutschland. *Biol. Abh.* Nr. 36, 28 pages.

Haarmann, K. and Pretscher, P. (1976). Die Feuchtgebiete internationaler Bedeutung in der Bundesrepublik Deutschland. *Vogelkdl. Bibliothek* Band 4, Greven: Kilda-Verlag, 102 pages.

Haarmann, K. (1984). *Feuchtgebiete internationaler Bedeutung und Europareservate in der Bundesrepublik Deutschland*. Zweiter Zustandbericht (Stand: Januar 1983). Ottendorf: Niederelbe-Verlag, 12 pages. (Fordsand Buch No. 3.)

Rieselfelder Münster

Location 52°09'N, 7°39'E. Situated 6km north of the town of Münster in the Federal State of Nordrhein-Westfalen.

Area 233ha

Degree of Protection The area is owned by the municipality of Münster and is administered by the Biological Station (Rieselfelder Münster, Wöstebach 11, 4400 Münster). It has been an Europareservat since 1978. Designated as a Ramsar site in 1983.

Site Description The site comprises about 140ha water and 93ha land. The water consists of shallow (10-23cm) eutrophic ponds created by dredging, and the land is mainly agricultural with some woodland. It is a man-made environment originally used for sewage disposal. Dominant vegetation around the pools consists of celery-leaved crowfoot *Ranunculus sceleratus*, marsh yellow-cress *Rorippa islandica*, stinging nettle *Urtica dioica*, curled dock *Rumex crispus*, broad-leaved dock *R. obtusifolius*, redshank *Polygonum persicaria*, pale persicaria *P. lapathifolium*, tripartite bur marigold *Bidens tripartita*, *Senecio* sp., water plantain *Alisma plantago-aquatica*, hastate orache *Atriplex hastata*, reed *Phragmites communis*, reedgrass *Phalaris arundinacea*, great reedmace *Typha latifolia*, Gibbon's duckweed *Lemna gibba* and woody nightshade *Solanum dulcamara*.

International and National Importance Rieselfelder Münster is the most important resting and moulting site for waders in the inner parts of the Federal Republic of Germany, and probably the principal summer resting and moulting site for teal *Anas crecca* and shoveler *A. clypeata*. Dominant species include lapwing *Vanellus vanellus*, snipe *Gallinago gallinago*, black-headed

gull *Larus ridibundus*, mallard *Anas platyrhynchos* and reed bunting *Emberiza schoeniclus*. 85 breeding species include 15 species listed in the Red Data Book (Federal Republic of Germany), including teal, garganey *Anas querquedula*, marsh harrier *Circus aeruginosus*, shoveler, water rail *Rallus aquaticus*, spotted crake *Porzana porzana*, snipe, redshank *Tringa totanus*, sparrowhawk *Accipiter nissus*, hobby *Falco subbuteo* and turtledove *Streptopelia turtur*. 150 other bird species visit the site.

Changes in Ecological Character The site had been endangered by possible industrial development in the immediate vicinity, but these plans have been rejected. There is some disturbance of the site owing to recreational pressures.

Management Practices Present management practices include clearing overgrown areas, and regulation of visitors. Future management will include deepening of the ponds. There are plans to designate the area as a nature reserve.

Scientific Research and Facilities The biological station at Rieselfelder has carried out ringing, moulting and ecological projects on ducks and waders for some years.

Principal Reference Material The above information is taken from documents supplied by the Government of the Federal Republic of Germany for designation in 1983. Supplemented by:

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

Additional references:

Haarmann, K. (1978). Erster Bericht über den Zustand der Feuchtgebiete internationaler Bedeutung in der Bundesrepublik Deutschland. *Biol. Abh.* Nr. 36, 28 pages.

Haarmann, K. and Pretscher, P. (1976). Die Feuchtgebiete internationaler Bedeutung in der Bundesrepublik Deutschland. *Vogelkdl. Bibliothek* Band 4, Greven: Kilda-Verlag, 102 pages.

Haarmann, K. (1984). *Feuchtgebiete internationaler Bedeutung und Europareservate in der Bundesrepublik Deutschland*. Zweiter Zustandbericht (Stand: Januar 1983). Ottendorf: Niederelbe-Verlag, 12 pages. (Fordsand Buch No. 3.)

Weserstaustufe Schlüsselburg

Location 52°27'N, 8°59'E. Situated west of Hannover in the Federal State of Nordrhein-Westfalen.

Area 1,550ha

Degree of Protection Ownership is divided between the federal government, the State of Nordrhein-Westfalen and private owners. The designated site contains five nature conservation areas with the remaining area protected as landscape protection areas. Designated as a Ramsar site in 1983.

Site Description The site comprises a section of the River Weser and a strip of land on both banks between the town of Petershagen and the state border of Niedersachsen. Most of the land is used for agriculture, comprising 95% grassland and 5% woodland. The remainder is exploited for gravel extraction which has created eight lakes (3-5m depth). In periods of flood these lakes are in contact with the river water which is eutrophic and brackish. However, due to the influence of groundwater, the salinity of the lakes is usually less than that of the river.

International and National Importance The site is important for passage and overwintering waterfowl, with 53 recorded species including pochard *Aythya ferina* (maximum 4,600), tufted duck *A. fuligula* (3,100 maximum), goldeneye *Bucephala clangula* (1,500 maximum), goosander *Mergus merganser* (750 maximum) and golden plover *Pluvialis apricaria* (1,000 maximum). This wetland is the most important overwintering area in the northern Federal Republic of Germany for goldeneye. It has some 16 breeding species of waterfowl including white stork *Ciconia ciconia* (3-6 pairs).

Changes in Ecological Character There is increasing disturbance of waterfowl especially from water sports and angling. The area is also disturbed by low-flying aircraft on military exercises. It is threatened by further drainage and conversion of grassland to arable land, but the threat has now receded owing to nature reserve designations and management agreements with farmers.

Management Practices No information

Scientific Research and Facilities A scientific report has been commissioned on disturbance to birds from aircraft.

Principal Reference Material The above information is taken from documents supplied by the Government of the Federal Republic of Germany for designation in 1983. Additional references:

Haarmann, K. (1984). Drei neue Feuchtgebiete internationaler Bedeutung in der Bundesrepublik Deutschland. *Ber. Dtsch. Sekt. Int. Rat. Vogelschutz* 23.

Unterer Niederrhein

Location 51°43'N, 06°14'E. Situated on the Netherlands border, 30km northwest of Duisburg in the Federal State of Nordrhein-Westfalen.

Area 25,000ha. The National Report submitted to the 1990 Conference of Contracting Parties in Montreux notes a planned extension to around 27,000ha.

Degree of Protection Ownership is part state and part private. The site is partially protected in twenty nature conservation areas. Designated as a Ramsar site in 1983.

Site Description The site comprises part of the Lower Rhine floodplain on both sides of the river between the town of Wesel and the Netherlands border. It is mainly managed grassland used for grazing, but contains some small areas of woodland and arable land. There is gravel

and sand extraction, which has created numerous artificial ponds and lakes which, together with the meadow dykes and old and present channels of the river, constitute a large area of open water. Water quality varies from mesotrophic/eutrophic in the gravel lakes to hyper-eutrophic and polluted in the river.

International and National Importance The site is important for bean goose *Anser fabalis*, with a large proportion of the West European population overwintering here and the remainder of the population using the site as a resting area. Other resting or overwintering species include white-fronted goose *Anser albifrons* (20,000), lapwing *Vanellus vanellus*, coot *Fulica atra*, golden plover *Pluvialis apricaria*, pochard *Aythya ferina*, tufted duck *A. fuligula* and teal *Anas crecca*. Breeding species include lapwing, shoveler *Anas clypeata* and great crested grebe *Podiceps cristatus*. The area has 25 species considered threatened in the Federal Republic of Germany including teal, shoveler, water rail *Rallus aquaticus*, corncrake *Crex crex*, ruff *Philomachus pugnax*, redshank *Tringa totanus*, curlew *Numenius arquata*, snipe *Gallinago gallinago* and grey heron *Ardea cinerea*.

Changes in Ecological Character The site is threatened by further sand and gravel extraction, drainage, conversion of pasture to arable land (outside nature reserve areas), and expansion of recreational activities such as sailing, angling and camping. A coal mine has been established in one area, but plans for compensation measures have been made.

Management Practices A number of measures are planned to improve the area for waterfowl including dredging of the old river channel in the Alter Rhein Nature Conservation Area.

Scientific Research and Facilities Some research has been carried out on the avifauna and conservation requirements of the wetlands.

Principal Reference Material The above information is taken from documents supplied by the Government of the Federal Republic of Germany for designation in 1983.

Supplemented by:

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland.

Additional references:

Haarmann, K. (1984). Drei neue Feuchtgebiete internationaler Bedeutung in der Bundesrepublik Deutschland. *Ber. Dtsch. Sekt. Int. Rat. Vogelschutz* 23. (ICBP German Section report.)

Ghana

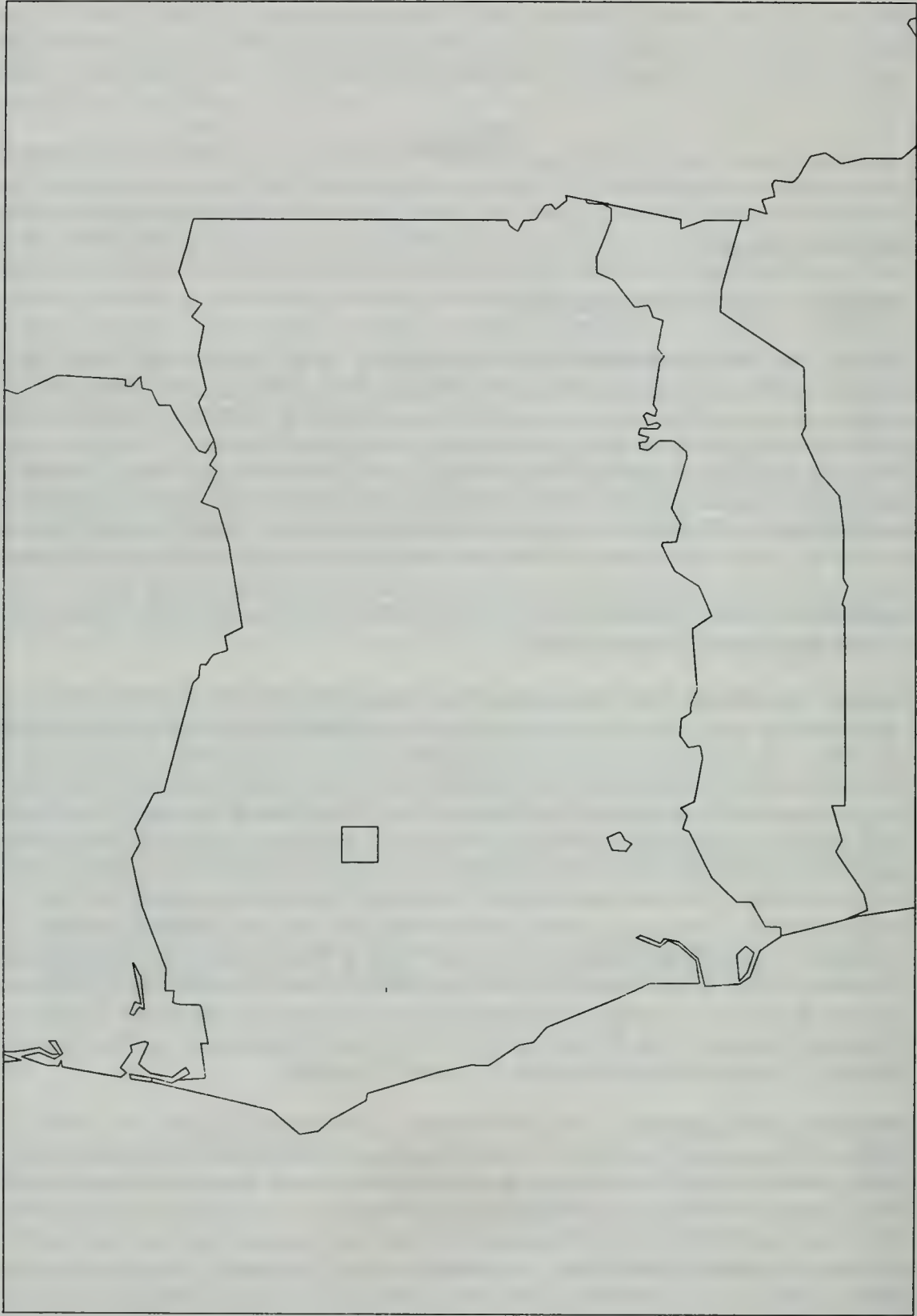
Area 238,538 sq.km

Population 13,812,000 (1988 estimate)

Summary of Wetland Situation Ghana is situated in the dry sector of the Guinea coast. Highest annual rainfall is in the south-west (2125mm). At Accra (annual rainfall 769mm) there are two wet seasons, March-June and again in October. Inland in the southern highlands there is rain nearly all year; in the north annual rainfall drops to about 1000mm. Along the coast, there is a series of coastal lagoons at river mouths, some open to the sea, some closed. Many of these support important fisheries. Their importance for waterfowl has recently been recognised and the Ghanaian government, in cooperation with the International Council for Bird Preservation and the British Royal Society for the Protection of Birds, is carrying out surveys, public awareness campaigns and conservation action under the SOS 'Save our Seabirds' project. Plans are in hand to establish reserves at several key sites such as Muni, Sakumo and the Densu delta, and to designate them as Ramsar sites.

Drainage is dominated by the Volta system. The Red and White Volta rivers rise in Burkina. In the north they have quite extensive flood plains. The total area of flood plain is approximately 250,000ha. The waterfowl of these areas is poorly known. The Red, White and Black Volta rivers flow into Lake Volta, which was created in 1964 by the closing of the Akosombo dam. It is the largest artificial water body in Africa, covering 848,000ha at low water. Drawdown arises only from evaporation and discharge for hydro-electric power generation. The lake has rarely been full because of the Sahel droughts. It supports a major fishery, although fish production in the Volta delta has suffered. Creation of the reservoir reduced incidence of sleeping sickness by destroying breeding sites of tsetse flies, but many fishermen are affected by bilharzia. Another dam planned on the Black Volta at Bui, has not yet been constructed. Lake Bosomtui is a circular crater lake, covering 3,850ha. Owaki, the Ramsar site, is centred on a dam on the Owaki stream built to provide water for Kumasi. The above note is based on information supplied to the Ramsar Bureau by the Ghanaian authorities, and on the draft Directory of African Wetlands (Mepham, R.H. and J.S., in press).

Protected Areas Legislation Under the Wild Animals Preservation Act No. 43 of 1961, the President is empowered (Section 11) to establish reserves within which it is unlawful to hunt, capture, destroy or collect any wild animals except those exempted. Legislative Instrument 710 of 20 September 1971 sets out the Wildlife Reserves Regulations stating that the consent of the Chief Game and Wildlife Officer is necessary for entry into those areas and that conditions for such entry may be determined by him. Any exemption given for capturing, killing or collecting plants or animals is only made for conservation or management purposes. The Chief Game and Wildlife Officer may seize and confiscate equipment which in his view can be used to kill or capture animals, and only with his consent may any cultivation or clearing be carried out in a reserve. Regulations also control lighting of fires, water pollution and litter.



Ramsar Sites in Ghana

This legislative instrument also sets up the first reserves; Mole, Digya, Bui, Shai Hills, Kogyae and Owabi. No separate definition is given for each of the terms (national park, game production reserve, strict nature reserve and wildlife sanctuary) in either the 1961 Act or the regulations. Other relevant laws are the Legislative Instruments 1022 of 1975, 1085 of 1976, 1105 of 1977 and 1283 of 1983, PNDC Law 42 and Act 405, the Ghana Forestry Commission Act, 1980. In practice, both categories of reserve, strict nature reserve and wildlife sanctuary, are protected in the same way as national parks. Game production areas differ from these areas in that compatible forms of land use such as logging may be permitted, and hunting may also be allowed (though entry into these areas without a permit is still punishable). To establish a conservation area, the land must be compulsorily acquired by the Government with compensation paid to the owner. Regulations within forest reserves are contained in the Forest Protection Decree of 1974; traditional hunting rights, access and collection of minor forest products are allowed.

Protected Areas Administration This is the responsibility of the Department of Game and Wildlife, which is a part of the Ministry of Lands and Natural Resources. Forest reserves come under the jurisdiction of the Forestry Department. There are plans to reorganise offices dealing with wildlife and forestry, and to integrate four previously separate departments, Game and Wildlife, Forestry Products Research Institute, Timber Marketing Board and the Forestry Department.

Sites designated under the Convention Accession on 22 February 1998 with one site listed.

Owabi Wildlife Sanctuary

Government body responsible for administration of the Convention

The PNDC Secretary for Lands and Natural Resources, Ministry of Lands and Natural Resources, PO Box M 212, Accra

Owabi Wildlife Sanctuary

Location 6°44'N, 1°41'W. The wildlife sanctuary lies approximately 10km north-west of Kumasi, Ghana's second largest city, in the Ashanti Region.

Area 7,260ha

Degree of Protection The area was initially protected as a catchment area for Owabi waterworks. Protection was the responsibility of the Forestry Department. Under L.I.171 of the Wild Animals Preservation Act, 1961 (Act. 43), the Owabi waterworks area became a game reserve in 1962. The area was expanded and redesignated Owabi Wildlife Sanctuary by L.I. 710 in 1971. The protection of the area has been the responsibility of the Department of Game and Wildlife since 1962. Designated as a Ramsar site on the accession of Ghana to the Convention on 22 February 1988.

Site Description The sanctuary centres on a reservoir formed by a dam constructed across the Owabi Stream in the 1940s to provide a water supply for Kumasi. About one third of the area consists of open water and inlets covered by aquatic plants *Pistia nymphia* and encroaching

reeds, ferns and other marsh plants. Surrounding the lake and marsh area is secondary forest (Celtic-Triplochiton association of semi-deciduous tropical forest) with some areas of plantations, mainly *Cashea siamea*. The forest and woodland contains Mona monkeys *Cercopithecus mona*, potto *Perodicticus potto*, Demidoff's galago *Galagoides demidoff* and small antelopes such as bushbuck *Tragelaphus scriptus*, various duikers *Cephalophus* and *Sylvicapra* sp., and royal antelope *Neotragus pygmeus*. Small mammals such as mongoose, brush-tailed porcupine *Atherurus africanus*, genet *Genetta* sp. and palm civet *Nandinia binotata* are also found. Reptiles include Nile monitor lizard *Varanus niloticus*.

International and National Importance Forest birds at the site include parrots (mostly West African Greys *Psittacus erithacus*), giant blue turaco *Corythaeola cristata* and a wide variety of other residents or local migratory species. Aquatic birds include large numbers of jacanas (lily trotters) *Actophilornis africana*, pygmy geese *Nettapus auritus* and various herons, including squacco *Ardeola ralloides* and very occasionally goliath and *Ardea goliath*. Dry season visitors include garganey *Anas querquedula*, sometimes in large numbers during drought years in their usual Sahelian wintering grounds.

Changes in Ecological Character Gangs of labourers formerly kept the water area clear of aquatic vegetation, but now that this control has been removed the open water area is being steadily reduced.

Management Practices The western extreme of the area, downstream from the dam, accommodates a water treatment plant presently used as a training school for waterwork technicians and a standby supply for Kumasi. The sanctuary is ideally located for educational and recreational use, being within easy reach of Kumasi.

Scientific Research and Facilities No information

Principal Reference Material The above information has been supplied by the Ghanaian government supplemented by:

Camdale, G.S. (1964). Report to the Government of Ghana on the establishment of zoological gardens and wildlife conservation. FAO, Rome. Report No. 1800. 43 pp.

Greece

Area 131,955 sq.km

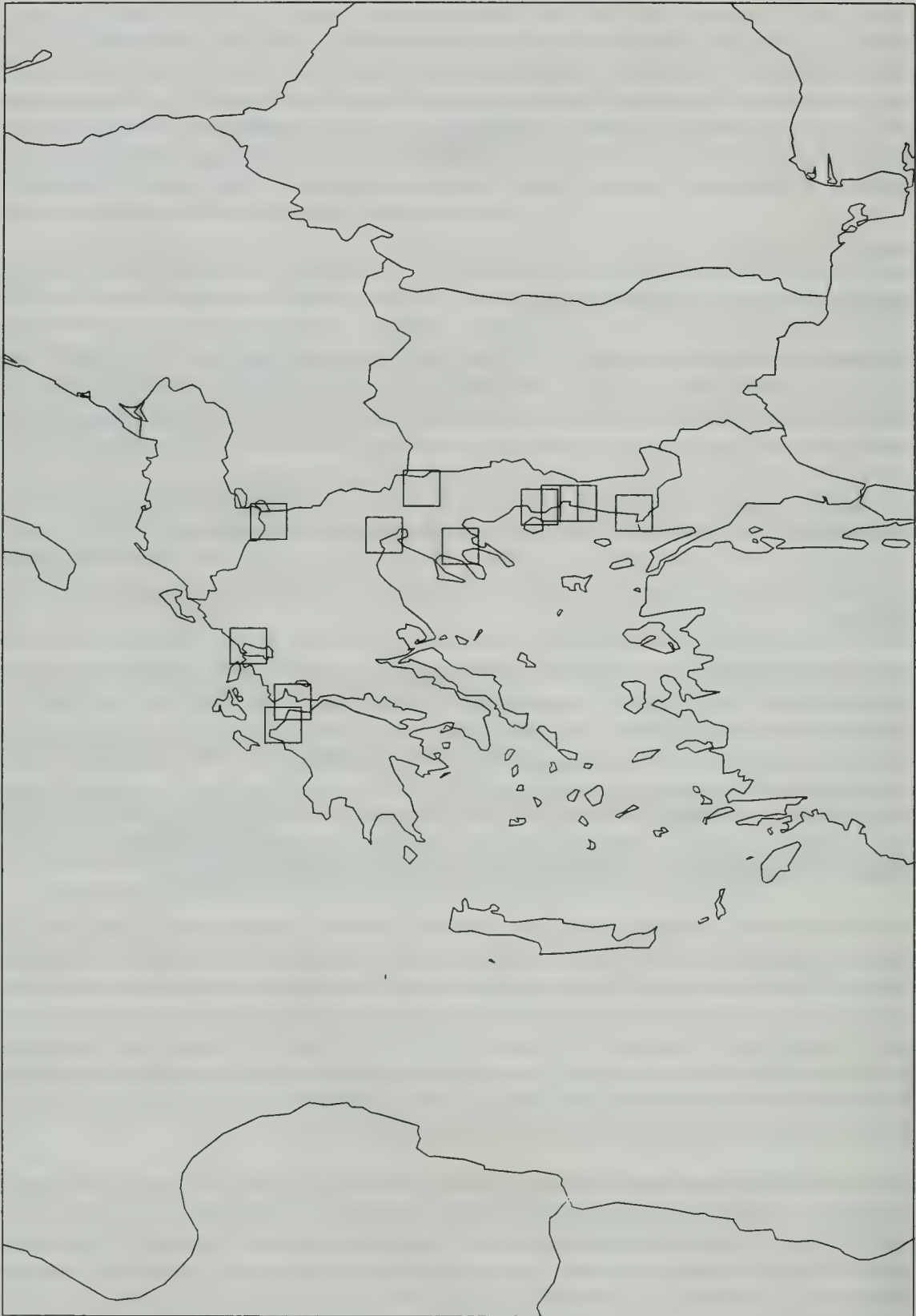
Population 9,990,000 (1987 estimate)

Summary of Wetland Situation A number of the Greek wetlands are amongst the most important in the Mediterranean basin. They comprise rich ecosystems, with a wide variety of flora and fauna, and are important for nesting and migration, as well as for feeding and wintering of many water-bird species. With the accession of Greece to the Ramsar Convention, 11 Greek wetlands have been designated as Wetlands of International Importance. However, the current situation regarding the conservation of these wetlands is not entirely satisfactory. This is attributed, to a certain degree, to the gaps and limitations of the existing legislation. However, under the recent Framework-law on the protection of the Environment (Law 1650/16 November 86), extensive and systematic protection of nature in general, and wetlands in particular, can be provided.

There has unfortunately been a considerable reduction in numbers of the waterfowl species in many wetlands in recent years. However, in others, as lakes Kerkini, Vistonis, and parts of Amvrakikos and Mesolonghion gulfs, bird populations seem to be in a relatively stable condition now, although there have been some problems over the past few years. Problems have largely occurred where natural vegetation and wildlife habitats have been affected by various human activities. These activities have included land reclamation, construction of river dams, illegal hunting and fishing, and agricultural pollution, in different degrees at each wetland. In some cases, wetlands have been threatened partly by urban and industrial pollution.

A series of assessment studies for the wetlands listed under the Convention have been initiated, which are gathering information on the status of the natural environment, and the threats and potential threats to each site. These assessments are also intended to indicate the main protective measures required within each area, and already play an important role in the decision making process regarding the regulation of various activities in these sites. By using these studies and the instruments which are offered by the new legislation, and having the expression of relatively favourable disposition of Public Opinion and of the government services, it is likely that these wetlands will be more efficiently protected in the years to come.

Protected Areas Legislation Presidential Decree 996/1971 enables the Greek Forest Service to establish national parks and aesthetic forests, as well as natural monuments. Public Law 998/1979 on forests and forest land protection, in addition to the above, includes in the protected areas "wetlands". Protection of flora and fauna is also provided by P.D. 61/1980 of the Greek Forest Service and Public Law 360/1976 Regional Planning and the Environment, Ministry of Coordination. Recently, new legislation on the protection of the environment has also been passed (Law 1650/1986), but this still requires further clarification by decrees, and existing laws remain valid. Lake Mikri Prespa was declared a national park in 1974.



Ramsar Sites in Greece

For the rest of the listed wetlands in Greece planning protection is applied, and the Directorates of Physical Planning and of the Environment are reticent to grant permits for activities which could have negative effects on the wetland ecosystems (taking into account the protection measures proposed as a result of the wetlands assessment studies). The recent Frame-Law will be applied to all wetlands in Greece.

Protected Areas Administration Responsibility for national parks and nature reserves lies with the Section of National Parks and Aesthetic Forests. This section is one of four reporting to the Protection of Forests and Forest Environment Division, which is one of ten under the Forest Department of the Ministry of Agriculture. Two Ministeries have responsibility for nature conservation. Originally it was administered by the Ministry of Agriculture further controlled by regional forestry departments and locally by forest inspectorates and game wardens. In 1978 the Ministry of Coordination established the National Council for Regional Planning and the Environment, although most of its responsibilities have now been taken over by the Ministry of Regional Planning, Housing and the Environment created in 1980 (later renamed the Ministry of Environment, Physical Planning and Public Works). In 1985 the Secretariat of the National Council was incorporated into the Ministry of Environment.

Sites designated under the Convention Accession on 21 August 1975 with 11 sites listed at accession

Evros Delta
 Lake Visthonis and Porto Lagos Lagoon
 Lake Mitrikou and adjoining lagoons
 Nestos Delta and Gumburnou Lagoon
 Lakes Volvis and Langada
 Lake Kerkini
 Axios-Aliakmon-Loudias Delta
 Lakes Mikra Prespa and Megali Prespa
 Amvrakikos Gulf
 Mesolonghi Lagoons
 Kotichi Lagoon

Government body responsible for administration of the Convention

Ministry of Environment, Physical Planning and Public Works, Environmental Planning Division, Nature Management Section, Trikalon 36, 115 26 Athens

Evros Delta

Location 40°52'N, 26°00'E. The Evros River forms the international boundary between Greece and Turkey. The delta is on the Aegean Sea to the west of Alexandroupolis in the Prefecture (Nomos) of Evrou in Thraki Province, north-east Greece.

Area Approximately 10,000ha; boundaries not yet confirmed

Degree of Protection Public property. The wetland is administered by the Directorate of the Environment in collaboration with the local authorities and services. It is partially protected under the Decision passed by the National Council on 13 March 1980 and the Joint Ministerial Decision by the Ministers of Coordination and Agriculture on 3 May 1980 under which the conservation and management of the wetland is regulated. A number of shooting zones were established at the time of designation. A national park has been proposed which would include the wetland area. Designated as a Ramsar site at the time of ratification after 19 November 1974. Also designated as an EC special protection area (SPA).

Site Description The delta region contains a diversity of habitat types: offshore sand islands and dunes, halophytic marshlands interspersed with saltwater lagoons and managed artificial salt pans, the freshwater River Evros fringed with tamarix scrub, grassland or temporary freshwater marshes, and reedswamp fringing the scattered freshwater lagoons. Most of the inland delta has been reclaimed for agriculture and the canals are embanked by retaining dykes. The delta is a valuable supplementary feeding ground for 30 of the 36 birds of prey recorded in the hills to the north. The coastal lagoon is an important nursery area for mullet and prawn.

International and National Importance The delta's importance for birds has undoubtedly declined in recent years as a result of habitat degradation, with pygmy cormorant *Phalacrocorax pygmeus*, night heron *Nycticorax nycticorax*, squacco heron *Ardeola ralloides*, little egret *Egretta garzetta*, great white egret *Egretta alba*, grey heron *Ardea cinerea*, glossy ibis *Plegadis falcinellus* and white-tailed eagle *Haliaeetus albicilla* no longer thought to be breeding. Numbers of wintering waterfowl have also decreased substantially. Breeding species include cormorant *Phalacrocorax carbo sinensis* (formerly 100 pairs; now much decreased to c. 15 pairs), little bittern *Ixobrychus minutus* (20+ pairs), purple heron *Ardea purpurea* (15 pairs), ruddy shelduck *Tadorna ferruginea* (1-5 pairs), ferruginous duck *Aythya nyroca* (20 pairs), black-winged stilt *Himantopus himantopus* (10 pairs), avocet *Recurvirostra avosetta* (5-120 pairs), stone curlew *Burhinus oedicnemus* (20 pairs), pratincole *Glareola pratincola* (200 pairs), Kentish plover *Charadrius alexandrinus* (c. 50 pairs), spur-winged plover *Hoplopterus spinosus* (6 pairs), Mediterranean gull *Larus melanocephalus* (formerly 1,000 pairs; colony displaced by drainage of Drana Lagoon), gull-billed tern *Gelochelidon nilotica* (50-100 pairs), common tern *Sterna hirundo* (400 pairs) and little tern *S. albifrons* (80-450 pairs). Greater flamingo *Phoenicopterus ruber* occur throughout the year but have not yet bred.

Passage migrants include white pelican *Pelecanus onocrotalus* (maximum 1,200), white stork *Ciconia ciconia* (maximum 7,500), glossy ibis (1,000), spoonbill *Platalea leucorodia* (300), white-fronted goose *Anser albifrons* (maximum 35,000), lesser white-fronted goose *A. erythropus* (50-150) and slender-billed curlew *Numenius tenuirostris* (regularly recorded in spring; the most important site in Greece and, possibly, Europe). The delta is still one of the most important areas in Greece for wintering waterfowl, and although numbers show considerable fluctuations, there has been a long-term decline since the 1970s. Mean January maxima for 1982-1986 included internationally important numbers of mute swan *Cygnus olor* (2,105), shelduck *Tadorna tadorna* (1,220), widgeon *Anas penelope* (15,000), gadwall *A. strepera* (1,000), teal *A. crecca* (35,000), pintail *A. acuta* (36,000) and coot *Fulica atra* (25,000). Other wintering species include pygmy cormorant (500), Dalmatian pelican *Pelecanus ruficollis* (0-1,800), marsh harrier *Circus aeruginosus* (30) and avocet (1,200).

Changes in Ecological Character The delta area has been disturbed by land reclamation schemes: the last remnant of gallery forest along the Greek side of the Evros River has been

cleared for cultivation; almost all grassland areas (major feeding grounds for wintering geese) have been drained; the falling water level has opened up most of the important bird habitats to grazing cattle which are degrading the vegetation; and several new access roads will result in an increase of the already high hunting pressure (despite current legal restrictions). In May 1987, Drana Lagoon, formerly one of the delta's most important habitats, was drained. Almost all nesting birds abandoned the site in 1988 and wintering waterfowl also declined. Following negotiations, the lagoon was reflooded in 1988/89, and three sluices have been constructed in order to regulate salinity. The ecosystem is reported to be recovering slowly.

Management Practices At the time of designation in 1974 the local authorities abolished the Evros Hunting Festival, shortened the open hunting season (now ending 31 January), established a number of no-shooting zones and limited the number of guns allowed in the area each day and the number of birds taken out by each hunter (10 duck, 3 geese and 35 coot). The coastal lagoons are fished commercially. Boundaries of three zones of protection, covering the broader area, have been proposed by the Ministry of the Environment and are being legally defined. Fishing, grazing and other activities are planned within the zone according to their potential impacts.

Scientific Research and Facilities WWF/IUCN Projects 1684 (birds of prey in Greece) and 1921 (national project for birds of prey) involved assessments of the wildfowl population of the delta. The site was also visited and studied by a team in the context of the "Determination of boundaries of the Ramsar Convention wetlands" project (Ministry of the Environment, Physical Planning and Public Works). A biological station has been established by the Hellenic Society for the protection of Nature in the Delta area, and there are several bird observation towers.

Principal Reference Material The above information is taken from:

Sekiziotis, S. and Kainadas, E. (1980). National Report of Greece. Prepared for Technical Conference (Ramsar) held in Cagliari in November 1980. Ministry of Coordination, Athens.

Supplemented by:

Duffey, E. (1982). *National Parks and Reserves of Western Europe*. Macdonald and Co., London.

Goutner, V. and Kattoulas, M.E. (in press). Breeding distribution of Lari (Charadriiformes) in the Evros Delta, Greece.

Hallman, B. (1980). Note on bird nesting and conservation in some Greek wetlands. IUCN/WWF Projects 1684 and 1921.

Hallman, B. and Handrinos, G. (1984). Midwinter waterfowl census in Greece 1984. I.W.R.B. report.

Hoffman, L., Bauer, W. and Muller, G. (1971). Proposals for Nature Conservation in northern Greece. *IUCN Occasional Paper* No. 1.

Scott, D.A. (1980). A preliminary inventory of wetlands of international importance for waterfowl in west Europe and northwest Africa. *IWRB Special Publication* No. 2.

Sevastos, C.G. (1976). Greece. In Smart, M. (Ed.). International Conference on the Conservation of Wetlands and Waterfowl, Heiligenhafen, Federal Republic of Germany. *Proceedings*, 2-6 December 1974. IWRB, Slimbridge, England.

Lake Vistonis and Porto Lagos Lagoon

Location 41°00'N, 25°00'E. Situated on the northern Aegean coast adjacent to the Ramsar site Lake Mitrikou and adjoining lagoons.

Area Approximately 10,000ha; boundaries not yet confirmed.

Degree of Protection Hunting is prohibited in part of the area and the heronry at Porto Lagos is protected. The development of housing, commercial fishing, agriculture, grazing etc. is planned to take account of protected area zonation which has been proposed by the Ministry of the Environment. However, these zones have not yet been established legally. Designated as a Ramsar site at the time of ratification, 19 November 1974. Also designated as an EC special protection area (SPA).

Site Description The site covers a large proportion of a complex of coastal brackish and freshwater lakes, the largest of which is Vistonis. The lakes are fringed by *Phragmites*, and the surrounding areas also include zones of *Tamarix* scrub, saltmarsh, riverine forest, freshwater pools and wet meadows.

International and National Importance Breeding species include pygmy cormorant *Phalacrocorax pygmeus*, night heron *Nycticorax nycticorax*, squacco heron *Ardeola ralloides*, little egret *Egretta garzetta*, grey heron *Ardea cinerea*, ferruginous duck *Aythya nyroca*, black-winged stilt *Himantopus himantopus*, avocet *Recurvirostra avosetta*, pratincole *Glareola pratincola*, spur-winged plover *Hoplopterus spinosus*, common tern *Sterna hirundo* and little tern *S. albigrons*. Passage migrants include white pelican *Pelecanus onocrotalus*, glossy ibis *Plegadis falcinellus* and *Numenius tenuirostris* (the most important Greek site other than the Evros Delta). Greater flamingo *Phoenicopterus ruber* occurs throughout the year, whilst wintering species include cormorant *Phalacrocorax carbo sinensis*, Dalmatian pelican *Pelecanus crispus*, great white egret *Egretta alba*, white-fronted goose *Anser albifrons*, lesser white-fronted goose *A. erythropus*, greylag goose *A. anser*, shelduck *Tadorna tadorna*, ruddy shelduck *T. ferruginea*, teal *Anas crecca*, pintail *A. acuta*, shoveler *A. clypeata*, white-headed duck *Oxyura leucocephala*, pochard *Aythya ferina*, coot *Fulica atra* and avocet.

Changes in Ecological Character Vistonis has been adversely affected by pollution from industrial, agricultural and domestic sources. Agricultural and urban development close to the lake has also caused a number of negative ecological changes.

Management Practices Most of the lakes are exploited as fisheries. Other activities include agriculture, grazing and construction. Integrated management would benefit greatly from the formal designation of protected area zonation, as proposed by the Ministry of the Environment. Clearance of oak forest has taken place on adjacent hills. Steps have been taken to try to reduce the impact of fisheries on Lake Vistonis. Pollution is a problem but a sewage treatment plant under construction at Xanthi is expected to help improve conditions in the lake.

Scientific Research and Facilities WWF/IUCN Projects 1684 (birds of prey in Greece) and 1921 (national project for birds of prey) included assessment studies of these areas. Studies for the ecological management and pollution control of some of the lakes have been carried out by Greek Universities. The site was visited and studied by a team in the context of "Determination of boundaries of the Ramsar Convention wetlands" project (Ministry of the Environment, Physical Planning and Public Works, 1986).

Principal Reference Material The above information is taken from the programme for determining the boundaries of the Ramsar Convention Wetlands. Ministry of the Environment, Physical Planning and Public Works - Athens, 1986.

Supplemented by:

Duffey, E. (1982). *National Parks and Reserves of Western Europe*. Macdonald and Co., London.

Grimmett, R.F.A. and Jones, T.A. (1989). *Important Bird Areas in Europe*. ICBP Technical Publication No. 9. International Council for Bird Preservation, Cambridge, UK.

Hallman, B. (1980). Note on bird nesting and conservation in some Greek wetlands. IUCN/WWF Projects 1684 and 1921.

Hoffman, L., Bauer, W. and Muller, G. (1971). Proposals for Nature Conservation in northern Greece. *IUCN Occasional Paper* No. 1.

Scott, D.A. (1980). A preliminary inventory of wetlands of international importance for waterfowl in west Europe and northwest Africa. *IWRB Special Publication* No. 2. 127 pp.

Sekliziotis, S. and Kainadas, E. (1980). National Report of Greece. Prepared for Technical Conference (Ramsar) held in Cagliari in November 1980. Ministry of Coordination, Athena.

Sevastos, C.G. (1976). Greece. In Smart, M. (Ed.). International Conference on the Conservation of Wetlands and Waterfowl, Heiligenhafen, Federal Republic of Germany. *Proceedings*, 2-6 December 1974. IWRB, Slimbridge, England.

Lake Mitrikou and adjoining lagoons

Location 41°00'N, 25°15'E. Situated on the northern Aegean Sea coast, at the mouth of the River Filiouri, between Porto Lago and Maronia in the Prefecture of Rodopis, Thraki Province, north-east Greece.

Area 3,800ha; precise boundaries not yet legally confirmed.

Degree of Protection Designated as a Ramsar site at the time of accession on 21 August 1975. Also designated as an EC special protection area.

Site Description The site comprises a complex of freshwater and brackish lagoons and marshes, with dunes and adjoining coastal waters. Lake Mitrikou is fed by the Philiouris and Pospos rivers and supports rich marshland vegetation. It is fringed by extensive reed beds of *Phragmites communis* and is covered in summer by water chestnut *Trapa natans*. To the south of Mitrikou, there is a large area dominated by halophytic and xerophytic vegetation. The remaining part of the wetland is surrounded by agricultural land.

International and National Importance The site is important for breeding waterfowl, including little bittern *Ixobrychus minutus*, purple heron *Ardea purpurea*, glossy ibis *Plegadis falcinellus*, spoonbill *Platalea leucorodia* (10-20 pairs), ruddy shelduck *Tadorna ferruginea*, ferruginous duck *Aythya nyroca*, collard pratincole *Glareola pratincola*, spur-winged plover *Hoplopterus spinosus*, and whiskered tern *Chlidonias hybridus*. Important wintering species include Dalmatian pelican *Pelecanus crispus*, lesser white-fronted goose *Anser erythropus* and white-headed duck *Oxyura leucocephala*.

Changes in Ecological Character Large-scale extraction of fresh water has caused increasing salinisation, whilst pesticide and fertiliser runoff and application (by fishermen) of herbicides to clear floating vegetation, have also contributed to a deterioration of water quality. In 1985 fishermen opened the lake to the sea, causing an inflow of salt water. A reduction in lake depth has resulted from sedimentation.

Management Practices A small dam has been constructed to regulate the entrance of salt water to Lake Mitrikou. Dykes and canals have been constructed along the eastern edge of the lake in order to demarcate and maintain the wetland area. All upgrading of aquaculture units was cancelled in order to protect the site. No grazing is permitted inside the dykes.

Scientific Research and Facilities No information

Principal Reference Material The above information was taken from documents submitted by the Greek authorities in 1988, supplemented by:

Grimmett, R.F.A. and Jones, T.A. (1989). *Important Bird Areas in Europe*. ICBP Technical Publication No. 9. International Council for Bird Preservation, Cambridge, UK.

Nestos Delta and Gumburnou Lagoon

Location Nestos Delta is centred on 40°57'N, 24°44'E. Gumburnou Lagoon is centred on 40°53'N, 24°47'E to the west of Nestos river mouth. The town of Keramoti is on the coast between the two Ramsar sites. Situated in Kavala Prefecture (Nomos), northeast Greece.

Area 10,600ha approx. (combined area). Boundaries not yet confirmed.

Degree of Protection Public property and private property. The wetland is administered by the Directorate of the Environment in collaboration with local authorities and services. The area is unprotected except for Ramsar status. Local authorities are responsible for fishing and hunting regulations. Designated as separate Ramsar sites at the time of ratification after 19 November 1974. Also designated as an EC special protection area.

Site Description The designated sites are: the area around the mouth of the Nestos river including reclaimed agricultural land and a few freshwater lagoons; and Gumburnou Lagoon at the western extreme of the delta, west of Keramoti. Most of the delta is covered by shrubland, grassland and agricultural crops, with a relict area of previously extensive groundwater forest (Kotzia Orman Wood) along the rivercourse near the mouth. Most of the Nestos river is

embanked by retaining dykes to separate it from the cultivated reclaimed land. Gumbournou saltwater lagoon supports an abundant fish population.

International and National Importance Nestos Delta is an important breeding ground for spur-winged plover *Hoplopterus spinosus* (largest breeding population in Europe), purple heron *Ardea purpurea*, little egret *Egretta garzetta*, squacco heron *Ardeola ralloides* (occasional), avocet *Recurvirostra avosetta* and gull-billed tern *Sterna nilotica*. Mediterranean gull *Larus melanocephalus* no longer breed in the delta area, but Gumbournou Lagoon still supports a population. Visitors to the delta area include pygmy cormorant *Phalacrocorax pygmeus*, Dalmatian pelican *Pelecanus crispus*, red-necked grebe *Podiceps grisegena* (occasionally breeding at Gumbournou), several species of rail (Rallidae) and gull (Laridae) and many duck (Anatidae) and coot *Fulica atra*.

Changes in Ecological Character Extensive reclamation schemes have converted much of Nestos Delta into cultivated agricultural land and Chryssoupolis Plain is being reclaimed. The flow of the Nestos River has decreased owing to dam construction in Bulgaria and extensive water extraction in Greece for agricultural purposes. There is pressure for resort/tourist development on the coast. The Ministry of Environment has begun developing a plan for rational use of the wetland and surrounding area.

Management Practices A preliminary management plan is being implemented.

Scientific Research and Facilities The site was visited and studied by a team in the context of the "Determination of boundaries of the Ramsar Convention Wetlands" project (Ministry of the Environment, Physical Planning and Public Works, 1986).

Principal Reference Material The above information is taken from the programme for determining the boundaries of the Ramsar Convention Wetlands - Nestos Delta. Ministry of the Environment, Physical Planning and Public Works - Athens, 1986.

Supplemented by:

Duffey, E. (1982). *National Parks and Reserves of Western Europe*. Macdonald and Co., London.

Hoffman, L., Bauer, W. and Muller, G. (1971). *Proposals for Nature Conservation in northern Greece*. IUCN Occasional Paper No. 1.

Scott, D.A. (1980). A preliminary inventory of wetlands of international importance for waterfowl in west Europe and northwest Africa. *IWRB Special Publication* No. 2. 127 pp.

Sekliziotis, S. and Kainadas, E. (1980). National Report of Greece. Prepared for Technical Conference (Ramsar) held in Cagliari in November 1980. Ministry of Coordination, Athena.

Sevastos, C.G. (1976). Greece. In Smart, M. (Ed.) *International Conference on the Conservation of Wetlands and Waterfowl*, Heiligenhafen, Federal Republic of Germany. *Proceedings*, 2-6 December 1974. IWRB, Slimbridge, England.

Lakes Volvis and Langada (Koronia)

Location 40°25'N, 23°40'E. Situated to the east of Thessaloniki in the prefecture (Nomos) of Thessalonikis, Makedhonia Province of northern Greece.

Area 2,400ha approx. Boundaries not yet confirmed.

Degree of Protection Mainly public property. The wetland is administered by the Directorate of the Environment in collaboration with local authorities and services. The area is currently unprotected except for Ramsar status. Local authorities are also responsible for fishing and hunting regulations, as well as forestry and housing development standards implementation. Designated as a Ramsar site at the time of ratification after 19 November 1974. Also designated as an EC special protection area.

Site Description The site comprises two freshwater lakes which are connected across a narrow strip of land by an open channel. Lake Langada is located at the west side of Migdonia basin, and Lake Volvi at the central part of the east side. Lakgadi Lake is fed by the Bojdana River. The lakes are fringed with some areas of reedbeds *Phragmites communis* and patchy woodland of poplar *Populus* sp. or oak *Quercus* sp. and *Paliurus* sp. with shrubs. Most of the surrounding land is under arable cultivation. The strip of land between the lakes supports mature plane trees *Platanus* sp. which are used by nesting heron colonies. There are numerous villages in the vicinity of the lakes.

International and National Importance Approximately 204 bird species are found in some numbers in the area. The lakes are an important breeding ground for herons: night heron *Nycticorax nycticorax*, little egret *Egretta garzetta*, grey heron *Ardea cinerea* and stork *Ciconia ciconia*. Migrant visitors include white pelican *Pelecanus onocrotalus*, and Dalmatian pelican *P. crispus*, also feeding in the area. Occasional white-headed duck *Oxyura leucocephala*, great white egret *Egretta alba* and spoonbill *Platalea leucorodia*. Also large populations of coot *Fulica atra* winter at the lakes.

Changes in Ecological Character There is a significant problem of water pollution due to fertilisers, as well as to the wastes from the town of Langada, which should be monitored and controlled. There are plans for the construction of a sewage treatment plant. There would appear to be excessive hunting in the area because of neighbouring Thessaloniki, which seems to have negative impacts on the bird population. By determining specific areas for hunting (away from nests etc.) it is hoped that these impacts will be reduced.

Management Practices A preliminary management plan is being implemented. Boundaries of three zones of protection, covering the broader area have been proposed by the Ministry of the Environment and are under discussion, before their final legal definition. Activities are planned within the zones according to their potential impacts, especially concerning fishing, agriculture, grazing and construction.

Scientific Research and Facilities The site was visited and studied by a team in the context of the "Determination of boundaries of the Ramsar Convention Wetlands" project (Ministry of the Environment, Physical Planning and Public Works, 1986).

Principal Reference Material The above information is taken from the programme for determining the boundaries of the Ramsar Convention Wetlands - Lakes Volvi and Langada. Ministry of the Environment, Physical Planning and Public Works - Athens, 1986.

Supplemented by:

Duffey, E. (1982). *National Parks and Reserves of Western Europe*. Macdonald and Co., London. Hoffman, L., Bauer, W. and Muller, G. (1971). *Proposals for Nature Conservation in northern Greece. IUCN Occasional Paper No. 1.*

Scott, D.A. (1980). A preliminary inventory of wetlands of international importance for waterfowl in west Europe and northwest Africa. *IWRB Special Publication No. 2.* 127 pp.

Sekliziotis, S. and Kainadas, E. (1980). National Report of Greece. Prepared for Technical Conference (Ramsar) held in Cagliari in November 1980. Ministry of Coordination, Athena.

Sevastos, C.G. (1976). Greece. In Smart, M. (Ed.). International Conference on the Conservation of Wetlands and Waterfowl, Heiligenhafen, Federal Republic of Germany. *Proceedings*, 2-6 December 1974. IWRB, Slimbridge, England.

Lake Kerkini

Location 41°12'N, 23°09'E. Situated in a military zone to the south-east of the intersection of the frontiers between Greece, Yugoslavia and Bulgaria in the Prefecture (Nomos) of Serron, northern mainland Greece.

Area Approximately 9,000ha. Boundaries not yet confirmed.

Degree of Protection Public property. Existing legislation concerning prohibition of hunting in an area of 9,000ha and management of felling and reclamation activities, is enforced by the local State Services (Prefecture). The definition of boundaries and a preliminary management plan are being legislated for by the responsible authority. Designated as a Ramsar site at the time of ratification after 19 November 1974. Also designated as an EC special protection area.

Site Description The site is an extensive shallow freshwater reservoir created in the 1950s to supply the Serres plain with irrigation water from the Strymonas River. A small barrage and dam were constructed across the Strymon Valley resulting in the area between Mavrovouni in the south and Kerkini mountain in the north being gradually flooded by the river. An extensive littoral zone has since developed through the combined action of natural siltation and nutrient inflow, with a gradual rise and seasonal fluctuation of the lake water level. The habitats formed are: (a) deep waters (2m) covering an area of 6,500ha, where water chestnut *Trapa natans* is growing, and most fish consuming birds such as pelicans, egrets and herons feed. During the summer, part of this area is transformed to mud islets and small water reservoirs; (b) shallow waters, where a rich floating and submerged vegetation is growing, such as lilies *Nymphaea*, duckweed *Lemna*, water milfoil *Myriophyllum* and *Potamogeton* sp. (a very important breeding

area for birds); (c) shallow waters with *Phragmites*, *Typha*, *Scirpus*, *Schoenoplectus*, covering 1,000ha in the north (a very important breeding place for waterfowl); (d) riverine forests along the river and estuary with *Tamarix*, *Salix*, *Alnus*, *Populus*, *Platanus* (tamarisk, willow, alder, poplar, plane) species (important bird breeding sites); (e) sand and mud islets at the river banks (important as roosts for birds); (f) forests and bushes in the surrounding area, of *Pinus*, *Fagus*, *Acer*, *Quercus*, *Pyrus* species (important as breeding sites for birds of prey). There are several villages and towns near the lake.

International and National Importance The lake supports a relatively rich wildfowl species population in terms of both number and diversity. Winter observations (Hallmann, 1984) show that duck populations are still present in big numbers : pochard *Aythya ferina*, teal *Anas crecca* and mallard *Anas platyrhynchos*. Other species include avocet *Recurvirostra avosetta*, white-fronted goose *Anser albifrons*, great white egret *Egretta alba*, cormorant *Phalacrocorax carbo sinensis*, pygmy cormorant *P. pygmaeus* and little grebe *Tachybaptus ruficollis*, and species such as spoonbill *Platalea leucorodia*, squacco heron *Ardeola ralloides*, little egret *Egretta garzetta*, etc. are reported to breed. The site is used extensively as a wintering area by Dalmatian pelican *Pelecanus crispus* and as a feeding ground by both *P. crispus* and white pelican *P. onocrotalus* throughout the rest of the year. Birds of prey, such as white-tailed eagle *Haliaeetus albicilla*, short-toed eagle *Circaetus gallicus*, Bonelli's eagle *Hieraaetus fasciatus*, spotted eagle *Aquila pomarina* and black kite *Milvus migrans* breed in nearby forests. Twenty five species on Annex I EEC Directive 79/409 breed here. In total 227 bird species are found in the area, with 128 breeding. Two endemic sub-species of fish are found in the lake waters, *Alburnus alburnus stumicae* and *Leuciscus cephalus macedonicus*. Among the amphibians, most interesting is the presence of *Triturus cristatus*, *T. vulgaris*, and *Hyla arborea*. Reptiles such as *Testudo hermanni*, *Lacerta viridis* and *Elaphe longissima* are also reported. Mammals, such as *Capreolus capreolus*, *Canis aureus*, *Canis lupus*, *Felis catus* and *Lutra lutra*, are found in the area.

Changes in Ecological Character The construction of a new dam in the same spot as the first one, was completed in 1982 and led to a rise in water levels (from 30.5m to 38m) during the following spring. As a result, some of the habitats described (especially shallow waters with floating vegetation and *Phragmites*) have suffered alteration in extent. Bird populations have been affected, and some species have ceased breeding. However, the environmental impacts were not all negative. Parts of the riverine forests have been felled and the colonies of *Egretta garzetta*, *Ardeola ralloides*, *Nycticorax nycticorax* and *Platalea leucorodia* have moved to the bushes near the lake. The construction of dams in Bulgaria has led to a decrease in flow of the Stryman River.

Management Practices Boundaries of three zones of protection covering the broader area have been proposed by the Ministry of the Environment, and are under discussion before their final legal definition. Activities are planned within the zones according to their potential impacts (in particular fishing, agriculture, grazing, felling and construction).

Scientific Research and Facilities The Department of Ecology, University of Thessaloniki, is carrying out a project for the management of the habitats of *Pelecanus crispus* and other endangered bird species in wetlands of Northern Greece in collaboration with the Ministry of the Environment. The wetland was visited and studied by a scientific team in the context of the "Determination of boundaries of the Ramsar Convention Wetlands" project (Ministry of the Environment, Physical Planning and Public Works, 1986). Researchers from the University of Thessaloniki are studying sedimentation rates in the lake and have also undertaken studies of

water quality. Long-term plans for increasing the quantities of water taken from the lake for irrigation purposes are under reconsideration in the light of the serious impact which the proposed measures would have on the wetland.

Principal Reference Material The above information is taken from the programme for determining the boundaries of the Ramsar Convention Wetlands - Lake Kerkini, Ministry of the Environment, Physical Planning and Public Works - Athens 1986.

Supplemented by:

Duffey, E. (1982). *National Parks and Reserves of Western Europe*. Macdonald and Co., London.

Hallman, B. (1980). Note on bird nesting and conservation in some Greek wetlands. IUCN/WWF Projects 1684 and 1921.

Scott, D.A. (1980). A preliminary inventory of wetlands of international importance for waterfowl in west Europe and northwest Africa. *IWRB Special Publication No. 2*. 127 pp.

Sekliziotis, S. and Kainadas, E. (1980). National Report of Greece. Prepared for Technical Conference (Ramsar) held in Cagliari in November 1980. Ministry of Coordination, Athena.

Sevastos, C.G. (1976). Greece. In Smart, M. (Ed.). International Conference on the Conservation of Wetlands and Waterfowl, Heiligenhafen, Federal Republic of Germany. *Proceedings*, 2-6 December 1974. IWRB, Slimbridge, England.

Axios - Aliakmon - Loudias Delta

Location 40°34'N, 22°39'E. Situated on the Thermaikos Gulf of the Aegean, southwest of Thessaloniki in the Prefecture (Nomos) of Imathios, Makedhonia Province, northern Greece.

Area Approximately 11,000ha. Boundaries not yet confirmed.

Degree of Protection Public property. Local state authorities have now prohibited hunting in the area (1983), while fishing activities are regulated by national Laws. The definition of boundaries, and a preliminary management plan, are being legislated for by the responsible authority. Designated as a Ramsar site at the time of ratification after 19 November 1974. Also designated as an EC special protection area.

Site Description The site comprises coastal saltwater lagoons and marshlands formed around the river mouths of the Axiou, Aliakmon and Loudias rivers. The whole length of the Axios River is embanked by retaining dykes. The vegetation comprises halophytic marshland along the shore succeeded inland by grassland and riverine forests. Characteristic species are *Phragmites communis*, *Typha latifolia*, *Tamarix jampeana*, *Arthrocnemum peren*, *Juncus acutus*, *Salix pedicellata*, *Salix alba*, *Populus alba* and *Alnus glutinosa*. There is apparently a high diversity of Cyanophyceae and Chlorophyceae. Dykes separate the wetland from reclaimed agricultural land, on which the principal crops are rice, wheat, cotton and maize. The grasslands are used for grazing. There are several villages and towns near the wetland.

International and National Importance Waterfowl numbers seem to be decreasing, but the site still supports significant breeding populations including night heron *Nycticorax nycticorax*, squacco heron *Ardeola ralliodes*, little egret *Egretta garzetta*, mallard *Anas platyrhynchos*, shelduck *Tadorna tadorna*, pratincole *Glareola pratincola* and little tern *Sterna albifrons*. No longer breeding in the wetland are Mediterranean gull *Larus melanocephalus* and slender-billed gull *L. genei*. The site is used as a wintering ground by Dalmatian pelican *Pelecanus crispus* and as a feeding ground by white pelican *P. onocrotalus* the rest of the year (Pyrovetsi, unpubl.). The delta is also one of the few remaining breeding sites in Greece of glossy ibis *Plegadis falcinellus* and of spoonbill *Platalea leucorodia*. In total, 214 bird species are recorded in the area, of which 74 breed in the buffer zone. There are some 177 species seen on passage, and 61 wintering species. 56 bird species are included in ANNEX I, of the EEC Directive 79/409. One endemic fish species, *Gobio uranoscopus elimeins* is found in the area, while 26 non-endemic species are recorded in Axios River and 30 in Aliakmon. Seven amphibians have been recorded, and 15 reptiles including *Emys orbicularis* and *Testudo hermanni*. Most outstanding of the 17 recorded species of mammals is *Lutra lutra*.

Changes in Ecological Character The delta area has been considerably modified by an extensive land reclamation scheme for agriculture. All three rivers, and especially Axios, are continually adding to the littoral zone as a result of excessive siltation. Fertilisers and wastes have altered the water qualities towards eutrophication, and are affecting the ecological character of the whole delta. The delta, with its small islands where all bird species nest, is seriously threatened by Thessaloniki's (1,000,000 inhabitants) sewage system, which ends there. Biological treatment is inadequate to save the biotopes. Illegal hunting is also putting pressure on the bird population to some extent. One of the most important heronries in the wetland was destroyed during illegal sand extraction from a small island in the Axios River in May 1988. A motor racing circuit was constructed within the proposed zones of protection at the Aliakmon Delta in July 1989. This operation was declared illegal and the track has never been used. Water flow in the Axios River has decreased owing, in part, to abstraction of water in Yugoslavia. The lower river flow has prompted consideration of routing outflow from the Thessaloniki sewage treatment plant (under construction) away from the Ramsar site, with a new outlet to the sea. In September 1989, local landowners destroyed vegetation and began excavating land at Alyki Kitrous for the construction of resort buildings. The case was reported to the authorities who took steps to safeguard the area.

Management Practices Local authorities are responsible for fishing and hunting regulations. Boundaries of three zones of protection covering the broader area have been proposed by the Ministry of the Environment, and are being legally defined. Fishing, grazing and farming activities are planned within the zones, according to their potential impacts.

Scientific Research and Facilities Several laboratories of the University of Thessaloniki, such as those of Ecology, Botany, Agricultural Planning, and Torrent Water Management, are carrying out projects. The wetland was also visited and studied by a scientific team in the context of the "Determination of boundaries of the Ramsar Convention Wetlands" project (Ministry of the Environment, Physical Planning and Public Works, 1986).

Principal Reference Material The above information is taken from the programme for determining the boundaries of the Ramsar Convention wetlands - Axios - Aliakmon - Loudias Delta. Ministry of the Environment, Physical Planning and Public Works - Athens, 1986.

Supplemented by:

- Duffey, E. (1982).** *National Parks and Reserves of Western Europe*. Macdonald and Co., London.
- Hoffman, L., Bauer, W. and Muller, G. (1971).** Proposals for Nature Conservation in northern Greece. *IUCN Occasional Paper* No. 1.
- Scott, D.A. (1980).** A preliminary inventory of wetlands of international importance for waterfowl in west Europe and northwest Africa. *IWRB Special Publication* No. 2. 127 pp.
- Sekliziotis, S. and Kainadas, E. (1980).** National Report of Greece. Prepared for Technical Conference (Ramsar) held in Cagliari in November 1980. Ministry of Coordination, Athena.
- Sevastos, C.G. (1976).** Greece. In Smart, M. (Ed.) International Conference on the Conservation of Wetlands and Waterfowl, Heiligenhafen, Federal Republic of Germany. *Proceedings*, 2-6 December 1974. IWRB, Slimbridge, England.

Lakes Mikra Prespa and Megali Prespa

Location 40°45'N, 21°06'E. Situated on the Greece/Albania frontier, west of the town of Florina in the Prefecture (Nomos) of Florinis, Makedhonia Province, north-west Greece.

Area 8,000ha. Boundaries not yet confirmed.

Degree of Protection Mainly public property. Three areas around the lake with reed beds and dense vegetation were declared as reserves in 1971 to protect the pelican breeding colonies. The lake and a peripheral zone were declared a national park on 14 January 1974 by the Ministry of Agriculture under Presidential Decree 46/14/1/1974, and it is administered by the District Directorate of Forests, based at Florina. The wetland is administered in collaboration with local authorities and services. Designated as a Ramsar site at the time of ratification after 19 November 1974. Also designated as an EC special protection area (SPA).

Site Description Lake Mikra Prespa is a shallow basin with a maximum depth of 7.70m, which, together with the neighbouring lakes of Ohrid, Megali, Prespa and Malik, is one of the deepest remains of the old Dassaritis Lake in the West Pelagonian massif of the Adriatic confluence. It lies between mountains at an altitude of 853m, and a sandy bar of alluvial deposits separates it from Lake Megali Prespa. The lake is dimistic oligo-mesotrophic, but there is evidence that it is gradually becoming eutrophic. The park flora consists of 1,249 wild plant species (Pavlidis, 1985). There are extensive areas of *Phragmites australis*, and many shallow lagoons of importance to breeding birds. Characteristic species of the aquatic ecosystem are *Nuphar lutea*, *Trapa natans*, *Nymphoides peltata*, *Nymphaea alba* and *Oenanthe aquatica*, *Salix cinerea*, *S. alba*, *S. fragilia* and of the terrestrial ecosystem *Juniperus foetidissima*, *J. exelsa*, *Carpinus orientalis*, *Quercus* sp., and *Fagus sylvatica*. There are also some endemic and rare species such as *Centaurea prespans*. 31 species of mammal have been reported in the area, among them *Lutra lutra*, *Canis lupus*, *Ursus arctos*, *Lynx lynx* and the introduced *Myocaster coypus*. The lake freezes over for a few days every year between December and February, and hence is of no importance for wintering wildfowl.

International and National Importance The lake is important for breeding water-birds, with large colonies using the marshlands. Particularly important are the colonies of Dalmatian pelican *Pelicanus crispus* and white pelican *P. onocrotalus*. As a result of the wide variety of biotopes and topography, the area is relatively species rich with over 200 species. Twenty two of the 74 bird species listed in Annex I of the EEC Directive on the conservation of wildbirds (79/409) breed in Prespa (Pyrovetsi et al, 1984): cormorant *Phalacrocorax carbo sinensis*, Egyptian vulture *Neophron percnopterus*, night heron *Nycticorax nycticorax*, griffon vulture *Gyps fulvus*, squacco heron *Ardeola ralloides*, marsh harrier *Circus aeruginosus*, little egret *Egretta garzetta*, black-winged stilt *Himantopus himantopus*, great white egret *Egretta alba*, pratincole *Glareola pratincola*, purple heron *Ardea purpurea*, wood sandpiper *Tringa glareola*, gull-billed tern *Gelochelidon nilotica*, spoonbill *Platalea leucorodia*, Sandwich tern *Sterna sandvicensis*, ferruginous duck *Aythya nyroca*, common tern *Sterna hirundo*, black kite *Milvus migrans*, little tern *Sterna albifrons*, white-tailed eagle *Haliaeetus albicilla* and black tern *Chlidonias niger*.

Changes in Ecological Character Introduced coypu are seriously damaging the reed beds and probably discouraging some birds from breeding in the area. There is a quarry which is still in operation. The local area is extensively farmed with some cattle grazing. The reedswamp is sometimes burnt illegally. Fishing continues. The park is a popular tourist attraction and has well developed road and trail systems. Changes have resulted in the eastern part of the wetland as a result of a programme which has included the improvement and extension of the irrigation network, and establishment of a fish breeding station. Extensive forest fires in 1988 destroyed more than 1,800ha. The use of Mikra Prespa's waters for irrigation purposes has considerably reduced the lake level. One of two Dalmatian pelican colonies was destroyed by reed burning in 1989.

Management Practices The national park is managed under the Lake Prespa management plan by a forest ranger and three forest service guards based at Laimos. Tourism is prohibited at bird nesting areas. The lake and the area around the lake are used, under certain conditions, for grazing and fishing by local people. Hunting, fishing and other activities for visitors are prohibited or strictly controlled according to Park Regulations. Traditional agriculture is exercised around the lake to a certain degree.

Scientific Research and Facilities Several ornithological studies of the lake have been carried out, including some by the Ministry of Agriculture. A biological research station was established by the Hellenic Society for the Conservation of Nature between the villages of Mikrolimni and Kranies. There are bird observation towers at the lake.

Principal Reference Material The above information is taken from:

- Katsadorakis, G. (1986). Biotopes and vertebrates in Prespa National Park, Macedonia, Greece.
- Kousouris, T. and Diapoulis, A. (1983). Development and Protection of freshwater resources in Greece. Lake Mikri Prespa. I.O.K.A.E.
- Pavlidis, G. (1985). Geobotanical study of the National Park of lakes Prespa, NW Greece - Part A (Ecology, Flora, Phytogeography, Vegetation). Thessaloniki, Greece.
- Pyrovetsi, M.D., Crivell, A.G., Gerakis, P.A., Karteris, M.A., Kastro, E.P., and Komninos, N. (1984). Integrated Environmental Study of Prespa National Park, Greece. Commission of the European Communities, DG XI (Contract E 83 1935/17-PM1/1983 D3 GR).
- Sekliziotis, S. and Kainadas, E. (1980). National Report of Greece. Prepared for Technical Conference (Ramsar) held in Cagliari in November 1980. Ministry of Coordination, Athena.

Supplemented by:

- Duffey, E. (1982).** *National Parks and Reserves of Western Europe*. Macdonald and Co., London.
- Scott, D.A. (1980).** A preliminary inventory of wetlands of international importance for waterfowl in west Europe and northwest Africa. *IWRB Special Publication No. 2*. 127 pp.
- Sevastos, C.G. (1976).** Greece. In Smart, M. (Ed.). International Conference on the Conservation of Wetlands and Waterfowl, Heiligenhafen, Federal Republic of Germany. *Proceedings*, 2-6 December 1974. IWRB, Slimbridge, England.

Additional information:

- Brosselin, M. and Molinier, A. (1968).** Visite au lac de Mikra Prespa. *Cyclostylé* Bureau MAR, Paris.
- Broussalis, P. (1975).** *The Prespa National Park*. Hellenic Society for the Protection of Nature, Athens.
- Crivelli, A. (1977).** Mission en Grece du Nord. Rapport.
- Geroudet, P. (1975).** Mikra Prespa, lac des pélicans. *Nos oiseaux*: 145-147.
- Hoffmann, L., Bauer, W. and Muller, G. (1971).** Proposals for Nature Conservation in Northern Greece. *IUCN Occasional Paper No. 1*.
- Terrasse, J.F. and Brosselin, M. (1969).** Avifaune d'un lac des Balkans: Mikra Prespa (Grece). *L'Oiseau et la Revue Française D'Ornithologie* 39:185-201.
- Thorpe, W.H., Cotton, P.T. and Holms, P.E. (1936).** Notes on the birds of lakes Ochrid, Malik and Prespa. *Ibis* 13: 557-580.

Amvrakikos Gulf

Location 39°05'N, 20°50'E. Situated on the Ionian coast, south-west of the town of Atra in the Prefectures (Nomos) of Prevezis and Artas, western Greece.

Area Approximately 25,000ha. Boundaries not yet confirmed.

Degree of Protection Most of the coastal area is public property with some private or community owned areas. The wetland is administered by the Directorate of the Environment in collaboration with the local authorities and services. The area is currently unprotected except for Ramsar status, but there is an integrated Development Programme which is based on the effective environmental protection of the wetland. Designated as a Ramsar site at the time of ratification after 19 November 1974. Also designated as an EC special protection area.

Site Description The gulf is a large, almost enclosed, shallow bay with brackish lagoons and extensive marshlands and reed swamps developed from silt deposited by the Lovros and Arakhthos rivers. It is connected to the Ionian Sea by a narrow channel near Prevesa. Extensive reedbeds of *Phragmites communis* and *Typha* sp. fringe the lagoon and river deltas, and provide refuge and feeding grounds for breeding birds. The wetland has a high diversity of other plant communities including some remnant forests along the river courses. The lagoon is a very important fishing and spawning ground, and also supports an abundant herpetofauna with over 21 recorded species (University of Essen, 1979). Several small villages border the lagoon

(including Smirtoula Kopraina and Preveza), and the road from Arta to Preveza runs along the northern shore.

International and National Importance The site is one of only two sites in Greece where Dalmatian pelican *Pelecanus crispus* is known to breed.

Other breeding birds include ferruginous duck *Aythya nyroca*, squacco heron *Ardeola ralloides*, little egret *Egretta garzetta*, night heron *Nycticorax nycticorax*, black-winged stilt *Himantopus himantopus*, glossy ibis *Plegadis falcinellus*, Kentish plover *Charadrius alexandrinus*, redshank *Tringa totanus* and common tern *Sterna hirundo*. Stone curlew *Burhinus oedicnemus* and pratincole *Glareola pratincola* breed on the dry saltings. Large numbers of wintering birds including spoonbill *Platalea leucorodia*, avocet *Recurvirostra avosetta*, greylag goose *Anser anser*, wigeon *Anas penelope*, teal *A. crecca*, pintail *A. acuta*, shoveler *A. clypeata*, common pochard *Aythya ferina*, coot *Fulica atra* and some pygmy cormorant *Phalacrocorax pygmeus*. Passage migrants include white pelican *Pelecanus onocrotalus* and great white egret *Egretta alba*. Other recorded species include grey heron *Ardea cinerea*, little bittern *Ixobrychus minutus* and white stork *Ciconia ciconia*.

Changes in Ecological Character There are several small settlements and associated access roads within the designated area. The deltaic marshlands used to be more extensive (30km by 10km), but much has been reclaimed for agriculture. Several parts of the wetland have been affected by the establishment of aquaculture units, especially at Psathotopi.

Management Practices An aquaculture (fisheries) development has been planned for a long section of the lagoon area. There is a Programme Agreement for the Amvrakikos area (signed on 27 March 1985), and the projects resulting from this Agreement have to be subject to an environmental impact study. Boundaries of three zones of protection covering the broader area, have been proposed by the Ministry of the Environment, and are under discussion before their final legal definition.

Scientific Research and Facilities The University of Essen (Federal Republic of Germany) carried out an ecological survey of the area in 1979. Project of Development and Environmental Protection: Ministry of the Environment, Physical Planning and Public Works, 1985-86.

Principal Reference Material The above information is taken from the Programme for determining the boundaries of the Ramsar Convention Wetlands - Amvrakikos Gulf - Ministry of the Environment, Physical Planning and Public Works - Athens, 1986.

Supplemented by:

Duffey, E. (1982). *National Parks and Reserves of Western Europe*. Macdonald and Co., London.

Joensen, A. H. and Madsen, J. (1985). "Waterfowl and Raptors Wintering in Wetlands of Western Greece, 1983-84" *Natura Intlandica*, Vol. 21, No. 11, pp 169-200.

Scott, D.A. (1980). A preliminary inventory of wetlands of international importance for waterfowl in west Europe and northwest Africa. *IWRB Special Publication* No. 2. 127 pp.

Sekliziotis, S. and Kainadas, E. (1980). National Report of Greece. Prepared for Technical Conference (Ramsar) held in Cagliari in November 1980. Ministry of Coordination, Athena.

Sevastos, C.G. (1976). Greece. In Smart, M. (Ed.). International Conference on the Conservation of Wetlands and Waterfowl, Heiligenhafen, Federal Republic of Germany. *Proceedings*, 2-6 December 1974. IWRB, Slimbridge, England.

Mesolonghi Lagoons

Location 38°20'N, 21°26'E. Situated in the extreme west of the south coast of mainland Greece on the Gulf of Patraikos on the Ionian Sea. In the Prefecture (Nomos) of Etoloakarnanias, Aitolia Province.

Area Approximately 13,900ha. Boundaries not yet confirmed.

Degree of Protection Mainly public property. The wetland is administered by the Directorate of the Environment in collaboration with the local authorities and services. The area is currently unprotected except for Ramsar status. Local authorities are responsible for fishing and hunting regulations. Designated as a Ramsar site at the time of ratification after 19 November 1974. Also designated as an EC special protection area (SPA).

Site Description The site comprises brackish coastal lagoons, mudflats, saltmarshes, dune-lands, sandbars and reclaimed polder, and it includes the deltas of the Acheloos and Evinos rivers. Freshwater inflow to the lagoon is from Lake Aitolikon and several streams. There are saltworks around Messolongion township. The local climate, topography and geomorphology of the gulf make it one of the most productive fishing grounds in Greece.

International and National Importance The Gulf of Mesolonghion is considered an important area for breeding and wintering of large bird populations. It is also an important area for rare and threatened waterfowl, and a principal migratory route recovery station. There are about 226 species of birds recorded here, approximately two-thirds of the number of species found in Greece. Of these, 135 species are seen regularly, and 95 species occur all year round. Characteristic species occurring in the area are coot *Fulica atra*, black-winged stilt *Himantopus himantopus*, little tern *Sterna albifrons* etc., as well as many raptor species breeding in the nearby hills and mountains and feeding in the area. Other species such as wigeon *Anas penelope*, pochard *Aythya ferina*, Dalmatian pelican *Pelecanus crispus*, shelduck *Tadorna tadorna*, cormorant *Phalacrocorax carbo*, little egret *Egretta garzetta*, great white egret *Egretta alba*, red-crested pochard *Netta rufina*, etc., occur in large numbers.

Changes in Ecological Character Large areas of the coastal lagoon system were reclaimed for agriculture but the crop production was not very successful. Other areas have been developed as commercial saltworks. Plans to extend the saltworks to cover about 2,900ha of the lagoon started to be implemented in 1980, but the constructions stopped in the same year. Nevertheless, the modification of the landscape resulting from these activities has led to population decline of many species, and especially of geese, mallard *Anas platyrhynchos*, gadwall *A. strepera* and teal *A. crecca* which breed at the lagoon. There has been illegal construction of summer houses in the Louros area. Parts of the site have also been damaged by aquaculture and land-fill projects. Some work has been undertaken, with the support of the Ministry of the Environment, to improve water quality in the wetland.

Management Practices The lagoons (Mesolonghi and Klisova) are intensively fished, and the saltworks are in operation. Boundaries of three zones of protection covering the broader area have been proposed by the Ministry of the Environment, and are under discussion before their final legal definition, and the impacts of these activities have been taken into consideration in the Management Plan. Local authorities are responsible for fishing and hunting regulations.

Scientific Research and Facilities The site was visited and studied by a team in the context of the "Determination of boundaries of the Ramsar Convention Wetlands" project (Ministry of the Environment, Physical Planning and Public Works, 1986).

Principal Reference Material The above information is taken from the programme for determining the boundaries of the Ramsar Convention Wetlands - Mesolonghion. Ministry of the Environment, Physical Planning and Public Works, Athens, 1986. Supplemented by:

Britton (April 1979). Environmental impact of proposed new salinas at Messolonghion. Report.

Scott, D.A. (1980). A preliminary inventory of wetlands of international importance for waterfowl in west Europe and northwest Africa. *IWRB Special Publication No. 2*. 127 pp.

Sekliziotis, S. and Kainadas, E. (1980). National Report of Greece. Prepared for Technical Conference (Ramsar) held in Cagliari in November 1980. Ministry of Coordination, Athena.

Sevastos, C.G. (1976). Greece. In Smart, M. (Ed.) International Conference on the Conservation of Wetlands and Waterfowl, Heiligenhafen, Federal Republic of Germany. *Proceedings*, 2-6 December 1974. IWRB, Slimbridge, England.

Kotichi Lagoon

Location 38°01'N, 21°18'E. Situated on the northwest coast of the Peloponnesus Peninsula on the Ionian Sea in the Prefecture (Nomos) of Ilias, Iliia Province, southern Greece.

Area Approximately 3,700ha. Boundaries not yet confirmed.

Degree of Protection Mainly public property. The wetland is administered by the Directorate of the Environment in collaboration with the local authorities and services. The area is currently unprotected except for Ramsar status. Local authorities are also responsible for fishing and hunting regulations, as well as forestry and housing development standards implementation. Designated as a Ramsar site at the time of ratification after 19 November 1974. Also designated as an EC special protection area (SPA).

Site Description The site comprises a small coastal freshwater lagoon and associated marshes isolated from the sea by dunes except for a narrow connecting channel. It is fed by several small streams which deposit a high content of suspended matter in the lagoon. This sedimentation process is steadily reducing the area of open water. The water is fringed with low vegetation which grades into grassland and finally agricultural land.

International and National Importance The lagoon is the largest existing wetland in Peloponnesus, and therefore very important (especially since the draining of the lakes Agouli-

nitsa and Mouria). It is also in an important geographic location, being on the western migratory route of birds in Greece. No recent figures of bird number are available, but the mild winter climate provides excellent conditions for many wintering many ducks. The predominant species in the area include mallard *Anas platyrhynchos*, wigeon *A. penelope*, pintail *A. acuta*, shoveler *A. clypeata*, little egret *Egretta garzetta* and purple heron *Ardea purpurea*. Various birds of prey have also been observed as well as the rare great white egret *Egretta alba* and Dalmatian pelican *Pelecanus crispus*.

Changes in Ecological Character In 1980 a privately owned 50ha fishpond was being constructed on the north-eastern part of the lagoon. No major reclamation schemes are planned. No important changes have been made in the lagoon during the last years, but the wetland's ecological character is threatened by eutrophication and siltation.

Management Practices A preliminary management plan is being implemented. Main activities are fishing and agriculture, with grazing in the nearby areas. The impacts of each of these activities have been taken into consideration in the Management Plan. Boundaries of three zones of protection covering the broader area, have been proposed by the Ministry of the Environment, and are under discussion before their final legal definition.

Scientific Research and Facilities The site was visited and studied by a team in the context of the "Determination of boundaries of the Ramsar Convention Wetlands" project (Ministry of the Environment, Physical Planning and Public Works, 1986).

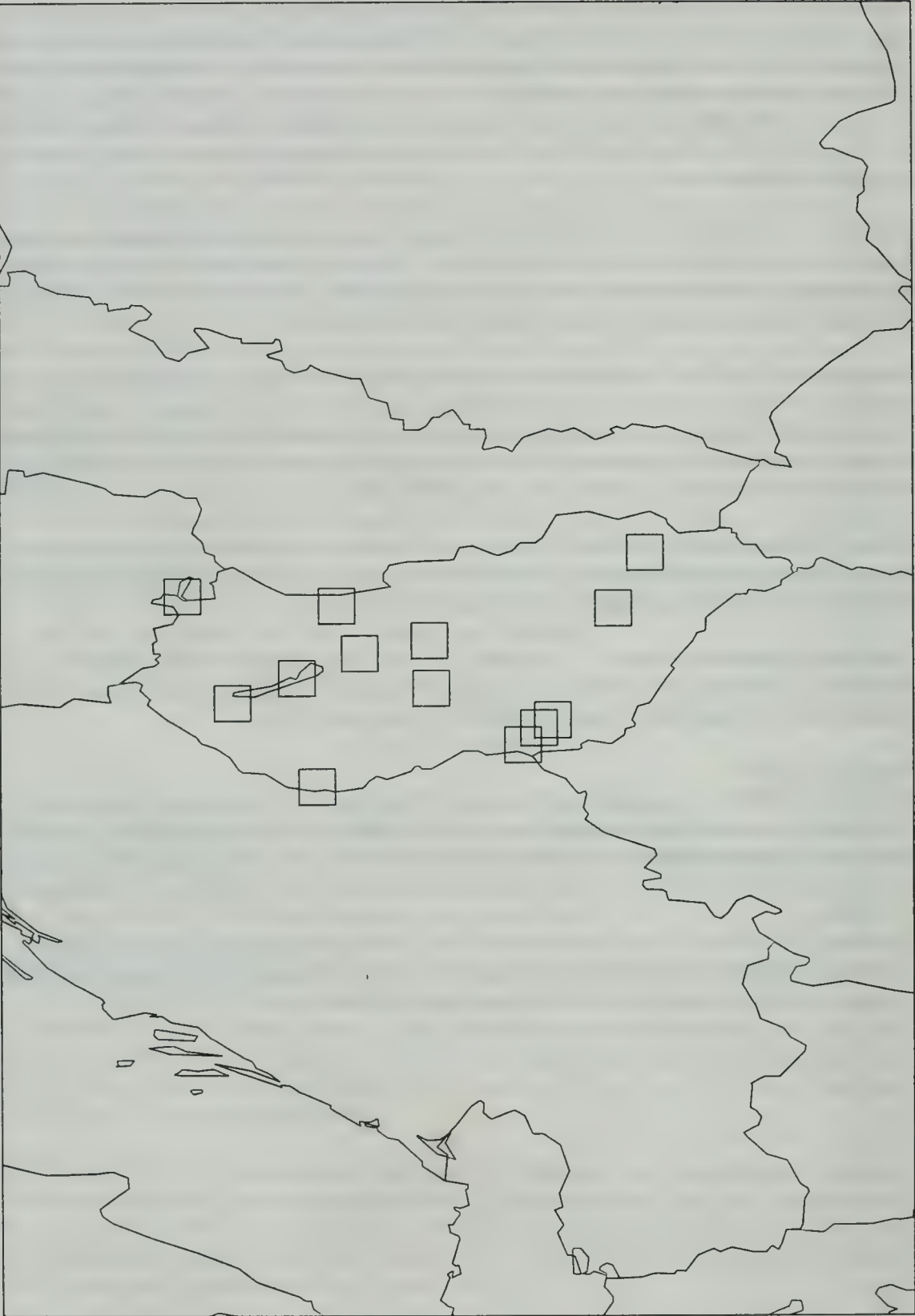
Principal Reference Material The above information is taken from the programme for determining the boundaries of Ramsar Convention Wetlands - Kotichi Lagoon. Ministry of the Environment, Physical Planning and Public Works - Athens, 1986.

Supplemented by:

Scott, D.A. (1980). A preliminary inventory of wetlands of international importance for waterfowl in west Europe and northwest Africa. *IWRB Special Publication* No. 2. 127 pp.

Sekliziotis, S. and Kainadas, E. (1980). National Report of Greece. Prepared for Technical Conference (Ramsar) held in Cagliari in November 1980. Ministry of Coordination, Athena.

Sevastos, C.G. (1976). Greece. In Smart, M. (Ed.) International Conference on the Conservation of Wetlands and Waterfowl, Heiligenhafen, Federal Republic of Germany. *Proceedings*, 2-6 December 1974. IWRB, Slimbridge, England.



Ramsar Sites in Hungary

Hungary

Area 93,030 sq.km

Population 10,604,000 (1988)

Summary of Wetland Situation The formerly vast area of 'puszta', or steppe, in north-eastern Hungary has undergone dramatic changes, and much of its formerly characteristic flora and fauna has declined or disappeared. The famous Hortobágy steppe (about 60,000ha) has become interspersed with arable land and rice fields, although fishponds still account for about 700ha. Nevertheless, considerable numbers of geese continue to frequent the steppe on migration and in winter, including white-fronted, greylag and lesser white-fronted geese.

The Biharagra fishpond complex, situated in an 8,000-10,000ha area of steppe and cultivation close to the Romanian border, provides wintering grounds for upwards of 15,000 white-fronted geese. Further south and west, the 100ha natron lake of Kardoskut (surrounded by about 2,000ha of fescue grass plains), declared a Nature Protection Area in 1965, remains fairly free from disturbance, and has become attractive to geese despite some scattered cultivation. Over 50,000 migrating and wintering white-fronted geese have been recorded, together with several hundreds, sometimes thousands of bean geese and several thousand lesser white-fronts. The nearby Pitvaros area, a complex of small, highly mineralised, eutrophic natron lakes in grassy plains (again with some cultivation), is also favoured by geese, their numbers building up when Kardoskut reaches saturation point.

In Central Hungary, another group of alkaline fishponds (of which the best known is the Fehér To) is situated in the Tisza River valley. Fehér To extends over about 850ha and once attracted the country's third largest concentration of geese, although numbers have now declined as a result of over-hunting, oilfield exploitation and fisheries. Other natron lakes in the Pusztaszer area include Csaj To, Donger To, Saser and Labodar, each surrounded by characteristic alkaline steppe and marshes fed by rainwater. Breeding birds include avocet, and kentish plover, numerous duck, waders and herons may be present during migration periods. The area is also of considerable limnological interest. Lastly, in this region, the floodplains of the River Tisza further upstream, included in the Mártély Landscape Conservation Area, are of great ornithological and botanical interest.

In the zone between the Tisza and Duna (Danube), the Szedlidi To and Kunfehér To are eutrophic soda lakes of great limnological interest. In western Hungary there is the Tata fishpond area, the importance of which is enhanced by the fact that one of the ponds and its associated channels are fed by warm springs (which prevent the water freezing). Lake Velence (Velencia To), lying between Budapest and Lake Balaton, is again of limnological interest as well as harbouring large flocks of bean goose in winter. Lake Balaton itself is the largest lake in Central Europe (around 55,000ha), with a typically 'Pannonian' character reflected in its flora and fauna. Its eutrophication is, however, increasing, and recreational activities have eliminated much of the shallow,

sparsely vegetated marginal zone formerly used by roosting geese, forcing them to roost in deep open water. Little or Kis Balaton, adjoining the main lake on the south-west, has hardly any open water, but its dense reedbeds provide cover for numerous nesting species, of which night heron, squacco heron and little egret are among the more noteworthy. Wintering geese in the Balaton area may number as many as 40,000 (largely bean geese).

Protected Areas Legislation The first comprehensive Act on Nature Conservation passed in 1935 laid the foundation for the preservation of scientifically valuable areas, wildlife communities, natural features and species. The act was subsequently updated to allow for the fundamental changes in the social and economic conditions and increasing awareness of nature conservation. In 1972 a special governmental decree was enacted which enabled the establishment of national parks, with the first created at Hortobagy in 1973. The need for stronger enforcement and nature conservation control led to the Act on the Protection of Human Environment which was endorsed by Parliament in 1976, and is the first legislative act to provide the comprehensive protection for the whole range of the environment, synthesising all earlier legislation. Current nature conservation legislation is based on the 1982 Act (Law decree No 4/1982) of the Presidential Council on Nature Conservation, new legislation which supercedes all former acts on nature conservation. This act allows for the establishment of national parks, landscape protection areas, natural monuments and nature conservation areas, with the latter divided into national and local level categories. The nature preserves belong to one of 6 categories, they represent geological, hydrological, zoological and botanical or cultural-historical values.

Protected Areas Administration At national level nature conservation is supervised by the National Authority for Environment Protection and Nature Conservation (OKTH). This organisation has seven inspectorates which actually carry out management. The national parks are managed by their own Directorates, which are themselves part of the OKTH. Several other ministries and departments also have an interest in nature conservation, as do certain local administrations.

Sites designated under the Convention Accession 11 April 1979 with eight sites listed at accession, and five more added in March 1989. Of these latter sites, "Old Lake" of Tata and Lake Balaton are only designated for the period 1 October to 30 April each year.

Szaporca Reserve
Velence-Dinnyés Reserve
Kardoskut Reserve
Kisbalaton or Little-Balaton Reserve
Martely Landscape Protection Area
Kiskunsag National Park
Pusztaszer Landscape Protection Area
Hortobagy National Park
Ocsa
"Old Lake" of Tata
Lake Fertő
Lake Balaton
Bodrozug

Government body responsible for administration of the Convention
Ministry for Environment and Water Management, PO Box 351, 1394 Budapest

Szaporca Reserve

Location 45°50'N, 18°06'E. Situated near Ilma-Puzzla village south of Pécs in Baranyo Province, southern Hungary near the Yugoslavia frontier.

Area 257ha

Degree of Protection Owned by the state and agricultural cooperatives. Szaporca has been protected as a reserve since 1969 under the Register of Nature Conservation No. 89/TT/69. Designated as a Ramsar Site at the time of accession on 11 April 1979.

Site Description The site comprises a marshy oxbow lake derived, but now separated, from the Drava River. Most of the lake has now been invaded by reedbeds, and only a few brackish open water pools remain. The vegetation is dominated by *Phragmites communis* with some willow *Salix* sp. There is a rich and varied aquatic vegetation including water lily *Nymphaea alba* and water soldier *Stratiotes aloides* in the pools. The village of Ilma-Pusztá lies in the central area enclosed on three sides by the isolated meander, with the river Drava flowing on the remaining side. The boundaries of the reserve are defined by the extent of flooding, and follow effectively the banks of the once-filled oxbow lake.

International and National Importance The site is an important nesting area for a number of waterfowl species including little egret *Egretta garzetta*, squacco heron *Ardea ralloides*, purple heron *Ardea purpurea*, ferruginous duck *Aythya nyroca*, pochard *A. ferinca*, mallard *Anas platyrhynchos* and gadwall *A. strepera*.

Changes in Ecological Character The oxbow is in an advanced state of eutrophication and the area of open water has decreased substantially. Natural vegetational change has been accelerated by the lowering of the ground water table in the region; the smaller range in water levels owing to dam construction in Yugoslavia; and poor sluice management.

Management Practices No information

Scientific Research and Facilities No information

Principal Reference Material The above information is taken from the document submitted at the time of accession in April 1979 and the National Report (1980) prepared for the Conference on the Conservation of Wetlands of International Importance especially as Waterfowl Habitat held in Cagliari, Italy in November 1980.

Velence - Dinnyés Reserve

Location 47°10'N, 18°32'E. Situated on Lake Velence, 45km south-west of Budapest and 12km east of Székesfehérvár in Fejér Province, west central Hungary.

Area 965ha (part of a 24,000ha lake and marshland complex)

Degree of Protection Owned by agricultural cooperatives and the state. The site is protected as Velence (established 1958) and Dinnyés (established 1966) Conservation Areas. Designated as a Ramsar Site at the time of accession on 11 April 1979. Expansion of the protected area is planned, together with establishment of adequate buffer zones.

Site Description The site comprises the disjunct Velence and Dinnyés conservation areas. Velence CA comprises a corner of the extensive Velence Lake fringed with extensive reedbeds of *Phragmites communis* with a rich and varied submerged vegetation in the eutrophic shallow waters. Dinnyés comprises the neighbouring moorland and periodically flooded pastures bordering the lake. Lake Velence was formed as a result of volcanic activity. A railway and main road between Budapest and Szekesfehervar run between the two conservation areas.

International and National Importance The site is the most significant area in Hungary for nesting and migrating waterfowl, including a major heronry of grey heron *Ardea cinerea*, purple heron *A. purpurea*, great white egret *Egretta alba* and bittern *Botaurus stellaris*. Other species include red-necked grebe *Podiceps grisegena*, spoonbill *Platalea leucorodia*, greylag goose *Anser anser*, gadwall *Anas strepera* and black-headed gull *Larus ridibundus*. Large numbers of migrant geese visit the lake in winter including up to 20,000 bean goose *Anser fabalis*.

Changes in Ecological Character There is increasing pressure from development of recreation facilities on the lakeshore. The quantity and quality of water reaching the lake has declined through human activities in the catchment. This has led to accelerating vegetational succession. Reedbed dredging and modification of the natural shoreline for recreational purposes have also led to habitat deterioration.

Management Practices The reedbeds are harvested annually, and there is a commercial fishery on the lake. Visitor access by permit only.

Scientific Research and Facilities Bird counts and observations have been carried out by the Ornithological Institute. There have been hydrobiological, botanical and zoological studies. There is a small research laboratory on the lakeshore.

Principal Reference Material The above information is taken from the document submitted at the time of accession in April 1979 and the National Report (1980) prepared for the Conference on the Conservation of Wetlands of International Importance especially as Waterfowl Habitat held in Cagliari, Italy in November 1980.

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

Additional references:

Donasky (1959). *Das Leben des Szelider Sees*. Budapest.

Ruttkay, Tilesch and Veszprémi (1964). *Nadgazdalkodás* (reedculture). Budapest.

Kardoskut Reserve

Location 46°30'N, 20°28'E. Situated to the west of the Tizza River, north of Szeged in Csongrad Province, southeast Hungary.

Area 488ha

Degree of Protection Cooperative ownership. Kardoskut has been protected as a reserve (conservation area) since 1965 under the Register of Nature Conservation No. 85/TT/66. Designated as a Ramsar Site at the time of accession on 11 April 1979.

Site Description The site comprises the soda lake (100ha), associated marshlands and surrounding sodic meadow. One third of the shallow lake (0.1-0.3m) is filled by reedbeds of *Phragmites communis*. The lake is extremely alkaline with a pH of 9 to 10, and it frequently dries out during the dry summer months (July-September) leaving the white soda deposits from which its name Feher-to (white lake) is derived. It is fed by runoff from nearby high ground. Plant associations are typical of halophytic and heath vegetation growing in saline marshes and on sodic soils: *Bolboschoenetum-Chenopodietosum botryoides*, *Bolboschoenetum-Phragmitetosum*, *Bolboschoenetum-Puccinellietonum*, *Agrosti-Caricetum distantis*, *Plantago maritima*, *Camphorosmetum annuae*, *Puccinellietum limosae*, *Salsola soda*, *Suaedetum maritimae-Crypsis*, *Acorelletum pannonicum*, *Camphorosma-Fesuca pseudovina* and *Astragalo-Poetum angustifoliae typicum*. The north side of the area is flanked by the Kardoskut-Hodmezovasarhely road and the east side by the Bekessomson road.

International and National Importance The highest concentration of geese in Hungary (40,000-100,000) occurs at the soda lake in late autumn, of which 90% are white-fronted goose *Anser albifrons*, 5% bean goose *A. fabalis* and 5% lesser white-fronted goose *A. erythropus*. Visiting migrants include crane *Grus grus* (5,000-10,000 October/November), mallard *Anas platyrhynchos* (up to 100,000), curlew *Numenius arquata*, whimbrel *N. phaeopus* and numerous waders. Major breeding species are avocet *Recurvirostra avosetta*, Kentish plover *Charadrius alexandrinus*, black-tailed godwit *Limosa limosa* and lapwing *Vanellus vanellus*. Blind mole rat *Spalax leucodon*, which is threatened in Hungary, is reported to occur in the conservation area.

Changes in Ecological Character Grazing is allowed on the pastures surrounding the lake.

Management Practices Access to the site is restricted and visitors require permits.

Scientific Research and Facilities Bird counts and observations have been carried out by the Ornithological Institute.

Principal Reference Material The above information is taken from the document submitted at the time of accession in April 1979 and the National Report (1980) prepared for the Conference on the Conservation of Wetlands of International Importance especially as Waterfowl Habitat held in Cagliari, Italy in November 1980.

Kisbalaton (Little Balaton) Reserve

Location 46°40'N, 17°15'E. Situated 5km from the south-west corner of Balaton Lake, west of Balatonszentgyörgy in Somogy Province, west central Hungary.

Area 14,745ha (originally 1,400ha; increased by 13,342ha on 17 March 1989)

Degree of Protection State ownership. The site has been protected as a strict nature reserve since 1951. Designated as a Ramsar Site at the time of accession on 11 April 1979 the wetland has since been enlarged on 17 March 1989, corresponding with the landscape protection area of the same area.

Site Description The site comprises a marshy area centred around the Zala River Delta with some relict shallow open-water ponds and a raised island. The area was once part of the extensive Balaton Lake which became isolated from the river and filled in by alluvium deposition. The marshland is predominated by reedbeds of *Phragmites communis* with occasional stands of willow *Salix* spp., reedmace *Typha* spp. and sedges (Cyperaceae), on 2-3m of peaty soil. The small eutrophic ponds support a rich and varied aquatic vegetation including waterlily *Nymphaea alba*, yellow waterlily *Nuphar lutea* and water soldier *Stratiotes aloides*. Since the initial designation a vast lake-system has been constructed around the reed-covered marshland, described above, in order to ensure that organic pollutants contained in the River Zala be filtered out by native aquatic vegetation before entering Lake Balaton. This filter-system greatly attracts bird-life and the avifauna of Kis-Balaton has multiplied both in number and composition.

International and National Importance The site is an important breeding ground for numerous bird species including cormorant *Phalacrocorax carbo sinensis* (1,000 pairs) the only colony in Hungary, grey heron *Ardea cinerea* (40 pairs), purple heron *A. purpurea* (40 pairs), squacco heron *Ardeola ralloides* (24 pairs), night heron *Nycticorax nycticorax* (150-200 pairs), great white egret *Egretta alba* (70-80 pairs), little egret *E. garzetta* (35 pairs), bittern *Botaurus stellaris* (10 pairs), spoonbill *Platalea leucorodia* (35 pairs), greylag goose *Anser anser* (80-100 pairs), mallard *Anas platyrhynchos* (1,000 pairs), garganey *Anas querquedula* (15-20 pairs), gadwall *Anas strepera* (50 pairs), pochard *Aythya ferina* (60 pairs), lapwing *Vanellus vanellus* (50 pairs), curlew *Numenius arquata*, black-tailed godwit *Limosa limosa* and common snipe *Gallinago gallinago*. It is significant as a resting place, and principal migrants are goldeneye *Bucephala clangula*, tufted duck *Aythya fuligula* (1,000), bean goose *Anser fabalis* (30-70,000), duck *Anas* spp., (20-30,000) and 2-3,000 coot *Fulica atra*.

Changes in Ecological Character The process of sedimentation is continuing to reduce the area of open water, and combined with the expansion of the reedbeds, could lead to eventual desiccation of the original wetland. Artificial water level regulation may threaten the nests of waterfowl and shorebirds.

Management Practices A regulated amount of reed cutting is allowed. Visitor access is by permit only, and is prohibited during the bird breeding season.

Scientific Research and Facilities Bird counts, observations and ringing programmes have been carried out by the Ornithological Institute. The Hungarian Academy of Sciences has been studying the hydrobiology and vegetation of the marshland. There is a field research station and several bird observation towers.

Principal Reference Material The above information is taken from the document submitted at the time of accession in April 1979 and the National Report (1980) prepared for the Conference on the Conservation of Wetlands of International Importance especially as Waterfowl Habitat held in Cagliari, Italy in November 1980. New information has been provided, through the expansion of the site, by the Hungarian government and from the International Council for Bird Preservation.

Additional references:

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

Darnay (1934). A Kisbalaton Osszeszsugoradasa (the shrinking of Kisbalaton). *Aquila* 55-58: 169-187.

Keve, A. (1975). Adatok a Kis-Balaton Madarvilagahoz I (with German summary). *Aquila* 82: 49-79.

Keve, A. (1976). Adatok a Kis-Balaton Madarvilagahoz II (with German summary). *Aquila* 83: 191-225.

Martély Landscape Protection Area

Location 46°25'N, 20°20'E. Situated on the east bank of the Tisza River, adjacent to Martely village and north of Szeged, in Csongrad Province, southern Hungary.

Area 2,232ha

Degree of Protection Owned by the state and agricultural cooperatives. The site has been protected as a 'district of landscape protection' since 1971. Designated as a Ramsar Site at the time of accession on 11 April 1979.

Site Description The site comprises two oxbow lakes isolated from the meandering Tisza River by dams constructed at the end of the 19th century, several flooded claypits (resulting from dam construction), the bank of the Tisza River, and associated floodplain marshlands and hay-meadows. The river floods regularly in March and May/June, and occasionally in winter, and the flow in the site area is sufficiently fast to ensure that it rarely freezes over in winter. The isolated oxbow lakes are shallow (1m-4m) and eutrophic, with a rich aquatic vegetation of water chestnut *Trapa natans*, *Myriophyllum vorticillatum*, *Najas marina*, *Polygonum amphibium*, *Ceratophyllum demersum*, pondweed *Potamogeton perfoliatus*, *Scirpus tabernaemontani* and *Dreissenia polymorpha* (important food source for wintering diving ducks). The flooded claypits support a similiar aquatic flora, and are surrounded by woodland and scrub of willow

Salix triandra, *Cornus sanguinea*, *Galium aparine* and *Polygono-Chenopodion* and *Salicion incanae* associations. The temporary flooded marshlands are covered by *Polygonum lapathifolium*, *Angelica sylvestris*, *Leucosium aestivum*, *Aristolochia clematitis*, *Amorpha fruticosa*, *Sambucus ebulus*, *Iris pseudocorus* and reedbeds of *Phragmites communis* with *Typha angustifolia*. The drier haymeadows are characterised by *Equisetum arvense*, *Melilotus officinalis*, *Chrysanthemum vulgare*, wild carrot *Daucus carota*, *D. vulgare*, *Lupinus lutea*, *L. albus*, *Trifolium campestre*, *Falcaria vulgaris*, chervil *Anthriscus cerefolium*, *Asperula rivalis*, *Dipsacus laciniatus* and *Convulvulus arvensis*. The designated marshland area is bordered by woodland of oak, poplar, willow and ash (*Quercus* sp., *Populus* sp., *Salix* sp., and *Fraxinus* sp.)

International and National Importance The site is an important breeding and wintering site for birds. Breeding birds include large numbers of wild duck such as mallard *Anas platyrhynchos* and garganey *A. querquedula*, squacco heron *Ardeola ralloides*, black stork *Ciconia nigra*, spoonbill *Platalea leucorodia* and black-headed gull *Larus ridibundus*. Several thousand visitors on winter migration include mallard, teal *Anas crecca*, common pochard *Aythya ferina*, ferruginous duck *A. nyroca*, coot *Fulica atra* and waders (Limicolae).

Changes in Ecological Character None reported

Management Practices No information

Scientific Research and Facilities No information

Principal Reference Material The above information is taken from the document submitted at the time of accession in April 1979 and the National Report (1980) prepared for the Conference on the Conservation of Wetlands of International Importance especially as Waterfowl Habitat held in Cagliari, Italy in November 1980.

Kiskunsag National Park

Location 46°49'N, 19°15'E. Situated between the Danube and Tisza rivers to the west of Kecskemét in Bacs-Kiskun Province, south central Hungary.

Area 3,903ha (within Kiskunsag National Park 30,527ha)

Degree of Protection 57% state, 42% co-operative and 1% private ownership. The designated site is within Kiskunsag National Park protected since 1974 under decree 1800/1974 of the Nature Conservancy Office. Park administration is at 6001 Kecskemét, Liszt Ferenc u 19. Kiskunsag National Park was accepted as a biosphere reserve in May 1979. Designated as a Ramsar site at the time of accession on 11 April 1979.

Site Description The site comprises the Kiskunsag soda lakes complex of small basins (hollows) without outlet, reedbeds, marshy fields and fenwoods on the plain of the Danube. The surface of the plain was formed by fluvial accretion during the Pleistocene and Holocene periods, which continued until the regulation of the waterways at the end of the last century. The smooth surface is covered mainly with loose fine-grained deposits of loam and silt (rich in carbonates).

Fluvial erosion is represented by former backwaters and dead channels of the Danube. The water level of the shallow natron lakes depends on rainfall, and most of the lakes dry up in dry summers. The water regulations have considerably modified the water balance, resulting in modification of the soil development and flora/fauna. Areas previously regularly flooded which were only locally sodic have now become saturated with native soda. Sodic soils of solonchak and solonchak-solonetz type with all types of salt microrelief occur. The meadows and sodic pastures are characteristic of dry and alkaline desert (salt puszta), with halophytic vegetation of *Festuca pseudovina*, *Camphorosma annua*, *Matricaria chamomilla*, *Hordeum hystris*, *Plantago tenuiflora*, *Salicola soda*, *P. schwarzebergiana*, *Suaeda maritima* and *Puccinellia limosa*. Endemic to the plain are *Limonium gmelini* subsp. *hungaricum* and *Aster tripolium* subsp. *pannonicus*. The fen meadows, marshy fields and wet (humid) grasslands bordering the lakes are characterised by *Phragmites communis*, *Carex elata*, *Angelica silvestris*, *Sanguisorba officinalis*, *Lychnis flos-coculi*, *Succisia pratensis* and *Nymphaea alba*. Birds nest in the open-water lakes (Kelemen-szék, Zab szék and Pipas-rét) or in lakes overgrown with reeds (Fehér-szék and Kis-rét).

International and National Importance Over 200 bird species occur at the site including 80 nesting species. Nesting birds include great bustard *Otis tarda* (in cultivated fields inside and outside the boundary), lapwing *Vanellus vanellus* (breeding in large numbers), black-tailed godwit *Limosa limosa*, redshank *Tringa totanus*, avocet *Recurvirostra avosetta*, pratincole *Glareola pratincola*, great egret *Egretta alba*, little egret *E. garzetta*, night heron *Nycticorax nycticorax*, stone-curlew *Burhinus oedicephalus*, Kentish plover *Charadrius alexandrinus*, black-winged stilt *Himantopus himantopus*, purple heron *Ardea purpurea*, spoonbill *Platalea leucorodia*, bittern *Botaurus stellaris*, Baillon's crane *Porzana pusilla* and greylag goose *Anser anser*. Passage breeders include skylark *Alauda arvensis* and tawny pipit *Anthus campestris*. The site is also an important feeding and resting ground for flocks of white-fronted goose *Anser albifrons*, bean goose *A. fabalis* and golden plover *Pluvialis apricaria*.

Changes in Ecological Character Changes may result from drainage and flood control works. The area is crossed by a main road and a number of minor roads, power lines, buried gas pipes and canals. There is considerable organised tourism.

Management Practices The core zones in the park are completely undisturbed. Arable land, meadows and pastures are managed in accordance with nature conservation interests by 20 park staff. Visitor access is prohibited to the strictly protected conservation areas. There is a reintroduction programme (by the Wildfowl Trust) for white-headed duck *Oxyura leucocephala*. Lack of rainfall and a lowering of the regional groundwater table have resulted in the loss of open shore habitats and eutrophication. The lake is surrounded by intensively cultivated land which accelerates eutrophication. Management of vegetation is undertaken in an effort to slow down the changes which are occurring.

Scientific Research and Facilities Research in the national park is carried out by the Hungarian Academy of Sciences, Museum of Natural Science and several universities. Regular study and ringing of nesting and migratory birds is carried out by specialised staff of the Board of Directors. Accommodation is available for scientists, and there are some bird observation towers and a ringing station.

Principal Reference Material The above information is taken from the document submitted at the time of accession in April 1979 and the National Report (1980) prepared for the Conference

on the Conservation of Wetlands of International Importance especially as Waterfowl Habitat held in Cagliari, Italy in November 1980.

Additional references:

Pecsi, M. (1967). *Danubian Lowland*. (A Dunai Alföld). Budapest.

Toth, K. *National Park in Kiskunsag*. (Nemzeti Park a Kiskunságban).

Tölgyesi, I. (1984). Nature conservation in Hungary: presentation of a National Park. *Parks* 8(4): 1-3.

Supplemented by: articles of scientific reviews, occasional and annual reports of research institutes and report of the SZAB on work carried out in the nature conservation area No. III of the Kiskunsag National Park.

Pusztaszer Landscape Protection Area

Location 46°15'N, 20°10'E. Situated to the north of Szeged on the west bank of the Tisza River in Csongrad Province, southern Hungary, near the frontier with Romania.

Area 5,000ha (part of the 22,000ha Pusztaszer Nature Conservation District)

Degree of Protection State and cooperative ownership. The four wetland systems are protected as part of the extensive Pusztaszer Nature Conservation District established in 1976 under Nature Conservation Registration No. 122/TK/76. Saker and Labodar Conservation Areas and the marshlands of the Pusztaszer-Budosszek Conservaton Area have strict protection. Designated as a Ramsar Site at the time of accession on 11 April 1979.

Site Description The designated site comprises four disjunct wetland systems: Szeged-Feherto artificial fishponds; Csaj Lake artificial fishponds and the meadows of Baks on the east bank of the Tisza river; Saker and Labodar Conservation Areas; and the marshlands of Pusztaszer-Budosszek Conservation Area, separated from Csaj Lake system by a canal. The fish ponds are highly alkaline soda lakes surrounded by reedbeds of *Phragmites communis* with *Typha angustifolia* (nesting area for herons) with characteristic sodic vegetation including *Festuca pseudovina*, *Matricaria chamomilla*, *Plantago tenuiflora*, *P. schwarzebergiana*, *Suaeda maritima* and *Limonium gmelini* ssp. *hungaricum*. In winter the levels of the ponds drop and the resultant shallows are valuable feeding grounds for visiting waders. The marshy flood-prone areas near the Tisza river, which often dry out, are characterised by *Polygonum lapathifolium*, *Angelica sylvestris*, *Leucojum aestivum*, *Aristolochia clematitis*, *Amorpha fruticosa*, *Sambucus ebulus* and *Iris pseudocorus*.

International and National Importance The fishponds attract large numbers of migrant waterfowl including 10,000-20,000 white-fronted goose *Anser albifrons*, numerous other Anatidae, and waders such as curlew *Numenius arquata* and whimbrel *A. phaeopus*. The fringing reedbeds are used by colonies of breeding heron including grey heron *Ardea cinerea*, purple heron *A. purpurea*, squacco heron *Ardeola ralloides*, great white egret *Egretta alba*, little egret *E. garzetta*, night heron *Nycticorax nycticorax* and bittern *Botaurus stellaris*. Other breeding species include red-necked grebe *Podiceps grisegena*, white stork *Ciconia ciconia*, white

spoonbill *Platalea leucorodia*, mallard *Anas platyrhynchos*, garganey *A. querquedula*, shoveler *A. clypeata*, pochard *Aythya ferina*, ferruginous duck *A. nyroca*, coot *Fulica atra*, lapwing *Vanellus vanellus*, Kentish plover *Charadrius alexandrinus*, redshank *Tringa totanus*, black-tailed godwit *Limosa limosa*, black-winged stilt *Himantopus himantopus*, avocet *Recurvirostra avosetta*, stone-curlew *Burhinus oedichenus*, black-headed gull *Larus ridibundus*, common tern *Sterna hirundo* and Mediterranean gull *L. melanocephalus* (only breeding ground in Hungary at Szeged-Feherto fishponds).

Changes in Ecological Character Nesting herons at Labodar have been forced to the edge of the heronry by an increasing cormorant population. The cormorants' droppings have caused the heronry trees to wither. Wardens have tried to deter further increase by frightening the birds away before the arrival of herons in spring. Tisza oxbow is being filled by sedimentation and vegetation succession.

Management Practices No information

Scientific Research and Facilities The Ornithological Institute has carried out bird counts and observations in the district.

Principal Reference Material The above information is taken from the document submitted at the time of accession in April 1979 and the National Report (1980) prepared for the Conference on the Conservation of Wetlands of International Importance especially as Waterfowl Habitat held in Cagliari, Italy in November 1980.

Hortobagy National Park

Location 47°37'N, 21°05'E. Situated in the north-east of the Great Gromboalian Plain on the Tisza River in Szolnok Province, east central Hungary.

Area 15,000ha (including Hortobagy fishpond and Zam, Pentezug and Angyalhaza steppes in Hortobagy National Park 43,550ha; Tiszafured Bird Sanctuary, which constitutes most of Tiszafured Conservation Area; and Juztus-Hagy as-Fekete meadowland in Egyek-Pusztakocsi Conservation Area).

Degree of Protection 53% state and 47% cooperative ownership. The designated site is partially in Hortobagy National Park established on 1 January 1973 under Decree 1850/1972 of the Nature Conservancy Office 'to improve the characteristic values of nature in the puszta; preserve the peculiar landscape of the plains, the fauna and flora of Hortobagy; and safeguard the undisturbed nesting and migration of Hortobagy's specific avifauna'. Park management is at Debrecen, Böszörményu ut 138. The remaining areas are protected within nature conservation areas. Hortobagy National Park was accepted as a biosphere reserve in May 1979. Designated as a Ramsar site at the time of accession on 11 April 1979.

Site Description The designated site comprises four disjunct wetlands on the extensive Hortobagy Steppe, which is the largest secondary steppe (puszta) in Europe, formed in the ancient flood plain of the Tisza River. Its last natural form was typical wooded steppe at the

end of the Bronze Age containing numerous lakes and marshes resulting from regular floods of the Tisza. This landscape has been transformed into a dry, treeless secondary steppe by human activities over the past centuries. Artificial fishponds and storage lakes have been established in the area from 1915 and extensive storage lakes have been recently formed along the Tisza River. The vegetation is characterised by halophytic and xerophilous species that have wide distribution in the Eurasian temperate zone, but there are also many Pontian and Pont-Mediterranean species. Prevalent species of the sodic soils of the alkaline steppes are *Plantago maritima*, *P. tenuiflora*, *Suaeda maritima*, *Salsola soda*, *Matricaria chamomilla*, *Cerastium dubium*, *Hordeum hystris*, *Puccinellia limosa*, *Festuca pseudovina*, *Trifolium angulatum*, *Limonium gmelini*, *Artemisia monogyna*, *Scorzonera cana*, *Ranunculus pedatus*, *Phaliurus pannicus*, *Camphorosma annua*, *Inula britannica*, *Cirsium furiens*, *Calatella punctata*, *Armoracia macrocarpa* and *Achillea asplensifolia*. The saltmarshes bordering the fishponds and occurring on the steppes are characterised by *Eleocharis palustris*, *Lythrum virgatum*, *Bolboschoenus maritimus*, *Atriplex litoralis*, *Scirpus tabernaemontani*, *Typha angustifolia*, *Phragmites communis*, *Lycopus exaltatus*, *Stratiotes aloides*, *Sagittaria agittifolia*, *Hydrocharis morus-ranae*, *Nymphaea alba*, *Salvinia natans*, *Trapa natans*, *Marsilea quadrifolia* and *Ranunculus aquatilis*. The flood zone of the Tisza (Tiszafured Sanctuary) supports patches of *Populus alba*, *Populus nigra*, *Salix alba*, *Salix fragilia*, *Quercus rober*, *Salix triandra purpurea*, *Fraxinus* sp. woodland. Endemics include *Aster tripolium* subsp. *pannonica*, *Suaeda pannonica* and *Plantago schwarzenbergiana*. Mean annual rainfall 400-500mm with high temperatures in the growing season. There are only 1-10 windless days in the year and whirlwinds are frequent.

International and National Importance Hortobagy National Park is an important area in Europe for migrating and wintering birds. Migrants include over 10,000 geese: white-fronted goose *Anser albifrons*, bean goose *A. fabalis* and lesser white-fronted goose *A. erythropus* (declining numbers), mallard *Anas platyrhynchos* (several 100,000), teal *A. crecca* and several hundred black stork *Ciconia nigra* and crane *Grus grus*. Some 300 recorded bird species occur at the site including 140 breeding. Breeding birds include pratincole *Glareola pratincola*, Kentish plover *Charadrius alexandrina*, snipe *Gallinago gallinago*, redshank *Tringa totanus*, lapwing *Vanellus vanellus*, stone-curlew *Burhinus oedicnemus*, great bustard *Otis tarda*, Baiton's crake *Porzana pusilla*, little crake *P. parva*, great white egret *Egretta alba*, little egret *Egretta garzetta*, grey heron *Ardea cinerea*, purple heron *A. purpurea*, squacco heron *Ardeola ralloides*, night heron *Nycticorax nycticorax*, white stork *Ciconia ciconia*, black-winged stilt *Himantopus himantopus*, avocet *Recurvirostra avosetta*, spoonbill *Platalea leucorodia*, red-necked grebe *Podiceps grisegena*, great-crested grebe *P. cristatus*, black-necked grebe *P. nigricollis*, greylag goose *Anser anser*, mallard *Anas platyrhynchos*, garganey *A. querquedula*, shoveler *Anas clypeata*, pochard *Aythya ferina*, ferruginous duck *A. nyroca*, coot *Fulica atra*, white-winged black tern *Chlidonias leucopterus*, black tern *C. niger*, whiskered tern *C. hybridus*, short-eared owl *Asio flammeus*, aquatic warbler *Acrocephalus paludicola*, short-toed lark *Calandrella brachydactyla hungarica* and bearded reedling *Panurus biarmicus*. Passage migrants include several raptors uncommon in Europe such as Imperial eagle *Aquila heliaca*, golden eagle *A. chrysaetos*, saker falcon *Falco cherrug*, peregrine falcon *F. peregrinus*, red-footed falcon *F. vespertinus* and short-toed eagle *Circus gallicus*. 20-25 white-tailed eagle *Haliaeetus albicilla* overwinter here regularly. Mammals include otter *Lutra lutra*.

Changes in Ecological Character The site contains 2,200ha farmland, 38,200ha alkali pastures (including 30,000ha free from irrigation and pesticide use), 2,500ha reedbeds and 1,000ha mowing meadows. There are some structures such as roads, canals and power lines. 1,000ha is used for tourism with severe overuse. The pastoral population (May-October) is small

and decreasing. In past centuries this salt desert (unique in Europe) was used for semi-nomadic shepherding which contributed to the formation of the present landscape of the puszta. A large oxbow in the central part of the Egyek-Pusztaköcs swamps has been restored by habitat reconstruction involving the establishment of a permanent water supply.

Management Practices The national park contains a number of core zones (varying from 15 to 200ha) which represent the most important habitats. These areas appear to be little affected by human activity, although they have been subject to extensive grazing. The core zones are buffered from more intensive use. There are 37 national park staff with 18 assigned to protection and 19 to management and maintenance. Visitor access is prohibited to the strictly protected conservation areas. There is organised tourism in the park, but there are no accommodation facilities.

Scientific Research and Facilities Research work on the national park is carried out by the Hungarian Academy of Sciences, Museum of Natural Science and several universities. Since 1955 there have been studies of the synecology of the fauna, flora and soils, including using Margita Wood as an IBP model area. Current research is out on the ecology of pools, alkali low grounds, salt steppes, nesting bird communities, trace elements and man-made water bodies. Regular study of breeding and migratory birds is carried out by the Ornithological Institute and the specialised staff of the Board of Directors of the park. Extensive studies have been made of the animal species and communities in the park, sponsored by the Hungarian Academy of Sciences and the National Nature Conservaton Office.

Principal Reference Material The above information is taken from the document submitted at the time of accession in April 1979 and the National Report (1980) prepared for the Conference on the Conservation of Wetlands of International Importance especially as Waterfowl Habitat held in Cagliari, Italy in November 1980.

Additional references:

- Berenyi, D. (1964).** Microclimatological Research in Hortobagy. *Acta Univ. Debrecen*, Series Geogr. IX/II.
- Kovacs, G. and Salamon, F. (1976).** Hortobagy, Budapest. *Natura* (further literature in preparation).
- Marosi, S. and Szilard, J. (1969).** *The Tisza Lowland*. Budapest Acad.
- Szabolcs, I. (1954).** *Soils of Hortobagy*. Agricultural Publishing House, Budapest.
- Szabolcs, I. (1961).** *Effects of regulations of waterways and irrigation on processes of soil formation from beyond the Tisza*. Publishing House of the Hungarian Academy of Sciences, Budapest. Pp. 1-369.
- Szujko-Lacza, J. (1981).** The vegetation of the Hortobagy National Park. In Mahunka, S. (Ed.) *The Fauna of the Hortobagy National Park*. Vol. 1: 15-32. Publishing House of the Hungarian Academy of Sciences, Budapest.
- Udvardy, M. (1941).** *Avifauna of Hortobagy*. Tisia.

Ocsa

Location 47°18'N, 19°14'E. Adjacent to the town of Ocsa, 25km south-west of Budapest.

Area 1,078ha

Degree of Protection The site comprises the western part of the Ocsa Landscape Protection Area. An area of 3,576ha area designated by Decision No. 3/1975 of 9 September 1975 by the National Agency for Nature Conservation, under the Protection of Characteristic Marshland. Designated as a Ramsar site on 17 March 1989.

Site Description This is a characteristic peatland formation of the Great Hungarian Plain, which lies south of Budapest, comprising island like habitat tracts of relict post-glacial species. The aeolian loess surface from the end of the Pleistocene has been eroded by the River Danube during the early Holocene period. Bogs have developed in depressions formed as run-off is hindered by the loess-sand ridges and influenced by the watertable. Rainfall is approximately 600mm per year and average annual temperature 10.5°C. As well as numerous characteristic Hungarian endemic species, such as *Alnus glutinosa*, *Fraxinus angustifolia* ssp. *pannonica* and *Populus* species, there is *Iris sibirica*, *Eriophorum* and other peatland species. Mammal species within the site include European otter *Lutra lutra* (V), stoat *Mustella erminea*, polecat *M. putorius* and beech marten *Martes foina*.

International and National Importance The 1,078ha serves as a regular gathering place for more than 10,000 waterfowl, mostly *Anas* species such as mallard *A. platyrhynchos*. Breeding birds include great white egret *Egretta alba*, curlew *Numenius arquata*, snipe *Gallinago gallinago* and long-eared owl *Asio flammeus*.

Changes in Ecological Character Possible threats are land reclamation and pollution from industry, agriculture and urban areas.

Management Practices No information

Scientific Research and Facilities Floral and faunal research has been carried out by Eötvös Lorand University of Sciences, Budapest, and there is a permanent bird watching and ringing station in the LPA. In summer a camp is organised for nature conservation education.

Principal Reference Material The above information has been provided by the Hungarian government.

"Old Lake" of Tata

Location 47°39'N, 18°18'E. The site is situated south of, and adjacent to the town of Tata. In the central range of the Hungarian Mountains, Komárom Region, 60 km north-west of Budapest.

Area 269ha

Degree of Protection The park of Tata surrounding the lake has county protection as a nature conservation area, and acts as a buffer zone around the lake site. The area was added to the Ramsar list on 17 March 1989. However, the wetland is specially designated and is only included in the list from 1 October to 30 April annually.

Site Description The lake is an artificial fish pond in the built-up area of Tata. It is partly bounded by buildings of the town and park, and woods occur at the south and south-west edges of the lake. The site is approximately 150m above sea level. Annual precipitation is 700mm and average temperature is 9.5°C.

International and National Importance The lake is one of the most important traditional bean goose *Anser fabalis* sites in Europe. Some 12% to 13% of the bean goose population residing on the continent in winter find a suitable habitat here (10,000 in winter; 7,000 spring passage and 25,000 autumn passage). Two to three hundred white-fronted goose *Anser albifrons* visit during both spring and autumn migrations. Other birds include mallard *Anas platyrhynchos* (2,500 winter; 4,000 spring passage; 3,000 autumn passage), garganey *A. querquedula* (500-600 spring migrants, 800 autumn migrants), teal *A. crecca* (100-200 wintering birds, 800 spring and 1,000 autumn visitors), pintail *A. acuta* (40-50 spring passage), pochard *Agthya ferina* (1,500 spring visitors), tufted duck *A. fuligula* (50-70 spring migrants) and goldeneye *Bucephala clangula* (250 overwintering birds and 400 spring migrants).

Changes in Ecological Character There is a hunting regulation in force. However, this is not enough to prevent disturbance.

Management Practices The "old lake" is used as a fish pond and during summer it is a site for recreation.

Scientific Research and Facilities No information

Principal Reference Material The above information has been supplied by the Hungarian government.

Lake Fertő

Location 47°45'N, 16°45'E. Situated in the north-west of the country on the border with Austria and 12km due east of Sopron. The site consists of two areas: 1) the lake section adjoining the villages Sarröd, Fertőszéplak and Hegybö; 2) the region of lakes Herlakni, Oberlakni and the old bath in Balf.

Area 2,870ha

Degree of Protection The wetland was declared a landscape protection area (LPA) in 1975 (12,543ha), under Decree No. 19/1977 of OKTH (National Authority for Environment Protection and Nature Conservation), and approved as a biosphere reserve in May 1979. The Ramsar

site was added to the list on 17 March 1980. The LPA is linked to the Neusiedlersee region in Austria, which is also an LPA, biosphere reserve (25,000ha, January 1977) and Ramsar site (60,000ha, 1982).

Site Description Lake Fertő (Neusiedlersee) divided between Austria and Hungary is the largest salt lake in Europe. It is alkaline and mesotrophic with low transparency and an average depth of 1m. The Fertő region is very rich in plant species and contains characteristic Pannionion (2.12.05) salt plant communities. The two areas of the site are characterised by the open water surface of Lake Fertő, as well as by an aquatic-marsh zone containing *Phragmites communis*, various *Carex* species and submerged plants. Characteristic plant communities to be found in the water of Lake Fertő are as follows: Lemno-utricularietum, Myriophyllo-potametum, Parvipotameto-zannichellietum, Potamogetosum pectinati, Najadetum arinae, dominated by *Potamogeton pectinatus* var. *balatonicus* and *Najas marina*, respectively. Of special importance is the subtropical Mediterranean freshwater rush *Schoenoplectus litoralis*. Plant communities encircling the open water form a zone in the following order: Scirpo-Phragmitetum with stands of *Schoenoplectus lacustris*, *Typha angustifolia* and *T. latifolia*, *Bolboschoenetum maritima continentale*, *Magnocaricion elatae*, *Carisetum gracilis*, *C. acutiformis-ripariae* and *Concetum dictichae*. 36 species of fish are recorded in the lake, including *Misgurnis fossilis* and *Cobotostania taenia*, 35 species of crayfish, and 41 worms. Altitude is approximately 114m.

International and National Importance The avifauna of Lake Fertő is of great importance, including great white egret *Egretta alba*, purple heron *Ardea purpurea*, spoonbill *Platalea leucorodia*, 4-5000 white-fronted geese *A. albifrons*, 20,000 bean geese *A. fabalis*, greylag goose *Anser anser* breeding in colonies, 25-30,000 *Anas* and *Aythya* species gather here regularly in migration periods. Other avian fauna found within the landscape protection area are red-necked grebe *Podiceps grisegena*, bittern *Botaurus stellaris*, grey heron *Ardea cinerea*, glossy ibis *Plegadis falcinellus*, white stork *Ciconia ciconia*, shoveler *Anas clypeata*, mallard *A. platyrhynchos*, teal *A. crecca*, red-crested pochard *Netta rufina*, marsh harrier *Circus aeruginosus*, buzzard *Buteo buteo*, kestrel *Falco tinnunculus*, hobby *F. subbuteo*, avocet *Recurvirostra avosetta*, curlew *Numenius arquata*, black-tailed godwit *Limosa limosa*, redshank *Tringa totanus*, snipe *Gallinago gallinago*, black-headed gull *Larus ridibundus*, savi warbler *Locustella luscinioides* and great reed warbler *Acrocephalus arundinaceus*.

Changes in Ecological Character Problems include shooting of waterfowl (ducks and geese) in some protection areas.

Management Practices Reed-cutting, fishing and hunting are dominant activities.

Scientific Research and Facilities Research in the biosphere reserve is coordinated by the Fertő Region Committee of the Hungarian Academy of Sciences. Surveys have been conducted and further research is planned on water conservation, the management and protection of the flora and fauna, and tourism. There is active cross-border cooperation involving joint monitoring programmes. Monitoring activities are founded on measuring the changes that are taking place in the lake as a result of human action. There is a geophysical laboratory present.

Principal Reference Material The above information has been supplied by the Hungarian government, supplemented by:

Carp, E. (1980). *A Directory of Western Palaearctic Wetlands*. IUCN/UNEP. 506 pp.

Lake Balaton

Location 46°55'N, 17°54'E. Approximately 85km south-west of Budapest.

Area 59,800ha

Degree of Protection Around Lake Balaton five large landscape protection areas and six small nature conservation areas provide for the preservation of natural assets in an area of approximately 37,000 ha. Within the main environmental protection programme numerous local and national regulations facilitate the proper care of the lake waters. The site was added to the Ramsar list on 17 March 1989. The wetland is specially designated and only applies to the list on a temporary basis from 1 October to 30 April each year. The lake is state owned.

Site Description Lake Balaton, extending in a south-west and north-east orientation in the western part of Hungary, is the largest lake in central Europe. The present form was shaped during the last glacial period. It is 70km long with an average width of 6km, varying from 2.5 to 12km extreme values; its depth is an average 3m, with 11.5m maximums. Bordered by a wide *Phragmites* reed belt, the lake is fairly rich in aquatic vegetation. Water is primarily provided by the River Zala, while a small amount comes from streams. The lake is connected with the River Danube through the river and the Sio Canal. Lake Balaton is typical Pannonion with eutrophic waters and an abundant fish fauna of 41 species, of which 'fogas' (pike-perch or zander) *Stizostedion lucioperca* is one of the most notable.

International and National Importance The site is of major importance as a winter refuge for bean goose *Anser fabalis*. The sizes of *Anser* flocks, comprising 90% bean goose, range from 40 to 70,000; while those of *Anas* and *Aythya* species from 20 to 30,000; goldeneye *Bucephala clangula* from 8 to 10,000 and the number of coot *Fulica atra* is approximately 10,000. The lake is visited for feeding by waterfowl from Kisbalaton Reserve.

Changes in Ecological Character The lake is used for many recreational purposes, including sailing, water-skiing and fishing, and there are numerous camping grounds and hotels along its length. The developments have contributed to increasing eutrophication and disturbance to the birdlife.

Management Practices Balaton is a very popular resort, in summer and winter, with a well-developed tourist trade.

Scientific Research and Facilities There has been a centre for limnological research at Tíkány since the early 1800s, based on the Biological Research Institute. It is maintained by the Hungarian Academy of Sciences and the Institute of Hydrology.

Principal Reference Material The above information has been supplied by the Hungarian government, supplemented by:

Carp, E. (1980). *A Directory of Western Palaearctic Wetlands*. IUCN/UNEP. 506 pp.

Bodrozug

Location 48°11'N, 21°24'E. Situated approximately 190km from Budapest, between the towns of Tarcál and Tokaj.

Area 3,782ha

Degree of Protection The western area of Bodrozug is a part of the Tokaj-Bodrozug Landscape Protection Area (4,242ha), designated in 1985. The wetland was added to the Ramsar list on 17 March 1989.

Site Description The site is characterised by remnants of former vast open hardwood ash-elm *Fraxinus-Ulmus* areas, as well as of hornbeam-oak *Carpinus-Quercus* forests and with extended grazing lands and hay fields. There is a variety of wetlands, and the area is covered by mortlakes separated from rivers, river bed remnants and small ponds, often accompanied by open willow forests.

International and National Importance Among breeding bird species corncrake *Crex crex* (K*) are found in fairly large numbers (approximately 100 pairs). During the migration period the gathering of black storks *Ciconia nigra* regularly exceeds 500 and the number of crane *Grus grus* reaches 5,000 individuals in the area. The site is also important as a nesting place for geese and ducks, greylag goose *Anser anser*, white-fronted goose *A. albifrons*, and mallard *Anas platyrhynchos*, their total number ranging over 15,000.

Changes in Ecological Character No information

Management Practices Economic activities include forestry, fishing and grazing.

Scientific Research and Facilities No information

Principal Reference Material The above information has been supplied by the Hungarian government. Supplemented by:

Grimmett, R.F.A., and Jones, T.A. (1989). *Important bird areas in Europe*. ICBP, Cambridge, United Kingdom. 888 pp.

Iceland

Area 102,828 sq.km

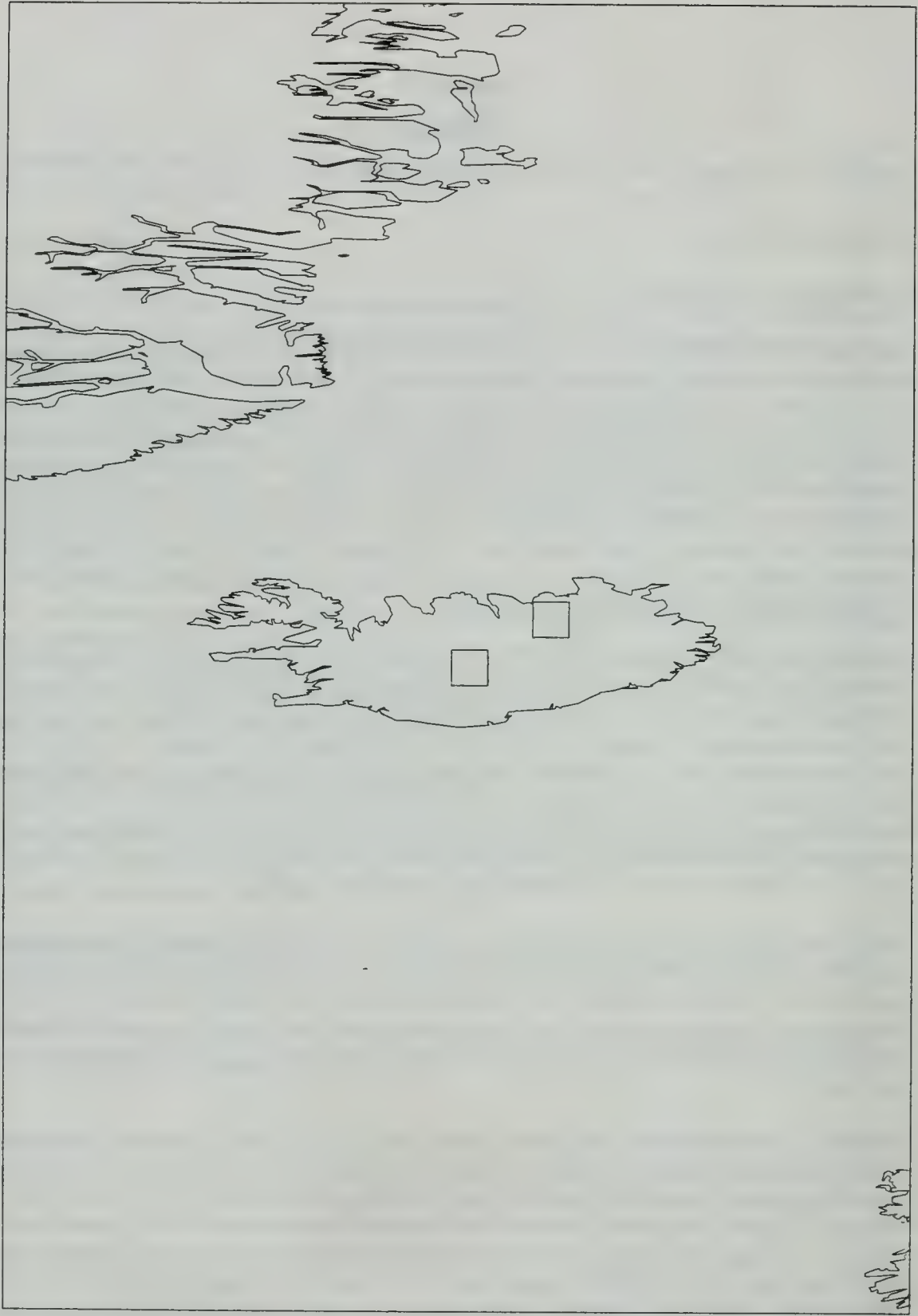
Population 247,357 (1987)

Summary of Wetland Situation The volcanic island of Iceland has a wide variety of wetlands, including extensive bogs, marshes and inland waters, as well as the shallows, and intertidal areas of an extremely indented coastline. These provide excellent habitats for waterfowl migrating from the Canadian Arctic and Greenland to Western Europe and *vice versa*, as well as wintering grounds for several species (sea ducks in particular). Further evidence of their international importance is the fact that in several Icelandic wetlands the numbers of breeding, feeding, moulting or resting waterfowl must reach the level of 50-100,000 individuals of a single species. Moreover, the freshwater lakes (which may be of glacial, volcanic or tectonic origin), are extremely diverse in their characteristics and hence offer the limnologist a wide field of study (which underlines their scientific importance).

Human interference with wetlands has so far been slight, but industrial and agricultural development and the accompanying road construction could affect several of them in the immediate future. At present only Thjorsarver is seriously threatened, in this case by flooding due to the construction of a dam for an hydro-electric power scheme. Thjorsarver, a wide river basin, is the nesting site for two-thirds of the world population of pink-footed goose, which only breeds in Iceland and Greenland. Research into all aspects of the unique Thjorsarver ecosystem has been in progress since 1970, with a view to reducing, and if possible compensating for, the effects of the proposed inundation. Concern is also felt about the future of the Olfusforir wetland, which is situated in the richest agricultural area, not far from Reykjavik.

Little in the way of legal protection has been extended to wetland sites. However, the outstanding waterfowl nesting area of Lake Myvatn and its effluent river, the Laxa, have been protected by law since 1974, and Svarfadardalur, also in northern Iceland, has been made into a reserve. This means that any changes in the landscape require the approval of the Nature Conservation Council and that hunting is forbidden. These measures were followed up by Iceland's accession to the Convention.

Protected Areas Legislation The Nature Conservation Act no. 47 of 1971 contains provisions for the establishment and management of protected natural areas. Each area is designated by separate regulations except for Myvatn and Laxa, which has been protected by a special act since 1974, and Thingvellir National Park which was established by legislation in 1928. Several other acts have an important bearing on nature conservation including the Act on Bird Hunting and Bird Preservation (No. 33/1966), Forestry (No. 3/1955) and Soil Conservation (No. 17/1969). The aim of the Nature Conservation Act is to ensure that nature and natural sites and processes can continue undisturbed and unpolluted, and the Nature Conservation Council maintains a list of sites of conservation interest.



Ramsar Sites in Iceland

Four types of protected area are defined in the legislation: natural monuments, nature reserves, national parks and recreation areas. Designation of protected areas is commonly by management agreement, but protection can be made compulsory or land expropriated. Care of the countryside as a whole is exercised through consultation in the planning process.

Protected Areas Administration Nature Conservation matters come under the Ministry of Environment (previously the Ministry of Culture and Education). The provisions of the Nature Conservation Act are carried out by the Nature Conservation Council, which is the central organisation for nature conservation. Special committees selected by Althingi, the legislative body, directs the matters of Thingvellir National Park and Myvatn-Laxa. No general guidelines exist for the management of the system of protected areas apart from the general provisions of the act. NCC is responsible for the planning of protected areas, and cooperates closely with local governments. It may also be directly or indirectly responsible for scientific research programmes connected with management problems. Many areas are traditionally used by farmers (though there may be some regulation of the intensity of use), and hunting and fishing may continue in some areas.

Sites designated under the Convention Accession on 2 December 1977 with 1 site listed at accession, and a second in March 1990.

Part of Myvatn-Laxa Region
Thjorsarver Nature Reserve

Government body responsible for administration of the Convention
Ministry of the Environment, Sgornarrad Islands, 101 Reykjavik

Part of Myvatn-Laxa Region

Location 65°40'N, 17°00'W. Situated in the north-east area of the highland interior of Iceland.

Area Approximately 20,000ha (within Myvatn-Laxa Conservation Area 440,000ha)

Degree of Protection Owned by private individuals and local and national governments. Administered by the Nature Conservation Council (Hverfisgata 26, 101 Reykjavik). The designated site is part of Myvatn-Laxa Conservation Area established on 2 May 1974 by a special act of parliament (No. 36/1974) issued on 9 March 1978. The whole area is protected by special law. Designated as a Ramsar site at the time of accession on 2 December 1977.

Site Description The designated site comprises the shallow eutrophic Myvatn Lake, its outflow river (Laxa) and numerous small lakes and ponds in the marshlands surrounding the lake. It is located in an active volcanic zone with frequent eruptions. The underlying geological formations are quite recent dating from the Ice Age and postglacial times. The uninhabited area is almost without soil or vegetation. Carpets of vegetation occur only in small oases associated with high ground-water levels. By springs and along streams garden angelica *Angelica archangelica* is common. The dominant plants in Lake Myvatn are blue-green alga *Anabaena flos-aquae*, *Fragilaria construens*, *Cladophora aegagropila*, slender-leaved pondweed *Pota-*

mogeton filiformis, spiked water milfoil *Myriophyllum spicatum* and three-leaved water crow-foot *Ranunculus trichophyllus*. Bogs and marshes occurring west and south of the lake are dominated by sedges *Carex chordorrhiza*, *C. lyngbyei* and *C. rostrata*. Birch *Betula pubescens* woodlands are conspicuous to the north and east. Common fauna are mink *Mustela vison* and long-tailed field mice *Apodemus sylvaticus*, but Arctic fox *Alopex lagopus* is now uncommon in the area and there is little fauna in the barren areas. Fish species include Arctic char *Salvelinus alpinus* (including local forms), three-spined stickleback *Gasterosteus aculeatus*, trout *Salmo trutta* and salmon *S. salar*. Lake Myvatn derives its name from the midges (Chironomids) and blackflies (Simuliids) swarming on the shores, which are an important food source for fish and birds. Important macroinvertebrates include *Daphnia longispina*, *Eurycercus lamellatus*, *Chironomus islandicus*, *Tanytarsus gracilentus*, *Simulium vittatum*, *Lymnaea pereger*, *Pisidium* spp, *Tubifex tubifex* and *Hydra* cf *attenuata*. Climate is fairly continental with short warm summers and cold winters. Much of the area is in the rain shadow of the Vatnajökull glacier, and it is the driest area in Iceland with annual precipitation under 400mm. Mean annual temperature 2.2°C. Mean temperature -4.2°C in February and 10.2°C in July.

International and National Importance Greater numbers of over 40 species of breeding birds occur at this site than elsewhere in Iceland, including 19 species of Anatidae, Barrow's goldeneye *Bucephala islandica* (only breeding site in Europe) and gadwall *Anas strepera* whilst common scoter *Melanitta nigra* rarely breed elsewhere in Iceland. Other waterfowl include tufted duck *Aythya fuligula*, scaup *A. marila*, wigeon *Anas penelope*, red-breasted merganser *Mergus serrator*, whooper swan *Cygnus cygnus*, red-necked phalarope *Phalaropus lobatus*, redshank *Tringa totanus*, snipe *Gallinago gallinago*, Slavonian grebe *Podiceps auritus* and harlequin *Histrionicus histrionicus*.

Changes in Ecological Character Large scale (presumably natural) changes have been shown to occur in the area during the active phase of the volcanic cycle. The area is thought to be presently subject to such a phase. There is some human pressure on the duck breeding areas, dredging of diatomite in Lake Myvatn and a geothermal power station nearby at Krafla.

Management Practices The Conservation Area has five seasonal rangers with three based at Myvatn and an allocation in December 1981 of £28,000. Normal farming practices are allowed in the area.

Scientific Research and Facilities The biology of Myvatn and Laxa has been studied extensively. Geological research has centered on Myvatn and the Krafla area. The NCC has a field station at Myvatn where extensive research is carried out (£20,000 of the budget was assigned to the field station in December 1981).

Principal Reference Material Above information is taken from the National Report of Iceland (1980) prepared for the Conference on the Conservation of Wetlands of International Importance especially as waterfowl habitat held at Cagliari, Italy in November 1980 and the documents submitted at the time of accession on 2 December 1977. Supplemented by:

Duffey, E. (1982). *National Parks and Reserves of Western Europe*. Macdonald and Co., London.

IUCN (1977). *World Directory of National Parks and other Protected Areas*. IUCN, Morges, Switzerland.

Jonasson, P.M. (1979). Lake Myvatn. *Oikos*, Suppl. 32

Thjorsarver Nature Reserve

Location 64°40'N, 18°40'W. Central Highlands, south of the Hofsjökull Glacier.

Area 37,500ha

Degree of Protection Declared a nature reserve in December 1982 under the Law on Nature Conservation. Designated as a Ramsar site in March 1990.

Site Description A tundra complex lying some 600m above sea level in the Central Highlands, containing rivers, lakes, ponds, and extensive marshy areas in the upper valley of the Thjorsa river. The reserve contains an exceptionally rich biota for the region, and more than 10,000ha are vegetated.

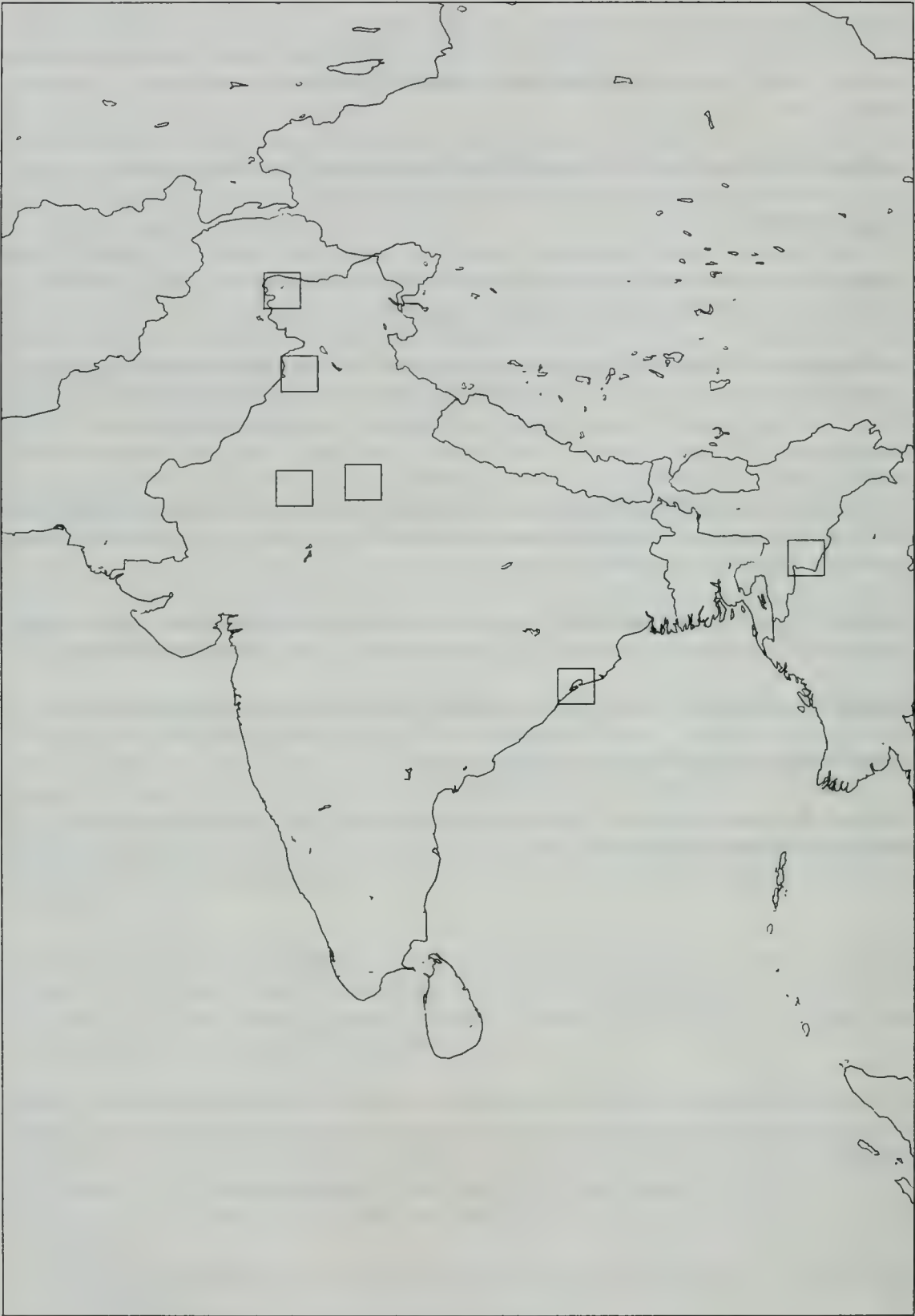
International and National Importance The reserve contains the main breeding site for pink-footed goose *Anser brachyrhynchus* (about 10,000 pairs), with over half of the Icelandic/Greenland breeding population nesting.

Changes in Ecological Character There is no use of the site currently (the region is largely uninhabited), although it was threatened by a hydroelectric power scheme in the 1970s.

Management Practices None. The area is difficult of access and seldom visited.

Scientific Research and Facilities No information

Principal Reference Material Above information taken from the material provided by the national authorities on designation.



Ramsar Sites in India

India

Area 3,287,593 sq.km

Population 683,810,051 (1981)

Summary of Wetland Situation As might be expected in a country the size of India there is a wide range of physiographic features. Rainfall also varies considerably. In parts of the western coast annual rainfall can exceed 5000mm, while other parts of the country may receive less than 200mm. Wetlands are therefore very varied, and in some areas numerous. Large amounts of water flow down from the Himalayan catchments, and in the Terai of the Himalayan foothills, some of the main wetlands are associated with the tributaries of the River Ganges. The wide variation in flow rate and volume of water can lead to large changes in the character of parts of the river bed, and consequently in the patterns and types of plants and animals along them. It is in rivers such as these that the endangered gharial *Gavialis gangeticus* is to be found. In addition, large areas of the Himalayan foothills used to be swamps and marshes. Pink-headed duck *Rhodonessa caryophyllacea* occurred in forest ponds and swamps in this region, but it is now thought to be extinct in India. In the peninsula, the flood plains of the Indo-Gangetic basin and alt flats of the Little Rann of Kutch are both important wetland regions, and the Chilka Lake on the east coast is the largest brackish lake in India, with an area of 1165 sq. km. India also has innumerable man-made lakes.

In Keoladeo (Bharatpur) National Park, the freshwater swamp of Keoladeo Ghana forms an abundant food supply for large numbers of resident water birds, including painted stork *Mycteria leucocephala*, three species of egret, open-bill stork *Anastomus oscitans*, white spoonbill *Platalea leucorodia*, white ibis *Eudocimus albus*, Indian pond heron *Ardeola grayii*, Indian darter *Anhinga melanogaster*, and large and small cormorants. Over a million migratory ducks, geese and waders can winter here. A particularly noteworthy visitor is Siberian crane *Grus leucogeranus*. Another important wetland area of India is the mangrove swamps of the Sundarbans, where the Ganges and Brahmaputra drain into the Bay of Bengal. Here the rivers divide into hundreds of streams and creeks, between which lie extensive tidal mudflats.

India contains important wintering grounds for the Caucasian and Siberian populations of a number of migratory birds, and an inventory of Indian wetlands, begun in the late 1960s by the Government of India, lists more than 400 sites. To update the available information, and to ascertain the present biological and ecological status of these wetlands, a working group was set up in 1983 to prepare a 'state of the ark' report.

Protected Areas Legislation Comprehensive central legislation, in the form of the Wildlife (Protection) Act, was enacted in 1972 to provide special legal protection to wildlife, and in particular to endangered fauna. The Act provides for the establishment of national parks, sanctuaries, game reserves and closed areas by state governments. It has been adopted by all States and Union Territories of the country apart from Jammu and Kashmir, and Nagaland.

Jammu and Kashmir has similar legislation while Nagaland is likely to adopt the Act. National parks and sanctuaries have in general been established to protect and manage populations of species and their habitats.

Protected Areas Administration The Indian Board for Wildlife is the main advisory body to the Government, and is chaired by the Prime Minister. At State level, State Wildlife Advisory Boards have been established under the 1972 Act. At central government level, the Department of Environment, Forests and Wildlife (established in September 1985) is responsible for environmental protection. Previously, forestry and wildlife had been the responsibility of a Joint Secretary within the Forestry Division of the Department of Agriculture and Cooperation. In response to central government proposals, a number of states have set up their own State Departments of the Environment. Within the forest department of other states, there is usually a wildlife wing under a Chief Wildlife Warden who is likely to be Deputy (or Additional) Chief Conservator of Forests. Divisional Forest Officers are often responsible for protected areas in their divisions, but important sanctuaries and national parks may be run by separate park and sanctuary superintendants.

Sites designated under the Convention Accession 1 October 1981 with 2 sites listed at accession

Chilka lake
Keoladeo National Park Bharatpur
Wular Lake
Harike Lake
Loktak Lake
Sambhar Lake

Government body responsible for administration of the Convention

Government of India, Department of Environment, Bikaner House, Shahjahan Road, 110011 New Delhi

Chilka Lake

Location 19°28'-19°54'N, 85°06'-85°35'E. Situated on the east coast in the State of Orissa.

Area 116,500ha

Degree of Protection State owned. Measures are being implemented to declare the area a sanctuary under the Wildlife (Protection) Act 1972. It already has sanctuary status under Orissa Forest (Shooting) Rules 1972. Designated as a Ramsar site on accession in October 1981.

Site Description Chilka is a shallow lake separated from the Bay of Bengal by a long sandy ridge not less than 200m wide. The lake is about 71km long and 3-32km wide, with an area in the dry season (December-June) of 89,100ha and in the rainy season (July-October) 116,500ha. The range in water depth is from 0.9-2.6m in the dry season to 1.8-3.7m in the rainy season. In the north, the Daya and Bhargavi rivers flow into the lake and, with some eight other rivers,

annually discharge about 375,000 cusecs of freshwater carrying some 13 million metric tonnes of silt into the lake. The lake is connected to the Bay of Bengal via a channel through the sand ridge in the north-east. These factors tend to dominate alternately the lake environment, resulting in extreme annual cyclic changes in salinity from 0.1 to 36.0 parts per 1,000. The northern and central sectors become almost fresh during the monsoon but in November-December the salinity starts rising to an April-June peak. The southern sector shows comparatively less fluctuation in salinity with a range of 9.5 parts per 1,000. The ranges of other parameters include: pH 6.8 to 9.7; and water temperature 17.5°C to 32.5°C. The lake vegetation varies with salinity. At high salinity it consists of species of the algae *Enteromorpha*, *Gracillaria*, *Spirogyra*, *Cladophora* and *Polysiphonia*. At low salinity it consists of naiad *Najas* sp., stoneworts *Chara* sp., *Nitella* sp. and *Hydrilla* sp. Pondweeds *Potamogeton* spp. are present throughout the year. On the sandy ridge and some islands the vegetation is plantation forest. The fauna includes 158 species of fish and crustaceans, blackbuck *Antelope cervicapra*, spotted deer *Axis axis*, feral cattle, striped hyena *Hyaena hyaena*, golden jackal *Canis aureus* and dolphin.

International and National Importance The site has a rich birdlife with over 150 recorded migratory and resident species. It has one of the largest concentrations of migratory waterfowl in India including large flocks of ducks (Anatinae), geese (Anserinae), flamingos *Phoenicopterus* sp., pelican *Pelecanus* sp., plover *Charadrius* sp., gulls *Larus* sp. and terns *Sterna* sp.

Changes in Ecological Character The area is threatened by pollution from domestic and industrial waste. The large number (400) of buffalos on Nalban Island is disturbing the avifauna.

Management Practices The lake supports a commercial fishery, involving some 12,250 fishermen. Nalban Island is the focal point for fishing activity. The emergent vegetation around the lake is cut for thatching.

Scientific Research and Facilities The Bombay Natural History Society has carried out some experimental bird ringing. The State Government of Orissa carries out research on salinity, temperature and turbidity of the lake and analyses fish catches.

Principal Reference Material The above information is taken from documents supplied by the Government of India for designation in 1981 and for the Groningen Meeting in May 1984. Additional information:

Directorate of Fisheries (1970). *The Chilka Lake*. Directorate of Fisheries, Government of Orissa, Cuttack.

Hussain, S.A., Mohapatra, K.K. and Ali, S. (1984). *Avifaunal profile of Chilka Lake: a case for conservation*. Technical Report No. 4. Bombay Natural History Society.

Keoladeo National Park

Location 27°07'-27°12'N, 77°29'-77°33'E. Situated in eastern Rajasthan, the park is 2km south-east of Bharatpur and 50km west of Agra.

Area 2,873ha

Degree of Protection State owned. The area was declared a national park on 10 March 1982, and accepted as a World Heritage Site in December 1985. Previously the private duck shooting preserve of the Maharaja of Bharatpur since the 1850s, the area was designated as a bird sanctuary on 13 March 1956 and a Ramsar site in October 1981. The last big shoot was held in 1964, but the Maharajah retained shooting rights until 1972.

Site Description The site comprises a freshwater swamp which is part of the Indogangetic Great Plains. For much of the year, however, the wetland area is only some 1,000ha. The area is flooded in the monsoon (July-September) to an average depth of 1-2m. From October to January the water level gradually falls, and from February the land begins to dry out. By June only some water remains. The environment is partly man-made with dykes dividing the area into 10 units, each with a system of sluice gates to control water level. It is unlikely that the site would support such numbers of waterfowl as it does without the addition of water from Ajan Bund, a man-made impoundment. Soils are predominantly alluvial - some clay has formed as a result of the periodic inundations. The mean annual precipitation is 662mm, with rain falling on an average of 36 days per year. The aquatic vegetation is rich and provides a valuable food source for waterfowl. Species include water lilies *Nymphaea nouchatia*, *N. stellata* and *N. cristata*, the true lotus *Nilumbium* sp., duckweeds *Lemna* sp. water fern *Azolla* sp., *Vallisneria* sp., *Hydrilla* sp., *Naja* sp., *Chara* sp., *Ipoma* sp., sedges *Cyperus* sp. and lesser reedmace *Typha angustata*. There is also wild rice. Other vegetation is characteristic of a semi arid zone dominated by babul *Acacia nilotica*, ber *Zizyphus mauritiana*, khejri *Prosopis cineraria*, *Salvadora oleoides*, *S. persica* and *Capparis aphylla*. The fauna includes: rhesus macaque *Macaca mulatta*, langur *Presbytis entellus*, small carnivores such as Bengal fox *Vulpes bengalensis*, jackal *Canis aureus*, striped hyena *Hyaena hyaena*, common palm civet *Paradoxurus hermaphroditus*, small Indian civet *Viverricula indica*, Indian grey mongoose *Herpestes edwardsi*, fishing cat *Felis viverrina*, leopard cat *F. bengalensis*, jungle cat *F. chaus* and smooth-coated otter *Lutra perspicillata*. Ungulates include blackbuck *Antelope cervicapra* (60), chital *Cervus axis* (350), sambar *C. unicolor*, hog deer *C. porcinus*, nilgai *Boselaphus tragocamelus* (480) and wild boar *Sus scrofa*. The figures in brackets refer to the number of animals counted in the 1980 census. Other mammals include Indian porcupine *Hystrix indica* and Indian hare *Lepus nigricollis*.

International and National Importance The site supports some 364 bird species and is considered to be one of the world's best and richest bird areas. It is the major wintering ground of the western population of the endangered Siberian crane *Grus leucogeranus*. A total of 41, including eight young, were recorded in December 1984, the highest number for many years (ICBP, 1985) but there were only 19 in 1988-89. Other species include gadwall *Anas strepera*, shoveler *A. clypeata*, common teal *A. crecca*, cotton teal *Nettapus coromandelianus*, tufted duck *Aythya fuligula*, comb duck *Sarkidiornis melanotos*, white spoonbill *Platalea leucorodia*, little cormorant *Phalacrocorax niger*, cormorant *P. carbo*, Indian shag *P. fuscicollis*, painted stork *Ibis leucocephalus*, Asian open-billed stork *Anastomus oscitans*, oriental ibis *Threskiornis melanocephalus*, ruff *Philomachus pugnax* (probably the most abundant wader), darter *Anhinga melanogaster*, spot-billed pelican *Pelecanus philippensis*, common sandpiper *Actitis hypoleucos*, wood sandpiper *Tringa glareola*, green sandpiper *T. ochropus* and Sarus crane *Grus antigone*. There are many birds of prey including osprey *Pandion haliaetus*, peregrine *Falco peregrinus*, Pallas' fish eagle *Haliaeetus leucoryphus*, short-toed eagle *Circetus gallicus*, tawny eagle *Aquila rapax*, imperial eagle *A. heliaca*, spotted eagle *A. clanga* and crested serpent eagle *Spilornis cheela*.

Changes in Ecological Character Leopard *Panthera pardus* has not been seen since its extermination from the area in 1964. Previous threats from fishing and cattle grazing have now been eliminated. The high level of pollutants in Arjan Bundh is believed to be responsible for the increasing number of piscivorous birds seen in a dazed state and unable to fly. Notably fewer birds were recorded in 1984 than in previous years. Disturbance from visitors can be cause for concern. The ban on grazing (November 1982) has caused local resentment, and aquatic plant growth is no longer kept in check. Also livestock dung provided nutrients and supported insects. The Ramsar Monitoring Procedure was applied in November 1988 because of concern that the lack of grazing was leading to weed infestation and loss of wetland.

Management Practices Water levels are regulated to benefit waterfowl. If the wetland is in danger of drying out completely there are arrangements to pump water from deep wells to ensure the survival of aquatic flora and fauna until the next monsoon. The boundaries are clearly delineated by a 32km long, 2m high stone wall, which totally encloses the park to prevent humans and domestic livestock from trespassing. Due to the dense human settlement surrounding the park, there is no possibility of creating a buffer zone. The road from Bharatpur town, which bisected the park, has been closed and relocated outside the boundaries. This has considerably reduced the level of disturbance by visitors from the town. Grazing and the collection of firewood and khus grass *Vetiveria zizanioides* were phased out in 1983. The absence of grazing, which is now believed to keep waterways open, is causing management problems as vegetation blocks up the channels. Remedial measures taken to control plant growth include manual removal of weeds and bulldozing. Burning and introduction of ungulates is under consideration.

Scientific Research and Facilities The Bombay Natural History Society has carried out bird ringing in the area for the past 20 years. Limnological studies are carried out by the Zoology Department of the University of Rajasthan, Jaipur. Monitoring of the population dynamics of birds has been undertaken by the park management. Under the Deputy Chief Wildlife Warden are a research officer, forester, three rangers, 20 wildlife guards, clerks and an accountant.

Principal Reference Material The above information is taken from documents supplied by the Government of India for designation in 1981 and for the Groningen Meeting in May 1984, and from Monitoring Procedure Report No. 7.

Additional information:

Abdulali, H. and Panday, J.D. (1978). Checklist of the birds of Delhi, Agra and Bharatpur. Unpublished report.

Ali, S. (1953). The Keoladeo Ghana of Bharatpur (Rajasthan). *Journal of the Bombay Natural History Society* 51: 531-536.

Ali, S. and Hussain, S.A. (1982). Studies on the movement and population structure of Indian avifauna. Annual Report II. Bombay Natural History Society, Bombay.

Breeden, S. and Breeden, B. (1982). The drought of 1979-1980 at the Keoladeo Ghana Sanctuary, Bharatpur, Rajasthan. *Journal of the Bombay Natural History Society* 79: 1-37.

Breeden, S. and Breeden, B. (1982-1983). A year at Bharatpur's Keoladeo National Park. *Hornbill* 1982 (3,4) and 1983 (1,2).

Grimwood, I.R. (1981). Impact of tourism on national parks in India. WWF-India. Unpublished report. Pp. 15-20.

ICBP (1985). *World Birdwatch* 7(1): 4.

Jackson, P. (1983). Crisis for birds and buffalos at Bharatpur. Unpublished report. 3 pp.

- Saxena, V.S. (1975).** *A study of the flora and fauna of Bharatpur Bird Sanctuary.* Department of Tourism, Jaipur, Rajasthan.
- Spillett, J.J. (1967).** A report on wild life surveys in North India and southern Nepal: the large mammals of the Keoladeo Ghana Sanctuary, Rajasthan. *Journal of the Bombay Natural History Society* 63: 602-607.

Wular Lake

Location 34°16'N, 74°33'E. Situated in Bandipur district of Jammu and Kashmir state.

Area 18,900ha

Degree of Protection The lake has been identified as one of the sites for conservation and management by the Ministry of Environment and Forests. The programme is being implemented by the State Steering Committee. Designated as a Ramsar site on 23 March 1990.

Site Description Wular is the largest freshwater wetland in India and is surrounded by high mountain ranges to the north-east. River Jhelum passes through the lake at Babyari and leaves it at Ningli. A number of wetlands, such as Malgam, Hygam and Nawgam, located on the fringes of the lake in the Baramula district of Kashmir, are important for sustaining a large population of both migratory and resident birds. The lake is covered by dense growth of macrophytes, particularly *Trapa natans*, which provides substantial revenue for the state government.

International and National Importance The wetland acts as a huge reservoir and absorbs the high flood waters of the River Jhelum. It is home to a number of migratory and resident birds. It is also a source of revenue for the state government in terms of licence fees and various lake products.

Changes in Ecological Character The conversion of a large proportion of the lake area for fuelwood plantations and paddy cultivation, compounded with the problem of siltation, has resulted in shrinkage of the wetland area. A decrease in biological diversity and loss of some important endemic and endangered species due to human pressures are quite apparent. Effluent brought in by the River Jhelum and from a large number of villages situated on the lake shore has resulted in deterioration of water quality.

Management Practices The state government has prepared an action plan for development of the catchment area and control of soil erosion. A comprehensive scheme for management of the lake on a sound ecological basis is also being developed.

Principal Reference Material The above information is taken from documentation provided by the Government of India at the time of designation.

Harike Lake

Location 31°13'N, 75°12'E. Situated in the districts of Kapurthala, Ferozepur and Amritsar in the state of Punjab.

Area 4,100ha

Degree of Protection The wetland has been identified as one of the sites for conservation under the Indian national wetland programme. The state government has prepared a management action plan for conservation of the wetland, funded by central government. The area has also been declared a wildlife sanctuary by the state government. Designated as a Ramsar site on 23 March 1990.

Site Description Harike Lake, formed by damming the Beas-Sutlej watershed, is the largest wetland system in Punjab. The lake attracts a large number of migratory birds. Because of heavy siltation due to denuded catchment area, the ponded area is gradually decreasing. The lake is heavily infested with water hyacinth. The main species of fish fauna present is hilsa.

International and National Importance Harike wetland is a source of water for irrigation and plays an important role in the economy of the state. During the winter, about 196 species of birds visit the lake, including migratory as well as resident. The livelihood of nearby villagers depends to some extent upon the lake's fish resources.

Changes in Ecological Character A major portion of the lake is infested with water hyacinth. The lake is also becoming contaminated with chemicals and insecticides used in the surrounding areas. Due to deforestation in the catchment area, the lake is becoming heavily silted and the ponded area is gradually decreasing.

Management Practices State government has prepared an action plan for conservation of the lake, funded by central government, which includes removal of water hyacinth and its use for generation of biogas, afforestation, water quality monitoring and protective measures.

Principal Reference Material The above information is taken from the documentation supplied by the Indian government at the time of designation.

Loktak Lake

Area 26,600ha

Degree of Protection The wetland has been identified as one of the sites for conservation under the Indian national wetland programme. The state government has also constituted Loktak Development Authority for development of the wetland area on a sound ecological basis. Designated as a Ramsar site on 23 March 1990.

Site Description Loktak Lake, the largest natural wetland in north-east India, is a large expanse of water west of the River Imphal. The catchment area is about 98,000ha. Run-off from the catchment drains into the lake mainly through seven streams which originate primarily in the northern and western flanks of the lake. Thick floating mats of weeds covered with soil, called 'phumids', are a characteristic feature of this lake. The main fish fauna present are minnows and minor carps. Keibul Lamjao National Park, habitat of the threatened brow antlered deer *Cervus eldi eldi* known locally as 'sangai', is located in the south-east area of the lake.

Changes in Ecological Character Due to deforestation in the catchment area and denudation of vegetation, the rate of soil erosion has increased considerably during recent years and has resulted in siltation of the lake. Severe infestation of the lake by water hyacinth, compounded with the problem of the 'phumids', interferes greatly with water circulation, resulting in increasing rate of siltation and deposit of pollutants in the lake ecosystem.

Management Practices A wetland management scheme, funded by central government, has been prepared by the state government. Furthermore, the North-eastern Council is keen to develop this wetland area.

Principal Reference Material The above information is taken from documentation supplied by the Government of India at the time of designation.

Sambhar Lake

Location 27°00'N, 75°00'E. Situated in the district of Jodhpur, Rajasthan.

Area 24,000ha

Degree of Protection The wetland has been identified as one of the sites for conservation under the Indian wetland programme and a detailed management plan for its conservation is being prepared. Designated as a Ramsar site on 23 March 1990.

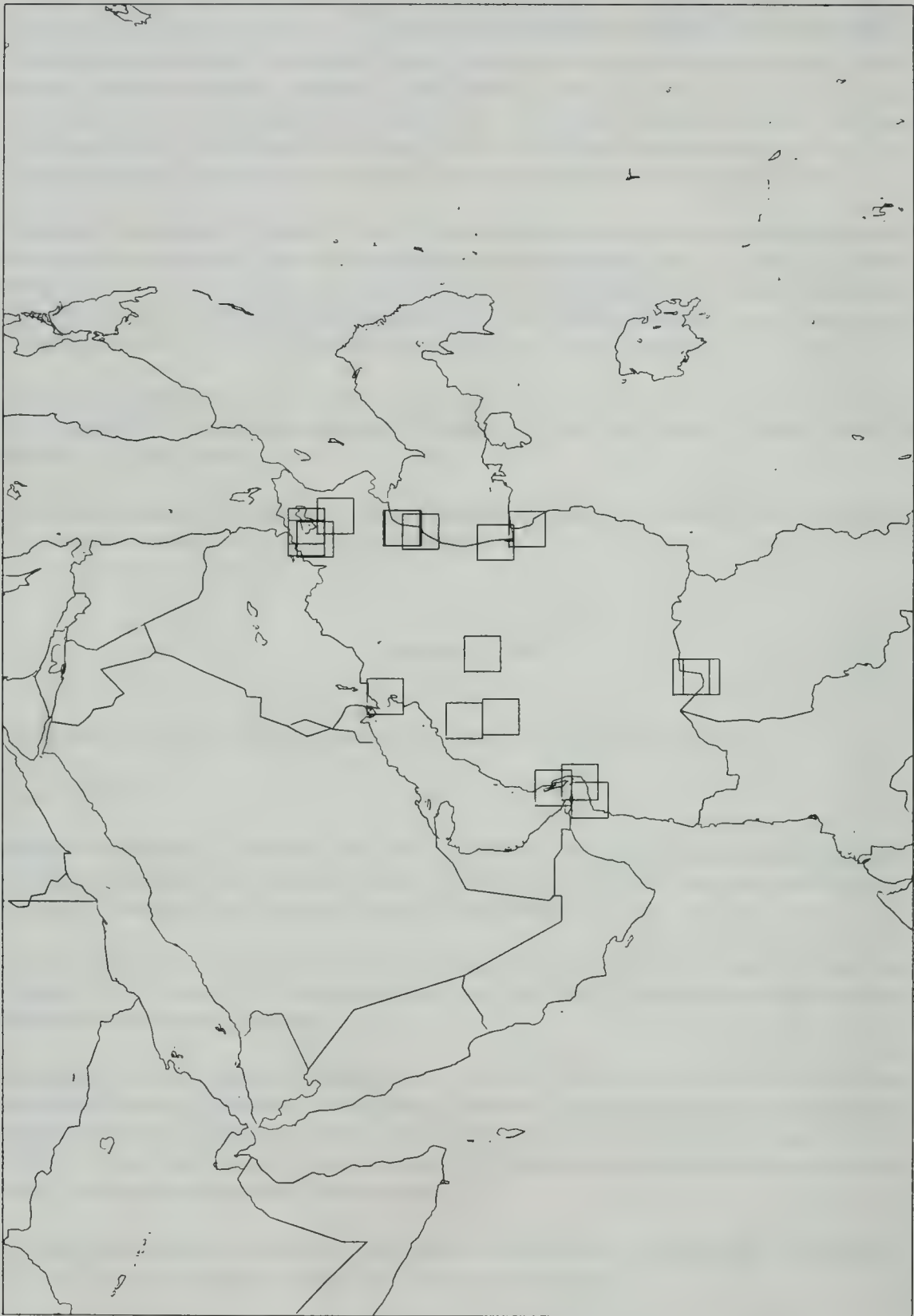
Site Description It is a shallow wetland, the depth ranging between 0.5m and 2m. Four main streams feed the lake from a drainage area of about 268,800ha. The vegetation present in the catchment area is mostly xerophytic.

International and National Importance Sambhar Lake is famous for harbouring large numbers of flamingos, second only to the Rann of Kutch. Waders congregate here in appreciable numbers, as well as migratory birds such as pochard, coot and other aquatic species. The terrestrial fauna confined to the catchment area includes rare/threatened species such as *Uromastix*, saw-scaled viper, desert cat and desert fox.

Changes in Ecological Character Siltation, soil salinisation and discharge of sewage from towns are some of the major problems confronting the wetland.

Management Practices A management scheme for the wetland ecosystem, funded by central government and other concerned agencies, is being prepared by the state government.

Principal Reference Material The above information was taken from documentation supplied by the Government of India at the time of designation.



Ramsar Sites in Iran

Iran

Area 1,648,184 sq.km

Population 53,920,000 (1988 estimate)

Summary of Wetland Situation Despite extensive rugged terrain and a climate of great extremes, Iran is one of the most important wintering areas for waterfowl from the eastern European part of the Soviet Union and from western Siberia. The interior plateau, with its vast semi-arid and arid areas, including the salt deserts and pans in Dasht-e-Kabir and Dasht-e-Lut, is surrounded on practically all sides by formidable mountain ranges. The Azarbaijan sector comprises high tablelands (with peaks rising to 4,500m) and lowland basins containing several lakes, of which the highly saline Oroomiyeh is the biggest.

Most of Iran has very low rainfall, the exceptions being the Caspian lowlands and Khuzestan in the south-west. In Khuzestan, rainfall during winter is abundant, and inundation of large areas of semi-arid country, and of the mudflats in the vicinity of the Gulf, can occur. The most important wintering areas for waterfowl border the Caspian, notably at Bandar-e-Anzali Mordab and the Bay of Gorgan, with the Miankaleh Peninsula which encloses it. In Azarbaijan wintering flocks of geese (mainly greylag and white-fronted) occur in the valley of the River Aras (Araxes) on the USSR Border. To the south, Lake Oroomiyeh and the salt swamps along the border offer open water in winter for wintering ducks and coots, whilst the lake is an important breeding area for greater flamingo and white pelican. Very high concentrations of waterfowl occur in Khuzestan, especially in the Shadegan marshes and their overflow after the winter rains, when large areas of semi-arid land and mudflats near the Gulf are inundated. Shadegan is little more than 100km east of Hawr Al Hammar in Iraq, where huge numbers of waterfowl spend the cold season, and considerable exchange of waterfowl between the two sites is likely. To the east there are several more areas of importance for breeding and wintering waterfowl, the most interesting being the Neyriz basin with lakes Bakhtegan and Tashk, and the marshland complex of Dasht-e-Arjan and Lake Parishan, which was declared an international reserve in 1971 on the occasion of the Ramsar Conference. In eastern Iran the wetlands of Seistan in the Helmand Basin on the Afghan border can be very important for waterfowl in years when the rains have been good. They comprise a mixture of fresh and brackish lakes and marshes, fed by overflow from four large rivers which rise in the Hindu Kush. Flood control in Afghanistan, and more particularly the construction of the Kajaki Dam on the Helmand River, have considerably affected the Seistan wetlands, but the Hamun-i-puzak offered excellent conditions for waterfowl in 1976.

Protected Areas Legislation A number of wildlife reserves were established as long ago as 1927, although more recently protection of wildlife areas commenced in 1956 with the creation of the Game Council of Iran, and its policy to set up hunting centres for the protection of endangered species and the control of hunting. In 1967, the Game and Fish department was established and certain areas declared for the protection of flora and fauna. In that year

legislation passed through parliament included the Law of Protection and Exploitation of Forest and Range (Khordad 1346/1967) and the Game and Fish law (Khordad 1346/1967). The latter was amended in March 1975 (Esfand 1353). The current law covering nature conservation, the Environmental Protection and Enhancement Act of 1974, supercedes all previous enabling legislation. Four categories of protected natural area can be established and protected under this law (any previously designated sites were reclassified). These designations are: National Parks (under the environment law of 1974 all wildlife parks automatically became national parks, although two sites were considered too small and were subsequently reclassified), Wildlife Refuges (renamed from wildlife reserves in legislation of 1974), Protected Areas (renamed from protected or restricted regions in legislation of 1974), and National Nature Monuments.

Protected Areas Administration The Game and Fish Department was established in 1967 (1346) and made responsible for wildlife, hunting, and fishing in the inland waters, as well as protection of the natural environment. With the environmental legislation of 1974 the department was absorbed into the Department of the Environment which had been established in March 1972 (Esfand 1350). After the Islamic Revolution the department became responsible for environmental preservation according to a new philosophy, policy aim and strategy, centred on the continued utilization of the environmental resources. The DoE is the only organisation undertaking long-term studies and management projects and is responsible for the conservation and enhancement of wildlife resources and the prevention of pollution. It also puts forward regulations on habitat management. The Department of the Environment has a long-term programme for the conservation of wilderness sites and wildlife, the cleaning of the Caspian sea and Iranian rivers and prevention of air pollution in Tehran and Isfahan. Some protected areas are controlled directly by local Department of the Environment personnel whilst others are controlled by local councils which include hunters and fishermen as well as department personnel.

Sites designated under the Convention Signature subject to ratification on 25 August 1972. Ratification on 23 June 1975. 18 sites listed at ratification.

Miankaleh Peninsula, Gorgan Bay and Lapoo-Zargmarz Ab-bandans
Lake Parishan and Dasht-e-Arjan
Lake Oroomiyeh (ex Lake Rezaiyeh)
Neiriz Lakes and Kamjan Marshes
Anzali (ex Pahlavi) Mordab Complex
Shadegan Marshes and tidal mud-flats of Khor-al Amaya and Khor Musa
Hamoun-e-Saberi
Lake Kobi
South end of Hamoun-e-Puzak
Shur Gol, Yadegarlu & Dorgeh Sangi Lakes
Bandar Kiashahr (ex Farahnaz) Lagoon and Mouth of Sefid Rud
Amirkelayeh Lake
Lake Gori
Alagol, Ulmagol and Ajigol Lakes
Khuran Straits (Bandar Abbas)
Deltas of Rud-e-Shur, Rud-e-Shirin and Rud-e-Minab
Deltas of Rud-e-Gaz and Rud-e-Hara
Gavkhouni Lake and marshes of the lower Zaindeh Rud

Government body responsible for administration of the Convention
Department of the Environment, PO Box 15875-5181, Teheran

Miankaleh Peninsula, Gorgan Bay, Lapoo-Zaghmarz Ab-bandans

Location 36°50'N, 53°17'E. Situated on the south-east shore of the Caspian Sea on the northern border of Iran in Mazandaran Province.

Area 40,000ha (designated as 100,000ha in 1975), given in Iranian report to Groningen Conference 1984.

Degree of Protection Government owned. Miankaleh Peninsula and Gorgan Bay (about 4,000ha) lie within Miankaleh Wildlife Refuge (81,180ha) which is part of Miankaleh Protected Region (97,200ha) established in 1970. The wildlife refuge is administered by the Department of the Environment. 68,800ha was approved as a Biosphere Reserve 1976. Lapoo-Zaghmarz Ab-bandans to the west are not included in any protected area. Designated as a Ramsar Site at the time of ratification 23 June 1975.

Site Description The designated site is 18-25m below sea level and comprises the open shallow saltwater (10-12%) of Gorgan Bay, the dunes of Miankaleh Peninsula which virtually cut the bay off from the Caspian Sea (there is a 12km wide channel in the east) and the mud flats and seasonal brackish marshes surrounding the bay, and Lapoo-Zaghmarz Ab-Bandans(reservoirs). The saltwater bay has a sand and mud bottom and is oligotrophic. The extensive marshes along the southern and eastern shore, which are flooded in autumn and winter, are eutrophic due to inflow from numerous freshwater streams, agricultural run-off and irrigation channels. The muddy-bottomed freshwater lakes and marshes are fed by irrigation, run-off and rainfall. Vegetation fringing the bay is predominantly glasswort *Salicornia* sp., sedges *Carex* spp. and rush *Juncus* sp. with some small reedbeds of *Phragmites communis* and *Tamarix* sp. There is a strip of vegetated sand dune along Miankaleh Peninsula, with some pomegranate *Punica* sp. scrub. Lapoo-Zagmarz Ab-bandans are characterised by extensive *Phragmites communis* reedbeds, with stands of reedmace *Typha* sp., willow *Salix* sp., *Ribes* sp., *Rubus* sp., pomegranate and abundant submerged vegetation. Grasses of the genera *Agropyron*, *Bromus*, *Dactylis*, *Cynodon* and *Festuca* are predominant on higher ground, with a shrub layer of hawthorn *Crataegus* sp., pomegranate, buckthorn *Rhamnus* sp. and *Rubus* sp. Cultivation bordering the bay in the south is predominantly wheat and cotton. There are several small villages along the southern and eastern edge of the bay linked by road and rail. The area has variable annual rainfall (200mm-1000mm), and a temperature range of -6° to 34°.

International and National Importance This coastal area is of great value as a wintering station for over a quarter of a million birds, including Dalmatian pelican *Pelecanus crispus*, greater flamingo *Phoenicopterus ruber*, greylag goose *Anser anser*, lesser white fronted goose *A. erythropus*, swans *Cygnus* spp., red-breasted merganser *Mergus serrator* and the rare white-headed duck *Oxyura leucocephala*. The number of breeding birds is greatest in years of high summer rainfall, and includes heron (Ardeidae), pratincole *Glareola pratincola* (large colonies), Kentish plover *Charadrius alexandrinus*, little tern *Sterna albifrons* and a large colony of whiskered tern *Chlidonias hybrida* beside the Lapoo-Zagmarz ponds.

Changes in Ecological Character Considerable areas are open to livestock grazing; the unprotected Lapoo-Zaghmarz Ab-bandans have been subjected to heavy hunting pressure; a nuclear power station is planned 10km to the west; and nearby irrigation schemes may reduce the flow of fresh water into the bay system. There is a fish processing factory at the village of Ashuradeh.

Management Practices The wildlife refuge is managed as a nature reserve. A major programme for wildlife management was outlined in 1974 but there is no recent information on its implementation. There is reed cutting and fishing by the local population in the protected area, and considerable areas are open to livestock grazing.

Scientific Research and Facilities SHILOT (Northern Fisheries Organisation) have carried out limnological and hydrobiological studies. The Environmental Research Centre of the Department of the Environment have studied bird migration and made regular wildfowl censuses.

Principal Reference Material The above information is taken from:

Mansoori, J. (1983). National Report on Iran's Wetlands of International Importance as Habitat for waterfowl for Groningen Conference, Netherlands in May 1984.

Supplemented by:

Biosphere Reserve nomination submitted to Unesco-MAB Secretariat (1976).

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

IUCN (1977). *World Directory of National Parks and other Protected Areas*. IUCN, Morges, Switzerland.

Lake Parishan and Dasht-e-Arjan

Location 29°30'N, 52°00'E. Situated on the south-west flank of the Zagros Mountains about 60km west of Shiraz and 15-25km south-east of Kazerun in the Province of Fars.

Area 6,600ha (Lake Parishan 4,200ha; Dasht-e-Arjan 2,400ha)

Degree of Protection Government owned. The protected area is administered by the Department of the Environment, Tehran. Both wetlands lie within Arjan National Park and International Reserve (65,750ha) established in March 1972 and approved as a biosphere reserve in June 1976. Designated as a Ramsar site at the time of ratification on 23 June 1975.

Site Description The two wetlands are not physically connected but were designated together as they are both in Arjan National Park. They are located in depressions in the Oligo-Miocene limestone formations of the Zagros Mountains. Lake Parishan is a large saline lake at 825m altitude with variable salinity and water level. In very wet years (such as 1971/72) the bay areas are almost fresh. The lake is oligotrophic and has a catchment area of some 29,000ha. It is fed by numerous springs, some temporary watercourses and rainfall but has no outflow channels. It is surrounded by eutrophic marshes with halophytic vegetation of the genera saltwort *Salsola*,

Kochia, *Camphorosma* and *Halocnemum* and extensive reedbeds of *Phragmites communis* and *Typha* sp. where the salinity is low. Dasht-e-Arjan is a shallow freshwater lake and marshland at 1,950m altitude surrounded by dry limestone mountains. It is eutrophic and fed by winter rainfall, snow melt, run-off, some small watercourses and the large springs at Chesmeh Salmon to the north-west. Because of the seasonality of the water supply and the outflow through swallow-holes in the south-east of this otherwise closed basin, the lake area varies considerably covering about 1,950ha in winter but only a few hundred hectares during the dry summer. The lake edge and fringing marshlands are covered by reedbeds of *Phragmites communis* and *Typha* sp., rushes *Juncus* spp. and aquatic vegetation. The surrounding flat lands are usually covered by terrestrial grasses or remain as bare baked mud, but in wet years sedges *Carex* sp. predominate. Mean annual rainfall is 400-500mm falling mainly in winter as snow and rain. Temperatures vary with altitude: Lake Parishan has a summer range of 22-40°C and winter range of 5-15°C; Dasht-e-Arjan has a summer range of 15-35°C and a more extreme winter range of -10 to 15°C.

International and National Importance The area is important as a resting station for large numbers of migrating wildfowl including a large concentration of greater flamingo *Phoenicopterus ruber*, pintail *Anas acuta*, mallard *A. platyrhynchos*, teal *A. crecca*, pochard *Aythya ferina*, coot *Fulica atra*, ruddy shelduck *Tadorna ferruginea*, white-headed duck *Oxyura leucocephala*, greylag goose *Anser anser*, crane *Grus grus*, pelicans *Pelecanus* spp. and grebes *Podiceps* spp. During wet years the area is an important breeding site for Dalmatian pelican *Pelecanus crispus*, marbled teal *Anas angustirostris*, ferruginous duck *Aythya nyroca*, coot *Fulica atra*, spoonbill *Platalea leucorodia*, glossy ibis *Plegadis falcinellus*, Baillon's crane *Porzana pusilla*, black-necked grebe *Podiceps nigricollis*, great crested grebe *P. cristatus* and little bittern *Ixobrychus minutus* with a large mixed heronry and tern (*Sternidae*) colony on Lake Parishan.

Changes in Ecological Character The area to the south and west of Lake Parishan is cultivated for wheat and there are several scattered settlements with gardens and orchards just outside the designated wetland areas but within the park. The area around the large village of Dasht-e-Arjan was grazed by cattle until recently. Hunting was prohibited in 1973 with national park status. Fishery ponds have been established in the west of Lake Parishan.

Management Practices The wetlands are managed as part of the national park with a staff of 44 in 1976. There is some controlled grazing, reed cutting and fishing in the wetlands.

Scientific Research and Facilities The Department of the Environment has studied the ecology of the area extensively and carried out a programme of annual bird censuses from 1969. The Biological Research Centre for the Southern Region of Iran is located in Shiraz.

Principal Reference Material The above information is taken from:

Mansoori, J. (December 1983). National Report on Iran's Wetlands of International Importance as habitat for waterfowl for Gröningen Conference, Netherlands in May 1984.

Supplemented by:

Biosphere Reserve nomination (1976).

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

IUCN (1977). *World Directory of National Parks and other Protected Areas*. IUCN, Morges, Switzerland.

Lake Oroomiyeh (ex-Rezaiyeh)

Location 37°00'-38°12'N, 44°40'-45°50'E. Situated about 70km southwest of Tabriz, Azarbaijan Province in north-west Iran.

Area 483,000ha (includes Oroomiyeh National Park 462,000ha)

Degree of Protection Government owned. The lake area is administered by the Department of the Environment. The designated area includes Oroomiyeh Lake National Park established in August 1967 (as Rezaiyeh Lake) and approved as a biosphere reserve in June 1976. Designated as a Ramsar site at the time of ratification on 23 June 1975.

Site Description The designated site comprises the shallow saline lake and islands (Oroomiyeh National Park) and the brackish marshlands on the north-east, north-west and south shores. The lake lies at 1,280m, and is the largest lake in Iran. It is fed by rainfall, run-off, streams, rivers, springs and seepage, with water level and salinity (8-28%) fluctuating seasonally. It supports an abundant growth of algae *Enteromorpha intestinalis*, with a rich algal bloom and increase in brine shrimp *Artemia salina* numbers in summer. The brackish marshes support typical salt marsh plant communities of rushes *Juncus* spp., reedbeds *Phragmites communis* and occasional stands of *Tamarix* sp. where the freshwater rivers and streams enter the lake. The 56 islands in the lake (largest: Kabudan) are now uninhabited but were formerly used for grazing livestock. Over 800 Armenian sheep *Ovis ammon gmelini* were recorded on Kabudan in 1976. Vegetation of the islands is characterised by steppe Artemisieta associations with remnant stands of pistachio trees *Pistacia atlantica*. There are rolling wheatlands to the west and south, semi-arid steppe and hills to the north and east, and small settlements around the lake shore. Mean annual precipitation of 400-600mm with hot summers and extremely cold winters (-17°C).

International and National Importance The site supports large breeding colonies of flamingo *Phoenicopterus ruber*, white pelican *Pelecanus onocrotalus*, shelduck *Tadorna tadorna*, ruddy shelduck *T. ferruginea*, spoonbill *Platalea leucorodia*, herring gull *Larus argentatus* and slender-billed gull *L. genei*. It is an important feeding station for large numbers of migrant and wintering birds including shelduck, mallard *Anas platyrhynchos*, teal *A. crecca*, pintail *A. acuta*, coot *Fulica atra*, flamingo, herons (Ardeidae), sandpipers (Charadriidae) and plovers. Kabudan Island supports the highest concentration of chukar *Alectoris chukar* (partridge) of any Iranian reserve.

Changes in Ecological Character There are several small villages on the lake shore, and a tug and lighter service transports cattle between five small 'ports'. Recreational use of the lake is poorly developed but could threaten the integrity of the site if any expansion is not carefully planned and controlled. There is some threat of pollution from the nearby towns of Tabriz and Oroomiyeh. According to the national report prepared for the Regina Conference, a number of waterfowl died in Garch Geshlagh Wetlands (south part of Oroomiyeh National Park) from 1985 onwards, after suffering diarrhoea and paralysis. The cause of death could not be identified.

Management Practices The wetland was managed as a nature reserve by 19 full time staff in 1976. The lake and 52 of the islands are included within the reserve, and constitute a sanctuary. Waterfowl nesting colonies are fully protected.

Scientific Research and Facilities Studies have been carried out on the pelican and flamingo populations. The Department of the Environment has carried out regular wildfowl counts.

Principal Reference Material The above information is taken from:

Department of the Environment (1987). Iran: National Report. Proceedings of the Ramsar Conference, Regina, Canada. May.

Mansoori, J. (1983). National Report on Iran's Wetlands of International Importance as habitats for waterfowl. Prepared for Groningen Conference, Netherlands in May 1984.

Supplemented by:

Biosphere Reserve nomination (1976).

Carp, E. (1980). *Directory of Western Palearctic Wetlands*. IUCN, Gland Switzerland. 506 pp.

Additional references:

Firouz, E. (1976). Environmental and Nature Conservation in Iran. *Environmental Conservation* 3(1): 33-42.

Firouz, E. and Harrington, F.A. (1976). Iran: Concepts of biotic community conservation. A paper presented at the international meeting on ecological guidelines for the use of natural resources in the Middle East and South West Asia. *IUCN Occasional Paper* No. 15. IUCN, Morges, Switzerland.

Savage, C.W.D. (1967). Lake Rezaieyeh: a specialised summer habitat for shelduck and flamingo. *The Wildfowl Trust 15th Annual Report 1962-63*: 108-113

Scott, D.A. (1975). Iran. In Kear, J. and Duplax-Hall, N. (Eds) *Flamingoes*. Pp. 18-32.

Neiriz Lakes (Tashk and Bakhtegan) and Kamjan Marshes

Location 29°40'N, 53°30'E. Situated about 125km east of Shiraz in the Bakhtegan basin, Fars Province in south-east Iran.

Area 108,000ha (lakes: 98,000ha and Kamjan Marshes: 10,000ha)

Degree of Protection Mainly government owned, with some private rice paddies in the Kamjan marshes area. The wetland is administered by the Department of the Environment. The lakes lie within the extensive Bakhtegan Protected Region (327,820ha) established in 1968. The marshlands lie on the north-west boundary of the protected region. Designated as a Ramsar site at time of ratification on 23 June 1975.

Site Description The lakes lie in Neiriz Basin in the Zagros Mountains at 1,550m, and the permanent Majan marshes lie in the Kor River valley upstream from where it enters the lakes. The two oligotrophic lakes are fed mainly by the Kor River and tributaries (which originate in the Zagros Mountains), supplemented by numerous springs such as Gomun Springs on the

south-east shore of Bakhtegan Lake. The eutrophic marshlands around the edges of the lakes vary from brackish to freshwater, resulting in a range of salinity in the lake waters. During very wet winters the two lakes, normally separated by a narrow strip of land, merge as the area floods (although degree of flooding varies considerably with rainfall). In the summer of 1971 the whole complex dried out except for a small lake at Gomun, while in the winters of 1971/72 and 1972/73 it was deeply flooded. Since the construction of the Dorvosan Dam on the Upper Kor River 95km north of Shiraz, the degree of flooding has been greatly reduced, with water being diverted for irrigation. The lake bottoms are covered by alluvial mud, sapropel, silt and some sand, deposited mainly by the river and floodwaters. They support a varied submerged vegetation, including numerous algae, stonewort *Chara* sp., pondweed *Ruppia* sp., *Althenia* sp., and are fringed by *Tamarix* sp., seablite *Suaeda* sp., *Cressa cretica*, reedbeds *Phragmites communis*, goosefoot (Chenopodiaceae) sedge *Carex* spp., and grasses. Most of the surrounding area consists of arid steppe hills and flats, with some cultivation along the Kor River valley. The lake islands support sparse steppe vegetation, with *Artemisia* and *Astragalus* species, and scattered almond *Prunus amygdalus* and Pistachio *Pistacia* trees. There are several small settlements in the area.

International and National Importance The site is an important breeding area for waterfowl, including shelduck *Tadorna tadorna* and *T. ferruginea*, marbled teal *Anas angustirostris*, Baillon's crake *Porzana pusilla*, black-winged stilt *Himantopus himantopus*, avocet *Recurvirostra avosetta*, white-tailed plover *Vanellus leucurus*, Kentish plover *Charadrius alexandrinus* and common tern *Sterna hirundo*. It is a resting station for large numbers of migrating and wintering birds including ducks (Anatidae), particularly pintail *Anas acuta* and marbled teal, ruddy shelduck *Tadorna ferruginea*, geese *Anser* spp., common crane *Grus grus* and greater flamingo *Pheonicopterus ruber*.

Changes in Ecological Character A dam constructed on the Kor River to supply irrigation waters to local agriculture affects the hydrological regime of the lake, with increased seasonal variation in the water level. In dry years the permanent marshlands can dry out considerably, affecting bird breeding populations. Some pollution enters the lakes via the river, and controls have been recommended (Carp, 1980). There is some light grazing pressure on the lake margins. Grazing and hunting continues in the marshlands and lower Kor River floodplain. The Iranian report to the Regina Conference 1987 indicates that Kamjan Marshes have been deleted from the List because of successive droughts and urgent national interest and requirement; it notes that Cheghakhur and Gandoman will supercede Kamjan. However, no formal notification has reached the Bureau. Because of this situation, Kamjan is listed in Regina document C.3.6 as one of the 29 Ramsar sites where the likelihood of major ecological change seems greatest.

Management Practices The wetland is protected as a nature reserve, and in 1975 was managed by 25 staff attached to Bakhtegan Protected Region.

Scientific Research and Facilities The Department of the Environment has conducted several studies and wildfowl counts in the area. The Biological Research Centre for the Southern Region of Iran is located in Shiraz. A limnological study of the lakes was carried out in the late 1950s as part of the International Biological Programme.

Principal Reference Material The above information is taken from:
Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland Switzerland.

- Department of the Environment (1987).** Iran: National Report. Proceedings of the Ramsar Conference, Regina, Canada. May.
- IUCN (1977).** *World Directory of National Parks and other Protected Areas*. IUCN, Morges, Switzerland.
- Mansoori, J. (1983).** National Report on Iran's Wetlands of International Importance as habitat for waterfowl. Prepared for Groningen Conference, Netherlands in May 1984.

Additional references:

- Löffler, H. (1967).** The hydrobiology of Lake Niriz, Iran. *Proceedings of a Technical Meeting on Wetland Conservation*. IUCN Publ. New Series No. 12. IUCN, Morges, Switzerland. Pp. 141-151.

Anzali Mordab Complex

Location 37°23'-37°37'N, 49°15'-49°35'E. Situated on the south-west shore of the Caspian Sea north-east of Rasht and adjacent to Bandar-e-Anzali township on the northern boundary in Gilan Province, northern Iran.

Area 15,000ha (including Anzali Mordab 10,990ha, Siahkesheem Marsh 3,650ha and Selke Ab-bandans 360ha).

Degree of Protection Mainly government owned, with some private ab-bandan (reservoirs). The wetland is administered by a council under the supervision of the Department of the Environment. Anzali (formerly Pahlavi) Mordab is not protected although Siahkesheem has been protected as a wildlife sanctuary since August 1967, and Selke since 1970. However, in 1978-83 the areas could not be effectively protected. Designated as a Ramsar Site at the time of ratification on 23 June 1975.

Site Description The designated area comprises the Anzali Mordab coastal lagoon, the associated Siahkesheem marshlands and the semi-natural flood plain and marshes of the Selke Ab-bandans (reservoirs). Anzali Mordab is a large shallow eutrophic freshwater lagoon fed by several rivers and streams (including tributaries of the Safi River) and rainfall run-off from the high ground around Rasht. It is separated from the Caspian Sea by an established dune system with only a narrow drainage channel flowing into the sea just east of Bandar-e-Anzali. Moderate seasonal fluctuations in water level (autumn/winter) sometimes result in flooding of the Siahkesheem marshes and nearby pastures. The abundant floating and submerged vegetation includes species of duckweed *Lemna*, pondweeds *Potamogeton*, *Elodea*, milfoil *Myriophyllum*, hornwort *Ceratophyllum* and arrowhead *Sagittaria*. The lake is fringed by reedbeds of *Phragmites communis* and *Typhas* spp., with rushes *Scirpus* spp. and *Cyperus* spp., willow and alder (*Salix* spp., *Alnus* spp.) on drier ground. The adjacent Siahkesheem eutrophic freshwater marshlands are fed by numerous rivers (including the Hohambar, Chakoor, Siahdarveshan and Nargestan), irrigation channels and rainfall. It drains into the lagoon to the north-west, and is periodically flooded when rainfall is heavy. The marshland vegetation is similar to that of the lagoon, with species of *Ceratophyllum*, *Alnus* and *Scirpus* absent but with species of water chestnut *Trapa natans*, sedges *Carex* and rushes *Juncus*. The Selke Ab-bandans comprise a semi-natural floodplain and eutrophic marsh with dykes constructed along the northern edge for water storage.

They have a flooded herbaceous vegetation, with algal growth during summer, some reedbeds *Phragmites communis* in the north and stands of rushes *Juncus* spp. and damp grassland in the south. The wetland is surrounded by cultivated land (rice), sand dunes, numerous small reservoirs and patches of forest to the south. Several small settlements border the area, and the town of Bandar-e-Anzali is on the northern shore of the lagoon. Mean annual rainfall is 1,000-2,000mm and temperature range -11° to 30°C.

International and National Importance The wetlands are an important feeding and resting station for breeding, migrant and wintering birds. Most breeding species nest by the lagoon or in the Siahkesheem marshes, and these include great crested grebe *Podiceps cristatus*, black-necked grebe *P. nigricollis*, purple gallinule *Porphyrio porphyrio*, herons (Ardeidae), rail (Rallidae), pygmy cormorant *Phalacrocorax pygmaeus* and a large colony of whiskered tern *Chlidonias hybrida*. Apart from coot *Fulica atra*, few duck (Anatidae) breed in the wetland, but in winter it is a very important refuge for surface-feeding and diving ducks, swans *Cygnus* spp., herons and coot. Many herons, ducks and grebes pass through the wetlands on migration. Selke Ab-bandans are of particular importance as a feeding and roosting area for birds from the more disturbed Anzali Mordab lagoon.

Changes in Ecological Character The lagoon area is heavily disturbed with commercial fishing, hunting of wildfowl, livestock grazing, reed cutting along the edges, and considerable boat traffic (centred round Bandar-e-Anzali). The gradual decline in the water level in the Caspian Sea will undoubtedly affect the wetland habitat in the long term. Reedbeds of *Phragmites communis* are spreading into open water areas.

Management Practices Hunting of wildfowl is prohibited on the Selke Ab-bandans, which are also managed as water storage reservoirs. Reed cutting and grazing are allowed on the Siahkesheem marshes.

Scientific Research and Facilities Numerous limnological and hydrological studies have been conducted by SHILOT (Northern Fisheries Organisation). The Department of the Environment have carried out wildfowl surveys.

Principal Reference Material The above information is taken from:

Mansoori, J. (1983). National Report on Iran's Wetlands of International Importance as habitat for waterfowl. Prepared for Groningen Conference, Netherlands in May 1984.

Supplemented by:

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland Switzerland. 506 pp.

IUCN (1977). *World Directory of National Parks and other Protected Areas*. IUCN, Morges, Switzerland.

Additional reference:

Ferguson, D.A. (1972). Waterfowl wintering, resting and breeding areas of the south west Caspian lowlands. *Wildfowl* 23: 5-24.

Shadegan Marshes and tidal mud-flats of Khor-al Amaya and Khor Musa

Location 30°30'N, 48°45'E. Situated about 45km north and north-east of Abadan in Khuzestan Province at the southern frontier with Iraq on the Gulf.

Area 190,000ha (designated as 400,000ha), area given as 190,000ha in Iranian report to Groningen Conference 1984.)

Degree of Protection Government owned except for about 1,000ha of private rice paddies. Administered by the Department of the Environment. The designated site lies in Shadegan Wildlife Refuge established in 1973. Hunting is prohibited. Designated as a Ramsar site at the time of ratification on 23 June 1975.

Site Description The designated site is part of the largest lowland expanse in Iran (3,800,000ha), and comprises the alluvial delta plain of the Karun and five other rivers which drain the extensive (11,500,000ha) catchment area at the north-west end of the Zagros mountain range. The better drained inland areas in the north support fresh/brackish sedge marshes, giving way to saltmarsh vegetation with glasswort *Salicornia* in the central floodplain, and barren tidal mudflats, creeks, sandbars and a low muddy island in the coastal region. The wetland is bordered on the east, north and north-west by barren dried-out saline flats, with the more fertile rice paddies, date palm groves, and associated settlements in the north-east. The delta region is fed by overflow channels from the River Karun, seepage, irrigation canals, and to a lesser extent by local rainfall and runoff. The water level is highest following spring floods but drains into the Gulf, and the sedge marshes in the north mostly dry out in summer. The road between Abadan on the eastern boundary and Bandar-e-Shahpur on the west passes through the northern sector of the wetland, and the Abadan-Ahwaz road runs along the north-north-east boundary. The climate is hot, with mean January temperature over 7°C, and mean July temperature over 45°C. Mean annual rainfall 146mm, with 92% falling between November and April.

International and National Importance The marshes are an important wintering and breeding area for a large number of waterfowl, with some 125 recorded species. During migration it is of particular importance to duck species, including a large proportion of the declining world population of marbled teal *Anas angustirostris* and also greylag goose *Anser anser*, herons (Ardeidae), sandpipers (Scolopacidae), gulls (Laridae), and large flocks of greater flamingo *Phoenicopterus ruber*. Breeding species include marbled teal, ferruginous duck *Aythya nyroca*, purple heron *Ardea purpurea*, slender-billed gull *Larus genei*, terns (Sterninae) and possibly sacred ibis *Threskiornis aethiopicus*. There is a large non-breeding population (several thousand) of Dalmatian pelican *Pelecanus crispus*.

Changes in Ecological Character The wetland is situated in a currently sensitive military zone between Iran and Iraq. The Iranian report to the Regina Conference 1987 indicates that wetlands in the border areas have been severely polluted by chemical agents, and that Shadegan Marshes and tidal mud-flats of Khor-al Amaya and Khor Musa have been damaged more than other areas by Iraqi chemical bombardments. The irrigation scheme developed in the north on the Karun River has reduced the inflow of fresh water. Part of the designated site is cultivated

in privately owned rice paddies. Some of the area has been degraded to sterile silt flats by natural salinity and soil deterioration, resulting from poorly managed irrigation schemes.

Management Practices The wetland is still used for traditional reed cutting, grazing and fishing.

Scientific Research and Facilities The Department of the Environment has conducted waterfowl surveys in the wetland.

Principal Reference Material The above information is taken from:

Mansoori, J. (1983). National Report on Iran's Wetlands of International Importance as habitat for waterfowl. Prepared for Groningen Conference, Netherlands in May 1984.

Department of the Environment (1987). Iran: National Report. Proceedings of the Ramsar Conference, Regina, Canada. May.

Supplemented by:

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

IUCN (1977). *World Directory of National Parks and other Protected Areas*. IUCN, Morges, Switzerland.

Additional references:

Firouz, E. (1971). *The Wetlands and Waterfowl of Iran*. Game and Fish Department of Iran, Tehran.

Firouz, E. (1974). *Environment Iran*. The National Society for the Conservation of Natural Resources and Human Environment, Tehran.

Scott, D.A. and Carp, E. (1971). A survey in Khuzestan, Iran. *Proc. Internat. Conf. on the Conservation of Wetlands and Waterfowl, Ramsar, Iran*. Pp. 291-298. IWRB, Slimbridge, England.

Hamoun-e-Saberi

Location 31°20'N, 61°20'E. Situated on the eastern frontier with Afghanistan, 35km north-west of Zabol in Seistan Province.

Area 50,000ha. Contiguous to the south end of Hamoun-e-Puzak Ramsar site (10,000ha) on the eastern boundary.

Degree of Protection Government owned, and administered by the Department of the Environment. 37,000ha of the designated site lies in Hamoun Wildlife Refuge (180,000ha) which is in Hamoun Protected Region (329,000ha) established in 1967. Hunting is prohibited. Designated as a Ramsar site at the time of ratification on 23 June 1975.

Site Description The designated site is in the sparsely-populated Hamoun River basin (Seistan lowlands), and comprises the southern portion of Saberi Lake (Hamoun-e-Helmand) to the south, and Hamoun-e-Saberi and Baring Dakegaz marshes extending southwards from Saberi Lake.

The shallow (average depth 0.5m) fresh to brackish lake has a bottom of alluvial silt, and is fed mainly by the Harut and Helmand rivers, with low input from local runoff. Drainage is essentially closed, but if the water level is exceptionally high, any overspill flows into Helmand River effectively reversing the flow temporarily. The marshland is predominantly eutrophic, with extensive reedbeds of *Phragmites communis* and *Typha* spp., sedges *Carex* spp. and *Tamarix* spp. In years of prolonged flooding (such as 1972, 1982 and 1986), an abundant submerged vegetation develops on the floodplains. Halophytic vegetation fringes the wetland, and includes *Halocnemum strobilaceum*, sea lavender *Limonium carnosum*, glasswort *Salsola* spp. and the orache *Atriplex verruciferum*. The surrounding area is arid, with very few settlements and limited irrigated cultivation to the south and east. The climate is hot with mean January temperature of 15-20°C and mean July temperature 35-40°C. Low mean annual rainfall of 100mm, falling mainly in winter.

International and National Importance The site supports a large number of breeding birds during wet years. Large concentrations of migrating and wintering birds include greylag goose *Anser anser*, mallard *Anas platyrhynchos*, teal *Anas crecca*, red-crested pochard *Netta rufina*, shoveler *Anas clypeata*, common pochard *Aythya ferina*, coot *Fulica atra*, white-headed duck *Oxyura leucocephala*, crane *Grus grus*, Dalmatian pelican *Pelecanus crispus* and white pelican *P. onocrotalus*.

Changes in Ecological Character Irrigation schemes on the Helmand River (in Iran and Afghanistan) have reduced the water supply to the lake and marshes, and hence reduced the degree of flooding. The Iranian report to the Regina Conference 1987 notes that Afghanistan has built two dams and is constructing a third without taking environmental considerations into account. Lake Hamoun is therefore listed in Regina document C.3.6 as one of the 29 Ramsar sites where the likelihood of major ecological change seems greatest. The wetland now floods only in wet years, drying out completely in drought years.

Management Practices Sparsely populated region with little grazing and traditional reed cutting.

Scientific Research and Facilities The Department of the Environment has carried out waterfowl counts and other studies in the wetland.

Principal Reference Material The above information is taken from:

Mansoori, J. (1983). National Report on Iran's Wetlands of International Importance as habitat for waterfowl. Prepared for Groningen Conference, Netherlands in May 1984.

Department of the Environment (1987). Iran: National Report. Proceedings of the Ramsar Conference, Regina, Canada. May.

Supplemented by:

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

IUCN (1977). *World Directory of National Parks and other Protected Areas*. IUCN, Morges Switzerland.

Additional references:

Firouz, E. (1971). *The Wetlands and Waterfowl of Iran*. Game and Fish Department of Iran, Tehran.

- Firouz, E. (1974).** *Environment Iran*. The National Society for the Conservation of Natural Resources and Human Environment, Tehran.
- Scott, D.A. and Carp, E. (1971).** A survey in Khuzestan, Iran. *Proc. Internat. Conf. on the Conservation of Wetlands and Waterfowl, Ramsar, Iran*. Pp. 291-298. IWRB, Slimbridge, England.

Lake Kobi

Location 36°57'N, 45°52'E. Situated about 75km south-east of Oroomiyeh Lake between the towns of Mahabad and Miandowab in Azarbaijan Province, northern Iran.

Area 1,200ha

Degree of Protection Government owned, and administered by the Department of the Environment. The area is unprotected, however, and due to continuing political unrest in this region, the future of the lake as a conservation area is uncertain. Designated as a Ramsar Site at the time of ratification on 23 June 1975.

Site Description The designated site comprises freshwater Kobi Lake and associated but disjunct marshlands. The shallow (maximum depth 1.5m) muddy-bottomed lake lies at 1,240m, and is supplied from rainfall, runoff, several springs, seepages and temporary water courses fed by snow-melt. It has no outlet channels, and when full the lake overflows flooding the marshlands to the north. The lake is eutrophic and supports an abundant submerged vegetation. Sedge (Cyperaceae) marshlands are extensive with grasslands and reedbeds of *Phragmites communis* south of the lake and in the marshes to the north-west. The wetland is surrounded by rolling hilly steppe, with scattered settlements and cultivation to the north and south. The climate is cold, and the lake regularly freezes over in winter.

International and National Importance The site is of major importance as a feeding station during migration for a large number of dabbling *Anas* and diving *Aythya* duck species and coot *Fulica atra*. Waterfowl breeding in the area include night heron *Nycticorax nycticorax*, glossy ibis *Plegadis falcinellus*, ferruginous duck *Aythya nyroca*, white-headed duck *Oxyura leucocephala*, coot, avocet *Recurvirostra avosetta*, collared pratincole *Glareola pratincola* and common tern *Sterna hirundo*.

Changes in Ecological Character The site is in a politically sensitive zone, and its future as a conservation area is uncertain. There is some grazing and hunting of wildfowl but the wetland is thought to be generally undisturbed (Carp, 1980).

Management Practices Some grazing and hunting

Scientific Research and Facilities Some wildfowl counts

Principal Reference Material The above information is taken from:

Mansoori, J. (1983). National Report on Iran's Wetlands of International Importance as habitat for waterfowl. Prepared for Groningen Conference, Netherlands in May 1984.

Supplemented by:

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

IUCN (1977). *World Directory of National Parks and other Protected Areas*. IUCN, Morges, Switzerland.

South End of Hamoun-E-Puzak

Location 31°20'N, 61°45'E. Situated 40km northeast of Zabol in the vicinity of the villages of Takht-e-Shah, Manmoodi and Shangali, Seistan Province. On the eastern frontier with Afghanistan.

Area 10,000ha. Contiguous to Hamoun-e-Saberi Ramsar site (50,000ha).

Degree of Protection Government owned, and administered by the Department of the Environment. The site contains the 180,000ha Wildlife Refuge of Hamoun Protected Region (329,000ha), established in 1967. Designated as a Ramsar site at the time of ratification on 23 June 1975.

Site Description The designated site comprises only the southern tip of the extensive Hamoun-e-Puzak system, the major part of which is located in neighbouring Afghanistan. It comprises freshwater brackish lagoons and marshes, dependent for water supply on the Helmand, Kash and Khuspas rivers, and on the water level in the Afghan portion of Hamoun-e-Puzak. Although it is the most permanent marshland area in the Iranian Seistan lowlands, it dries out during drought years. There is no overflow except in very wet years, when flooding usually occurs in late winter and spring. Vegetation includes extensive reedbeds of *Phragmites communis* and *Typha* spp. fringing the lagoons, sedges (Cyperaceae) and *Tamarix* spp. During prolonged periods of flooding an abundant submerged vegetation develops. The climate is hot, with mean January temperature 15-20°C, and mean July temperature 35-40°C. Low mean annual rainfall of 100mm falling mainly in winter.

International and National Importance The wetland is an important nesting area for waterfowl in wet years, and is used as a resting station by many migrating species including feeding ducks and waders (Limicolae). Large numbers of *Anas* spp., herons (Ardeidae) and coot *Fulica atra* overwinter in the area.

Changes in Ecological Character Irrigation schemes along the Helmand River in Afghanistan threaten the marshlands in years of low rainfall, as they divert floodwaters away from the wetland. Like Hamoun-e-Saberi (q.v.), Hamoun-e-Puzak is affected by dams in Afghanistan, and is included in the 29 Ramsar sites where likelihood of ecological change seems greatest. Some illegal hunting has been reported (1980). Traditional reed cutting, fishing and some grazing continue.

Management Practices No information

Scientific Research and Facilities The Department of the Environment have carried out wildfowl counts and several special studies in the wetland.

Principal Reference Material The above information is taken from:

Department of the Environment (1987). Iran: National Report. Proceedings of the Ramsar Conference, Regina, Canada. May.

Mansoori, J. (1983). National Report on Iran's Wetlands of International Importance as habitat for waterfowl. Prepared for Groningen Conference, Netherlands in May 1984.

Supplemented by:

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

IUCN (1977). *World Directory of National Parks and other Protected Areas*. IUCN, Morges, Switzerland.

Additional references:

Firouz, E. (1971). *The Wetlands and Waterfowl of Iran*. Game and Fish Department of Iran, Tehran.

Firouz, E., Hassinger, J.D., and Ferguson, D.A. (1970). The Wildlife Parks and Protected Regions of Iran. *Biol. Conservation* 3(1): 37-45.

Shur Gol, Yadegarlu and Dorgeh Sangi Lakes

Location 37°00'N, 45°26'-35'E. Situated north-west/west of Lake Kobi Ramsar Site in the plains south of Lake Oroomiyeh, and about 35km north-west of Mahabad in Azarbaijan Province, north-west Iran.

Area 2,500ha (Shur Gol 2,000ha, Yadegarlu 350ha and Dorgeh Sangi 150ha)

Degree of Protection Government owned, and administered by the Department of the Environment. The site is unprotected, and due to continuing political unrest in the region, its future as a conservation area is uncertain. Designated as a Ramsar site at the time of ratification on 23 June 1975.

Site Description The designated site comprises the three lakes and their associated marshlands. The shallow silt-bottomed Shur Gol is surrounded by Hassanlu Marshes. The water is brackish to saline, and is fed by rainfall, runoff from surrounding high grounds, springs, seepages and several small streams. The marsh usually floods during autumn and winter, and due to absence of outflow channel, dries out only in very dry years. The eutrophic marshlands support extensive stands of sedge *Carex* spp., with an abundant submerged vegetation during prolonged flooded periods. Yadegarlu is a much smaller shallow freshwater lake, supporting an abundant submerged vegetation, and surrounded by eutrophic marshlands of sedge (Cyperaceae) and grasses. It is fed by runoff, rainfall, springs, seepages and small streams, and its size fluctuates considerably, almost drying out completely by late summer. Dorgeh Sangi is the smallest of the three lakes and is also a shallow freshwater eutrophic lake fed by small springs, seepages, rainfall and run-off with size fluctuating considerably. After winter rains it can overspill to the west.

The limited amount of vegetation includes some sedges and grasses, and sparse submerged vegetation. All three lakes freeze over to some degree during the cold winters. The disjunct wetland complex is surrounded by wheat cultivation on rolling hills and plains to the north, with more intensive agriculture around the villages in the south. There are several settlements interspersed among the lakes, and the main road north to Oroomiyeh passes through the wetland.

International and National Importance Breeding waterfowl include ruddy shelduck *Tadorna ferruginea*, marbled teal *Anas angustirostris*, coot *Fulica atra*, waders (Limicolae), terns (Sterninae), great crested grebe *Podiceps cristatus* and white stork *Ciconia ciconia* (at Yadegarlu) and black-necked grebe *P. nigricollis* (at Dorgeh Sangi). Migrant visitors include greylag goose *Anser anser*, *Anas* and *Aythya* spp., and coot *Fulica atra* and occasional Bewick's swan *Cygnus columbianus bewickii* visit Dorgeh Sangi and Yadegarlu when they are not completely frozen over. Small numbers of Anatidae including smew *Mergus albellus* winter in the area. According to the national report prepared for the Regina conference, Yadegarlu has suffered from drought and because of special conditions caused by attacks from Iraq. The report says that Yadegarlu will be deleted and replaced by Chegakhur and Gandoman Marshes, but no further information has been forwarded to the Bureau. Yadegarlu was listed in Regina document C.3.6 as one of the 29 Ramsar sites where the likelihood of major ecological change seems greatest.

Changes in Ecological Character There is continuing threat from over-grazing and excessive hunting pressure on wildfowl. The local population is expanding, which could lead to degradation of the wetlands through urbanisation. The area is in a politically sensitive zone and its condition is uncertain.

Management Practices Traditional reed cutting is still practised.

Scientific Research and Facilities The Department of the Environment has carried out waterfowl counts.

Principal Reference Material The above information is taken from:

Department of the Environment (1987). Iran: National Report. Proceedings of the Ramsar Conference, Regina, Canada. May.

Mansoori, J. (1983). National Report on Iran's Wetlands of International Importance as habitat for waterfowl. Prepared for Groningen Conference, Netherlands in May 1984.

Supplemented by:

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

IUCN (1977). *World Directory of National Parks and other Protected Areas*. IUCN, Morges, Switzerland.

Additional references:

Firouz, E. (1971). *The Wetlands and Waterfowl of Iran*. Game and Fish Department of Iran, Tehran.

Firouz, E. (1976). Environmental and nature conservation in Iran. *Environmental Conservation* 3(1): 33-42.

Firouz, E. and Harrington, F.A. (1976). Iran: concepts of biotic community conservation. A paper presented at the international meeting on ecological guidelines for the use of natural

resources in the Middle East and South West Asia. *IUCN Occasional Paper* No. 15. IUCN, Morges, Switzerland.

Bandar Kiashahr Lagoon and the mouth of Sefid Rud

Location 37°25'N, 49°19'E. Situated 15km north/northwest of Rasht town, east of Anzali Mordab complex (Ramsar Site) on the Caspian Sea in Gilan Province, northern Iran.

Area 500ha

Degree of Protection Government owned, and administered by the Department of the Environment. Unprotected except for Ramsar status. Designated as a Ramsar site at the time of ratification on 23 June 1975.

Site Description The designated area comprises the lagoon (formerly called Bandar-e-Farahnaz Lagoon), the mouth of the Sefid Rud and associated marshes and grassy dunelands. The shallow freshwater coastal lagoon and swamp are fed by two streams from Sefid Rud to the west, and they drain northward through a narrow channel into the Caspian Sea. The freshwater input is supplemented by seepages and rainfall, and (although fluctuations in water level tend to be slight) there can be some flooding in winter. The lagoon bottom is a mixture of sand and mud, and the waters are predominantly oligotrophic except towards the marshy western extreme. Reedbeds of *Phragmites communis* and *Typha* spp. predominate in the west, with stands of rushes *Juncus* spp. in the eastern and southern marshy areas. Scrub and dune vegetation predominates on the higher ground in the north and north-west, with grasslands subject to periodic flooding along Sefid Rud. There are several settlements to the south of the lagoon, surrounded by cultivated land with patches of woodland. The two streams from Sefid Rud are used as a supply for local irrigation schemes.

International and National Importance The site is of major importance as a wintering area for waterfowl, including grebes *Podiceps* spp., Dalmatian pelican *Pelecanus crispus*, greater flamingo *Phoenicopterus ruber*, herons (Ardeidae), greylag goose *Anser anser*, shelduck *Tadorna tadorna*, gulls (Laridae) and some waders (Limicolae). It is a breeding site for cormorant *Phalacrocorax carbo* and several species of heron (Ardeidae). It is of less importance as a resting station with moderate numbers of passage species.

Changes in Ecological Character A fishery has been established on the lagoon. There is serious hunting and over-grazing pressure in the area and the level of disturbance is increasing with sport and recreational activities.

Management Practices Traditional reed-cutting, livestock grazing and commercial fisheries.

Scientific Research and Facilities The Department of the Environment has carried out waterfowl surveys.

Principal Reference Material The above information is taken from:

Mansoori, J. (1983). National Report on Iran's Wetlands of International Importance as habitat for waterfowl. Prepared for Groningen Conference, Netherlands in May 1984.

Supplemented by:

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

IUCN (1977). *World Directory of National Parks and other Protected Areas*. IUCN, Morges, Switzerland.

Additional reference:

Ferguson, D.A. (1972). Waterfowl wintering, resting and breeding areas of the Southwest Caspian lowlands. *Wildfowl* 23: 5-24

Amirkelayeh Lake

Location 37°17'N, 50°12'E. Situated on the shore of the Caspian Sea 15km north of Langarud township and 60km east of Rasht in the north of Gilan Province.

Area 1,230ha

Degree of Protection Government owned, and administered by a local Council under the supervision of the Department of the Environment. The designated site is in Amirkelayeh Wildlife Refuge (1,230ha) established in 1971. Designated as a Ramsar site at the time of ratification on 23 July 1975.

Site Description The designated site comprises a freshwater lake (3-4m depth) and associated marshes at 20m below sea level. The eutrophic lake is fed by springs, run-off from nearby irrigated land, and rainfall. It can flood the marshes or at the highest flood levels overspill into the Caspian Sea to the north (although the fluctuation in water level is usually slight). The vegetation is predominantly reedbeds of *Phragmites communis* with some reedmace *Typha* spp. and willows *Salix* spp. The more open water supports an abundant submerged vegetation. There are several small settlements in the vicinity, with a small road linking those in the north to the Langarud road. The surrounding area comprises cultivated rice paddies with patches of woodlands of *Salix caprea*, *S. micans* and *Pterocarya fraxinifolia*, and there are remnants of former coastal forest cover.

International and National Importance The wetland is notable for breeding populations of heron (Ardeidae), duck (Anatidae) and rail (Rallidae), and large numbers of winter migrants such as coot *Fulica atra*, swans *Cygnus* spp. and herons (Ardeidae).

Changes in Ecological Character None reported

Management Practices The wildlife refuge is supervised by game guards from the Department of the Environment. For many years the wetland was maintained as a strict nature sanctuary with all exploitation and interference prohibited.

Scientific Research and Facilities The Department of the Environment has carried out some waterfowl surveys.

Principal Reference Material The above information is taken from:

Mansoori, J. (1983). National Report on Iran's Wetlands of International Importance as habitat for waterfowl. Prepared for Groningen Conference, Netherlands in May 1984.

Supplemented by:

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

Additional references:

Ferguson, D.A. (1972). Waterfowl wintering, resting and breeding areas of the southwest Caspian Lowlands. *Wildfowl* 23: 5-24.

Firouz, E. (1971). *The Wetlands and Waterfowl of Iran*. Game and Fish Department of Iran, Tehran.

Harrison, J. (1972). South of the Caspian Sea. *World of Birds* (January).

Lake Gori

Location 37°55'N, 46°42'E. Situated 40km east/south-east of Tabriz in Azarbaijan Province, north-west Iran.

Area 120ha

Degree of Protection Government owned, and administered by the Department of the Environment, Tehran. Unprotected except for Ramsar status. Designated as a Ramsar site at the time of ratification on 23 June 1975.

Site Description The site comprises a freshwater/brackish lake in a depression in the shale and rock substrate at 1,950m, surrounded by higher ground. It is fed by rainfall, runoff, springs, seepages and small streams, with inflow greatest during and after the spring thaw. The fluctuation in water level is slight, and any overflow feeds a small stream to the northeast. The lake always freezes over in winter, and is under deep snow by midwinter. It supports an abundant submerged vegetation, and is fringed by extensive reedbeds of *Phragmites communis*, rushes *Juncus* spp., sedges *Carex* spp. and *Scirpus* spp. The surrounding area is semi-arid steppe, with a small settlement (Yusef Abad) and associated wheat cultivation to the west, and damp grassland to the south-west. The main road between Tabriz and Tehran passes along the southern boundary of the designated site.

International and National Importance Breeding birds include large colonies of grebes such as black-necked grebe *Podiceps nigricollis*, coot *Fulica atra* and a variety of ducks (Anatidae) including white-headed duck *Oxyura leucocephala*. Small numbers of various waterfowl species visit the area during their migration, except during winter when the lake is frozen over.

Changes in Ecological Character Recreational pressure from the urban population of Tabriz has increased, and could become excessive. Sport fishing, wildfowl hunting, grazing and reed-cutting persist.

Management Practices No information

Scientific Research and Facilities Some wildfowl counts have been carried out.

Principal Reference Material The above information is taken from:

Mansoori, J. (1983). National Report on Iran's Wetlands of International Importance as habitat for waterfowl. Prepared for Groningen Conference, Netherlands in May 1984.

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland Switzerland. 506 pp.

IUCN (1977). *World Directory of National Parks and other Protected Areas*. IUCN, Morges, Switzerland.

Additional reference:

Gyllin, R. (1970). Bilder fran en perssk fagelsjo. *Fauna och Flora* 3: 113-117.

Alagol, Ulmagol and Ajigol Lakes

Location 37°23'N, 54°35'E. Situated just south of the international frontier with USSR, a few kilometres east of the Caspian Sea in Mazandaran Province, northern Iran.

Area 1,400ha (Alagol lake 1,000ha, Ulmagol lake 200ha and Ajigol lake 200ha)

Degree of Protection Government owned, and administered by the Department of the Environment. Unprotected except for Ramsar status. Designated as a Ramsar site at the time of ratification on 23 June 1975.

Site Description The designated site comprises the disjunct lake and marshland complex at sea level in the mud flats east of the Caspian Sea and south of the Atrak River. The mud and sand-based Alagol lake lies south-west of the other lakes. It is slightly saline and is fed by seepage, springs, rainfall and local runoff. The water level varies considerably due to the seasonal nature of the inflow, flooding in winter but drying out completely in particularly dry summers. The vegetation is sparse, with some fringing rushes *Juncus* spp., sedges *Carex* spp. and grasses (mainly in the north-east), and small patches of reedbeds of *Phragmites communis*. The closely associated Ulmagol and Ajigol are seasonal freshwater lakes fed by rainfall and runoff in autumn and winter, and drying out completely during periods of drought. They lie on a mud and clay substrate, but vary slightly in the vegetation they support. Ulmagol lake supports a sparse vegetation of *Juncus* spp, duckweed *Lemna* spp., *Phragmites communis*, *Alhagi* spp. and algae. Ajigol lake supports some *Tamarix* sp., grasses and saltbush, with extensive reedbeds of *Phragmites communis* spreading over the lake at the eastern end and an abundant submerged vegetation. There are several small settlements in the general area of the lake complex.

International and National Importance The three lakes support a varied population of breeding wildfowl, including coot *Fulica atra* and Kentish plover *Charadrius alexandrinus* at Alagol Lake, little grebe *Tachybaptus ruficollis* and white-tailed plover *Vanellus leucurus* at Ajigol Lake and great crested grebe *Podiceps cristatus* at all three lakes. In winter there is a moderate influx of a wide variety of waterfowl on migration or overwintering, including greater flamingo *Phoenicopterus ruber* (at Alagol), geese and ducks (Anatidae) such as *Anas* spp., red-crested pochard *Netta rufina*, *Aythya* spp. and smew *Mergus albellus*, and large numbers of coot, grebes (Podicipitidae), great egret *Egretta alba* and swans *Cygnus* spp.

Changes in Ecological Character The main disturbance is from hunters in winter, particularly at the smaller Ulmagol and Ajigol lakes where wildfowl hunting pressure can be considerable. Alagol lake being less accessible is relatively undisturbed.

Management Practices Reed cutting, grazing and some fishing continue.

Scientific Research and Facilities Wildfowl counts were carried out each year between 1969 and 1974.

Principal Reference Material The above information is taken from:
Mansoori, J. (1983). National Report on Iran's Wetlands of International Importance as habitat for waterfowl. Prepared for Groningen Conference, Netherlands in May 1984.

Supplemented by:

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

IUCN (1977). *World Directory of National Parks and other Protected Areas*. IUCN, Morges, Switzerland.

Additional reference:

Firouz, E. (1971). *The Wetlands and Waterfowl of Iran*. Game and Fish Department of Iran, Tehran.

Khuran Straits

Location 26°40'-27°03'N, 55°30'-55°53'E. Situated between the southern Iranian mainland and Qeshm Island. The wetland is approximately equidistant between the towns of Bandar Abbas and Bandar-e-Lengen in Bandar Abbas Province on the Gulf Coast.

Area 100,000ha

Degree of Protection Government owned, and administered by the Department of the Environment. The designated site includes 82,360ha in Hara National Park, which was enlarged and upgraded from the 65,750ha Hara Protected Region established in 1972, and 85,360ha in the fully protected Hara Biosphere Reserve approved in June 1976. The unprotected areas in the east are threatened with degradation through illegal logging of the mangroves. Designated as a Ramsar site at the time of ratification on 23 June 1975.

Site Description The major feature of the reserve is the Mehran River delta, which forms extensive intertidal silt flats with marshy coastal shoreline and mangrove *Avicennia* spp. forests, numerous small islands and creeks and smaller estuaries. Red (Rhodophyceae) and brown (Phaeophyceae) algae predominate in the saline shallows. The intertidal and mangrove zones provide a suitable habitat for abundant crustaceae, which form an important food source for wildfowl. There are a few settlements scattered along the mainland shore. The climate is tropical to subtropical with summer temperature reaching 45°C. Annual rainfall of 100-300mm falling mainly between November and April.

International and National Importance The coastal wetland is an important breeding site for herons (Ardeidae), notably great egret *Egretta alba*, western reef heron *E. gularis*, Indian pond heron *Ardeola grayii* and goliath heron *Ardea goliath*, and also crab plover *Dromas ardeola* and stone-curlew *Burhinus oedipnemus*. Numerous species of plover (Charadriidae) pass through the area on migration. In winter the wetland is of special importance as a feeding station for heron, plover and sandpipers (Scolopacidae) including grey heron *Ardea cinerea*, redshank *Tringa totanus*, Terek sandpiper *Xenus cinereus*, bar-tailed godwit *Limosa lapponica* and curlew *Numenius arquata*. Wintering flocks of Dalmatian pelican *Pelecanus crispus*, spoonbill *Platalea leucorodia* and greater flamingo *Phoenicopterus ruber* have been recorded. Green turtle *Chelonia mydas* occurs in significant numbers offshore close to Qeshm Island.

Changes in Ecological Character The local population continues to cut mangroves and manufacture charcoal in some areas. There is some disturbance from continuing fishing and boat traffic in the straits.

Management Practices None reported

Scientific Research and Facilities Waterfowl counts have been carried out. There is a marine research station on Hormoz Island east of the reserve.

Principal Reference Material The above information is taken from:

Mansoori, J. (1983) National Report on Iran's Wetlands of International Importance as Habitat for waterfowl for Groningen Conference, Netherlands in May 1984.

Supplemented by:

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

Biosphere Reserve nomination (1976).

IUCN (1977). *World Directory of National Parks and other Protected Areas*. IUCN, Morges, Switzerland.

Additional references:

Firouz, E. (1967). Environmental and nature conservation in Iran. *Environmental Conservation* 3(1): 33-42.

Firouz, E. (1971). *Conservation and Wildlife Management in Iran*. Game and Fish Department of Iran. Ziba Press, Tehran.

Firouz, E. (1974). *Environment Iran*. The National Society for the Conservation of National Resources and Human Environment. Tehran.

- Firouz, E., Harrington, F.A. (1976).** Iran: concepts of biotic community conservation. A paper presented at the international meeting on ecological guidelines for the use of natural resources in the Middle East and South West Asia. *IUCN Occasional Paper No. 15*. IUCN, Morges, Switzerland.
- Firouz, E., Hassinger, J.D. and Ferguson, D.A. (1970).** The wildlife parks and protected regions of Iran. *Biological Conservation* 3(1): 37-45.
- Harrington, F.A. (1976).** Surveys of the southern Iranian coastline with recommendations for additional marine reserves in promotion of the establishment of marine parks and reserves in the Northern Indian Ocean, Red Sea and Persian Gulf. IUCN Publ. New Series No. 35. IUCN, Morges, Switzerland. Pp. 50-75.

Deltas of Rud-e-Shur, Rud-e-Shirin and Rud-e-Minab

Location 27°00'N, 56°22'-57°00'E. 55 km stretch of coast on the Strait of Hormuz (the Gulf) 25km east of Bandar Abbas in Bandar Abbas Province, southern Iran.

Area 20,000ha. Just east of Khouran Straits Ramsar Site (100,000ha)

Degree of Protection Government owned, and administered by the Department of the Environment. Unprotected except for Ramsar status. Designated as a Ramsar site at the time of ratification on 23 June 1975.

Site Description The designated site comprises tidal mudflats, mangrove *Avicennia* spp., swamp and saltmarsh formed around the mouths of the three rivers. Rud-e-Shirin and Rud-e-Minab are freshwater rivers, while Rud-e-Shar is more brackish. All tend to flood in winter and spring. The inshore zone is shallow with numerous sandbars and spits formed from alluvium, silt and mud deposited by the rivers. The mudflats are barren of vegetation except for stands of mangrove in the creeks and rivermouths, and characteristic saltmarsh plant associations. The arid plains stretching northwards inland from the coast are sparsely vegetated, while the steppelands to the south support some *Acacia* spp. and date palm *Phoenix dactylifera*. There are a few small settlements near the wetland.

International and National Importance The coastal wetland is an important wintering area for cormorant *Phalacrocorax carbo*, various herons (Adeidae), greater flamingo *Phoenicopterus ruber*, waders such as oystercatcher *Haematopus ostralegus*, bar-tailed godwit *Limosa lapponica* and curlew *Numenius arquata*, and gulls (Laridae). The breeding population has yet to be investigated in detail and could be comparable with the nearby Khuran Straits Ramsar Site.

Changes in Ecological Character Fishing and cutting of brushwood for fuel continue in the area.

Management Practices Traditional fishing practices and firewood collection continue.

Scientific Research and Facilities The wetland is poorly studied as yet although some wildfowl counts have been carried out. There is a marine research station established on Hormoz island just off the western end of the designated area.

Principal Reference Material The above information is taken from:

Mansoori, J. (1983). National Report on Iran's Wetlands of International Importance as habitat for waterfowl. Prepared for Groningen Conference, Netherlands in May 1984.

Supplemented by:

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

IUCN (1977). *World Directory of National Parks and other Protected Areas*. IUCN, Morges, Switzerland.

Deltas of Rud-e-Gaz and Rud-e-Hara

Location 25°55'-26°32'N, 57°10'E. Situated on the east side of the straits of Hormuz (Gulf of Oman) 120km south-east along the coast from Bandar Abbas in Bandar Abbas Province, southern Iran.

Area 15,000ha

Degree of Protection Government owned, and administered by the Department of the Environment. Unprotected except for Ramsar status. Designated as a Ramsar site at the time of ratification on 23 June 1975.

Site Description The designated site comprises tidal mudflats, creeks, saltmarsh, mangroves, sand banks and low muddy offshore islands formed at the mouths of the two main rivers and several intermittent streams. The river waters vary from fresh to brackish and have a sluggish flow, which has resulted in deposition of alluvium, silt, mud and sand in the shallow inshore zone. The saltmarshes and sand dunes support typical vegetation, and there are stands of mangrove *Avicennia* spp. and agao in the shallows. The mudflats are barren with no covering of seaweed. The low-lying hinterland to the east of the wetland is very arid and only sparsely vegetated. The whole area is remote and sparsely populated.

International and National Importance This coastal wetland is an important wintering site for cormorant *Phalacrocorax carbo*, several species of heron (Ardeidae), spoonbill *Platalea leucorodia*, Dalmatian pelican *Pelecanus crispus*, waders such as oystercatcher *Haematopus ostralegus*, redshank *Tringa totanus*, bar-tailed godwit *Limosa lapponica* and curlew *Numenius arquata* and gulls (Laridae). The area's breeding population has yet to be investigated in detail but it could be comparable with the nearby Khuran Straits Ramsar Site.

Changes in Ecological Character Fishing and cutting of brushwood for fuel continue in the area.

Management Practices Traditional fishing and firewood collection continue.

Scientific Research and Facilities The wetland is poorly studied as yet, although some wildfowl counts have been carried out. There is a marine research station established on Hormoz Island just off the western end of the designated area.

Principal Reference Material The above information is taken from:

Mansoori, J. (1983). National Report on Iran's Wetlands of International Importance as habitat for waterfowl. Prepared for Groningen Conference, Netherlands in May 1984.

Supplemented by:

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

IUCN (1977). *World Directory of National Parks and other Protected Areas*. IUCN, Morges, Switzerland.

Gavkhouni Lake and marshes of the lower Zaindeh Rud

Location Gavkhouni Lake: 32°08'-32°20'N, 52°45'-52°52'E. Lower Zaindeh Rud: 32°30'N, 51°55'-52°18'E. Situated equi-distant (about 120km) between Isfahan city and Yazd in Isfahan Province, Central Iran.

Area 43,000ha (Gavkhouni Lake 12,000ha, permanent marsh 1,000ha and temporary marsh 30,000ha)

Degree of Protection Government owned, and administered by the Department of the Environment. Unprotected except for Ramsar status. Designated as a Ramsar Site at the time of ratification on 23 June 1975.

Site Description The designated site comprises the disjunct enclosed basin of the shallow saltwater Gavkhouni Lake, and associated marshlands upstream on the Zaindeh Rud. Zaindeh Rud is the main water supply to the lake, supplemented by rainfall and run-off from the surrounding high ground. The water level fluctuates considerably, with floods occurring in winter and spring. The temporary flooded marshlands can extend over 50km upriver in a wet year. The lake is oligotrophic, with a limited vegetation of *Phragmites communis* and *Tamarix* spp. around the river delta area, surrounded by a low cover of halophytic vegetation. There are expanses of bare saltflats and mud-flats. The marshes upstream on the lower Zaindeh Rud are a complex of freshwater marsh and floodplain, predominantly fed by the main river supplemented by irrigation channels, numerous small streams, rainfall and runoff. The area usually floods in early winter and dries out in spring. The substrate is rich alluvial soil, silt and mud, and much of the land is now used for agriculture (wheat and rice cultivation) with only a small amount of marshland remaining. The flooded areas sometimes freeze over in winter.

International and National Importance The lake and river marshlands are of great importance to wintering and migrating birds, particularly *Anas* and *Tadorna* spp., crane *Grus grus* and coot *Fulica atra*. As they usually dry out in summer they are of minor importance for breeding birds.

Changes in Ecological Character Parts of the floodplain are used for agriculture, livestock grazing and wildfowl hunting. Gavkhouni saltlake is relatively inaccessible, especially during winter floods, and is still mainly undisturbed although brushwood collection for fuel, grazing

and some hunting occurs in about 1,000ha at the mouth of the Zaindeh. The Zaindeh Rud flows from Isfahan, and pollution from the city may be carried into the wetland and lake.

Management Practices No information

Scientific Research and Facilities The Department of the Environment has carried out some waterfowl surveys.

Principal Reference Material The above information is taken from:

Mansoori, J. (December 1983). National Report on Iran's Wetlands of International Importance as habitat for waterfowl. Prepared for Groningen Conference, Netherlands in May 1984.

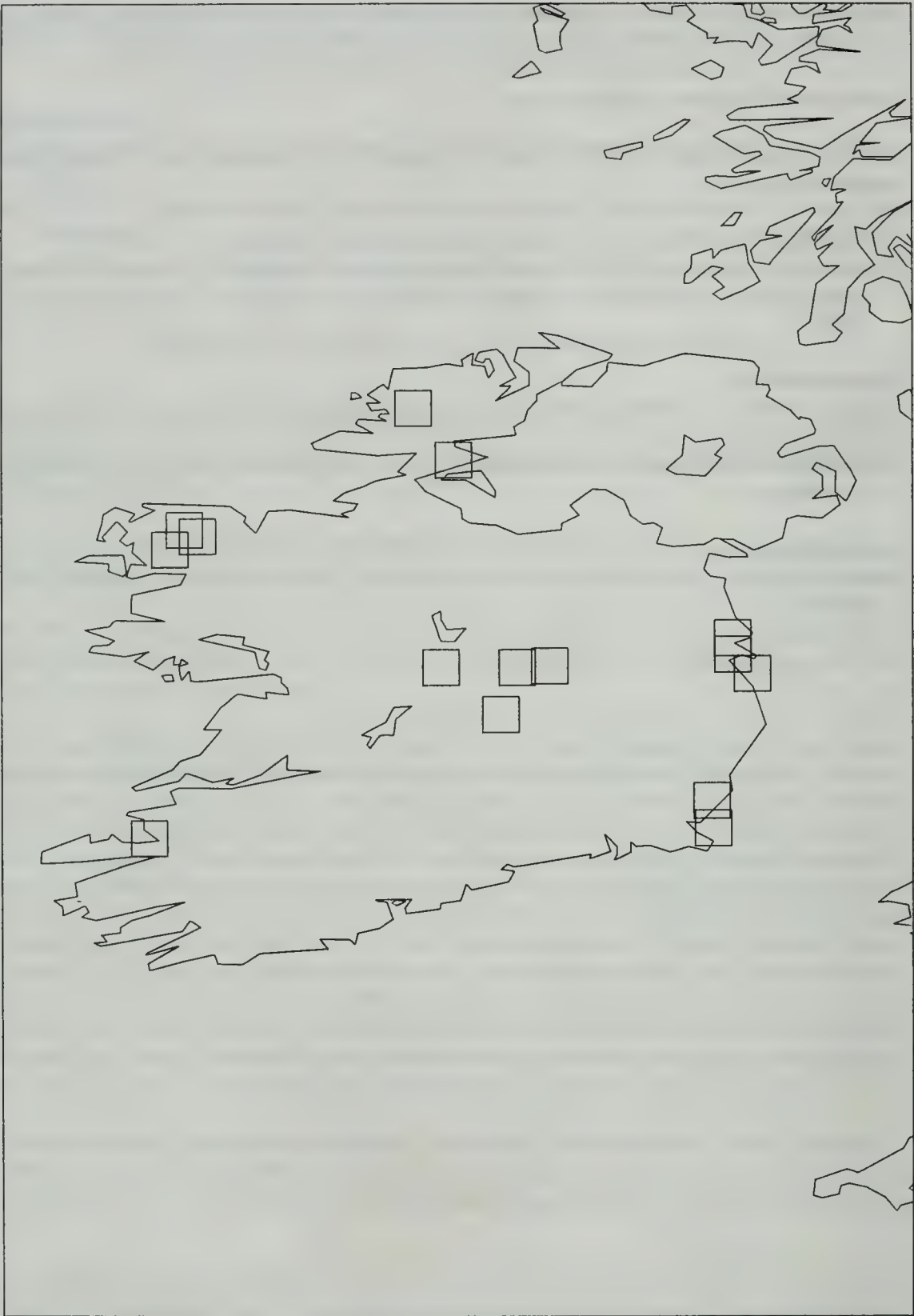
Supplemented by:

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

IUCN (1977). *World Directory of National Parks and other Protected Areas*. IUCN, Morges, Switzerland.

Additional reference:

Firouz, E. (1971). *The Wetlands and Waterfowl of Iran*. Game and Fish Department of Iran, Tehran.



Ramsar Sites in Ireland

Ireland

Area 70,282 sq. km

Population 3,537,195 (1986)

Summary of Wetland Situation Ireland, with its mild winters, high rainfall and position at the junction of two major flyways, provides an ideal wintering area for large numbers of waterfowl. Many suitable habitats exist all round the coast, extending to over 70km inland up the Shannon estuary on the west coast. However, because the country's economy is largely based on agriculture, efforts to improve marginal farming areas have resulted in the disappearance of a number of good inland wetlands. This applies particularly to the former 'turlough' area in Counties Galway and Mayo. Another threat is the increase in the amount of peat extracted from the bogs since the energy crisis began in 1973/74.

The winter quarters of two distinctive populations of wild geese are in Ireland. The Greenland race of white-fronted goose *Anser albifrons flavirostris* winters mainly on the Wexford Slobbs in the south-east, on the central portion of the Shannon, which includes the Little Brosna River and at Sheskinmore, Lough Gara and the river Suck. The Greenland population or light-bellied race of Brent goose *Branta bernicla hrota* has its winter quarters in various sites from the Rogerstown and Malahide estuaries and North Bull Island to the north of Dublin, south and west round the coast to Tacumshin Lake, Castlemaine Harbour, Tralee Bay and Cummeen Strand in Sligo Bay. Both whooper swan *Cygnus cygnus* and Bewick's swan *C. columbianus bewickii* winter on the River Shannon and Rahasane Turlough; the whooper only, on Lough Oughter, Birra Lough and Lough Swilly; Bewick's only on the Wexford Slobbs. Finally, large numbers of waders winter in Dundalk Bay, North Bull Island, Wexford Harbour and Slobbs, Cork Harbour and Ballymacoda Estuary, 12km to the east of it, and the Shannon Estuary. The numbers of ducks of surface-feeding species nesting in Ireland have decreased in recent years, whilst both resident and wintering diving ducks are increasing.

Protected Areas Legislation The Wildlife Act, 1976, provides for the protection of all species of flora and fauna in Ireland. The Act provides for the establishment of nature reserves on both State and privately owned lands, the establishment of wildfowl sanctuaries and the designation of refuges for fauna. Local Authorities have power under the Planning Acts, 1963 to 1976, to create special amenity areas. Each Authority is required to submit and keep updated a development plan setting out the objectives and requirements of the Authority for the physical planning and development of its area.

Protected Areas Administration The Wildlife Service, which operates the Wildlife Act, was previously an office of the Department of Energy (and prior to that the Department of Tourism, Fisheries and Forestry), but has been transferred to the Office of Public Works (which reports directly to the Prime Minister). National parks are the responsibility of the National Parks and

Monuments Branch of the Office of Public Works. Local authorities, come under the Department of the Environment.

Sites designated under the Convention Ratification 15 November 1984, with one site listed at ratification; another four added on 31 July 1986; three sites on 1 June 1987; one site on 6 September 1988; two sites on 25 October 1988; three sites on 6 December 1988 and one further site added on 10 July 1989.

Wexford Wildlife Reserve
The Raven Nature Reserve
Pettigo Plateau Nature Reserve
Slieve Bloom Mountains Nature Reserve
The Owenduff Catchment
Owenboy Nature Reserve
Knockmoyle/Sheskin Nature Reserve
Lough Barra Bog
North Bull Island
Rogerstown Estuary
Baldoyle Estuary
Clara Bog
Mongan Bog
Raheenmore Bog
Tralee Bay Nature Reserve

Government body responsible for administration of the Convention

Wildlife Service, Office of Public Works, Leeson Lane, Dublin 2

Wexford Wildfowl Reserve

Location 52°30'N, 6°20'W. Situated on the north side of Wexford Harbour on North Slob, Co. Wexford. It forms approximately 10% of the area of the North Slob and about 5% of the North and South Slobs combined.

Area 110ha

Degree of Protection The site is a statutory Nature Reserve under Section 15 of the Wildlife Act, 1976, since 1981. It was designated as a Ramsar site at the time of ratification on 15 November 1984. It is jointly owned by the Wildlife Service (75%) and the Irish Wildbird Conservancy (25%), which is a voluntary, non-governmental organisation with the help of a financial contribution from WWF.

Site Description The 'sloblands' to the north and south of Wexford Harbour, the estuary of the River Slaney, are areas of alluvial mud which have been reclaimed from the sea, drained and are now under cultivation or grazing. Extensive areas of wheatfield and pasture are separated by drainage ditches, which empty into larger drainage channels. The water level can be controlled to provide irrigation in summer. Within the slobs, plant communities, other than

controlled pasture-swards and arable crops, are restricted to the ditches and their margins. Elsewhere there are areas of sand-dune and saltmarsh bordering the harbour-edge, particularly in the vicinity of Raven and Rosslare Points, the Rosslare dune communities being unusual in that they contain patches of dune scrub of which introduced sea buckthorn *Hippophae rhamnoides* is a notable ingredient. The main plant communities in the sloblands are re-seeded grassland dominated by rye grasses *Lolium perenne* and *L. multiflorum*, cat's tail *Phleum pratense* and white clover *Trifolium repens*, plus fields of wheat and barley on the drained land. In the small undrained area of the North Slob there are old pastures of mixed common and creeping bent *Agrostis tenuis* and *A. stolonifera*, scented vernal grass *Anthoxanthum odoratum* and Yorkshire fog *Holcus lanatus*.

A major portion of the reserve is subject to relatively intensive agricultural management, namely a rotation of reseeded grassland and arable crops mostly barley and root crops such as beet. Semi-natural vegetation is restricted to pools and the drainage channels. In the channels, rooted vegetation only occurs in water less than one metre deep and consists of submergents *Zannichellia palustris*, *Potamogeton pectinatus* and *Myriophyllum spicatum*, usually backed by the emergents *Scirpus maritimus* and in less brackish sections *S. tabernae montanii*. These in turn give way to species-rich grasslands dominated by *Festuca rubra*, with *Agropyron repens* on the channel's banks. Several pools are strongly influenced by seawater seepage. Here *Ruppia cirrhosa* is the main submerged species with *Puccinellia maritima* dominated salt marsh on the gently sloping margins and *Festuca rubra*/*Agropyron repens* grassland on the steeper drier banks.

International and National Importance The North Slob is the world's most important wintering ground for Greenland white-fronted goose *Anser albifrons flavirostris*, with more than half (5,000-7,000) of the world population seen there during the winter months. Greenland white-fronted goose is listed in Annex 1 of the EEC Directive 79/409, on the conservation of wildbirds, as a subspecies whose habitat requires special protection measures. Other species occurring on the reserve include Bewick's swan *Cygnus columbianus bewickii*, greylag goose *Anser anser*, pink-footed goose *A. brachyrhynchus*, Brent goose *Branta bernicla*, barnacle goose *B. leucopsis*, Canada goose *B. canadensis*, wader species and a large variety of duck, such as mallard *Anas platyrhynchos*, teal *A. crecca*, pintail *A. acuta*, gadwall *A. strepera*, shoveler *A. clypeata*, wigeon *A. penelope*, goldeneye *Bucephala clangula*, black-tailed godwit *Limosa limosa*, scaup *Aythya marila* and tufted duck *Aythya fuligula*.

Changes in Ecological Character None

Management Practices The reserve is managed by the Wildlife Service. Management practices include the growing of special grass cereals and root crops, in order to maximise goose use of the reserve subject to the maintenance of the fertility of the area and the demands of good agricultural practices. Disturbance is kept to a minimum by erecting fences, embankments etc. The reserve has an interpretative centre and observation tower for general public use.

Scientific Research and Facilities There have been important and continuing studies on the numbers, distribution, productivity and food preferences of *Anser albifrons flavirostris* and of how changing farming practices have affected their behaviour and distribution.

Principal Reference Material The above information is supplied by the Irish Wildlife Service. Supplemented by:

Carp, E. (Ed.) (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

Additional references:

Poore, D. and Gryn-Ambroes, P. (1980). *Nature conservation in northern and western Europe*. For UNEP and IUCN, with the financial support of WWF. IUCN, Gland, Switzerland.

Duffey, E. (1982). *National Parks and Reserves of Western Europe*. Macdonald and Co., London.

The Raven Nature Reserve

Location 52°20'N, 6°19'W. Situated in County Wexford, south-east Ireland, on the northern side of the estuary of the River Slaney.

Area 589ha

Degree of Protection The site is a statutory Nature Reserve under Section 15 of the Wildlife Act 1976 since 1983, and is owned by the Wildlife Service. It was designated a Ramsar site on 31 July 1986.

Site Description The site comprises a sand dune system which extends southwards into the estuary of the River Slaney as a highly unstable spit, the intertidal zone and inshore waters make a total water area of 604ha. It is bordered to the west by the North Wexford Slob wetland ecosystem (also a Ramsar site).

International and National Importance The spit is the world's most important winter night roost for Greenland white-fronted goose *Anser albifrons flavirostris*, and a flock of 6,000-8,000 uses the site, feeding by day on the Wexford Slob. Two other species which are listed in Annex 1 of the EEC Directive 79/409 as species whose habitat requires special conservation measures nest on the spit, common tern *Sterna hirundo* and little tern *S. albigularis*.

Changes in Ecological Character None

Management Practices The reserve is managed by the Wildlife Service.

Scientific Research and Facilities There are continuing studies on the numbers, distribution and food preferences etc of Greenland white-fronted goose *Anser albifrons flavirostris*.

Principal Reference Material The above information is supplied by the Irish Wildlife Service.

Pettigo Plateau Nature Reserve

Location 54°36'N, 7°55'W. Situated in County Donegal, north-west Ireland, just west of Lough Derg.

Area 900ha

Degree of Protection The site is a statutory Nature Reserve under Section 15 of the Wildlife Act 1976 since 1984 and is owned by the Wildlife Service. It was designated a Ramsar site on 31 July 1986.

Site Description The site is an excellent example of highland blanket bog at approximately 200m above sea level, and includes low hills and broad basins. There are numerous pools and lakes, including Dunragh Lough, Dunrach Middle Lough, Lough Barderg and part of Lough Golagh, within the reserve. The vegetation is dominated by purple moor grass *Molinia caerulea*, with a notable absence of black bogrush *Schoenus nigricans*, except in flushes. Other species present include cross-leaved heath *Erica tetralix*, deer sedge *Scirpus cespitosus*, ling *Calluna* spp., sundews *Drosera* spp., white-beaked sedge *Rhynchospora alba*, bog asphodel *Narthecium ossifragum* and lichens. Drier rocky sites are characterised by an abundance of ling *Calluna vulgaris* with woodland elements like hard fern *Blechnum spicant*.

International and National Importance The site is a traditional feeding and roosting site for Greenland white-fronted goose *Anser albifrons flavirostris*. It is also a relatively undisturbed example of highland blanket bog.

Changes in Ecological Character None

Management Practices The reserve is managed by the Wildlife Service.

Scientific Research and Facilities Research is carried out by the personnel of the Wildlife Service and by outside bodies under licence from the Minister.

Principal Reference Material The above information is supplied by the Irish Wildlife Service.

Slieve Bloom Mountains Nature Reserve

Location 53°02'N, 7°38'W. Situated in the centre of southern Ireland, in Counties Offaly and Laois.

Area 2,230ha

Degree of Protection The site is a statutory Nature Reserve under Section 15 of the Wildlife Act 1976, since 1985 and is owned by the Wildlife Service. It was designated a Ramsar site on 31 July 1986.

Site Description The reserve covers part of a mountain blanket bog at an altitude of about 400m which has a total area of 2230ha. The vegetation consists of hummocks of *Calluna* and lichen *Cladonia* spp. and sphagnum moss *Sphagnum capillifolium* with moss *Hyphnum jutlandicum*, cotton grasses *Eriophorum* spp., bilberry *Vaccinium myrtillus*, deer sedge *Scirpus cespitosus*, bog asphodel *Narthecium ossifragum* and lesser twayblade *Listera cordata*. The main variations in this type of vegetation are to be found in flushed sites and stream sides, where patches of purple moss-grass *Molinia* and/or rush *Juncus* spp. occur, or small stands of willow *Salix* spp.

International and National Importance The site is an excellent example of a mountain blanket bog, one of a range of bog types occurring in Ireland. Of particular interest is the presence of bog rosemary *Andromeda polifolia* and cranberry *Vaccinium oxycoccos*, and their occurrence along with crowberry *Empetrum nigrum* is particularly noteworthy.

Changes in Ecological Character None

Management Practices The reserve is managed by the Irish Wildlife Service.

Scientific Research and Facilities Research is carried out by the personnel of the Wildlife Service and by outside bodies under licence from the Minister.

Principal Reference Material The above information is supplied by the Irish Wildlife Service.

The Owenduff Catchment

Location 54°03'N, 9°40'W. Situated in County Mayo, in the west of Ireland.

Area 1,382ha

Degree of Protection Designated a Ramsar site on 31 July 1986. It will be given statutory protection under the Wildlife Act 1976 very soon. It is owned by the Wildlife Service.

Site Description The site is part of an extensive area of lowland blanket bog which grades into mountain blanket bog and wet heath. It includes most of the headwaters of two small streams, and there are a few small pools. The lowland bog vegetation includes purple moor grass *Molinia caerulea*, blackbog rush *Schoenus nigricans* and deer sedge *Scirpus cespitosus*, with white-beaked sedge *Rhynchospora alba* in wetter places. This group of characteristic species is completed by cross-leaved heath *Erica tetralix*, ling *Calluna vulgaris*, bog asphodel *Narthecium ossifragum*, carnation sedge *Carex panicea*, bog cotton *Eriophorum angustifolium*, tormentil *Potentilla erecta*, spike rush *Eleocharis multicanlis*, sundew *Drosera* spp. and grass *Nardus stricta*. Mosses include *Leucobryum glaucum*, *Sphagnum rubellum* and *Campylopus atrovirens*.

Lichens present include *Cladonia impexa* and *C. uncialis*. Pool complexes and wet areas with *Sphagnum* hummocks are also present.

International and National Importance The site is one of the best developed and least disturbed examples of Atlantic blanket bog in Europe. It supports a small flock of Greenland white-fronted goose *Anser albifrons flavirostris* in winter, and in summer breeding birds include golden plover *Pluvialis apricaria*.

Changes in Ecological Character None

Management Practices The reserve is managed by the Irish Wildlife Service.

Scientific Research and Facilities Research is carried out by the personnel of the Wildlife Service and by outside bodies under licence from the Minister.

Principal Reference Material The above information is supplied by the Irish Wildlife Service.

Owenboy Nature Reserve

Location 54°06'N, 9°30'W. Situated 10km west of Crossmolina and 10km east of Bellacorrick on the south side of Ballina, County Mayo.

Area 397ha

Degree of Protection Since 1986 the site has been a statutory nature reserve under section 15 of the Wildlife Act (1976), and is owned by the Wildlife Service. It was designated a Ramsar site in June 1987.

Site Description Owenboy Nature Reserve forms part of an extensive bog of an intermediate type lying in a broad basin. It contains several very wet, pool-studded, plateaux and low domes resembling raised bogs which are characterised by an abundance of black bog rush *Schoenus nigricans*, white-beaked sedge *Rhynchospora alba* and several *Sphagnum* species. These areas are separated by flushes and broad valleys, many of which are very wet with stands of mud sedge *Carex limosa*, common reed *Phragmites australis* and purple moor grass *Molinia caerulea*. Drier areas are characterised by vegetation dominated by ling heather *Calluna vulgaris* and purple moor grass.

International and National Importance The site is one of the most easterly areas of bog still intact in north-west Mayo, and is of particular value for investigating aspects of the west-east gradient of bogland plants, especially purple moor grass and black bogrush *Schoenus nigricans*, the distribution of which seems to be related to slight variations in the nutritional status of the peat. The rare moss *Homalothecium nitens* occurs in some flushes. The reserve is also a feeding and roosting area in winter for the few remaining bogland flocks of Greenland white-fronted goose *Anser albifrons flavirostris*, which is listed in Annex I of the EEC Council Directive 409/1979 (on the conservation of wildbirds), as a species whose habitat requires special conservation

measures. The ecological interest of other similar sites has been damaged to varying degrees, so that this is the only remaining site of its type and therefore worthy of international status.

Changes in Ecological Character None

Management Practices The reserve is managed by the Irish Wildlife Service, whose principal management requirement is to safeguard the hydrology of the area and prevent major changes in land use. The present level of grazing, which is confined to the sides of Fiddauna Toghaun River, is considered acceptable. The eastern and southern boundaries are fenced and a firebreak is being considered at the eastern end to protect the adjacent forest from accidental fire. Additional fencing will be reviewed on an ongoing basis.

Scientific Research and Facilities Research is carried out by the personnel of the Wildlife Service and by outside bodies under licence from the Minister.

Principal Reference Material The above information is supplied by the Irish Wildlife Service.

Knockmoyle/Sheskin Nature Reserve

Location 54°10'N, 9°35'W. Situated between the Oweniny River on the eastern side and Sheskin Lodge on the western side of Bellacorrick, County Mayo.

Area 732ha

Degree of Protection The site is a statutory Nature Reserve under Section 15 of the Wildlife Act, 1976, since 1986 and is owned by the wildlife Service. It was designated as a Ramsar site in June 1987.

Site Description Knockmoyle/Sheskin Nature Reserve forms part of an extensive area of lowland blanket bog, with a remarkably dense network of pools and small lakes. Between the pools the peat is relatively dry and has a well-developed cover of purple moor grass *Molinia caerulea*, deer sedge *Scirpus cespitosus*, ling heather *Calluna vulgaris* and *Sphagnum capillifolium*. Valleys and flushes running through the bog have a rich flora as a result of the absence of burning and grazing, including common reed *Phragmites australis*, meadow sweet *Filipendula ulmaria*, devil's bit scabious *Succisa protensis* and willows *Salix curita*. A very unusual feature is the presence of small stands of birch *Betula pubescens* and the rare moss *Homalothecium nitens*.

International and National Importance The reserve is a site of international importance containing a wide variety of peatland habitats and plant communities. The area is strategically placed in the centre of north-west Mayo, a blanket bog site ideal for examining the gradients of morphology and vegetation. The presence of the rare moss *Homalothecium nitens* is particularly noteworthy.

Changes in Ecological Character None

Management Practices The reserve is managed by the Irish Wildlife Service whose principal requirement is to safeguard the hydrology of the area and prevent major land use changes.

Scientific Research and Facilities Research is carried out by the personnel of the Wildlife Service and by outside bodies under licence from the Minister.

Principal Reference Material The above information is supplied by the Irish Wildlife Service.

Lough Barra Bog

Location 54°55'N, 9°05'W. Situated in the upper part of the Gweebarra River valley due south of Slieve Snaght and south-west of Lough Barra, County Donegal.

Area 176.4ha

Degree of Protection The site is a statutory nature reserve under Section 15 of the Wildlife Act 1976 since 1987 and is owned by the Wildlife Service. Designated as a Ramsar site on the first of June 1987.

Site Description Lough Barra bog forms part of an extensive area of lowland blanket bog which is one of the most northerly intact sites in the country. It contains a characteristic assemblage of plant species, including purple moor grass *Molinia caerulea*, blackbog rush *Schoenus nigricans*, ling heather *Calluna vulgaris* and deer grass *Scirpio caespitosa*. There are small pool complexes and flushes and the valley of the Gweebarra River contains remnants of deciduous native woodland dominated principally by oak *Quercus petraea*.

International and National Importance On a world scale blanket bog has a very restricted distribution and the Irish formation is distinctive in terms of the vegetation and structure. Extensive intact examples, particularly those with populations of rare birds, are consequently of international significance. The merlin *Falco columbarius* breeds there, while in winter a small flock of Greenland white-fronted geese *Anser albifrons flavirostris* frequents the area. Both are listed in Annex I of the EEC Council Directive 409, 1979 (on the conservation of wild birds) as species whose habitat requires special conservation measures.

Changes in Ecological Character None

Management Practices The reserve is managed by the Irish Wildlife Service. Management practices include the control of grazing and burning, with additional enclosures in certain places, particularly alongside the Gweebarra River, to encourage woodland and scrub development.

Scientific Research and Facilities Research is carried out by the personnel of the Wildlife Service and by outside bodies under licence from the Minister.

Principal Reference Material The above information is supplied by the Irish Wildlife Service.

North Bull Island

Location 53°17'N, 6°05'W. An island situated in Dublin Bay and within the boundaries of the City of Dublin, County Dublin.

Area 1,436ha (118ha of North Bull Island, and 1,318ha of the surrounding foreshore)

Degree of Protection Both the island and foreshore are afforded statutory protection as nature reserves under the Wildlife Act (1976). The relevant orders were signed on the 21 September 1988. Prior to that most of the area has been protected from hunting since 1931 when it was designated a wildlife sanctuary under the Wild Bird Protection Act (1930). Designated a Ramsar site on 6 September 1988. The island and part of foreshore was accepted as a Unesco-MAB Biosphere Reserve in October 1981 and the whole area designated as a special protection area under EC Council Directive 407/79 in 1986. The island is owned by Dublin Corporation and the foreshore is state-owned.

Site Description The island has developed from a sand bar, created as a result of the construction of the North Bull wall in 1768. The area behind the wall acts as a sediment trap and has allowed sand dune development to continue for nearly two hundred years. Where the south-eastern side of the island is dominated by a dune stack, the more sheltered north-western side has developed a salt-marsh facing the lagoon, which separates the island from the mainland. The lagoon is uncovered at each tide, providing extensive mud-flats. The land area is formed of sand and gravel from post-Pleistocene sediment: sand dunes and beach deposits being composed of sea/tide borne and aeolian sand particles. The salt-marsh and inter-tidal mudflats are constituted from silt originating from the rivers Liffey, Tolka and Dodder. The island contains well developed salt-marsh and dune systems, which display all stages of development. Consequently there is a fine range of plant communities present, from algal mudflats to saltflats populated with glasswort *Salicornia* spp., through sea lavender *Limonium* spp. and sea aster *Aster tripolium* zones to a sea rush *Juncus maritimus* zone at the high water mark. In the dunes all stages from embryo sea couch *Elymus farctus* colonised areas to a mature marram *Ammophila arenaria* zone and dune grassland are present.

The island has populations of hare *Lepus timidus hibernicus*, rabbit *Oryctolagus cuniculus* and a variant of harvest mouse *Mus musculus*. Field mouse *Apodemus sylvaticus* also occurs and foxes *Vulpes vulpes* make occasional visits to the island.

International and National Importance Some of the highest densities of waterfowl noted in the British Isles have, on occasion, been recorded here and approximately 200 bird species have been identified. The area is particularly important for brent goose *Branta bernicla*, knot *Calidris canutus*, sanderling *C. alba*, curlew *Numenius arquata* and for its numbers of other waders, especially dunlin *C. alpina*, bar-tailed godwit *Limosa lapponica* (10% of Irish population), redshank *Tringa totanus*, oystercatcher *Haematopus ostralegus* and grey plover *Pluvialis squatarola*. Large numbers of duck also occur, especially shelduck *Tadorna tadorna* (a maximum of 900), wigeon *Anas penelope* (a maximum of 4,000), teal *A. crecca*, pintail *A. acuta* (a maximum of 450) and shoveler *A. clypeata* (1200). In 1987 80 pairs of little terns *Sterna*

albifrons (nearly one third of the Irish population) bred on the island. As a result of its international importance for brent geese, the area was designated a sister reserve by the Canadian Wildlife Service, and linked with Polar Bear Pass National Wildlife Area.

Changes in Ecological Character The introduction of a solid causeway between the island and the mainland has changed currents and patterns of silt deposition, although this may not significantly affect the biological value of the area. Also, the site is within Dublin Bay, and therefore potentially threatened by any industrial development within the area.

Management Practices There are two golf courses within the dune grassland on the island (both excluded from the reserve designation), and the area is heavily used for low level recreation, such as swimming and walking. A management planning process for the reserves is underway, following designation.

Scientific Research and Facilities Research has been ongoing since 1900, with studies on pollution and water quality, sedimentation rates, algal growth, ornithology, ecological succession, etc. The area is also widely used as an outdoor laboratory in natural history by schools and the university.

Principal Reference Material The above information is taken from documents supplied by the Government of Ireland. Supplemented by:

Carp, E. (Ed) (1980). *A Directory of Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

Harris, C.R. (1974). The evolution of North Bull Island, Dublin Bay. *Sci. Proc. R. Dub. Soc.* A5(14): 237-252.

Jeffrey, D.W. et al. (Eds) (1977). North Bull Island, Dublin Bay - Modern coastal natural history. Royal Dublin Society.

Report on Wetlands of International and National Importance in the Republic of Ireland. November 1974.

Unesco (1986). MAB Information Systems: Biosphere Reserves - Compilation 4. Prepared for the MAB Secretariat by the IUCN Conservation Monitoring Centre. Unesco, Paris.

Rogerstown Estuary

Location 53°30'N, 6°12'W. Situated in County Dublin, Province of Leinster, 16km north-north-east of Dublin City and 3km north of Donabate.

Area 196ha

Degree of Protection The site is designated as a nature reserve (14 April 1988) and has the same area as the Ramsar site that was added to the list on 25 October 1988. The site had previously been protected with a no-shooting order under the Game Preservation Act (1930). It is state-owned.

Site Description The estuary is a small tidal bay which comprises the estuaries of several small rivers and streams that flow in at the western and north-western sides. The estuary mouth is narrowed and sheltered by a long sand spit running north from Portrane. Over 90% of the bay

dries out at low tide (tidal variation is between 3.2m and 4.6m) exposing extensive areas of mud, sand and gravel. These inter-tidal mudflats appear to be slowly accreting and provide rich feeding grounds for waterfowl with extensive beds of *Mytilus edulis* and *Zostera angustifolia*. There is a narrow fringe of salt-marsh grassland around the estuary, broadening in the vicinity of the sand spit and at the estuary-head. Stands of *Spartina townsendii* are widely distributed and spreading. Vegetation communities present include: *Ruppion maritimae*, *Puccinellion maritimae*, *Spartinetum townsendii* and wet pasture.

International and National Importance Rogerstown Estuary is primarily important as a wintering area for waterfowl, especially for Brent goose *Branta bernicla hrota* (475) from the Canadian Arctic/North Greenland. The geese stay from December to March or April, and for this species the site is internationally important. The site also holds up to 5,300 wildfowl and up to 7,800 waders, and is nationally important for pintail *Anas acuta* (250). Other species include common shelduck *Tadorna tadorna* (600) and knot *Calidris canutus* (1,300).

Changes in Ecological Character A domestic refuse dump occupies an area that would otherwise be salt marsh and its expansion may be proposed. Sewage and other eutrophication waste could potentially alter bottom conditions in the estuary, although the rivers entering the site pass mainly through farmland and receive little industrial effluent. *Spartina townsendii* is present and spreading. It would further invade wildfowl feeding grounds. If increased, the presence of pleasure craft moored over areas of inter-tidal mudflats could be a problem.

Management Practices Apparently, a small amount of shooting continues within the Estuary.

Scientific Research and Facilities No information

Principal Reference Material The above information has been supplied by the Irish Government, supplemented by:

Anon. (1984). *Report on wetlands of international and national importance in the Republic of Ireland*. Forest and Wildlife Service, Dublin. 107 pp.

Carp, E. (Ed.) (1980). *A Directory of Palaearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

Scott, D.a. (1980). *A preliminary inventory of wetlands of international importance for waterfowl in West Europe and North-west Africa*. IWRB, Slimbridge, England. 127 pp.

Baldoyle Estuary

Location 53°24'N, 6°12'W. Situated 5km north-east of Dublin City, County Dublin.

Area 203ha

Degree of Protection The site is protected as a nature reserve (203ha) under section 15 Of the Wildlife Act, 1976. The estuary was added to the Ramsar List on 25 October 1988, and is state owned.

Site Description The estuary consists of a tidal bay protected from the sea by a large sand dune system to the east of the site. Approximately 95% of the area dries out at low spring tides. The

revealed sediment at low tide is mainly muddy substrate, with large areas of *Spartina* in the northern portion of the reserve.

International and National Importance The site is of international importance as a wintering area for brent geese *Branta bernicla hrota*, and also supports a variety of other migratory waterfowl species, which the area undoubtedly shares with nearby North Bull.

Changes in Ecological Character No information

Management Practices The estuary is the habitat of certain species of birds included in Annex 1 of EEC Council Directive 409/79 on the conservation of wild birds (Bird Directive) and as such is the subject of special conservation measures concerning their habitat.

Scientific Research and Facilities No information

Principal Reference Material The above information has been supplied by the Irish government.

Clara Bog

Location 53°19'N, 7°32'W. Situated approximately 2km south of the town of Clara in north County Offaly.

Area 480ha

Degree of Protection Declared a nature reserve on 23 September 1987 under the Wildlife Act, 1976 and designated a Ramsar site on 6 December 1988. The site is owned by the Department of Fisheries and Forestry, having recently been acquired from Bord na Mona.

Site Description The site is the largest, reasonably intact raised bog remaining east of the River Shannon, and one of the largest remaining in Ireland. The reserve is divided into two roughly equal parts by a road running north-north-east to south-south-west. The bog contains all the characteristic features of a raised bog: hummocks and hollows, *Sphagnum* lawns, pools and a typical flora. The outstanding feature of the bog is the series of soaks or flushes where mineral-rich water influences the surface of the bog, resulting in the development of distinctive flora characterised by species typical of poor fens. Most of the soaks are marked by the presence of birch *Betula pubescens*. At Lough Roe, on the eastern side, the very rare *Scheuchzeria palustris* was transplanted from Pollagh Bog in the 1950s. It may still be present although it has not been seen in recent years. If present, it would be the only station for it in Ireland.

International and National Importance This site is among the few large raised midland bogs remaining substantially intact.

Changes in Ecological Character No information

Management Practices No information

Scientific Research and Facilities No information

Principal Reference Material The above information has been supplied by the Irish Government and supplemented by:

Oldfield, S. (1984). Mires in danger in western Europe. *Oryx* 21: 229-232.

Mongan Bog

Location 53°19'N, 8°00'W. Situated near Clonmacnoise in County Offaly.

Area 119ha

Degree of Protection The area was designated as a nature reserve on 23 September 1987, under the Wildlife Act, 1976. It was added to the Ramsar list on 6 December 1988. The site is state-owned and is run by An Taisce, a voluntary conservation group.

Site Description The reserve is a classic example of a midland raised bog, lying in a basin surrounded by esker ridges. Mongan is unusually wet and has a particularly pronounced pattern of pools, lawns and hummocks. Hydrological studies suggest that the central part of the bog is still growing. The site is botanically rich, with nearly 50 species of lichen alone, and is one of the Irish wintering sites for the Greenland white-fronted goose *Anser albifrons flavirostris*.

International and National Importance The bog contains plant and animal species of some rarity or restricted distribution in Ireland, including *Rhynchospora fusca* which is at the northern limit of its European distribution here. It also contains the first Irish record of *Gongylidiellum latebricola*, *Biselachista serricornis*, *Aristotelia ercinella*, *Coenonymphatullia* and *Saturnia-pauonia*. The reserve is also a feeding and roosting area in winter for one of the few remaining bogland flocks of Greenland white-fronted goose *Anser albifrons flavirostris*, which is listed in Annex 1 of the EEC Council Directive 409 on the conservation of wildbirds as a species whose habitat requires special conservation measures.

Changes in Ecological Character Peripheral drainage and cutting has affected the water table at the margins of the bog.

Management Practices No information

Scientific Research and Facilities This site is one of the most intensively studied of Ireland's raised bogs.

Principal Reference Material The above information has been supplied by the Irish Government, supplemented by:

Oldfield, S. (1984). Mires in danger in Western Europe. *Oryx* 21: 229-232.

Raheenmore Bog

Location 53°20'N, 7°19'W. Situated 4 miles north-west of Daingean in County Offaly.

Area 162ha

Degree of Protection Established as a nature reserve on 12 November 1987, under the Wildlife Act, 1976. Designated as a Ramsar site on 6 December 1988. The site was donated by Bord na Mona and is state-owned.

Site Description The reserve is a well-developed and exceptional example of a deep midland raised bog. The site has typical fauna and plant communities associated with raised bogs, but without pool systems.

International and National Importance The site is regarded as being of national importance.

Changes in Ecological Character There has been relatively little disturbance from cutting, but in recent years drainage has occurred around the region.

Management Practices No information

Scientific Research and Facilities No information

Principal Reference Material The above information has been supplied by the Irish Government.

Tralee Bay Nature Reserve

Location 52°16'N, 9°48'W. On the north side of the Dingle Peninsula, west of the town of Tralee, County Kerry.

Area 754ha

Degree of Protection State-owned foreshore, established as a nature reserve in June 1989 by Statutory Instrument No. 106. Designated a Ramsar site in July 1989.

Site Description Most of the site comprises intertidal mudflats intersected by a number of tidal channels, creeks and runnels. The flats are composed of very fine sediments in the more sheltered and higher parts of the intertidal zone, grading to sandier sediments near the tip of Derrymore Island. Derrymore Island (which is actually a peninsula) is a recurve sand/gravel spit with dunes and saltmarsh. The area is fringed by saltmarsh to the south and east, and by a deep water channel to the north.

International and National Importance The mudflats and Derrymore Island have been designated as internationally important on ecological (botanical and ornithological) and geomorphological grounds. The wintering population of pale-bellied brent geese *Branta bernicla hrota* is of international importance, while those of wigeon *Anas penelope*, pintail *A. acuta* and teal *A. crecca* are of national importance.

Changes in Ecological Character No information

Management Practices No information

Scientific Research and Facilities No information

Principal Reference Material The above information has been supplied by the Irish Government.

Italy

Area 301,190 sq.km

Population 57,399,108 (1987)

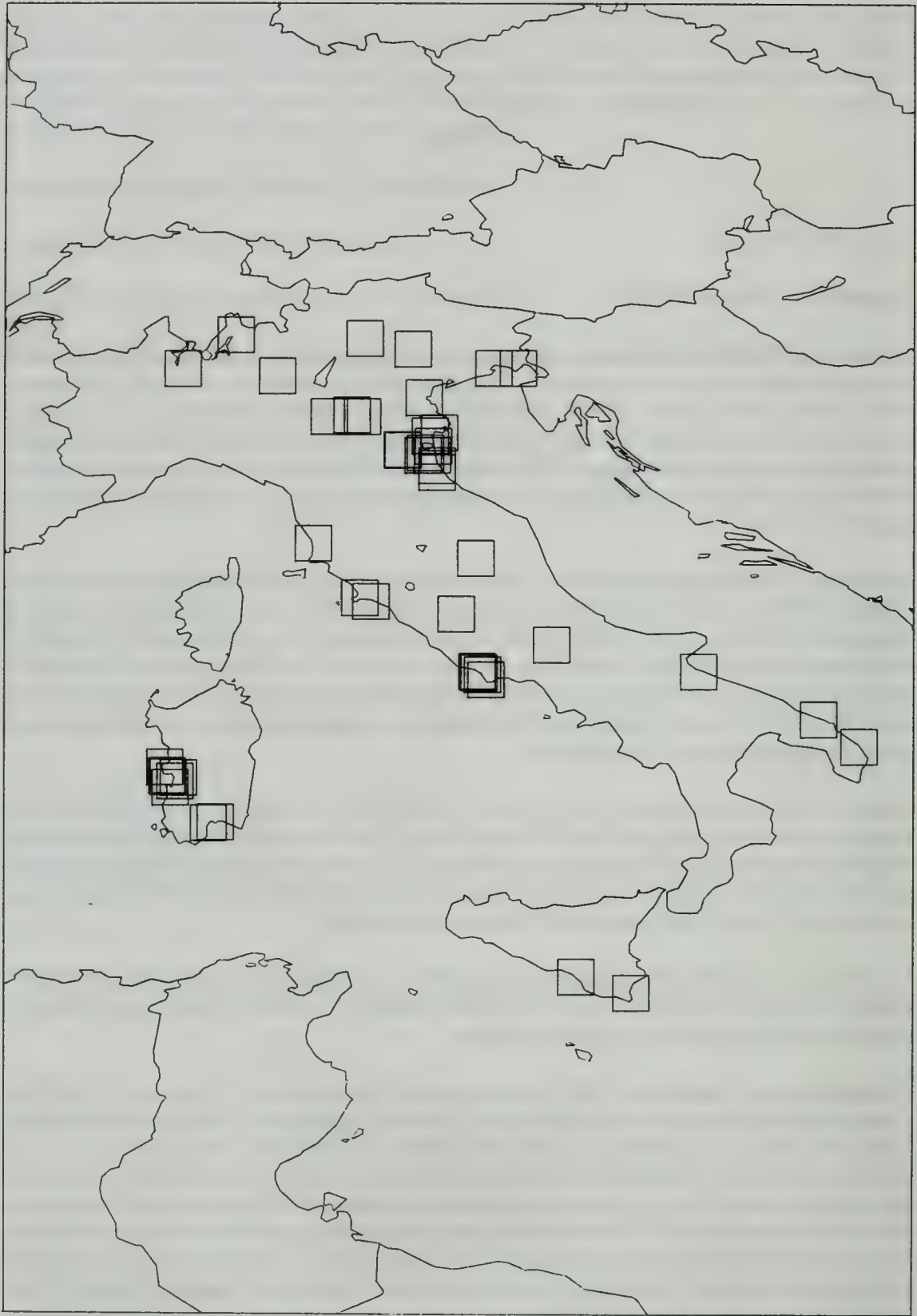
Summary of Wetland Situation In Roman times approximately one tenth of Italy (almost 3 million hectares) consisted of wetlands. Only 764,000ha remained by 1865, and just over a century later, in 1972, after a massive drive to eliminate malaria and to provide agricultural land, the figure had been further reduced to only 190,000ha. A Special Committee of the Senate dealing with ecological problems in 1972, recommended that the remaining wetlands should be preserved and protected as useful and necessary for maintaining an ecological balance in the country as a whole.

Some large wetland complexes still exist, particularly along the north-west shores of the Adriatic (Lagune di Marana e Grado, Laguna di Venezia, Delta del Po and the Valli in the provinces of Ferrara and Ravenna); all of them still retain most interesting flora and fauna, and remnants of their formerly characteristic landscapes. Surveys to assess their importance as habitats for breeding, migrating and wintering waterfowl are continuing, but there is little doubt that these wetlands harbour waterfowl which reach internationally important numbers, especially in severe winters in central and south-east Europe.

Only a few wetland reserves exist along the Tyrrhenian coast (Bolgheri, Orbetello, Saline Tanquinia and Circeo National Park). The wetlands of Sardinia, are important to migrating and wintering waterfowl, including greater flamingos. In some of the 'stagni' the scarce purple gallinule still breeds. It is likely that some of the wetlands in Sicily are important staging posts for migratory waders, and these should be further investigated.

A number of wetlands of the mountainous regions in Northern and Central Italy, and others situated in Puglia, Sicily and even on the small island of Pantelleria, rate as internationally important because of their limnological interest.

Protected Areas Legislation There are no general laws on nature conservation, though the Constitution stipulates that the Republic shall "protect the landscape". The national parks were created by specific legislation and were established both for protection of flora, fauna and landscape, and (with the exception of Gran Paradiso) for tourism. Not until 1968, nine years after establishment of the first nature reserve, was an act passed which conferred full legal status on the term 'nature reserve'. The absence of general or enabling legislation has been exacerbated to some extent by the problems of regionalisation. A presidential decree (616/1977) completed transfer to the regions of administrative responsibility for agriculture, forestry, hunting, fishing (inland), protection of nature, nature reserves and nature parks. More recently some of the responsibility for national parks has also been devolved.



Ramsar Sites in Italy

One issue of past legislation which may have more effect on present day attitudes is that all four major national parks were established by decree during the fascist periods, and were imposed on local communities without adequate compensation.

Protected Areas Administration Prior to 1977, primary responsibility for nature conservation and protected areas rested with the Ministry of Agriculture and Forests (though the Ministry of Cultural and Environmental Heritage also had an interest), and, in particular, with the State Forest Administration. Many of their powers have now been devolved to the regions. Although the legal situation varies from park to park, in at least one (Stelvio) regionalisation has caused some problems because the park lies within more than one region. If there is human activity in the reserves it is generally strictly controlled; this in contrast to national parks where diverse human activities have continued, including agriculture and forestry. In July 1986 a Ministry of the Environment was created, which is trying to increase coordination in conservation effort between the different regions and committees involved.

Sites designated under the Convention Signed subject to ratification on 10 January 1975; ratified on 14 December 1976. 19 sites were listed at ratification, with one site added on 10 March 1978; four on 28 March 1979; one each on 14 May 1979, 2 August 1979, 19 September 1980 and 21 July 1981, six on 4 September 1981, two on 3 May 1982, four on 5 December 1984; one on 12 April 1988 and four on 11 April 1989.

Lago di Mezzola - Pian di Spagna
 Vinchetto di Cellarda
 Sacca di Bellocchio
 Valle Santa
 Punte Alberete
 Palude di Colfiorito
 Palude di Bolgheri
 Laguna di Orbetello (Northern part)
 Lago di Burano
 Lago di Nazzano
 Lago di Fogliano
 Lago di Monaci (see sheet for Fogliano)
 Lago di Caprolace (see sheet for Fogliano)
 Lago di Sabaudia (see sheet for Fogliano)
 Lago di Villetta Barrea
 Stagno S'Ena Arrubia
 Stagno di Molentargius
 Stagno di Cagliari
 Le Cesine
 Valle Cavanata
 Stagno di Cabras and adjacent territory
 Corru S'Ittiri Fishery with salt-pan and contiguous sea area - Stagno di San Giovanni e Marceddi
 Stagno di Pauli Maiori and adjacent territory
 Valle Campotto e Bassarone
 Marano Lagunare - Mouth of the Stella
 Salina di Margherita di Savoia
 Lago di Tovel

Torre Guaceto, adjacent territory and sea area
Valle di Gorino & adjacent territories
Valle Bertuzzi & adjacent water surfaces
Valli residue del Comprensorio di Comacchio (See sheet for Bellochio)
Pialassa della Baiona and adjacent territories
Ortazzo and adjacent territories
Saline di Cervia
Stagno di Sale Porcus
Stagno di Mistras and adjacent territory
Valli del Mincio
Torbiere d'Iseo
Palude Brabbia
Paludi di Ostiglia
Il Biviere di Gela
Valle Avertò
Riserva naturale Vèndicari
Isola Boscone
Bacino dell'Angitola

Government body responsible for administration of the Convention

Ministerio dell'Ambiente, Servizio Conservazione della Natura, Corso Vittorio Emanuele 18,
00186 Roma

Lago di Mezzola - Pian di Spagna

Location 46°13'N, 9°26'E. The lake is near Novate Mezzola town and straddles the border between Como and Sondrio Provinces in the Lombardi region of northern Italy.

Area 1,740ha. Extended from 1,086ha in 1980 by the inclusion of Spagna Plain.

Degree of Protection Mezzola Lake (1,086ha) was designated as a Ramsar site at the time of ratification after 14 December 1976. Spagna plain was included in June 1980 by Ministerial Decree No. 275.

Site Description The site comprises a freshwater lake in the foothills of the Alps connected by a channel to Lake Como, and the broad floodplains around the confluence of the Adda and Mera rivers which flow into the lake.

International and National Importance The wetland is an important breeding and wintering area for mute swan *Cygnus olor*. Numerous waterfowl, including some threatened species, use the lake as a resting station during migration. They include red-crested pochard *Netta rufina*, pochard *Aythya ferina*, tufted duck *A. fuligula*, mallard *Anas platyrhynchos*, teal *A. crecca*, coot *Fulica atra* and great crested grebe *Podiceps cristatus*. Otter *Lutra lutra* is thought to still be present in the area.

Changes in Ecological Character None reported

Management Practices No information

Scientific Research and Facilities The Universities of Milano and Pavia have conducted research on birds and mammals of the lake area.

Principal Reference Material The above information is taken from the decree document (11 June 1980) for the designation *Gazzetta Ufficiale della Repubblica Italiana* No. 275 (7 October 1980).

Vincheto di Cellarda

Location 46°01'N, 11°58'E. Situated between the villages of Cellarda to the south and Nemeoggio to the north-west in Feltre commune, Belluno Province of Venezia, north-east Italy.

Area 99ha

Degree of Protection Designated as a Ramsar site at the time of ratification after 14 December 1976.

Site Description The site lies in a valley bottom in the foothills of the Alps on the west bank of the River Piave, and includes a portion of the channels and mudbanks of this sluggishly flowing braided stretch of the river. The area contains a mixture of willow woodland and meadows, which provide ideal nesting sites and refuges for a varied waterfowl population.

International and National Importance No information

Changes in Ecological Character A network of tracks runs throughout the site, and there is a fishery in the north-west.

Management Practices No information

Scientific Research and Facilities No information

Principal Reference Material The above information is taken from the decree document for the designation *Gazzetta Ufficiale della Repubblica Italiana* No. 70 (11 March 1978).

Sacca di Bellochio/Valli residue del Comprensorio di Comacchio

Location 44°30'N, 12°07'E. Situated about 14 km due north of Ravenna in Ferrara Province, Emilia Romagna.

Area 13,500ha

Degree of Protection Azienda Valli Comacchio and Orsi-Mangelli Preserve are privately owned, and the wetland complex contains several private bird sanctuaries and hunting reserves in which hunting is controlled. The remaining area (Ente Delta Padona) is state owned. The complex also includes a landscape reserve and hydrological reserve, in which the water regime is regulated. 1,000ha of bird refuges with adequate protection have been established. Sacca di Bellochio was designated as a Ramsar site after August 1979. The residual plains of Comacchio were designated as a Ramsar site two years later in September 1981.

Site Description The designated sites comprise the residual Valli di Comacchio and the adjacent Vene Bellochio which extend from the Reno River estuary on the Adriatic to Agosta dam on the western boundary and from Comacchio township in the north to the banks of the Reno River in the south. The Valli di Comacchio are the remnants of a large coastal and inland complex of lagoons and marshes which were extensively drained since the 1850s for agricultural purposes. The Valli, Fossa di Porto, Campo and Lido di Magnavacca constitute a lagoon (maximum depth 2.5m) fed by inflow from the sea and freshwater rivers, particularly the Reno. They are partially separated from one another by sand and shell banks and small islands which indicate historical shorelines. Sacca di Bellochio is part of the Vene Bellochio which are a complex of saltmarshes and parallel basins bordering the Adriatic. The submerged vegetation comprises mainly *Chara* spp., *Lamprothamnium papulosum* (Vene Bellochio and Valle Lido di Magnavacca) and tassel pondweed *Ruppia spiralis* (Valle Fossa di Porto). Halophytic vegetation includes pure stands of shrubby glasswort *Salicornia fruticosa*, and associations in which dominant species include *S. herbacea* or sea blit *Sueda maritima* and saltwort *Salsola soda* or couchgrass *Agropyron elongatum* and golden samphire *Inula crithmoides*. Occasional freshwater bodies support reedbeds of *Phragmites communis* and glasswort *Salicornia*. Orsi-Mangelli Hunting Preserve is the only uncontaminated area at the northern end of the marsh, and is partially covered by woods of stone pine *Pinus pinea*.

International and National Importance The wetland complex supports a rich avifauna including breeding and winter migrant populations. Breeding birds include black-winged stilt *Himantopus himantopus*, avocet *Recurvirostra avosetta*, purple heron *Ardea purpurea*, mallard *Anas platyrhynchos*, garganey *A. querquedula*, shoveler *A. clypeata*, pochard *Aythya ferina*, ferruginous duck *A. nyroca*, shelduck *Tadorna tadorna*, redshank *Tringa totanus*, pratincole *Glareola pratincola*, little tern *Sterna albifrons*, Caspian tern *S. caspia*, sandwich tern *S. sandvicensis*, common tern *S. hirundo*, gull-billed tern *Gelochelidon nilotica*, Mediterranean gull *Larus melanocephalus*, slender-billed gull *L. genei*, herring gull *L. argentatus* and bearded tit *Panurus biarmicus*. Hundreds of thousands of passage and wintering wildfowl visit the wetland complex, including pochard (over 20,000), coot *Fulica atra* (about 40,000), bean goose *Anser fabalis*, white-fronted goose *A. albifrons*, wigeon *Anas penelope*, gadwall *A. strepera*, teal *A. crecca*, mallard, shoveler, ferruginous duck and tufted duck *Anas fuligula*. Otter *Lutra lutra* is thought to still be present in Orsi-Mangelli Preserve.

Changes in Ecological Character Traditional fishing practices are being replaced by fish farming projects, with associated excessive clearing of *Salicornia* vegetation to enlarge the fish ponds. The northern area of the marshes is completely degraded, and the wetlands are slightly contaminated by crop spray and water pollutants carried in by the River Reno. Since the mid 1950s, some 25,000ha of Valli di Comacchio have been drained for cultivation. The reclamation programme has been suspended but there is still some degree of threat from agriculture in Orsi Mangella, as well as in the rest of the Comacchio Valley.

Management Practices The inflow to the Valli from the sea and the Reno River is fully controlled. Orsi-Mangelli Hunting Preserve is well managed, with shooting maintained at a moderate level.

Scientific Research and Facilities Hydrobiological research projects by the Universities of Bologna and Ferrara. Studies have been undertaken concerning the establishment of a regional park.

Principal Reference Material The above information is taken from:

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

Scott, D.A. (1980). A preliminary inventory of wetlands of international importance for waterfowl in west Europe and northwest Africa. *IWRB Special Publication* No. 2. 127 pp.

Additional references:

Ferrari, G., Pirola, A. and Piccoli, F. (1972). Saggio Cartografico della Vegetazione delle Valli di Comacchio. *Ann. Univ. Ferrara. N.S.I.* 1(2): 35-64.

Montalenti, G. (Ed.) (1967). Relazione sulla protezione delle lagune e degli stagni costieri della penisola e delle grandi isole. *Ricerca Scientifica* 38. C.N.R., Roma. 47 pp.

Pondesan, M. and Bucci, V. (1972). Gli antichi cordoni litoranei del settore sud-occidentale delle Valli di Comacchio. *Atti Acc. Sci. Ferrara* 48: 1-18.

Toschi, A. and Spagnesi, M. (1971). Ricerche di Biologia della Selvaggina. *Ricerca Scientifica* 52. Caccia, Bologna. 99 pp.

Valle Santa

Location 44°34'N, 11°50'E. Situated east of Portomaggiore 27km south-east of Ferrara, 27km from the Adriatic and 36km north-west of Ravenna, Ferrara Province, Emilia Romagna.

Area 261ha. Separated from Valle Campotto e Bassarone Ramsar site (1,363ha) by the Sussulano Canal.

Degree of Protection Privately owned by the Società Bonifiche Renane, Valle Santa is a partially protected bird and fish sanctuary with shooting prohibited. Under control of several bodies and the University of Parma. Commercial and sport fishing allowed. Designated as a Ramsar site at the time of ratification after 14 December 1976.

Site Description The site comprises a shallow reservoir (maximum depth 2m) which, with Valle Campotto, supplies Ravenna and its industries and acts as an overflow basin for Reno River floodwaters. It is one of the last remnants of the formerly extensive swamps of the south-east River Po flood plains, which were mostly drained for reclamation during the 19th century. Low level pollution has made it a highly productive eutrophic lake supporting extensive reedbeds of *Phragmites communis*, interspersed with channels and stretches of open water (maintained by man) with floating white water lily *Nymphaea alba* and typical submerged plant associations. The rich aquatic fauna includes pike *Esox lucious*, tench *Tinca tinca* (fished commercially and for sport), and pond terrapin *Emys orbicularis*.

International and National Importance Great numbers of waterfowl including grebes (Podicipedidae), herons (Ardeidae), ducks (Anatidae), rails and coots (Rallidae), plovers (Charadriidae) and sandpipers (Scolopacidae) congregate in the reservoir in winter. Breeding species include night-heron *Nycticorax nycticorax*, purple heron *Ardea purpurea*, squacco heron *A. ralloides*, bittern *Botaurus stellaris*, little egret *Egretta garzetta*, glossy ibis *Plegadis falcinellus*, several hundred pairs of great crested grebe *Podiceps cristatus*, mallard *Anas platyrhynchos*, gadwall *A. strepera*, garganey *A. querquedula*, coot *Fulica atra*, a large colony of whiskered tern *Chlidonias hybridus* and black tern *C. niger*.

Changes in Ecological Character Low level pollution has resulted in a small degree of eutrophication making the waters extremely productive for phyto- and zooplankton and fish. Otter *Lutra lutra* is probably locally extinct.

Management Practices Management is subject to some hydrological constraints, as Valle Sante is a supply reservoir. The water level is kept generally low to attract birds, although the area is sometimes flooded by the River Reno. Some reed cutting and clearing of channels is undertaken.

Scientific Research and Facilities Two companies (Tecneco and Italeco) have carried out ornithological and hydrological studies on behalf of the regional government.

Principal Reference Material The above information is taken from:

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

Additional reference:

Toschi, A. (1968). Interesse faunistico e paesistico delle Valli dolci e salmastre delli Emilia orientale. *Studi Romagnoli* XIX, 12pp.

Punte Alberete

Location 44°32'N, 12°09'E. Situated about 10km north of Ravenna on the north-west coast of the Adriatic, Ravenna Province, Emilia Romagna.

Area 480ha

Degree of Protection Most of the area is owned by the Municipality of Ravenna. The site includes Punte Alberete Bird Sanctuary (222ha) and Valle della Canna created in 1969 which is managed as a nature reserve by WWF and other organisations. Designated as a Ramsar site in August 1981.

Site Description The site comprises only a part of the extensive inland wetland complex which occupies the floodplains of the River Po system north of Ravenna. Much of the site is covered by swampy woodland associations dominated by white poplar *Populus alba* and willows *Salix* spp. Ash *Fraxinus oxycarpa* and English elm *Ulmus procera* grow on the relict sand dunes which mark the former shoreline. The lower lying areas are flooded, mainly by the waters of

the River Lamone, and support extensive reedbeds of *Phragmites communis* with stands of reedmace *Typha latifolia* and *T. angustifolia*, and plant associations with sedges *Carex* spp. and fen-sedge *Cladium mariscus*. The more open water (maximum depth 2m) has a covering of floating aquatic plants, such as white water lily *Nymphaea alba* and pondweeds *Potamogeton* spp., with a rich submerged flora including stonewort *Chara* sp., bladderwort *Utricularia vulgaris* and frogbit *Hydrocharis morsus-ranae*. The marshland vegetation includes greater water parsnip *Sium latifolium*, Jersey orchid *Orchis laxiflora* and field gladiolus *Gladiolus italicus* (segetum). The area has a rich aquatic fauna including the amphibians: newts *Triturus vulgaris meridionalis* and *T. cristatus carnifex*, frogs *Rana dalmatina* and *R. latastei* and pond terrapin *Emys orbicularis*.

International and National Importance The site is an unique example of swampy woodland on the eastern edge of the River Po floodplains and is an important site for breeding and overwintering (up to 15,000) wildfowl. Breeding birds include great crested grebe *Podiceps cristatus*, whiskered tern *Chlidonias hybrida*, bittern *Botaurus stellaris*, gadwall *Anas strepera*, ferruginous duck *Aythya nyroca*, marsh harrier *Circus aeruginosus* and a large heronry of night heron *Nycticorax nycticorax* (4-500 pairs), squacco heron *Ardeola ralloides* (10-20 pairs), purple heron *Ardea purpurea*, little egret *Egretta garzetta* (7-800 pairs) and occasional glossy ibis *Plegadis falcinellus* (1-5 pairs). The winter population includes gadwall, mallard *Anas platyrhynchos*, shoveler *A. clypeata*, garganey *A. querquedula*, pochard *Aythya ferina* (5,000), coot *Fulica atra* (8,000), penduline tit *Remiz pendulinus*, bearded tit *Panurus biarmicus*, occasional ferruginous duck, and also two pairs of breeding pygmy cormorant *Phalacrocorax pygmeus*. Several locally rare invertebrates occur in the wetland, such as beetle *Carabus clathratus antonelli* and the endemic *Iphidrus carrarei*.

Changes in Ecological Character Hunting pressure is often severe in the neighbouring unprotected Valle Mandriole, which is an important feeding ground for the waterfowl breeding populations at Punte Alberete.

Management Practices The bird sanctuary is managed by WWF and other organisations. Water level in the lagoon is controlled; and canals and small pools are kept open. Other management practices include reed-cutting and fishing, and food is put out for the birds in winter.

Scientific Research and Facilities Investigations by the Laboratorio di Zoologia in Bologna, Istituto Botanico di Bologna and a team from two companies (Tecneco and Italeco) in connection with the regional park project. An observation tower, open to the public, has been constructed in the bird sanctuary.

Principal Reference Material The above information is taken from:

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

Additional reference:

Stinchi, E., Toschi, A. and Corbetta, F. (1968). *Le Punte Alberete e la Valle del Lamone. Ricerca Scientifica* 48. C.N.R., Roma.

Palude di Colfiorito

Location 43°01'N, 12°53'E. Situated to the south-east of Forcatura township in Foligno Commune, Perugia Province, Umbria.

Area 157ha

Degree of Protection Designated as a Ramsar site at the time of ratification after 14 December 1976.

Site Description The site comprises marshland and a network of drainage ditches on the limestone plateau (Carsica) between the Eastern Alps and the Illyria Mountains, and is flanked along the south-east and north-east boundary by roads. It provides a valuable refuge for many relict plant species confined to isolated pockets along the Appenine chain of mountains.

International and National Importance No information

Changes in Ecological Character None reported

Management Practices No information

Scientific Research and Facilities The marshland has been the site of numerous university research projects.

Principal Reference Material The above information is taken from the decree document for the designation *Gazzetta Ufficiale della Repubblica Italiana* (17 December 1977).

Palude di Bolgheri

Location 43°14'N, 10°33'E. Situated near Renaione on the west coast in Castagneto Carducci Commune, Livorno Province, Tuscany.

Area 562ha

Degree of Protection Privately owned by the Marquese della Rocchetta. The ponds lie within the Bolgheri Wildlife Refuge (22,000ha) which was established by the owner in 1962 with termination of hunting rights. Management was taken over by WWF Italy in 1970. Designated as a Ramsar site at the time of ratification after 14 December 1976.

Site Description The site is a coastal wetland comprising a freshwater swampland separated from the sea by the Bolgheri sand dunes (tombolo). The marshland is a grid system of pools and ditches recently extended to favour the waterfowl. The site is bounded to the north by a ditch which drains into the sea, to the west by the Tyrrhenian Sea, and to the east by a parallel

road and railway. The Bolgheri sand dunes support a mixed vegetation of woodland and maquis-type associations.

International and National Importance The wetland is the most southerly nesting area in Italy for lapwing *Vanellus vanellus*. Other breeding birds include black-winged stilt *Himantopus himantopus*, night heron *Nycticorax nycticorax*, and purple heron *Ardea purpurea*. Many migrant species of wader and other wildfowl have been recorded, including osprey *Pandion haliaetus*, lesser spotted eagle *Aquila pomarina*, black stork *Ciconia nigra*, crane *Grus grus*, bluethroat *Luscinia svecica* and Blyth's reed warbler *Acrocephalus dumetorum*. Otter *Lutra lutra* occurs in the reserve.

Changes in Ecological Character The marshland has been extended to improve its value to waterfowl by a series of ditches along which water is pumped.

Management Practices Managed as a nature reserve by WWF-Italy.

Scientific Research and Facilities There is an observation tower in the marshlands for ornithological studies.

Principal Reference Material The above information is taken from the decree document of the designation *Gazzetta Ufficiale della Repubblica Italiana* No. 210 (2 August 1977). Supplemented by:

Duffey, E. (1982). *National Parks and Reserves of Western Europe*. Macdonald and Co., London.

Laguna di Orbetello (northern part)

Location 42°27'N, 11°13'E. Coastal lagoon situated at the base of the Argentario peninsula, about 35 kmsouth of the town of Grosseto in Grosseto Province, south-west Tuscany.

Area 887ha

Degree of Protection Part state and part local government ownership. The site is included in the landscape reserve with some protection of the lake area. The area contains 1,000ha of *Salicornia* covered dunes which are protected and managed as a WWF reserve. Designated as a Ramsar site at the time of ratification after 14 December 1976. In 1982 a very important brackish part of this lagoon bordering the Ramsar site was declared a state nature reserve of 800ha.

Site Description The designated site comprises the northern portion of Orbetello Lagoon (4,200ha) and the surrounding coastal wetland. It is a typical brackish lagoon with salinity varying from 15% to 30% (average 20%), separated from the sea by two narrow sand dunes (tombolo). Typical brackish-water vegetation of *Salicornia fruticosa* and some well developed fringing reedbeds of *Phragmites communis*. The shallow parts of the lagoon (average depth 1m) have a submerged vegetation of aquatic genera such as *Chaetomorpha*, *Valonia*, *Cistoseira*, *Cymodocea* and *Zostera*, with an abundance of associated small invertebrates such as sandhop-

pers (Amphipoda) and mosquitoes (Culicidae), which are an important foodsource for visiting birds and commercial fish stocks. Fish species include eel *Anguilla anguilla*, mullet *Mugil* spp., bass *Dicentrarchus labrax* and tooth carp *Aphanius fasciatus*.

International and National Importance The lagoon is an important feeding station for migrating and wintering waterfowl including wigeon *Anas penelope*, teal *A. crecca*, pintail *A. acuta*, pochard *Aythya ferina*, shelduck *Tadorna tadorna*, red-breasted merganser *Mergus serrator*, plovers (Charadriidae), great crested grebe *Podiceps cristatus*, black-necked grebe *P. nigricollis*, cormorant *Phalacrocorax carbo sinensis*, little egret *Egretta garzetta* and flocks of gulls (Laridae). Breeding birds include mallard *Anas platyrhynchos*, black-winged stilt *Himantopus himantopus* (50 pairs), Kentish plover *Charadrius alexandrinus*, stone curlew *Burhinus oedipnemos*, Montagu's harrier *Circus pygargus*, great spotted cuckoo *Clamator glandarius* and bee-eater *Merops apiaster*.

Changes in Ecological Character Visitor pressure is increasing, especially on the coastal dunes. The expansion of Orbetello port, and the organic pollution from the town entering the lake, are increasingly degrading the environment.

Management Practices The areas of *Salicornia*-covered dunes in the WWF reserve are actively managed. Commercial fishing including eel, mullet, bass and tooth carp.

Scientific Research and Facilities Stazione Romana per la Osservazione e la Protezione degli Ocelli has been studying the avifauna since 1965.

Principal Reference Material The above information is taken from:

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

Scott, D.A. (1980). A preliminary inventory of wetlands of international importance for waterfowl in west Europe and northwest Africa. *IWRB Special Publication* No. 2. 127 pp.

Additional reference:

Pratesi, F. *et al.* (1972). In Pedrotti, F. (ed.). *Una Vita per la Natura*. Associazione Italiana per il WWF, Roma. Pp. 331-350.

Lago di Burano

Location 42°24'N, 11°23'E. Situated south of the Argentario Peninsula on the western Tyrrhenian sea coast. 10km east-south-east of Orbetello Ramsar site, in the Grosseto Province of Tuscany.

Area 410ha

Degree of Protection Privately owned and rented by WWF. The reserve was established in 1962, and is part of a 496ha landscape reserve. Hunting is prohibited. Designated as a Ramsar site at the time of ratification after 14 December 1976.

Site Description The site comprises a saline lake about 3km long, isolated from the sea by a double line of sand dunes (tombolo) except for one connecting channel. Several plant associations typical of lagoons and marshlands occur. Dominant species include tassel pondweed *Ruppia spiralis*, reeds *Phragmites communis*, sea club rush *Scirpus maritimus* and fen sedge *Cladium mariscus*. The Tombolo di Capalbio supports a Mediterranean maquis vegetation which includes Monterey cypress *Cupressus macrocarpa*, juniper *Juniperus phoenicea*, olive *Olea europea* var. *oleaster*, myrtle *Myrtus communis*, mastic tree *Pistacia lentiscus* and holm oak *Quercus ilex*. There are scattered patches of herbaceous vegetation with spring sedge *Carex caryophyllea*, clover *Trifolium cherleri*, *Romulea columnae* and *Crassula tillaea*.

International and National Importance The lake is a wintering site for waterfowl, particularly cormorant *Phalacrocorax carbo sinensis*, grey heron *Ardea cinerea*, wigeon *Anas penelope*, teal *A. crecca*, pintail *A. acuta*, pochard *Aythya ferina* and coot *Fulica atra* and breeding site for marsh harrier *Circus aeruginosus* and mallard *Anas platyrhynchos*.

Changes in Ecological Character Disturbances include traffic on the road along the sand dunes, pollution and excavation of sandpits nearby, and intensive tourist use with some accidental fires during dry summers. Before the reserve was established about 6,000 birds were killed annually by hunters, but hunting is now prohibited.

Management Practices Managed as a sanctuary by WWF-Italy. Commercial fishing is still allowed, but hunting is prohibited.

Scientific Research and Facilities WWF has supervised research on the lake biota.

Principal Reference Material The above information is taken from:

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

Additional references:

Orsomando, E. (1971). Censimento dei biotopi de rilevante interesse vegetazionale meritevole di conservazione in Italia. *Soc. Bot. Ital.* publication. Camerino.

Pratesi, F. (1970). Palude, lagune e stagni costieri in Italia: nuove prospettive ed indirizzi per la loro conservazione. *Italia Nostra* 6. Roma. 62 pp.

Lago di Nazzano

Location 42°13'N, 12°36'E. Situated in the hills north-east of Rome in Roma Province, Latium.

Area 265ha

Degree of Protection Designated as a Ramsar site at the time of ratification after 14 December 1976.

Site Description The site is an artificial reservoir formed by damming the River Tevere where it meanders through the flat plain just south of Torrita, and includes the surrounding marshes. The lake level is regulated by man. The whole region, being close to Rome, is highly developed. The north-south motorway to Rome is on the western boundary of the site, a main railway on the eastern boundary, and a major road cuts across the site from east to west.

International and National Importance A wintering area for dabbling ducks (1,000 birds maximum), including teal *Anas crecca*, pintail *A. acuta*, pochard *Aythya ferina* and coot *Fulica atra*.

Changes in Ecological Character The whole reserve is artificially maintained by the dam system. It is a popular tourist attraction for the nearby urban populations, and there is easy road access. The lake shores are dissected by numerous pathways.

Management Practices The hydrological regime is regulated.

Scientific Research and Facilities No information

Principal Reference Material The above information is taken from the decree document for the designation *Gazzetta Ufficiale della Repubblica Italiana* No. 45 (15 February 1978).

Laghi di Fogliano, Monaci, Caprolace e Sabaudia (Laghi Pontini)

Location 41°17'-24'N, 12°54'-13°02'E. The lakes are within Circeo National Park on the west coast of Italy in Latina Province, Latium.

Area Fogliano Lake 395ha; Monaci Lake 94ha; Caprolace Lake 229ha; Sabaudia Lake 1,475ha. Within Circeo National Park 8,400ha.

Degree of Protection State owned. The lakes were included in Circeo National Park in 1975. Circeo was established in 1967 and is administered by the Ministry of Agriculture and Forestry. The park also contains the Forêt Domaniale du Circeo (near Sabaudia Lake) which was approved as a biosphere reserve in January 1977. The designated sites have partial protection from hunting and commercial fishing is allowed. The four lakes were designated as four separate Ramsar sites at the time of ratification after 14 December 1976.

Site Description The four sites are brackish coastal lakes isolated from the sea, except for occasional narrow outflow channels, by an extensive sand dune system. The salinity of the lakes varies from 1% (Monaci) to 3.9% (Caprolace) depending on the presence or absence of direct connections with the sea, another lake or freshwater inflow. Aquatic plants include *Potamogeton* spp. and *Chaetomorpha*, with marsh plant communities along the lake shores and Mediterranean maquis vegetation on the dunes including Phoenician juniper *Juniperus phoenicea*, prickly juniper *J. oxycedrus* and *Thymelaea hirsuta*. The lakes provide a favourable environment for fish such as eel, sand smelt, sole, bass (*Anguilla anguilla*, *Atherina presbyter*, *Solea* sp., *Dicentrarchus labrax*), silver bream (*Diplodus sargus*, *Sparus auratus*) and mullets (*Mugil cephalus*, *M. chelo*, *M. capito*). The coastal area has a mean annual rainfall of 850-937mm

falling on 82-105 days. Mean annual temperature is 15.5°C with mean annual minimum of 11°C. The Palace of the Roman Emperor Dominican, built in the first century AD on the shores of Sabaudia Lake, is being excavated.

International and National Importance The lakes are important overwintering and resting stations for migratory waterfowl, with over 220 recorded species, including cormorant *Phalacrocorax carbo sinensis* (January maximum 600), garganey *Anas querquedula* (up to 15,000), wigeon *Anas penelope* (up to 3,000), shoveler *A. clypeata* (up to 470), teal *A. crecca* (up to 3,000), pochard *Aythya ferina* (up to 2,600), coot *Fulica atra* (up to 21,000), spoonbill *Platalea leucorodia* (up to 20 on passage) and glossy ibis *Plegadis falcinellus* (up to 30 on passage).

Changes in Ecological Character The whole coastal area has been considerably modified by human interference, and about 8,000 people live inside the park boundary centred on the recently constructed new town of Sabaudian on the north-east shore of Sabaudia Lake in the designated area. A system of asphalt roads has been constructed in the coastal zone and along the length of dunes which separate the lakes from the sea. The increase in visitors from Rome and nearby urban areas, using the improved access roads, is leading to degradation of this delicate ecosystem. The lakes are threatened by increasing levels of pollution discharged by local industrial centres. The construction of the new town and tourist accommodation required filling in of some wetland areas. Shooting pressure on the wildfowl is heavy in some areas.

Management Practices There are commercial fisheries. Some sites have partial protection from hunting.

Scientific Research and Facilities The Laboratorio Centrale di I'drobiologia based in Rome has made some studies of the lakes. The Roman site at Sabaudia is being excavated.

Principal Reference Material The above information is taken from:

Allavena, S. (1978). Circeo National Park: reclaiming a rich heritage. *Parks* 3(3).

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

Duffey, E. (1982). *National Parks and Reserves of Western Europe*. Macdonald and Co., London.

Scott, D.A. (1980). A preliminary inventory of wetlands of international importance for waterfowl in west Europe and northwest Africa. *IWRB Special Publication No. 2*. 127 pp.

Additional reference:

Montalenti, D. (ed.) (1967). Relazione sulla protezione delle lagune e degli stagni costieri della Penisola e della grande isole. *Quaderni de la Ricerca Scientifica* 38. C.N.R., Roma. 47 pp.

Lago di Villetta Barrea

Location 41°47'N, 13°58'E. Situated between Villetta Barrea and Barrea villages, 35km south of Siena in the central Apennines, L'Aquila Province, Abruzzi.

Area 303ha (contained within Abruzzo National Park 40,000ha)

Degree of Protection The lake is owned by the local municipality, and is administered by Abruzzo National Park Agency. The designated site is within Abruzzo National Park established in 1922 and protected by law in 1923. The site therefore has full protection. Abruzzo received the European Diploma Award for the Conservation of Nature from the Council of Europe in 1972. The lake was designated as a Ramsar site at the time of ratification after December 1976.

Site Description The freshwater lake lies at about 800m in the north-east of Abruzzo National Park.

International and National Importance It is a wintering area for teal *Anas crecca*, mallard *A. platyrhynchos* and wigeon *A. penelope*. Several endemic amphibian species and subspecies occur in the site: yellow-bellied toad *Bombina variegata pachypus* and toad *Bufo bufo spenosa*.

Changes in Ecological Character There is heavy visitor pressure in this easily accessible area of Abruzzo.

Management Practices The lake is managed as part of the national park which has some 50 permanent and 50 temporary staff.

Scientific Research and Facilities There is an active research programme in the national park.

Principal Reference Material The above information is taken from:
Council of Europe (1972). Diplôme Européen pour la Sauvegarde de la Nature (leaflet).

Stagno S'Ena Arrubia

Location 39°49'N, 8°34'E. Situated north of Arborea township on the Gulf of Oristano, Oristano Province in western Sardinia.

Area 300ha

Degree of Protection Owned by the Land Reclamation Syndicate of Ardorea (Consorzio di Bonifica di Arborea). The site lies within Oasi Permanente di Protezione Faunistica e di Catura (351ha), in which hunting is prohibited. Commercial fishing is allowed. Designated as a Ramsar site at the time of ratification after 14 December 1976.

Site Description The freshwater lagoon is the last remnant of Sassu Pond (originally 3,270ha) which included over 200 small ponds and marshes, all reclaimed for agriculture between 1934 and 1937. The lagoon once contained brackish water, but the natural channel connecting the site to the sea has been converted to an outflow canal with sluice control and is fed by three canals which derive their water from irrigation channels and run-off from surrounding farmland. The submerged aquatic vegetation is characterised by curled pondweed *Potamogeton crispus*, fennel-leaved pondweed *P. pectinata*, horn-wort *Ceratophyllum demersum* and water milfoil *Myriophyllum verticillatum* with extensive reedbeds of *Phragmites communis*, reedmace *Typha*

latifolia and sea club rush *Scirpus maritimus* fringing the shallow edges and on the small islands in the southwest of the lagoon. The temporary flooded areas support a typical halophytic vegetation of searush *Juncus maritimus*, cordgrass *Spartina* sp. (probably *S. versicolor*) and glasswort *Salicornia fruticosa*. There is a small area of pine woodland on the sand dunes which separate the lagoon from the sea. It has a typical Mediterranean maquis type shrub layer with narrow-leaved cistus *Cistus monspeliensis*, mastic tree *Pistacia lentiscus*, *Asparagus albus* and the broom *Calicotome spinosa*. The lagoon waters support an abundant fish population including carp, eel *Anguilla anguilla* and mullet *Mugil* sp. *Gambusia affinis* was introduced during the anti-malaria campaign, and has become established in the canals.

International and National Importance The lagoon is an important breeding location for purple gallinule *Porphyrio porphyrio*, with 40-45 pairs recorded each year from 1966 to 1976. Other breeding species include great crested grebe *Podiceps cristatus* (3-5 pairs), little grebe *Tachybaptus ruficollis*, purple heron *Ardea purpurea* (10 pairs), little bittern *Ixobrychus minutus*, mallard *Anas platyrhynchos*, pochard *Aythya ferina* (2-3 pairs 1979), ferruginous duck *A. nyroca* (irregular), red-crested pochard *Netta rufina* (5 pairs), coot *Fulica atra*, moorhen *Gallinula chloropus*, water rail *Rallus aquaticus* and marsh harrier *Circus aeruginosus* (1 pair 1980). Numerous migratory birds stop over or winter in the wetland, including little grebe (480 September), cormorant *Phalacrocorax carbo sinensis* (60 January), grey heron *Ardea cinerea* (65 January), teal *Anas crecca* (maximum 1,600 January), tufted duck *Aythya fuligula* (1,300 January), ferruginous duck (210 September) and coot (8,000 February).

Changes in Ecological Character The area surrounding the lagoon has been extensively reclaimed for agriculture, and the outflow channel into the sea is now controlled by a sluice. Water entering the lagoon from the surrounding farmland carries a high level of artificial fertilisers and pesticides, resulting in eutrophication of the waters and consequent change in vegetation. Partially decomposed organic debris is collecting on the bottom. The continuing eutrophic conditions could soon have a detrimental effect on the wetland ecology, and the fish mortality rate is already high - especially in summer due to de-oxygenation of the water. There is some poaching within the protected area.

Management Practices The water level of the lagoon is controlled by a pumping station, and the lagoon is utilised for fish production. Hunting is prohibited.

Scientific Research and Facilities Study of local vegetation by the University of Sassari; geomorphological research by the University of Cagliari; and mid-winter counts of waterfowl from 1974-77 in cooperation with IWRB. A comprehensive biological and hydrological research programme to improve planning and conservation of Sardinia's coastal wetlands has been launched by the Regione Autonome della Sardegna.

Principal Reference Material The above information is taken from:

Schenk, H. (1980). Wetlands of International Importance in Sardinia. Annex to the Italian National Report prepared for the Conference on the Conservation of Wetlands of International Importance especially as Waterfowl Habitat held in Cagliari, Italy.

Additional references:

Di Gregoria, F. (1977). Studio geomorfologico del Golfo di Oristano. *Boll. Soc. Sard. Sci. Nat.* 16: 113-122.

Hudson, R. (1975). *Threatened birds of Europe*. London.

- Morani, V. (1957).** *La bonifica di Arborea di Sardegna e i suoi problemi agronomici.* Gallizi, Sassari.
- Schenk, H. (1976).** Analisi della situazione faunistica in Sardegna. Uccelli e mammiferi. *SOS Fauna, Animali in pericolo in Italia.* Pp. 465-556.
- Valsecchi, F. (1972).** La vegetazione dello stagno di S'Ena Arrubia nel Golfo di Oristano.
- Walter, H. (1964).** Vogel an sardischen Salinen. *Bonn. Zool. Beitr.* 15:198-210.

Stagno di Molentargius

Location 39°14'N, 9°09'E. Situated on the northern shore of Cagliari Gulf between Cagliari township to the west and Quartu S. Elena to the east in Cagliari Province, southern Sardinia.

Area 1,401ha; including Molentargius pond (454ha), Quartu pond (218ha), Bellarosa pond (118ha) and Is Arenas fossilised dunes (about 600ha).

Degree of Protection 500ha privately owned and the remaining area state owned. The designated site is a landscape reserve in which hunting is prohibited. Designated as a Ramsar site at the time of ratification after 14 December 1976.

Site Description The site comprises a lagoon complex of the man-made saltpans Molentargius and Quartu ponds; Bellarosa pond, which is a freshwater basin separated from the saline evaporation ponds by a large earth bank; and the fossilised dunes of Is Arenas which lie between Molentargius and Quartu ponds. The saltpans are fed with seawater through an artificial canal into Molentargius pond which acts as the primary evaporation basin. The gradient of salinity increases from 3.5 parts per thousand in the peripheral basins to 10 parts per thousand in the shallows (Bassofondo) from where the water flows through a connecting canal into the second evaporation basins of Quartu pond where the salt concentration increases to 20 parts per thousand prior to entering the final crystallisation pans. The saline density is lowest during winter, due to high rainfall and minimum evaporation, and highest in July. The salt is extracted in September. The vegetation of the less saline peripheral basins is characterised by tassel pondweed *Ruppia spiralis*, glasswort *Salicornia fruticosa* and sea purslane *Halimione portulacoides*, with a rich aquatic fauna of molluscs, crustacea and insects. Fish species include smelt *Atherina mochon* and *Ciprinodon calaritanus*, which are abundant in the shallow medium-salinity waters. Vegetation cover becomes more sparse with increasing salinity, with sea worm-wood *Artemisia maritima*, *Dunalia* sp. and blue green algae (Cyanophyceae) in basins of medium to high salinity, and halophytic communities of fleabane *Inula crithmoides*, *Arthrocnemum* sp., hairgrass *Aira capillaris*, sea plantain *Plantago maritima*, squirrel-tail grass *Hordeum marinum* and *Halocnemum strobilaceum* along the edge of Quartu pond. Bellarosa pond originally stored freshwater from three temporary streams and regularly dried up in summer. Since the early 1960s, sewage inflow to the pond has gradually transformed it from a temporary pond with halophytic vegetation to a permanent freshwater system with rapidly expanding reedbeds of *Phragmites isiaca*, *Typha angustifolia* and *T. latifolia*. Floating vegetation is characterised by water milfoil *Myriophyllum spicatum*, *Zostera* sp. and (especially in spring and summer) an extensive coverage of the alga *Enteromorpha intestinalis*. In temporary flooded areas there are dense zones of *Juncus subulatus*, surrounded by glasswort *S. fruticosa*, sea purslane *H. portulacoides*, *Cressa cretica* and sea aster *Aster tripolium*, with bushes of shrubby orache *Atriplex*

halimus along the raised banks. The fossilised dunes are covered by crops such as cereals, vines and almond orchards, and act as an effective buffer zone against the sewage inflow.

International and National Importance Breeding waterfowl include purple gallinule *Porphyrio porphyrio* (45 pairs 1980), black-winged stilt *Himantopus himantopus* (50 pairs 1980), avocet *Recurvirostra avosetta* (200 pairs 1976), little tern *Sterna albifrons* (about 100 pairs 1971: continual decline), little grebe *Tachybaptus ruficollis*, mallard *Anas platyrhynchos*, garganey *A. querquedula* (1-2 pairs 1965-80), pochard *Aythya ferina* (40 pairs 1980), water rail *Rallus aquaticus*, moorhen *Gallinula chloropus*, coot *Fulica atra*, little ringed plover *Charadrius dubius* (single pairs irregularly), Kentish plover *C. alexandrinus* (20-30 pairs) and herring gull *Larus argentatus michahellis* (single pairs irregularly). Greater flamingo *Phoenicopterus ruber* nested in the area in 1975 and 1980. Migratory waterfowl include cormorant *Phalacrocorax carbo sinensis* (maximum 620 in 1979), greater flamingo (1,437 January average 1974-78; 3,200 November), shoveler *Anas clypeata* (1,538 January average 1974-78; 2,500 January maximum 1980), coot (10,000 December), Kentish plover (800 in September), spotted redshank *Tringa erythropus* (840 in October), little stint *Calidris minuta* (400 in November), Audouin's gull *Larus audouinii* (70 July/August), grey heron *Ardea cinerea* (200 in November), little egret *Egretta garzetta* (330 November), great white egret *A. alba* (3 in November/December), shelduck *Tadorna tadorna* (120 January), wigeon *Anas penelope* (1,100 November; maximum 2,500 January), mallard (2,200 November), pochard (2,600 January), little ringed plover (320 September), black-tailed godwit *Limosa limosa* (650 March), redshank *Tringa totanus* (1,000 November), marsh sandpiper *T. stagnatilis* (5-10 April), slender-billed gull *Larus genei* (70 April), little gull *L. minutus* (330 February), black tern *Chlidonias niger* (660 September). The site is one of the few Italian overwintering areas for black-winged stilt (30-60), wood sandpiper *Tringa glareola* (10-15), ruff *Philomachus pugnax*, bluethroat *Luscinia svecica cyanecula* and swallow *Hirundo rustica*.

Changes in Ecological Character The great increase in nutrient levels (particularly phosphates) in Bellarosa Minore basin, as a result of sewage inflow since the 1960s, initially increased the diversity of vegetation types, and resulted in an increase of breeding bird species from 8 in 1962 to 22 in 1976. Eutrophication is still increasing, and some areas are now totally covered by reedbeds with partially decomposed organic debris collecting on the basin floor. Sulphide-reducing bacteria associated with the eutrophic conditions release hydrogen sulphide, which can poison shallow waters. These chemical and environmental changes could soon have a detrimental effect on the ecology of the pond. Uncontrolled visitor access and unleashed dogs disturb the bird breeding colonies, and power lines crossing the saltpans are a hazard to birds in flight.

Management Practices Plans have been proposed by the Commune di Cagliari to build a sewage treatment plant in the area of Is Arenas dunes. It is hoped that this will improve the eutrophic conditions in Bellarosa Minore. Salt is extracted commercially from the state saltpans, and the water level of the ponds is regulated. The regional government of Sardinia has been promoting a conservation and utilisation plan for the entire wetland area.

Scientific Research and Facilities Geomorphological, vegetation and ornithological studies have been carried out. A hydro-biological research programme was carried out by Cagliari University in 1980. Annual mid-winter bird census is conducted in cooperation with IWRB.

Principal Reference Material The above information is taken from:

Schenk, H. (1980). Wetlands of International Importance in Sardinia. Annex to the Italian National Report prepared for the Conference on the Conservation of Wetlands of International Importance especially as Waterfowl Habitat held in Cagliari, Italy.

Additional references:

Hudson, R. (1975). *Threatened birds of Europe*. London.

Massoli-Novelli, R. (1976). *Lo Stagno di Molentargius*. Cagliari.

Mistretta, P., Mossa, L., Schenk, H., Lo Monaco, M. and Puddu, P. (1976). Il sistema del Molentargius. *Critica Tecnica* 5(3): 1-24.

Palmerini, V. and Zidda, P. (1977). Ricerca geosedimentologica su alcuni sondaggi effettuati negli Stagni di Molentargius e Quartu (Cagliari). *Redn. Sem. Fac. Sci.* Università di Cagliari 62: 314.

Schenk, H. (1970). Über Vorkommen, Salztoleranz, Vergesellschaftung und Mäuser des Schwarzhalsstauchers *Podiceps nigricollis* auf Sardinien. *Vogelwelt* 91: 230-235.

Schenk, H. (1976). Analisi della situazione faunistica in Sardegna. Uccelli e mammiferi. *SOS Fauna, Animali in pericolo in Italia* p. 465-556.

Soprintendenza ai Monumenti e Gallerie di Cagliari (1975). Piano Territoriale Paesistico del Molentargius. Cagliari.

Walter, H. (1964). Vogel an sardischen Salinen. *Bonn. Zool. Beitr.* 15: 198-210.

Stagno di Cagliari

Location 39°13'N, 9°03'E. Situated on the northern shore of Cagliari Gulf to the west of Cagliari township in Cagliari Province, southern Sardinia.

Area 3,466ha. Santa Gilla pond and Macchiareddu saltpan were added to the Ramsar site in 1979, increasing the area from 3,105ha. 258ha were removed from the site after 1980 to allow construction of the industrial port of Cagliari, but 360ha were subsequently added at the other end of the designated water surface.

Degree of Protection State owned. The Ramsar site lies within Oasi Permanente Faunistica (5,000ha), in which hunting is prohibited. Commercial and sport fishing have been banned since 1976. Designated as a Ramsar site at the time of ratification after 14 December 1976.

Site Description The site comprises Cagliari pond and the contiguous salt pans on the west bank. The site is bounded to the east by the Cagliari-Elmas railway, and separated from the saline Cagliari Bluff by sand dunes. The site is part of a flooded delta fed by freshwater inflow from the Cixerri and Mannu rivers, which has been modified extensively by land reclamation schemes. The man-made salt pans now cover nearly 2,000ha of the Cagliari pond area, and are divided into a series of connected evaporation basins in which the salinity increases along a gradient of 3.5 - 20 parts per thousand. The salt is extracted in September following the dry summer. The open lagoon supports an abundance of molluscs such as cockles, carpet shell, Mediterranean mussel (*Cerastoderma* sp., *Venerupis decussatus*, *Mytilus galloprovincialis*); crustacea such as Mediterranean crab *Carcinus mediterraneus*; and fish such as eel, smelt, bass, sole, gilthead (*Anguilla anguilla*, *Atherina mochon*, *Dicentrarchus labrax*, *Solea solea*, *Sparus*

auratus) and mullets (*Mugil auratus*, *M. cephalus*). The northern shore of the pond near the freshwater inflow is dominated by large reedbeds of *Phragmites communis*, *Typha* sp. and *Juncus* spp. The central and southern areas of the lagoon, and the low salinity saltpans, are characterised by typical brackish and saltwater associations of glasswort *Salicornia* sp., seablite *Sueda* sp., orache *Atriplex* sp., and the very localised *Halocnemum strobilaceum*.

International and National Importance The wetland is important for breeding and migrating birds. Breeding birds include purple gallinule *Porphyrio porphyrio* (30-50 pairs), black-winged stilt *Himantopus himantopus* (40-70 pairs), avocet *Recurvirostra avosetta* (250 pairs in 1980), Kentish plover *Charadrius alexandrinus*, gull-billed tern *Gelochelidon nilotica* (90 pairs in 1980), little tern *Sterna albifrons* (200 pairs), little egret *Egretta garzetta* (10-15 pairs in 1979: first recording record for Sardinia), little bittern *Ixobrychus minutus*, shelduck *Tadorna tadorna* (2 pairs in 1979), mallard *Anas platyrhynchos*, marsh harrier *Circus aeruginosus* (1-2 pairs), water rail *Rallus aquaticus*, moorhen *Gallinula chloropus*, coot *Fulica atra*, little ringed plover *Charadrius dubius* (maximum 10 pairs), redshank *Tringa totanus* (3-5 pairs), pratincole *Glareola pratincola* (single pairs breeding irregularly), herring gull *Larus argentatus* (about 50 pairs), black-headed gull *L. ridibundus* (20 pairs in 1980), common tern *Sterna hirundo* (50-60 pairs in 1980). In 1979 about 50 pairs of greater flamingo *Phoenicopterus ruber* nested in the wetland, and in 1980 breeding purple gallinule and over 700 pairs of slender-billed gull *Larus genei* were recorded: all on the Red List of threatened birds in Europe (Hudson, 1975). Migratory waterfowl include cormorant *Phalacrocorax carbo sinensis* (maximum 620 in 1979) with the winter population continually increasing from 1976 due to lack of competition from fishermen, greater flamingo *Phoenicopterus ruber*, avocet *Recurvirostra avosetta* (800 in November), little stint *Calidris minuta* (1,000 in February), black-necked grebe *Podiceps nigricollis* (140 in November), great white egret *Egretta alba* (3-5 in October to January), wigeon *Anas penelope* (2,400 in January), pintail *Anas acuta* (2,350 in January), pochard *Aythya ferina* (3,700 in February), coot *Fulica atra* (7,100 in January), marsh sandpiper *Tringa stagnatilis* (25 in April), curlew sandpiper *Calidris ferruginea* (500 in August), Audouin's gull *Larus audouinii* (regularly up to 35 in July/August) and slender-billed gull *L. genei* (up to 50 in October/March).

Changes in Ecological Character Industrial pollution (mainly from a petro-chemical plant built on the north-west shore of the pond in the 1960s) and urban pollution have resulted in a marked decline of the fish population. All fishing is now prohibited. An industrial port is now being built on Cagliari Pond, and the ecological consequences for the Ramsar site will be negative. Bird breeding colonies in the salt pans are being disturbed by poachers and illegal egg collecting.

Management Practices The RAS implemented a programme for about 2,000ha of the pond to reduce pollution. A network of stations has been established to monitor the physical, chemical and biological parameters within the pond system. Wetland management measures have been planned for 360ha in the south-west of S. Gilla saltpan, with emphasis on the wildfowl population.

Scientific Research and Facilities Cagliari University has been studying the local flora, hydrobiology of the pond, and effects of pollution since 1965. There is a long-term research programme (started in 1976) on the bird breeding communities in the saltpans, particularly the ecology of slender-billed gull, by the Centro Italiano Studi Ornithology. Regular waterfowl censuses are carried out in January as part of a mid-winter population monitoring scheme

coordinated by IWRB, and monthly counts are made of the flamingo population in cooperation with Tour du Valat/Carmague.

Principal Reference Material The above information is taken from:

Schenk, H. (1980). Wetlands of International Importance in Sardinia. Annex to the Italian National Report prepared for the Conference on the Conservation of Wetlands of International Importance especially as Waterfowl Habitat, held in Cagliari, Italy.

Additional references:

Cottiglia, M., Manca, G. and Mascia, L. (1968). Fenomeni di inquinamento nelle acque della Sardegna. Influenza di una industria petrolchimica sul biotopo salmastro di S. Gilla e conseguenti ripercussioni sulla ittiofauna. *Acqua Industriale* pp 3-19.

Cottiglia, M., Axia, C. and Tagliasacchi, M.L. (1973). L'inquinamento nello Stagno di Cagliari. *La Programmazione in Sardegna* 48: 3-55. Cagliari.

Hudson, R. (1975). *Threatened birds of Europe*. London.

Italia Nostra (1973). *Santa Gilla - una laguna condannata a morte*. Cagliari.

Mistretta, P., Mossa, L. and Schenk, H. (1975). Lo Stagno di Cagliari come zona umida d'importanza internazionale in base alla Convenzione di Ramsar (Iran) 1971. Relazione p. 1-13 e allegati. Regione Autonoma della Sardegna. Assessorato Difesa Ambiente.

Schenk, H. (1976). Analisi della situazione faunistica in Sardegna. Uccelli e mammiferi. *SOS Fauna, Animali in pericolo in Italia* Pp. 465-556.

Walter, H. (1964). Vogel an sardischen Salinen. *Bonn. Zool. Beitr.* 15: 198-210.

Le Cesine

Location 40°20'N, 18°23'E. Situated on the east coast of the 'heel' of southern Italy, north of Cape Otranto (the eastern extreme of Italy) in Vernole Commune, Lecce Province, Puglia.

Area 620ha

Degree of Protection The site is managed as a nature reserve by WWF-Italy with shooting prohibited. Designated as a Ramsar site in December 1977.

Site Description The site comprises a coastal brackish wetland centred around the swamp of Pantano Grande, which is fed by the freshwater Collettore canal entering the reserve near Idrovoro monument in the north. Habitats include marshland, patches of woodland, isolated brackish pools and sand dunes fringing the Adriatic shoreline. The designated area is bounded to the east by the Adriatic sea, and to the west and south by the Allacciante canal. Several tracks and pathways provide access to most parts of the site.

International and National Importance The site is an important resting station for migrants and overwintering birds, with over 10,000 birds visiting the wetland each year. Species include glossy ibis *Plegadis falcinellus* (100 on passage), black-winged stilt *Himantopus himantopus* (150), little egret *Egretta garzetta* (300), spoonbill *Platalea leucorodia* (30), crane *Grus grus* (100), teal *Anas crecca* (up to 3,000) and gull-billed tern *Gelochelidon nilotica* (40-50 on passage).

Changes in Ecological Character None reported (1980)

Management Practices No information

Scientific Research and Facilities No information

Principal Reference Material The above information is taken from the decree document for the designation *Gazzetta Ufficiale della Repubblica Italiana* No. 215 (8 August 1977). Supplemented by:

Scott, D.A. (1980). A preliminary inventory of wetlands of international importance for waterfowl in west Europe and northwest Africa. *IWRB Special Publication* No. 2. 127 pp.

Valle Cavanata

Location 45°45'N, 13°29'E. Situated on the northern shore of the Gulf of Trieste on the Adriatic. In Grado Commune, Gorizia Province, Friuli-Venezia Giulia, north-east Italy.

Area 243ha

Degree of Protection Designated as a Ramsar site in March 1978.

Site Description The site comprises the brackish Cavanata pool; an artificial fishery separated from the pool by a sand embankment; the terminal portion of Averso Canal; and surrounding marsh areas. The site is separated from the Gulf of Trieste by a series of sandbanks, and is surrounded by reclaimed agricultural land irrigated by a network of channels. The pool supports a rich aquatic fauna with amphibians, reptiles such as pond terrapin *Emys orbicularis*, fish, crustacea and molluscs.

International and National Importance The site is an important breeding area and rest station for migrating waterfowl, particularly greylag goose *Anser anser* and breeding little tern *Sterna albifrons*.

Changes in Ecological Character None reported (1978)

Management Practices The fishery is managed for commercial purposes.

Scientific Research and Facilities No information

Principal Reference Material The above information is taken from the decree document for the designation *Gazzetta Ufficiale della Repubblica Italiana* No. 50 (20 February 1978).

Stagno di Cabras and adjacent territory

Location 39°53'N, 8°28'E. Situated in the south-east of Sinis Peninsula in Riola Sardo Cabras Commune, Oristano Province, west Sardinia. Just south of Sale Porcus Ramsar site.

Area 3,575ha

Degree of Protection Privately owned. The Regione Autonoma della Sardegna was negotiating purchase of some of the area in 1980. Hunting is prohibited in about 30ha on the northern edge of Mari e Pauli pond, which is protected as an Oasi Permanente di Protezione Faunistica e di Cattura. A regional nature park or a series of nature reserves, which would include Cabras pond, have been proposed for Sinis peninsula. Designated as a Ramsar site in March 1979.

Site Description Cabras pond is the largest shallow freshwater lake in Sardinia, and together with Mistras pond and Sale Porcus (Ramsar sites) is a remnant of an ancient channel which once separated Sinis peninsula from the mainland. Mare Foghe River is the main freshwater feeder, with smaller inflows along the eastern edge draining nearby agricultural land. The pond is joined to Oristano Gulf by a natural connecting channel, but the inflow of seawater is minimal, especially since a large canal was constructed nearby leading to the gulf. The aquatic vegetation is characterised by water milfoil *Myriophyllum verticillatum*, horn-wort *Ceratophyllum* sp., pondweed *Potamogeton* spp. and *Enteromorpha* sp., with tassel pondweed *Ruppia spiralis* in the more brackish areas such as along the eastern edge of the pond. Extensive beds of pennywort *Hydrocotyle ranunculoides* grow along the main pond. Some mixed stands of *Phragmites communis* and sea club rush *Scirpus maritimus* occur. In Mari e Pauli pond there is a typical vegetation succession from *P. communis* to reedmace *Typha* sp. The series of depressions along the eastern edge of Cabras pond collects rainwater from October to April but usually dry out completely during the summer. Mineral salts accumulate as a result of these alternating wet and dry periods and a typical halophytic plant community has developed, with glasswort *Salicornia fruticosa*, sea purslane *Halimione portulacoides*, saltwort *Salsola soda*, sea lavender *Limonium vulgare* and sea club rush, and extensive areas of submerged tassel pondweed and pondweed *Potamogeton pectinatus* when filled with water. The pond is very rich in fish, with an annual production before 1970 of 225 kg/ha (primarily mullet *Mugil* sp., eel *Anguilla anguilla*, smelt *Atherina mochon* and Cyprinidae).

International and National Importance Due to limited human impact in the area, the breeding bird population of the wetland is an important example of undisturbed freshwater and brackish water communities of the central Mediterranean region. The site should, therefore, be regarded as of particular importance for the maintenance of genetic and ecological diversity in this region. Breeding birds include purple heron *Ardea purpurea* (15 pairs), little bittern *Ixobrychus minutus*, bittern *Botaurus stellaris*, black-winged stilt *Himantopus himantopus* (10-30 pairs 1970-80), purple gallinule *Porphyrio porphyrio* (over 50 pairs 1976-80), moorhen *Gallinula chloropus*, great crested grebe *Podiceps cristatus* (4-12 pairs 1965-76), little grebe *Tachybaptus ruficollis*, white-headed duck *Oxyura leucocephala* (maximum 5 pairs; no recent breeding records), mallard *Anas platyrhynchos*, garganey *A. querquedula*, pochard *Aythya ferina* (5 pairs), red-crested pochard *Netta rufina* (10-15 pairs 1976-80), water rail *Rallus aquaticus*1, little ringed

plover *Charadrius dubius*, Kentish plover *C. alexandrinus*, stone curlew *Burhinus oedicnemus*, coot *Fulica atra*, pratincole *Glareola pratincola*, black-headed gull *Larus ridibundus* (45 pairs 1980), little tern *Sterna albifrons*, marsh harrier *Circus aeruginosus* (5-6 pairs) and Montagu's harrier *C. pygargus* (1-2 pairs 1980). The ancient dune system to the west supports an important population of Barbary partridge *Alectoris barbara* and large colonies of bee-eater *Merops apiaster*. Nearby seacliffs have small breeding colonies of cormorant *Phalacrocorax carbo sinensis*, shag *P. aristotelis desmarestii*, herring gull *Larus argentatus michahellis*, kestrel *Falco tinnunculus*, lesser kestrel *F. naumanni* and peregrine *F. peregrinus brookei*. Large numbers of migratory birds visit the wetland including greater flamingo *Phoenicopterus ruber* (maximum 2,500 October 1980), great crested grebe (200 February), black-necked grebe *Podiceps nigricollis* (25 February), glossy ibis *Plegadis falcinellus* (34 September), wigeon *Anas penelope* (1,650 February), teal *A. crecca* (1,500 January), pintail *A. acuta* (1,700 January), red-crested pochard (about 100 April and August), pochard (4,500 December), coot (2,100 January), avocet *Recurvirostra avosetta* (200 September) and cormorant (200 February).

Changes in Ecological Character The construction of the canal from the pond to the north of Oristano Gulf has almost precluded inflow of seawater into the freshwater pond. Run-off from surrounding agricultural land entering the wetland system contains high levels of fertilisers and pesticides, which is resulting in eutrophication of the waters, especially in the small Mari e Pauli and Su Sali ponds on the eastern edge. Some of the temporary ponds have been reclaimed for agriculture. Poaching and legal hunting in the area has had a significant impact on wintering wildfowl populations.

Management Practices Fisheries and hunting are allowed in the wetland. The bird population is monitored, and an ornithological station is being established near Mari e Pauli pond.

Scientific Research and Facilities Botanical research has been carried out by the University of Bologna; monthly counts of the flamingo population; annual monitoring of the breeding populations of purple gallinule and red-crested pochard; and several studies concerning the proposed regional nature park or series of nature reserves.

Principal Reference Material The above information is taken from:

Schenk, H. (November 1980). Wetlands of International Importance in Sardinia. Annex to the Italian National Report prepared for the Conference on the Conservation of Wetlands of International Importance especially as Waterfowl Habitat, held in Cagliari, Italy.

Additional references:

Hudson, R. (1975). *Threatened birds of Europe*. London.

Schenk, H. (1976). Analisi della situazione faunistica in Sardinia. Uccelli e mammiferi. *SOS Fauna, Animali in pericolo in Italia* p. 465-556.

Walter, H. (1964). Vogel an sardischen Salinen. *Bonn. Zool. Beitr.* 15: 198-210.

Corru S'Ittiri Fishery with salt pan and contiguous sea area -Stagno di San Giovanni e Marceddi

Location 39°44'N, 8°30'E. Situated in the southern part of Oristano Gulf near Torralba, in Oristano and Cagliari provinces on the west coast of Sardinia.

Area 2,610ha (Corru de S'Ittiri Fishery 250ha; San Giovanni and Marceddi Ponds 1,200ha).

Degree of Protection Public property. The site is a designated fish reservoir with commercial fishing and hunting allowed. Designated as a Ramsar site in March 1979.

Site Description The designated site comprises a system of lagoons separated from the southern part of Oristano Gulf by a system of sand dunes, except for a wide communicating channel. The three main ponds in the system have different hydrological characteristics. Corru S'Ittiri (which merges with Marceddi) is the most northerly, with only one marine inflow entering at the north from Pauli Pirastu storage pond (which contains water already used for agricultural irrigation). Marceddi pond is brackish. San Giovanni is a freshwater pond separated from Marceddi by an embankment broken by small channels. It is fed by two freshwater rivers, the Flumini Mannu and Riu Mogoro, which once formed a large river delta with numerous small fresh and brackish ponds (now all reclaimed for agriculture). The vegetation demonstrates a typical succession determined by water salinity, with vast reedbeds of *Phragmites communis*, reedmace *Typha* sp., *Scirpus* sp., *Juncus* spp. and *Tamarix* sp. around the freshwater S. Giovanni pond, and halophytic associations of glasswort *Salicornia* sp., seablite *Suaeda* sp. and *Cressa cretica* around Marceddi and Corru S'Ittiri. The ponds are very productive for fish (San Giovanni 390kg/ha per annum, Marceddi 140kg/ha and Corru S'Ittiri 416kg/ha). The main species are eel, smelt, bass, gilthead (*Anguilla anguilla*, *Atherina mochon*, *Decentrachus labrax*, *Sparus aurata*), mullet, goby *Gobius* sp. and *Lithognathus mormyrus*.

International and National Importance Breeding birds include purple heron *Ardea purpurea* (10 pairs), little bittern *Ixobrychus minutus*, bittern *Botaurus stellaris*, purple gallinule *Porphyrio porphyrio* (about 30 pairs in San Giovanni and Pauli Pirastu 1978-80), moorhen *Gallinula chloropus*, great crested grebe *Podiceps cristatus* (5-10 pairs), little grebe *Tachybaptus ruficollis*, mallard *Anas platyrhynchos*, garganey *A. querquedula* (2-3 pairs), red-crested pochard *Netta rufina* (2-3 pairs), water rail *Rallus aquaticus*, little ringed plover *Charadrius dubius* (occasional), Kentish plover *C. alexandrinus* (20-30 pairs), coot *Fulica atra*, pratincole *Glareola pratincola* (irregular breeder at Corru Mannu), little tern *Sterna albifrons* (maximum 50 pairs especially at Corru Mannu; decreasing) and marsh harrier *Circus aeruginosus* (1 pair). A maximum of 10,600 migratory coot has been recorded at this site in December, but the numbers are decreasing. Other migrants include greater flamingo *Phoenicopterus ruber* (300 in April), black-necked grebe *Podiceps nigricollis* (50 January), wigeon *Anas penelope* (1,650 February), teal *A. crecca* (1,500 January), pintail *A. acuta* (900 January), pochard *Aythya ferina* (1,300 January), tufted duck *A. fuligula* (500 December) and cormorant *Phalacrocorax carbo sinensis* (maximum 150 December/January).

Changes in Ecological Character Mining and other industrial effluent, agricultural run-off and urban pollutants flow into the wetland system, with adverse effects including eutrophication (especially at Corru S'Ittiri). The bird population is subject to hunting pressures, with hunting being legal in the area.

Management Practices The ponds (especially Corru S'Ittiri) are intensively fished on a commercial basis.

Scientific Research and Facilities Cagliari University has conducted research on fish production and pollution. Irregular mid-winter waterfowl counts are made. The Autonomous Region of Sardinia has launched a comprehensive programme on the biology and hydrology of the site.

Principal Reference Material The above information is taken from:

Schenk, H. (1980). Wetlands of International Importance in Sardinia. Annex to the Italian National Report prepared for the Conference on the Conservation of Wetlands of International Importance especially as Waterfowl Habitat held in Cagliari, Italy.

Additional references:

Cottiglia, M. (1970). Pesca marittima e lagunare in Sardegna. *La Programmazione in Sardegna* 27: 29-32.

Cottiglia, M. (1972). La Pesci negli stagni salmastri in Sardegna. *La Programmazione in Sardegna* 39/40: 48-52.

De Angelis, C. (1953). Osservazione su alcuni stagni della Sardegna. *Boll. Pesca, Piscicoltura e Idrodiologia* 28.

Stagno di Pauli Maiori and adjacent territory

Location 39°52'N, 8°37'E. Situated east of Santa Giusta Pond, in Oristano Province near the west coast of Sardinia.

Area 287ha, including 60ha of open water

Degree of Protection Public property. Hunting and fishing allowed. Designated as a Ramsar site in March 1979.

Site Description This irregularly-shaped site comprises the small freshwater Pauli Maiori Pond and extensive surrounding reedbeds. The only natural inflow is run-off from the Campidano di Oristano irrigation scheme, and a communicating canal with Santa Giusta pond supplies a very low inflow of brackish water. A railway line cuts across the wetland just west of the pond. The submerged aquatic vegetation of the open water consists of dense beds of pondweed *Potamogeton* sp., hornwort *Ceratophyllum* sp. and water milfoil *Myriophyllum* sp. The extensive reedbeds are dominated by *Phragmites communis*, with local stands of reedmace *Typha angustifolia*. The feeder rivers and some smaller shallow bays are partially covered by pennywort *Hydrocotyle ranunculoides*.

International and National Importance The wetland is most important for breeding waterfowl, with the highest concentration of purple gallinule *Porphyrio porphyrio* in Sardinia (about 70 pairs). Other breeding waterfowl include purple heron *Ardea purpurea* (30-35 pairs), little bittern *Ixobrychus minutus*, bittern *Botaurus stellaris* (status uncertain), moorhen *Gallinula chloropus*, little grebe *Tachybaptus ruficollis*, white-headed duck *Oxyura leucocephala* (status unknown), mallard *Anas platyrhynchos*, water rail *Rallus aquaticus*, coot *Fulica atra*, marsh harrier *Circus aeruginosus* (2-4 pairs 1976-80) and Montagu's harrier *C. pygargus* (2 pairs since 1976: first nesting record for Sardinia). The wetland is also a stopover and wintering station for various waterfowl.

Changes in Ecological Character The inflow of agricultural and urban pollutants has caused a problem of eutrophication in the wetland.

Management Practices The pond supports extensive fisheries, and hunting is permitted.

Scientific Research and Facilities The Autonomous Region of Sardinia has launched a comprehensive research programme on the biology and hydrology of the site.

Principal Reference Material The above information is taken from:

Schenk, H. (1980). Wetlands International Importance in Sardinia. Annex to the Italian National Report prepared for the Conference on the Conservation of Wetlands of International Importance especially as Waterfowl Habitat held in Cagliari, Italy.

Additional reference:

Montalenti, G. (1967). Relazione sulla protezione delle lagune e degli stagni costieri della penisola e delle grandi isole. *La Ricerca scientifica* 38, Roma.

Gruppo Lavaca, A. (1972/75). *Studio del Parco del Limbara sul sistema Regionale di Parchi*. Prima e seconda fase. Centro Regionale di Programmazione. Cagliari.

Valle Campotto e Bassarone

Location 44°35'N, 11°49'E. Situated about 38km north-west of Ravenna in Ferrara Province, Emilia Romagna.

Area 1,363ha. Separated from Valle Sante Ramsar site (261ha) by the Sussulario canal.

Degree of Protection Privately owned by the Societa Bonifiche Renane. The site is partially protected as a private hunting reserve in which shooting is controlled. Commercial and sport fishing allowed. Designated as a Ramsar site in March 1979.

Site Description The site comprises a shallow freshwater reservoir which, with Valle Sante, supplies Ravenna and its industries with water and acts as an overflow basin for Reno River floodwaters. It is one of the last remnants of the formerly extensive swamps of the south-east Po floodplains which were mostly drained for reclamation during the 19th century. Low level pollution has made it a highly productive eutrophic lake supporting extensive reedbeds of *Phragmites communis*, interspersed with channels and stretches of open water (maintained by

man) with floating white water lily *Nymphaea alba* and typical submerged plant associations. The rich aquatic fauna includes pike *Esox lucious*, tench *Tinca tinca* (fished commercially and for sport) and the pond terrapin *Emys orbicularis*.

International and National Importance Great numbers of waterfowl, including grebes (Podicipedidae), herons (Ardeidae), ducks (Anatidae), rails and coots (Rallidae), plovers (Charadriidae) and sandpipers (Scolopacidae), congregate in these reservoirs in winter. Breeding species include night-heron *Nycticorax nycticorax*, purple heron *Ardea purpurea*, squacco heron *A. ralloides*, bittern *Botaurus stellaris*, little egret *Egretta garzetta*, glossy ibis *Plegadis falcinellus*, several hundred pairs of great crested grebe *Podiceps cristatus*, mallard *Anas platyrhynchos*, gadwall *A. strepera*, garganey *A. querquedula*, coot *Fulica atra*, a large colony of whiskered tern *Chlidonias hybridus* (reputedly the only one in Italy), and black tern *C. niger*.

Changes in Ecological Character Low level pollution has resulted in a small degree of eutrophication making the waters extremely productive for phyto- and zoo plankton and fish. Otter *Lutra lutra* is probably locally extinct.

Management Practices Management is subject to some hydrological constraints, as Valli Campotto e Bassarone is a supply reservoir. The water level is kept generally low to attract birds, although the area is sometimes flooded by the River Reno. Some reed cutting and clearing of channels is undertaken.

Scientific Research and Facilities Two companies (Tecneco and Italeco) have carried out ornithological and hydrological studies on behalf of the regional government.

Principal Reference Material The above information is taken from:

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

Additional reference:

Toschi, A. (1968). Interesse faunistico e paesistico delle Valli dolci e salmastre delli Emilia orientale. *Studi Romagnoli* XIX. 12 pp.

Marano Lagunare - Mouth of the Stella

Location 45°45'N, 13°08'E. Northern shore of the Adriatic (Gulf of Trieste) in Udine Province of Friuli-Venezia Giulia, north-west Italy.

Area 1,400ha

Degree of Protection The wetland is under state and private ownership including some wildfowl refuges created from previous private hunting reserves. The area is legally unprotected, but all planned alterations to the wetland must be approved by the authorities responsible for landscape conservation. Commercial fishing and shooting are allowed in the bay, and there are some private hunting reserves. Designated as a Ramsar site in May 1979.

Site Description The site is part of a larger wetland complex within the extensive Marano Lagoon on the Adriatic coast which includes Grado Lagoon, Valli di Zignago, Cortelazzo pool and Tagliamento River estuary. The site lies between two headlands, and is separated from the open sea by a line of dunes. The water is brackish to saline, and is a highly productive source of fish. The vegetation is dominated by associations of glasswort *Salicornia* and tassel pondweed *Ruppia maritima*.

International and National Importance Large numbers of waterfowl breed or overwinter on the wetland including little tern *Sterna albifrons* (250 pairs), purple heron *Ardea purpurea* (50 pairs) and black-winged stilt *Himantopus himantopus* (30 pairs). Wintering wildfowl include goldeneye *Bucephala clangula* (January average 2,000/maximum 5,100), red breasted merganser *Mergus serrator* (January average 700/maximum 1,600), coot *Fulica atra* (January average 14,000/maximum 20,000), teal *Anas crecca* (2,200) and pintail *A. acuta* (830).

Changes in Ecological Character The most serious threats in the area are drainage, in-filling, tourist developments, such as the construction of marinas for pleasure boats, and increasing pollution.

Management Practices No information

Scientific Research and Facilities No information

Principal Reference Material The above information is taken from:

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

Additional references:

Fornaciari, G. (1968). Aspetti floristici e fitosociologici della laguna di Grado e del suo litorale. *Att. Acc. Sc., Lett. Arti. Udine Serie VII* (6).

Montalenti, G. (1967). Relazione sulla protezione delle lagune e degli stagni costieri della Penisola e delle grandi isole. *Ricerca Scientifica* No. 38, Consiglio nazionale delle Ricerche, Roma.

Salina di Margherita di Savoia

Location 41°24'N, 16°05'E. Situated immediately north-west of the town of Barletta on the Adriatic coast in Foggia Province, Puglia.

Area 3,871ha

Degree of Protection State owned salinas. The area is now protected as a state nature reserve with access only allowed for those accompanied by a guide. Shooting is prohibited. The reserve is administered by the Ministry of Agriculture and Forests (General Direction of Mountain Economy and Forests). Designated as a Ramsar site in August 1979.

Site Description The reserve comprises a complex of saltwater basins linked by a network of channels to a series of canals opening into the Gulf of Manfredonia. The hydrology of the salt pans is varied, with brackish to saltwater depending on the depth and rates of evaporation. They support a rich flora of rushes (Juncaceae), sedges (Cyperaceae), goosefoot (Chenopodiaceae) and aquatic algae.

International and National Importance The salt pans are important for breeding, wintering and migrating waterfowl. Breeding species include black-winged stilt *Himantopus himantopus*, avocet *Recurvirostra avosetta*, pratincole *Glareola pratincola*, gull-billed tern *Gelochelidon nilotica* and little tern *Sterna albifrons*. Many thousands of birds winter or pass through the area on migration, including avocet, glossy ibis *Plegadis falcinellus*, black-winged stilt, crane *Grus grus*, spoonbill *Platalea leucorodia*, white-fronted goose *Anser albifrons*, wigeon *Anas penelope* (up to 19,000), pintail *A. acuta* (2,100), gadwall *A. strepera*, shoveler *A. clypeata* (1,700), teal *A. crecca* (500), shelduck *Tadorna tadorna* (2,200), pochard *Aythya ferina* (210), coot *Fulica atra* (10,000), little stint *Calidris minuta*, curlew *Numenius tenuirostris*, cormorant *Phalacrocorax carbo*, slender-billed gull *Larus genei* and gull-billed tern *Gelochelidon nilotica*.

Changes in Ecological Character Although hunting is prohibited, there is still some poaching. A road runs along the dunes between the salt pans and the sea, making access to the site difficult to control.

Management Practices The area is managed as a nature reserve by the Ministry of Agriculture and Forests, and the channels and basins are maintained.

Scientific Research and Facilities There are observation huts for ornithological studies.

Principal Reference Material The above information is taken from:

Duffey, E. (1982). *National Parks and Reserves of Western Europe*. Macdonald and Co., London.

Scott, D.A. (1980). A preliminary inventory of wetlands of international importance for waterfowl in West Europe and northwest Africa. *IWRB Special Publication No. 2*. 127 pp.

Lago di Tovel

Location 46°10'N, 11°17'E. Situated north-west of Trento and immediately south-west of Tuenno village in the Dolomite mountains of northern Italy in Trento Province, Trentino Alto Adige.

Area 37ha (within Adamello-Brenta Natural Park 436ha).

Degree of Protection The area is protected as a nature reserve being part of Adamello-Brenta Natural Park. Designated as a Ramsar site in September 1980.

Site Description The lake is an alpine freshwater lake fed by numerous streams originating in the surrounding mountains and surrounded by coniferous and mixed woodland. The lake supports an alga (Rhodophyta) which turns the water red at certain times of the year.

International and National Importance No information

Changes in Ecological Character There is unrestricted public access within the park, and visitor pressure is high at the lake which is easily accessible from Tuenno.

Management Practices The park is managed as a nature reserve.

Scientific Research and Facilities No information

Principal Reference Material The above information is taken from:

Duffey, E. (1982). *National Parks and Reserves of Western Europe*. Macdonald and Co., London.

Torre Guaceto, adjacent territory and sea area

Location 40°43'N, 17°48'E. Situated on the Adriatic coast immediately north of Brindisi Port on the heel of Italy in Brindisi Province, Puglia.

Area 940ha

Degree of Protection Puglia regional government is responsible for the conservation and management of the area. Designated as a Ramsar site by the Ministry of Agriculture and Forestry by Decree No. 0212 on 18 May 1981, and added to the Ramsar list in July 1981.

Site Description The site comprises the coastal marshlands around the Guaceto headland (Torre Guaceta), littoral dunes, and the small offshore islands. The vegetation comprises three main associations: glasswort *Salicornia fruticosa*, halophytic *Suedeto-Salsoletum-Sodae*, and reedbeds dominated by *Phragmites communis*. There are Bronze age archaeological remains, and evidence of a Neolithic village have been found nearby.

International and National Importance Birds recorded in the wetland include dotterel *Eudromia morinellus*.

Changes in Ecological Character None reported

Management Practices No information

Scientific Research and Facilities No information

Principal Reference Material The above information is taken from the Ministry of Agriculture and Forestry Decree No. 0212 (May 1981).

Valle di Gorino and adjacent territories

Location 44°49'N, 12°21'E. Situated west of Gorino on the Adriatic coast of northern Italy in Ferrara Province, Emilia Romagna.

Area 1,330ha

Degree of Protection Part of the area has recently been declared, in part, a State Nature Reserve administered by the Ministry of Agriculture and Forest, the remaining part is protected by the Province of Ferrara. Designated as a Ramsar site in September 1981.

Site Description The site comprises the coastal lagoons west of the Po di Goro River mouth and is part of the large estuarine complex around Porto Tolle where three major rivers (Po di Goro, Po di Tolle and Po Grande) enter the sea. The lagoon area is enclosed on three sides by sandbars, islets and sediments from the river deposited as a result of onshore coastal currents, but is open to the sea on the fourth side.

International and National Importance No information

Changes in Ecological Character No information

Management Practices No information

Scientific Research and Facilities No information

Principal Reference Material No information

Valle Bertuzzi and adjacent water surfaces

Location 44°47'N, 12°13'E. Situated on the Adriatic coast in the vicinity of Comacchio, 35km north of Ravenna in Ferrara Province, Emilia Romagna.

Area 3,100ha

Degree of Protection Privately owned by the Societa Berufiche Terreni Ferraresi. The designated site includes a partially protected landscape reserve (1,900ha). It has been proposed that the area be included in a regional park on the coast, but no information is available on implementation. Commercial fishing is controlled and some of the area is a shooting preserve. Designated as a Ramsar site in September 1981.

Site Description The wetland comprises a brackish lagoon on the Adriatic isolated from the sea by sandspits. The inner Valle Contone and outer Valle Bertuzzi (divided by sand islands) are the remnants of the vast 'valli' which once extended from Ferrara to the sea. They represent

the only large natural body of water between the Valli di Comacchio to the south and the Po di Goro to the north (Porto Tolle). The wetland is a complex of habitat types: shrubby glasswort *Salicornia fruticosa* on the ancient dunes which mark the old shoreline; communities of halophytes such as couch grass *Agropyron* sp., golden samphire *Inula crithmoides* and sea aster *Aster tripolium* on the small islands in the lagoon; typical Mediterranean species including thickets of holm oak *Quercus ilex* and *Phillyrea* sp. on the higher dunes; and reedbeds of *Phragmites communis* in the shallow, less saline waters of the inner Valle Contone which merge with the regularly inundated coastal mudflats offshore.

International and National Importance Breeding waterfowl include purple heron *Ardea purpurea* (100 pairs), little tern *Sterna albifrons* (200 pairs), common tern *S. hirundo* (70-80 pairs), little egret *Egretta garzetta* (50 pairs), black-winged stilt *Himantopus himantopus* (10 pairs), herring gull *Larus argentatus* (300 pairs), mallard *Anas platyrhynchos*, coot *Fulica atra*, and in some years pratincole *Glareola pratincola*. Wintering and migrating birds include tufted duck *Aythya fuligula* (January average 3,600/maximum 6,200), coot (January average 11,000/maximum 24,000), mallard, teal *Anas crecca*, wigeon *A. penelope*, great crested grebe *Podiceps cristatus*, little grebe *Tachybaptus ruficollis*, grey heron *Ardea cinerea*, plovers and sandpipers (Charadriiformes).

Changes in Ecological Character Freshwater from the heavily polluted Volano River cannot be used for abstraction purposes. Yields of traditional fisheries have been decreasing because the lagoon water often becomes severely deoxygenated during summer droughts, due to isolation from the sea and to polluted waters from the Volano. The pollution may also have adverse effects on birds which use the fish as a food source. Areas of the wetland have been drained in the past, but drainage programmes have now stopped almost completely.

Management Practices The water level in the lagoon is controlled. In the 1970s, shooting in the area was prohibited for at least two years, but there was no resultant increase in the numbers of wintering waterfowl.

Scientific Research and Facilities Vegetation study by Corbetta (1968). A feasibility study for the regional park project, undertaken by two companies (Tecneco and Italeco), was sponsored jointly by the government and the Regione Emilia-Romagna.

Principal Reference Material The above information is taken from:

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

Additional references:

Corbetta, F. (1968). La vegetazione della 'valli' del litorale ferrarese e ravennate. *Not. Fitosoc.* 5: 67-98.

Toschi, A. and Spagnesi, M. (1971). Ricerche di Biologia della Selvaggina. *Quaderni de la Ricerca Scientifica* 52. Caccia, Bologna.

Pialassa della Baiona and adjacent territories

Location 43°30'N, 12°15'E. Situated on the Adriatic coast south-east of Ravenna in Ravenna Province, Emilia Romagna.

Area 1,630ha

Degree of Protection Designated as a Ramsar site in September 1981.

Site Description The site is a brackish-water coastal wetland drained by a dendritic network of canals. Bounded to the east and west by pine plantations.

International and National Importance The wetland complex supports a rich avifauna including breeding and winter migrant populations. Breeding birds include black-winged stilt *Himantopus himantopus*, avocet *Recurvirostra avosetta* and little tern *Sterna albifrons*. It is also an important feeding area for little egret *Egretta garzetta*.

Changes in Ecological Character There is heavy hunting pressure.

Management Practices No information

Scientific Research and Facilities No information

Principal Reference Material No information

Ortazzo and adjacent territories

Location 44°21'N, 12°19'E. Situated on the Adriatic coast in Ravenna Province, Emilia Romagna.

Area 440ha

Degree of Protection State owned. Hunting is prohibited. Designated as a Ramsar site in September 1981.

Site Description The site encloses the confluence of the rivers Bevano and Ghiaia, and includes the river mouths, estuarine lagoons, coastal dunes and some arable grassland. A pine wood has been planted behind the dunes.

International and National Importance This coastal area is an important wintering ground for teal *Anas crecca* (8,000 January) and mallard *A. platyrhynchos* (5,000 January).

Changes in Ecological Character None reported

Management Practices No information

Scientific Research and Facilities No information

Principal Reference Material The above information is taken from:

Scott, D.A. (1980). A preliminary inventory of wetlands of international importance for waterfowl in West Europe and northwest Africa. *IWRB Special Publication* No. 2. 127 pp.

Salina di Cervia

Location 44°15'N, 12°19'E. Situated immediately inland from Cervia on the east coast of Italy in Ravenna Province, Emilia Romagna.

Area 785ha (part of a state nature reserve 1,100ha).

Degree of Protection State owned. The salt pans are protected as a state nature reserve. Designated as a Ramsar site in September 1981.

Site Description The site comprises a grid complex of artificially maintained salt pans, derived from coastal lagoons but now isolated from the sea. It is bounded on all sides by Girondario and Girondarie canals. A road bisects the site.

International and National Importance Important for breeding and migratory waterfowl. Breeding species include black-winged stilt *Himantopus himantopus* (50 pairs), avocet *Recurvirostra avosetta* (15 pairs) and little tern *Sterna albifrons* (60-70 pairs). Migratory species include little egret *Egretta garzetta* (up to 500), little stint *Calidris minuta* (2,000), curlew sandpiper *C. ferruginea* (3,000), ruff *Philomachus pugnax* (12,000) and black-tailed godwit *Limosa limosa* (5,000).

Changes in Ecological Character None reported

Management Practices No information

Scientific Research and Facilities No information

Principal Reference Material The above information is taken from:

Scott, D.A. (1980). A preliminary inventory of wetlands of international importance for waterfowl in West Europe and northwest Africa. *IWRB Special Publication* No. 2. 127 pp.

Stagno di Sale Porcus

Location 40°01'N, 8°25'E. Situated north of Cabras Pond (Ramsar site) in the north of Sinis Peninsula, Oristano Province in western Sardinia.

Area 330ha: 325ha is open water in winter (initially proposed as 450ha)

Degree of Protection Owned by the Autonomous Region of Sardinia, and protected as an 'Oasi Permanente di Protezione Faunistica e di Cattura'. Hunting is prohibited. Managed by the Commune of San Vero Milis and the Italian League for the Protection of Birds (LIPU). Designated as a Ramsar site in May 1982.

Site Description Sale Porcus pond is the largest temporary water body in Sardinia, and is part of a large complex of temporary salt lakes (similar to the North African 'sebkha') along the western edge of the permanent Cabras Pond. The cycle of wet and dry conditions has led to the accumulation of mineral salts such as sodium chloride (salt) in the soil, which forms a white covering on the dried up pond during summer. The vegetation is halophytic with seablite *Suaeda* sp. and glasswort *Salicornia* sp., and only a narrow belt of reed *Phragmites communis* interspersed with *Tamarix* sp. along the eastern edge. The three small islets in the north are important resting and breeding sites for waterfowl when the pond is filled.

International and National Importance The site is one of the most important areas in the Mediterranean for migrating greater flamingo *Phoenicopterus ruber* between September and April (depending on water level), with 5,000 in mid-January 1977/78 and maximum of 8,500 in November. Other wintering species include avocet *Recurvirostra avosetta* (700 November), Kentish plover *Charadrius alexandrinus* (900 November), little stint *Calidris minuta* (1,000 November), shelduck *Tadorna tadorna* (80 March), shoveler *Anas clypeata* (820 January), tufted duck *Aythya fuligula* (780 January), coot *Fulica atra* (1,500 February), spotted redshank *Tringa erythropus* (400 November), redshank *T. totanus* (450 November) and crane *Grus grus* (5-10 October to February; maximum 16 November 1980). Breeding species include shelduck (1-2 pairs), avocet and black-winged stilt *Himantopus himantopus* (5-10 pairs) on the islets; Kentish plover (10-15 pairs), moorhen *Gallinula chloropus*, purple gallinule *Porphyrio porphyrio* (unconfirmed), water rail *Rallus Aquaticus*, mallard *Anas platyrhynchos*, coot (depending on water level) and little tern *Sterna albifrons* (5 pairs irregularly).

Changes in Ecological Character Increasing eutrophication from surrounding agricultural areas.

Management Practices A nature trail with observation hides has been established along the eastern shore of the pond. Educational and research activities in the wetland are promoted by the Executive Committee of the Sanctuary. A feasibility study was carried out in 1980 on a habitat management project to encourage flamingo to breed at the site.

Scientific Research and Facilities The Autonomous Region of Sardinia has launched a comprehensive research programme on the biology and hydrology of the site. There are monthly counts of flamingo, and midwinter counts of waterfowl.

Principal Reference Material The above information is taken from:

Schenk, H. (1980). Wetlands of International Importance in Sardinia. Annex to the Italian National Report prepared for the Conference on the Conservation of Wetlands of International Importance especially as Waterfowl Habitat held in Cagliari, Italy.

Additional reference:

Gruppo Lacava, A. (1972/75). *Studio del Parco del Limbara nel Sistema Regionale di Parchi*. Prima e seconda fase. Centro Regionale di Programmazione. Cagliari.

Stagno di Mistras and adjacent territory

Location 39°54'N, 8°27'E. Situated just south of Cabras Pond on the northern shore of Oristano Gulf in Cabras Commune, Oristano Province, Sardinia.

Area 680ha (originally proposed as 450ha).

Degree of Protection Private ownership. Protected as an 'Oasi Permanente di Protezione Faunistica e di Cattura' in which hunting is prohibited. Designated as a Ramsar site in May 1982.

Site Description The site comprises the shallow (1m-1.7m) Mistras Lagoon, which opens into Oristano Gulf via a wide channel containing Mistras fishery (just outside the boundary), and includes the surrounding wetland and coastal dunes. The lagoon waters are brackish but variable, with salinity reaching 49 parts per 1,000 during dry summers, compared with normal levels of below the average for seawater. There are no inflow rivers or canals, and freshwater input comes almost exclusively from rainfall and run-off. The shallow eastern part of the lagoon, with numerous sandbanks and islets, can dry up in summer as a result of high evaporation rate and low rainfall. The bottom fauna is rich in bivalve molluscs. Fish include bass *Dicentrarchus labrax*, gilthead *Sparus aurata*, bream *Pagellus mormyrus* and mullet *Mugil cephalus*. The lagoon vegetation is characteristically halophytic, with aquatic communities of tassel pondweed *Ruppia maritima* and *Enteromorpha intestinalis*, and glasswort *Salicornia fruticosa*, *S. europaea* (= *S. herbacea*), saltwort *Salsola soda* and shrubby glasswort *Arthrocnemum glaucum* are found fringing the lagoon and on the islets.

International and National Importance Breeding birds include pratincole *Glareola pratincola* (maximum 30 pairs), black-winged stilt *Himantopus himantopus* (10-15 pairs), little ringed plover *Charadrius dubius* (about 10 pairs), Kentish plover *C. alexandrinus* (50-60 pairs), mallard *Anas platyrhynchos*, black-headed gull *Larus ridibundus* (15-20 pairs), herring gull *L. argentatus* (about 30 pairs), common tern *Sterna hirundo* (10-20 pairs 1978-80) and little tern *S. albigularis* (80-100 pairs 1979-80). The lagoon is an important resting station for migrating greater flamingo *Phoenicopterus ruber*, with 1,400 recorded in January 1978-79 and a minimum of 2,000 during August. Other winter migrants include Kentish plover (350 November/December), grey heron *Ardea cinerea* (60 December) and cormorant *Phalacrocorax carbo sinensis*. Numerous waders and gulls on passage particularly during spring migration.

Changes in Ecological Character There are some unauthorised settlements at Sa Siccu. Grazing sheep threaten ground nesting areas as they can trample the nests. Access to the wetland is uncontrolled and there is poaching. There are plans to construct a fishery within the lagoon, although productivity has decreased from 140kg/ha per annum to 25kg/ha over the past decade. Excavation of a broad channel has transformed part of the lagoon system and adjacent areas, but has also created new habitats used by breeding colonies of little tern, Kentish plover and pratincole.

Management Practices It is proposed to construct commercial intensive and semi-intensive fish rearing facilities over 8.2ha of the central part of the lagoon. However, before giving their

approval, the Autonomous Region of Sardinia is insisting on an environmental impact assessment (with particular reference to the waterfowl population).

Scientific Research and Facilities Hydrological, botanical and geomorphological research has been carried out. Counts of flamingos are carried out monthly.

Principal Reference Material The above information is taken from:

Schenk, H. (1980). Wetlands of International Importance in Sardinia. Annex to the Italian National Report prepared for the Conference on the Conservation of Wetlands of International Importance especially as Waterfowl Habitat held in Cagliari, Italy.

Additional references:

Corbetta, F. and Lorenzoni, G.G. (1976). La vegetazione degli stagni del Golfo di Oristano (Saredegna). *Suppl. Ric. Biol. Selv.* 7: 217-219.

de Angelis, C. (1953). Osservazione su alcuni stagni della Sardegna. *Boll. Pesca, Piscicoltura e Idrobiol.* 28(2): 5-43.

Schenk, H. (1979). Zone umide Italiane come habitat degli Uccelli acquatici. *Quad. Agricolt. Amb. Suppl.* al n. 3 di Agricoltura Ambiente. Settembre 1979: 20-28.

Valli del Mincio

Location 45°03'N, 10°46'E. Located in the province of Mantova, in the Lombardia region.

Area 1,082ha

Degree of Protection Designated as a Ramsar site on 5 December 1984.

Site Description No information

International and National Importance The site is an important area for migratory waterfowl.

Changes in Ecological Character No information

Management Practices No information

Scientific Research and Facilities No information

Principal Reference Material The above information is taken from the documents supplied by the Government of Italy for designation in December 1984.

Torbiere d'Iseo

Location 45°38'N, 10°02'E. Located in the province of Brescia, in the Lombardia region.

Area 325ha

Degree of Protection Designated as a Ramsar site on 5 December 1984. The northern part of the Ramsar site was listed as an Important Bird Area (IBA) by the EEC in February 1979.

Site Description The site consists of lowland, inland, open waters and basin mires.

International and National Importance The site is an important area for migratory waterfowl. Breeding species listed for the IBA site include grey heron *Ardea cinerea* (2 pairs), purple heron *A. purpurea* (5 pairs), night heron *Nycticorax nycticorax* (5 pairs), ferruginous duck *Aythya nyroca* (3-4 pairs) and marsh harrier *Circus aeruginosus* (1 pair). Also listed for the area are little bittern *Ixobrychus minutus*, garganey *Anas querquedula*, spotted crane *Porzana porzana* and little crane *P. parva*.

Changes in Ecological Character No information

Management Practices No information

Scientific Research and Facilities No information

Principal Reference Material The above information is taken from the documents supplied by the Government of Italy for designation in December 1984, supplemented by information supplied by ICBP.

Additional reference:

Brichetti, P., (1975). L'avifauna nidificante della Torbiera d'Iseo. *Natura Bresciana* No. 12. Brescia.

Crescini, A. (Sept. 1969). Lama (Torbiera) d'Iseo. In Gruppo di Lavoro per la conservazione della natura della Societa' Botanica Italiana (1971). *Censimento dei biotopi di rilevante interesse vegetazionale meritevoli di conservazione in Italia*. Savini-Mercuri, Camerino.

Palude Brabbia

Location 45°44'N, 8°40'E. Located in the province of Varese, in the Lombardia region.

Area 459ha

Degree of Protection Designated as a Ramsar site on 5 December 1984.

Site Description No information

International and National Importance The site is an important area for migratory waterfowl.

Changes in Ecological Character No information

Management Practices No information

Scientific Research and Facilities No information

Principal Reference Material The above information is taken from the documents supplied by the Government of Italy for designation in December 1984.

Paludi di Ostiglia

Location 45°04'N, 11°06'E. Located in the province of Mantova, in the Lombardia region.

Area 123ha

Degree of Protection Designated as a Ramsar site on 5 December 1984.

Site Description The site consists of inland, open waters, with running water.

International and National Importance The site is an important area for migratory waterfowl. Breeding species listed for the IBA site just south of the Ramsar site including the Ostiglia Révara include purple heron *Ardea purpurea*, night heron *Nycticorax nycticorax*, little egret *Egretta garzetta*, black kite *Milvus migrans*, Montagu's harrier *Circus pygargus*, stone curlew *Burhinus oedicephalus*, common tern *Sterna hirundo*, little tern *S. albigaster* and kingfisher *Alcedo atthis*. Little bittern *Ixobrychus exilis* is also listed for the area.

Changes in Ecological Character No information

Management Practices No information

Scientific Research and Facilities No information

Principal Reference Material The above information is taken from the documents supplied by the Government of Italy for designation in December 1984, supplemented by information supplied by ICBP.

Il Biviere di Gela

Location 37°02'N, 14°20'E. Situated 6km south-east of the town of Gela.

Area 256ha

Degree of Protection Declared a faunal protection zone by the Region of Sicily which is responsible for conservation and management of the wetland. The site was added to the Ramsar list on 12 April 1988.

Site Description The site is one of several coastal lagoons.

International and National Importance The area is important for aquatic bird migration, in particular, populations of ca. 400 glossy ibis *Plegadis falcinellus*, 60 spoonbill *Leucorodia platalea*, 150 squacco heron *Ardeola ralloides*, 300 little egret *Egretta garzetta*, 100 purple heron *Ardea purpurea* and 2,000 garganey *Anas querquedula*. Species nesting regularly include little bittern *Ixobrychus minutus*, night heron *Nycticorax nycticorax*, ferruginous duck *Aythya nyroca* and pratincole *Glareola pratincola*. During spring migration populations of glossy ibis and white spoonbill exceeding 1% of the entire Mediterranean migrating population have been recorded during surveys of the site by the Italian League for the Protection of Birds. The area can be considered to be a biotic community characteristic of a type which is disappearing from the Mediterranean. The area is particularly valuable for the maintenance of ecological and genetic diversity in the Mediterranean because of the richness and diversity of its flora and fauna, and constitutes a representative example of a wetland characteristic of the region.

Changes in Ecological Character No information

Management Practices No information

Scientific Research and Facilities Population surveys are undertaken by the Italian League for the Protection of Birds.

Principal Reference Material The above information is taken from documents supplied by the Italian Government.

Valle Averso

Location 45°19'N, 12°08'E. Sited approximately 20km south-west of Venice, in Campagna Lupia, Province of Venice.

Area 200ha

Degree of Protection Declared a natural fauna and flora oasis by the region of Veneto and also a WWF Refuge. Added to the Ramsar list on 10 February 1989.

Site Description Situated on the Adriatic Coast in the Veneto region as part of the Laguna di Venezia complex. Water from the Adriatic flows through the lagoon complex in tidal movements which exhibit great variation and intensity. Characteristic plant associations are sea lavender *Limonietum* and wormwood *Artemisetum*. Along shorelines are a number of pinewoods and dunes.

International and National Importance Important during migration for aquatic birds, such as little egret *Egretta garzetta* (600), up to 80 purple heron *Ardea purpurea*, black-winged stilt *Himantopus himantopus*, avocet *Recurvirostra avosetta* and pochard *Aythya ferina* (1,000). Nesting on a regular basis are mute swan *Cygnus olor*, purple heron *Ardea purpurea*, little bittern *Ixobrychus minutus*, marsh harrier *Circus aeruginosus*, black-winged stilt and common tern *Sterna hirundo*. The zone is particularly valuable for the richness of its flora and fauna species which help to maintain ecological and genetic diversity.

Changes in Ecological Character Possible threats include pollution, drainage and tourist developments along the coast.

Management Practices Hunting is prohibited.

Scientific Research and Facilities No information

Principal Reference Material The above information is taken from documents supplied by the Italian Government.

Supplemented by:

Carp, E. (1980). *Directory of Western Palearctic Wetlands*. IUCN/UNEP. 506 pp

Grimmett, R.F.A. and Jones, T.A. (1989). *Important bird areas in Europe*. ICBP, Cambridge, United Kingdom. 888 pp.

Riserva naturale Vendicari

Location 36°48'N, 15°07'E. Located 30km south-west of Siracuse, in Noto Commune, Siracusa Province, Region of Sicily.

Area 1,450ha

Degree of Protection The regional authorities of Sicily are responsible for the conservation and management of this natural faunal reserve, under regional law No.98/81, notified on 14 March 1984. Designated a Ramsar site on 11 April 1989.

Site Description Comprises five lakes, Pantano Piccolo, Pantano Grande, Pantano Roveto or Pantano di Vendicari, Pantano Sichilli and Pantano Scirbia characterised by brackish water with variable salinity and which dry out temporarily in summer, with the exception of Pantano Piccolo which holds water throughout the year. Vegetation is typically halophytic in the most salty areas and hygrophilic in the freshwater and less salty areas, constituting a well preserved complex environment of great natural value.

International and National Importance Located on a migration route for aquatic birds, it is a regular nesting site for Kentish plover *Charadrius alexandrinus*, black-winged stilt *Himantopus himantopus* and is visited less regularly by little tern *Sterna albifrons*. It is a stop-over for spoonbill *Platalea leucorodia*, glossy ibis *Plegadis falcinellus*, purple heron *Ardea purpurea*, little egret *Egretta garzetta*, squacco heron *Ardeola ralloides*, little stint *Calidris minuta*, curlew sandpiper *Calidris ferruginea*, ruff *Philomachus pugnax*, avocet *Recurvirostra avosetta*, slender-billed gull *Larus genei*, Caspian tern *Sterna caspia*, gull-billed tern *Gelochelidon nilotica*, black tern *Chlidonias niger*, and an important wintering area for shelduck *Tadorna tadorna*, lesser black-backed gull *Larus fuscus* and regularly supports greater flamingo *Phoenicopterus ruber*, greylag goose *Anser anser*, teal *Anas crecca*, wigeon *Anas penelope*, pintail *Anas acuta*, coot *Fulica atra* and Mediterranean gull *Larus melanocephalus* during the summer months. It is a regular summer site for Audouin's gull *Larus audouinii*. During spring migration it regularly hosts 20,000 sandpipers and populations of spoonbill and glossy ibis which are above 1% of the

entire European population. Due to the originality of its flora and fauna it plays a particular role in maintaining ecological and genetic diversity in the Mediterranean region.

Changes in Ecological Character No information

Management Practices Protection of the site is in the hands of the Sicilian regional authorities, who are bound to inform the Ministry of Agriculture of any eventual project or initiative susceptible of altering the status of the site, or the level of environmental protection and particularly the protection of flora and fauna.

Scientific Research and Facilities No information

Principal Reference Material The above information is taken from documents supplied by the Italian Government.

Isola Boscone

Location 45°03'N, 11°15'E. Located in Carbonara di Po Commune, Mantua Province.

Area 201ha

Degree of Protection Responsibility for conservation and management lies with the Lombardy regional authorities under regional law no.33 of 27 July 1977. Designated a wetland of international importance on 15 October 1985.

Site Description The wetland is a particularly interesting example of a natural progression, with willows surrounded by areas of vegetation in different stages of evolution, only parts of which have been studied, but recognised as being of particular value in maintaining genetic and ecological diversity because of the richness of its flora and fauna. The area constitutes an irreplaceable habitat for a variety of plants and animals.

International and National Importance There is a nesting population of ca. 400 night heron *Nycticorax nycticorax*, ca. 10 pairs of little egret *Egretta garzetta* and several pairs of squacco heron *Ardeola ralloides*, according to 1981 research.

Changes in Ecological Character No information

Management Practices Protection of the site is in the hands of the Mantuan regional authorities, who are bound to inform the Ministry of Agriculture of any project proposal or initiative likely to alter the status of the site, or the level of environmental protection and particularly the protection of flora and fauna.

Scientific Research and Facilities No information

Principal Reference Material The above information is taken from documents supplied by the Italian Government, supplemented by:

Grimmett, R.F.A. and Jones, T.A. (1989). *Important bird areas in Europe*. ICBP, Cambridge, United Kingdom. 888 pp.

Bacino dell'Angitola

Location 38°45'N, 16°14'E. Situated between the communes of Maierato and Monterosso in the province of Calabria.

Area 875ha

Degree of Protection Under the responsibility of the Calabrian regional authorities who have banned hunting in the entire area. Designated as a Ramsar site on 11 April 1989.

Site Description This is the only lake site of its type for several hundred kilometres between the Sierra Persano in Salerno province and Sicily, along the coast of the Tyrrhenian Sea.

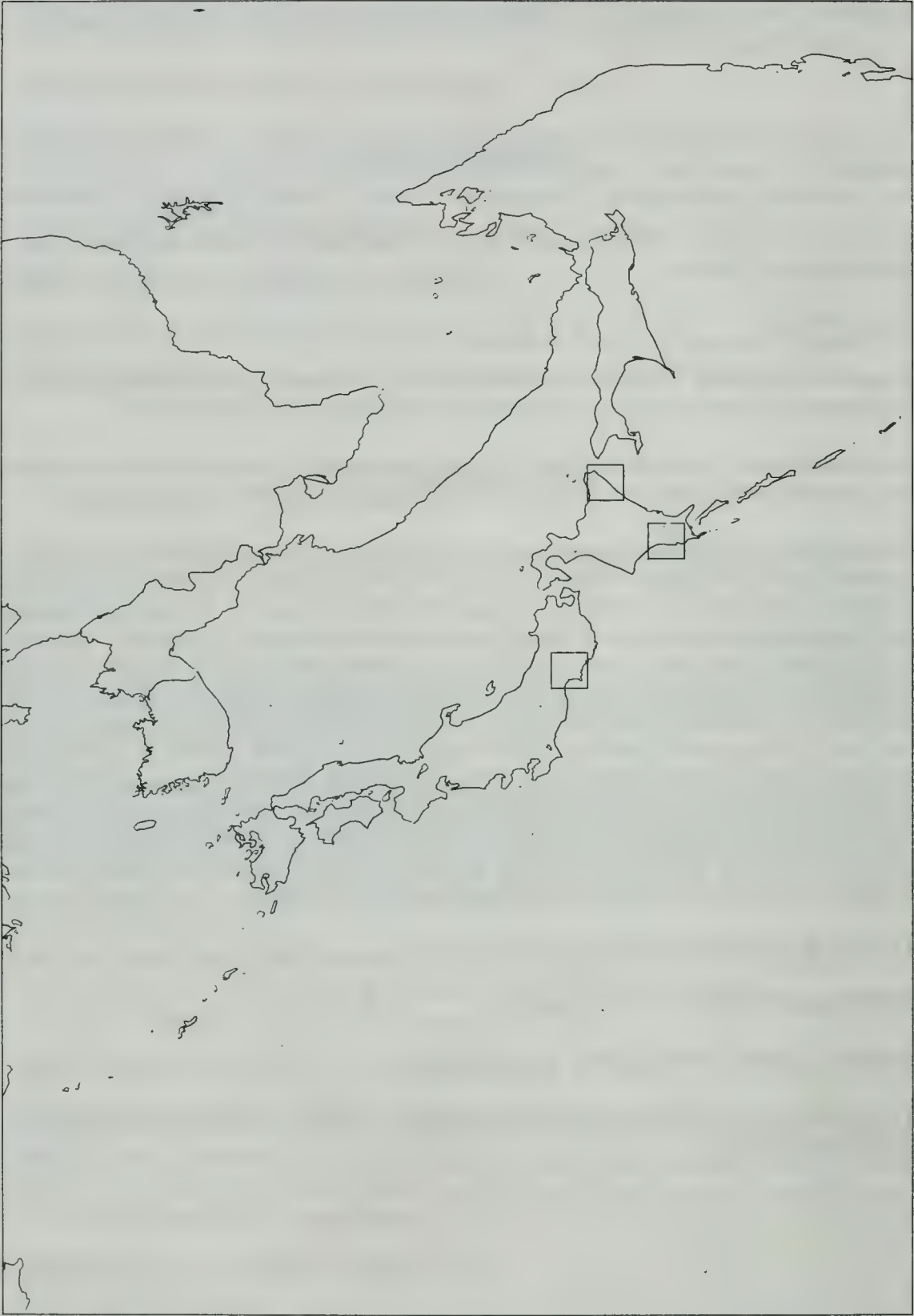
International and National Importance The area is a nesting site for little grebe *Tachybaptus ruficollis*, great-crested grebe *Podiceps cristatus*, little bittern *Ixobrychus minutus* and penduline tit *Remiz pendulinus* and a summer site for garganey *Anas querquedula*, pochard *Aythya ferina* and ferruginous duck *A. nyroca* which will probably nest at the site soon. It is a wintering ground for little bittern *Ixobrychus minutus* (over 350), great-crested grebe *Podiceps cristatus* (over 80), black-necked grebe *Podiceps nigricollis* (over 100), shelduck *Tadorna tadorna* (over 60), wigeon *Anas penelope* (ca. 100), teal *Anas crecca* (ca. 500), common shoveler *Anas clypeata* (ca. 100), pochard *Aythya ferina* (3,000), ferruginous duck *Aythya nyroca* (50), tufted duck *Aythya fuligula* (300) and common coot *Fulica atra* (3,000). Research has shown that during migration various species of Ciconiformes rest at the site, such as night heron *Nycticorax nycticorax*, Squacco heron *Ardeola ralloides*, purple heron *Ardea purpurea*, white stork *Ciconia ciconia*, glossy ibis *Plegadis falcinellus*, and also Falconiformes such as osprey *Pandion haliaetus* and marsh harrier *Circus aeruginosus* and Charadriiformes.

Changes in Ecological Character No information

Management Practices No information

Scientific Research and Facilities No information

Principal Reference Material The above information is taken from document supplied by the Italian Government.



Ramsar Sites in Japan

Japan

Area 369,698 sq.km

Population 122,264,000 (1987 estimate)

Summary of Wetland Situation Some 70% of Japan is mountainous and the wetland habitats are thus restricted to the flood plains of water courses, coastal marshes and estuaries of the major rivers. Wetlands tend to be small in size and consequently the waterbird populations tend to be small on individual wetlands. Japan has, however, important heron and egret breeding colonies and is a major wintering area for cranes. There are three major problems facing Japanese wetlands. Large-scale land reclamation and drainage activities for extra industrial and agricultural land peaked in the 1960s and severely affected the Tokyo Bay and Seto Inland Sea coastal areas. Since 1975 there have been no further large scale reclamation projects. Water pollution in wetlands surrounded by residential and agricultural lands occurs. This pollution is largely effluent, both domestic and industrial. Commercial fishing causes disturbance and reduces food resources. There have been reports of egrets causing damage to fish stocks and wigeon *Anas penelope* damaging seaweed cultures. The hunting season at present lasts until 15 February (31 January in Hokkaido).

Since 1970 winter waterfowl counts have been held in mid-January and about 3,260 locations are censused throughout Japan. This is organised by the Environmental Agency and relies on voluntary help. A wader count organised by the Wild Bird Society of Japan has been held annually in May and September since 1973. An annual Japanese crane count has been held every December since 1952. The 1986 counts showed the presence of some 28,000 swans, 10,000 geese, 1,576,000 duck and between 50,000 and 100,000 waders (on passage). The largest number of duck included over 200,000 of mallard *Anas platyrhynchos* and spotbill *Anas poecilorhyncha*. There are indications that the numbers of ducks, cranes, and geese are increasing. A ringing programme has also been carried out, 100,000 birds having been ringed including waders, ducks, swans and hooded cranes *Grus monachus*.

Protected Areas Legislation The first modern legislation whose primary purpose was the conservation of the natural environment was the National Parks Law passed by the Government Diet in 1931 (Law No.36/1931). The chief objective of this law is the preservation of the natural landscape on public and private land for public enjoyment and recreation. Twelve areas were designated between 1934-36, including coastal areas, and by 1987 there were 27 sites.

The Natural Parks Law (Law No.161 of 1 June 1957) supercedes the 1931 Law and defines a system of three categories of park with grades from nationally important sites (National Parks) through to regional (Quasi-National Parks) and local sites (Prefectural Natural Parks), each area being designated irrespective of land ownership. The act declares that the natural parks are national assets, designated areas of scenic beauty created to provide a cultural and recreational

asset for the public. In 1970 the law was revised to allow the creation of Marine Parks within natural park areas.

The Nature Conservation Law (Law No.85 of 22 June 1972) was enacted to provide a framework for all legal measures concerning the natural environment and nature conservation. It also ensures designation of areas for the protection of nature - Wilderness areas, Nature Conservation areas and Prefectural Nature Conservation areas. Fifty eight Articles are specified under the Law, including basic policies, designations and provisions.

Protected Areas Administration National Parks are administered by the Environmental Agency (under the powers of the Director General) with advice from the Council of Nature Conservation and delegated to the Governor of the Prefecture as provided for by Cabinet Order. Quasi-national parks are administered by prefectural governments in accordance with the provisions of the Natural Parks Law. A particular feature of parks management is the designation of special protection areas (SPA) in the quasi-national parks. Nature conservation areas and wildlife protection areas are established and managed either by the Environmental Agency or prefectural governments.

Sites designated under the Convention Accession 17 June 1980 with 1 site listed at accession, another added on 13 September 1985 and a third on 6 July 1989.

Kushiro-shitsugen
Izu-numa and Uchi-numa
Kutcharo-ko

Government body responsible for administration of the Convention
Environment Agency, 3-1-1 Kasumigaseki, Chiyoda-ku, Tokyo

Kushiro Shitsugen

Location 43°09'N, 144°26'E. North of Kushiro city on Hokkaido.

Area 7,726ha

Degree of Protection Ownership is mainly state (4,878ha) and some private (134ha). Administered by the Environmental Agency, 1-2-2 Kasumigaseki, Chiyoda-ku, Tokyo. Designated as a special protection area in 1935 by the Director General of the Environment Agency under the law concerning wildlife protection and hunting and also protected as a national monument in 1967 under the Law for the Protection of Cultural Properties. Land reclamation, tree and bamboo felling and building of structures are strictly controlled, and hunting and fishing are prohibited. Designated as Japan's 28th national park (26,861ha) in June 1987. Designated as a Ramsar site at the time of accession on 17 June 1980, originally covering 5,012ha, extended to 7,726ha in June 1989. The extended area includes the area around Aka-Numa that has recently been designated as a special protection area, the area around the confluence of the Kottaro and Kushiro rivers, Shirarutoro Pond and Lake Touro (the latter two forming part of the newly-designated Kushiro Shitsugen National Wildlife Protection Area).

Site Description This is a lowland site at 10-80m altitude comprising a marshy floodplain surrounded by high ground on three sides, including a hilly area, a flat tableland and a terrace area, but open to the south. The wetland has developed along the Kushiro River which cuts through the centre of the plain and the Akan River which flows along the western edge. The waters of these rivers combine within the site and flow south to the river mouth at Kushiro. The whole area is underlain by peat soils of predominantly low quality. The extended area, a flat peaty wetland centres around the northern part of Kushiro Shitsugen. Rivers such as the Kushiro, Setsuri, Kenecharashibetsu and Kutcharo meander through the area. Shirarutoro Pond, an inland-sea/lake is 2.5km long, 1km wide, 8m above sea level, 10km in circumference, 1.5m in average depth and covers an area of 180ha. Lake Touro, another inland-sea lake is 6km long, 1km wide, 18km in circumference, 3m in average depth, 7m maximum depth and covers an area of 640ha. Except for a certain small area that has been influenced by human activity, the wetland has remained under natural stratigraphic processes and is considered to be one of the most well preserved wetlands in Japan. Mean annual temperature of 5.5°C and mean annual rainfall 1112mm. The weather in spring through summer is cold and humid due to the influence of sea fogs, but autumn and winter it tends to be fine and dry, maintained by continental or mobile high pressure conditions. There is snow in winter with a maximum of 123cm falling at one time. The wetland vegetation is dominated by reedbeds of *Phragmites communis* with extensive areas of sedges *Carex augustinowiczii*, *C. caespitosa* and *C. schmidtii*. Other common species include *Calamagrostis langsdorffii*, *Alnus japonica* and *Sanguisorba tenuifolia* var. *alba*. Species present in medium-elevation wetlands include *Moliniopsis japonica* and *Myrica gale* var. *tomentosa*. *Sphagnum* occurs in high wetlands. Several communities of aquatic plants such as *Potamogeton oxyphyllus*, *Vallisneria asiatica*, *Trapa japonica* and *Nuphar pumilum* range in a belt-shaped way along the margin of Lake Touro. *Carex communis* and *Potamogeton oxyphyllus* communities are present around Shirarutoro Pond, and *Aegagropila* is present in the lake bottom. The site contains 26 recorded mammal species including red fox *Vulpes vulpes*, racoon-dog *Nyctereutes procyonoides*, weasel *Mustela nivalis* and Siberian chipmunk *Tamias sibiricus*; 150 bird species; 10 species of amphibian and reptile including *Salamandrella keyserlingii*, *Hyla arborea japonica* and skink *Eumeces latiscutatus*; 31 fish species including carp *Cyprinus carpio*, *Carassius carass* and *Hucho perryi*; 46 dragonfly species (Odonata); and 84 butterfly species (Lepidoptera).

International and National Importance This site is one of the most valuable remaining wetlands in Japan due to its undisturbed condition. Approximately 160 species of birds have been observed, including endemic Japanese crane *Grus japonensis*, dusky thrush *Turdus naumanni* and Eurasian siskin *Carduelis spinus*. The wetland supports a rich migrant avifauna. Summer visitors include little grebe *Podiceps ruficollis*, red-necked grebe *P. grisegena*, spotbill duck *Anas poecilorhyncha*, water rail *Rallus aquaticus*, Japanese snipe *Gallinago hardwickii*, stonechat *Saxicola torquata*, Japanese robin *Erithacus akahige*, black-browed reed warbler *Acrocephalus bistrigiceps* and reed bunting *Emberiza schoeniclus*. Winter visitors include whooper swan *Cygnus cygnus*, mallard *Anas platyrhynchos*, shoveler *Anas clypeata*, tufted duck *Aythya fuligula*, greater scaup *A. marila* and goldeneye *Bucephala clangula*.

Changes in Ecological Character The wetland is in a largely undisturbed state with no notable artificial developments.

Management Practices Under the management plan, trained managers are stationed at the site throughout the year based at the specially constructed management office and observation tower.

Officials in charge of wildlife protection undergo an annual training session at the Training Institute for Environmental Pollution Control (Environmental Agency).

Scientific Research and Facilities The wetland was surveyed in 1978 as part of a national wildlife survey. An annual winter survey of the living conditions of ducks (Anatidae) is conducted with the help of volunteers (one of 4,171 locations throughout Japan). The Japanese crane habitat was surveyed in 1985 by the Environment Agency in order to promote their effective conservation. In addition, two surveys were conducted by the Agency in 1983 and 1985 in order to assess how best to conserve the site.

Principal Reference Material Above information is taken from Japan's national reports prepared for the Ramsar conference held in Cagliari in 1980 and Montreux in 1990 and from the documentation supplied at the time of extension in 1989. Supplemented by:

ICBP (1984). *Wetlands in East Asia - A preliminary review and inventory*. ICBP Study Report No.6. ICBP, Cambridge, England.

Japanese National Section ICBP (1984). National Report on Wetlands and Waterfowl Conservation in Japan. Unpublished manuscript presented at the 10th Asian Continental Section Conference of ICBP.

Izu-numa and Uchi-numa

Location 38°43'N, 141°06'E. In the north of Miyagi prefecture in the northern part of Hokkaido Island.

Area 559ha

Degree of Protection In November 1966 an area of 520ha of this wetland was designated as a prefectural wildlife protection area under the Wildlife Protection and Hunting Law, 1917. Designated as a Ramsar site on 13 September 1985. In September, 1967 520ha of this wetland was designated as a natural monument, "Birds and Their Habitat of Izu-numa and Uchi-numa" under the Cultural Properties Preservation Law, 1950. In August 1973 559ha was designated as Izu-numa and Uchi-numa Prefectural Nature Conservation Area. The whole area is an ordinary area under the Nature Conservation Law 1972. Subsequently, in November 1982 this area was incorporated into a newly designated national wildlife protection area which covers 1,450ha, including a 920ha special protection area.

Site Description The site contains two lakes. Izu-numa Lake is 7m above sea level, just over 1m deep and extends 4.5km west-east and 2km north-south, covering about 400ha. Uchi-numa Lake is situated south-west of Izu-numa, extending 1.5km west-east and 1.2km north-south and covers about 150ha. The two lakes are connected by a channel half a kilometre long. The wetland area of these two lakes was formed through the alluvial banking process of Sako River. Frequent land reclamation works done on the wetland since the late 19th century contributed to shaping it into the present landscape. In the central area of the lakes submerged plants such as *Hydrilla verticillata* occur and floating water plants such as East Indian lotus *Nelumbo nucifera* and *Trapa natans* var. *quadrispinosa* are abundant. Along the lakeshore Manchurian wild rice *Zizania latifolia* or reed *Phragmites japonica* communities are dominant.

International and National Importance The site is an important breeding area for reedbed birds and in winter is visited by thousands of migrant birds. The avifauna comprises about 200 species. In summer the reed and wild rice beds on the lakeshore form the breeding habitat for eastern great reed-warbler *Acrocephalus arundinaceus orientalis*, black-browed reed-warbler *A. bistrigiceps*, Japanese fan-tail warbler *Cisticola juncidis brunniceps*, Chinese little grebe *Podiceps ruticollis poggei*, coot *Fulica atra atra*, Japanese ruddy crane *Porzana fusca erythrothorax*, Indian moorhen *Gallinula chloropus indica* and spotbill duck *Anas poecilorhyncha zonorhyncha*. In winter, the lakes provide a habitat for many Anatidae including eastern bean-goose *Anser fabalis serrirostris*, tundra swan *Cygnus columbianus* and whooper swan *C. cygnus*. The national survey of Anatidae conducted in January 1985 counted 4,100 geese and 5,100 swans (45% and 20% respectively of total migrants to Japan). In spring and autumn the wetland plays an important role as a migration stopover for many species, especially common sandpiper *Tringa hypoleucos*, common snipe *Gallinago gallinago*, eastern solitary snipe *G. solitaria japonica* and Pacific golden plover *Pluvialis fulva*.

Changes in Ecological Character None reported

Management Practices To prevent eutrophication, discharge of phosphorous and nitrogen came under additional regulation in July 1989.

Scientific Research and Facilities The area was surveyed in 1985 as part of the national survey of Anatidae.

Principal Reference Material The above information was taken from the document submitted at the time of designation in September 1985, and from the Japanese report to the Montreux Conference 1990. Supplemented by:

Anon. (undated). *Izunuma Marsh. A wildlife preserve, Miyagi, Japan.* Yasuhito Goto, Miyagi, Japan. (English version of guide book.)

ICBP (1984). *Wetlands in East Asia - A preliminary review and inventory.* ICBP Study Report No.6. ICBP, Cambridge, England.

Japanese National Section ICBP (1984). National Report on Wetlands and Waterfowl Conservation in Japan. Unpublished manuscript presented at the 10th Asian Continental Section Conference of ICBP.

Kutcharo-ko

Location 45°09'N, 142°20'E. North of Kushiro city on Hokkaido.

Area 1,607ha

Degree of Protection Designated as a wildlife protection area and special protection area in 1983 and since 1986 as North Ohotsuku Prefectural Natural Park. Designated as a Ramsar site on 6 July 1989.

Site Description Kutcharo-ko is an inland-sea lake covering approximately 1,607ha, 0m above sea level, 2.5m at maximum depth and 30km in circumference. There are large-scale communities of reeds along most of the lake margin and aquatic plants occur.

International and National Importance Approximately 210 species of birds have been observed. The lake is the northernmost transit point in Japan for such migratory birds as wild goose, wild duck and swan, especially tundra swan *Cygnus columbianus* and wigeon *Anas penelope*. The low-lying wetland surrounding the lake plays an important role as a breeding place for waterfowl and land fowl. Almost the whole population (10,000) of tundra swan coming to Japan makes use of the lake temporarily each year. The forest area located to the north of the lake is an important habitat for various kinds of sylvan avifauna such as white-tailed eagle *Haliaeetus albicilla*.

Changes in Ecological Character None reported

Management Practices No information

Scientific Research and Facilities No information

Principal Reference Material The above information was supplied by the Japanese government at the time of designation.

Jordan

Area 97,739 sq.km

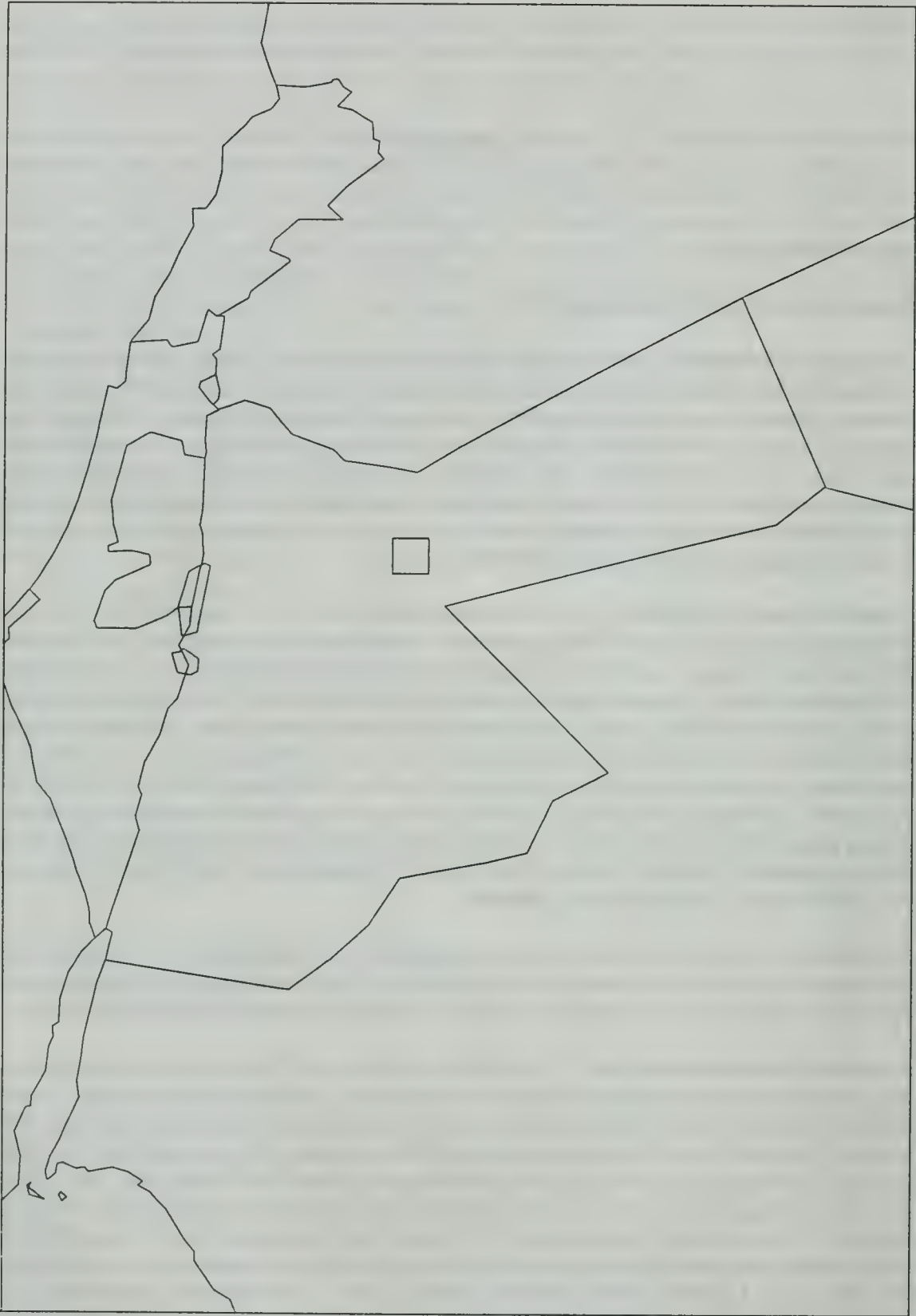
Population 2,910,000 (East Bank; 1988)

Summary of Wetland Situation As a semi-arid to very arid country, Jordan has few permanent wetlands. Away from the Jordan Valley itself, Azraq Oasis is the only significant natural wetland, although throughout the country the largely limestone landscape is dissected by numerous wadis, few of which have been dammed. There are plans for a joint Syrian-Jordanian dam project on the Yarmuk River. The scarcity of water means that Jordan's few wetlands are of major ecological and socio-economic importance; none more so than Azraq Oasis. The large and increasing consumption of water in Jordan has led to the development of problems requiring a "wise use" approach to Azraq and elsewhere.

Protected Areas Legislation The Woods and Forests Law of 1927 (amended 1951) covers protection of woods and forests and delimitation of protected forest boundaries, and Law No. 20 of the Code of Agriculture (1973) relates to both state and private forests owned by individuals and corporate bodies. Natural Resources Authority Law No. 12 of 1968 prohibits habitation within government forests, grazing on forested land without authorisation; and the cutting of forest trees of any kind during the period March to end May. In Article 144-155 of Act No. 20, the hunting of birds and wildlife is prohibited without authorisation from the Ministry of Agriculture, and Articles 180-186 of the same Act make declarations on marine or freshwater fishing areas, and areas and seasons in which fishing may be prohibited or specific kinds of fishing permitted. The Law of Hunting No. 28 of 1957, Ordinance No. 1 of 1958, and Ordinance No. 2 1966 relating to general game protection.

The different categories of protected area include national parks, wetland reserves (designated under internationally recognised strict nature reserve criteria), wildlife reserve (designated under internationally recognised managed nature reserve criteria), and marine parks and nature reserves

Protected Areas Administration The Ministry of Agriculture delegates protected area establishment and management responsibilities to a private body, the Royal Society for the Conservation of Nature (RSCN). The RSCN, financed by both government and private donations, was set up in 1966 and has the role dealing with wildlife conservation, management and control of hunting. Commencing in 1974, support was forthcoming from WWF and IUCN. The RSCN now advises the government on hunting quotas, species and seasons, as well as issuing hunting licences. The activities of the Ministry of Tourism and Antiquities include restoration of antiquities and responsibility for the national parks and historic monuments systems of Jordan. The Ministry of Agriculture is the chief enforcement agency in State forest land. Officers of the Ministry are authorised to seize forest products obtained without a licence and to arrest those illegally cutting timber within all State forest. The Forest Department controls about 131,500ha designated as forest land.



Ramsar Sites in Jordan

The Forestry and Soil Conservation Directorate is composed of four divisions: Forestry, Investment and Protection, Soil Conservation and Nurseries. The Natural Resources Authority (NRA) was established to formulate a national water policy, as well as the utilisation and development of mineral resources. It cooperates with the Ministry of Agriculture in such matters as irrigation and reclamation. Its Water Resources Division is concerned with water pollution. The Jordan Valley Authority has responsibility for the economic development of the Jordan Valley, including water resources, irrigation and hydroelectric power stations.

Sites designated under the Convention Accession on 10 January 1977 with 1 site listed at accession

Azraq Oasis

Government body responsible for administration of the Convention

Ministry of Municipal & Rural Affairs and the Environment, Environment Department, PO Box 35206, Amman

Azraq Oasis

Location 31°49'N, 36°48'E. Some 80km east-south-east of Amman at the centre of a large desert drainage basin which extends over more than 12,700 sq.km. Major highways from Amman and Zarqa, to Iraq and Saudi Arabia, transect the area and there are two settlements, North Azraq (formerly Druze) and South Azraq (formerly Shishan) on the north-western edge of the oasis itself.

Area 7,372ha

Degree of Protection The Ramsar site is state owned. 1,255ha, close to South Azraq, has been designated as Azraq Wetland Reserve and is wardened by the Jordanian Royal Society for the Conservation of Nature (RSCN). Designated as a Ramsar site at the time of accession on 10 January 1977.

Site Description The larger part of the site (approximately 6,000ha) is known as Qa Azraq and consists of an extensive playa or salt flat which receives surface runoff from an extensive network of wadis. The playa is flooded irregularly, reflecting the fact that most rainfall comes from seasonal thunderstorms, and is largely devoid of vegetation, except for a fringe of succulent halophytes such as *Halopeplis* and *Halocnemum*. Until recently, there were two groups of freshwater springs (close to the villages of North and South Azraq, respectively) which were fed by the upper of three aquifer systems which underlie the oasis. Streams carried water from the spring pools eastwards towards the playa, giving rise to a variety of habitats, including *Typha*, *Scirpus* and *Cyperus* communities in the wetter areas and *Nitraria* and *Tamarix* communities on the silty dunes between the streams and pools. It is the spring-fed area close to South Azraq which constitutes Azraq Wetland Reserve. However, owing to factors outlined below under 'changes in ecological character', the North Azraq spring group has now dried up and water reaching the wetland reserve has decreased substantially.

International and National Importance Among the few wetlands of this semi-arid to very arid country, Azraq Oasis is of major strategic importance for migratory birds, especially waterfowl, raptors and passerines such as warblers Sylviidae using the Palearctic-Ethiopian flyway. The wetland reserve supports a range of plant species and vegetation communities found nowhere else in Jordan and is also important for amphibians and reptiles, such as marsh frog *Rana ridibunda* and black water snake *Tropidonotus tessalate*. The oasis also constitutes a major social and economic resource, being one of Jordan's largest and most heavily exploited sources of water for human consumption. Qa Azraq also supports a substantial salt industry.

Changes in Ecological Character The ecological character of the wetland has altered radically during the last decade. Some of these changes are relatively superficial (e.g. villages have grown in size; litter has become a major eyesore) and are linked to the routing of new highways through the area. However, other changes have been more fundamental and have resulted from the extraction of Azraq's groundwater to supply the Amman/Zarqa district. Since 1982, large quantities of groundwater have been pumped from well fields a few kilometres outside the Ramsar site and extraction (for irrigation) from private, unlicensed wells has also increased, so that by 1988, total withdrawals approached the Jordanian's government's estimate of the annual groundwater recharge. As a result of this, the groundwater table was lowered substantially, causing the springs at North Azraq to dry up and the flow from South Azraq springs, which feeds the wetland reserve, to be greatly reduced, in turn causing impoverishment of vegetation and desiccation of some formerly wet areas. There are also fears that unlimited extraction would lead ultimately to groundwater salinisation. At the Conference of the Contracting Parties held at Regina in 1987, delegates approved Recommendation C.3.8 which called for a proper assessment of the environmental impact of pumping and suggested at least a 50% reduction in the level of extraction. A special Committee of the Jordanian Cabinet subsequently approved a "safe yield" identified by the Water Authority. A Ramsar Bureau mission in March 1990 found that Azraq Oasis remained internationally important, but that the wetland's ecological character was continuing to deteriorate. A full report with detailed recommendations was submitted to the Jordanian authorities.

Management Practices The wetland reserve is fenced and there is an RSCN warden allocated to the reserve, although any active management is extremely limited. No management plan has been implemented, although one was drawn up some years ago.

Scientific Research and Facilities Research has been carried out by the Universities of Jordan and Yarmouk and the oasis vegetation has been studied in detail by Nelson (1973). An International Biological Research Station was established at the site in 1968 but was closed in 1969.

Principal Reference Material

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

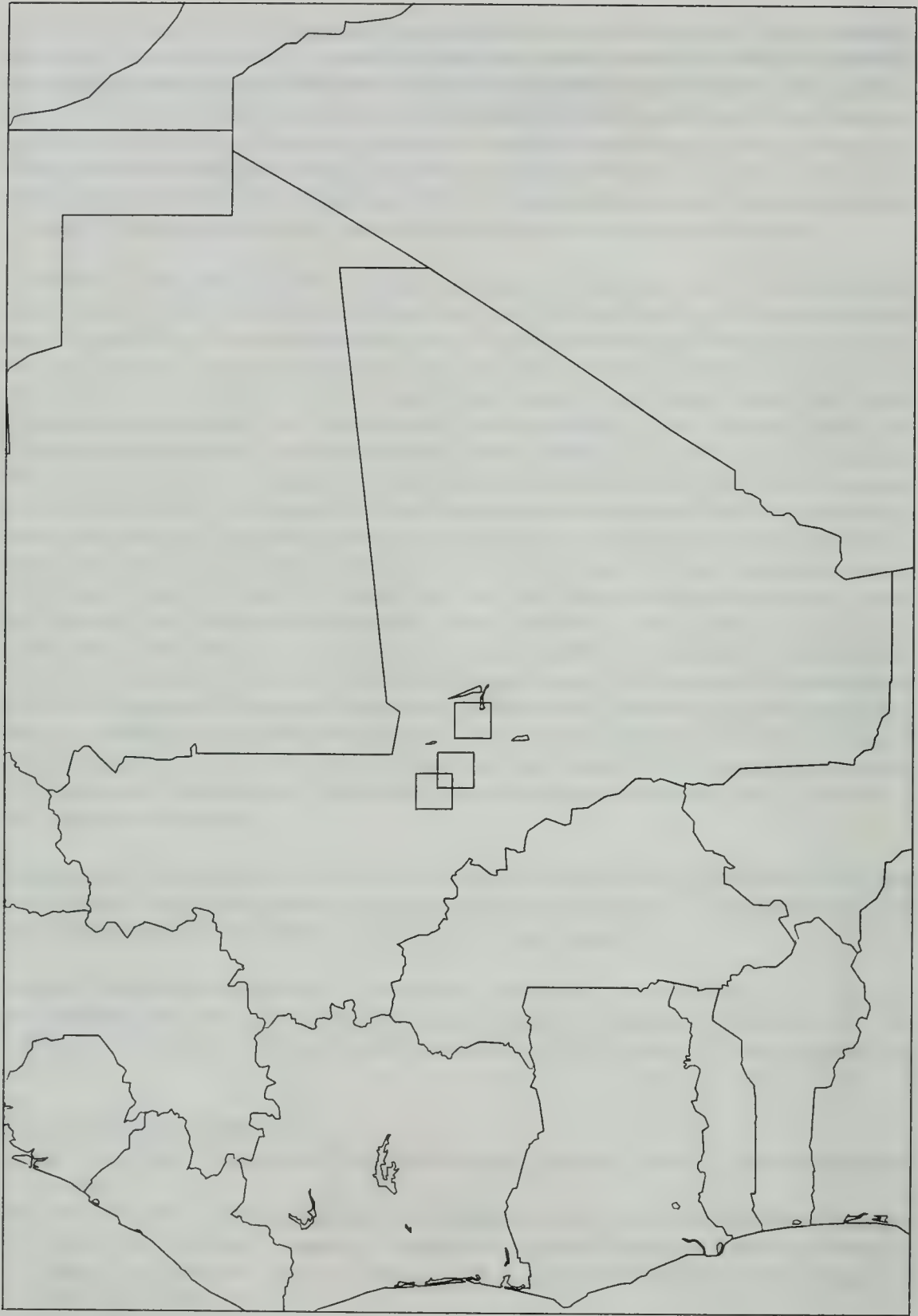
Department of Environment, Ministry of Municipal and Rural Affairs and the Environment (1989). *Country Report of Jordan: Review on Reserves and Al-Azraq Wetland Reserve*. Unpublished report to Workshop on Integrated Management of Mediterranean Wetlands, Donana, Spain.

Directorate of Water Resources Studies, Water Authority, Ministry of Water and Irrigation (1990). *A Brief Discussion on the Hydrology and the Hydrogeology of Azraq Basin*. Unpublished Report.

Nelson, B. (1973). *Azraq: Desert Oasis*. Allen Lane, London.

Nelson, J.B. (1985). Return to Azraq. *Oryx* 19(1): 22-26.

Ramsar Convention Bureau (1988). *Proceedings of the Third Meeting of the Conference of the Contracting Parties*. Ramsar Bureau, Gland, Switzerland.



Ramsar Sites in Mali

Mali

Area 1,204,022 sq.km

Population 7,780,000 (1988)

Summary of Wetland Situation Mali is a land-locked state in West Africa, of which much of the territory is desert. The vast northern areas are virtually rainless. Elsewhere, rainfall occurs as the inter-tropical convergence zone moves north from June onwards and then south again in September and October. In the Soudanian zone in the south, rainfall varies between 600mm and 1275mm per annum; thus, Bamako, the capital, receives a mean annual rainfall of 1037mm, mainly from June to October. In the Sahelian zone further north rainfall varies from 200mm to 600mm mainly in July and August. The wetlands are dominated by the River Niger, which rises in the Fouta Djallou hills of Guinea (which receive heavy monsoon rain) and flows northward into Mali. Within Mali, the Niger spreads out into a vast inland delta, 425km long and on average 90km wide, with a minimal gradient (a drop of only 8m over the whole delta). Beyond the delta and Tombouctou, the great Niger bend takes the river through Niger and Nigeria to its mouth in the Gulf of Guinea. Apart from a small area in the south-west, which drains into the Senegal and Bafing basin, the whole of Mali drains into the Niger River. The extent of flooding of the inner delta varies from year to year. The maximum area in good years, when the associated delta lakes such as Debo are filled, is over 3 million ha. When rainfall in Guinea is low, the flood is poor, as happened several times in the 1970s and 1980s, provoking the Sahel droughts. In such years, lakes and flooded areas dry up early in the season, crops and fisheries fail and livestock die. Mali's three Ramsar sites are sectors of the inner delta selected for their value for wildlife, and waterfowl in particular. The inner delta as a whole, however, is a wetland of immense productivity which has been exploited on a sustainable basis by mankind for centuries. The Malian government has in recent years been carrying out a series of projects, in cooperation with the IUCN and WWF, to investigate the best way of combining conservation with wise use.

The above note is based on information supplied by the Malian government and on the draft Directory of African Wetlands (Mephram, R.H. and J.S., in press).

Protected Areas Legislation Wildlife protection dates back to 1938 when the London Convention for Protection of African Flora and Fauna was ratified by the French colonial authorities. Current legislation relating to the protection of natural resources originates from two decrees promulgated by the French colonial authorities, one of 4 July 1935 under which the forestry regime was established in French West Africa, and another of 18 November 1947, whereby hunting was controlled in French overseas territories. Following independence in 1960, these decrees have been superceded. The Wildlife Management Code (Loi No. 86-43/AN-RM portant Code de Chasse et de Conservation de la Faune et de Son Habitat of 30 January 1986), which replaced the earlier Hunting Code (Ordonnance portant institution d'un Code de chasse en République du Mali, No. 60/CMLH of 11 November 1969), provides for the establishment of réserves naturelles intégrales (natural integral reserves), parcs nationaux

(national parks), réserves de faunes (faunal reserves) and réserves spéciales ou sanctuaires (special reserves or sanctuaries). Hunting has been banned throughout the country for an indefinite period since 1 November 1977 (Decree No. 193/PG-RM).

Loi No. 86-42/AN-RM of 30 January 1986 sets out the Forestry Code, replacing the earlier Ordinance No. 68-8/AN-RM of February 1968. The permanent state forest consists of forêts classées (classified forests), périmètres de reboisement (reforestation areas) and périmètres de protection (protection areas). Mountain slopes with gradients of 33° or more, ravines and landslides, shifting sand dunes, and degraded land around population centres are of necessity classified as protection areas. In addition, all land with insufficient forest for regeneration, notably in the Sahel zone, is automatically classified as protection area. Other state forest not constituted under permanent tenure is classified as protected forest. The primary role of classified forests is to protect the vegetation and water catchments. Classified forests are managed in a similar way to faunal reserves though control of exploitive activities is likely to be better enforced. Felling of trees is prohibited and traditional rights of use, such as cultivation, grazing and exploitation of forest resources, are restricted.

Protected Areas Administration This is the responsibility of the National Parks Department (Direction des parcs nationaux) which is supervised by the Department of Water and Forests (Direction générale des eaux et forêts). The Ministry responsible for the parks is the Ministry of Natural Resources (Ministère des ressources naturelles). The Forestry Service, also within the Direction générale des eaux et forêts, is responsible for management of classified forests.

Sites designated under the Convention Accession on 25 May 1987 with three sites listed on accession.

Walado Debo/Lac Debo
Séri
Lac Horo

Government body responsible for administration of the Convention

Ministère des Ressources Naturelles, Direction Générale des Eaux et Forêts, BP 275, Bamako

Lac Debo/Walado Debo, Lac Horo, Séri

Location Lac Debo/Walado Debo 15°01'-15°24'N, 4°02'-4°27'W; Lac Horo 16°09'-16°16'N, 3°38'-3°58'W; Séri 14°43'-15°01'N, 4°32'-4°48'W. All three sites are situated in the Inner Delta of the Niger, which lies in the 5th and 6th administrative regions of Mopti and Tombouctou, respectively.

Area Lac Debo/Walado Debo 103,100ha; Lac Horo 18,900ha; Séri 40,000ha

Degree of Protection Following a study on the feasibility of establishing protected areas for birds in the most important feeding, roosting and nesting area of the Inner Delta of the Niger, these three sites were identified and subsequently designated as Ramsar sites in May 1987. Lac Debo/Walado Debo is state-owned, but villages lying within its boundaries have customary areas

for exploitation. At Séri, land belongs to the Peuls in the north and to the Nyasso in the south, but the course of the intervening boundary is disputed. Lac Horo lies in the officially administered area known as l'Office du Niger.

Site Description The Inner Delta of the Niger River, which extends over an area of 50,000 sq.km, is the largest wetland in West Africa. It forms part of the semi-desert region of the Sahel, but is exceptional in the abundance of water that annually floods some 20,000-25,000 sq.km of land (in drought years, less than 5,000 sq.km may be flooded). In addition to the flood plain, there is a large network of over a dozen lakes, including Lac Debo and Lac Horo. Together, the three sites cover 162,000ha, less than 5% of the inner Niger Delta. Lac Debo/Walado Debo consists of a flood plain, lakes and ponds, and rivers which are flooded annually. Only the eastern sector is not inundated during years of heavy flooding. Flooding occurs from August to January, but it is in the dry season that this wetland is vitally important for waterfowl, because it is the last stretch of water in the central part of the Delta to dry up. Séri comprises a flood plain fed by the flood waters of the Diaka. In October 1985, flood waters attained a depth of 2m and covered most of the plain. The numerous large and small ponds are important watering points for cattle, until April in many cases. Lac Horo is separated from the Niger River by a sluice. Before its construction, the lake would have been permanent, with water remaining throughout the dry season. In recent drought years, the lake has not filled up as previously and begins to dry out from April onwards. The sluice gates are normally opened mid-November to allow the lake to fill up after the harvesting of millet which is grown during the wet season. After poor floods, however, the gates are opened at the beginning of November to allow enough time for the lake to fill up.

Lac Debo/Walado Debo supports a heterogenous assemblage of species, among which aquatic grass *Echinochloa stagnina* and *Vossia cuspidata* predominate throughout the site. At Séri, wild rice *Oriza longistaminata* and *Eleocharis dulcis* comprise 50% of the vegetation, *Echinochloa stagnina* 16% and associations with *Vetiveria nigriflora* 19%. Most of the area around Lac Horo is cultivated for production of millet during the wet season. The centre of the lake and much of its surface, when flooded, supports natural vegetation, dominated everywhere by *Typha australis* and *Polygonum senegalense*. Certain clearings are colonised by *Nymphaea* spp. and *Vossia cuspidata*.

The Niger Delta used to be rich in mammals, but antelopes such as topi *Damaliscus lunatus* and Defassa waterbuck *Kobus ellipsiprymnus* were wiped out in the 1968-1973 droughts. Only one or two thousand warthog *Phacochoerus aethiopicus* and a few hippopotamuses *Hippopotamus amphibius* remain. The largest surviving population of West African manatee *Trichechus senegalensis* is found here.

International and National Importance The delta contains an important proportion of the world wintering population of garganey *Anas querquedula* and pintail *Anas acuta*. The three sites have been selected on the basis of their biological importance, according to the distribution of the three main duck species (garganey, pintail and ferruginous duck *Aythya nyroca*). The area is a wintering ground of crucial importance for a large variety of Palaearctic birds, as well as for species which migrate inside Africa. Of a total of at least 350 species recorded so far within the limits of the flood zone of the Niger, 108 are wholly or partly of Palaearctic origin. Some 500,000 garganey and over 200,000 pintail have been counted on the delta in January and February. Recent counts suggest that these wintering populations have been considerably affected by the last few years of drought. The area is no less important for a wide range of

resident and Afrotropical species. Spur-winged goose *Plectropterus gambensis* and northern-crowned crane *Balearica pavonica* breed on the flooded plains; large numbers of local herons, ibises and cormorants breed in colonies in flooded woodlands; and Eurasian white pelicans *Pelecanus onocrotalis* have occasionally been found breeding on sandbanks exposed as the flood falls. In drought years, Lac Horo is the only source of the aquatic plant *Typha australis*, an important food for waterfowl such as purple gallinule *Porphyrio porphyrio*, African spoonbill *Platalea alba*, little crane *Porzana parva* and ferruginous duck. For the last species, Lac Horo regularly holds more than 50% of the West African population.

Changes in Ecological Character Livestock densities in the central delta are the highest in Africa at critical times of the year. Fuelwood is not an immediate problem, due to the abundance of dead wood from trees affected by recent droughts. The wildfowl population is exploited by local people, with tens, possibly hundreds of thousands of ducks and some waders being consumed annually. This level of harvesting is thought to be sustainable. Each site experiences some pressure due to the local population: Lac Debo/Walado Debo has about 1,700 inhabitants distributed among nine villages. There are a further 15 villages, with about 15,800 inhabitants peripheral to the site. In addition, thousands of fishermen and pastoralists enter the area during the dry season, when up to 230,000 cattle and hundreds of thousands of sheep and goats may be present. At Séri there are two villages, Séri and Koubitera (with a total of approximately 350 people), and a further six villages (with about 1,150 people) on the periphery. In addition, there is a significant seasonal influx of pastoralists and fishermen. In March 1981 there were an estimated 24,000 cattle at Séri. Rice fields cover 3% of the site. Lac Horo is subject to multiple uses. The surrounding area is intensively cultivated, leaving the central portion for fishing and, when the lake dries up, pastoralism.

Management Practices At Lac Horo, important waterfowl habitat lies adjacent to an intensive and economically profitably agricultural improvement scheme. Agricultural development over the last 50 years has not detracted from this importance and there exists the potential for integrating management for conservation with agricultural improvement in the future. There is no management plan yet for any of the three sites.

Scientific Research and Facilities Maps of exceptional quality, published by the IGN, Paris, are available at three scales. The International Livestock Centre for Africa has produced a detailed vegetation map of the entire delta based on interpretation of conventional aerial photography. Maps on a variety of themes (e.g. vegetation, water resources, agricultural development) have been produced by Projet Inventaire Ressources Terrestres; these are based on Landsat imagery. The anti-locust organisation OICMA produced detailed maps of the land use and flood and vegetation characteristics of the central delta, based on aerial photography in the early 1970s. Research on migrating bird populations in the delta has been conducted by the Centre de Recherches sur la Biologie des Populations d'Oiseaux, Paris, since the early 1970s. Aerial surveys have been carried out by the centre since 1972 and more recently (1984 onwards) under the Projet de Conservation de l'Environnement dans le Delta Intérieur du Niger. An evaluation of the status of natural resources in the delta (IUCN/WWF Project No. 9016) was followed up in 1984 by a project to establish protected areas in the most important areas of the wetland for birds (WWF/IUCN Project No. 3062). Other research on fisheries, agriculture, pastoralism and hydrology is reviewed by Cobb (1983).

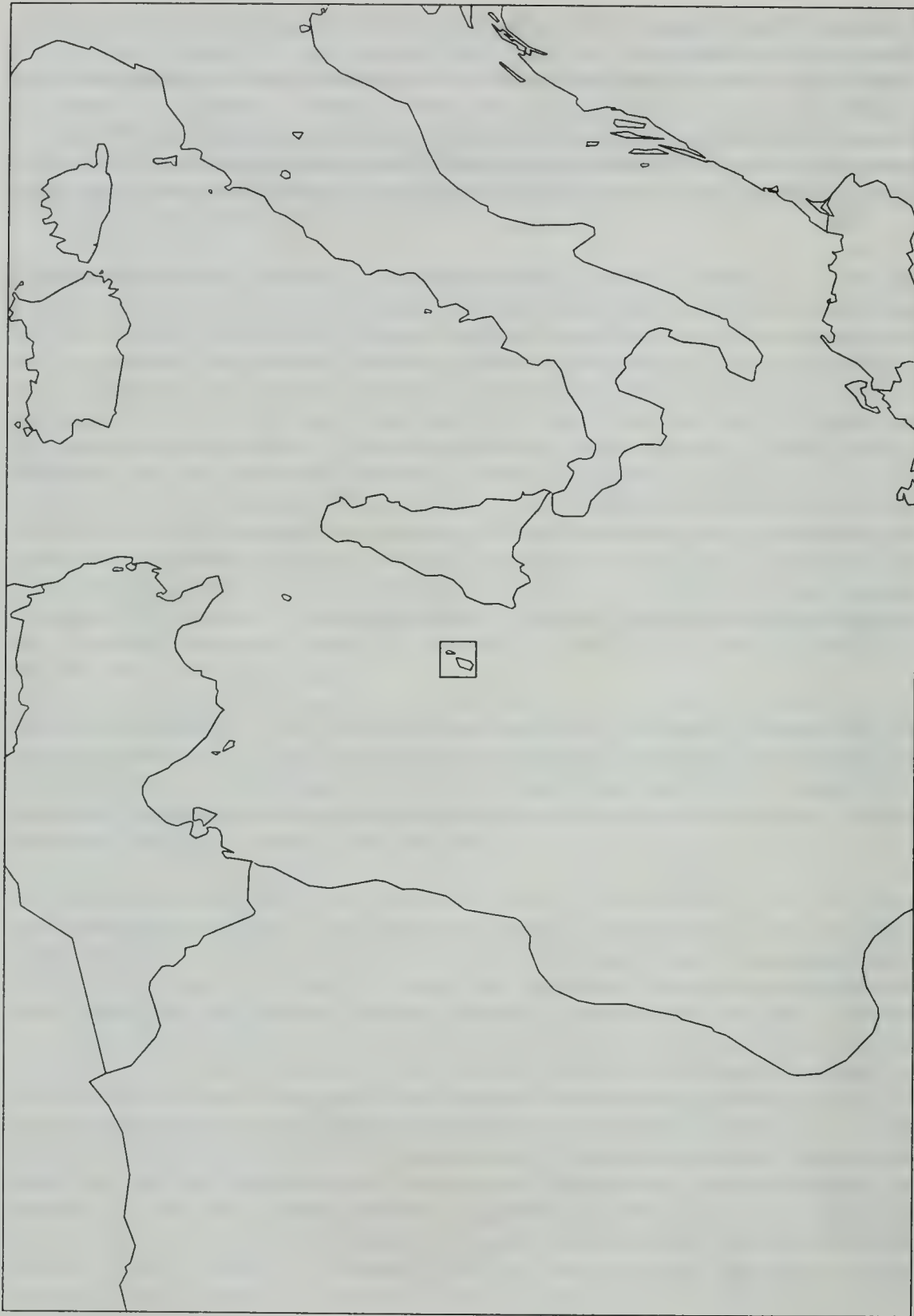
Principal Reference Material The above information has been supplied by the Government of Mali, supplemented by:

Anon. (1985). Wetland conservation in a desert region. WWF Monthly Report May 1985: 109-111.

Anon. (1985). Research in the Niger Delta. WWF Monthly Report May 1985: 113-116.

Anon. (1986). Wetlands in Mali's Niger Delta. WWF Monthly Report March 1986: 75-77.

Cobb, S. (1983). Conservation in the inland delta, Mali. Unpublished report. IUCN, Gland. 21 pp.



Ramsar Sites in Malta

Malta

Area 316 sq.km.

Population 345,636 (1987)

Summary of Wetland Situation Owing to their size, geology, climate and land-use history, the Maltese islands have only one significant wetland, Ghadira, in north-west Malta, which has been designated under the Ramsar Convention since Maltese accession in 1989. The wetland is one of two ancient sites (the other being Salina Bay) where salt extraction was carried out on the island. According to 16th century maps, the area was formerly a salt-pan, but subsequent siltation led to the development of saltmarsh, with a shallow pool holding water from October to May. The pool was fed by rain water with occasional incursions of sea water during winter storms. Ghadira is now the most important site in Malta for migratory and wintering waterfowl and is being carefully managed in order to enhance its ecological value and is also being developed as an increasingly important conservation education resource.

Protected Areas Legislation The Bird Protection Act and Regulations of 1980 gives protection to all breeding birds, all birds of prey and large numbers of migrant species. Protected nature conservation areas include bird sanctuaries established under the Bird Protection Act by edict of the Ministry of Agriculture, although the habitat and the species other than birds are not protected within these sanctuaries, and protection is restricted to prohibition of shooting and trapping. Nature reserves can be established by specific act. The first, the saline marshland at Ghadira was established in 1978 by Legal Notice No. 126, Protection of Birds (Amendment) Regulations. Assistance with its establishment and a comprehensive management plan approved by the Maltese government came from the WWF, the International Council for Bird Preservation and the DBV of the Federal Republic of Germany. The Filfla Nature Reserve Act No XV, which was passed by the House of Representatives on 10 May 1988, established the Filfla protected area. Presently, various bodies, including the Environmental office for Conservation in the Environmental Division of the Ministry of Education, are working on a list of new areas to be declared nature reserves.

Protected Areas Administration The authority responsible for nature conservation is the Environmental Officer for Conservation in the Environmental Division of the Ministry of Education, which administers and manages nature reserves. Bird sanctuaries are administered by the Department of Agriculture.

Sites designated under the Convention Accession on 30 September 1988 with one site listed.

Ghadira

Government body responsible for administration of the Convention

Ministry of Education and Environment, Environment Division, Beltia Sebh, Valletta

Ghadira

Location 35°58'N, 14°21'E. Situated on an isthmus at the neck of the peninsula formed by the Marfa Ridge, north-western Malta. The isthmus runs west-east between Ic-Cumnija and Mellieha Bay, a distance of about 1,280m.

Area Reserve area is approximately 6ha and is surrounded by a 500m-wide no bird hunting buffer zone.

Degree of Protection The wetland reserve was established by Legal Notice No. 126 of 1978, Protection of Birds (Amendment) Regulations. The site is state-owned and was added to the Ramsar list on the accession of Malta to the Convention on 30 September 1988.

Site Description The wetland area originated in a deep fault, where alluvial soil has accumulated as a result of erosion of steep Upper Coralline limestone hills and particularly of exposed sections of a blue clay stratum. The pool is a depression of impermeable clay, the retained surface water (largely derived from winter rains) becomes steadily more saline, and before it was deepened it used to dry out completely in summer (June-September). The area is 5m above sea level and water depth varies from 1cm to 15cm, although it can be as much as 1m in deeper pockets. Annual precipitation is approximately 600mm, 70% of this falling between September and March. Temperatures average 30°C in September to 9.5°C in January. Winds dominate from the north-west.

The area has been used for cultivation and salt pans in the past, but the pool is now surrounded by halophile scrub, with species such as seablite *Suaeda maritima*, glasswort *Salicornia europaea* and golden samphire *Inula crithmoides*, and sandy patches supporting a rare species of arrow grass *Triglochin bulbosum*. Bordering this in the south is a grove of tamarisk *Tamarisk gallica*, with a variety of halophilous vegetation on the hill slopes and plantations of *Acacia* and *Eucalyptus* on the dunes separating the eastern end of the reserve from the sea. Wetter patches support stands of cane *Arundo donax* and common reed *Phragmites* which, together with a number of carob trees *Ceratonia siligua*, provide nesting sites for 5 out of Malta's 18 species of breeding bird. The adjoining sand-dunes are one of two supporting the only European population of sand brookrape *Orobanche densiflora* form *melitensis*. Tassell weed *Ruppia drapensis* occurs only in this wetland area. It is both rare and threatened not only locally but also on a European scale. Mammals recorded in the area include weasel *Mustela nivalis*, Algerian hedgehog *Erinaceus algirus*, pygmy white-toothed shrew *Suncus etruscus*, house rat *Rattus rattus* and brown rat *R. norvegicus*. Reptiles *Coluber viridiflavus carbonarius* and *Chameleo chameleon* have also been recorded. A healthy population of brackish water fish *Aphinus fasciatus*, which is in danger in other parts of the island, is found at this reserve. A new species of brackish water snail has also been identified and is still being studied. The area supports a very diverse entomofauna, some species of which are known only from this area, such as tettigoniid grasshoppers *Odontura stenosciphe* and two species of possibly undescribed endemic wasps.

International and National Importance The reserve is the most important wetland area in Malta and a vital stepping stone for birds migrating between Europe and North Africa. The great number of migrant species which are attracted to it rest, provided that water and insects are available. The site is especially important for waders, such as ruff *Philomachus pugnax* (up to 100 in spring) and passerines. It is also a good wintering area for little grebe *Tachybaptus ruficollis*, black-necked grebe *Podiceps nigricollis*, coot *Fulica atra*, moorhen *Gallinula chloropus*, water rail *Rallus aquaticus* and kingfisher *Alcedo atthis*. Breeding birds at Ghadira include the declining corn bunting *Miliaria calandra* and fan-tailed warbler *Cisticola juncidis*.

Changes in Ecological Character Disturbance is caused by a busy road along the eastern boundary of the reserve and by tourists, especially as the site is next to Malta's most popular beach, Mellieħ Bay. Shooting still occurs on nearby hills and control of the numerous rats could be a problem.

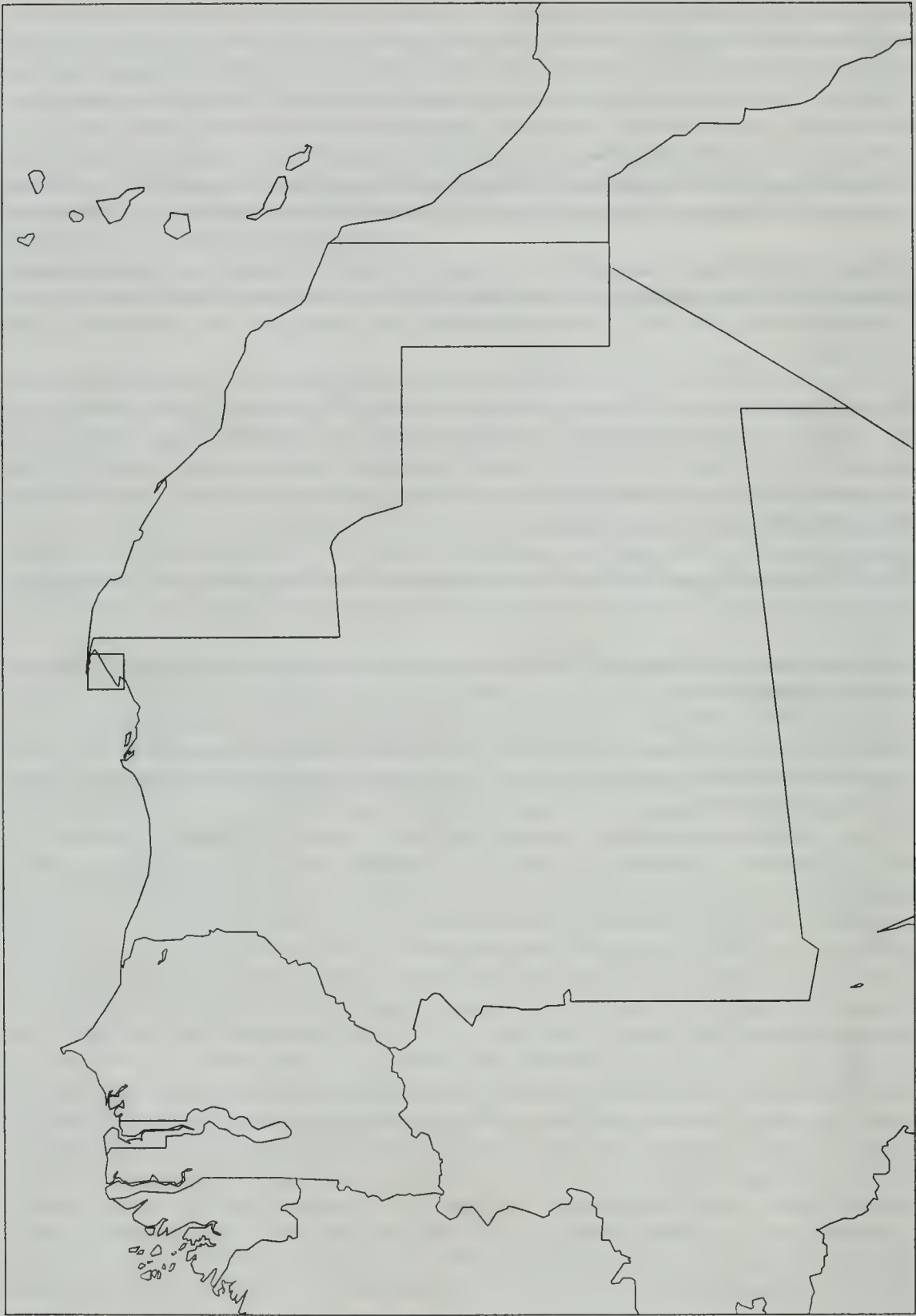
Management Practices The area has been fenced off with controlled access and is managed by a full-time warden supported by three night watchmen. In 1980 a management plan was prepared (WWF Project No. 1505). The pool was enlarged by dredging, surrounded by a ditch, and several islands of different sizes and heights were created. Hides and a visitor centre have been provided for educational purposes.

Scientific Research and Facilities The area has been kept under observation by ornithologists for the last 25 years.

Principal Reference Material The above information was supplied by the Maltese government, supplemented by:

Carp, E. (1980). *Directory of Western Palearctic Wetlands*. IUCN, Gland. 506 pp

Schembri, P.J., Lanfranco, E., Farrugia, P., Schembri, S. and Sultana, J. (1987). *Localities with conservation value in the Maltese Islands*. Environment Division, Ministry of Education, Malta. 27 pp.



Ramsar Sites in Mauritania

Mauritania

Area 1,118,604 sq.km

Population 1,894,000 (1988 estimate)

Summary of Wetland Situation The two principal areas of importance within Mauritania are the Banc d'Arguin area, and the wetlands of the Senegal River Valley. Banc d'Arguin is a national park covering some 15,000 sq.km of shallow seas, islands, mudflats and adjacent desert landmass, and is clearly of major importance for its rich fisheries and mudflats which support up to two million waders each winter. There are also a number of major breeding colonies on the islands. Various sites in the Senegal Delta are of importance with a series of floodplains, temporary freshwater marshes, shallow brackish lakes, channels and mangroves all deriving water from the annual flood of the river. Plans are in hand for the establishment of a national park at Diawling, opposite Djoudj in Senegal. The adjacent Aftout-es-Sahel, a series of depressions running parallel to the coast north of the delta with an irregular water supply, is similarly important. Further upstream there are a number of other interesting sites in the Senegal flood plain. Two other sites worth mentioning are lakes Aleg and Mal, both of which dry out periodically.

Protected Areas Legislation The Hunting and Wildlife Protection Act (No. 3 of 15 January 1975) provides for the creation of national parks and faunal reserves, as well as including a range of measures aimed at controlling hunting within the country.

Protected Areas Administration Is basically the responsibility of the Directorate of Nature Protection within the Ministry of Rural Development. Banc d'Arguin is directly administered by the government, and managed by an Administrative Council in which the government is actively involved.

Sites designated under the Convention Accession 22 October 1982 with 1 site listed at accession

Banc d'Arguin

Government body responsible for administration of the Convention

Ministère du Développement Rural, Direction de la Protection de la Nature, B.P. 170, Nouakchott

Banc d'Arguin

Location 19°21'-21°51'N, 16°00'-16°45'W. On the West African coast, midway between Nouakchott and Nouadhibou.

Area 1,173,000ha

Degree of Protection The designated site comprises Banc D'Arguin National Park established on 24 June 1976 by Decree No. 76147/PR with total protection by law. Park administration is at BP 124, Nouadhibou, République Islamique de Mauritanie. Designated as a Ramsar site on accession in 1982.

Site Description The site is a vast area (between sea level and 15m) of coastal seas and mudflats with 14 permanent islands and includes mainly areas of sand, sandhills and cliffs. It is an unique example of where the Sahara Desert meets the Atlantic Ocean. Extrapolations from the weather stations at Nouakchott and Nouadhibou are difficult due to the great difference in latitude. The area is of great meteorological interest with contrast between the coastal climate, 'desert cold' and hot continental climate and strong winds (8m/sec). Rainfall is irregular and very low with an average of 34mm per year. Temperatures are fairly similar all year, with a mean monthly minimum in December of 8°C and maximum in September of 34°C. The sandy seashores and islands have a holophyte vegetation such as *Salsola baryosma*, *Salicornia senegalensis*, *Suaeda fruticosa* and *Arthrocnemum* sp., *Zostera noltii*, *Cymmodocea nodosa* and *Halodule wrightii* on mudflats; and various seaweeds. The land area is dominated by an African type of Saharan vegetation although there is a Mediterranean influence. Tree species include *Acacia tortilis raddiana*, *Balanites aegyptiaca*, *Maerus crassifolia* and *Capparis decidua*. Herbaceous species include *Panicum turgidum*, *Cassia italica*, *Pergularia tomentosa* and *Heliotropium bacciferum*. The dunes are dominated by *Stipagrostis pungens*, *Cornulaca monacantha*, *Euphorbia balsamifera* and *Calligonum comosum*. Two small stands of mangrove *Avicennia africana* exist near the northern tip of Tidra and near Cap Timiris. These are probably relicts from the period when some of the coastal "oueds" carried freshwater. They are the most northerly stands of mangrove on the eastern shore of the Atlantic. The southern fringe of the site is dominated by *Euphorbia balsamifera*. There is a two-way gradient of littoral between the marine and continental flora and north-south with many species at extreme limits of their distribution. Recorded mammals include Dorcas gazelle *Gazella dorcas*, jackal *Canis aureus*, fennec fox *Fennecus zerda*, sand fox *Vulpes rueppelli*, sand cat *Felis margarita*, wild cat *F. silvestris*, Saharan striped weasel *Poecilogale albinucha*, ratel *Mellivora capensis*, striped hyena *Hyaena hyaena* and several species of dolphin such as Atlantic humpback *Sousa teuszi*, common *Delphinus delphis*, rough-toothed *Steno bredanensis*, bottle-nosed *Tursiops truncatus*, Risso's *Grampus griseus* and killer whale *Orcinus orca*. Other recorded species include fin or common rorqual *Balaenoptera physalus* and common porpoise *Phocoena phocoena*.

International and National Importance The site is the most important area on the western side of the Atlantic for waders and as a crossroad for migrant waterfowl between Europe and Northern Asia and most of Africa. Migrants include over 2 million waders recorded in winter, hundreds of thousands of black tern *Chlidonias nigr*a and tens of thousands of flamingo

Phoenicopiterus ruber, ringed plover *Charadrius hiaticula*, grey plover *Pluvialis squatarola*, whimbrel *Numenius phaeopus*, knot *Calidris canutus*, curlew sandpiper *C. ferruginea*, dunlin *C. alpina*, little stint *C. minuta*, turnstone *Arenaria interpres*, redshank *Tringa totanus* and bar-tailed godwit *Limosa lapponica*. Breeding birds include white pelican *Pelecanus onocrotalus*, endemic subspecies of heron *Ardea cinerea monicae* and white spoonbill *Platalea leucorodia balsaci*, reed cormorant *Phalacrocorax africanus*, cormorant *Phalacrocorax carbo lucidus*, western reef heron *Egretta gularis*, gull-billed tern *Gelochelidon nilotica*, Caspian tern *Hydroprogne caspia*, royal tern *Sterna maxima*, common tern *Sterna hirundo*, bridled tern *Sterna anaethetus* and slender-billed gull *Larus genei*. There is a small population of monk seal *Monachus monachus* in the 'annex' of Cap Blanc near Nouadhibou. 4 species of threatened turtle frequent the area: *Chelonia mydas*, *Caretta caretta*, *Eretmochelys imbricata* and *Dermochelys coriacea*. The site is a very important fish reproduction area, because of offshore upwellings. A population of the Imraguen tribe (450) lives and fishes in the area although they must go outside the boundary for freshwater.

Changes in Ecological Character Much of the area has been little or never disturbed by man. Use of the area by nomads is decreasing due to the area becoming more desertified. Illegal hunting of gazelle (by motorcycle) and marine turtles (particularly for tourist demand) and overgrazing by several hundred camels and goats have been reported but are now under control. Black rats have invaded the area. Pollution, particularly from non-biodegradable waste, is found along the shoreline. Fishing nets could have a negative impact on monk seal but this has not been studied. The status of the monk seal population in the area is critical after collapse of their breeding caves in 1982. The Baie du Lévrier and the harbour of Nouadhibou have become a very important base for a fleet of fishing boats, including factory ships from many nations, especially Japan, USSR, Portugal and Spain but also from Poland, Romania, Norway, Sweden, Egypt, Morocco, Cuba and France. Overfishing by the international fishing fleets in the waters just off the Banc d'Arguin might cause a decline in the breeding colonies of the fish-eating bird species such as cormorants and pelicans. The national park's policy is to maintain the traditional lifestyle of the Imraguen people. If motorised fishing vessels are allowed in the park, this could affect both Imraguen and ecological conditions.

Management Practices A preliminary management plan was published in January 1984 by WWF and IUCN with collaboration of the Belgian Royal Institute of Natural Sciences. Camel patrols have been introduced to warden the park. An international foundation (FIBA, c/o IUCN, Gland) has been established to provide funds and management advice).

Scientific Research and Facilities Research includes ornithology, oceanography, inventories of species, study of the phyto-plankton biomass and studies on the reproductive biology of white pelican *Pelecanus onocrotalus*. The Netherlands government has expressed special interest in Banc d'Arguin and has financed extensive research in the late 1980s. A station in the park (IWIK) is equipped for 6 persons with 3 Zodiacs, 1 motor launch and 3 radio stations for both broadcasting and receiving.

Principal Reference Material The above information is taken from the documents submitted at the time of designation in 1982 from FIBA reports and from the Mauritania report to the Montreux Conference 1990, and:

Verschuren, J. (1984). *Republique Islamique de Mauritanie Parc National du Banc d'Arguin Plan Directeur Préliminaire*. Published by WWF/IUCN in collaboration with the Institut Royal des Sciences Naturelles de Belgique Bruxelles, Belgique.

Supplemented by:

- Engelmoer, M., Piersma, T., Altenburg, W. and Mes, R. (1984).** The Banc d'Arguin (Mauritania). In Evans, P.R., Goss-Custard, J.D and Hale, W.G. (Eds). *Coastal waders and wildfowl in winter*. Cambridge University Press, Cambridge. Pp. 293-310.
- Gee, J.P. (1984).** Birds of Mauritania. *Malimbus* 6:31-66.
- IUCN/WWF Project 1333.** Mauritania, Banc d'Arguin National Park.
- NOME (1982).** *Wintering waders on the Banc d'Arguin*. Waddenses Working Group.
- Scott, D.A. (1980).** A preliminary inventory of wetlands of international importance for waterfowl in West Europe and Northwest Africa. *IWRB Special Publication* No. 2. 127 pp.

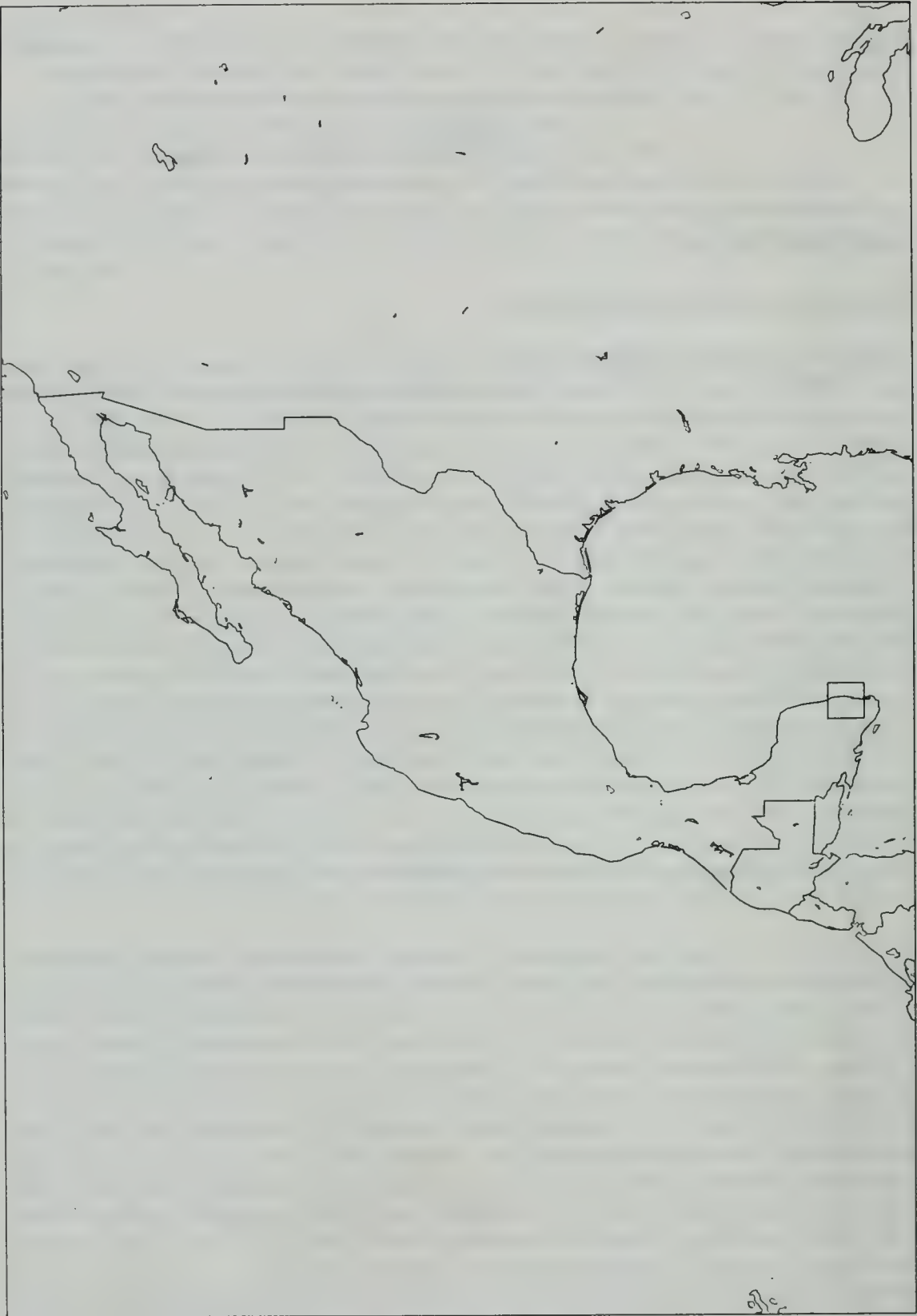
Mexico

Area 1,972,355 sq.km

Population 82,734,454 (1988 estimate)

Summary of Wetland Situation Mexico has about 6,760km of coastline on the Pacific and some 2,900km on the Gulf of Mexico. The coastal plains vary greatly in width, and are crossed by numerous rivers which are subject to seasonal flooding, particularly the delta regions, where lagoons are important for waterfowl. Inland the country has two great mountain systems running parallel to the coasts rising to over 3,000m, between which is an immense dry plateau where there were once numerous lakes, most of which have now dried out. These cordillera join in the region of the Valle de Mexico, forming the Sierra Madre del Sur, which is connected by a lower ridge to the Sierra de Chiapas in the east. To the north and north-east of these sierras are the plains of Tabasco, a vast delta region with extensive lakes and marshes, and the lowlands of Campeche, Yucatan and Quintana Roo on the Yucatan Peninsula. This peninsula is a calcareous plain with subterranean drainage which comes to the surface near the coast, giving rise to a series of wetlands. The lagoons on the north of the peninsula are some of the most important areas for migratory waterfowl in Mexico. The central plateau has a temperate climate with summer wet season but the lowlands are tropical, with high humidities and rainfall in the Gulf of Mexico and a much drier climate on the Pacific coast. Hurricanes along the Gulf of Mexico Coast have had a destructive effect on wetlands on several occasions, and the Yucatan Peninsula wetlands have still not recovered from the effects of hurricanes in the 1930s and 1940s when large areas of mangroves were destroyed. The country incorporates parts of two biogeographic realms, the Nearctic and Neotropical, and thus possesses a great diversity of flora and fauna as well as being on a land route for many birds migrating between the north and south American continents.

The Pacific coast is particularly important for wintering brown pelican *Pelecanus occidentalis* and brent goose *Branta bernicla* and herons Ardeidae. The Bahia de Santa Maria is the principal area for wintering brent geese, and this site, with the Ensenada del Pabellon and Boca de la Barra, are important breeding areas for many birds, including 3,000 brown pelican. These sites also held about 113,000 waders in January 1972. Further south, the marismas nacionales which cover 200,000ha are extremely important for breeding and wintering birds of a wide range of species, but are being threatened by encroachment by the local population and tourism, and have suffered from low water levels since dry seasons from 1978 and 1982. Some areas in the southern part of the Pacific Coast have declined considerably in importance for Anatidae since the 1940s. One of the few protected areas on this coast (established in 1937) is Lagunas de Chacahua National Park, 150km south-west of Oaxaca, Oaxaca state, which includes 3,525ha of wetlands important for breeding, passage or wintering waders and wintering Anatidae. In the south-western lowlands, largely in Jalisco, are a group of inland lakes of both freshwater and saline nature which are important for wintering ducks and breeding herons, and particularly important for wintering American avocet *Recurvirostra americana*.



Ramsar Sites in Mexico

The Gulf of Mexico coast is particularly important for breeding Ciconiiformes, with over 20,000 pairs at one site; for wintering Anatidae and coot *Fulica* spp., and for other species on passage. This area is particularly under threat from agricultural expansion and drainage, urbanisation and oil development (large oil fields were recently discovered in this area). Mangroves are also being exploited for timber. Several areas in Yucatan have some form of protection: Ria de Celestun Faunal Refuge (59,130ha) was established in 1979 and holds large numbers of wintering birds, including up to 100,000 Anatidae and up to 100,000 American coot *Fulica americana*. It also has large numbers of breeding birds, and is an important feeding area for greater flamingo *Phoenicopterus ruber* from Ria Lagartos, the latter being the only Yucatan breeding area for this flamingo, and a faunal refuge of 48,000ha, also established in 1979. Off the north-east tip of Yucatan, Isla Contoy Ecological Reserve was established in 1971 and is important for breeding brown pelican (up to 600 pairs), and also has large breeding colonies of seabirds. In Quintana Roo two large shallow bays, Bahía de La Ascension and Bahía del Espíritu Santo, are extremely important for breeding, passage and wintering Ardeidae but unimportant for wintering Anatidae.

The north-east part of Mexico and the Gulf Coast north of Baja California is generally important for breeding and wintering Ardeidae and wintering waders. Sandhill crane *Grus canadensis* winters at a few sites. It is also important for some endangered species of salamander: *Ambystoma dumieri dumieri*, *A. lermaensis* and *A. mexicanum*, each only known from one site.

Protected Areas Legislation Protected areas are established by Presidential Decree under sections of the Ley Organica de la Administracion Publica Federal, the Ley Federal de Caza, the Ley Forestal and the regulatory decree of the Forestry Law. Declarations are published in the Diario Oficial. The protected areas system includes faunal reserves, refuges, sanctuaries, biological reserves and national parks. Hunting legislation relevant to the present day dates from 1952 but the system of hunting control is reported to be inefficient, and no longer applicable in the present situation. A number of parks and reserves have been declared protected but do not fulfil the criteria with which they are defined. For this reason reviews of the protected areas of the country are currently being conducted.

Protected Areas Administration The Direccion General de Parques, Reservas y Areas Ecologicas Protegidas (Secretaria de Desarrollo Urbano y Ecologia) is responsible for protected areas. The Direccion General de Flora y Fauna Silvestres (Secretaria de Desarrollo Urbano y Ecologia) conducts research, including studies relating to the conservation of greater flamingo and osprey *Pandion haliaetus*. The Direccion de Flora y Fauna Acuaticas (Direccion de Flora y Fauna Silvestres) is responsible for an inventory of aquatic flora and fauna. The Comision del Lago de Texcoco (Secretaria de Agricultura y Recursos Hidraulicos) is concerned with the investigation and conservation of Lago de Texcoco. There are many private organisations dedicated to conservation of wetlands, including the Instituto de Ecologia, which is dedicated to ecological research and the creation of reserves, Ducks Unlimited Mexico (DUMAC) which concentrates on migratory waterfowl, and a number of Mexican universities.

Sites designated under the Convention Accession 28 July 1986 with one site listed at succession

Ria Lagartos

Government body responsible for administration of the Convention

Direccion General de Conservacion, Secretaria de Desarrollo Urbano y Ecologia (SEDUE), Rio Elba Num. 20, 10° piso, 06500 MEXICO DF

Ria Lagartos

Location 21°30'N, 87°34'-88°18'W. On the coast of the Gulf of Mexico, 50km north of Tizimin, Yucatan.

Area 47,480ha

Degree of Protection The site is a faunal refuge, established in 1979 to protect flamingo nesting habitat. Land tenure is divided between the state, local government and private owners. It was designated a Ramsar site on 4 July 1986.

Site Description The site includes about 75km of low-lying coastline, including several small estuaries and a string of lagoons separated from the sea by a sand barrier. The lagoons are all flooded at high tide, and there is some inflow of freshwater from seepage and local rainfall. Salinities vary from 33 to 107 parts per 1,000. About 30,000ha are permanently flooded but the rest dries out during the dry season. There are fringing mangrove swamps with *Avicennia germinans*, *Laguncularia racemosa* and *Rhizophora mangle*. Parts of the sand dunes are vegetated, and there is some halophytic vegetation.

International and National Importance The refuge is the only regular breeding site for the Yucatan population of greater flamingo *Phoenicopterus ruber*, and supports large numbers of other waterfowl. Greater flamingo numbers increased from an estimated 8,000 birds in 1975 to 26,000 in 1981, and are probably still increasing. 19,000 were recorded in November 1989 after the passage of Hurricane Gilbert. The breeding population at Ria Lagartos numbered at least 4,250 pairs in 1982, and was thought to be 5,000 in 1984. Other breeding birds include 150 pairs of olivaceous cormorant *Phalacrocorax olivaceus* and large numbers of laughing gull *Larus atricilla*, royal tern *Thalasseus maximus* and elegant tern *T. elegans*. The area is also an important feeding area for brown pelican *Pelecanus occidentalis*, American wood ibis *Mycteria americana*, white ibis *Eudocimus albus*, roseate spoonbill *Ajaia ajaja*, boat-billed heron *Cochlearius cochlearius*, snowy egret *Egretta thula* and many passage or wintering waders and Laridae. Relatively few Anatidae winter in the area, the only species present in significant numbers being red-billed whistling duck *Dendrocygna autumnalis*, American wigeon *Anas americana*, pintail *A. acuta*, blue-winged teal *A. discors* and lesser scaup *Aythya affinis*. Other fauna include the endangered Morelet's crocodile *Crocodylus moreletii*, olive ridley turtle *Lepidochelys olivacea* and leatherback turtle *Dermochelys coriacea*.

Changes in Ecological Character Disturbance from tourists, particularly in powerboats, has caused problems in the flamingo colony, and further development of facilities for tourist recreation in the area is likely to increase the problem in the future. In addition, flamingo feeding and nesting habitat is being destroyed for salt extraction. Following the passage of Hurricane Gilbert in September 1988, the dune cordon was breached in several places. The Ramsar Bureau received reports of the damage caused by the hurricane and of the effects of extensions to

commercial salt pans, and therefore operated the Ramsar Monitoring Procedure in June 1989. The report suggested that the effects of the hurricane were none too serious and could be overcome by careful dredging; it noted the determination of SEDUE to control damaging extension of the salt works.

Management Practices Experiments are now being carried out with the construction of artificial nest sites for the flamingos. These would not be subject to flooding. A comprehensive management plan for the whole area is being developed by SEDUE and CINVESTAV, Merida.

Scientific Research and Facilities Basic floral and faunal surveys have been conducted in the refuge and the flamingo population has been studied for some years (including work on the effect of the recent provision of artificial nest sites).

Principal Reference Material Documents supplied by the Government of Mexico at the time of designation and Mexican report to the Montreux Conference 1990, and:

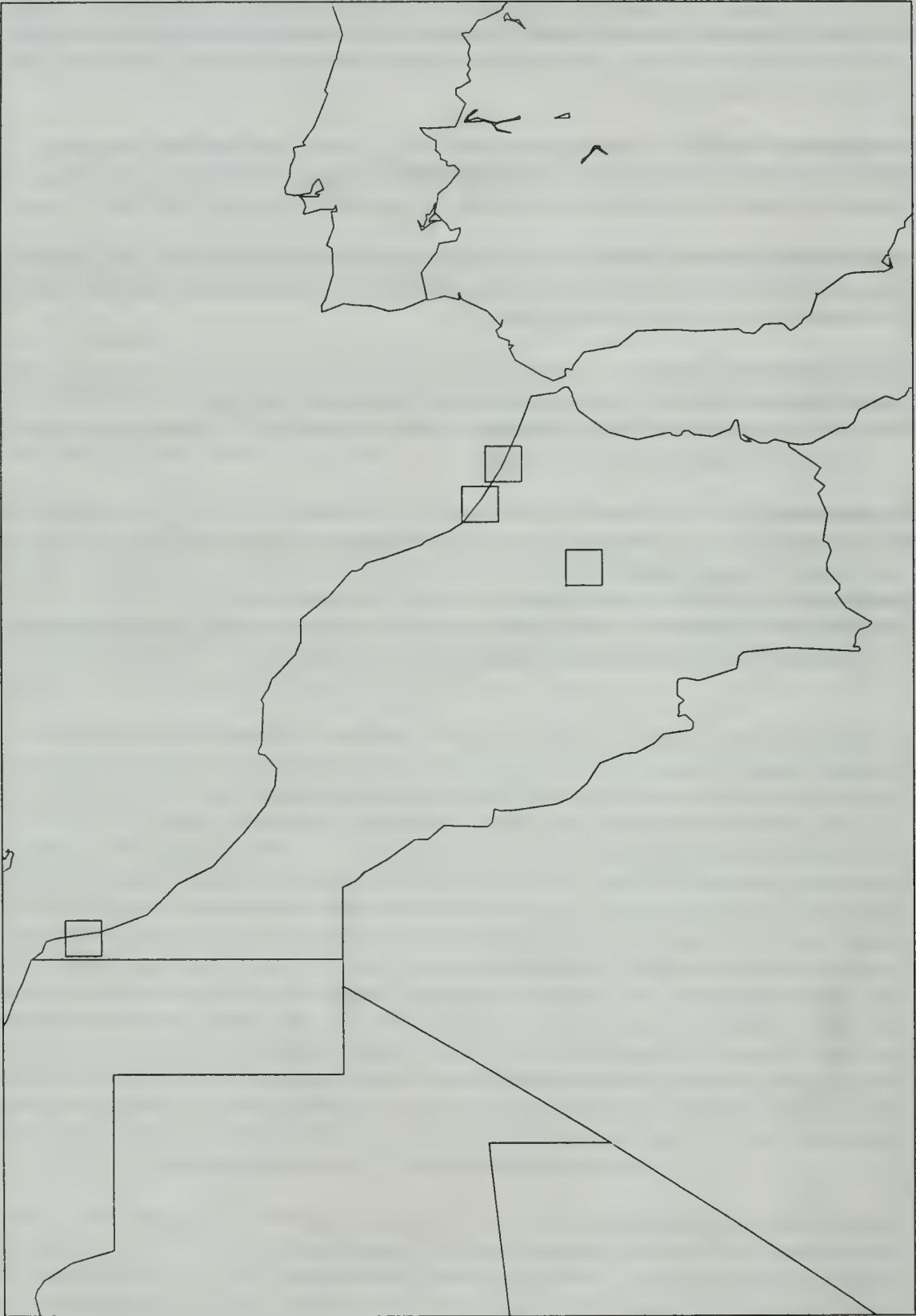
Scott, D.A. and Carbonell, M. (Compilers) (1986). *A Directory of Neotropical Wetlands*. IUCN Cambridge and IWRB Slimbridge.

Supplemented by:

Hernandez, G.M.A. and Vargas N.A. (1976). Censo de patos cazados en las costas de Yucatan. *Bosque y Fauna* 13.

Mondragon S.J. (1979). Los flamencos de Yucatan. *Bosque y Fauna* 2.

Saunders, G.B. and Saunders, D.C. (1981). Waterfowl and their wintering grounds in Mexico, 1937-64. *FWS, U.S. Department of the Interior, Res. Publ.* 138.



Ramsar Sites in Morocco

Morocco

Area 622,012 sq.km

Population 23,557,000 (1987 estimate)

Summary of Wetland Situation Situated on the Mediterranean coast of Morocco, the estuary of the Moulouya River is of international significance as habitat for waterfowl. This is enhanced by the fact that the Spanish Islas Chafarinas, just off the Cabo di Aqua 10km north-west of the river mouth, are the breeding place of perhaps two-thirds of the world population of the rare Audouin's gull *Larus audouinii*. The wetlands along the Atlantic coast are of extraordinary importance as feeding and roosting sites for great numbers of waterfowl moving between their breeding grounds in Northern Europe and wintering areas in tropical West Africa. Merja Zerga towards the northern end of the coast, and Khnifiss Bay close to the southern end, are reckoned to be the most valuable of these sites. Several of the mountain lakes in the Atlas region are of limnological interest. Some of them in the Middle Atlas offer suitable habitat for waterfowl, and have important populations of the rare, declining, and now possibly threatened, crested coot *Fulica cristata*. Finally, near to where the River Dra meets the southern border with Algeria, the highly variable Iriki wetland in some years provides suitable conditions for greater flamingo to nest.

Protected Areas Legislation National parks are established under a Royal Decree of 11 September 1934 on the creation of national parks, and Ministerial Order of 26 September 1934 which lays out the procedures to be followed. Each park is actually created by Ministerial Order or Decree, in which the regulations governing the area are laid down individually for each area. Basically any act liable to lead to modification of the environment is forbidden without authorisation from the Administration of Water and Forests. There is no enabling legislation for the establishment of nature reserves, so each is created separately under local regulations. There are a number of hunting reserves (where hunting is forbidden), and several sites receive a degree of protection as royal hunting reserves.

Protected Areas Administration The responsible authority is the Division of Hunting, Fishing and the Protection of Nature, within the Ministry of Agriculture and Agrarian Reform (and in particular within the Administration of water and forests and soil conservation).

Sites designated under the Convention Signed without reservation as to ratification on 20 June 1980 with four sites listed at signature

Merja Zerga
Merja Sidi-Bourhaba
Lac d'Affenourir
Khnifiss Bay or Puerto Cansado

Government body responsible for administration of the Convention

Direction des Eaux et des Forêts et de la Conservation des Sols, Ministère de l'Agriculture et de la Réforme Agraire, BP Rabat - Chellah

Merja Zerga

Location 34°50'N, 6°20'W. Situated adjacent to Moulay Bousselham in the Province of Kenitra.

Area 3,500ha (Biological Reserve 7,425ha)

Degree of Protection There is a proposal to establish the area as a national park. Merja Zerga Biological Reserve was established in 1978. Designated as a Ramsar site in 1980. The Eaux et Forêts has authority over all wildlife and fish in the reserve.

Site Description The site comprises a vast tidal lagoon whose surface water varies from 1,500ha to 3,200ha. It is separated from the sea by sand dunes except for a connecting stream. There are large areas of mudflats at low tide. Apart from the avifauna there is little noteworthy fauna apart from a selection of reptiles including turtles, lizzards and snakes.

International and National Importance Merja Zerga is recognised as the premier wetland site in Morocco, and is the most important wintering area in Morocco for several tens of thousands of waterfowl. Counts of ducks and waders include: gadwall *Anas strepera* (8,000), wigeon *A. penelope* (21,000), teal *A. crecca* (20,000), shoveler *A. clypeata* (16,000), avocet *Recurvirostra avosetta* (2,000), ringed plover *Charadrius hiaticula* (5,000), Kentish plover *C. alexandrinus* (3,000), grey plover *Pluvialis squatarola* (8-10,000) and black-tailed godwit *Limosa limosa* (10,000). Slender-billed curlew *Numenius tenuirostris* have also been recorded here, and the area is known to be an important staging site for spoonbill *Platalea leucorodia*. Also listed are little stint *Calidris minuta*, shelduck *Tadorna tadorna*, pintail *Anas acuta*, pochard, mallard *A. platyrhynchos*, greylag goose *Anser anser* (150), coot *Fulica atra* (12,000), crested coot (40), lapwing *Vanellus vanellus* (40-50,000), dunlin *Calidris alpina* (100-150,000), spotted redshank *Tringa erythropus* (500), redshank *T. totanus* (5-6,000), greater flamingo *Phoenicopterus ruber* (183), bluethroat nightjar, warblers, and African marsh owl, as well as mute swans and darter.

Changes in Ecological Character SOCHATOUR has hunting rights north of Oued Drater for waterfowl except geese and shelducks, and waders (snipe, redshanks, spotted redshanks, curlews, grey and golden plovers and lapwings). There are problems with local people capturing and/or killing flightless birds and killing non-targeted species such as flamingo and terns. Fishing is permitted in the outlet of Merja Zerga and the ocean. It is a popular resort for Moroccan tourists. There are two camp sites along the south side of the Merja Zerga outlet and the lake is used for numerous water sports. The 204ha of marsh vegetation of the west side of Merja Zerga is cut. Incidental cutting occurs around the northern end of Merja Zerga and possibly along the east side. Shooting is described as excessive by Carp (1980), but was reported to have stopped with the shooting butts and huts dismantled. Morgan (1982) recommended that the development

of tourism needed to be carefully controlled and noted that grazing pressure, thought by some to be detrimental to the site, was not excessive.

Management Practices No information

Scientific Research and Facilities No information

Principal Reference Material

- Carp, E. (1980).** *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.
- Fender, W. and Bousselham, M. (1985).** Merja Zerga Biological Reserve in service training site report. Nov. 19-22, 1985. Maroc. Peace Corps Volunteers unpublished report.
- Gryn-Ambroes, P. (1980).** *Preliminary annotated lists of existing and potential Mediterranean protected areas*. UNEP/IUCN Report. UNEP/IG 20.
- Kersten, M. and Smit, C.J. (1984).** The Atlantic coast of Morocco. In Evans, P.R., Goss-Custard, J.D., and Hale, W.G. (eds). *Coastal waders and wildfowl in winter*. Cambridge University Press, Cambridge. Pp. 276-291.
- Morgan, N.C. (1982).** An ecological survey of standing waters in Northwest Africa: III. Site description for Morocco. *Biological Conservation* 24:161-182.
- Poorter, E.P.R. and Wigbels, V.L. (1984).** *Verslag van de Lepelaarstudie reis Naar Frankrijk, Spanje en Marokko in Februari en Maart 1984*. (Report on Spoonbills in France, Spain and Morocco in February and March 1984.) Nederlandse Stichting voor internationale vogelbescherming, Zeist. Lelystad.
- Scott, D.A. (1980).** A preliminary inventory of wetlands of international importance for waterfowl in West Europe and Northwest Africa. *IWRB Special Publication* No. 2. 127 pp.
- Scott, D.A. and Prater, A.J. (1982).** Slender-billed curlew *Numenius tenuirostris*. Unpublished manuscript.

Merja Sidi-Bourhaba

Location 34°15'N, 6°40'W. Situated near (north) Rabat at Mehdiya in the Province of Kenitra.

Area 200ha

Degree of Protection Protection of the area is being considered. Designated as a Ramsar site in 1980.

Site Description The site comprises a coastal non-tidal brackish marsh separated from the ocean by an area of sanddunes. It is surrounded by dense thickets of *Juniperus* woodland.

International and National Importance Particularly important during periods of passage for large numbers of ducks and waders. The site is also a wintering and nesting site for waterfowl. The uncommon crested coot *Fulica cristata* nests here.

Changes in Ecological Character The lake was reported to be under considerable recreational pressure. However, measures have been taken by the Administration des Eaux et Forêt to

improve the situation. Grazing of cattle is prevented on the marshland surrounding the lakes. This has caused some problems recently as in several places the extensive marshland vegetation consisting of *Juncus* sp., has been overgrown by a tall stand of mixed *Phragmites* and *Typha* communities

Management Practices No information

Scientific Research and Facilities Situated close to the main university of Rabat, the site is frequently visited by school groups and students during courses. Eaux et Forêts constructed a museum in 1976, which is to be used as a visitors centre.

Principal Reference Material

Gryn-Ambroes, P. (1980). Preliminary annotated lists of existing and potential Mediterranean protected areas. UNEP/IUCN Report. UNEP/IG 20.

Morgan, N.C. (1982). An ecological survey of standing waters in Northwest Africa: III. Site description for Morocco. *Biological Conservation* 24:161-182.

Lac d'Affenourir

Location 33°20'N, 05°10'W. Situated in the region of Azrou in the Province of Meknès.

Area 380ha

Degree of Protection Designated as a Ramsar site in 1980.

Site Description The site comprises a mountain lake. In 1988 and 1989, following a long period of drought, water levels have returned to normal.

International and National Importance The site is a wintering area and crossroads for migrants and a nesting site for waterfowl.

Changes in Ecological Character No information

Management Practices No information

Scientific Research and Facilities No information

Principal Reference Material Documentation provided by the Moroccan authorities on accession, and report to the Montreux Conference 1990.

Khniess Bay or Puerto Cansado

Location 28°00'N, 12°25'W. Situated north of La'youn in the Province of Tarfaya.

Area 6,500ha

Degree of Protection Designated as a Ramsar site in 1980.

Site Description The site comprises a large coastal brackish lagoon (20km long and 3km wide) with several marshy areas. It is open to the sea via a gulley through the littoral zone. There are vast areas of mudflats and *Ruppia* spp. which are uncovered at low tide.

International and National Importance Recognised as being the second most important wetland site in Morocco. The numbers of waders counted here has varied markedly, with 95,000-115,000 in 1964, 25,700 in 1972, 5080 in 1973 and 23,000 in 1974, with the most numerous species being dunlin *Caldris alpina* (max. 10,000), knot *C. canutus* (max. 4,000), grey plover *Pluvialis squatarola* (max. 3,000), bar-tailed godwit *Limosa lapponica* (max. 2,000) and redshank *Tringa totanus* (max. 1,000). The largest number of slender-billed curlew *Numenius tenuirostris* reported outside the USSR this century were recorded here, with 500-800 birds in January 1964. However, none has been recorded at this locality since.

Changes in Ecological Character Carp (1980) suggests that road building and military activity would be detrimental to the area from increased disturbance. Oil exploitation could also affect the area. The extent to which this has advanced, and the result of such exploitation, should be evaluated.

Management Practices No information

Scientific Research and Facilities No information

Principal Reference Material

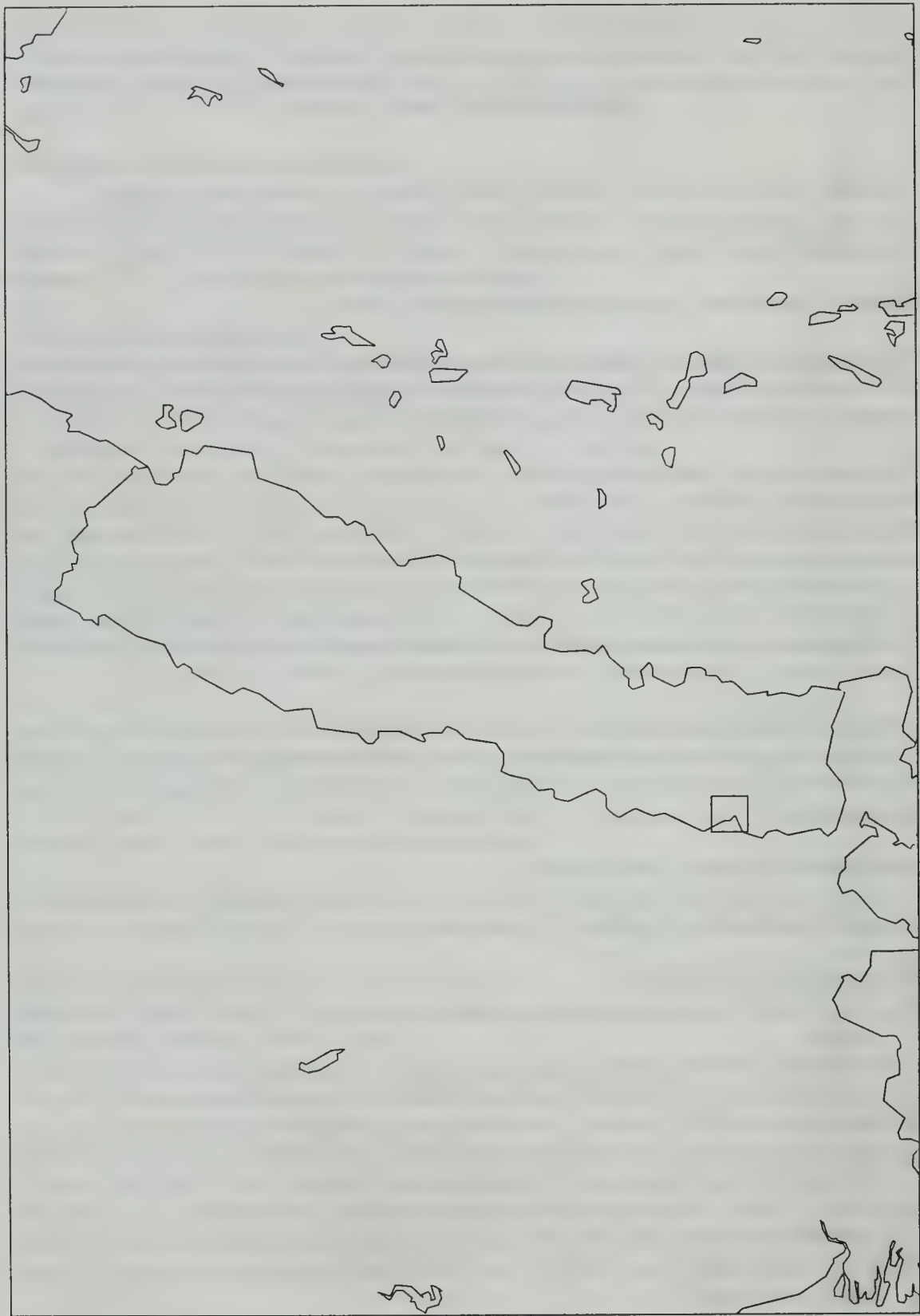
Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

Gryn-Ambroes, P. (1980). Preliminary annotated lists of existing and potential Mediterranean protected areas. UNEP/IUCN Report. UNEP/IG 20.

Kersten, M. and Smit, C.J. (1984). The Atlantic coast of Morocco. In Evans, P.R., Goss-Custard, J.D., and Hale, W.G. (Eds). *Coastal waders and wildfowl in winter*. Cambridge University Press, Cambridge. Pp. 276-291.

Scott, D.A. (1980). A preliminary inventory of wetlands of international importance for waterfowl in West Europe and Northwest Africa. *IWRB Special Publication* No. 2. 127 pp.

Scott, D.A. and Prater, A.J. (1982). Slender-billed curlew *Numenius tenuirostris*. Unpublished manuscript.



Ramsar Sites in Nepal

Nepal

Area 141,414 sq.km

Population 16,625,449 (1985 estimate)

Summary of Wetland Situation Lacking a coastline, and with over two-thirds of its territory mountainous, Nepal has rather few wetlands other than fast-flowing rivers and streams. There are three major river systems fed by the snows and glaciers of the Himalayas: the Kosi in the east, the Gandak in the centre and the Karnali in the west. These rivers, along with the numerous smaller rivers rising in the Mahabharat and Siwalik ranges, contribute up to 40% of the annual flow of the Ganges River, and 71% of its dry season flow. Other wetlands include about 5,000ha of small lakes scattered throughout the country, 1,200ha of man-made reservoirs, 5,000ha of village tanks and ponds, and some 185,000ha of rice paddies. Large reservoirs under construction in the Gandak River (45,000ha), Bagmati River basin (9,000ha) and Karnali River basin (24,000ha) will add a further 80,000ha of surface water area when completed. Most of the lakes in the highlands are oligotrophic and many are of recent glacial origin. There are small pockets of marshy grassland in river valleys, and a few of the mid-elevation lakes have fringing marshes. The most extensive marshes occur in the lowlands, on the flood plains of the three major rivers. Severe flooding during the summer monsoon and constant shifting of river channels have created wide flood plains with a mosaic of sand and shingle banks, oxbow lakes, patches of riverine forest, marshes and seasonally flooded grasslands. Although Nepal possesses rather few wetlands, the ecological diversity of the wetland ecosystems is very great, and this is reflected in the great variety of wetland fauna. A total of 164 indigenous species of fishes has been recorded, with species of *Schizothorax*, *Orienus*, *Schizothorichtys* and *Tor* dominating in most of the rivers and streams in the midland and highland zones. Over 130 species of waterfowl have been recorded, including most species typical of the Gangetic plain, and a wide variety of migrants which cross the Nepalese Himalayas on their way between breeding areas in north and central Asia, and wintering areas further south in the India subcontinent. The aquatic reptiles include two threatened species of crocodilians, marsh crocodile *Crocodylus palustris* and gharial *Gavialis gangeticus*. Gharial is endangered throughout its range, and the Nepalese populations may now be the most viable remaining in the wild.

Many of Nepal's most important wetlands are included within the protected area system. Most of the important highland lakes are situated in the three large Himalayan national parks (Sagarmatha, Langtang and Shey Phoksundo); the country's largest lake, Lake Rara, is protected in Lake Rara National Park; and significant tracts of the riverine wetlands in the lowlands are protected in Royal Sukla Phanta Wildlife Reserve, Royal Bardia Wildlife Reserve, Royal Chitwan National Park and Kosi Tappu Wildlife Reserve. However, by far the most important site for waterfowl in Nepal, namely Kosi Barrage, is unprotected. It has been recommended that the nearby Kosi Tappu Wildlife Reserve be extended southwards to include the barrage, but the situation is complicated because the area is leased to the Government of India.

Protected Areas Legislation The National Parks and Wildlife Conservation Act 2029 was introduced in March 1973 to provide a legal basis to Nepal's conservation programme, which was initiated by His Majesty's Government in 1971. This act superseded the Wildlife Protection Act of 1958 (amended in 1967) and the Hunting Rules of 1967, under which six royal hunting reserves were gazetted for the protection of wildlife in July 1969. Due to the absence of proper legislation and bye-laws at that time, measures to conserve wildlife in these hunting reserves remained ineffective (Upreti, 1979). Since the introduction of the 1973 Act, the National Parks and Wildlife Protection Regulations were drawn up in 1974 to control hunting and restrict trade in wild animals in accordance with CITES, of which Nepal is a signatory. The Royal Chitwan National Park Regulations (1974), Wildlife Reserve Regulations (1975) and Himalayan Mountain National Park Regulations (1979) have also become law. In addition to national parks, the legislation provides for the establishment of three categories of reserve, namely: wildlife reserves, which differ from national parks in that they are not developed for tourism; strict nature reserves, in the case of areas of unusual ecological significance, where no form of human disturbance is allowed and where entry is permitted only for purposes of scientific research; and hunting reserves, which are managed for purposes of sport hunting on a sustained yield basis. A network of national parks and wildlife reserves has been established, beginning in 1976, and various hunting reserves have been proposed. No strict nature reserves have been introduced to date although the legislation exists should the need arise. More recently, the Panchayat Forests and Panchayat Protected Forests Regulations have been enacted, giving local communities ownership and/or control of forest land and thereby encouraging them to conserve such resources for sustainable use and to plant unproductive land with trees. Also, provision has been made under the Soil Conservation and Watershed Management Act (1982), for the protection of watershed areas.

Protected Areas Administration Conservation, prior to the 1973 legislation, was the responsibility of the Forest Department, which established wildlife and hunting reserves, issued hunting licences and controlled hunting within forest reserves. The level of protection within reserves was inadequate, due to understaffing, and so the National Parks and Wildlife Conservation Office was set up in July 1972 as a semi-autonomous branch of the Forest Department. Subsequently, in 1982, it was upgraded to departmental status within the Ministry of Forests. The department is responsible for the administrative management and field operations of parks, reserves and Kathmandu Zoo and for the co-ordination of the activities of wildlife guards, who are armed and have a basic military training. The provision of guards and enforcement of law in all parks and reserves has been the responsibility of the Royal Nepal Army since 1975. The Department of Soil Conservation and Watershed Management was set up in 1974 and is responsible for the management of watershed protection areas.

Sites designated under the Convention Accession on 17 December 1987 with one site listed on accession.

Koshi Tappu

Government body responsible for administration of the Convention

Department of National Parks and Wildlife Conservation, His Majesty's Government of Nepal,
PO Box 860, Babarmahal, Kathamandu

Koshi Tappu Wildlife Reserve

Location 26°35'-26°40'N, 86°56'-87°04'E. Lies in the flood plain of the Sapta Kosi River at the most north-easterly extension of the Gangetic Plain, close to Nepal's southern border with Bihar State in India.

Area 17,500ha

Degree of Protection The designated site is within Koshi Tappu Wildlife Reserve, gazetted in July 1976. Protection within the reserve is total for the purposes of wildlife conservation and management. The site was added to the Ramsar List on 17 December 1987, at the accession of Nepal to the Convention.

Site Description The reserve, which extends along the Sapta Kosi River for some 24km, consists of extensive mudflats and marshes. Just south of the reserve is a large expanse of open water, marshes and reed-beds, created by the construction of a barrage in 1958-1964. The vegetation of the area originally comprised khair-sissoo forest, dominated by *Acacia catechu* and *Dalbergia sissoo*, mixed deciduous forest and grassland, but much of this has been degraded due to rise in water table, siltation and over-exploitation. The area contains Nepal's last surviving population of wild water buffalo *Bubalus bubalis*, which appears to have increased from an estimated 60 in 1977 to 91 in 1988. It is reported, however, that the entire population has hybridised with feral water buffalo. Other mammals include leopard *Panthera pardus*, fishing cat *Felix viverinus*, jungle cat *F. chaus*, gangetic dolphin *Platanista gangetica* (occasionally seen), smooth coated otter *Lutra perspicillata*, spotted deer *Cervus axis*, hog deer *Cervus porcinus*, nilgai *Boselaphus tragocamelus* and wild boar *Sus scrofa*. Tiger *Panthera tigris* is no longer present. Gharial *Gavialis gangeticus* from the Chitwan rearing project were released upstream from the reserve in 1981 and 1984; but a recent survey indicates that very few of these crocodiles have stayed in the area (Heinen *et al.*, 1988). Fifty-two species of fish have been reported from the Nepalese side of the Kosi drainage.

International and National Importance Of the 250 species of bird recorded, 87 are winter visitors and passage migrants. Lesser spotted eagle *Aquila pomarina*, tawny eagle *Aquila rapax vindhiana*, red-necked falcon *Falco tinnunculus*, swamp francolin *Francolinus gularis*, yellow-legged button quail *Turnix tanki*, watercock *Gallicrex cinerea*, orange-breasted green pigeon *Treron bicincta*, pompadour green pigeon *T. pompadora*, black-breasted weaver *Ploceus benghalensis*, black-headed cuckoo-shrike *Coracina melanoptera*, white-tailed stonechat *Saxicola leucura* and striated marsh warbler *Megalurus palustris* are particularly noteworthy. Changeable hawk-eagle *Spizaetus cirrhatus*, bengal florican *Houbaropus bengalensis* and dusky eagle owl *Bubo coromandus* have not been recorded since 1976. At certain times of the year, notably winter, vast numbers of waterfowl congregate at Koshi Barrage, Nepal's most important wetland, to the south of the reserve. The reserve is the only protected area in Nepal where watercock are known to occur, and the area contains the country's last surviving population of wild water buffalo.

Changes in Ecological Character The construction of the Kosi Barrage on the Nepal-India border for irrigation and hydroelectric power has had a devastating effect on the reserve, although it has created an area of extensive wetland to the south which is used by migrating waterfowl (up to 50,000 ducks have been recorded in February). Habitat destruction, overstocking by domestic animals, disease introduced by domestic livestock and flooding have undoubtedly limited the increase in populations of water buffalo and other wild ungulates. The grazing problem is especially acute as there are several thousand head of feral cattle and over 100 domestic water buffalo in the reserve, along with several hundred water buffalo which are occasionally present.

Management Practices The long-range objective is to build up a healthy breeding population of wild buffalo from which other areas can be restocked. Considerable progress has been made, including the establishment of a headquarters and three guard posts and the provision of the necessary staff. The reserve was brought under reasonable control in 1978 and by 1979 12,000 villagers had been moved out of the reserve and resettled elsewhere.

The Churia or Siwalik Range to the west provides refuge for some Terai fauna, including gaur *Bos gaurus*, hence the plan to incorporate the proposed Trijuga Hunting Reserve within the reserve. The reserve is scheduled to be extended to the north; landowners will be financially compensated with revenues generated from the sale of sissoo trees killed by changing water tables. An estimated US\$250,000 worth of thatch grass was legally removed during the 1987 thatch-cutting season. Reserve staff also supply permits for the collection of fish, edible fruits and ferns, and cotton. A fence was erected in 1982 to try to prevent the reserve's water buffalo from wandering into adjacent cultivations and to keep local people and their livestock out of the protected area. The feral cattle population is being reduced by allowing them to be caught by local residents, to whom ownership is conferred. Eight domesticated female elephants *Elephas maximus* are kept at the reserve headquarters, Koshi Tappu being the only protected area in Nepal where domesticated elephants have been successfully and repeatedly bred.

Scientific Research and Facilities A fish survey was conducted in the drainage basin in 1949. The status of Bengal florican in the reserve was investigated in 1982 and the species was found to be absent. There are no research facilities.

Principal Reference Material The above information comes from information supplied by the Nepalese Government, supplemented by:

FAO (1980). National parks and wildlife conservation, Nepal: project findings and recommendations. UNDP/FAO Terminal Report, Rome. 63 pp.

Heinen, J.T., Kattel, B. and Metha, J.N. (1988). National Park administration and wildlife conservation in Nepal. Draft. 93 pp.

Inskipp, C. (1988). Nepal's forest birds. their status and conservation. Draft. ICBP, Cambridge. 160 pp.

Inskipp, C. and Inskipp, T. (1983). Results of a preliminary survey of Bengal floricans *Houbaropsis bengalensis* in Nepal and India, 1982. ICBP Study Report No. 2. 54 pp.

Khan, H.A. and Yusuf-Kamal, M. (1979). On a collection of fish from River Kosi (Bihar). *Journal of the Bombay Natural History Society* 76: 530-534.

Poppleton, F. and Shah, B.B. (1977). WWF/IUCN Project 1605. Nepal - Koshi Tappu Buffalo Sanctuary.

Netherlands

Area 36,174 sq.km

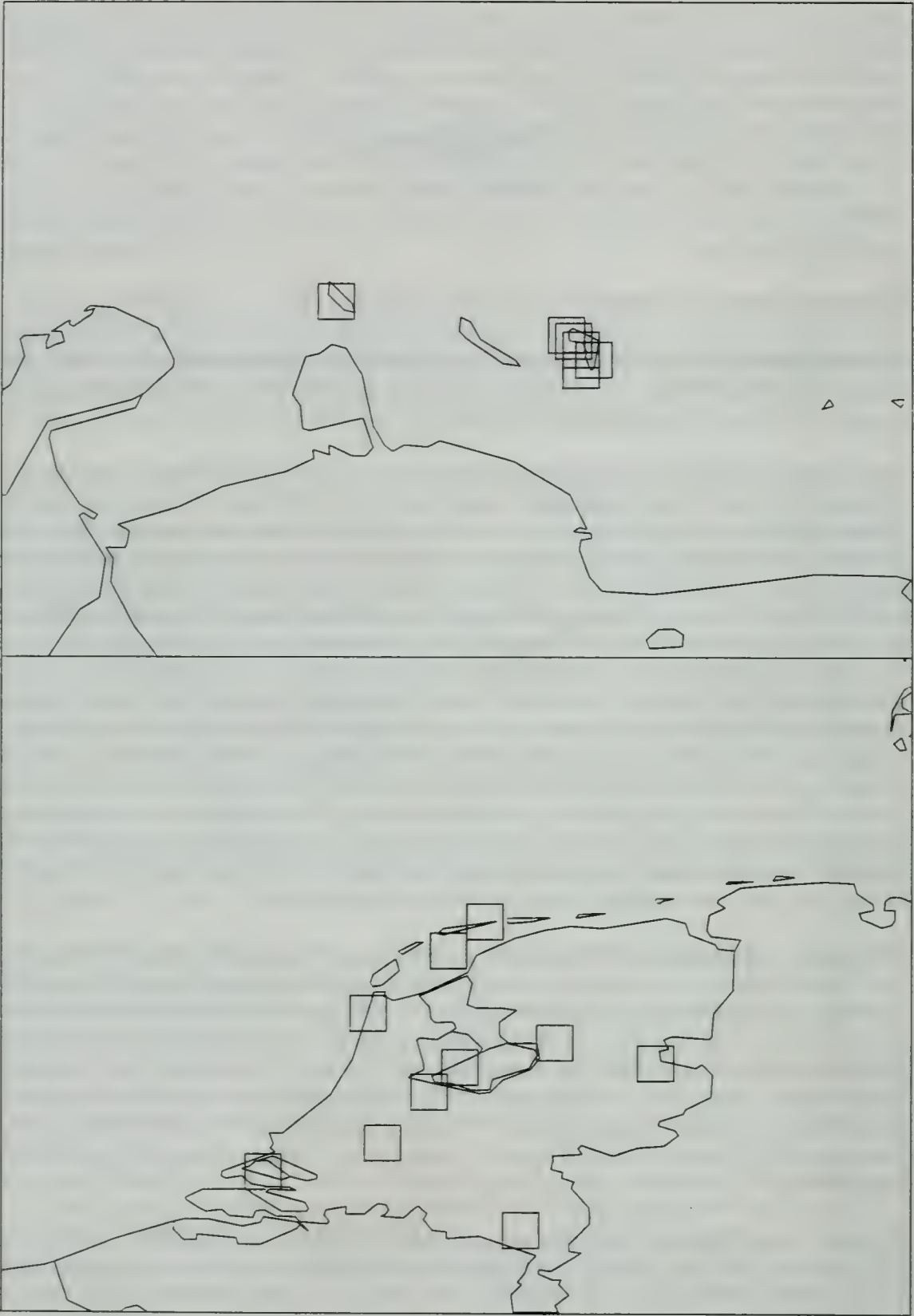
Population 14,714,948 (1988)

Summary of Wetland Situation The flat, open country of the Netherlands, dominated by the deltas of the rivers Rhine, Maas, Schelde, IJssel and their numerous tributaries, has a great number of wetlands of international importance.

The Wadden Sea, which extends from the north of the country along the coasts of the Federal Republic of Germany and Denmark, is undoubtedly the most important single wetland in Western Europe, and of vital importance to huge numbers of waterfowl both breeding in the area and passing through during migration seasons. Its shallow and relatively warm water provides an excellent nursery-ground for many species of fish and crustacea. In the delta area, many inlets of the sea along the coast and between the islands of the Zuid-Holland and Zeeland provinces have been closed off by dykes to prevent a repetition of the catastrophic floods of 1953. As a result, the salt water character of the wetlands in this region has been giving way to a fresh water environment. These areas, which have always been of great importance to waterfowl (especially wintering geese), seem to maintain their former significance. In various inland parts of the country, a number of major freshwater lake complexes are of great importance to breeding and wintering waterfowl. Several of them are of limnological interest, and many also serve recreational purposes during the summer months. The characteristic deep waterholes along riverbanks (in Dutch: *wielen*), formed by dyke-falls, are of particular scientific interest by reason of their limnological and hydrobiological qualities. Some of the recently drained polders of the IJsselmeer provide additional suitable habitats for waterfowl.

Protected Areas Legislation The principal act is the Nature Conservation Act of 15 November 1967 which protects all designated sites from activities which are harmful to their natural or scientific interest (although some activities are allowed with a permit). Proposals for designation of a protected natural area are made by ministerial announcement after which interested parties make their views known. Decisions are taken by the Minister in consultation with the Nature Conservation Council and the Government Physical Planning Commission. The law enables the Minister to devise a management plan for each protected area. Other acts that affect the management of these sites are the Physical Planning Act of 1962 and the Land Consolidation Act of 1954.

Protected areas legislation passed by the central government of the Netherlands Antilles (in Curaçao) has in the past provided the basis for measures in these territories, but responsibility for the environment is now being devolved, which creates a need for each island to develop its own legislation.



Ramsar Sites in The Netherlands

Protected Areas Administration Responsibility for wetlands is vested in the Ministry of Agriculture and Fisheries in The Hague, through its Department for Nature Conservation, Environmental Protection and Fauna Management. The Minister is advised by the Nature Conservancy Council (set up under the 1967 Act). He is assisted by the National Forest Service of the Ministry, and by the Research Institute for Nature Management (RIN), a scientific research institute. The Ministry has a nature conservation officer based in each province. With assistance from the State, private associations also play a major role in purchasing, creating and managing protected natural areas. The most important of these groups is the 'Vereniging tot Behoud van Natuurmonumenten' which, for example, manages and owns Het Naardermeer. It is policy that all state nature reserves should have management plans. These are prepared by local managers and then submitted to the Research Institute for Nature Management and National Forest Service. The approved plan is deposited with the Ministry.

In the Netherlands Antilles, there is no government organisation administering parks and reserves, which is done instead by the Netherlands Antilles National Parks Foundation (Stichting Nationale Parken Naderlandse Antillen - STINAPA). There are independent offices on Aruba, Bonaire and Curaçao.

Sites designated under the Convention Accession 23 May 1980 with 12 sites listed at accession (6 in the Netherlands Antilles); with single sites added May 1984, 3 April 1987 and 15 June 1988, and two on 2 June 1989.

- De Groote Peel
- De Weerribben
- Het Naardermeer
- De Boschplaat
- De Griend
- Part of De Biesbosch
- Dutch section of the Wadden Sea
- Oosterschelde
- Zwanenwater
- Oostvaardersplassen
- Engbertsdijkvenen

Netherlands Antilles

- Het Lac (Bonaire)
- Het Pekelmeer (Bonaire)
- Klein Bonaire Island and part of the adjacent sea (Bonaire)
- Het Gotomeer (Bonaire)
- De Slagbaai (Bonaire)
- Het Spaans Lagoen (Aruba)

Government body responsible for administration of the Convention

Ministerie van Landbouw en Visserij, Directie Natuur, Milieu en Faunabeheer, Postbus 20401, 2500 EK The Hague

De Groote Peel

Location 51°20'N, 5°45'E. Situated near Eindhoven in Noord Brabant Province, south-east Netherlands.

Area 900ha

Degree of Protection The site is part of De Groote Peel Nature Reserve (1,400ha) which was established in 1953 and is managed by the National Forestry Service. In 1985 De Groote Peel was declared a national park in formation. Designated as a Ramsar site at the time of accession on 23 May 1980.

Site Description De Groote Peel and the nearby Mariapeel Nature Reserve are all that remain of some 30,000ha of peat moor, now extensively reclaimed for agriculture. The site contains a range of habitats including open water pools, wet marshlands, peat moorlands, heaths and birch *Betula* sp. woodland in the drier areas. Numerous artificial channels dissect the southern sector. The area is still relatively undisturbed, and supports an abundant species-rich fauna, especially insects, including dragonflies (Odonata) and butterflies (Lepidoptera) characteristic of peat moors and heathlands.

International and National Importance De Groote Peel is important as a breeding ground and as a feeding area for wintering and migrant birds. Breeding species include teal *Anas crecca*, shoveler *A. clypeata*, tufted duck *Aythya fuligula*, pochard *A. ferina*, black tern *Chlidonias niger*, common tern *Sterna hirundo*, black-headed gull *Larus ridibundus*, bittern *Botaurus stellaris*, curlew *Numenius arquata*, black-tailed godwit *Limosa limosa*, redshank *Tringa totanus*, lapwing *Vanellus vanellus* and oystercatcher *Haematopus ostralegus*. Partridge *Perdix perdix* and pheasant *Phasianus colchicus* breed in the heathlands. The wetland is one of the few areas in the Netherlands used by hundreds of crane *Grus grus* on autumn migration. It is also an important winter refuge for up to 3,000 bean goose *Anser fabalis* and a stopover for hundreds of white-fronted goose *A. albifrons* and thousands of mallard *Anas platyrhynchos*, teal and shoveler.

Changes in Ecological Character In most parts, the peat has been cut. The area around the reserve has been extensively drained and reclaimed for agriculture, and mostly for arable farming which requires the water table to be maintained at a low level. Wetlands have therefore to be artificially maintained to keep their original marshy condition. The main threat to the site is acidification of the water by nitrous oxides. Also, high ammonia input from the surrounding intensive stock farms, causes eutrophication of bog areas. There is a constant problem of invasion of heathlands by grasses and tree seedlings, and a large colony of black-headed gulls is competing for habitats used by waterfowl. Ruff *Philomachus pugnax* has disappeared.

Management Practices The heathlands are managed to maintain heathland plant communities, and to prevent invasion by grass and tree species. In 1984 a shepherded flock of sheep was introduced for this purpose. The reserve management plan is designed to promote optimum environmental conditions for waterfowl, and includes dredging canals, maintaining the water

table at a sufficient level for marsh conditions and regeneration of *Sphagnum* mosses, controlled burning of heathlands and some reed-cutting.

Scientific Research and Facilities In 1985 two research projects were undertaken, one concerning the hydrology of the reserve in relation to its surroundings, and one concerning the possibilities of regeneration of the ombrotrophic peat-forming processes. In 1986 another project was initiated to study the effects of the high concentrations of ammonia on peat-forming processes and on the oligotrophic vegetation types which characterise the area.

Principal Reference Material The above information is taken principally from the document submitted at the time of designation in May 1980, supplemented by recent additions from the Ministry, and:

Duffey, E. (1982). *National Parks and Reserves of Western Europe*. Macdonald and Co., London.

Scott, D.A. (1980). A preliminary inventory of wetlands of international importance especially for waterfowl in west Europe and northwest Africa. *IWRB Special Publication No. 2*. 127 pp.

Additional reference:

Beintema-Hietbrink, R.J. (1985). *Handboek van natuurgebieden en wandelterreinen in Nederland*. Vereniging tot Behoud van Natuurmonumenten in Nederland, s'-Graveland.

De Weerribben

Location 52°37'N, 5°59'E. Situated 10km west of Meppel and Steenwijk in the north-west of Overijssel Province.

Area 3,400ha (increased from 2,500ha originally designated).

Degree of Protection State owned. The designated site includes 2,150ha within the Weerribben National Nature Reserve established in 1957. The area has recently been declared a national park in formation. Designated as a Ramsar site at the time of accession on 23 May 1980.

Site Description De Weerribben and Wieden National Park (4,004ha) comprise a substantial part of the once extensive lowlands of water and peat. The wetland habitat includes all stages of peat formation, areas of poor soil, reed marshes and quaking bogs, and has been greatly affected by centuries of peat cutting. Most of the fenlands and open-water broads are the result of over-intensive peat cutting which has exposed the lower peats and soil to wind erosion. The diversity of vegetation types is of great botanical interest and includes: various stages of the aquatic *Hydrochrito-Stratiotetum* succession in the open water ponds; floating mat vegetation in former peatholes (quaking bogs) comprising numerous species such as sphagnum moss, bog bean *Menyanthes trifoliata*, slender cotton grass *Eriophorum gracile*, downy-fruited sedge *Carex lasiocarpa*, two-stemmed sedge *C. diandra*, fen orchid *Liparis loeselii*, early marsh orchid *Dactylorhiza incarnata*, water forget-me-not *Myosotis scorpioides*, Parnassus grass *Parnassia palustris* and bladderwort *Utricularia intermedia*; reedmarsh dominated by *Phragmites communis*; *Cirsio-Molinetum* (thistle moor grass) community dominating the natural meadows;

shrubby marshes and woodland (climax community) of bog myrtle *Myrica gale*, birch *Betula pubescens*, buckthorn *Frangula alnus* and common alder *Alnus glutinosa*. The dark sedge *Carex buxbaumii* (threatened throughout Europe) occurs in the transition zone between the quaking bog and drier unmanured pastures. The fauna is diverse in wetland species, including the highly localised large copper butterfly *Lycena dispar*. The wetland is surrounded by reclaimed polder, with several small settlements on the boundary and the village of Kalenberg within the reserve. Several roads pass through the wetland linking Ossenzijl, Kalenberg and Wetering.

International and National Importance The site is important for breeding birds and migrants. Breeding birds include grey heron *Ardea cinerea*, purple heron *A. purpurea*, bittern *Botaurus stellaris*, great-crested grebe *Podiceps cristatus*, curlew *Numenius arquata*, snipe *Gallinago gallinago*, shoveler *Anas clypeata*, black-headed gull *Larus ridibundus*, black tern *Chlidonias niger*, marsh harrier *Circus aeruginosus*, hen harrier *C. cyaneus*, long-eared owl *Asio otus* and Savi's warbler *Locustella luscinioides*.

Changes in Ecological Character Eutrophication is resulting from the intake of water from the canals between Ossenzijl and Blokzijl (largely derived from the IJsselmeer, and originating from the River Rhine). From these canals eutrophic water penetrates into the waterzone beneath the floating mats of vegetation. Another problem concerns the reduction of upwelling water originating from Pleistocene rocks near Paaslo, which was caused by the creation of the Noordoostpolder in the IJsselmeer in the 1940s where the water table is maintained at a low level, and by cultivation of the neighbouring Wetering polder. These problems will increase because the water table of the surrounding polders will have to be lowered still further as the peat underlying them dries out, oxidises and shrinks.

Management Practices Traditional agricultural practices have been retained at a regulated level as part of the management plan. They include reed-cutting, woodland coppicing, hay-making, some grazing, the dredging of ditches and waterways, and localised, strictly controlled, hunting. Recreational activities are controlled.

Scientific Research and Facilities The University of Amsterdam, the Agricultural University of Wageningen, and the RIN have carried out hydrobiological and hydrological investigations.

Principal Reference Material The above information is principally taken from the document submitted at the time of designation in May 1980, supplemented by information recently supplied by the Ministry, and:

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

National Report on the Netherlands (1984). Meeting of the Contracting Parties, Groningen.

Scott, D.A. (1980). A preliminary inventory of wetlands of international importance especially for waterfowl in west Europe and northwest Africa. *IWRB Special Publication* No. 2. 127 pp.

Additional references:

Beintema-Hietbrink, R.J. (1985). *Handboek van natuurgebieden en wandelterreinen in Nederland*. Vereniging tot Behoud van Natuurmonumenten in Nederland, s'-Graveland.

Gerritsen, G. (1984). Noord-West Overijssel. In: *Vogels in Overijssel*. Waanders, Zwolle.

Leentvaar, P. (1945). Hydrobiologische waarnemingen in het plassen gebied van N.W. Overijssel I. *Biol. Jaarboek Dodonea* 33.

- Luther, H. and Rzoska, J. (1971).** Project AQUA *IBP Handbook* No. 21.
- Schroevers, P. (1965).** Hydrobiologische waarnemingen N.W. Overijssel II. *Biol. Jaarboek Dodonea* 33.
- Westhoff, V., Bakker, B.A., van Leeuwen, C.G. and Van der Voo, C.G. (1971).** *Wilde Planten Deel II and list of references Deel III*. Vereniging tot Behoud van Natuurmonumenten in Nederland, Amsterdam.
- Wirdum, G. van (1982).** The ecohydrological approach to nature protection. Annual Report 1981, Research Institute for Nature Management, Arnhem.

Het Naardermeer

Location 52°17'N, 5°07'E. Situated between Amsterdam and Hilversum in Noord Holland Province.

Area 752ha

Degree of Protection Privately owned by the Vereniging tot Behoud van Natuurmonumenten. Designated as a Ramsar site at the time of accession on 23 May 1980.

Site Description The wetland comprises a typical lowland mire system. The open water pools are colonised by pondweeds *Potamogeton*, waterlilies *Nuphar* and Hydrocharitaceae, and by small concentrations of the genera *Chara*. Reedbeds and grassy marshlands support *Phragmites communis*, *Typha angustifolia*, *Scirpus lacustris*, *Carex paniculata* and *C. elongata*. There is meadowland on poor soil, and swamp woodland of *Alnus* sp. and birch *Betula pubescens*. The site is surrounded by agricultural polders on three sides and to the east by the densely populated districts of Naarden and Bussum in the Hilversum conurbation.

International and National Importance The wetland is an important breeding ground for waterfowl, including grey heron *Ardea cinerea*, purple heron *A. purpurea* (50-75 pairs), bittern *Botaurus stellaris*, spoonbill *Platalea leucorodia* (125 pairs), red-crested pochard *Netta rufina*, gadwall *Anas strepera*, black tern *Chlidonias niger* and cormorant *Phalacrocorax carbo sinensis* (5,000 pairs: the largest colony in Europe). Other breeding birds include bearded tit *Panurus biarmicus*, and several species of warbler including Savi's *Locustella luscinioides*. Large numbers of dabbling and diving duck (Anatidae) pass through on autumn and spring migration, and may overwinter in a mild winter.

Changes in Ecological Character Until 1984 polluted surface water was being discharged into the pools from surrounding farmland, in an attempt to compensate for the reduction in oligotrophic seepage entering the wetland. This had caused increased eutrophication, and caused expansion of reedbeds and rushes. Instead, a water purification plant was employed with markedly positive results in recent years. Power cables in the area are a potential hazard to birds. There are no other significant disturbances. Night heron *Nycticorax nycticorax* and ferruginous duck *Aythya nyroca* have both disappeared.

Management Practices Management practices include some reed-cutting to maintain the diversity of mire plant communities. Access to some parts is strictly limited. Visitors have to make an appointment, and must be accompanied by a reserve guide.

Scientific Research and Facilities The vegetational succession has been studied for over 50 years. Ornithological research has included regular monitoring of breeding species and in particular studies of the biology and population dynamics of spoonbill.

Principal Reference Material The above information is taken from the document submitted at the time of designation in May 1980, from material provided by the Vereniging tot Behoud van Natuurmonumenten in Nederland, and:

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

Supplemented by:

Scott, D.A. (1980). A preliminary inventory of wetlands of international importance especially for waterfowl in west Europe and northwest Africa. *IWRB Special Publication* No. 2. 127 pp.

Additional references:

Beintema-Hietbrink, R.J. (1985). *Handboek van natuurgebieden en wandelterreinen in Nederland*. Vereniging tot Behoud van Natuurmonumenten in Nederland, s'-Graveland.

Vereniging tot Behoud van Natuurmonumenten (1974). *Het Naardermeer Nature Reserve Handbook*. Amsterdam.

De Boschplaat

Location 53°27'N, 5°30'E. Situated on the eastern part of Terschelling Island in the Wadden Sea, Friesland.

Area 4,400ha

Degree of Protection State owned. The beach and outer dune ridge are managed by the Ministry of Public Works and the remaining area by the Friesian branch of the Netherlands National Forestry Service. Protected as a Nature Reserve since 1924. The site is contiguous with two other reserves on Terschelling Island: Noordvaarder and Koegelwieck, amounting to a total protected area on the island of 9,400ha. De Boschplaat received the European Diploma for Nature Conservation in 1970. Designated as a Ramsar site at the time of accession on 23 May 1980.

Site Description De Boschplaat developed from sandflats which were built up into dunes not always covered by the flood tide, and which then became linked with Terschelling Island when the Koggesdiep channel silted up. The construction of an artificial dune ridge in 1931-36 enabled vegetation to become established on the dunes which were then protected from the high North Sea tides. The vegetation ranges from pioneer species such as glasswort *Salicornia europaea* on the saltmarsh to mud rush *Juncus gerardii*, creeping fescue *Festuca rubra*, thrift *Armeria*

maritima and distant sedge *Carex distans* on the highest levels of the sandflats. Where the influence of salt diminishes and periods of flooding are shorter, *Salicornia* is replaced by *Puccinella maritima*, *Atriplex maritima* and *Obione pedunculata*. Behind the dunes lies a thick scrub of sea buckthorn *Hippophae rhamnoides* and crowberry *Empetrum nigrum*. In the southern slacks a natural 'woodland' (the first of its kind in the Wadden area) has developed naturally, with silver birch *Betula alba*, aspen *Populus tremula*, grey willow *Salix cinerea* and some *Viburnum opulus* and *Sambucus nigra*. The dunes and their hinterland support a fascinating diversity of plant communities, depending on salinity, soil chemistry, stage of dune development and geomorphology. Mammals are scarce and many common species are absent.

International and National Importance The site's position between the North Sea and Wadden Sea, the rich food resources of the mudflats, and isolation from many predators make it important for breeding birds as well as migrants. It has almost 50 breeding bird species including hen harrier *Circus cyaneus*, Montagu's harrier *C. pygargus*, marsh harrier *C. aeruginosus*, kestrel *Falco tinnunculus*, short-eared owl *Asio flammeus*, eider *Somateria mollissima*, shelduck *Tadorna tadorna*, curlew *Numenius arquata*, redshank *Tringa totanus*, black-tailed godwit *Limosa limosa*, lapwing *Vanellus vanellus*, oystercatcher *Haematopus ostralegus*, wheatear *Oenanthe oenanthe*, grasshopper warbler *Locustella naevia*, reed bunting *Emberiza schoeniclus*, avocet *Recurvirostra avosetta*, spoonbill *Platalea leucorodia*, herring gull *Larus argentatus*, lesser black-back gull *L. fuscus*, common gull *L. canus*, common tern *Sterna hirundo*, arctic tern *S. paradisea*, little tern *S. albifrons*, Kentish plover *Charadrius alexandrinus*, ringed plover *C. hiaticula*, and occasionally sandwich tern *S. sandvicensis*. In autumn some 30,000 migratory birds have been counted along the coast, including large numbers of teal *Anas crecca*, wigeon *A. penelope*, shelduck, dunlin *Calidris alpina*, knot *Calidris canutus*, bar-tailed godwit *Limosa lapponica*, curlew and oystercatcher. Less numerous species include greylag goose *Anser anser*, brent goose *Branta bernicla*, eider, grey plover *Pluvialis squatarola*, great black-backed gull *Larus marinus*, herring gull, common gull and turnstone *Arenaria interpres*. Migrants also include small numbers of birds of prey such as osprey *Pandion haliaetus*, white-tailed eagle *Haliaeetus albicilla*, peregrine *Falco peregrinus* and merlin *F. columbar*

Changes in Ecological Character Terschelling Island has a permanent population of over 4,300, and farmers are allowed to graze cattle on 300ha of dune meadow within the reserve. The large breeding population of herring gull threatens the success of other less abundant breeding species.

Management Practices Open to the public all year. The Forest Service controls access paths to minimise erosion of the dunes by walkers; bird breeding grounds are patrolled; access is restricted from mid-April to mid-July; and motor traffic within the reserve is prohibited. There is a forestry officer in charge of the area, with 1-2 wardens increased to four during the bird breeding season. Measures are being taken to restrict the number of breeding pairs of herring gull.

Scientific Research and Facilities There is continuous monitoring of the dune vegetation development and bird breeding colonies. There is a Biological Research Station (Schellingerland) on Terschelling run by the Research Institute for Nature Management.

Principal Reference Material The above information is taken from the Council of Europe (1970), European Diploma for Nature Conservation: Boschplaat Leaflet, and the document submitted at the time of designation in May 1980. Supplemented by:

Duffey, E. (1982). *National Parks and Reserves of Western Europe*. Macdonald and Co., London.

National Report on the Netherlands (1984). Meeting of the Contracting Parties, Groningen.

Additional reference:

Beintema-Hietbrink, R.J. (1985). *Handboek van natuurgebieden en wandelterreinen in Nederland*. Vereniging tot Behoud van Natuurmonumenten in Nederland, s'-Graveland.

Verwey, J. *et al.* (1966). *A plea for the Waddensee*. Committee for Nature and Landscape Preservation, Den Haag.

De Griend

Location 53°15'N, 5°15'E. An island in the west-central part of the Wadden Sea, south-west Friesland, and the fringe of islands north of Den Helder.

Area 23ha

Degree of Protection State owned. Griend Island is protected as a Nature Reserve. This island and several other areas of the Wadden Sea were recently declared a state nature monument under Article 21 of the Nature Conservation Act. Designated as a Ramsar site at the time of accession on 23 May 1980.

Site Description Griend is a small uninhabited island which is the highest part of the 'Griender Waard', a sandy mudflat on which saltmarsh vegetation has become established. It is in a favourable, undisturbed location for breeding birds, especially as it is inaccessible to land predators such as rats, weasels and polecats. The island is surrounded by tidal marshes.

International and National Importance The island is an important breeding ground for sandwich tern *Sterna sandvicensis*, Arctic tern *S. paradisaea*, little tern *S. albifrons*, common tern *S. hirundo*, oystercatcher *Haematopus ostralegus*, redshank *Tringa totanus*, shelduck *Tadorna tadorna* and several other species of duck (Anatidae). It is important as a high tide roost and as a stopover for migrants. Numbers are comparable with those of larger Wadden islands. Species include dunlin *Calidris alpina*, knot *C. canutus*, turnstone *Arenaria interpres*, shelduck, eider *Somateria mollissima*, curlew *Numenius arquata*, brent goose *Branta bernicla*, great black-backed gull *Larus marinus*, common gull *L. canus* and black-headed gull *L. ridibundus*. The island and surrounding marshes are probably the most important area in the Wadden Sea for bar-tailed godwit *Limosa lapponica* and grey plover *Pluvialis squatarola*.

Changes in Ecological Character The island is largely undisturbed but there is increasing industrial activity in the surrounding area of the Wadden Sea, including gas and oil exploration, pollution with waste discharged from the mainland, military exercises, and tourist recreation. There is some tidal erosion of this unstable mud island.

Management Practices The breeding colonies are patrolled by reserve wardens. Access is prohibited during the breeding season under a management programme to optimise environmental conditions for waterfowl populations. A coastal protection project has been undertaken in an attempt to minimise tidal erosion of the island.

Scientific Research and Facilities The Wadden Working Group and the Institute for Marine Research on Texel Island have carried out research projects for the governmental Wadden Sea Committee.

Principal Reference Material The above information is taken from the document submitted at the time of designation in May 1980, and from:

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

Supplemented by:

National Report on the Netherlands (1984). Meeting of the Contracting Parties, Groningen.

Scott, D.A. (1980). A preliminary inventory of wetlands of international importance especially for waterfowl in west Europe and northwest Africa. *IWRB Special Publication* No. 2. 127 pp.

Additional references:

Beintema-Hietbrink, R.J. (1985). *Handboek van natuurgebieden en wandelterreinen in Nederland*. Vereniging tot Behoud van Natuurmonumenten in Nederland, s'-Graveland.

Verwey, J. et al (1966). *A plea for the Waddensee*. Committee for Nature and Landscape Preservation, Den Haag.

Part of De Biesbosch

Location 51°56'N, 4°48'E. Situated between the Amer and Nieuwe Merwede branches of the Rhine Delta where these flow into the Hollands Diep; south-east of Rotterdam in Noord-Brabant Province, south-west Netherlands.

Area 1,700ha.

Degree of Protection Owned mainly by the Ministry of Agriculture and Fisheries. The designated area includes 1,500ha protected as Brabantse Biesbosch State Nature Reserve. All land outside the dykes is classified as 'natural area' in the land use plans of the neighbouring municipalities. De Biesbosch has been declared a national park in formation. Designated as a Ramsar site at the time of accession on 23 May 1980. The area is contiguous with Dordtsche Biesbosch and Sliedrechtse nature reserves on the opposite bank of the Nieuwe River.

Site Description The designated site is bounded by two tributaries of the Rhine and Maas rivers as they flow into the delta, and comprises a network of large and small creeks enclosing a mosaic of reclaimed polders, water reservoirs, marshland and swampy woodland. The man-made reservoirs (for drinking water) and some agricultural polders are excluded from the designated site. Biesbosch was originally a freshwater tidal area, but in November 1970 the Haringvliet

Dam was completed with the result that the average tidal range was reduced from 2m to 20cm, resulting in some areas which used to be regularly uncovered being permanently underwater while others remained dry. This has had a drastic effect on the structure and composition of the subsoil and plant and animal communities, and the area is gradually becoming a marshland with some closed creeks drying out to form peat. The vegetation successions include reed *Phragmites communis*, bulrush *Scirpus triducter*, marsh marigold *Caltha palustris* var. *araneosa* and willow *Salix* sp., and communities with species of thistle *Cirsium* and nettle *Urtica dioica* invading the drier areas.

International and National Importance Biesbosch is an area of great scientific interest, particularly for ornithology. The new, drier, conditions attract a great variety of breeding birds with numbers still increasing, including marsh harrier *Circus aeruginosus*, gadwall *Anas strepera*, garganey *A. querquedula* and shoveler *A. clypeata*; new species nesting since 1970 include great-crested grebe *Podiceps cristatus*, tufted duck *Aythya fuligula*, kingfisher *Alcedo atthis* and nightingale *Luscinia megarhynchos*. Bittern *Botaurus stellaris*, grey heron *Ardea cinerea* and Savi's warbler *Locostella luscinioides* also breed here. The area used to be the most northerly breeding site in Europe for colonies of night heron *Nycticorax nycticorax* but now only a few isolated pairs remain. The changing conditions are unlikely to affect the importance of the area as a stopover for migrating geese including greylag *Anser anser*. Other migrants include mallard *Anas platyrhynchos*, teal *A. crecca*, pintail *A. acuta* and pochard *Aythya ferina*. Cormorant *Phalacrocorax carbo* and spoonbill *Platalea leucorodia* use the wetlands as a post-breeding feeding ground.

Changes in Ecological Character The construction of Haringvliet Dam has dramatically changed the nature of the wetland, including increasing the number and variety of breeding birds, particularly those favouring stagnant water and rough vegetation. However, the disappearance of mud has reduced the number of waders, and the reduction in reedbeds has reduced the numbers of birds dependent on these. On the other hand, the increased acreage of stagnant water and rough bank vegetation has resulted in a growing number of birds common to these habitats. The most serious threats to the wetland are pollution of river sediment and of the water in the Maas River (several birds have been examined, and high levels of PCBs have been found; research into changes in water quality has been initiated), installation of power lines, reservoir construction, and increasing recreational activities.

Management Practices Some sectors of the reserve are closed to the public and managed as a strict reserve. Some waterways are closed to motor boats. Reed-cutting continues in some places. Fishing and the controlled catching of ducks with the help of decoys is still allowed in places. A large scale recreational development was being built in 1984 just outside the reserve boundary in an attempt to reduce recreational pressure in the sensitive parts of the wetland, and a similar project, also outside the reserve, was being planned in 1986.

Scientific Research and Facilities There are studies of vegetation succession, and zoological and hydrobiological studies, particularly on birds and insects.

Principal Reference Material The above information is taken from the document submitted at the time of designation in 1980, and from:

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

Supplemented by:

Duffey, E. (1982). *National Parks and Reserves of Western Europe*. Macdonald and Co., London.

National Report on the Netherlands (1984). Meeting of the Contracting Parties, Groningen.

Additional references:

Anon (1970). *Over de hartslog van het National Park de Biesbosch*. Grontmij, de Bilt.

Zonneveld, I.S. (1970). De Biesboch is dood, leve de Biesbosch. *Natuur en Landschap* 24(4).

Dutch section of the Wadden Sea

Location 53°15'N, 5°15'E. The marine zone situated between the mainland of the provinces of Groningen, Friesland and Noord Holland, and the fringe of islands bordering it to the west and north from Den Helder to Borkum-Emden. The Dutch Wadden Sea is the westernmost sector of the vast complex of shallows stretching along the coast of the Federal Republic of Germany and thence north to Esbjerg on the west coast of Denmark. The Boschplaat and Griend Island are part of the Wadden Sea area.

Area 249,998ha

Degree of Protection Mostly state-owned (Ministry of Finance; Domeinen) but some small areas, totalling about 4,500ha, are privately owned. The Eendracht-polder salt marshes on Texel are on a long-term lease to the Vereniging tot Behoud van Natuurmonumenten. Several areas are protected as state-owned, wardened, nature reserves: the mudflats of the Dollart (with a 14km coastline), the De Band polder including some of its periphery (320ha), Bildtpolden (3,200ha), saltmarshes behind the Eendracht polder on Texel (6,700ha), Eyerlandse Gat seal reserve (20,000ha), Noordsvaarder (650ha), Boschplaat (4,400ha, awarded the Council of Europe's Diploma), another seal reserve south-east of Schiermonnikoog, Kobbeduinen (2,400ha) and Griend (23ha). The implementation of the Nature Conservation Act on 18 May 1981 resulted in the designation 150,000ha as a national area of natural beauty. Designated as a Ramsar site on 2 May 1984.

Site Description The Dutch Wadden Sea stretches for about 200km between the mainland and a string of offshore islands, from the province of North-Holland in the west, north along the Enclosure Dam and then eastwards along the coast of Friesland and Groningen to the mouth of the river Eems. Its width varies from about 30km at Texel to 6-7km at Ameland. Sea inlets vary in width from 3-6km, with depths in places of 30-50m. The area is an extensive, open and relatively flat region comprising open water, sandbanks, mud flats, marsh and reclaimed land. Large areas of sandbanks and mud flats on the lee side of the chain of islands become exposed at low tide, and they are dissected by a fine network of small channels. Some areas are dyked to prevent flooding, but outside the dykes the salt marshes in particular have interesting plant communities including some rare species, and there is a marked zoning of halophytic plants, related to tidal movements.

Texel, the largest of the Wadden Sea islands, has two nature reserves, De Geul en Westerduinen (1681ha) and De Muy en De Slufter (700ha). De Slufter consists of a coastal plain with mudflats

and a shallow lagoon connected to the North Sea by several creeks. De Geul, at the southern end of the island, contains open dunes, wet valleys and areas of scrub and mudflats with many interesting species. Terschelling, the second largest island in the Dutch Wadden Sea, has three nature reserves: Koegelwieck (250ha), Noordvaarder (650ha) and Boschplaat (4400ha). The plant life ranges from pioneer species such as glasswort on the saltmarsh to mud rush, creeping fescue, thrift and distant sedge at the highest levels of the sandflats. Behind the dunes is a thick scrub of sea buckthorn and crowberry. In some areas there are beautiful dune valleys with orchids, Dyer's greenweed, marsh gentian and impressive areas of dune heath. The flora of the reserve also includes some interesting immigrant species from the north, notably bearberry and chickweed wintergreen, both normally montane plants. Noordvaarder and Koegelwieck reserves are both extensive dune valleys of sand with a low lime content, on which a rich flora has developed. The coastal strip of the mainland along the Dutch area of the Wadden Sea is an area of low population density, concentrated in the harbour towns of Den Helder (60,000 residents), Harlingen (15,000 residents) and Delfzijl (25,000 residents).

International and National Importance The Wadden Sea is ecologically the most important tidal area of Western Europe, and a vital stopover on the Western Palaearctic migration route for waterfowl. From July to September the bird population in the area is greatest. On the sandbanks and saltmarshes of Texel, breeding birds include shelduck *Tadorna tadorna*, eider *Somateria mollissima*, oystercatcher *Haematopus ostralegus*, avocet *Recurvirostra avosetta*, Kentish plover *Charadrius alexandrinus*, terns *Sterna* spp., marsh harrier *Circus aeruginosus* and several more common species. The birdlife on Terschelling Island is extraordinarily rich. Among the less common birds breeding on the island are Kentish plover, avocet, black-tailed godwit *Limosa limosa*, hen harrier *Circus cyaneus*, Montagu's harrier *C. pygargus*, spoonbill *Platalea leucorodia* and several species of duck including eider and pintail *Anas acuta* and occasionally Sandwich tern *Sterna sandvicensis*. The reserves are also important stopovers for several species of wading birds. The Wadden Sea is an extremely important nursery and spawning ground for North Sea fish, and the only part of the Netherlands with a harbour seal colony of any size.

Changes in Ecological Character The area is affected by mass recreation and other tourist activities; gas and oil exploitation; industrialisation at Dollarthafen; military manoeuvres; pollution by waste water; and by canal construction. It is also confronted with pollution from heavy metals, pesticides and polychlorinated biphenyls absorbed by organisms of the area, resulting in the death of birds and to a decline in the reproduction of seals. In the summer of 1988 the Wadden Sea's seal population was devastated, with about two-thirds of the population killed by a viral infection. In 1987, the Dutch government decided against the reclamation of a 900ha area in the Wadden Sea.

Management Practices Most reserves in the area are closed to the public, but some can be visited on guided tours. The nature reserves and the bird breeding colonies are warded, and measures are taken to restrict the number of breeding pairs of herring gull *Larus argentatus*.

Scientific Research and Facilities Investigation into the hydrological, hydro-biological, floral, faunal and ecological aspects of the area have been carried out for many years and are continuing. A multidisciplinary group of scientists, the Wadden Working Group, and the Institute for Sea Research (NIOZ) on Texel in particular, have been involved in the studies undertaken for the governmental Wadden Sea Committee.

Principal Reference Material The above information is taken from the document submitted at the time of designation in May 1984, supplemented by: Braakhekke, W.G. and Drijver, C.A. (1984). Wetlands importance, threats and protection. The Dutch Society for the Protection of Birds, Zeist, Netherlands.

Bruning, H.A. (1981). Analysis of the present state of the recreational activities in the area of the Dutch Wadden Sea. Contribution to the 3rd Danish-Dutch-German symposium on environmental problems of the Wadden Sea on Norderney, October, 27th-30th, 1981.

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

Duffey, E. (1982). *National Parks and Reserves of Western Europe*. Macdonald and Co., London.

Additional References:

Anon. (1974). Rapport van de Waddenzee commissie. Staatsuitgeverij, Den Haag.

IUCN/WWF (1983). Serious threats in the Dutch Wadden Area. Vadehaus Waddenzee Wattenmeer. *Watt International* Nr. 2.

Verwey, J. et al. (1966). A plea for the Wadden Sea. Contact Committee for Nature and Landscape Preservation, Den Haag.

Waddenzee Provinces Steering Committee (1981). The Waddenzee - on course for the future. Summary of part 4 of The Interprovincial Structure Plan for the Waddenzee region. The Structure Plan. Published jointly by the provinces of North Holland, Friesland and Groningen.

Oosterschelde

Location 51°44'N, 03°59'E. Situated to the west of Bergen op Zoom, the wetland comprises the Oosterschelde River, the areas lying on the landward side of its dykes and the Markiezaatsmeer (inundated land belonging to the Marquisate of Bergen op Zoom). These three elements together constitute the Ramsar site.

Area 38,000ha

Degree of Protection Mostly state-owned, but some small sites are private property. The government, provincial and municipal authorities have set up the so-called Oosterschelde Steering Group which has drawn up a policy plan for the area. The main objective is conservation and, if possible, the enhancement of the wetland's natural values. The steering group is assessing the scope for enforcement of the Nature Conservation Act for (certain parts of) the Oosterschelde area. To date, management responsibility for Markiezaatsmeer nature area has rested with the National Service for Lake Yssel Polders but will be transferred to the Brabant Landscape Foundation (SBL), a private nature conservation body. The south-eastern part of Markiezaatsmeer is already protected under the Nature Conservation Act. Designation of the area as a wetland in the Netherlands also means that the area will be included in the provincial regional plan as a quiet area.

Site Description Oosterschelde is one of Western Europe's chief tidal waters with the following ecosystems: tidal marshes, shoals and mudflats (the intertidal area), shallows, deep

water, submerged parts of dykes and land inside dykes (twenty-seven individual areas). Hydraulic engineering works have been undertaken to protect the area against floods. A storm-surge barrier has been built in the mouth of the estuary, in addition to a compartmentation dam and a waterway connecting the rivers Scheldt and Rhine. The dykes have also been raised. These works have reduced not only the flow rate in the mouth, but also the surface area of Oosterschelde, and the tide has been subdued. The erosion and sedimentation processes caused by the tidal currents produce ever-changing patterns of deep tidal gullies, mud flats, shoals and tidalmarshes. The deepest tidal gullies are situated in the mouth, their depth is no less than 45m. There are vast shallows between these gullies and east of the Zeeland Bridge. In the eastern and northern parts are large areas with mud-flats. Until recently, Markiezaatsmeer was part of this tidal water, but a dam has separated it. A process of desalination will gradually change Markiezaatsmeer into a freshwater swamp. Nevertheless, the interrelationship between the two areas will continue to be close.

The water, intertidal area and land inside the dykes together constitute a varied natural environment supporting a high diversity of plant and animal species. The tidal marshes constitute the higher margins of the tidal zone, which are occasionally totally or partially flooded and are intersected by a fine-meshed network of tidal gullies. Their vegetation is halophilous and their relief supports a wide variety of vegetation types. They are major feeding and breeding areas and also high-tide refuges for waterfowl. Brackish vegetation types are seen in transition zones. Here are found organisms such as sea anemones, sponges and seaweed, and various fish, crustacea, crab, worm and mollusc species. Thanks to its ample food supply, the intertidal area serves as the nursery of Oosterschelde. The shallows (situated between the mean low tide and 5m above the Normal Amsterdam Level) contain a large proportion of the mussel plots and all the oyster banks. The areas on the landward side of the dykes are valuable elements, such as "karrevalden" (former cart tracks), secondary sea defenses, former creeks and pools that were created by dyke bursts. The natural values of these areas closely depend on the presence of large variations in salinity, the relatively high groundwater table (highly dependent on seepage), the good quality of the water, the extensive land use and disturbance of the area. Waterfowl use them as high-tide refuges, breeding, feeding and resting areas.

International and National Importance Oosterschelde constitutes a vital link in a coherent system of wetlands in Europe, West Africa, the Arctic regions of North Asia and North-east Canada: the Western Palaearctic migration route. Oosterschelde regularly supports 47,000 ducks, geese and swans, as well as 160,000 waders. It is a major resting, moulting and feeding area for many species of waterfowl. The actual numbers of 2 species of goose, 6 species of duck and 13 wader species are a multiple of the 1% criterion. The area is very important for nesting birds, in particular for marsh harrier *Circus aeruginosus* (5 pairs), hen harrier *C. cyaneus* (6 pairs), avocet *Recurvirostra avosetta* (420 pairs), common tern *Sterna hirundo* (460 pairs), little tern *Sterna albifrons* and Kentish plover *Charadrius alexandrinus*, a species for which the area meets the 1% criterion. The land inside the dykes is very important for other waders, ducks and gulls. The avifauna of Markiezaatsmeer is closely related to that of Oosterschelde. The great masses of lower plant and animal species found there are a source of food for a large number of waterfowl species from the entire area. Markiezaatsmeer is a major breeding area for oystercatcher *Haematopus ostralegus* and redshank *Tringa totanus*. It makes a major contribution to the ecological and genetic diversity of the entire Delta area. The estuary is also important for non-breeding waterfowl including: barnacle goose *Branta leucopsis* (2,700), brent goose *B. bernicla* (7,500), shelduck *Tadorna tadorna* (7,200), wigeon *Anas penelope* (18,900), pintail *A. acuta* (6,700), common shoveler *A. clypeata* (2,360), oystercatcher (88,000), avocet (700),

ringed plover *Charadrius hiaticula* (2,000), Kentish plover (1,000), grey plover *Pluvialis squatarola* (7,000), knot *Calidris canutus* (18,000), dunlin *C. alpina* (58,000), bar-tailed godwit *Limosa lapponica* (7,000), curlew *Numenius arquata* (10,000), spotted redshank *Tringa erythropus* (1,500), redshank (4,000), greenshank *T. nebularia* (900) and turnstone *Arenaria interpres* (1,300).

The following species are found in Oosterschelde: 250 varieties of phytoplankton, 150 types of zoo plankton, 200 different algae, 700 marine animal species, 86 different fish, including six cuttlefish species, 207 varieties of higher plants, 300 different insects and 28 breeding bird species. It also serves as a nursery for plaice and dab, amongst others, and a spawning area, for example for garfish and anchovy.

Changes in Ecological Character Hydraulic engineering projects will reduce the flow rate and surface area, and subdue the tide. Precipitation and the discharge of fresh water will gradually reduce the salinity of Markiezaatsmeer which has already been separated from Oosterschelde. The organisms that depend on the tide and on salt water will gradually die out and it will become a vast freshwater swamp. Even so, it will remain of great scientific interest. Changes in existing biological communities will create new ones and it may become a very important breeding and feeding area for cormorant, various herons and large birds of prey.

Management Practices Under supervision of the Oosterschelde Steering Group (the Steering Group consists of representatives of the government (ministries), of the provinces of Zeeland and Noord-Brabant, of the municipalities in the Oosterschelde area and of the water control boards concerned), a policy plan has been drawn up for Oosterschelde in which the views of the Steering Group on the policy to be conducted, with respect to development and management, up to 1990 has been incorporated. Management in Oosterschelde is non-specific. Most of the land within the dykes is managed as nature areas. The management of Markiezaatsmeer will be delegated to the Brabant Landscape Foundation (SBL). A management committee still to be instituted will harmonise the management of private and state territory and supervise the implementation of the management plan.

Scientific Research and Facilities The government supports a number of institutes that undertake research. Some government institutes carry out research as well, particularly the Delta Institute for Hydrobiological Research and the Tidal Waters Division of 'Rijkswaterstaat', the Netherlands Department of Waterways and Drainage.

Principal Reference Material The above information has been supplied by the Dutch government, supplemented by:

- Baptist, H.J.M. and Meininger, P.L. (1979).** *Vogeltellingen in Oosterschelde en Krammer-Volkerrakgebied. Bird censuses carried out between September 1975 and August 1979.* Paper DDMI-79.502. Rijkswaterstaat, Deltadiest afdeling Milieuonderzoek.
- Baptist, H.J.M. and Meininger, P.L. (1979).** *Broedvogels van het Oosterschelde gebied in 1978.* Paper DDMI-79.07. Rijkswaterstaat, Deltadienst afdeling Milieuonderzoek.
- Carp, E. (1980).** *A Directory of Western Palearctic Wetlands.* IUCN, Gland, Switzerland. 506 pp.
- Saeijes, H.L.F. and Baptist, H.J.M. (1977).** Wetland criteria and birds in a changing Delta. *Biological Conservation* 11: 251-266.

Saeijes, H.L.F. and Baptist, H.J.M. (1978). *Evaluatie van West-Europese overwinteringsgebieden van watervogels*. Paper 78-10. Rijkswaterstaat, Deltadienst afdeling Milieuonderzoek.

Zwanenwater

Location 52°49'N, 4°42'E. The site is a dune area situated in the municipalities of Callantsoog and Zijpe, 25km north of Alkmar, in the province of Noord-Holland.

Area 573ha

Degree of Protection Ratified as a special protected area under Article 4 of EEC Bird Directive 79/409/EEG on 2 April 1979. Zwanenwater lies in the regional plan area "Kop van Noord-Holland en Texel". The greater part of the area is owned by the Society for the Conservation of Nature Monuments in the Netherlands, the remainder by the Noord-Hollands Noorderkwartier Drainage Board and the state (forest agency). A part of the property has been let out on long lease to Rijkswaterstaat, for coastal defence work.

Site Description The area evolved after the Zijpe was closed off. As a result, sand dunes were able to form, first to the east of the existing beach barrier and later to the west. Between the two ridges a dune valley formed. The western ridge of dunes has always been unstable, resulting in an intricate complex of secondary valleys and parabole dunes. A freshwater lens floats on saltwater located deep in the substratum. The freshwater supply has a convex water table, so that in the lowest-lying part of the dune area standing water forms. The two lakes are amongst the largest of their type in Europe. The water of both lakes is oligohaline, eutrophic and rich in organic matter. Very diverse plant communities occur within the area due to the great diversity in habitat. Both lakes are surrounded by a wide stretch of marshland. Characteristic of this marsh area is a freshwater flora and vegetation which is totally absent in the rest of North Holland north of the Nordzeekanaal. Due to the variation in water level with respect to the ground level, as a result of existing micro-relief, a highly varied vegetation pattern including reeds, herbage and brushwood is found in this littoral zone. Less common and rare plants occur in this area. The area supports a large and varied mammal population, including stoat *Mustela erminea*, weasel *Mustela nivalis*, root vole *Microtus oeconomus*, harvest mouse *Micromys minutus* and otter *Lutra lutra* (V). The area is also important for many insects, especially butterflies (200 species) and hoverflies. A number of fish species occur in the lakes and water holes.

International and National Importance Zwanenwater is hydrobiologically of international importance as a freshwater dune lake and is included as such in the AQUA list. The area is of great ornithological significance, mainly due to the large number of birds which breed there, an average of 80 to 90 different species. Most important are spoonbill *Platalea leucorodia* (60-90 pairs) and grey heron *Ardea cinerea*, several colonies of which are present in the area at the same time. Many species of ducks, seagulls and song birds also breed in the area, the song birds being represented by a great many species, such as skylark *Alauda arvensis*, nightingale *Megarhynchos luscinia* and Cetti's warbler *Cettia cetti*. The area is also important to migratory birds, particularly black-tailed godwit *Limosa limosa*, hundreds of which regularly roost in the area. There is also a varied vegetation cover, including many rare plant species.

Changes in Ecological Character Increasing pressure from recreational use of the area; lowering of the water table in the immediate vicinity; and pollution from outside the reserve are all potential threats. Noise pollution from the nearby artillery range may cause a problem as the area is included in the provincial regional plan as a quiet area.

Management Practices A management plan exists for the area owned and managed by Nature Monuments, with the following objective. The management of Zwanenwater shall be aimed at the conservation and development of as varied a dune area as possible, in the interest of as diverse biological communities as possible with their specific fauna and flora. Intervention in the populations is only permitted on the grounds of disproportionate damage to surrounding farmland or unaccountable damage to the coastal ridge in its coastal defence function. Although the wetland is freely accessible to members of the Society and to others on payment, visitors must keep to pathways, and in general management of the reserve is strict. However, limited hunting and fishing is permitted.

Scientific Research and Facilities Hydrobiological investigations and surveys of breeding and migratory waterfowl have been carried out.

Principal Reference Material The above information is taken from documents supplied by the Dutch Government for designation in June 1988, and is supplemented by:

Carp, E. (1980). *A Directory of Western Palaearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

Oostvaardersplassen

Location 52°27'N, 5°20'E. Situated in the south polder of the Province of Flevoland. The wetland is bounded on the south initially by the municipal limits of Lelystad and Almere and then by the northern inset of the ditch parallelling the railway line to Lelystad. The boundary follows the ditch to where the railway line traverses the Knardijk. From here the boundary runs along the western foot of the Knardijk to the Oostvaardersdijk.

Area 600ha

Degree of Protection Designated a state nature monument under the Nature Conservancy Act in 1986, and as a Ramsar site in June 1989.

Site Description The wetland is composed of an embanked area consisting of open water, marsh, reedland, tangled growth and willow forests, and an unembanked area consisting of reedland, tangled growth and willow forests, as well as some plots on which organic farming is practised and several plots seeded with grass for goose grazing. It was established in 1967 when the south polder of Flevoland was reclaimed and laid out.

International and National Importance The value of the wetland rests mainly on its similarity to ecosystems that were once characteristic of the large river deltas of Europe. The area takes its great biotic value from a combination of a large stretch of shallow eutrophic water, a vast marsh surrounding this water, and drier parts. The wetland is exceptionally rich in birds, both

in and out of the breeding season. An important part of the north-west European population of several species of birds stays in the area for some time each year to breed, moult, winter, or roost during migration, and greylag goose *Anser anser* breeds, moults and occurs in autumn and spring as on migration. Moreover, the area functions as a reservoir for other nature areas in the Netherlands and abroad. Species such as bearded reedling *Panurus biarmicus* and marsh harrier *Circus aeruginosus* move from other suitable habitats to Oostvaardersplassen. The site is of great importance to many species of birds, including rare and less common species such as cormorant *Phalacrocorax carbo sinensis*, bittern *Botaurus stellaris*, spoonbill *Platalea leucorodia*, greylag goose, pintail *Anas acuta*, shoveler *A. clypeata*, marsh harrier, hen harrier *Circus cyaneus*, water rail *Rallus aquaticus*, avocet *Recurvirostra avosetta*, bluethroat *Erithacus svecicus*, sedge warbler *Acrocephalus schoenobaenus*, great reed warbler *A. arundinaceus*, bearded reedling, gadwall *Anas strepera*, short-eared owl *Asio flammeus*, spotted crake *Porzana porzana*, redshank *Tringa totanus*, common tern *Sterna hirundo* and little grebe *Tachybaptus ruficollis*. Marsh harrier breeds in large numbers in the area. As a moulting site it is of great importance especially to greylag goose, teal *Anas crecca* and shoveler. Ducks, mergansers and geese winter here, as well as a few white-tailed eagle *Haliaeetus albicilla*. Osprey *Pandion halietus* is observed regularly and buzzard *Buteo buteo* and rough-legged buzzard *B. lagopus* winter in large numbers. Tens of thousands of migrating birds use the area as a resting site, including several species of birds of prey, geese, ducks, waders and gulls, many species of reedland and marsh songbirds, numerous swifts and sand martins.

Changes in Ecological Character The area has changed since the south polder of Flevoland was reclaimed, developing into a marsh ecosystem. The natural development continued as a result of the construction of an embankment to make an independent water regime possible, and as a result of management measures geared to the natural function of the that were taken by the IJsselmeerpolders Development Authority. Consequently, despite the relatively short period of development, the natural values of the area are remarkably high. The development of the area into a complete freshwater marsh ecosystem is well underway. Thanks to the occurrence of greylag goose during a large part of the year and the presence of numerous moulting birds in summer, the marsh vegetation is effectively grazed, which prevents the pools from becoming overgrown and from being choked by water plants. Because of their grazing, the presence of greylag goose is of great importance to maintaining the dynamic processes in the marsh ecosystem. In order to stimulate the development of a marsh ecosystem, the area is experimentally grazed by large wild herbivores. Parts of the wetland are disturbed by noise from activities on the adjacent "De Vaart" industrial park and as a result of traffic on the Flevo railway line.

Management Practices The management committee aims to "maintain the actual qualities of the water and marsh area and create optimum conditions for developing the area into a eutrophic freshwater swamp ecosystem that is as complete as possible". The land within the unembanked part, temporarily used for agricultural purposes, is to be laid out and managed as part of the total wetland area. Application of agricultural methods, such as grazing, on behalf of nature management, will remain possible and may contribute to the maintenance and development of the natural values. Recreational use of the area, according to the management committee, is fairly limited and does not affect the ecological development possibilities of the area. The water regime is to be geared to the maintenance and development of the natural values.

Scientific Research and Facilities Possibilities for research are part of the management committee's aims, in order to increase knowledge of the area and influence management decisions.

Principal Reference Material The above information is taken from the document submitted by the Dutch government at the time of designation in June 1989.

Engbertsdijksvenen

Location 52°29'N-6°40'E. Situated in the Province of Overijssel, immediately south of Kloosterhaar and north of Vriezenveen. The entire wetland lies within the limits of the municipality of Vriezenveen. It is bounded on the south by Geesterensche Stroomkanaal, on the west by Geesterensche Stroomkanaal and Paterswal, and on the north by the ditch De Dooze and the road from Kloosterhaar to Sibculo. The eastern boundary is formed by the young reclamation landscapes of Bruinehaarsvenen and Balkenbeltsvenen.

Area 975ha

Degree of Protection 865ha of the wetlands is owned by the state and managed by the National Forest Service. Engbertsdijksvenen has been designated as a nature monument under the Nature Conservancy Act.

Site Description Engbertsdijksvenen is a moorland reserve consisting of an intact high-moor heart covering about 17ha and parts of high moor that were completely or partly cut in the past. There is a heathland in the north and in some places on the edges, where the moor has dried out, birch forests are developing. The wetland is a representative and valuable remnant of what used to be the large moorland area of Vriezenveen-Vroomshoop-Daalerveen, and is one of the subatlantic moors which have almost disappeared elsewhere. It is not rich in higher plant species, but the relatively small number of species and the vegetation pattern are characteristic of the moorland biotope. Less common and rare species occurring in Engbertsdijksvenen include bog rosemary, cranberry, hare's tail cotton grass, bog asphodel, deer hair, crowberry, sundew, slender cotton grass, white-beaked sedge, liverworts *Odontoschisma sphagni*, *Mylia anomala*, *Telaranea setacea*, *Cephalozia connivens* and also eight species of Sphagnum.

International and National Importance The wetland is especially important for birds. About 200 species are found here, amongst them 85 breeding species. It is also important as a foraging, roosting and wintering site, especially to the European bean goose *Anser fabalis*. Besides being a breeding site for seven species of duck, including garganey *Anas querquedula*, teal *A. crecca*, shoveler *A. clypeata*, tufted duck *Aythya fuligula* and pochard *A. ferina*, the area is important as a roosting and moulting ground for these and several other species such as shoveler (100 pairs), pochard (115), tufted duck (40), garganey (800), teal (30), wigeon *Anas penelope* (50), gadwall *A. strepera* (10), pintail *A. acuta* (50) and mallard *A. platyrhynchos* (2,000). All species of swallow occurring in the Netherlands are observed here and one of the largest Dutch colonies of sand martin *Riparia riparia* (50 breeding pairs) is to be found on the western edge. More than 10 species of gulls and terns occur, including little gull *Larus minutus* and whiskered tern *Chlidonias hybrida*. A fairly constant number of pairs (12) of black tern *Chlidonias niger* breeds at the site. Bluethroat *Erithacus svecicus*, a breeding bird characteristic of moorlands, has returned in the last few years. Other songbirds, such as whinchat *Saxicola rubetra*, stonechat *Saxicola torquata*, grasshopper warbler *Locustella naevia* and wheatear also breed in the area. European bean goose *Anser fabalis* winters in the wetland. In 1987 about 1,400 were recorded

using the cultivated land north of the moorland and the Overijsselse Vecht river valley as foraging sites. During the migratory season many species of waders use the area as a loafing and foraging site. More than 25 species, including curlew *Numenius arquata*, black-tailed godwit *Limosa limosa*, lapwing *Vanellus vanellus*, snipe *Gallinago gallinago*, whimbrel *Numenius phaeopus*, greenshank *Tringa nebularia* and ruff *Philomachus pugnax* are observed each year in numbers varying from tens to thousands. Black grouse *Tetrao tetrix* has almost disappeared. By using traditional arable farming methods as part of small-scale management, the National Forest Service attempts to restore the wetland to a suitable environment for black grouse. Cranes *Grus grus* return each year to Engbertsdijkerven on their way from breeding grounds in Scandinavia to their wintering quarters. Three species of harrier are found, including marsh harrier *Circus aeruginosus* and hen harrier *C. cyaneus*. Other birds of prey occurring in winter or spring are merlin *Falco columbarius*, rough-legged buzzard *Buteo lagopus*, peregrine *Falco peregrinus*, hobby *F. subbuteo*, kestrel *F. tinnunculus* and red-footed falcon *F. vespertinus*.

The area is also of importance as a habitat for various reptile species, such as viviparous lizard and viper, and also for various amphibian species and insects.

Changes in Ecological Character The area is traversed by a ditch carrying eutrophic water off from surrounding agricultural lands. It is planned to divert the ditch outside the wetland boundaries shortly. In view of the site's extensive character, recreational use does not affect its ecological development possibilities.

Management Practices Management is aimed at maintaining and developing a typical moorland community, characterised by a gradual transition to the adjacent area. The transition zone is extraordinarily rich in species. The water regime, both quantitatively and qualitatively, is to be geared permanently to the maintenance and development of the site's natural values.

Scientific Research and Facilities Research into moorland communities is carried out by, for example, the Rijksinstituut voor Natuurbeheer.

Principal Reference Material The above information is taken from the document submitted by the Dutch government at the time of designation in June 1989.

Het Lac

Location 12°06'N, 68°14'W. Situated on the coast of Bonaire Island to the east of Curaçao in the Lesser Antilles (in the Caribbean off the coast of Venezuela).

Area 700ha (within the underwater park of 6,000ha which includes the complete coastline of Bonaire and Klein Bonaire)

Degree of Protection Owned by the Government of Bonaire. Protected within the underwater park (6,000ha) established in May 1979. Designated as a Ramsar site at the time of accession by the Netherlands on 23 May 1980.

Site Description Het Lac is a shallow (0-3m) sandy/muddy-bottomed lagoon, partly separated from the open sea by a bar of coral debris cemented together by red coralline algae (*Lithothamnion*) and other organisms. The lagoon is fringed by mangrove swamps and beds of sea grass *Thalassia testudium*. The mangroves provide shelter, and produce large amounts of organic debris which is washed into the lagoon making the waters highly productive for fish and invertebrates (a rich food source for birds). The sea grass is browsed by invertebrates such as queen conch *Strombus gigas*, sea urchins and giant seastar *Oreaster reticulatus*, which are also a food source.

International and National Importance The lagoon is an important feeding ground for birds including waders, terns (*Sternidae*), frigate bird *Fregata* sp., pelicans *Pelecanus* spp. and herons (*Ardeidae*). Numerous species breed in the shelter of the mangroves.

Changes in Ecological Character The site is undisturbed.

Management Practices None reported

Scientific Research and Facilities The Caribbean Marine Biological Institute based in Curaçao is studying the coastal coral reefs.

Principal Reference Material The above information is taken from:

Kristensen, I. (1980). Description of the Netherlands Antilles Wetlands to be conserved. Caribbean Marine Biological Institute, Curaçao.

Het Pekelmeer

Location 12°02'N, 68°15'W. Situated on the southern coast of Bonaire Island, east of Curaçao in the Lesser Antilles (in the Caribbean off the coast of Venezuela).

Area 400ha (including the flamingo sanctuary 56ha)

Degree of Protection Owned by the International Antillean Salt Company (AISCO). The designated site includes the flamingo sanctuary supervised by the Flamingo Sanctuary Commission, AISCO, Bonaire. Designated as a Ramsar site at the time of accession by the Netherlands on 23 May 1980.

Site Description Pekelmeer is a shallow strip of seawater located between a solid ridge of beachrock (recrystallised coral debris) and the AISCO solar saltworks. A channel has been dug at the eastern tip of the lagoon linking it with the open sea. The flamingo sanctuary along the north bank of the lagoon is separated from Pekelmeer by a dyke. A pump maintains the water level in the sanctuary. Vegetation is sparse, with a coating of algae on the muddy bottom: the major foodsource for the flamingo.

International and National Importance The sanctuary is one of the few breeding sites in the Caribbean for red flamingo *Phoenicopterus ruber ruber*, with an average of 1,000 pairs recorded during the breeding season. Terns (*Sternidae*) and pelicans *Pelecanus* spp. fish in the lagoon.

Changes in Ecological Character There is a problem of disturbance during the flamingo breeding season mainly by visiting photographers and ornithologists, light aircraft overflying the area and some poachers.

Management Practices Access to the bay in the sanctuary by visitors and scientists is prohibited during the flamingo breeding season.

Scientific Research and Facilities The population and behavioural ecology of the flamingo colony has been studied since 1959.

Principal Reference Material The above information is taken from:

Kristensen, I. (March 1980). Description of the Netherlands Antilles Wetlands to be conserved. Caribbean Marine Biological Institute, Curaçao.

Additional references:

de Boer, B.A. (1979). Flamingos on Bonaire and in Venezuela. *STINAPA Documentation Series* No. 3.

Rooth, J. (1965). *The flamingo on Bonaire*. Utrecht.

Klein Bonaire Island and part of the adjacent sea

Location 12°10'N, 68°19'W. Situated 2km off the west coast of Bonaire in the Lesser Antilles (in the Caribbean off the coast of Venezuela).

Area 600ha

Degree of Protection The island is privately owned. The surrounding sea and coastal reefs are owned by the Island Government of Bonaire, and the reefs are protected within Bonaire Underwater Park established in 1979 under the administration of the Underwater Park Board of STINAPA (Stichting National Parken Nederlandse Antillen), Curaçao. Designated as a Ramsar site at the time of accession by the Netherlands on 23 May 1980.

Site Description Klein Bonaire is a small uninhabited coral island. It is flat and barren, with little topsoil supporting only sparse vegetation of shrubs and cacti. There are lagoons along the southern shore, and the water is brackish for most of the year. The coral reefs surrounding the island support an extremely rich reef fauna.

International and National Importance The offshore coral reefs are of great scientific interest, supporting an abundant and species-rich reef fauna.

Changes in Ecological Character The coral reefs are damaged by illegal spear-fishing, collection of coral, boats anchoring offshore, and local oil spills.

Management Practices None reported

Scientific Research and Facilities None reported

Principal Reference Material The above information is taken from:
Kristensen, I. (March 1980). Description of the Netherlands Antilles Wetlands to be conserved. Caribbean Marine Biological Institute, Curaçao.

Supplemented by:
IUCN (1982). *IUCN Directory of Neotropical Protected Areas*. Tycooly Int. Pub. Ltd., Dublin.

Material collected for the Directory of Coral Reefs of International Importance. IUCN Cambridge, UK.

Het Gotomeer

Location 12°14'N, 68°22'W. Situated on the north-west coast of Bonaire Island in the Lesser Antilles (in the Caribbean off the coast of Venezuela).

Area 150ha (within Washington-Slagbaai National Park of 5,900ha).

Degree of Protection Owned by the Island Government of Bonaire. The lake is protected within Washington-Slagbaai National Park established in May 1969 (extended September 1977). The park is administered by the Netherlands Antillean National Parks Foundation (STINAPA). Designated as a Ramsar site at the time of accession by the Netherlands on 23 May 1980.

Site Description Gotomeer is a shallow coastal lagoon isolated from the sea by a bank of beachrock (recrystallised coral debris). The water in parts of the lake is supersaline for much of the year, becoming brackish after periods of heavy rain. Evaporation is partly compensated for by a constant seepage of seawater through the beachrock barrier. Brine shrimp *Artemia salina* and brine fly *Aphydra* sp. are abundant in the supersaline areas, and constitute a valuable foodsource for birds.

International and National Importance The lake is an important feeding ground for many species of wader, red flamingo *Phoenicopterus ruber ruber*, herons (Ardeidae) and stilts (Recurvirostridae).

Changes in Ecological Character The BOPEC oil terminal is situated just southwest of the lake.

Management Practices None reported

Scientific Research and Facilities None reported

Principal Reference Material The above information is taken from:
Kristensen, I. (1980). Description of the Netherlands Antilles Wetlands to be conserved. Caribbean Marine Biological Institute, Curaçao.

Supplemented by:

IUCN (1982). *Directory of Neotropical Protected Areas*. Tycooly Int. Pub. Ltd., Dublin.

Additional reference:

Anon (1979). Field Guide to Washington National Park. *STINAPA Documentation Series* No. 9.

De Slagbaai

Location 12°16'N, 68°25'W. Situated on the northwest coast of Bonaire Island in the Lesser Antilles (in the Caribbean off the coast of Venezuela).

Area 90ha (within Washington-Slagbaai National Park 5,900ha).

Degree of Protection Owned by STINAPA. The lake is protected within Washington-Slagbaai National Park established in May 1969 (extended in September 1977). The park is administered by the Netherlands Antillean National Parks Foundation (STINAPA). Designated as a Ramsar site at the time of accession by the Netherlands on 23 May 1980.

Site Description Slagbaai is a shallow, landlocked lake, isolated from the sea by a bank of beachrock (recrystallised coral debris). The water in parts of the lake is supersaline for much of the year, becoming brackish after periods of heavy rain. The evaporation is partly compensated by a constant seepage of seawater through the beachrock barrier. Brine shrimp *Artemia salina* and brine fly *Aphydra* sp. are abundant in the supersaline areas and constitute a valuable foodsource for birds.

International and National Importance The lagoon is an important feeding ground for many species of wader, red flamingo *Phoenicopterus ruber ruber*, herons (Ardeidae) and stilts (Recurvirostridae).

Changes in Ecological Character None reported

Management Practices None reported

Scientific Research and Facilities None reported

Principal Reference Material The above information is taken from:

Kristensen, I. (March 1980). Description of the Netherlands Antilles Wetlands to be conserved. Caribbean Marine Biological Institute, Curaçao.

Supplemented by:

IUCN (1982). *IUCN Directory of Neotropical Protected Areas*. Tycooly Int. Pub. Ltd., Dublin.

Additional reference:

Anon (1979). Field Guide to Washington National Park. *STINAPA Documentation Series* No. 9.

Het Spaans Lagoen

Location 12°30'N, 70°00'W. Situated on the south coast of Aruba Island in the Lesser Antilles (in the Caribbean off the coast of Venezuela).

Area 70ha

Degree of Protection Owned by the Island Government of Aruba. The lagoon is protected as a Conservation Area under the administration of the Netherland Antillean National Parks Foundation (STINAPA). Designated as a Ramsar site at the time of accession by the Netherlands on 23 May 1980.

Site Description Het Spaans is a narrow coastal inlet 2km long and 200-500m wide, fringed by mangrove swamps and mudflats. The mangroves provide a stopover site for numerous bird species, and the lagoon is an important nursery area for fish and shrimps which are a food source for the birds.

International and National Importance The lagoon is an important resting and feeding ground for numerous bird species.

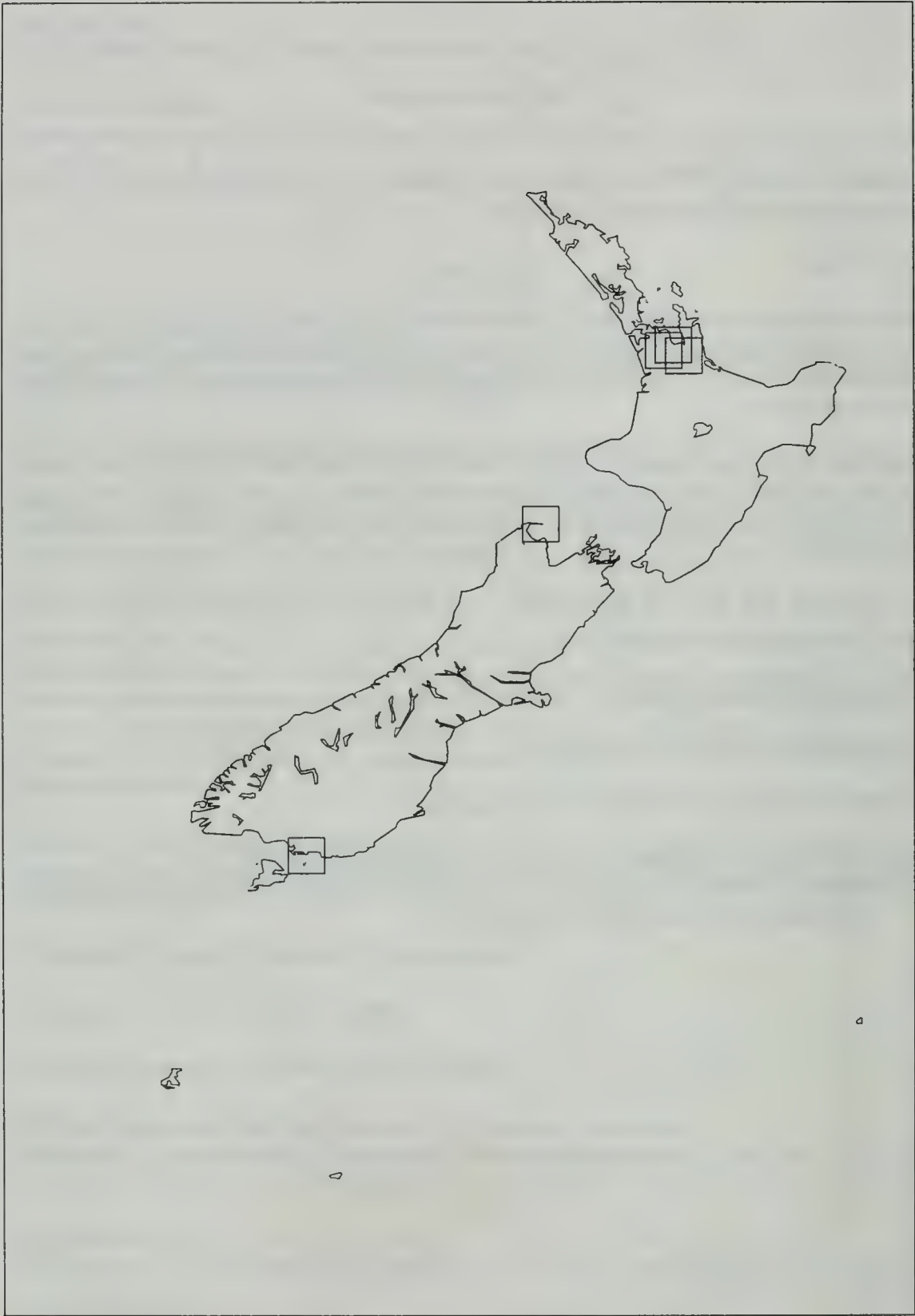
Changes in Ecological Character None reported

Management Practices None reported

Scientific Research and Facilities None reported

Principal Reference Material The above information is taken from:

Kristensen, I. (1980). Description of the Netherlands Antilles Wetlands to be conserved. Caribbean Marine Biological Institute, Curaçao.



Ramsar Sites in New Zealand

New Zealand

Area 268,675 sq. km

Population 3,307,984 (1986)

Summary of Wetland Situation New Zealand has a widespread, diverse range of wetland habitats, being a geologically complex archipelago which has experienced recent glacial and volcanic activity. It is in middle latitudes, and has a humid, temperate climate. Wetland communities which are particularly distinctive of the country include flax swamps of *Phormium* sp.; braided rivers which form good waterfowl habitat; high country with cushion bogs and tarns; salt rush and reed estuaries with *Leptocarpus* and *Juncus* spp.; and kahikatea swamp forest with *Dacrycarpus dacrydoides*. There is a considerable history of modification and use of wetlands. Activities such as kauri-gum digging, flax milling, land drainage, gold mining, flood control, land clearance and agricultural development have collectively contributed to their depletion. It is estimated that only 10% of the pre-European wetlands remain, and this represents less than 2% of the total land area of New Zealand. A major effort is now underway to stem the loss of wetland environments, including: ratification of a Government policy in 1986; an inventory, Wetlands of Ecological and Representative Importance (WERI), has been compiled; the provision of government financial subsidies to drain wetlands is to be phased out; and a new Department of Conservation with a mandate to conserve natural heritage will bring together several agencies with an interest in the ecology of wetlands and responsibility for their protection and management.

Protected Areas Legislation There is a wide range of legal measures covering various categories of protected areas, some of which are summarised here. The National Parks Act (1980) contains provision for the establishment of National Parks, and special areas within them as National Park Specially Protected Areas or National Park Wilderness Areas. Scientific Reserves, Nature Reserves and Scenic Reserves and a range of other categories are covered under the Reserves Act (1977), Wildlife Sanctuaries and Refuges under the Wildlife Act (1953) and Forest Reserves under the Forest Act (1949). Separate legislation covers the establishment of marine reserves (Marine Reserves Act 1971). The Conservation Act 1987 makes provision for Ecological Areas (previously under the Forest Act), for Conservation Areas, Wilderness Areas, and for a several other designations allowing for either protection of private land for conservation purposes, or for access. The new Department of Conservation has instigated a review of the range of categories of protected area, and of the legislation involved.

Protected Areas Administration National parks and scenic, nature and scientific reserves were all administered by the Department of Lands and Survey (being the responsibility of the Director of National Parks and Reserves), and the the wildlife sanctuaries, management reserves and refuges by the Wildlife Service. However in 1986/7 New Zealand established a Department of Conservation which now has administrative responsibility for all government established parks and reserves. The National Parks and Reserves Authority is a representative statutory

body appointed by the government to formulate policy and oversee its application for national parks and reserves.

Sites designated under the Convention Signature without reservation as to ratification 13 August 1976, with two sites listed at signature, two more added on 4 December 1989 and a fifth on 29 January 1990

Waituna Lagoon Wetlands Management Reserve
Farewell Spit
Whangamarino Wetland
Kopuatai Peat Dome and adjoining Swamplands
Firth of Thames

Government body responsible for administration of the Convention
Department of Conservation, PO Box 10-420, Wellington

Waituna Lagoon

Location 46°34'S, 168°36'E. Located about 10.5km south-east of the city of Invercargill on the southern coast of the South Island.

Area 3,556ha

Degree of Protection Government owned. The area is is a scientific reserve subject to the Reserves Act 1977 and administered by the Department of Conservation under the control of the Commissioner of Crown Lands, Invercargill, who has established an advisory committee. Designated a Ramsar site on 13 August 1976.

Site Description The site comprises a lagoon and surrounding peat bogs on the coastal margin of a glacio-fluvial plain of quartz rich gravels. Longshore drift of sediment has created a spit and barrier behind which the lagoon has formed. By impeding drainage the spit has allowed the development of thick deposits of peat which extend for some miles inland. The reserve contains over 150 species of native plants, including montane and subalpine species which are otherwise confined to mountainous areas above 900m in North Island. Other vegetation includes peat moss communities; some stunted coastal rimu *Dacrydium cupressinum* forest on better drained parts of the peat; several types of lagoon edge vegetation (salt marsh and allied communities are extremely well developed in south-eastern New Zealand); and coastal species along the shore. The lagoon is a trout fishery of some importance (brown trout *Salmo trutta*) and there was commercial eel fishing of short-finned eel *Anguilla australis schmidtii* and long-finned eel *A. dieffenbachii*.

International and National Importance The site is an important summer refuge and feeding area for many trans-equatorial migrants, and the only significant habitat in the far south for sooty crane *Porzana tabuensis*. It has 69 recorded bird species including 55 waterfowl. Breeding birds include great cormorant *Phalacrocorax carbo*, little pied cormorant *P. melanoleucos brevirostris*, white-faced heron *Ardea novaehollandiae*, Australian bittern *Botaurus stellaris*

poiciloptilus, black swan *Cygnus atratus*, Australian grey duck *Anas superciliosa*, New Zealand shoveler *A. rhynchotis variegata*, purple gallinule *Porphyrio porphyrio melanotus*, Baillon's crake *Porzana pusilla*, oystercatcher *Haematopus ostralegus*, variable oystercatcher *H. unicolor*, banded dotterel *Charadrius bicinctus*, black-winged stilt *Himantopus himantopus*, southern black-backed gull *Larus dominicanus*, caspian tern *Hydroprogne caspia*, white-fronted tern *Sterna striata* and fern bird *Bowdleria punctata punctata*. The lagoon is the principal black swan habitat in the southern region, and probably one of the most important remaining grey duck localities in the far south. It is also an important moulting refuge for New Zealand shoveler and Baillon's crake. Visiting birds include white spoonbill *Platalea leucorodia*, paradise duck *Tadorna variegata*, grey teal *Anas gibberifrons*, Pacific golden plover *Pluvialis fulva*, New Zealand dotterel *Charadrius obscurus*, far eastern curlew *Numenius madagascariensis*, asiatic whimbrel *N. phaeopus variegatus*, bar-tailed godwit *Limosa lapponica*, turnstone *Arenaria interpres*, knot *Calidris canutus*, sharp-tailed sandpiper *C. acuminata* and pectoral sandpiper *C. melanotos*. The reserve is also important for its unique moorlike vegetation characterised by herbs and shrubs adapted to cold peaty conditions more and usually found in montane or subalpine conditions, and not at sea level. These include *Donatia novae-zelandiae* cushion bog with grass lily *Oreostylidium subulatum* and comb sedge *Carpha alpina*.

Changes in Ecological Character No changes have been noted and the swamp areas are largely unaffected by artificial drainage. However, fire has periodically damaged some swamp vegetation temporarily, and some bird species have been adversely affected, particularly fern bird, although some, such as banded dotterel and whimbrel, take advantage of the bare burnt ground for breeding or roosting. Due to periodic blocking of the sea outlet, the lagoon is subject to considerable fluctuations in water level. When blocked during high rainfall periods the water floods back into marginal vegetation. If this occurs during July-November it can stimulate the breeding activity of black swan to a marked degree. However, it can also be very detrimental for other species such as waders; as the mudflats are not exposed, or the small islands favoured as nesting sites for tern, oystercatcher and stilts are submerged. When tidal conditions prevail, some drying out of the marginal vegetation occurs. Blocking of the inlet also causes drainage problems on some farms close to the lagoon, and a number of farmers are requesting drainage schemes that could adversely affect the reserve. There is some pollution from adjacent farmlands via creeks draining into the lagoon. The reserve lies near (and possibly over) extensive lignite coal fields, which are being investigated for possible exploitation.

Management Practices These include the preservation of flora and wildlife, and fishing and shooting are controlled. Periodic opening of the tidal inlet through the shingle bar is carried out to facilitate lagoon drainage. Entry to the reserve is not restricted and there is limited hut accommodation but the relative isolation and difficulty of access ensure minimum disturbance. A management plan has been prepared.

Scientific Research and Facilities There are annual bird checks by the Ornithological Society. A survey of the vegetation was carried out in 1967. There is a bird ringing station.

Principal Reference Material The above information is taken from documents provided by the New Zealand Government for designation in 1976 and for the Cagliari Conference 1980 and the Groningen Conference 1984.

Additional references:

- Kelly, G.C. (1967). Proposal for a wetland reserve adjacent to Waituna Lagoon. Toetoes Bay Southland Dept. Lands and Survey, Private Bag, New Zealand.
- Sutton, R.R. (1967). Whimbrels at Lake Waituna, Southland. *Notornis* 14(1): 34.
- Sutton, R.R. (1967). Sanderlings at Lake Waituna, Southland. *Notornis* 14(2): 83.

Farewell Spit

Location 40°30'-40°36'S, 172°46'-173°05'E. Located 38km from the town of Takaka in Nelson district at the north-west extremity of the South Island.

Area 11,388ha

Degree of Protection Government owned. The area is a subject to the Reserves Act 1977, and is administered by the Department of Conservation under control of the Commissioner of Crown Lands, Nelson. Day-to-day management is by the Abel Tasman National Park Board. It has been a protected area since 1938 when almost all the land (1,961ha) above high-tide level was set aside as a flora and fauna reserve, and all the area uncovered at low tide (9,360ha) was set aside as a sanctuary for the preservation of wildlife. Designated a Ramsar site on 13 August 1976.

Site Description Farewell Spit is a classic recurved spit, composed predominantly of uniform quartz sand derived from rivers draining westwards and transported northward by the Westland current. The subaerial part of the spit averages about 1km in width, and extends for about 22km eastwards into Golden Bay. It is reported to be extending eastwards by 15m annually. At low tide, sandflats and salt marsh extend for about 6km to the south of the spit. Along the northern coast there is a succession of fairly stable barchans up to 27m height (a dune formation rare in New Zealand). The interdune areas contain a series of damp hollows and small lakes, some of which have fresh water and may be semi-permanent. The dry land areas are almost totally transformed from original light coastal bush, scrub and native grasses, to a predominantly exotic cover dominated by marram grass *Ammophila arenaria* and lupin *Lupinus arboreus*, but with some native manuka *Leptospermum scoparium*, kanuka *L. ericoides*, flax *Phormium tenax*, bracken *Pteridium aquilinum* var. *esculentum*, sedges *Carex* Sp. and herbs. Isolated regeneration forest species include the native kaitomako *Pennantia corymbosa*, rimu *Dacrydium cupressinum* and some small akeake *Dodomaea viscosa*. The dune hollows and small lakes contain milfoil *Myriophyllum* sp., *Glossostigma elatinoides*, *Limosella tenuifolia*, *Lilaeopsis orbiculatus*, sand gunnera *Gunnera arenaria*, sedges *Carex* sp. and rushes *Juncus* spp. The saltmarsh follows a classical development, with eelgrass *Zostera* spp. at the lower limit, then distinct zones of glasswort *Salicornia* spp., sea rush *Juncus maritimus* var. *australiensis* and jointed rush *Leptocarpus simplex* and finally a zone of flax near the dunes.

International and National Importance The spit is of national and international importance for many of the 18 migratory species of bird which breed in Arctic and sub-Arctic regions but spend the northern winter feeding throughout coastal New Zealand, parts of Australia and the South Pacific. These number up to 46,000, with 99% comprising red knot *Calidris canutus*, bar-tailed godwit *Limosa lapponica* and turnstone *Arenaria interpres*. New Zealand is the major

overwintering area for bar-tailed godwit and red knot. The site also supported in 1967 a total of 5,500 birds of eight species breeding inland in New Zealand and returning to the coast for late summer, autumn or winter, dominated by oystercatcher *Haematopus ostralegus*, banded dotterel *Charadrius bicinctus* and black-billed gull *Larus bulleri*. Up to 10,000 black swan *Cygnus atratus* are also present, with up to 15% of the New Zealand population using the area as a moulting refuge. Twenty-nine other resident and breeding species include variable oystercatcher *Haematopus unicolor* and caspian tern *Hydroprogne caspia*. About 10 other species are observed in small numbers but not breeding. 95 bird species were recorded on the spit in March 1974.

Changes in Ecological Character Prior to designation, native vegetation had been extensively modified by burning, planting and grazing. In 1975 all cattle and sheep were removed from the spit, and since then, despite the presence of some deer, the natural vegetation has begun to regenerate, including golden pingao *Desmoschoenus spiralis* which, in the absence of introduced marram grass, would be one of the chief sand-binders. There is evidence to suggest that this species is now competing successfully with marram grass. There are still problems with invasion of other introduced species such as gorse *Ulex europaeus*, blackberry *Rubus fruticosus* and cordgrass *Spartina* spp. There is some damage and disturbance from off-road vehicles such as dune buggies and trail bikes.

Management Practices Measures are being taken to eradicate introduced plant species. Access is by permit only. A management plan has been completed for the reserve.

Scientific Research and Facilities Waterfowl research includes periodic bird censuses. Colour infra-red analysis of Farewell Spit vegetation was investigated during 1985.

Principal Reference Material The above information is taken from documents supplied by the Government of New Zealand for designation in 1976 and for the Cagliari Conference 1980 and the Groning Conference 1984.

Additional references:

Barlett, R.M. (1985). Farewell Spit Vegetation - Colour Red Analysis. Department of Lands and Survey, unpublished.

Kelly, G.C. (1972). Farewell Spit science and allied reserves report. Dept. Lands Survey, Botany Division, Private Bag, New Zealand.

Simpson, M.J.A. (1973). Farewell Spit: Valuable sanctuary and interesting botanical study. *Forest and Bird* 190: 19-21.

Whangamarino Wetland

Location 37°19'S, 175°12'E. In the Lower Waikato, 65km from Auckland and Hamilton.

Area 5,690ha

Degree of Protection Department of Conservation (DOC) stewardship land (4,960ha); Auckland Acclimatisation Society (730ha managed for waterfowl).

Site Description The wetland complex includes peat bog, swamp land, mesotrophic lags, open water and river systems. It supports an appreciable number of threatened plant and animal species but is equally important for its diversity and hence ability to support a wide range of regionally rare communities. Past land management attitudes have meant that in the Waikato basin and lowlands, an area of once vast wetlands now only has Whangamarino Wetland, the very small Moanatuatua Scientific Peat Reserve, and a series of peat lakes with almost non-existent marginal vegetation and severe eutrophication problems. Whangamarino Wetland, linked with the large lower Waikato lakes (including lakes Waahi, Whangape, Waikare) and the Waikato River provide what was described by the New Zealand Wildlife Service (Ogle and Cheyne, 1981) as the most important freshwater wetland wildlife habitat in New Zealand.

International and National Importance The following threatened plant species have been recorded in Whangamarino: club moss *Lycopodium serpentinum*, fern *Cyclosorus interruptus*, robust milfoil *Myriophyllum robustum*, buttercup *Ranunculus urvilleanus*, spider orchid *Corybas carsei*, floating bladderwort *Utricularia australis*, bladderworts *U. novae-zelandiae* and *U. lateriflora*. There is a healthy population of the threatened black mudfish *Neochanna diversus* throughout the peat and mesotrophic areas. The highest population of threatened Australian bittern *Botaurus stellaris poiciloptilus* uses many of the mesotrophic and swampland areas of the wetlands all year round. In 1981 Ogle and Cheyne estimated that between 30,000 and 50,000 waterfowl (largely black swan *Cygnus atratus*, mallard *Anas platyrhynchos*, grey duck, shoveler *Anas clypeata*, grey teal) use the wetlands seasonally. Since then no definite census has been made. Numbers, however, may be on the decline because of dropping water levels. North Island fernbird *Bowdleria punctata vealeae* which is locally threatened is very common in mesotrophic and peat bog areas, and also some mineralised patches. A large percentage of habitat and birds was destroyed in January 1989.

Changes in Ecological Character Ongoing problem of eutrophication of peat bog margins from farm land. There is no boundary fencing. Fire is also a threat (for example, recently 2,000ha burnt). Mining is practised in the catchment posing problems of discharge (now being resolved). A new mine, plus rubbish landfill, is in the planning stages.

Management Practices Whangamarino Wetland Draft Management recently developed by the DOC calls for "leave alone" management of peat bog areas. There are plans to raise water levels in swamplands in the near future to rectify the drying out process. Review of some grazing leases is to be carried out. Agreement has been reached between the Catchment Board, county councils and the DOC that no more drainage be carried out.

Scientific Research and Facilities Studies have been undertaken on swamp resources, wildlife and wildlife values and on the Meremere-Maramarua causeway (see below).

Principal Reference Material The above information was supplied by the Department of Conservation (Hamilton) at the time of designation, listing:

Irving, R., Nieuwland, F. and Deans, N. (1989). *Meremere-Maramarua Causeway Ecological Study*. A report prepared for Electricity Corporation of New Zealand Ltd by DOC.

Ogle, C.C. and Cheyne, J. (1981). *Wildlife and Wildlife Values of Whangamarino Wetlands*. NZ Wildlife Service Fauna Survey Unit Report 28. 94 pp.

Waikato Valley Authority (1981). *Whangamarino Swamp Resource Study WVA Technical Publication 20*. 167 pp.

Kopuatai Peat Dome and adjoining swamplands

Location 37°26'S, 175°34'E. Located on Hauraki Plains west of Te Aroha and Paeroa, approximately 70km from Hamilton.

Area 9,665ha (8,765ha peat bog, and approx. 900ha swampland)

Degree of Protection All land is Crown owned, administered by the Department of Conservation. 8,765ha Kopuatai Peat Dome stewardship land, 900ha swampland including Patetonga Lake Wildlife Management Reserve, Paterson Lagoon Wildlife Management Reserve and ABCD Flax Block Wildlife Management Reserve.

Site Description The largest remaining freshwater wetland in North Island, most of which is peat bog. Altitude 3m above sea level. The peat dome is the only remaining example of its type in North Island. Other wetland types are swampland, open water and river systems. Approximately one third of the peat dome is dominated by the vulnerable species *Sporadanthus traversii*, now found only in very few sites, and probably the only mainland (also found on the Chatham Islands) site which is viable in the long term. A kahikatea stand (an excellent example of a now regionally rare forest type) of approximately 22ha is situated at the south-western end of the dome. It is flooded periodically and regeneration is continuing despite a problem with willow, privet and Jerusalem cherry. Threatened species recorded on Kopuatai include creeping clubmoss *Lycopodium serpentinum*, greater jointed rush *Sporadanthus traversii*, fern *Cyclosorus interruptus*, floating bladderwort *Utricularia australis*, bladderworts *U. novae-zelandiae* and *U. lateriflora*. Detailed species lists of different vegetation zones are given in the designation documentation.

International and National Importance The threatened black mudfish *Neochanna diversus* has been recorded on the semi-mineralised fringes of the peat bog, but little work has been done on the extent of the population. Threatened Australian bittern *Botaurus stellaris poiciloptilus* occurs in scattered distribution on mineralised fringes and locally-threatened North Island fernbird *Bowdleria punctata vealeae* occurs in patchy distribution throughout the peat bog.

Changes in Ecological Character Possible (although unlikely) effect from other catchment water demands. However, pending hydrological work by catchment board should highlight this. There is a danger of fires.

Management Practices The DOC stewardship land is managed for conservation. There is some recreational shooting in mineralised areas. The wildlife management reserves are managed for wildlife protection and recreational hunting. Generally a "leave alone" policy for peat bog.

Scientific Research and Facilities Studies have been undertaken on vegetation, peat stratigraphy and past vegetation patterns. Also a series of studies on management and conservation of peatlands (Thompson, 1987) (see below) and the unpublished results of Fauna Survey Unit, Wildlife Service (1981).

Principal Reference Material The above information was supplied by the Department of Conservation (Tainui District, Hamilton) at the time of designation, listing:

de Lange, P. (in press). MSc thesis on peat stratigraphy and past vegetation patterns. University of Waikato.

Irving, R., Skinner, M. and Thompson, K. (1984). *Kopuatai Peat Dome - a vegetation survey*. Crown Land Series 12. 35 pp.

Thomson, K. (1987). *Annotated Bibliography of New Zealand Peat and Peatlands*. Water and Soil Miscellaneous Publications 114.

The Firth of Thames

Location 37°13'S, 175°23'E. On the east coast of North Island. The northern boundary is 52km from the city of Auckland, the southern boundary 70km.

Area 7,800ha

Degree of Protection Under Crown (Department of Conservation) ownership. The DOC owns a coastal reserve of about 30ha, flanked by approximately 1.6km of coastline north of Miranda and adjacent to a major series of shellbanks. This recently-acquired reserve has been included within the wetland site. A small recreation reserve borders the DOC reserve to the north. The 27.7ha farm property between the coast road and the sea adjoins the DOC reserve to the south and has recently been placed under conservation covenant. Land adjoining the site lies under several territorial authorities and protection status varies accordingly. Franklin County Council has designated all land adjoining the coast as 'Government Purpose Wild Life Reserve', while the farming hinterland has a Rural 2 zoning. Waikato County has a Rural A zoning over the small area of county adjacent to the coast. Hauraki Plains County has a Rural designation on the farmlands adjoining the southern Firth coast. Regional planning boundaries are currently being reviewed. The Kaiaua-Miranda coastline is recognised in the operative Auckland Regional Plan as having international and national significance, and it is unlikely that this will change under another authority. The Waikato Region seems to have made no moves toward formal protection of wildlife values of this coast.

Site Description The site lies in the northern part of the Hauraki graben bounded by fault lines along the Hunua and Coromandel ranges. The sea floor consists of fine clay, silt and sand sediments laid over pumice sands. Three rivers, the Waihou, Piako and Waitakaruru flow into the Firth from the south. These rivers and the strong north-east wave action determine the biological character and natural resource values of the Firth. In particular, the graded fossil beach ridges between Miranda and Kaiaua are an example of a Chenier Plain, a landform unique in New Zealand and globally rare. The range of sediment types in the area are reflected in the range of habitats that are available for wildlife. A past history of dynamic coastal change continues to-day. Shellbanks move, salt marsh areas dry up and mangrove forest increases in area. Details of vegetation patterns and full species list is given in the designation documentation.

International and National Importance The wetland reserve is an internationally important feeding ground for 30,000 birds, many migratory. It includes most of the approximately 8,500ha

of exposed intertidal feedings grounds in the Firth and can be considered in two parts: (a) the coastline between Miranda and Kaiaua consists of sand and shell deposits. The shell banks present in the area are used as high tide roosts by these birds. Adjacent grass flats are used for feeding and as roosts by some species. (b) the remaining area, from Miranda to the Waihou River mouth, consists of soft mudflats, flourishing and expanding mangrove communities and some intermingling salt marsh, mainly *Salicornia australis*. It is an important feeding ground for such birds as pied stilt and herons. Mangrove *Avicennia resinifera*, here within 100km of its southern limit, is increasing in area.

In winter, the dominant species are internal migrants, South Island pied oystercatcher *Haematopus finschi*, pied stilt *Himantopus leucocephalus* and wrybill *Anarchynchus frontalis*. Spring sees the arrival of thousands of birds of Siberian origin and the shore is dominated by eastern bar-tailed godwits *Limosa lapponica*, lesser knot *Calidris canutus canutus*, and a number of others. Over 35 species of migrants originating from beyond New Zealand have been recorded on this coast. The estuarine habitat of the Firth of Thames is one of New Zealand's three most important coastal stretches for wading birds and has been assessed (December, 1981) as having 'outstanding wildlife value' by the Fauna Survey Unit of the New Zealand Wildlife Service (now DOC). More than 100 bird species, many rare or uncommon, have been recorded at this site (list appended to designation documentation). The average number of waders present in the area over the year is around 16,000, while the total number present may peak at as many as 40,000 migratory birds during the summer months (Ornithological Society of New Zealand bird count data). Eastern bar-tailed godwit *Limosa lapponica baueri* overwinters in New Zealand, and approximately 8% of the New Zealand population of 100,000 has been counted in the Firth area. The endemic New Zealand wrybill, a threatened species, migrates north from the South Island riverbeds to overwinter in North Island harbours. An average of 2,870 of the estimated total population of 5,000 to 7,000 has overwintered in the Firth in each of the last 20 winters. Two endangered New Zealand birds, the New Zealand dotterel *Charadrius obscurus* and black stilt *Himantopus novaezealandiae* visit the area in small numbers regularly and the former species is known to nest at Miranda. Occasional rare migrants of other species are reported. Bird list appended to designation documentation.

Changes in Ecological Character Farms and small farming settlements surround the site and contribute to nutrient runoff into the Firth. Drainage, cultivation and the planting of trees on nearby farms could affect habitats. Unsuitable farming practices, such as factory farming, could affect water quality. Fitch farming, sand gravel and shell extraction is undertaken. Prospecting and mining has been proposed for much of the coast and could threaten both water quality and sediment pollution. Currently, zoning discourages housing development along the coast, but this could change as district schemes are modified. Land development and poor land use could increase sediment deposition and speed the growth of mangroves and loss of intertidal feeding grounds. However, bush clearance, formerly the cause of much sedimentation, has stopped in most of the hinterland. At least one local body has strong bush protection measures incorporated in its planning scheme. Aquaculture ventures could affect water quality. Loss of feeding grounds due to rising sea levels may be countered to some extent by silt deposition.

Management Practices Management of the area has been slight. Some years ago the Taramaire drainage canal was diverted in order to discourage public access to the shell bank. This measure seems to have been effective. Grass on the shell bank area under covenant (an old lime works now regarded almost as an historic site), has been kept short by cattle grazing. Future management plans will probably need to consider the following points: (a) controlled public

access and the provision of viewing points, hides and screening vegetation will be required. Despite the threats that people bring, public education in wildlife values is essential to the future of such a reserve. (b) a planting programme including suitable indigenous screen plants and the provision of special plantings if needed by individual species. For example, banded rail *Rallus philippensis* need sea rush *Juncus maritimus* and jointed rush *Leptocarpus simplex*, and these may not be in sufficient abundance for this species. (c) the continued provision of short-grass roost sites. The practice of grazing grass roost areas within the reserves, on covenanted lands, and if possible on farmlands adjacent to the coast, should continue. (d) management of freshwater wetland areas on the site so that present swamp and pools do not dry out. (e) In view of the shifting nature of this coast, some creation of permanent water of varying depths may be needed for waders. (f) the future predicted rise in sea level could affect high tide roosts so that artificial management of these could become necessary. (g) the zoning provisions for adjacent land use so that suitable mitigation measures could be undertaken, if needed. In some cases, greater planning controls may be needed. (h) all land between the Kaiaua-Miranda road and the shore that is not in the reserve should be purchased as it comes on the market and be added to the reserve. Land that cannot be purchased should be placed under covenant. (i) restrictions should be placed on the use of farm lands near recognised roost sites so agriculture and tree planing is not permitted. This could be undertaken in conjunction with rate relief or covenanting.

Scientific Research and Facilities The Miranda coast has long been recognised as a wildlife area of special significance. In 1982, Auckland natural history groups placed it on a list of the ten most important sites in the Auckland region. Together with the extensive ornithological surveys, work on the botany and entomology of the salt marsh and mangrove area has been conducted. The Miranda Naturalists Trust plans to build a public education facility and research base north of Miranda. Wildlife use of the area has been monitored since the 1940s when studies of breeding birds and migrant counts were begun. Summer and winter census figures are available for the past 38 years. Thus, a base-line exists against which trends in population may be examined and site management proposals assessed. Most survey data and research information has been published in *Notornis*, Journal of the New Zealand Ornithological Society, and in publications of the Miranda Naturalists Trust.

Principal Reference Material The above information was supplied by the government of New Zealand (Department of Conservation) at the time of designation.

Niger

Area 1,267,000 sq.km

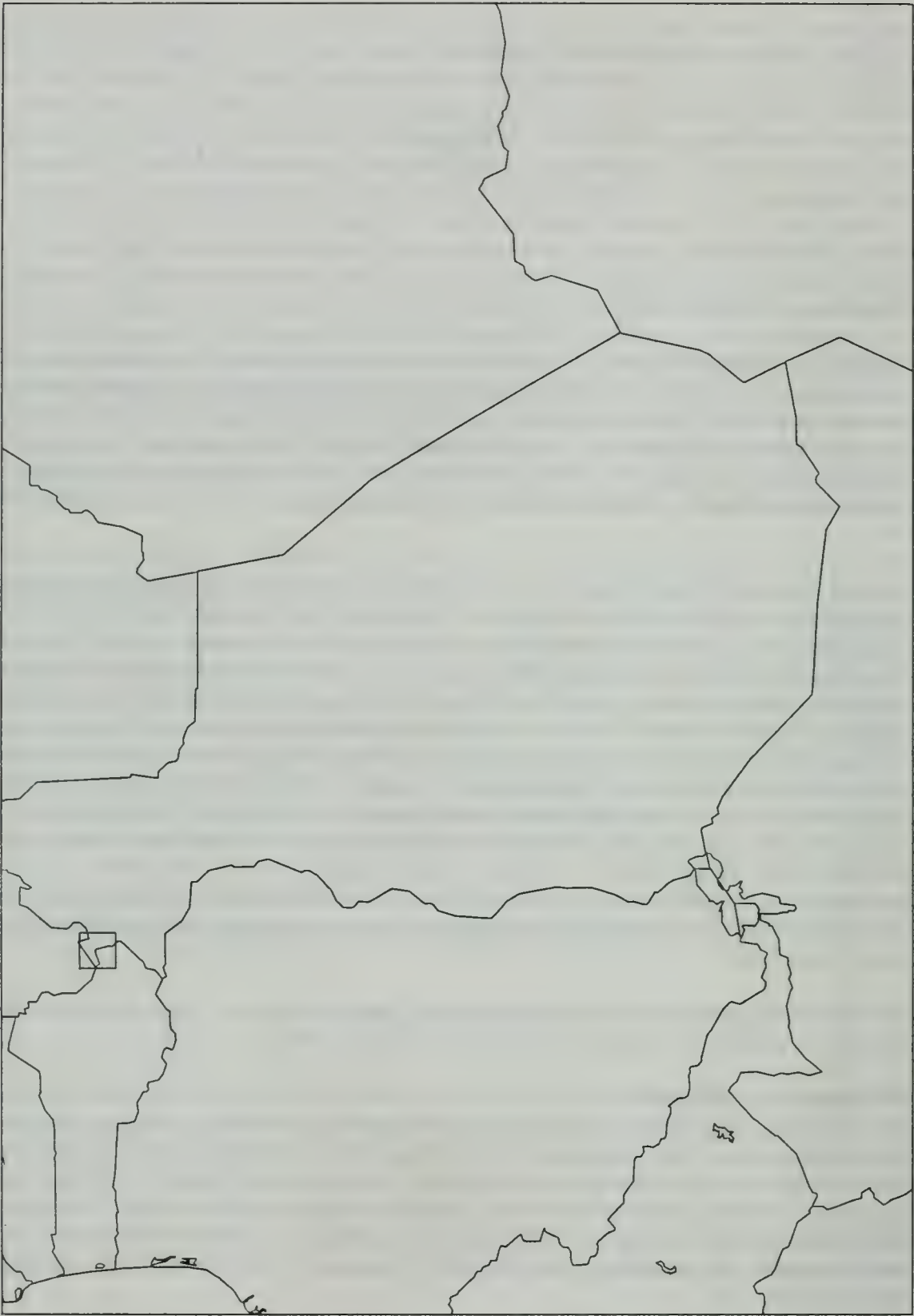
Population 7,190,000 (1988)

Summary of Wetland Situation Niger is a landlocked country of the West African Sahel, of which much of the territory is desert. It is one of the hottest countries in the world (absolute maximum recorded 46°C, absolute minimum 8°C). Precipitation decreases to the north and east, with no assured rainfall north of Agadez (annual rainfall 125mm, nearly all in August). Elsewhere, rain falls mainly from June to October, as the inter-tropical convergence moves north, then retreats southwards. Mean annual rainfall is 650mm at the capital, Niamey, and 800mm at Gaya.

The two dominant wetland areas are the Niger River and Lake Chad basin. The Niger flows from Mali, across the south-western corner of Niger for 570km, and then into Nigeria. The Niger flood plains as such are unprotected but a section of the river is protected in "W" National Park, Niger's Ramsar site. Since the national park also covers neighbouring sections of Benin and Burkina, there are wide opportunities for international cooperation in wetland conservation, management and wise use. The basin of Lake Chad includes the Korama and Komadougou Yobe systems which flow through Niger and Nigeria before reaching the lake. The lake itself, shared between Niger, Nigeria, Cameroun and Chad, has an area within Niger of approximately 421,250ha. With the Senegal delta and the inner delta of the Niger, Lake Chad represents one of the three great wetland basins of west/central Africa, of enormous importance to the human populations and wildlife (notably waterfowl) which co-exist there. Much further study and management of the whole basin is desirable. Niger's wetlands also comprise a number of oases (particularly in the Air mountains) and a series of fossil water courses which are relicts of a former pluvial age.

The above note is based on information supplied by the Government of Niger and on the draft Directory of African Wetlands (Mephram, R.H. and J.S., in press).

Protected Areas Legislation The principal acts covering establishment and management of protected areas would appear to be the law No. 62-28 of 4 August 1962 fixing the hunting regime. Before a reserve is officially designated and legally gazetted, the scientific aspects of a proposal must be approved by the administration's technical services and be studied by national and regional governments, and by the traditional authorities in the region of the reserve. Comments and criticisms made at these levels are evaluated and amendments or modifications made as and where necessary. After approval by the Council of Ministers, a decree is prepared for signature by Head of State.



Ramsar Sites in Niger

Protected Areas Administration Vested in the Direction des eaux et forêts, which is within the Ministère de l'agriculture et de l'environnement. At national level, the central directorate has various sub-sections, of which two are concerned with faunal matters: the Service aménagement de la faune and the Service protection de la nature. These are represented at regional levels by various departmental and district services and by forest department sections. The Service aménagement de la faune is responsible for conservation, management and administration of existing reserves, the creation and management of new reserves, and research. The Section protection de la nature is responsible for guarding against infractions of hunting and forestry legislation as well as the deliverance of various permits and authorisations.

Sites designated under the Convention Accession on 13 April 1987 with one site listed on accession.

Parc national du "W"

Government body responsible for administration of the Convention

Directeur de la Faune, de la Pêche, et de la Pisciculture, Ministère de l'Agriculture et de l'Environnement, BP 721, Niamey

Parc national du "W"

Location 12°15'N, 2°25'E. Located 150km south-south-east of Niamey on the right bank of the River Niger and extending to a point where the border of Niger, Burkina and Benin intersect.

Area 220,000ha

Degree of Protection Established as a national park in 1954; originally classified as a faunal reserve and state forest on 25 June 1953. The park is state-owned and was added to the Ramsar list on 30 April 1987.

Site Description The park takes its name from the double bend of the Niger between the points where two tributaries from the west, the Topoa and the Mekrou, flow into it. Geologically, the park consists of lateritic peneplains at a ruling level of approximately 250m, with rock outcrops of quartz, schists and gneisses. The oldest rocks are of Pre-cambrian age, and the park is cut from south-west to north-east by the Atakora quartzite chain. The climate is typically Sahelo-Sudanian; the temperature ranges from a maximum of 36.1°C to a minimum of 21.6°C and the rainfall, although averaging between 600 and 700mm, is very unreliable. The predominant vegetation type is Sudanese wooded savanna, and the park lies in the transition zone between Sudan and Guinea savannas. Secondary forest is composed of a mixture of grassland and stunted savanna woodland with species such as *Celtis integrifolia*, *Boscia senegalensis*, *Balanites aegyptiaca*, *Parkia biglobosa*, *Diospyros mespiliformis*, *Bauhinia reticulata*, *Adamsonia digitata*, *Tamarindus indica*, *Terminalia avicennioides*, *Procopis africana*, *Pterocarpus erinaceus*, *Piliostigma reticulatum*, shrubland species such as *Combretum* spp., *Guiera senegalensis*, *Acacia* spp. and *Lannea* spp., and grasses such as *Andropogon gayanus*. Many of these species

are present in the gallery forests which also have *Anogeinus leiocarpus*, *Boranus aethiopum*, *Mitragyna inermis*, *Vitex chrysoclada* and good stands of *Cola laurifolia* and *Kigelia aethiopum*.

Elephant *Loxodonta africana*, buffalo *Syncerus coffer*, and kob *Kobus kob* are the only remaining examples of Sudanese savanna fauna within the country. Large mammals include carnivores such as spotted hyena *Crocuta crocuta*, common jackal *Canis aureus*, serval *Felis serval*, caracal *F. caracal*, lion *Panthera leo* and cheetah *Acinonyx jubatus*, anubis baboon *Papio anubis*, patas monkey *Erythrocebus patas*, and ungulates such as warthog *Phacochoerus aethiopicus*, hippopotamus *Hippopotamus amphibius*, bushbuck *Tragelaphus scriptus*, red-flanked duiker *Cephalophus rufilatus*, common duiker *Sylvicapra grimmia*, defassa waterbuck *Kobus ellipsiprymnus*, reedbuck *Redunca redunca*, roan antelope *Hippotragus equinus*, hartebeest *Alcelaphus buselaphus*, topi *Damaliscus lunatus*, oribi *Ourebia ourebi* and red-fronted gazelle *Gazella rufifrons*. Nile crocodile *Crocodylus niloticus* is present in the river.

International and National Importance The site forms part of a large international protected area and is contiguous to sites in Burkina (190,000ha) and Benin (502,050ha) and the Réserve de Faune de Tamou (75,600ha) to the north. Avifauna is varied and abundant and migratory aquatic birds are common in the period between February and May. Guinea-fowl (Numididae), bustards (Otididae), hornbills (Bucerotidae) and francolins *Francolinus* spp. are found throughout the park, and raptors, such as vultures (Accipitridae), fish eagle *Haliaeetus vocifer*, martial eagle *Polemaetus bellicosus* and gobar goshawk *Melierax gabor* are also common. The waterbirds most frequently encountered include geese and ducks (Anatidae), waders, ibises (Threskiornithidae), storks (Ciconiidae), herons and egrets (Ardeidae).

Changes in Ecological Character Poaching, illegal grazing and annual migration of the Fulani's cattle, uncontrolled bushfires, fishing and cultivation within the park still occur. There are proposals for phosphate mining, damming of rivers, and railroad construction, which could seriously affect parts of the park.

Management Practices Waterhole construction and annual grass-burning have been used to improve the park, along with the development of fire management and park management plans, all carried out by US Peace Corps volunteers assigned to the park. A visitor permit is required for foreigners.

Scientific Research and Facilities Projects include the ecology of the African elephant, and vegetation ecology. Facilities include a small museum, herbarium and reference library at the park headquarters in Niamey.

Principal Reference Material The above information has been supplied by the Government of Niger, supplemented by:

IUCN/UNEP (1987) *Directory of Afrotropical Protected Areas* IUCN, Gland, Switzerland and Cambridge, UK. 1,034 pp.

Norway

Area 324,218 sq.km

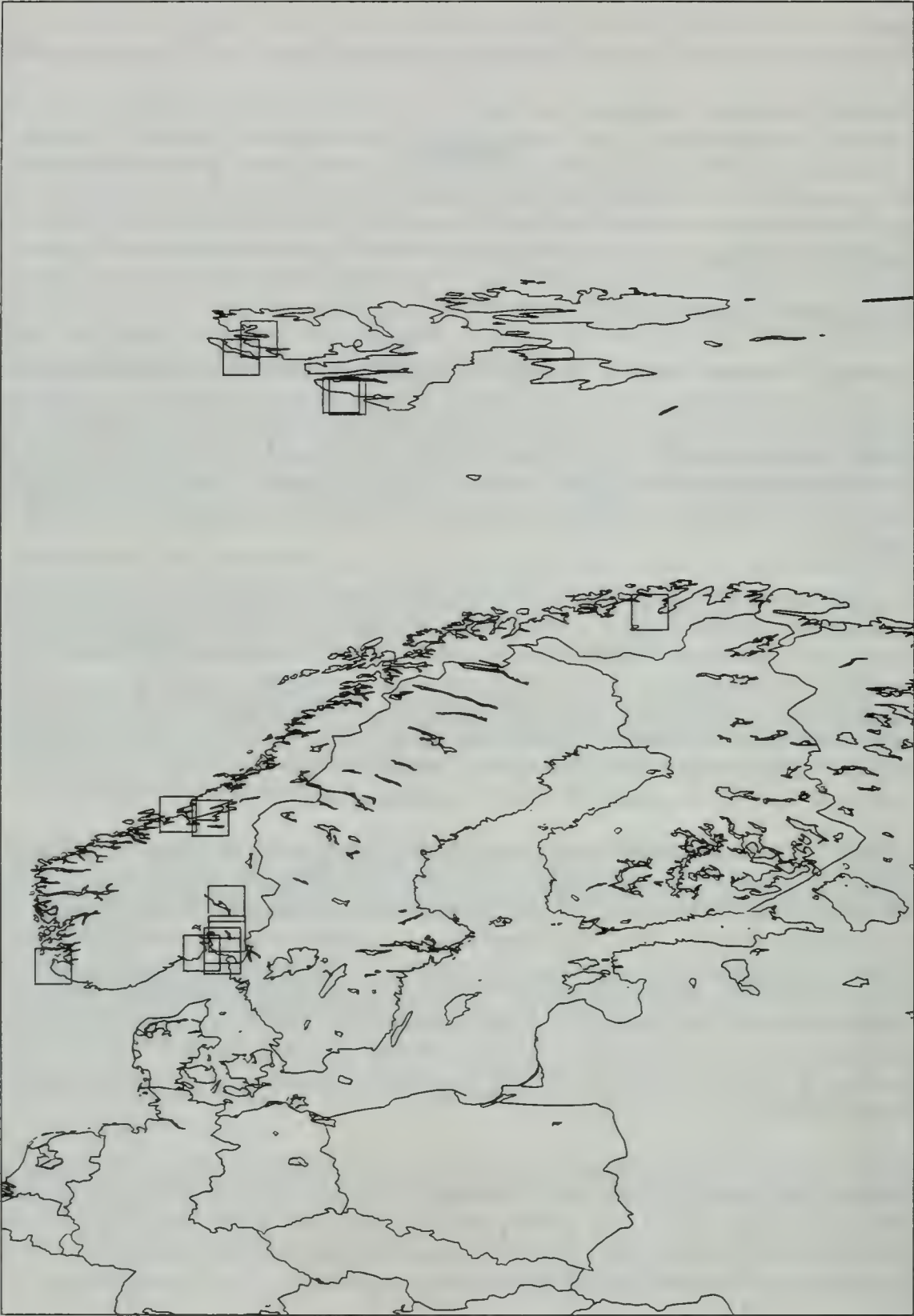
Population 4,198,300 (1988)

Summary of Wetland Situation With its long, rugged coastline, fiords, multitude of large and small islands, watercourses, lakes and vast mires, Norway offers excellent breeding, moulting and roosting areas for a great variety of migrating waterfowl. The coastal waters and some of the lakes in the southern part of the country also provide important wintering grounds for many of the more northerly breeding species. Norway is of great scientific interest geologically, and many of the lakes, fiords and other water bodies are of international importance for limnological research.

The principal conservation authority in Norway is the Directorate for Nature Management under the Ministry of the Environment. A special working group for Scandinavian cooperation in the field of international nature conservation has drawn up a list of 40 wetland sites in Norway and 7 more in Svalbard, which are deemed to be of outstanding importance. Since the early 1970s the Ministry of the Environment has initiated systematic surveys of wetlands, mires and breeding sites of importance to seabirds. Based on these surveys, plans for the establishment of nature reserves have been published county by county. 79 wetland areas (305 sq.km), 120 mires (197 sq.km) and 196 seabird colonies (204 sq.km) are protected as nature reserves (1985).

Protected Areas Legislation A wide range of long-term planning and protective measures, intended to preserve the quality of life for the future, is laid down in legislation. The Planning and Building Act (1985) specifies that nature conservation interests must be taken into account in the planning process. The Nature Conservation Act of 1970, which is administered by the Ministry of the Environment, constitutes the legal base for the establishment of national parks, nature reserves, and protected landscapes. Decisions to designate protected areas under the Nature Conservation Act are made by the government. Strict regulations are given for national parks and nature reserves, including a ban on hunting and public access in most wetlands reserves. In addition the Wildlife Act (1981) provides for the protection of habitats of importance to wildlife.

Protected Areas Administration The County Governors (on the mainland) and Governor of Svalbard (on Svalbard) are the local management authorities for protected areas. Physical management takes place in a few nature reserves, but in most areas the policy remains to let nature evolve without intervention (most of the ecosystems being relatively undisturbed by man). Research tends to be directly related to management problems or conservation objectives.



Ramsar Sites in Norway

Sites designated under the Convention Signature without reservation as to ratification 9 July 1974, with one site listed at signature and another 13 added 24 July 1985.

Akersvika Nature Reserve
 Ora Nature Reserve
 Kurefjorden Nature Reserve
 Nordre Oyeren Nature Reserve
 Ilene and Presterodkilen Wetland System
 Jaeren Wetland System
 Orlandet Wetland System
 Tautra and Svaet Nature Reserve
 Stabbursneset Nature Reserve
 Forlandsoyane Bird Sanctuary
 Dunoyane Bird Sanctuary (Spitsbergen)
 Kongsfjorden Bird Sanctuary (Spitsbergen)
 Isoyane Bird Sanctuary (Spitsbergen)
 Gasoyane Bird Sanctuary (Spitsbergen)

Government body responsible for administration of the Convention

The Royal Ministry of Environment, Myntgaten 2, Postboks 8013 Dep., 0030 Oslo

Akersvika Nature Reserve

Location 60°50'N, 11°08'E. Situated on Lake Mjosa near the town of Hamar in Hedmark County.

Area 415ha (300ha lake surface)

Degree of Protection The man-made area of the reserve is privately owned by 32 individuals and a local municipality. The area was established as a nature reserve in July 1974. Designated as a Ramsar site in July 1974 as a site of 300ha, and extended as a Ramsar site in July 1985.

Site Description The site comprises a shallow bay on the eastern side of the freshwater Mjosa Lake, and includes the lower part of one of the two rivers entering the bay. It is surrounded by urban, industrial and agricultural land. The vegetation is strongly influenced by the regulation of water-levels in Lake Mjosa. The vegetation in the reserve is wet grassland, and alder *Alnus* sp. and willow *Salix* sp. scrub. Willow also occurs along the shore with broad zones of bladder sedge *Carex vesicaria*, *Carex juncella* and grass *Calamagrostis purpurea* and several species of *Salix*. Near the shore the vegetation is dominated by moss *Fontinalis hypnoides*.

International and National Importance The site is of special importance to migrating ducks and waders, being an important part of the eastern flyway for waterfowl in Norway. About 190 species have been observed here, of which 60-70 are wetland species.

Changes in Ecological Character In early 1984 the reserve was extended from 300ha to 415ha. During the last 10 years there has been some expansion of alder and willow species into

former grassland, due to a reduction in grazing. The National Report (1980) reported a proposal to locate a waste recycling plant near the reserve, but the decision on this is unknown. There are also threats from potential road building projects. Due to changes in the control of pollution, the water quality in Lake Mjosa has improved since the mid-1970s, but the situation is still not satisfactory.

Management Practices A management plan is being prepared, based on the results of a botanical study initiated in 1980, and ornithological studies. An observation tower was raised in May 1985, and public information improved.

Scientific Research and Facilities Surveys on wildlife have been undertaken and a botanical study was initiated in 1980, and finished in 1983. A detailed vegetation map was produced.

Principal Reference Material The above information is taken from documents supplied by the Government of Norway for designation in 1974 and from the Norwegian National Report to the Cagliari Conference in 1980 and to the Groningen Conference in 1984.

Ora Nature Reserve

Location 59°10'N, 11°00'E. Situated at the outlet of River Glomma at Fredrikstad, Ostfold County.

Area About 1,560ha (230ha land area)

Degree of Protection Most of the area is owned by the Fredrikstad municipality. Ora was established as a nature reserve in September 1979, under local administration of the Ostfold County Governor. Strict regulations prevent human activity, including building, hunting, and drainage, as well as visiting in two key resting areas in spring and autumn, and in a few breeding localities for gulls, etc. Designated as a Ramsar site in July 1985.

Site Description The reserve comprises a large estuary, formed by the outlet of the River Glomma. There are lots of small, granitic islands, often with large areas of fluvial sediments. Except for a few deep channels, most of the sea area comprises shallow water. Reed areas cover extensive parts of the estuary.

International and National Importance Very important resting and wintering area for ducks, swans and waders. More than 500 whooper swans *Cygnus cygnus* and 500 mute swans *C. olor* have been observed in one day. In autumn, large numbers of mallard *Anas platyrhynchos* and teal *A. crecca* forage in the shallow areas, whereas goldeneye *Bucephala clangula* occurs in large numbers in late winter. The most numerous wader species are dunlin *Calidris alpina* and ruff *Philomachus pugnax*. More than 220 bird species have been registered in the area, of which 67 species are waterfowl. Many threatened species are regularly observed in Ora Estuary. Breeding species include black-tailed godwit *Limosa limosa* and dunlin *Calidris alpina*, and Caspian tern *Sterna caspia* was found breeding a few years ago.

Changes in Ecological Character Due to construction of a large stone pile along the river course in 1974, salinity of the water within the estuary increased gradually for some years. The increased salinity led to great ecological changes, and in particular a few dominant bottom plants nearly disappeared. To protect the estuary, it was decided to remove the stone pile, and to secure a supply of fresh water by building a channel from the river into the estuary. It is not yet clear whether these measures have served to improve the flora and fauna situation. The estuary is also subjected to pollution from the River Glomma, and the situation is under continual supervision by the Norwegian State Pollution Control Authority.

Management Practices No management measures have so far been taken in the area.

Scientific Research and Facilities Extensive zoological, botanical and geophysical research has been carried out in the reserve, but no facilities are available. In 1986, a research project was carried out on the ecological status of the area, in order to show the effects of the channel from the river into the estuary.

Principal Reference Material The above information is taken from documents supplied by the Government of Norway for designation in July 1985.

Additional references include the publications of the Zoological Museum, Oslo, and the local ornithological society, and:

Krohn, O. (Ed.) (1981). Ora Naturreservat. Ostlandske Naturvernforenings smaskrifter 11: 1-60

Kurefjorden Nature Reserve

Location 59°30'N, 11°00'E. Situated on the eastern coast of the Oslo Fjord in Ostfold County.

Area 400ha (30ha land area)

Degree of Protection Privately owned, with 25 individual owners. Kurefjorden was established as a nature reserve in December 1978. Strict regulations prevent human activity, including building, hunting, drainage etc. Visits are forbidden in two key bird resting areas in spring and autumn. Designated as a Ramsar site in July 1985.

Site Description The reserve covers a shallow marine bay on the Oslo Fjord coast, mainly surrounded by agricultural land. Land vegetation is dominated by wet grassland, whereas mudflats are covered by *Salicornia europaea*. *Zostera marina* and *Ruppia* spp. cover extensive parts of the shallow bottom areas.

International and National Importance Kurefjorden is one of the most important resting areas for migrating waterfowl at the Oslo Fiord. The most numerous species are mallard *Anas platyrhynchos*, teal *A. crecca*, goldeneye *Bucephala clangula*, dunlin *Calidris alpina* and ruff *Philomachus pugnax*. More than 2,000 ducks and 1,000 waders are observed in autumn, and more than 200 bird species have been registered. More than 60 species of waterbirds are observed annually, among them several threatened species.

Changes in Ecological Character None recorded within the reserve, but extensive drainage projects have recently been completed in the surrounding area, for agricultural purposes.

Management Practices None

Scientific Research and Facilities Extensive zoological and botanical studies have been carried out in the reserve.

Principal Reference Material The above information is taken from documents supplied by the Government of Norway for designation in July 1985. Additional references include unpublished and published records in Department of Zoology, University of Oslo, and the local ornithological society, and:

Lagbu, O. and Rosnes, A. (1982). Kurefjorden 1973-1978. Ornitologiske undersøkelser og utviklingen i området. *Ostfold-Natur* 10: 1-84.

Nordre Oyeren Nature Reserve

Location 59°53'N, 11°09'E. Situated in the northern part of Lake Oyeren in Akershus County, 20km east of Oslo.

Area 6,260ha (5,510ha lake surface)

Degree of Protection Mostly privately owned. The area was established as a nature reserve in December 1975, under local administration of the Oslo and Akershus County Governor. Strict regulations prevent human activity, but maintenance of agriculture, and outdoor recreation such as boat traffic, fishing and regulated hunting for ducks are possible. Designated as a Ramsar site in July 1985.

Site Description The reserve comprises the largest inland delta in Scandinavia, formed by the outlets of the rivers Glomma, Leira and Nitelva. The delta consists of flat accumulated islands and land tongues, with varying degrees of vegetation. In front of the delta the lake is shallow; more than 50 sq.km has a depth of less than 5m. The vegetation in Nordre Oyeren is a mixture of deciduous forest, salix-scrub, grassland, cultivated ground and halophytic vegetation. Recently formed islands lack vegetation.

International and National Importance Nordre Oyeren is one of the most important resting area for swans, ducks and waders in southern Norway. As many as 100 species of waterfowl have been recorded in the reserve. In early winter more than 1,000 whooper swans *Cygnus cygnus* may be seen in the delta, and in spring and autumn, shallow areas function as feeding grounds for huge numbers of mallard *Anas platyrhynchos*, teal *A. crecca*, wigeon *A. penelope*, goldeneye *Bucephala clangula* and goosander *Mergus merganser*. The most characteristic waders are ruff *Philomachus pugnax*, lapwing *Vanellus vanellus* and dunlin *Calidris alpina*. Nordre Oyeren is one of only a few breeding sites for black-tailed godwit *Limosa limosa* in this part of Norway.

Changes in Ecological Character None recorded

Management Practices A plan for management of the area has been drawn up. The administration practises controlled burning and clearance of scrub to maintain the variety of different biotopes. However, structural changes in agricultural practice have made practical management of the area more difficult. Burning of scrub and mowing are practised as experiments. To protect the bird populations, regulation and reduction of duck hunting has been established.

Scientific Research and Facilities Zoological, botanical and limnological studies are carried out in the Reserve. No facilities are available.

Principal Reference Material The above information is taken from documents supplied by the Government of Norway for designation in July 1985.

Additional references:

Publication of the Norges Landbrukshoyskole and the Zoologisk Museum, Oslo.

Nordre Oyeren Fuglestasjon 1979: "Nordre Oyeren - rapport 1976" pg. 139

Nordre Oyeren Fuglestasjon 1984: "Nordre Oyeren - rapport 1977-1983" pg. 105.

Annual reports from Avloppssambandet Nordre Oyeren (ANO) Reports from Norwegian Institute for Water Research (NIVA).

Ilene and Presterodkilen Wetland System

Location 59°15'N, 10°20'E. Situated on the western coast of the Oslo Fiord, at Tonsberg in Vestfold County.

Area 177ha (45ha land area)

Degree of Protection Most of the areas are in private ownership, with 15 individual owners. Established as nature reserves in 1969 (Presterodkilen) and 1981 (Ilene), under local administration of the County Governor. Strict regulations prevent human activity, including building, hunting, drainage etc. Designated as a Ramsar site in July 1985.

Site Description Shallow marine bays with mud flats, at Tonsberg. Ilene has a mosaic landscape with reed areas, meadows, pastures and spruce forests. Presterodkilen is surrounded by belts of reeds, and is more urbanised than Ilene.

International and National Importance More than 55 species of waterfowl have been recorded in the area. Ilene/Presterodkilen is one of the most important resting areas for migrating waterbirds at the Oslo Fiord coast, especially for waders and dabbling ducks. Teal, mallard, mute swan, dunlin, ruff and lapwing (*Anas crecca*, *A. platyrhynchos*, *Cygnus olor*, *Calidris alpina*, *Philomachus pugnax* and *Vanellus vanellus*) are the most numerous species. Several threatened species are found regularly in the area, and dunlins breed annually.

Changes in Ecological Character Large areas surrounding Ilene were drained for agricultural purposes before the reserve was established.

Management Practices None at present. An information centre and observation tower will be established at Ilene.

Scientific Research and Facilities Extensive ornithological studies, including ringing of waders and passerines, take place in the reserve.

Principal Reference Material The above information is taken from documents supplied by the Government of Norway for designation in July 1985.

Additional references include published and unpublished records made by the local ornithological society.

Jaeren Wetland System

Location 58°50'N, 5°34'E. Comprising several separate lakes, shallow sea areas and sea shores, west and south of the City of Stavanger, in the Jaeren area, Rogaland County, south-west Norway.

Area Approximately 400ha (excluding sea area) are at the moment under legal protection.

Degree of Protection Mostly privately owned. One important area of the wetland system, Grudevatnet, was established as a nature reserve in July 1974, whereas Kolnes, Revtingen and Skeie received landscape protection and bird life protection in September 1977. These areas are under strict regulations preventing human activities such as building, hunting, drainage etc. Planning is in progress to put other important parts of the wetland system under legal protection, (e.g. Hafrsfjord, Orrevatnet, Ergavatnet og Soylandsvatnet). The Jaeren wetland system was designated as a Ramsar site in July 1985.

Site Description The Jaeren area has a gently undulating landscape, mainly built up by moraine soil. Jaeren is one of the main agricultural districts in Norway, with the northern parts having a more urban character. The lakes are eutrophic, mainly due to the influence of pollution from agricultural areas, resulting in rich aquatic vegetation. Reed *Phragmites communis* and sedge *Scirpus* spp. are wide-spread in most lakes, and *Salix* scrub is also common. The coastline comprises both sand dune shores and shores consisting of pebbles and boulders.

International and National Importance Jaeren is the most important resting and wintering area for waterfowl in south-west Norway. More than 10,000 individuals are regularly seen in the area in winter. Several threatened species breed and rest in the area, and more than 250 species have been recorded. Large numbers of ducks use the area in autumn and winter, with mallard *Anas platyrhynchos* being the most common species. Thousands of Arctic waders rest in the area, especially during autumn migration.

Changes in Ecological Character Pollution has intensified growth of aquatic vegetation, which may change the habitat considerably within a few years. Pollution has also resulted in more or less yearly blooms of blue-green algae, some of which are toxic. The potential effects on bird life are not yet known.

Management Practices A plan for management of Grudevatnet Nature Reserve has been prepared, but no practical measures have so far been taken.

Scientific Research and Facilities Extensive ornithological studies have been made in the area, including regular winter counts of waterfowl. Stavanger Museum runs a bird ringing station at Revtingen.

Principal Reference Material The above information is taken from documents supplied by the Government of Norway for designation in July 1985.

Additional references include published and unpublished recordings made by the Department of Zoology, Stavanger Museum and the local ornithological society, and:

Byrkjedal, I. and Eldoy, S. (1980). Bestanden av ender, svaner og sothons på Jaeren gjennom vinterhalvåret i tiarsperioden 1965/66 - 1974/75. *Fauna norv. Ser. C. Cinclus* 3: 36-48.

Byrkjedal, I. and Eldoy, S. (1981). Forekomsten av gjess på Jaeren - vinterbestand i perioden 1963/64 - 1979/80 og variasjoner gjennom året. *Stav. Mus. Arb.* 1980: 31-39.

Eldoy, S. (1980). Grudevatnet Nature Reserve. *Stav. Mus. Arb.* 1979: 79-102.

Eldoy, S. (1981). Jaerstrendene landskapsvernområde. *Stav. Mus. Arb.* 1980: 53-76.

Lye, K.A. (Ed.) (1978). *Naturmiljøet Jaerboka* 2: 263-274. Stavanger.

Orlandet Wetland System

Location 63°42'N, 9°35'E. Four wetland areas on the Trondelag coast, Sor-Trondelag County, Central Norway: Grandefjaera Nature Reserve, Krakvagsvaet, Innstrandfjaera and Hovsfjaera bird sanctuaries.

Area 2,920ha (87ha land area).

Degree of Protection Most of the area is in private ownership, with some 97 different owners. The areas were placed under protection in December 1983, and are under the local administration of the Sor-Trondelag County Governor. Strict regulations prevent human activity such as building, hunting, and drainage. Designated as a Ramsar site in July 1985.

Site Description The four areas which comprise the wetland system mainly consist of large tidal mud flats and shallow marine water. Belts of seaweed form the outer edge of the tidal zone. Large areas with meadows and marsh land used to make up the inner part of the shore, but most of these areas have recently been drained for agricultural purposes.

International and National Importance The system is the most important resting and wintering area for wetland birds in Central Norway. Large numbers of ducks and waders have been observed in autumn and winter, with common eider *Somateria mollissima*, velvet scoter *Melanitta fusca*, purple sandpiper *Calidris maritima* and dunlin *C. alpina* the most numerous species. More than 70 different species of wetland birds have been recorded, and several threatened species are regularly observed in the area.

Changes in Ecological Character None recorded

Management Practices No information

Scientific Research and Facilities Ornithological studies have been conducted by Department of Zoology, DKNVS Trondheim Museum, and by the local ornithological society. No facilities are available.

Principal Reference Material The above information is taken from documents supplied by the Government of Norway for designation in July 1985.

Additional references:

Bevanger, K. and Frengen, O. (1979). Ornitologiske verneverdier i Orland kommunes vatmarksområder, Sor-Trondelag. *K. norske Vidensk. Selsk. Mus. Rapport Zool.* 1: 1-93.

Tautra and Svaet Nature Reserve

Location 63°35'N, 10°37'E. Situated in the Trondheim Fiord, at the southern point of the Frosta peninsula, Nord-Trondelag County, Central Norway.

Area 2,054ha (174ha land area).

Degree of Protection Most of the area is in private ownership, with 20 owners. Established as a nature reserve in 1984, under local administration of the County Governor. Strict regulations prevent human activity, including building, hunting, and drainage, in two smaller reserve areas, whereas there is less regulation of activity within the two larger bird sanctuaries. In the nature reserves public access is prohibited part of the year. Designated a Ramsar site in July 1985.

Site Description Large, flat island surrounded by shallow marine water. The northern part is dominated by cultural landscape, with farms, houses, roads etc. Most of the southern part is agricultural land, with a small, eutrophic pond. The southern point is dominated by spruce wood and juniper scrub.

International and National Importance Tautra is of considerable importance as a breeding and resting area for waterfowl. Common eider *Somateria mollissima* and velvet scoter *Melanitta fusca* are the predominant duck species, and oystercatcher *Haematopus ostralegus*, dunlin *Calidris alpina*, little stint *C. minuta* and ringed plover *Charadrius hiaticula* are the most numerous wader species.

Changes in Ecological Character The island is now connected to the mainland by a stone pile. This has made it possible for mink *Mustela vison*, pine marten *Martes martes* and fox *Vulpes vulpes* to reach the island, and as a consequence nest predation has increased considerably.

Management Practices No measures have been taken so far, except a few trials to reduce numbers of predators on the island.

Scientific Research and Facilities Extensive ornithological research has been carried out in the reserve.

Principal Reference Material The above information is taken from documents supplied by the Government of Norway for designation in July 1985.

Additional references:

Suul, J. and Frengen, O. (1976). *Notat om fuglefaunaen pa Tautra, Frosta kommune, Nord-Trondelag.* DKNVS museet i Trondheim.

Stabbursneset Nature Reserve

Location 70°10'N, 24°40'E. Situated on the west coast of the inner part of Porsanger Fiord, Finnmark County, northern Norway.

Area 1,620ha (22ha land area)

Degree of Protection Parts of the area are in private ownership, with five individual owners. Stabbursneset Nature Reserve was established in December 1979. Strict regulations prevent human activity, such as building, hunting, and drainage. Visitors are not permitted in parts of the reserve in the spring. Designated as a Ramsar site in July 1985.

Site Description Stabbursneset is part of an estuary situated at the outlet of Stabburselva. Most of the area consists of shallow marine water, with sand banks exposed at low tide. The land area is covered by salt marshes, with wet mires in the inner part.

International and National Importance Stabbursneset is very important as a resting area during migration, and as a moulting area for waterfowl, and is also botanically important because of its shore meadows containing arctic plant associations and species. More than 30,000 knots *Calidris canutus* have been observed in the area in May. Other numerous species are dunlin *C. alpina* and bar-tailed godwit *Limosa lapponica*. Little stint *C. minuta* has been found breeding. Common eider *Somateria mollissima* is the predominant species moulting in the area, with more than 5,000 individuals recorded in July. In addition, large numbers of velvet scoter *Melanitta fusca* have been recorded. The area is a regular resting site for lesser white-fronted goose *Anser erythropus* in the spring (30-50 individuals).

Changes in Ecological Character None recorded

Management Practices No measures have been taken.

Scientific Research and Facilities The area is not well studied yet, and only irregular observation activity has been conducted. No facilities are available.

Principal Reference Material The above information is taken from documents supplied by the Government of Norway for designation in July 1985.

Forlandsoyane Bird Sanctuary

Location 78°20'N, 11°36'E. Situated on the west side of Spitsbergen.

Area About 60ha

Degree of Protection The area is owned by the Norwegian state, and was established as a bird sanctuary in June 1973 under local administration of the Governor of Svalbard. Strict regulations prevent human activity, including building, hunting, and drainage. Designated as a Ramsar site in July 1985.

Site Description The reserve is situated on three islands and a few small skerries. One island is completely bare, the two others are grassy islands with small ponds.

International and National Importance Breeding site for three goose species, barnacle goose *Branta leucopsis* (500-600 pairs), brent goose *B. bernicla* (5-10 pairs) and pink-footed goose *Anser brachyrhynchus* (20-30 pairs), and a large colony of common eider *Somateria mollissima* (500-1000 pairs).

Changes in Ecological Character No changes have occurred in the biotope. The common eider population has decreased considerably since the turn of the century when 10-11,000 pairs bred. This is due mostly to egg and down collection.

Management Practices No management measures have so far been taken.

Scientific Research and Facilities Some zoological research has been carried out in the sanctuary. No facilities are available.

Principal Reference Material The above information is taken from documents supplied by the Government of Norway for designation in July 1985.

Additional references include the publications of the Norwegian Polar Research Institute.

Dunoyane Bird Sanctuary (Spitsbergen)

Location 77°04'N, 15°00'E. Situated at the southern point of Spitsbergen.

Area 120ha

Degree of Protection The area is owned by the Norwegian state, and was established as a bird sanctuary in June 1973 under local administration of the Governor of Svalbard. Strict regulations prevent human activity, including building, hunting, and drainage. Designated as a Ramsar site in July 1985.

Site Description Three islands and a number of small islets. The islands have rich, grassy vegetation and several freshwater ponds, whereas the islets are barren and rocky.

International and National Importance Dunoyane is one of the most important breeding and moulting areas for barnacle goose *Branta leucopsis* and common eider *Somateria mollissima* (about 500 pairs) on Spitsbergen.

Changes in Ecological Character None recorded

Management Practices No management measures have been taken.

Scientific Research and Facilities Some zoological research has been carried out in the sanctuary. No facilities are available.

Principal Reference Material The above information is taken from documents supplied by the Government of Norway for designation in July 1985.

Additional references include the publications of the Norwegian Polar Research Institute.

Kongsfjorden Bird Sanctuary (Spitsbergen)

Location 78°55'N, 12°10'E. Situated on the north-western part of Spitsbergen, at Ny-Alesund.

Area About 140ha

Degree of Protection The area is owned by the Norwegian state, and was established as a bird sanctuary in June 1973 under local administration of the Governor of Svalbard. Strict regulations prevent human activity, including building, hunting, and drainage. Designated as a Ramsar site in July 1985.

Site Description Consists of about 10 islands of various sizes. Most of the islands have rich, grassy vegetation, except two islands which until recently were covered by ice. Small freshwater ponds are found on some islands.

International and National Importance The area has a very dense breeding population of common eider *Somateria mollissima* (3,000-4,000 pairs), and large numbers rest in the area before the breeding season.

Changes in Ecological Character Human activity and increased tourism have resulted in reduced breeding populations of the common eider.

Management Practices No management measures have been taken.

Scientific Research and Facilities Extensive zoological research has been carried out in the sanctuary. Modern research facilities are available in Ny-Alesund.

Principal Reference Material The above information is taken from documents supplied by the Government of Norway for designation in July 1985.

Additional references include publications of the Norwegian Polar Research Institute.

Isoyane Bird Sanctuary (Spitsbergen)

Location 77°08'N, 14°48'E. Situated in the south-western part of Spitsbergen.

Area 30ha

Degree of Protection The area is owned by the Norwegian state, and was established as a nature reserve in June 1973 under local administration of the Governor of Svalbard. Strict regulations prevent human activity, including building, hunting, and drainage. Designated as a Ramsar site in July 1985.

Site Description The site consists of two islands, of which the northern one has rich, grassy vegetation and small freshwater ponds. The southern island has less developed vegetation.

International and National Importance Among the more important breeding localities for the barnacle goose *Branta leucopsis* on Spitsbergen.

Changes in Ecological Character None recorded

Management Practices No management measures have been taken.

Scientific Research and Facilities Extensive zoological research has been carried out in the sanctuary. No facilities are available.

Principal Reference Material The above information is taken from documents supplied by the Government of Norway for designation in July 1985.

Additional references include the publications of the Norwegian Polar Research Institute.

Gasoyane Bird Sanctuary (Spitsbergen)

Location 78°20'N, 11°36'E. Situated on the west side of Spitsbergen, on three islands in the Billefjord area.

Area About 100ha

Degree of Protection The area is owned by the Norwegian state, and was established as a bird sanctuary in June 1973 under local administration of the Governor of Svalbard. Strict regulations

prevent human activity, including building, hunting, and drainage. Designated as a Ramsar site in July 1985.

Site Description Three small islands, partly vegetated and with a few freshwater ponds. Parts of the shoreline have cliffs, giving the possibility for nesting by seabirds (e.g. puffin *Fraterula arctica*).

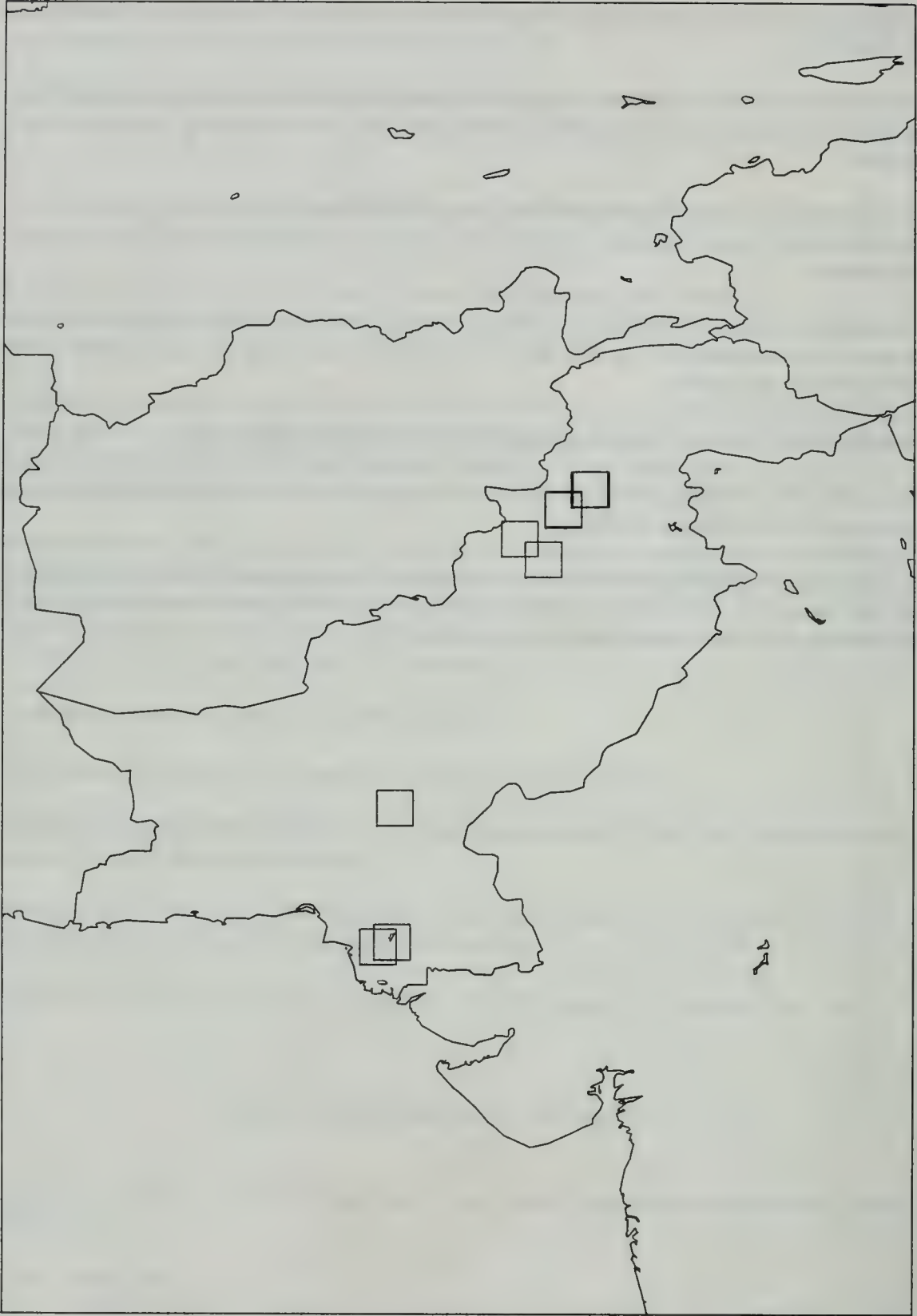
International and National Importance The sanctuary has a large breeding population of barnacle goose *Branta leucopsis*, common eider *Somateria mollissima* and Arctic tern *Sterna paradisaea*.

Changes in Ecological Character No changes have occurred in the biotope. Due to the short distance to Longyearbyen, egg and down collection has been a serious disturbance to the common eider population.

Management Practices No management measures have so far been taken.

Scientific Research and Facilities Some zoological research has been carried out in the sanctuary. No facilities are available.

Principal Reference Material The above information is taken from documents supplied by the Government of Norway for designation in July 1985. Additional references include the publications of the Norwegian Polar Research Institute.



Ramsar Sites in Pakistan

Pakistan

Area 803,941 sq.km

Population 102,200,000 (1986)

Summary of Wetland Situation Most of the natural lakes in this predominantly semi-arid and arid country have disappeared over the last fifty years, as a result of irrigation projects and drainage aimed at providing more arable land for food production. However, several new lakes have been created upstream of dams constructed in recent years on the River Indus (water for human consumption as well as for irrigation). Some have become very important wintering areas for waterfowl and these and other wetlands, particularly in the great valleys of Sind and Punjab, are feeding grounds for huge concentrations of Anatidae and also for coots. Elsewhere, the mudflats and mangrove vegetation along the coast of the Arabian Sea provide particularly favourable habitat for herons, ibises and pelicans, as well as great numbers of waders.

The Government is well aware of the rich natural resources represented and indicated by these birds, and has developed an active conservation policy. The Forest Department and the Sind Wildlife Management Board have been particularly active in the creation of protected areas, and many of the state-owned lakes have become game sanctuaries. Such natural lakes as survive are often in private ownership, but they are generally used for hunting on only a few days a year. They are generally well managed, and are kept free from disturbance for the rest of the year. Several wetlands in the Punjab are of importance to threatened species. Thus, white-headed duck *Oxyura leucocephala* winters in some numbers on Lake Khabbaki, Lake Nemal Game Sanctuary and the Kharrar Lake Wildlife Sanctuary. Bar-headed goose *Anser indicus* seems to have its main wintering area in Pakistan at Taunsa Barrage Wildlife Sanctuary and at Chashma Lake Wildlife Sanctuary. Other areas with notable concentrations of a wide variety of waterfowl in winter are Lalsohanra National Park in the Punjab; and Ghuaspur Jheels, Lakes Drigh (WS), Langh (WS), Kalri, Hadero Lake (WS) and Haleji Lake (WS) in Sind.

The mouth of the River Indus is another area of special interest, with its extensive mudflats and mangroves (mainly *Avicennia officinalis* and *Ceriops candoleana*). Bird species frequenting it include spot-billed pelican *Pelecanus philippensis*, western reef heron *Egretta garzetta gularis*, grey heron *Ardea cinerea* and many species of Limicolae. The construction of dams and large scale irrigation projects further upstream has reduced the flow of water, and many former rice growing areas near the rivermouth, around Ketu Bandar for example, have been replaced by dry pastures. Black finless porpoise *Neophocaena phocaenoides* inhabits the tidal zone of the Indus, and the shallows along the coast. Five species of marine turtle, all of which are threatened, occur in territorial waters; green turtle *Chelonia mydas*, olive ridley *Lepidochelys olivacea*, loggerhead *Caretta caretta*, leatherback *Dermochelys coriacea* and hawksbill *Eretmochelys imbricata*. Molluscs of economic importance include *Plocuna* sp., found in shallow waters of creeks and along the coast, and the oysters *Ostrea gryphoides*, *O. cuculata* and *O. discoides*, which are common in the creek system of Korangi. Commercial fishing has increased greatly, and the

stock of shrimps is showing signs of depletion. Research is being carried out to measure the effects of fishing on stocks, and to help in developing conservation measures.

Protected Areas Legislation Draft legislation prepared by the Wildlife Enquiry Committee set up in 1968, has been adopted, with minor modifications, at provincial level through the provision of various acts and an ordinance, namely: Sind Wildlife Protection Ordinance, 1972, Punjab Wildlife (Protection, Preservation, Conservation and Management) Act 1974, Baluchistan Wildlife Protection Act, 1974, North West Frontier Province Wildlife (Protection, Preservation, Conservation and Management) Act, 1975. Separate laws were passed for the Northern Areas, Azad State of Jammu and Kashmir and Federal Capital Territory of Islamabad. These are the Northern Areas Wildlife Preservation Act, 1975, Azad Jammu and Kashmir Wildlife Act, 1975 and the Islamabad Wildlife (Protection, Preservation, Conservation and Management) Ordinance, 1979 (Rau, 1984). This is the first time in the history of Pakistan's wildlife legislation that an attempt has been made to conserve habitat (although limited to protected areas) and species other than game species. All of these statutes provide for the creation and management of national parks, wildlife sanctuaries (synonymous with wildlife reserves in the Northern Areas Act), game reserves (synonymous with controlled hunting areas in the Northern Areas Act) and, in the case of the Punjab, NWFP and Islamabad legislation, private game reserves.

Protected Areas Administration Following the recommendations of the Wildlife Enquiry Committee (Government of Pakistan, 1971), a National Council for Conservation of Wildlife was established on 7 July 1974 within the Federal Ministry of Agriculture, Food and Cooperatives, to co-ordinate central and provincial government efforts in the formulation and implementation of wildlife policies. The Inspector General of Forests is assisted by a Conservator of Wildlife, who acts as an adviser on wildlife, but the actual management of wildlife is handled by the provincial forest (wildlife) departments. Sind, Punjab and Azad State of Jammu and Kashmir have separate wildlife departments but in North West Frontier Province, Baluchistan and Northern Areas wildlife is administered by branches of the respective forest departments. In general, forest staff look after wildlife in reserved or protected forests while wildlife staff are concerned with protecting wildlife in other protected areas and elsewhere. Within the Capital Territory of Islamabad, the Directorate of Horticulture is responsible for the administration of protected areas. In addition, legal provision has been made for the creation of a wildlife management board, to approve wildlife policies and monitor development activities, in Punjab, Sind, North West Frontier Province and Islamabad. North-West Frontier Province and Sind have effectively operating wildlife management boards, which are considered to be the most progressive wildlife organisations in Pakistan. Boards exist in Baluchistan, Azad State of Jammu and Kashmir and Northern Areas but only in an advisory capacity. Provision has been made for the appointment of honorary officers to help implement wildlife legislation in all areas except Baluchistan and Islamabad.

Sites designated under the Convention Signature subject to ratification 17 November 1975. Ratification on 23 July 1976 with 9 sites listed. The Pakistan report to the Regina Conference 1987 indicates that the designated sites were reviewed in the light of the criteria established at Cagliari in 1980. As a result of this review and a national wetland inventory, an adjustment is required in the list of Ramsar sites, but as yet no changes have been indicated to the Bureau.

Thanadarwala Game Reserve
Malugul Dhand Wetland
Kandar Dam Wetland

Tanda Dam Wetland
 Kheshki Reservoir Wetland
 Khabbaki Lake Wildlife Sanctuary
 Kinjhar Lake Wildlife Sanctuary
 Drigh Lake Wildlife Sanctuary
 Haleji Lake Wildlife Sanctuary

Government body responsible for administration of the Convention

National Council for Conservation of Wildlife in Pakistan, Ministry of Food, Agriculture and Cooperatives, Government of Pakistan, Bungalow No. 485, St No. 84, G-6/4, Islamabad

Thanadarwala Game Reserve

Location 32°35'N, 71°05'E. Situated in Lakki Tehsil, Bannu Province.

Area 4,047ha

Degree of Protection State owned. Administered by the National Council for Conservation of Wildlife in Pakistan based in Islamabad. Legal protection under provincial law. Designated as a Ramsar site on 23 July 1976.

Site Description The wetland is a seepage lagoon supplied from the River Kurram. The surrounding areas are saline in character. The vegetation is comprised of *Tamarix dioica*, *Typha angustata*, *Phragmites karka*, *Saccharum* spp., *Desmostachya bipinnata* and *Imperata cylindrica*.

International and National Importance The wetland provides an excellent habitat for the migratory waterfowl.

Changes in Ecological Character None reported

Management Practices None reported

Scientific Research and Facilities None reported

Principal Reference Material The above information is taken from the national reports for Pakistan presented at the Cagliari 1980, Groningen 1984 and Regina 1987 Ramsar conferences.

Malugul Dhand Wetland

Location 33°00'N, 70°36'E. Situated between the villages of Mughal Mangi Wala (west), Chikarry Wanda (east) and Kala Magiwala (south), Bannu District, North West Frontier Province.

Area 405ha

Degree of Protection State owned. Administered by the National Council for Conservation of Wildlife in Pakistan based in Islamabad. Legal protection under provincial law. Designated as a Ramsar site at the time of ratification on 23 July 1976.

Site Description The wetland comprises a waterlogged area with slightly brackish water, bounded to the north by the Kurram River. Vegetation comprises *Juncus* spp., *Typha angustata*, *Phragmites karka*, *Demostachya bipinnata* and *Imperata cylindrica*. The surrounding area is mainly canal-irrigated, with some tropical thorn forest of *Prosopis* spp., *Tamarix articulata* and *Saccharum* spp.

International and National Importance No information

Changes in Ecological Character None reported

Management Practices No information

Scientific Research and Facilities No information

Principal Reference Material The above information is taken from the national reports for Pakistan presented at the Cagliari 1980, Groningen 1984 and Regina 1987 Ramsar conferences.

Kandar Dam Wetland

Location 33°36'N, 71°29'E. Situated in the district of Kohat in North West Frontier Province.

Area 251ha

Degree of Protection State owned. Administered by the National Council for Conservation of Wildlife in Pakistan based in Islamabad. Legal protection under provincial legislation. Designated as a Ramsar site at the time of ratification on 23 July 1976.

Site Description A small water storage reservoir.

International and National Importance A staging and wintering area of only minor importance for small numbers of waterfowl. Not considered to merit designation as of international importance by Scott (1989). One of the sites to be considered in the adjustment of Pakistan's Ramsar sites.

Changes in Ecological Character None reported

Management Practices No information

Scientific Research and Facilities No information

Principal Reference Material The above information is taken from the national reports for Pakistan presented at the Cagliari 1980, Groningen 1984 and Regina 1987 Ramsar conferences, and from
Scott, D.A. (ed.) (1989). *A Directory of Asian Wetlands.* IUCN, Gland, Switzerland and Cambridge, UK., 1181 pp.

Tanda Dam Wetland

Location 33°35'N, 71°29'E. In the Province of North West Frontier between the village of Barh in the west and Kohat city in the east.

Area 405ha

Degree of Protection State owned. Administered by the National Council for Conservation of Wildlife in Pakistan based in Islamabad. Legal protection under provincial legislation. Designated as a Ramsar site at the time of ratification on 23 July 1976.

Site Description Freshwater reservoir bounded by hills in the north, and by the cultivated areas of Shahpur in the south and Bai in the west. Vegetation in and surrounding the reservoir is scanty, with no reed beds. Resting areas for ducks are provided by some mudbanks. The paucity of submerged aquatic vegetation has resulted in low fish productivity, despite the Fisheries Department stocking programme. Terrestrial vegetation is typical sub-tropical broad leaf forest dominated by *Acacia modesta*, with *Dodonea viscosa*, *Monothea buxifolia* and *Gymnosporia roylaena*. Important grass species are *Desmostaya bipinnata*, *Cymbopigon jwarancusa*, *C. shoenanthus*, *Aristida depressa*, *Saccharum spontaneum* and *Pannisetum orientale*. Agricultural crops around the lake provide food for ducks.

International and National Importance Important wildfowl species are mallard *Anas platyrhynchos*, tufted duck *Aythya fuligula*, great crested grebe *Podiceps cristatus*, black-necked grebe *P. nigricollis*, grey heron *Ardea cinerea*, great white egret *Egretta alba* and herring gull *Larus argentatus*.

Changes in Ecological Character None reported

Management Practices No information

Scientific Research and Facilities No information

Principal Reference Material The above information is taken from the national reports for Pakistan presented at the Cagliari 1980, Groningen 1984 and Regina 1987 Ramsar conferences.

Kheshki Reservoir Wetland

Location 34°00'N, 72°02'E. Situated between Kheshki village (east) and Samad Garhi (west) in the district of Peshawar, North West Frontier Province.

Area 263ha

Degree of Protection State owned. Administered by the National Council for Conservation of Wildlife in Pakistan based in Islamabad. Legal protection under provincial legislation. Designated as a Ramsar site at the time of ratification on 23 July 1976.

Site Description A small reservoir fringed with reedbeds and surrounded by forest providing shelter for waterfowl. There is a PAF Boating Club resthouse on the bank.

International and National Importance Waterfowl species include grey heron *Ardea cinerea*, green-winged teal *Anas crecca*, coot *Fulica atra*, lapwing *Vanellus vanellus*, green sandpiper *Tringa ochropus* and common snipe *Gallinago gallinago*. Not considered by Scott (1989) to merit designation as of international importance. One of the sites to be considered in the adjustment of Pakistan's Ramsar sites.

Changes in Ecological Character Waste from a papermill and sugar refinery nearby is discharged into the lake which has adversely affected water quality. This site was, therefore, listed in Regina document C.3.6 as one of the 29 Ramsar sites where likelihood of major ecological change seems greatest.

Management Practices No information

Scientific Research and Facilities A hydrological study was carried out from May 1975 to May 1976 by PCSIR.

Principal Reference Material The above information is taken from the national reports for Pakistan presented at the Cagliari 1980, Groningen 1984 and Regina 1987 Ramsar conferences, and from

Scott, D.A. (ed.) (1989). *A Directory of Asian Wetlands*. IUCN, Gland, Switzerland and Cambridge, UK. 1181 pp.

Khabbeki Lake Wildlife Sanctuary

Location 34°00'N, 72°00'E. In the Province of Punjab.

Area 283ha

Degree of Protection State owned. Administered by the National Council for Conservation of Wildlife in Pakistan based in Islamabad. Gazetted as a wildlife sanctuary in 1966 and renotified in November 1975, but recently denotified because of changes in ecological character and the decline in numbers of wintering waterfowl. Designated as a Ramsar site at the time of ratification on 23 July 1976.

Site Description A shallow, brackish lake in the Salt Range, with a little aquatic vegetation but no extensive reedbeds. Fed by local rainfall and intermittent streams. A recent rise in water level of 30cm-60cm has caused an increase in the size of the lake and a decrease in salinity.

International and National Importance Waterfowl species include mallard *Anas platyrhynchos*, grey heron *Ardea cinerea*, egret *Egretta alba*, Eurasian wigeon *Anas penelope*, green-winged teal *Anas crecca*, tufted duck *Aythya fuligula*, common pochard *Aythya ferina*, white-headed duck *Oxyura leucocephala*, little grebe *Tachybaptus ruficollis*, black-necked grebe *Podiceps nigricollis*, coot *Fulica atra*, greater flamingo *Phoenicopterus ruber*, lapwing *Vanellus vanellus* and snowy plover *Charadrius alexandrinus*. Formerly a very important wintering area for waterfowl, but numbers have fallen drastically in recent years, and no *P. ruber* or *O. leucocephala* have been recorded for several years.

Changes in Ecological Character The change in salinity and water level has brought about a change in the ecology of the lake and this has been compounded by large-scale stocking with herbivorous fish species. The site was therefore listed in Regina document C.3.6 as one of the 29 Ramsar sites where likelihood of major ecological change seems greatest.

Management Practices No information

Scientific Research and Facilities No information

Principal Reference Material The above information is taken from the national reports for Pakistan presented at the Cagliari 1980, Groningen 1984 and Regina 1987 Ramsar conferences, and from:

Scott, D.A. (ed.) (1989). *A Directory of Asian Wetlands*. IUCN, Gland, Switzerland and Cambridge, UK. 1181 pp.

Kinjhar (Kalri) Lake Wildlife Sanctuary

Location 24°56'N, 68°03'E. Situated in the district of Thatta in Sind Province, 104km east of Karachi. The town of Thatta is 19km to the south on the Hyderabad road.

Area 13,468ha (comprising the lake surface area). The buffer zone of 1 mile radius was increased to 3 miles in July 1975. An enlargement to enclose the 3 seepage lagoons as far as the Hyderabad road has been recommended.

Degree of Protection Owned by the Provincial Government of Sind. First protected as a game sanctuary in 1971 under section 15/1 of the West Pakistan Wildlife Ordinance of 1959. Declared a wildlife sanctuary in March 1977 under section 14 of the Sind Wildlife Protection Ordinance

of 1972, which affords complete protection to flora and fauna. As a source of freshwater for Karachi the Karachi Development Authority has prohibited swimming. Fishing is still allowed under license. The area is closed to hunting, shooting or trapping, and is defined as an undisturbed breeding ground. The protection status applies to all natural resources of the area. Designated as a Ramsar site at the time of ratification on 23 July 1976.

Site Description Large irregular-shaped freshwater lake in stony desert landscape underlain by alternating layers of fossil-bearing limestone and sandstone. It is the major source of freshwater for Karachi, and was created in the 1930s from the two lakes Kinjhar and Kalri by the construction of a dam at Chilia Bangla and an 8 mile long embankment (bund) along the east side. The low-lying flat western shore is predominantly sandstone, while higher land often comprises limestone capped peninsulas. The lake is 38.9km by 10.36km at the widest point, with a maximum depth of 8m. It is flanked to the north-west by the road from Buradabad to Hyderabad, and to the south-east by the national highway from Thatta to Hyderabad running alongside the Indus River. The lake is fed in the north-east by the K.B. feeder, and on the north and west by many streams (during the rainy season). The only outlet is through the dam and the branch canal in the south-east. The shallow waters in the west and north sustain a rich aquatic/semi-aquatic vegetation of *Hydrilla verticillata*, *Juncus articulatus*, *Phragmites karka*, *Polygonum barbatum*, *Potamogeton pectinatus*, *P. perfoliatus*, *Tamarix dioica* and *Typha angustata*, which supports a large waterfowl population using the lake as a winter refuge. On the east side of the bund a new canal, carrying water for irrigation, was being constructed in 1976/77. Beyond this canal, between Hillaya and the north end of the bund, are three seepage lagoons separated by stands of *Acacia* trees. The central of the three lagoons is fringed by *Tamarix dioica*, and is popular with dabbling ducks. Regional mean annual rainfall is 175mm falling mainly during the monsoon season. Summers are hot with temperatures up to 49°C in the shade, and winters cold with mean January temperature of 1.7°C. The prevailing wind direction is from west-south-west from May-September and north-east in December and January.

International and National Importance The lake provides a winter refuge for a major population of tufted duck *Aythya fuligula*. Other recorded species include mallard *Anas platyrhynchos*, spotbill duck *A. poecilorhyncha* (nationally threatened), gadwall *A. strepera*, Eurasian wigeon *A. penelope*, pintail *A. acuta*, green-winged teal *A. crecca*, shoveler *A. clypeata*, common pochard *Aythya ferina*, ferruginous duck *A. nyroca*, shelduck *Tadorna tadorna*, ruddy shelduck *T. ferruginea*, pygmy goose *Nettapus coromandelianus*, red-crested pochard *Netta rufina*, coot *Fulica atra*, purple gallinule *Porphyrio porphyrio*, moorhen *Gallinula chloropus*, pheasant-tailed jacana *Hydrophasianus chirurgus*, great crested grebe *Podiceps cristatus*, little grebe *Tachybaptus ruficollis*, cormorant *Phalacrocorax carbo*, pygmy cormorant *P. niger*, purple heron *Ardea purpurea*, grey heron *Ardea cinerea*, egret *Egretta alba*, little egret *E. garzetta*, Indian pond heron *Ardeolia grayii*, red-wattled lapwing *Vanellus indicus*, white-tailed lapwing *V. leucurus*, snowy plover *Charadrius alexandrinus*, greenshank *Tringa nebularia*, green sandpiper *T. ochropus*, Eurasian curlew *Numenius arquata*, black-winged stilt *Himantopus himantopus*, river tern *Sterna aurentia*, herring gull *Larus argentatus*, black-headed gull *L. ridibundus*, great black-headed gull *L. ichthyæetus*, Indian shag *Phalacrocorax fuscicollis*, black-crowned night-heron *Nycticorax nycticorax*, white spoonbill *Platalea leucorodia*, wood sandpiper *Tringa glareola*, marsh sandpiper *T. stagnatilis*, whiskered tern *Chlidonias hybrida* and marsh harrier *Circus aeruginosus*.

Changes in Ecological Character The commercial fishing disturbs the resting and feeding waterfowl.

Management Practices The sanctuary was managed according to a management plan prepared in 1976/77 for the major wetlands of Sind Province. Fencing is required along the southern limits of the central lagoon near the village, to prevent encroachment from grazing. Management efforts should be concentrated on the seepage lagoons rather than the main lake where fishing is a major disturbance. This would involve the maintenance of water supply to the lagoons; raising the level of the small islands to improve roost facilities for the birds, and active management of the vegetation. A nature education centre is proposed for the visitor complex being constructed by the Pakistan Tourist Development Corporation at Hillaya. In 1977 there were no wardens based at Kinjhar.

Scientific Research and Facilities Annual waterfowl census from 1971 to 1978 carried out in collaboration with Sind Wildlife Management Board. A booklet on the ducks, geese and swans of Pakistan has been produced. A survey of main waterfowl foods and their distribution should be conducted and used to enhance management.

Principal Reference Material The above information is taken from the national reports for Pakistan presented at the Cagliari 1980, Groningen 1984 and Regina 1987 Ramsar conferences, supplemented by:

Conder, P.J. (1977). Lake Kinjhar Wildlife Sanctuary management plan.

Scott, D.A. (ed.) (1989). *A Directory of Asian Wetlands*. IUCN, Gland, Switzerland and Cambridge, UK. 1181 pp.

WWF Project Reports 1360 and 1656.

Drigh Lake Wildlife Sanctuary

Location 27°34'N, 68°06'E. Situated 32km north-west of Larkana, in the district of Larkana in Sind Province. Access from Larkana is by road via Qambar.

Area 164ha

Degree of Protection Owned by the Provincial Government of Sind. Established as a wildlife sanctuary for 5 years in 1972 under section 14 of the Sind Wildlife Protection Ordinance 1972 which affords complete protection to flora and fauna. The area is closed to hunting, shooting or trapping and is defined as an undisturbed breeding ground. The protection status applies to all natural resources of the area. Designated as a Ramsar site at the time of ratification on 23 July 1976.

Site Description Situated on the silt soils of the Indus River flood plains. The lake is an ancient arm of the Indus, but the river now flows some 32-48km away. Fertile soils containing about 20% sand and 80% clay and silt. In 1977 the soils were heavily impregnated with salts following heavy flooding. The land surrounding the lake is generally flat with limestone and sandstone hills of the Kalat range some 80km to the west. The plains area is divided into small fields used mainly for rice cultivation, with irrigation canals from the Indus River, and is a good feeding ground for lake birds. The lake is fed by monsoon rains, but water also enters via a small canal to the north. There is no outlet channel. During the dry summer months parts of the lake dry up. The eastern boundary of the sanctuary is defined by an earth bunker constructed to help

retain the water. The main road from Larkana to Quamper defines the northern boundary. The lake vegetation contains aquatic and marshland species including *Cyperus alternifolius*, *Hydrilla verticillata*, *Najas minor*, *Scirpus littoralis*, *Ipomoea aquatica*, *Juncus articulatus*, *J. maritimus*, *Nymphaea lotus*, *Potamogeton pectinatus*, *Tamarix dioica* (predominant) and *Typha angustata*. The higher ground is partially covered with *Saccharum* grass. Regional mean rainfall is 175mm falling mainly during the monsoon season. Summers are hot with maximum temperature 49°C in the shade. Winters are cold with January mean of 1.7°C.

International and National Importance Important overwintering site for numerous waterfowl species including gadwall *Anas strepera*, pintail *A. acuta*, garganey *A. querquedula*, wigeon *A. penelope*, green-winged teal *A. crecca* (several thousands), shoveler *A. clypeata*, mallard *A. platyrhynchos*, tufted duck *Aythya fuligula*, common pochard *A. ferina*, ferruginous duck *A. nyroca*, little grebe *Tachybaptus ruficollis*, cormorant *Phalacrocorax carbo*, pygmy cormorant *P. niger*, purple heron *Ardea purpurea*, grey heron *A. cinerea*, little egret *Egretta garzetta*, great white egret *E. alba*, black-crowned night-heron *Nycticorax nycticorax*, common snipe *Gallinago gallinago*, pond heron *Ardeola grayii*, darter *Anhinga anhinga* and painted snipe *Rostratula benghalensis*. Roosts can number up to 18,000. The following birds of prey have also been recorded: osprey *Pandion haliaetus*, marsh harrier *Circus aeruginosus*, pallid harrier *C. macrourus*, shikra *Accipiter badius*, great spotted eagle *Aquila clanga*, tawny eagle *A. rapax*, imperial eagle *A. heliaca* and Bonelli's eagle *Hieraetus fasciatus*.

Changes in Ecological Character Outbreaks of Kuthari, the tamarisk defoliating caterpillar, occur from time to time. Regular bird shoots are held. Some grazing, fuelwood collection and poaching. In recent years, the diversion of water for irrigation has resulted in lower water levels. The area of open water has decreased and much of the wetland is overgrown by *Typha* and *Tamarix*. The Pakistan report to the Regina Conference states that the lake has been drained and is now being used for agriculture by the owners. The site was, therefore, listed in Regina document C.3.6 as one of the 29 Ramsar sites where likelihood of major ecological change seems greatest.

Management Practices The sanctuary was managed according to a management plan prepared in 1976/77. Recommendations for improved management include the construction of an embankment (bund) with sluices, around the sanctuary to control water levels and minimise the threat of flooding and the consequential problems of salinity.

Scientific Research and Facilities Annual waterfowl census carried out from the early 1970s in collaboration with Sind Wildlife Management Board. A booklet on the ducks, geese and swans of Pakistan has been produced. A proposed research programme includes preparing inventories of plant life and a bird ringing programme. Tower hides should be constructed and boats purchased for use by visitors and scientists.

Principal Reference Material The above information is taken from the national reports for Pakistan presented at the Cagliari 1980, Groningen 1984 and Regina 1987 Ramsar conferences, supplemented by:

Conder, P.J. (1977). Lake Kinjhar Wildlife Sanctuary management plan.

Scott, D.A. (ed.) (1989). *A Directory of Asian Wetlands*. IUCN, Gland, Switzerland and Cambridge, UK. 1181 pp. WWF Project Reports 1360 and 1656.

Haleji Lake Wildlife Sanctuary

Location 24°47'N, 67°46'E. 80km from Karachi and 16km from the town of Thatta in the district of Thatta in Sind Province.

Area 1,704ha, surrounded by a buffer zone of 3 miles radius (extended from 1 mile in 1975).

Degree of Protection Owned by the Provincial Government of Sind but managed by the Sind Wildlife Management Board by agreement with the Karachi Development Authority which affords complete protection to flora and fauna. It was established as a wildlife sanctuary in March 1977. The area is closed to hunting, shooting or trapping and is defined as an undisturbed breeding ground. The protection status applies to all natural resources of the area although fishing is allowed under locally issued licenses. Designated as a Ramsar site at time of ratification on 23 July 1976.

Site Description Perennial freshwater lake set in a stony desert of limestone and sandstone bedrock, an important water source for Karachi during April when the Kinjhar Lake canal is cleaned. To the west the land is 12m higher, with a cap of limestone which dips gently to the west. To the north-east the land is more fertile, but elsewhere waterlogging and salinity preclude agriculture. It is fed by Kinjhar Lake through the Jam branch canal, and is drained by a link canal at the south-west corner. The maximum depth of water in winter is 17ft. The lake is surrounded by embankments (bunds) constructed in 1938/39 which carries a road lined with *Acacia arabica*, *Ficus* sp. and *Casuarina* sp. These in turn are encircled by a series of seepage lagoons fed during the monsoon by overflow from the lake via the by-pass regulator. The seepage lagoons are an integral part of the waterfowl habitat. Beyond these is a zone of stony desert sparsely covered with *Euphorbia cauduciflora* vegetation. Chateji Dhand, which only floods during heavy monsoons, lies near the village of Kalri, between lakes Haleji and Hadero. The lake has abundant aquatic vegetation with common species including *Phragmites karka*, *Typha angustata*, *Juncus articulatus*, *Ipomoea aquatica*, *Cyperus alterniflora*, *Scirpus tuberosus*, *S. littoralis*, *Polygonum barbatum* and patches of *Nymphaea lotus*. Submerged species include *Potamogeton pectinatus*, *P. perfoliatus*, *P. lucens* and *Hydrilla verticillata*. Dominant land vegetation around the lake comprises *Calotropis*, *Acacia arabica*, *Alhaji*, *Zizyphus*, *Parkinsonia*, *Prosopis spicigera*, *Salvadora*, *Salix*, *Euphorbia*, *Sagittaria* and *Salsola* genera which provide nesting cover for forest birds, notably large numbers of small warblers which breed in the north and winter here. They are chiefly representatives of the following genera - *Acrocephalus*, *Cettia*, *Hippolais*, *Phylloscopus* and *Sylvia*. It is also a suitable habitat for many insects on which the birds feed. The site harbours a large concentration of wildfowl which are undisturbed from October through February. Regional mean annual rainfall is 175mm falling mainly during the monsoon season. Summers are hot with temperatures up to 49°C in the shade and winters cold with mean January temperature of 1.7°C.

International and National Importance The large waterfowl population includes mallard *Anas platyrhynchos*, spotbill duck *A. poecilorhyncha* (nationally threatened), gadwall *A. strepera*, Eurasian wigeon *A. penelope* (several thousand), pintail *A. acuta*, green-winged teal *A. crecca* (up to 6,000), garganey *A. querquedula*, shoveler *A. clypeata*, tufted duck *Aythya*

fuligula, common pochard *A. ferina*, ferruginous duck *A. nyroca*, red-crested pochard *Netta rufina*, shelduck *Tadorna tadorna*, pygmy goose *Nettapus coromandelianus*, vast numbers of coot *Fulica atra* (up to 70,000), purple gallinule *Porphyrio porphyrio*, moorhen *Gallinula chloropus*, white-breasted waterhen *Amaurornis phoenicurus*, pheasant-tailed jacana *Hydrophasianus chirurgus*, great crested grebe *Podiceps cristatus*, little grebe *Tachybaptus ruficollis*, European white pelican *Pelecanus onocrotalus*, dalmatian pelican *P. crispus*, cormorant *Phalacrocorax carbo*, pygmy cormorant *P. niger*, 12 species of heron such as purple heron *Ardea purpurea*, grey heron *Ardea cinerea* and Indian pond heron *Ardeola grayii*. Also listed: egret *Egretta alba*, little egret *E. garzetta*, little bittern *Ixobrychus minutus*, black bittern *I. flavicollis*, glossy ibis *Plegadis falcinellus*, great flamingo *Phoenicopterus ruber*, red-wattled lapwing *Vanellus indicus*, white-tailed lapwing *V. leucurus*, snowy plover *Charadrius alexandrinus*, little stint *Calidris minutus*, Temminck's stint *C. teminckii*, spotted redshank *Tringa erythropus*, redshank *T. totanus*, greenshank *T. nebularia*, green sandpiper *T. ochropus*, Eurasian curlew *Numenius arquata*, black-winged stilt *Himantopus himantopus*, river tern *Sterna aurentia*, white-winged black tern *Chlidonias leucopterus*, herring gull *Larus argentatus* and black-headed gull *L. ridibundus*. The lake also supports crocodile *Crocodylus palustris*. Black cobra *Naia tripudians* occurs in the area.

Lake Haleji is attractive to birds of prey. The commonest species are marsh harrier *Circus aeruginosus* and osprey *Pandion haliaetus*. Other species are great spotted eagle *Aquila clanga*, imperial eagle *A. heliaca*, tawny eagle *A. rapax*, black kite *Milvus migrans*, white-rumped vulture *Gyps bengalensis*, griffon vulture *G. fulvus*, black-shouldered kite *Elanus caeruleus*, brahminy kite *Haliastur indicus*, Pallas fish eagle *Haliaeetus leucoryphus*, which has a regular nest site near the lake, white tailed eagle *H. albicilla*, Egyptian vulture *Neophron percnopterus*, black vulture *Aegypius monachus*, short-toed eagle *Circaetus gallicus*, pallid harrier *Circus macrourus*, shikra *Accipiter badius*, white-eyed buzzard *Butastur teesa*, long-legged buzzard *Buteo rufinus*, kestrel *Falco tinnunculus*, red-headed merlin *F. chicquera* and peregrine falcon *F. peregrinus*.

Changes in Ecological Character There are several small villages and nomadic settlements within the buffer zone. It is proposed to build another reservoir nearby. The extensive beds of *Phragmites* are mown annually by boat. Uncut patches are used as roosts by herons. Chateji Dhand is occasionally illegally shot for waterfowl, and is disturbed by fishing and other activities by the nearby nomadic camp people. There is some illegal fishing, shooting and encroachment, in and around the main Haleji Lake. The lake has been dredged in the past.

Management Practices The sanctuary was managed according to a management plan prepared in 1976/77 for the major wetlands of Sind Province. The administrative plan for management recommends the appointment of a sanctuary warden, 2 or 3 deputy wardens and 7 assistants to cover both Haleji Lake and Lake Hadero, with a system of active patrols to discourage illegal access. Spoil from any further dredging should be used to create roosting islands in the lake for wintering birds. A restaurant and observation tower have been planned and 5 partially-built hides already exist. An interpretive nature centre should be added with exhibition space, lecture hall and administrative facilities for the wardens. Visiting permits are not required. The proposed reservoir should be integrated with the Haleji management plan. The Karachi Development Authority has a camp beside the lake where the water engineer is based along with a police post, rest house and houses used by KDA staff. There is a small tea house and building used by the game wardens beside the entry gate as well as two huts near the tail regulator. Two

pumping stations extract water from the lake and water is discharged, through the by-pass regulator, from the tail regulator into the seepage lagoons.

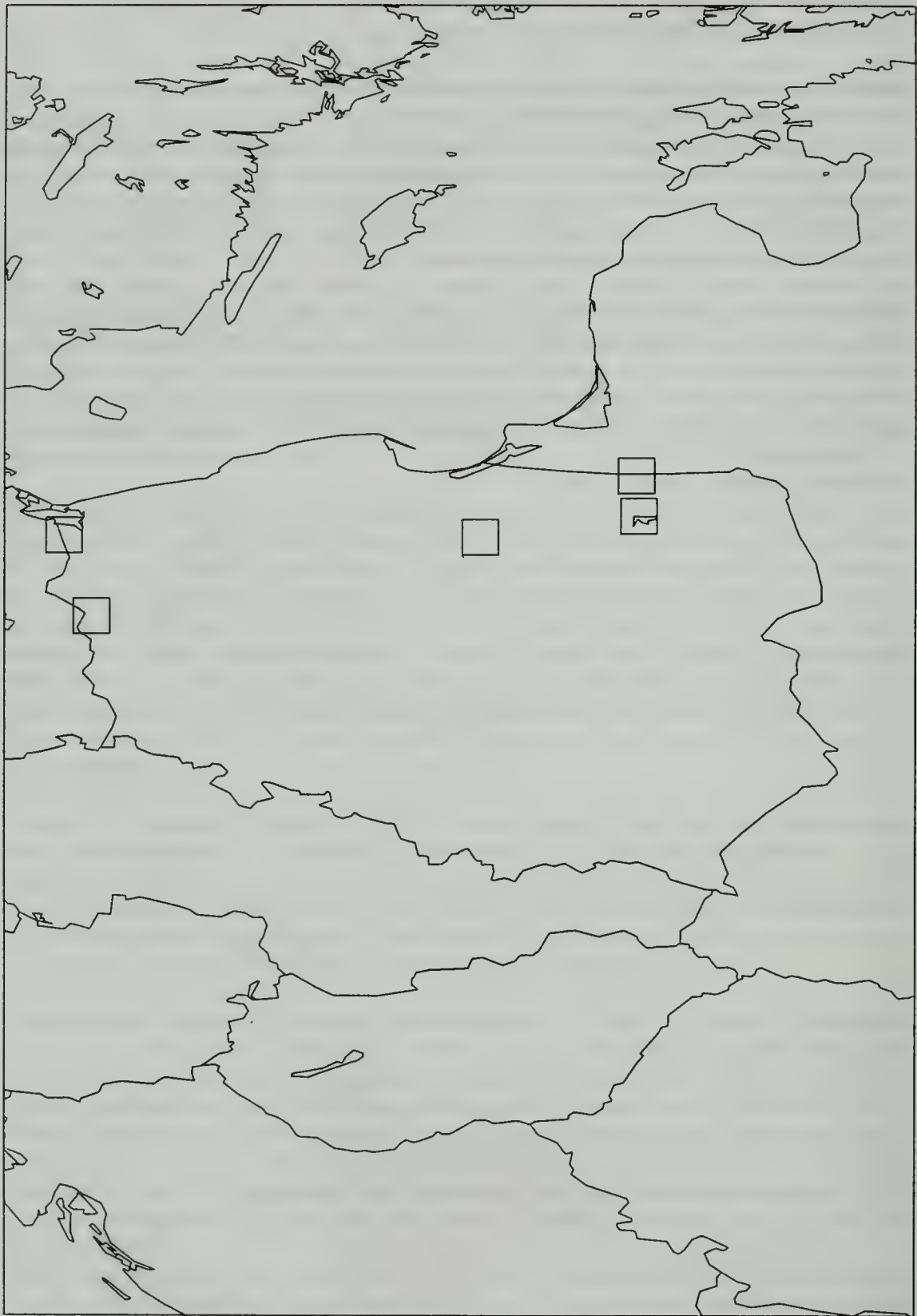
Scientific Research and Facilities Annual waterfowl censuses from the early 1970s carried out in collaboration with Sind Wildlife Management Board. A booklet on the ducks, geese and swans of Pakistan has been produced. The Limnological Department of Karachi University has studied the lake, and several papers have been published in the Pakistan Journal of Ecology. Recommended studies include the preparation of an inventory of food plants used by waterfowl to be used to recommend management procedures; monthly censuses of birds should be made; a research biologist should be assigned to the reserve.

Principal Reference Material The above information is taken from the national reports for Pakistan presented at the Cagliari 1980, Groningen 1984 and Regina 1987 Ramsar conferences, supplemented by:

Conder, P.J. (1977). Lake Kinjhar Wildlife Sanctuary management plan.

Scott, D.A. (ed.) (1989). *A Directory of Asian Wetlands*. IUCN, Gland, Switzerland and Cambridge, UK. 1181 pp.

WWF Project Reports 1360 and 1656.



Ramsar Sites in Poland

Poland

Area 312,677 sq. km

Population 37,764,000 (1988)

Summary of Wetland Situation Poland is especially rich in lakes, the majority of which provide excellent habitat for breeding and migrating waterfowl. There are about 9300 lakes which cover an area greater than one hectare, with a total area of about 3,200 sq.km. (1% of the territory). The majority are postglacial lakes, which are polymictic and eutrophic or mesotrophic in character, with a relatively well-formed reed belt and frequently forested banks. Most of the freshwater sites freeze over in winter for about four months, so numbers of wintering ducks and geese are comparatively low. The Polish Baltic coast is on one of the more important bird migration routes. In spring and autumn, haffs, bays and coastal lakes act as refuges for many waterfowl.

The most important wetland complex in the country is formed by the Mazurian Lakes in the north-east. This complex includes over 4,000 lakes (with a total surface area of about 115,000ha), the largest being Sniardwy (10,660ha) and Mamry (10,400ha). The Mazurian lakes are of various types, ranging from shallow with dense vegetation to deep with rather poor plant cover, and are often surrounded by forest. They are of great interest both limnologically and for waterfowl. Typical breeding species include bittern *Botaurus stellaris*, grey heron *Ardea cinerea*, black stork *Ciconia nigra*, mute swan *Cygnus olor*, greylag goose *Anser anser*, several of the *Anas* ducks, and raptors including white-tailed eagle *Haliaeetus albicilla* and osprey *Pandion haliaetus*. Lake Luknajno (Nature Reserve) is notable for having the densest breeding population of mute swans in Europe (about 1,000 pairs). Lake Druzno, situated in the extreme north-west of the Mazurian complex, near Elblag, is an ornithological reserve. Between the Mazurian Lakes and the town of Bialystok is a considerable area of marshland along the Biebrza River and Augustowski canal. Of the original 50,000ha, about 3,500ha have already been protected. Characteristic breeding birds of this area include bittern, grey heron and black stork, as well as black grouse *Tetrao tetrix*, ruff *Philomachus pugnax*, curlew *Numenius arquata* and penduline tit *Remiz pendulinus*.

Although in general the wetlands away from the north-east tend to be smaller, Lake Miedwie in the north-west, the Liwia Luza and Lubiatowskie lakes close to the Baltic coast, and Lebsko and Gardno lakes further to the east and only separated from the sea by a narrow strip of land, are all of value to breeding waterfowl, and support large concentrations during migration. The two last-named are of particular importance as breeding places of crane *Grus grus*, greylag goose and mute swan, and have been included in a national park. Another important nesting area, particularly for Anatidae and Limicolae, is Ptasi Raj Reserve situated around the Wisla (Vistula) river mouth and including two densely overgrown lakes. Further south, the Zegrze reservoir, near the confluence of the Bug and Narew rivers, is of importance to migrating waterfowl, as are the marshes to the west of Warsaw and north-west of Lodz along the Warta river, and also

the 6,521ha fishpond complex of the Barycz river near Milicz. This complex, created in the 14th century, has, or had, a good breeding population of greylag goose, several species of *Anas*, and some bittern and black stork, although in winter and during the migration hundreds more geese, mainly greylag and white-fronted, and several thousand duck arrive. A large part of the complex is a nature reserve.

In the south-east are Imielty Lug Lake and marshes, surrounded by uninhabited peat bogs and vast forests. But the most important wetlands in southern Poland are situated to the west of Krakow, the fishponds of Zator, the reservoir of Goczałkowice further upstream, and the fishponds of Lezczak. They are particularly important to waterfowl migrating through the Moldawska Gate, the main pass between the Sudety and the Carpathian ranges. Two further sites, lakes Dobskie and Warmoly, also sustain large numbers of waterfowl. The conservation of waterfowl habitat has also increased with the creation of two sites which include a substantial amount of good waterfowl habitat, Suwalk Landscape Park with a protected zone of 8,470ha, and Wigry Landscape Park (10,940ha) with a protected area of 2,770ha, both in the extreme north-east of the country.

Protected Areas Legislation In Poland, legal conservation of nature and landscape has a long tradition, with the first ordinance regulating hunting issued at the very beginning of the 11th century. Currently, the most important act for nature protection is the National Constitution of 1952, specially amended to include sections dealing with nature conservation and the protection and rational development of the natural environment. The major piece of legislation is the Law on Nature Conservation of 7 April 1949 which governs the organisation of nature conservation in general and introduces three protected area categories: national parks, nature reserves and natural monuments. This law governs the creation, administration and management of these three types of area. Two further types of protected area, landscape parks and areas of protected landscape, began to be created in the 1970s, and the Law of 1980 concerning Protection and Management of the Environment regulates all problems connected with landscape protection. This is a general act, passed in January 1981, to regulate natural resource use in the national planning context and to control pollution levels and apply protection of the landscape in general terms.

All sites designated as Ramsar sites by Poland are nature reserves. These are areas where protection is given either to the complete ecosystem or to one or more of its components, and which are used for scientific and educational purposes. Reserves are created under the 1949 Law, by decree of the Ministry for Conservation of the Environment and Natural Resources, and are classified into nine basic types, according to the main object of protection: forest reserves, floristic reserves, steppe vegetation reserves, halophytic reserves, peatbog reserves, water reserves, faunal reserves, inanimate nature and landscape reserves. Reserves are divided for management purposes into strict (fully protected) reserves and partial (partially protected) reserves. The former are used exclusively for research, the latter are subjected to controlled management activities. Most areas belong to the second group, while many reserves are mixed, with strict and partial protection of respective parts).

Protected Areas Administration The Law on Nature Conservation of 1949 was followed by a Council of Ministers' Order of 1950 creating the State Council for Nature Conservation (PROP), and in 1969 Conservators of Nature offices were established in each of the 17 administrative regions of the country. Under Article 9 of the 1949 Law, nature conservation became the responsibility of a Chief Conservator of Nature within the Ministry of Forestry and

Timber Industry, but in the 1970s a separate Ministry, the Ministry of Administration, Regional Economy and Environmental Protection took over the overall control of environmental protection and spatial planning functions. On 12 November 1985 a new law created the new Ministry for Conservation of the Environment and Natural Resources which deals with all aspects of environmental protection (air, water, solid wastes, soils), water management, geology and nature conservation and all matters governed by the Law on Nature Conservation of 7 April 1949, except the administration of national parks. The national park system is managed by the Ministry of Agriculture, Forestry and Food Economy, and specifically by its Department of Forestry and National Parks. According to the Law of 23 October 1987, The State Council for Nature Conservation and the State Council for Environmental Conservation are the official advisory bodies, the former on nature conservation matters, and the latter on environmental conservation aspects. The Minister for Conservation of the Environment appoints members of both bodies and is their Chairman. The Council for Nature Conservation gives advice and expert opinions on all projects concerning the creation of national parks, landscape parks and nature reserves and also presents its own initiatives. The State Council consists of a Secretariat, and seven Permanent Commissions, including the Commission on National Parks and Nature Reserves, the Commission on the Protection of Inanimate Nature and the Commission on the Protection and Management of the Landscape.

Sites designated under the Convention Accession 22 November 1977 with one site listed at accession and four added on 3 January 1984

Luknajno Lake Nature Reserve
 Slonsk Reserve
 Swidwie Lake
 Karas Lake
 Siedem Wysp (Seven Islands) Reserve

Government body responsible for administration of the Convention

Ministry for Environmental Protection, Natural Resources and Forestry, Wawelska 52/54, 00-922 Warsaw

Luknajno Lake Nature Reserve

Location 53°49'N, 21°38'E. Located in the east Baltic lowland, 2.5km east of the town of Mikolajki in north-east Poland.

Area 710ha

Degree of Protection State owned. Managed by the State Forest District Board at Bialystok (Nadlesnictwo Maskulinskie, Superintendent Forestry Maskulinskie, 12-220 Ruciane-Nida, Poland). Established as a reserve in 1947 to protect the habitat of mute swan *Cygnus olor* and other waterfowl. The protected area includes the entire lake and a 300m wide strip of surrounding shore. Accepted as a biosphere reserve in June 1976. Designated as a Ramsar site at the time of accession on 22 November 1977.

Site Description The reserve comprises 585ha of open water, 101ha bank swamp area, 15ha forest and 9ha meadows and grassland. Lukajno Lake is 115m in altitude and of glacial origin, with a flat-bottom and maximum length north-south of 3,300m and east-west of 2,900m. Average depth is 0.6m and maximum depth about 3m. The lake is fed by numerous drainage channels from the surrounding marshy areas, and water flows out if it through a channel to Sniardwy Lake. The major aquatic plant communities are: *Charetum acuteolatae* (occupying nearly two-thirds of the lake bottom); *C. contrariae* (25% of the lake bottom); and *C. asperae* and *C. tomentosae*, which are the main foodsource for mute swan *Cygnus olor*. 166 species of vascular plants have been recorded in the reserve including starwort *Callitriche verna*, mezerion *Daphne mezereum*, willow *Salix nigricans*, small bur-reed *Sparganium minimum*, marsh stitchwort *Stellaria palustris* and marsh arrow-grass *Triglochin palustris*. The lake is a natural spawning ground for many fish species. The mean annual air temperature is 6.5°C and mean annual precipitation 550-600mm.

International and National Importance The reserve contains the largest wild colony of mute swan *Cygnus olor*, with up to 2,000 birds including about 20 breeding pairs, which migrate each winter. There are about 168 species of birds in the reserve or its immediate surroundings, of which 122 breed or probably breed, and 36 are wintering or migrant species. Breeding birds include black-necked grebe *Podiceps nigricollis* (180 pairs), coot *Fulica atra* (80 pairs breeding and about 5000 birds during migration), red-crested pochard *Netta rufina* (3-5 pairs), bittern *Botaurus stellaris* (about 15 pairs), black-headed gull *Larus ridibundus* (200 pairs), Bewick's swan *Cygnus columbianus bewickii*, crane *Grus grus* (4-5 pairs), bearded tit *Panurus biarmicus* (1-2 pairs), black kite *Milvus migrans* (1 pair), marsh harrier *Circus aeruginosus* (about 10 pairs), hen harrier *C. cyaneus* (1 pair), white-tailed eagle *Haliaeetus albicilla* (2 pairs), golden eagle *Aquila chrysaetos*, lesser-spotted eagle *A. pomarina* (1 pair) and osprey *Pandion haliaetus* (2 pairs).

Changes in Ecological Character The lake is considered to be largely unmodified by man, although much of the surrounding watershed is used for agriculture. There is no tourist accommodation within the reserve.

Management Practices The 300m strip of land within the reserve surrounding the lake constitutes a buffer zone. Supervision of protection and management of the reserve is carried out by the district nature conservator in the district office at Suwalki. The reserve is guarded by a warden for nature conservation, and by forest personnel. Access is carefully controlled to prevent disturbance of birds. Hunting is prohibited, and fishing is allowed only after the mute swan migration in autumn.

Scientific Research and Facilities Major topics needing further research include: influence of agriculture in the catchment on eutrophication; pesticide residue impacts and methods of protecting the lake against pollution; population dynamics of waterfowl including mute swan and their impact on aquatic vegetation. Scientific supervision of the reserve is carried out by the Field Station of the Zoology and Ecology Institute of the Warsaw University.

Principal Reference Material The above information is taken from the Biosphere Reserve nomination submitted to Unesco (1976). A bibliography of 35 entries is on file with MAB Secretariat, Unesco, Paris.

Slonsk Reserve

Location 52°33'N, 14°43'E. Situated in Gorzow province near the confluence of the Warta and Odra rivers on the German Democratic Republic frontier in western Poland. The nearest towns are Kostrzyn on the north-west boundary, Czarnow to the south, and Slonsk to the south-east.

Area 4,166ha (including a strict nature reserve of 1,128ha)

Degree of Protection State owned. The area is protected as a nature reserve established under the order of the Minister of Forestry and Timber Industries of 21 July 1977 (Monitor Polski 1977 Nr 19 pos. 107). The reserve contains a strict nature reserve. Designated as a Ramsar site on 3 January 1984.

Site Description The site is in the ancient Torun-Eberswalde Valley, and comprises the Warta River, the winding Postomia River, marshlands and numerous old drainage canals, shallow lakes, meadows and pastures in the Warta river floodplain, and a disused artificial reservoir. The water level of the river varies considerably, with an annual range of up to 4m. The area is flooded for about 8 months of the year. Characteristic plant species include great yellow-cress *Rorippa amphibia*, water dropwort *Oenanthe aquatica*, water speedwell *Veronica anagalis*, *Polygonum persicaria*, bistort *P. amphibius*, plantain *Plantago pauciflora*, golden dock *Rumex maritimus*, great water dock *R. hydrolapathum*, reed canary-grass *Phalaris arundinacea*, goose-foot *Chenopodium vulvaria*, marsh cudweed *Gnaphalium uliginosum*, crack willow *Salix fragilis*, white willow *S. alba*, eared sallow *S. aurita* and dispersed stands of alder *Alnus glutinosa*.

International and National Importance Slonsk Reserve is one of the more important inland sites for waterfowl, as a breeding and moulting ground, resting station for migrants, and a wintering site. There are at least 40 species recorded breeding, including greylag goose *Anser anser* (about 100 pairs), mute swan *Cygnus olor* (25 pairs), mallard *Anas platyrhynchos* (1,900 pairs), garganey *A. querquedula* (150 pairs), gadwall *A. strepera* (120 pairs), shoveler *A. clypeata* (150 pairs), pochard *Aythya ferina* (150 pairs), tufted duck *A. fuligula* (100 pairs), coot *Fulica atra* (10,000 pairs), black-headed gull *Larus ridibundus* (6,000 pairs) and cormorant *Phalacrocorax carbo* (64 pairs). White-tailed eagle *Haliaeetus albicilla* has bred successfully in the area. Visiting migrants recorded during November include 35,000-40,000 geese (mainly bean goose *Anser fabalis*), 30,000-70,000 duck (Anatidae) and 800 swans *Cygnus* spp.

Changes in Ecological Character Since establishment of the reserve the area has been relatively undisturbed. There are traces of abandoned drainage and road building works.

Management Practices Grass-mowing and cattle grazing are allowed in the reserve after 15 June (end of the breeding season), except in the strictly protected area.

Scientific Research and Facilities Scientific supervision of the reserve is provided by the Scientific Station of the Polish Hunting Association in Czempin.

Principal Reference Material The above information is taken from:
Ministry of Forestry and Timber Industries (1983). Selected Wetlands of International Importance in Poland. Document submitted at the time of Designation in January 1984. Warsaw.

Swidwie Lake

Location 53°34'N, 14°22'E. Situated north of Szczecin town and west of Wegornik, in Szczecin Province on the frontier with the German Democratic Republic in northern Poland.

Area 382ha

Degree of Protection State owned. The lake area is protected as a nature reserve established on 14 January 1963 by order of the Ministry of Forestry and Timber Industries (Monitor polski 1963, Nr 14 pos. 82). Designated as a Ramsar site on 3 January 1984.

Site Description Swidwie is a eutrophic lake with the area of open water gradually reducing through hydrosereal succession. At present about 75% of the lake area is overgrown by reedbeds of *Phragmites communis* and bulrush *Scirpus lacustris*, and stands of reed *P. communis* and reedmace *Typha latifolia* divide the lake surface into several small areas of open water varying from 1ha to 50ha. These shallow (0.7-1.5m) relict waterbodies are rapidly silting up with organic debris, and are covered by water plants, predominantly water soldier *Stratiotes aloides*. The wetland is fed by four ditches draining from the surrounding meadows and fields. Gunica River is the only outflow. The reserve is surrounded by some 2,800ha of meadows and fields, and 25,000ha of the ancient virgin forest of Wkra. The villages of Bolkow, Wegornik and Zawisie lie close to the perimeter and connecting roads pass around the area. The wetland itself is inaccessible as treacherous mats of vegetation overlies deep water.

International and National Importance Swidwie Lake is an important wildfowl resting and feeding station located at the intersection of two major spring and autumn migration routes. Thousands of birds pass through the area including greylag goose *Anser anser* (several thousand), bean goose *A. fabalis*, white-fronted goose *A. albifrons* (major spring migrant), pochard *Aythya ferina*, scaup *A. marila*, garganey *Anas querquedula*, mallard *A. platyrhynchos* (spring migrant), spotted crake *Porzana porzana*, little crake *P. parvus* and water rail *Rallus aquaticus*. In July to October up to 3,000 warblers a day pass through the reserve, particularly reed warbler *Acrocephalus scirpaceus*, sedge warbler *A. schoenobaenus* and marsh warbler *A. palustris*. Immature and moulting species recorded include crane *Grus grus* (60-80 non-breeding birds: March to October), greylag (20-30 moulting birds: April to September) and mute swan *Cygnus olor* (30-80 immature birds in spring). Birds breeding include white-tailed eagle *Haliaeetus albicilla* (1 pair), osprey *Pandion haliaetus* (1 pair), Montague's harrier *Circus pygargus* (1 pair), hen harrier *C. cyaneus* (3 pairs), black stork *Ciconia nigra* (1 pair), goldeneye *Bucephala clangula* (4 pairs), mute swan (10 pairs), bluethroat *Luscinia svecica* (5 pairs) and bearded tit *Panurus biarmicus* (9 pairs).

Changes in Ecological Character A sluice gate built on the Gunica River has raised the water level in the reserve by about 0.3m. The main threat to the reserve is spraying of insecticides and fungicides onto adjoining fields and meadows.

Management Practices All economic activities are prohibited in the reserve.

Scientific Research and Facilities Scientific supervision of the reserve is provided by the Swidwie Ornithological Station.

Principal Reference Material The above information is taken from:

Ministry of Forestry and Woodworking Industries (1983). Selected Wetlands of International Importance in Poland. Document submitted at the time of Designation in January 1984. Warsaw. Ministry of Environment Protection and Natural Resources.

Karas Lake

Location 53°33'N, 19°38'E. Situated west of Ostroda in Olsztyn Province, northern Poland.

Area 815ha

Degree of Protection State owned. The lake is protected as a nature reserve established on 12 April 1958 under the order of the Minister of Forestry and Timber Industries (Monitor Polski 1958 No. 42 pos. 243). Designated a Ramsar site on 3 January 1984.

Site Description The nature reserve comprises 377.49ha lake area surrounded by 246.83ha forest, 182.4ha peatbogs and marshlands, and 3.21ha drainage ditches. The lake basin is at an advanced stage of hydrosereal succession, with shallow areas of open water (on average 0.6m deep, maximum 2.8m) which are rapidly filling in with sediment and are extensively colonised by submerged vegetation of charales *Chara fragilis*, *C. aspera* and *C. intermedia*, and vascular plants such as pondweeds *Potamogeton lucens*, *P. perfoliatus* and *P. gramineus*, bladderwort *Utricularia vulgaris* and *Najas marina*. The area bordering the water, which is exposed when the water level drops, and the islands on the interlake shallows are covered by rushes *Juncus* spp. and reedbeds of *Phragmites communis*, *Scirpus lacustris*, *Typha latifolia* and *T. angustifolia*. To the west of the lake, extensive peatbogs have formed with sedges *Carex gracilis* and *C. rostrata* predominant. On the higher ground near the edge of the original lake basin is scrub and woodland of willows *Salix cinerea*, *S. rosmarinifolia*, *S. pentandra*; birches *Betula pubescens*, *B. verrucosa*; alder *Alnus glutinosa* and buckthorn *Frangula alnus*. Marsh species include sundews *Drosera rotundifolia* and *D. anglica* (vulnerable within Poland), marsh helleborine *Epipactis palustris* and lesser butterfly orchid *Platanthera bifolia*.

International and National Importance The reserve was established to protect the important Polish breeding site of greylag goose *Anser anser*, with 20 breeding pairs and up to 100 non-breeding birds. After moulting, some 500 birds gather in the reserve prior to migration. Other waterfowl breeding in the wetland include mute swan *Cygnus olor* (some pairs and about 100 non-breeding birds), gadwall *Anas strepera*, wigeon *A. penelope*, northern shoveler *A. clypeata*, red-crested pochard *Netta rufina*, goldeneye *Bucephala clangula*, goosander *Mergus merganser*, red-necked grebe *Podiceps grisegena* and black-headed gull *Larus ridibundus* (1,000 pairs). The reserve is a moulting refuge for males of various species such as greylag goose and mallard, and is a resting station for spring and autumn migrants. Otter *Lutra lutra* has been recorded in the reserve.

Changes in Ecological Character The lake is exploited as a commercial fishery.

Management Practices None reported

Scientific Research and Facilities None reported

Principal Reference Material The above information is taken from:

Ministry of Forestry and Timber Industries (1983). Selected Wetlands of International Importance in Poland. Document submitted at the time of Designation in January 1984. Warsaw.

Siedem Wysp (Seven Islands) Reserve

Location 54°20'N, 21°36'E. Situated in north-west Poland at the intersection of the Polish Provinces of Suwalkie and Olsztyn, and the frontier with the Soviet Union.

Area 1,016ha

Degree of Protection State owned. The wetland is protected as a nature reserve established on 30 May 1956 under the order of the Ministry of Forestry and Timber Industries (Monitor Polski 1956, Nr 54 pos. 591). Designated as a Ramsar site on 3 January 1984.

Site Description The reserve comprises Oswin Lake (339.21ha); associated marshlands (474.96ha); meadows (67.55ha); and woodland (134.24ha). Oswin Lake is a shallow (1-3m) freshwater lake colonised by aquatic plants such as pondweed *Potamogeton* spp., and extensively overgrown by reedbeds *Phragmites communis*. Genera predominant in the woodland areas are alder, oak, ash, lime and elm (*Alnus*, *Quercus*, *Fraxinus*, *Tilia* and *Ulmus*). Mammals in the reserve include wild boar *Sus scrofa*, roe deer *Capreolus capreolus*, elk *Alces alces*, fox *Vulpes vulpes*, hare *Lepus* sp., beaver *Castor fiber* and muskrat *Ondatra zibethicus*.

International and National Importance The lake is very important during migration times, particularly during the autumn migration when it is a resting place for flocks numbering dozens of crane *Grus grus*, many thousands of ducks and geese (Anatidae), gulls and coots. Over 180 bird species have been recorded in the reserve including 99 breeding or probably breeding. Breeding birds include great crested grebe *Podiceps cristatus* (up to 90 pairs), bittern *Botaurus stellaris* (6-7 pairs), black stork *Ciconia nigra*, mute swan *Cygnus olor* (up to 20 pairs breed, with 30 to 200 non-breeding summer visitors), greylag goose *Anser anser* (one breeding pair but up to 10 birds in summer), white-tailed eagle *Haliaeetus albicilla* (1 pair), crane (6-7 pairs, black-headed gull *Larus ridibundus* 3,000-5,000 pairs, peregrine *Falco peregrinus*, river warbler *Locustella fluviatilis* (15-20 pairs), bluethroat *Luscinia svecica* (ca 20 pairs) and bearded tit *Panurus biarmicus* (8 pairs).

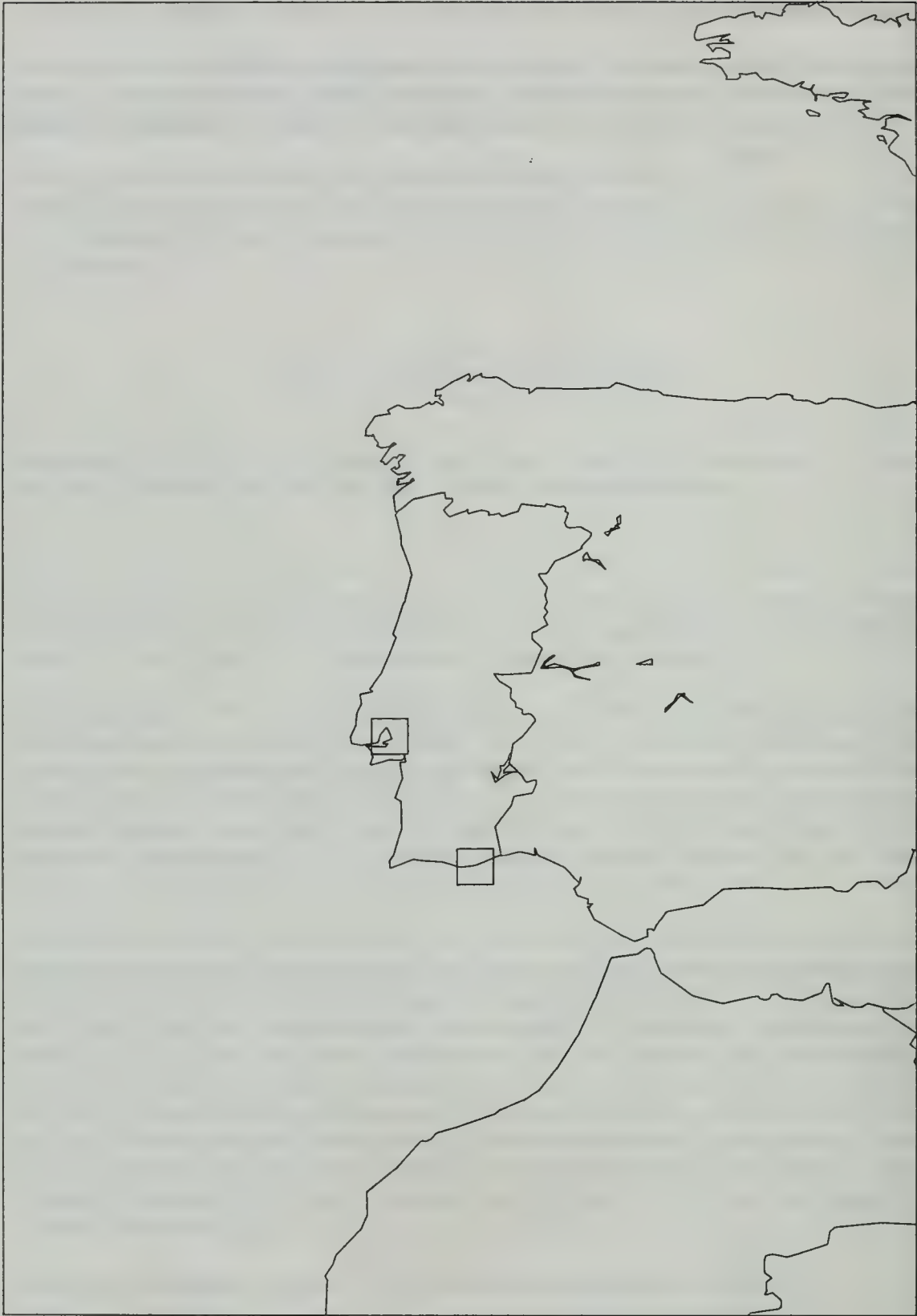
Changes in Ecological Character The area is inaccessible and still undisturbed.

Management Practices None reported

Scientific Research and Facilities None reported

Principal Reference Material The above information is taken from:

Ministry of Forestry and Woodworking Industries (1983). Selected Wetlands of International Importance in Poland. Document submitted at the time of Designation in January 1984. Warsaw.



Ramsar Sites in Portugal

Portugal

Area 91,971 sq.km

Population 9,707,000 (1986 estimate)

Summary of Wetland Situation Several Portuguese wetlands are of special importance as feeding areas for large numbers of wintering and migrating waders and gulls, in particular the Ria d'Aveiro, the Tejo Estuary, the Sado Estuary, and the mudflats and marshes near Faro.

The Ria d'Aveiro comprises a 6,000ha lagoon and a network of channels, much of them covered by rushes and eel grass. The lagoon is full of fish, but excessive algal growth prevents large scale fishing. The algae are harvested for fertilizer. In the northern part of the lagoon, which is connected to the sea by a narrow inlet, salt pans provide favourable habitat for waders and gulls, and there is a heronry in the *Pinus pinaster* stand around Sao Jacinto, on the sandbar separating the lagoon from the sea. This area has lost its importance as a breeding place for other species of waterfowl, mainly because of disturbance. Hunting pressure in winter is severe, but there are plans to establish a 1,500ha nature reserve at Pateira de Fermentelos, comprising a marsh with reedbeds.

The Tejo (Tagus) Estuary upstream of Lisbon is a vast intertidal zone of mud flats uncovered at low tide, bordered by about 2,800ha of saltmarsh and rice fields. Inland to the east the polder landscape has been somewhat modified by industrial installations, but the estuary is still frequented in winter and at migration time by over 50,000 waders, including avocet *Recurvirostra avosetta*, sandpipers *Calidris* spp., curlew *Numenius arquata*, and godwits *Limosa* spp., as well as by several thousand duck, mainly mallard *Anas platyrhynchos*, wigeon *A. penelope*, teal *A. crecca*, shoveler *A. clypeata* and pochard *Aythya ferina*. Greater flamingo *Phoenicopterus ruber* also occurs occasionally. Some 22,850ha of the saltmarsh, mudflats at Pancas and islands of the inner estuary, including Mouchao do Lombo do Tejo, Mouchao da Povia, Mouchao do Alhandra and Mouchao des Garcas, are included in a 'Reserva Natural', but only the Pancas flats and saltmarsh, and the lagoon on Mouchao do Lombo, are strict reserves.

Paul do Boquilobo Nature Reserve was established near Golega nearly 100km up the Tejo from Lisbon. It includes a freshwater marsh, with a lake and surrounding willow and poplar stands, with abundant submerged and emergent vegetation, the sedges being grazed by horses and cattle in summer. The reserve has the most important mixed heronry in Portugal, with little egret *Egretta garzetta*, cattle egret *Bulbulcus ibis*, squacco heron *Ardea ralloides* and night heron *Nycticorax nycticorax*, with a total of about 2,000 nests. In winter the area is visited by up to 2,500 duck, mainly mallard (1,000), pintail *Anas crecca* (500) and shoveler (400 to 500), but also teal, wigeon, gadwall *A. strepera* and tufted duck *Aythya fuligula*.

The Ria Sado Estuary also comprises vast mudflats and saltmarshes, with several small reservoirs (for irrigation purposes) and extensive rice fields. Up to 20,000 waders winter in this varied

habitat, including avocet, redshank *Tringa totanus* and curlew. Further south in the Algarve is another major site for wintering waders and gulls, in the vicinity of Faro and the coastal strip eastwards to Tavira. The area consists of a mixture of sandy islands, coastal marshes and mudflats. Ludo Marsh in particular is excellent waterfowl habitat, and the site of a nature reserve (very necessary in the light of hunting pressure and tourist development in the Algarve region).

A few other areas are of interest. Ilha Berlengo, some 12km offshore from Peniche, has nesting colonies of seabirds, mainly of herring gull *Larus argentatus*, but also small numbers of Cory's shearwater *Calonectis diomedea* and razorbill *Alca torda*. The coast south of Lisbon between Sesimbra and Setubal, declared a 'parque natural' in 1977, is composed of calcareous cliffs of palaeontological interest, the cliff tops covered by a rich maquis-type flora, and the offshore rocks providing nesting ledges for guillemots *Uria aalge*. Further south again, the cliffs of Cabo de Sao Vicente are still inhabited by peregrine *Falco peregrinus* and chough *Pyrrhocorax pyrrhocorax*, and provide an excellent look-out post for studying migration. Separated from the Portuguese mainland by some 1,200km of Atlantic Ocean, the Ilhas Selvagens, situated between Madeira and the Canary Islands, have important breeding colonies of seabirds which include Cory's shearwater, frigate petrel *Pelagodroma marina*, Madeiran petrel *Oceanodroma castro*, little shearwater *Puffinus assimilis* and Bulwer's petrel *Bulweria bulwerii*, and a rich flora with several endemic species. The seabird colonies, which were decimated in 1975 and 1976 by fishermen taking not only young but also adults from the nests, are reported to be recovering since the islands were wardened and became a protected area in 1977.

Protected Areas Legislation There are three types of conservation area defined in Portugal: national park, nature park and nature reserve. There is only one national park, Peneda-Gerês, and the primary objectives of this area are conservation and education. By definition only park facilities are allowed within the boundaries of the park. Nature parks are areas planned to meet the requirements of recreation, nature conservation and landscape protection, but do not have the size or recreational value of a national park. There would appear to be some emphasis on Portugal's conservation effort being combined with traditional rural land use.

Protected Areas Administration The Secretaria de Estado do Urbanismo e Ambiente (previously the Secretaria de Estado Ambiente e Recursos Naturais) within the Ministério do Plano da Administração do Território, and especially the Serviço Nacional de Parques, Reservas e Conservação da Natureza, are making great efforts to extend and improve the network of reserves in Portugal. They are being assisted by organisations such as the Centro de Estudos de Migrações e Protecção de Aves (CEMPA).

Sites designated under the Convention Signature subject to ratification 15 July 1976, finally ratified on 24 November 1980 with 2 sites listed at ratification.

Natural Reserve of the Tagus Estuary
Natural Reserve of Formosa Sound

Government body responsible for administration of the Convention
Secretaria de Estado do Urbanismo e Ambiente, Serviço Nacional de Parques, Reservas e Conservação da Natureza, Rua da Lapa 73, 1200 Lisboa

Natural Reserve of the Tagus Estuary

Location 38°50'N, 8°57'E. Situated in the Tagus River estuary about 17km north-east of Lisbon on the south-west coast of Portugal.

Area 14,563ha

Degree of Protection Most of the reserve is privately owned, with some public corporation and private land. The designated site is protected within the natural reserve established by Order in Council No. 565/76 on 19 July 1976 (partially altered on 17 November 1977). The following are prohibited or restricted in the reserve: construction activities, erection of telephone or power cables, introduction of exotic plants and animals, aircraft overflying below 300m, hunting outside defined areas, camping, and navigation of motorboats outside defined channels. An area in the east has been set aside as a strict nature reserve in which all hunting, fishing and access for domestic animals, the public or vehicles is prohibited. The natural reserve is administered by the Central Department of the National Parks Service. Designated as a Ramsar site at the time of ratification on 24 November 1980.

Site Description The site is a complex of saltmarshes, mudflats, shallow lagoons, dunelands and reclaimed polders around the tidal estuary of the Tagus River and its tributary, the Sorraia. The marshlands and consolidated dunes (7,000ha) support a diverse Lusitanian flora. The water channels are predominantly covered by water hyacinth *Eichornia crassipes*, an introduced pest species. The estuary is bordered by a hinterland of dry grassland, cornfields and woodland of stone pine *Pinus pinea* and cork oak *Quercus suber*. Several reptile and amphibian species occur, including European pond terrapin *Emys orbicularis*, and stripe-necked terrapin *Mauremys caspica*. The reserve is surrounded by agricultural land, and the urban developments of Alcochete, Sacavém, Vila Franca de Xira and Benavente.

International and National Importance The marshlands are an important feeding ground for large numbers of migrating waterfowl, including an estimated 75% of the western European population of avocet *Recurvirostra avosetta*. Other species include grey plover, ringed plover, dunlin, redshank, curlew, godwits, mallard, shoveler, teal, greylag goose, spoonbill, ruff and greater flamingo (*Pluvialis squatarola*, *Charadrius hiaticula*, *Calidris alpina*, *Tringa totanus*, *Numenius arquata*, *Limosa* spp., *Anas platyrhynchos*, *A. clypeata*, *A. crecca*, *Anser anser*, *Platalea leucorodia*, *Philomachus pugnax* and *Phoenicopterus ruber*). Nesting species include purple heron *Ardea purpurea*, grey heron *A. cinerea*, avocet, stone curlew *Burhinus oedicnemus*, Kentish plover *Calidris alexandrinus*, black-winged stilt *Himantopus himantopus*, red-crested pochard *Netta rufina*, white stork *Ciconia ciconia* and collared pratincole *Glareola pratincola*. Non-aquatic birds breeding in the drier areas include black kite *Milvus migrans*, black-shouldered kite *Elanus caeruleus*, short-toed eagle *Circus gallicus*, Montagu's harrier *Circus pygargus*, red-legged partridge *Alectoris rufa*, little bustard *Otis tetrix*, red-necked nightjar *Caprimulgus ruficollis*, bee-eater *Merops apiaster*, spotless starling *Sturnus unicolor* and azure-winged magpie *Cyanopica cyanus*.

Changes in Ecological Character The rapid expansion of floating water-hyacinth is choking the water channels, and by superceding the natural aquatic vegetation reducing the fish population. There is a serious threat of pollution as the reserve is surrounded by military, naval, oil refining and other industrial installations.

Management Practices The reserve is managed by staff from the Central Department of the National Service for Parks, Reserves and Nature Conservation, and has received grants from WWF. Access to, and activities within, the reserve are strictly controlled.

Scientific Research and Facilities A study of the Tagus estuary has been undertaken by the National Commission for the Environment within the framework of the UNESCO Man and Biosphere Programme. The National Service of Parks coordinates studies of the reserve's flora and fauna.

Principal Reference Material The above information is taken from:

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

Supplemented by:

Duffey, E. (1982). *National Parks and Reserves of Western Europe*. Macdonald and Co., London.

Natureza e Paisagem. Bulletin published by National Service for Parks, Reserves and Nature Conservation.

Scott, D.A. (1980). A preliminary inventory of wetlands of international importance especially for waterfowl in west Europe and northwest Africa. *IWRB Special Publication* No. 2.

Natural Reserve of Formosa Sound

Location 37°03'N, 7°47'W. Situated on the south coast near the town of Faro.

Area 16,000ha

Degree of Protection Part state and part private ownership. The site includes Ludo Game Reserve (744ha) west of Faro. Designated as a Ramsar site at the time of ratification on 24 November 1980.

Site Description The site is a complex of freshwater and brackish marshes, lagoons, mudflats, beaches, dunes and salt pans, and extends from some 15km west of Faro to about 60km east of the town. There are extensive beds of *Phragmites* sp. and *Typha* sp., and the site contains a wide range of habitats which is reflected in the abundance of bivalve molluscs, crustaceans and fish. Exploitation of these resources provides a living for some 5,000 people.

International and National Importance The site is an important passage and wintering area for waterfowl, with up to 20,000 waders in winter (January average 15,000). Species include ringed plover, Kentish plover, bar-tailed godwit, knot, little stint, dunlin and wigeon (*Charadrius hiaticula*, *C. alexandrinus*, *Limosa lapponica*, *Calidris canutus*, *C. minuta*, *C. alpina* and *Anas*

penelope). Breeding species include purple gallinule *Porphyrio porphyrio*, little egret *Egretta garzetta*, grey heron *Ardea cinerea*, white stork *Ciconia ciconia*, black-winged stilt *Himantopus himantopus*, little tern *Sterna albifrons*, pratincole *Glareola pratincola*, Kentish plover, avocet and redshank *Tringa totanus*. Other species occurring at the site include greater flamingo *Phoenicopterus ruber* and spoonbill *Platalea leucorodia*.

Changes in Ecological Character Some offshore sandbars are crowded with holiday homes, and there is some pollution by sewage. The western part of the reserve lies in the flight path of Faro Airport. There is also considerable hunting pressure.

Management Practices Since the establishment of Formosa Natural Reserve, any new buildings or change in agricultural or industrial practices must have authorisation from the administrating committee. No form of exploitation except fishing is allowed in Ludo Game Reserve.

Scientific Research and Facilities Research includes studies of the flora, molluscs and fish culture and ornithology.

Principal Reference Material The above information is taken from the documents supplied by the Government of Portugal for designation in 1980.

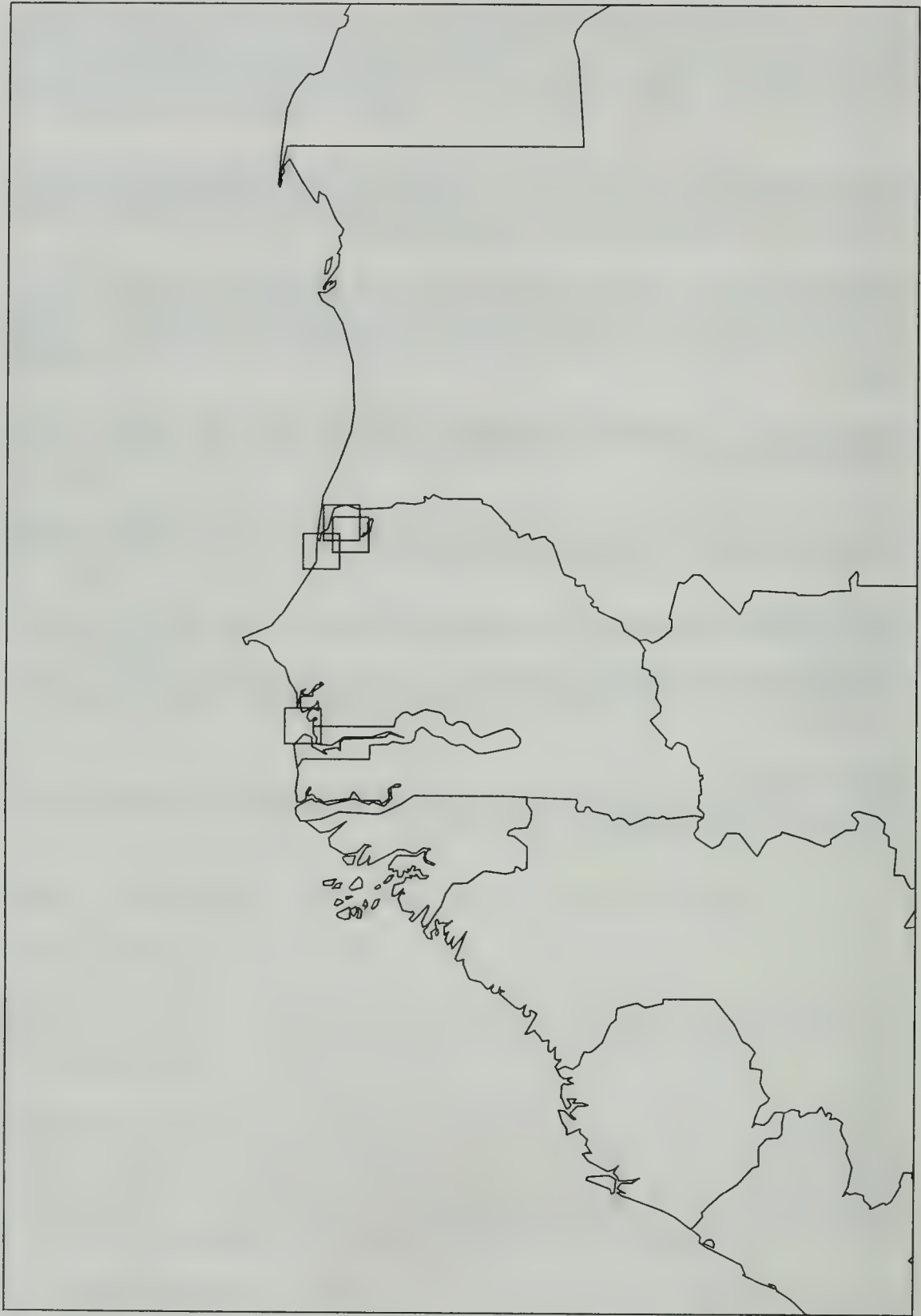
Supplemented by:

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

Duffey, E. (1982). *National Parks and Reserves of Western Europe*. Macdonald and Co., London.

Additional reference:

Rufino, R., Miranda, P., Pina, J.P. and Araujo, A. (1983). Wader populations in the Ria Formosa. XXIX IWRB Meeting, Huelva - Espana



Ramsar Sites in Senegal

Senegal

Area 197,160 sq.km

Population 6,980,000 (1988)

Summary of Wetland Situation The country is generally flat, apart from the volcanic peaks of Cape Verde and the Fouta Djallon. The major wetland areas are rivers and their deltas, the levels of which vary enormously through the year; the major sites for waterfowl depend on this alternation of wet and dry, fresh and salt cycles. The most important areas are:

The Senegal Delta (partly in Mauritania); this area is of international importance, being one of the three great wetlands in West Africa for Palaearctic migrants. It is the first available stopping point after a 2,000km crossing of the Sahara. Development projects carried out since 1963 have canalised the river, preventing large areas from being flooded, while recent droughts have aggravated this process and greatly decreased the value of the Senegalese side of the delta for waterfowl. The completion of the Diama dam, 40km upstream from the sea, in 1986 may make more water available to supply the remaining wetlands. Major wetland areas, such as Djoudj, the floodplains of rivers Lampsar and Djeuss, Langue de Barbarie National Park, Gueumbeul Reserve, Trois Marigots, Ndiaël depression and Richard-Toll Lake, still exist.

The Gambia river and its tributaries; in particular it supplies Niokolo-Koba National Park in the south-east. By the end of the rainy season, the Sudan savannas and marshes are almost entirely underwater, but in May, at the end of the dry season, they resemble a semi-desert. It is an important area for birds, with over 320 recorded species. The area is threatened by the Gambia and Niokola-Koba damming projects.

Saloum delta is situated on the central coast and consists of a mosaic of sandy islands and lagoons, with a wide variety of mangrove swamps, some of the most northerly in Africa. The islands have herbaceous populations of helophiles of varying importance. The surrounding area comprises open forest with sandy soil. The avifauna is mainly seabirds, although flamingos do breed here. The greatest threat to the area, particularly the mangroves, is the extension of the rice culture.

The Casamance river and its regime of watercourses in the extreme south has little in common with northern Senegal. The area is densely populated, with rich well-watered soils and areas of tropical rainforest and mangroves. Birds are well represented, with over 200 species including a number of Palaearctic migrants and species of Afrotropical bird fauna.

The Senegal government is attempting to alleviate the consequences of drought and construction of dams etc. by reflooding areas. It is considering the possibility of creating another reserve at Palmarin in the Saloum delta areas, having recently established Gueumbeul Reserve in the Senegal delta. In addition, sections of all four wetland areas are designated national parks.

Protected Areas Legislation Until recently the Forest Code and the Code of hunting and the Protection of Nature were in force, and each protected area also had its own set of rules and regulations. National parks are seen as having three main roles, conservation, scientific research, and controlled tourism, the aim being to conserve complete ecological units in as many of Senegal's ecosystems as is possible. Presidential Decree 69-858 of 22 July 1969 made the National Parks Office responsible for all parks, under the Minister for Nature Protection. The Game and Wildlife Protection Regulations 1986 provides for a system of reserves to protect fauna.

Protected Areas Administration The National Parks Directorate and the Water and Forestry Directorate come under the direct responsibility of the Ministry of Nature Protection. There is also a National Committee to deal with poaching, and a Council of Hunting.

Sites designated under the Convention Accession 11 July 1977, with 2 sites listed at accession, another added on 3 April 1984 and another added in September 1986.

Parc national des Oiseaux du Djoudj
Bassin de la Réserve spéciale de faune du Ndiaël
Le Delta du Saloum
Réserve spéciale de faune de Gueumbeul

Government body responsible for administration of the Convention
Ministère de la Protection de la Nature, Building Administratif, Dakar

Parc national des Oiseaux du Djoudj

Location 16°30'N, 16°10'W. Situated 15km north of Ross-Bethio and about 60km north-east of Saint-Louis on the Senegal River delta, Fleuve Region, in the extreme north of Senegal.

Area 16,000ha

Degree of Protection State owned. Administered by Conservateur, Parc national des Oiseaux de Djoudj (Saint-Louis BP 80, Senegal). Total protection as a national park, with access permitted only for 'educational tourism' and scientific research. Established on 14 April 1971 by Decree No. 71-411. Enlarged from 13,000ha in 1975 by Decree No. 75-1222. Accepted as a World Heritage site in 1981. Designated as a Ramsar site in 1977.

Site Description The site comprises a vast basin in the delta of the Senegal River, with impermeable halomorphic soils forming saline flats between the main channel to the north, and the Djoudj and the Gorom channels to the south. The delta has been subject to flooding and the development of dyke systems (most recently in 1963), which have allowed longer retention of waters in the Djoudj basin than normal. This has been beneficial to the waterfowl. Salinity varies with water level from nearly fresh during winter inundations to brackish as the water level falls. Climate is Sahelian with alternate wet and dry seasons. Minimum annual precipitation 300mm, and mean annual temperature 27°C. During the dry season the site is the only naturally

verdant area in the region. The vegetation reflects the relatively low rainfall on unfavourable halomorphic soils, and is of Sahelian type with savanna dominated by spiny bushes, acacias such as *A. nilotica*, *A. raddiana* and *A. seyal*, tamarisk *Tamarix senegalensis* and *Balanites aegyptiaca*. During the rains, dense populations of *Typha* and waterlily species appear in the flooded zones. Halophytic plants such as *Salicornia* cover much of the area. Mammals include warthog *Phacochoerus aethiopicus* and West African manatee *Trichechus senegalensis*. Several species of crocodile and gazelle have been successfully reintroduced into the area.

International and National Importance The Senegal delta, along with the Inner Niger Delta (Mali) and Lake Chad, is one of the three major West African sanctuaries for Palaearctic migrants (being one of the first places with permanent freshwater south of a 2,000km stretch of the Sahara) with an estimated 3 million passage migrants in September to April. The avifauna is the main reason for establishment of the park, with some 300 recorded species. Common migrants are ducks and waders including garganey *Anas querquedula*, shoveler *A. clypeata*, pintail *A. acuta*, ruff *Philomachus pugnax* and black-tailed godwit *Limosa limosa*. Regular nesting species include cormorants *Phalacrocorax* spp., white pelican *Pelecanus onocrotalus*, white-faced tree duck *Dendrocygna viduata*, fulvous tree duck *D. bicolor*, spur-winged goose *Plectropterus gambensis*, purple heron *Ardea purpurea*, night heron *Nycticorax nycticorax*, egrets *Egretta* spp., spoonbill *Platalea leucorodia*, anhinga *Anhinga anhinga* and Arabian bustard *Otis arabs*.

Changes in Ecological Character The park includes only part of the delta. A serious concern for water management in the region is represented by the barrages built at Diama near the Senegal mouth and Manantali near the border with Mali. It is generally thought that absence of water is more of a problem than excess, and that upstream damming and proper water control could possibly help rather than harm the waterfowl populations in the sanctuary. There is intense cultivation upstream of the park, with agricultural products draining into the Gorom. Another potential problem is the construction of a road between Senegal and Mauritania. Because of the doubts over water supply, Djoudj was listed in Regina document C.3.6 as one of the 29 Ramsar sites where likelihood of major ecological change seemed greatest. The Ramsar Monitoring Procedure was operated there in 1988. The report suggested that, given the availability of water from the Diama dam, water supply problems could be overcome if all sluices were repaired and if a detailed management plan were to be adopted.

Management Practices Administration zones are coordinated by park wardens stationed in five watch posts. The park is closed for three months of the year for management purposes. There are plans for construction of a dyke around the park, so that water levels will not be affected by variations in level of the River Senegal now the barrage has been built.

Scientific Research and Facilities Research includes rodent studies, identification of new species, origin of birds, lines of migration and population dynamics (ringing studies). ORSTOM has sponsored research in the area since 1955. An eco-museum and observation hut were financed by ANCGE.

Principal Reference Material The above information is taken from Senegalese national reports to the Ramsar conferences at Cagliari 1980, Groningen 1984 and Regina 1987, supplemented by:

Dupuy, A.R. (1971). Les oiseaux et les mammifères de la cuvette du Djoudj (delta du fleuve Sénégal). *Bull. IFAN* 33 A(1): 237-248.

- Dupuy, A.R. (1971). Contribution à l'étude de l'avifaune du delta du Sénégal. *Bull. IFAN* 33 A(3): 737-753.
- Dupuy, A.R. (1971). Mission au nouveau parc national des oiseaux du Djoudj. *Notes Africaines* 132.
- Dupuy, A.R. (1972). Le parc national des oiseaux du Djoudj. *Bull. IFAN* 34 A(3): 775-81.
- Dupuy, A.R. and Suiro, P. (1983). *Les Oiseaux du Djoudj*. Parcs Nationaux du Senegal.
- Roux, F., Jarry, G., Mahéo, R. and Tamisier, A. (1976). Importance, structure et origine des populations d'Anatidés hivernant dans le delta du Sénégal. *L'Oiseau et R.F.O.* 46: 299-336 and 47: 1-24.
- Secrétariat d'Etat chargé de la nature (1974). Le parc national des oiseaux du Djoudj, Dakar.
- Thorsell, J. (1985). World Heritage Report - 1984. *Parks* 10(1):8-9. World Heritage Nomination submitted to UNESCO.

Bassin de la Réserve spéciale de faune du Ndiaël

Location 16°10'N, 16°05'W. Situated near the Senegal River delta about 12km south-east of Djoudj National Park, and 40km north-east of Saint-Louis in the extreme north of Senegal.

Area 10,000ha (basin)

Degree of Protection State owned. Administered by the Directorate for Water and Forestry. Ndiaël Fauna Reserve (46,550ha) was created by Decree No. 65/053 on 2 February 1965 to protect the rich avifauna of the Senegal delta. Designated as a Ramsar site in 1980.

Site Description The site comprises a basin with impermeable halomorphic soils dominated by a graminaceous perennial vegetation, with an abundance of annuals such as *Paspalum*, *Panicum* and *Eragrostis* spp.

International and National Importance When the area was regularly inundated in good seasons, it was particularly important for Palaearctic migrants, due to the shallow muddy water and inaccessibility for man. Avifauna is essentially similar to Djoudj National Park.

Changes in Ecological Character The construction of the Saint-Louis to Rosso road and the reservoirs of Guier Lake and Lampsar-Djeuss (for irrigation supply) involved damming of the Niet Yone, Ngalam and Bombol channels (all three of which carried water from the Senegal River to Ndiaël at the height of the flood). The Ndiaël has therefore dried up to some extent, although it still receives a small amount of water each year when the SAED (Société d'Aménagement et d'Exploitation du Delta) drains the rice plantations in the upper delta. Because of this situation, Ndiaël was listed in Regina document C.3.6 as one of the 29 Ramsar sites where likelihood of major ecological change seemed greatest. The Ramsar Monitoring Procedure was operated there in 1988. The report noted that there were two projects to restore water supplies, one funded by CIC and involving reopening of the Niet Yone channel, the other funded by IUCN and involving sustainable development of the whole reflooded area. The two are entirely complementary and should be carried out.

Management Practices The Minister for Rural Development and Hydrology has given formal instructions to agricultural organisations to release water to inundate the Ndiaël during development.

Scientific Research and Facilities No information

Principal Reference Material The above information is taken from the documents supplied by the Government of Senegal at the time of designation in 1980 and the national reports to the Ramsar conferences at Groningen 1984 and Regina 1987.

Le Delta du Saloum

Location 13°35'-13°55'N, 16°27'-16°48'W. Located 150km from Dakar, on the main road between Dakar and Banjul, and 80km from Kaolack.

Area 73,000ha. The biosphere reserve is 180,000ha, with a core zone of 73,000ha (the national park). Four-fifths of the national park is marine, whereas the biosphere reserve comprises a 72,000ha marine sector, 23,000ha of flooded areas, and 85,000ha of terrestrial islands.

Degree of Protection The core area (the national park) and part of the buffer zone are government-owned. The remainder belongs to the local community. Established as a national park by Decree no. 76-577 on 28 May 1976 and is administered by the National Parks Directorate. An international park with the Gambia is planned. The national park and its surroundings were accepted as a biosphere reserve in 1980, and the national park was listed as a Ramsar site on 3 April 1984.

Site Description The Delta of the seasonal Sine and Saloum rivers, includes many sand islands and lagoons, Sangomar point and coastal waters, and the forests of Fathala. Most of the terrestrial area of the park is covered by mangroves made up principally of four species: *Rhizophora racemosa*, *R. mangle*, *R. harrisonii* and *Avicennia nitida*; sand dunes are present, and there is open forest on sandy soils. There are islands of herbaceous populations of halophiles - *Sesuvium portulacastrum*, *Philoxerus vermicularis*, and *Paspalum vaginatum*. The distributaries of the delta at the coast are almost exclusively saline. The fauna is, however, Sudano-Sahelian and very varied, with many small mammals in the dry forest of Fathala. There are also bay colobus *Colobus badius temmincki* present. Large mammals have probably never been abundant here. It is an important nesting and wintering site for waterfowl. The climate comes between the Sudanese and the Sudano-Sahelian types characterised by a rainy season in July-October (maximum in August). The mean annual temperature is 28°C and mean annual precipitation 800mm.

International and National Importance Many seabirds nest on the deserted islands, including about 1,000 pairs each of lesser flamingo *Phoeniconaias minor* and greater flamingo *Phoenicopterus ruber*, 4,000 pink-backed pelicans *Pelecanus rufescens*, and there are ten pairs of goliath heron *Ardea goliath*. Many wintering waders use the area. On the coast species of particular note include manatee *Trichechus senegalensis* and hump-backed dolphin *Sousa teuszii*. Reptiles are well represented, predominantly by marine turtles, including olive ridley

Lepidochelys olivacea, green *Chelonia mydas*, and loggerhead *Caretta caretta*. Crocodile *Crocodylus niloticus* is also present. It is an important fish spawning ground.

Changes in Ecological Character The mangroves could be damaged by extension of rice cultivation and exploitation of forest in the Fathala area. Protection does not extend to the salt flats, nor to the whole of the Fathala forest. There are, however, proposals to include the whole of the latter within the park. Fire in the forest zone, excessive fishing, destruction of bird colonies, projects to reintroduce species such as antelope *Hippotragus* sp., and conflicts with industrial and agricultural development, could all be extremely detrimental to the area.

Management Practices The core area of the national park is surrounded by a buffer zone (which gives a total of just over 73,000ha). The classified forest zone, where exploitation is forbidden, comprises the forests of the islands of Saloum, Béhtanti, Sangako, and Fathala (around 70,000ha). Part of the groundnut lands and Point Sangomar and its fishing cooperative (around 90,000ha) are included in the buffer zone. A special faunal reserve has been established at Palmarin. Several administrative sectors are coordinated by a park conservator. There is an environmental education programme. The inhabitants of the biosphere reserve participate in its running and management through a rural council, in liaison with national park and forest service authorities. Radios have been provided by an IUCN/WWF Project to help safeguard the fish spawning grounds.

Scientific Research and Facilities There have been studies of birds and mammals, vegetation and water pollution, but little published. There is a meteorological station.

Principal Reference Material This information is taken from documentation submitted to the Ramsar Convention Bureau and the national reports presented to the Ramsar conferences at Cagliari 1980, Groningen 1984 and Regina 1987, supplemented by: IUCN/WWF Project 3113. Proposed Delta du Saloum International Park.

Larivière, J. and Dupuy, A. (1978). *Sénégal: Ses parcs, ses animaux*. Editions Fernand Nathan, Paris.

Réserve spéciale de faune de Gueumbeul

Location 15°75'N, 16°28'W. Near the coast of northern Senegal in the district of Rao, Dagana region, about 12km south of Saint-Louis. The road from Gandiole to Rao forms the southern boundary.

Area 720ha

Degree of Protection The site was made a special faunal reserve under Decree No. 83-550 of 30 May 1983. It is classified as forest estate and managed by the National Parks Service. Designated a Ramsar site on 29 September 1986.

Site Description The site comprises a lagoon about 2.5km long by nearly 1km wide, and the land about 500m around it, which forms a shallow depression. The lagoon varies in depth and salinity; in winter it is fed by rainwater and saltwater inflow from creeks of the Senegal river

and the Djeuss marsh. Many of the soils are halomorphic. Along its shores are sandy ridges with sparse thorny vegetation, dominated by acacias. There is a relict area of mangrove, one of the most northerly in Africa.

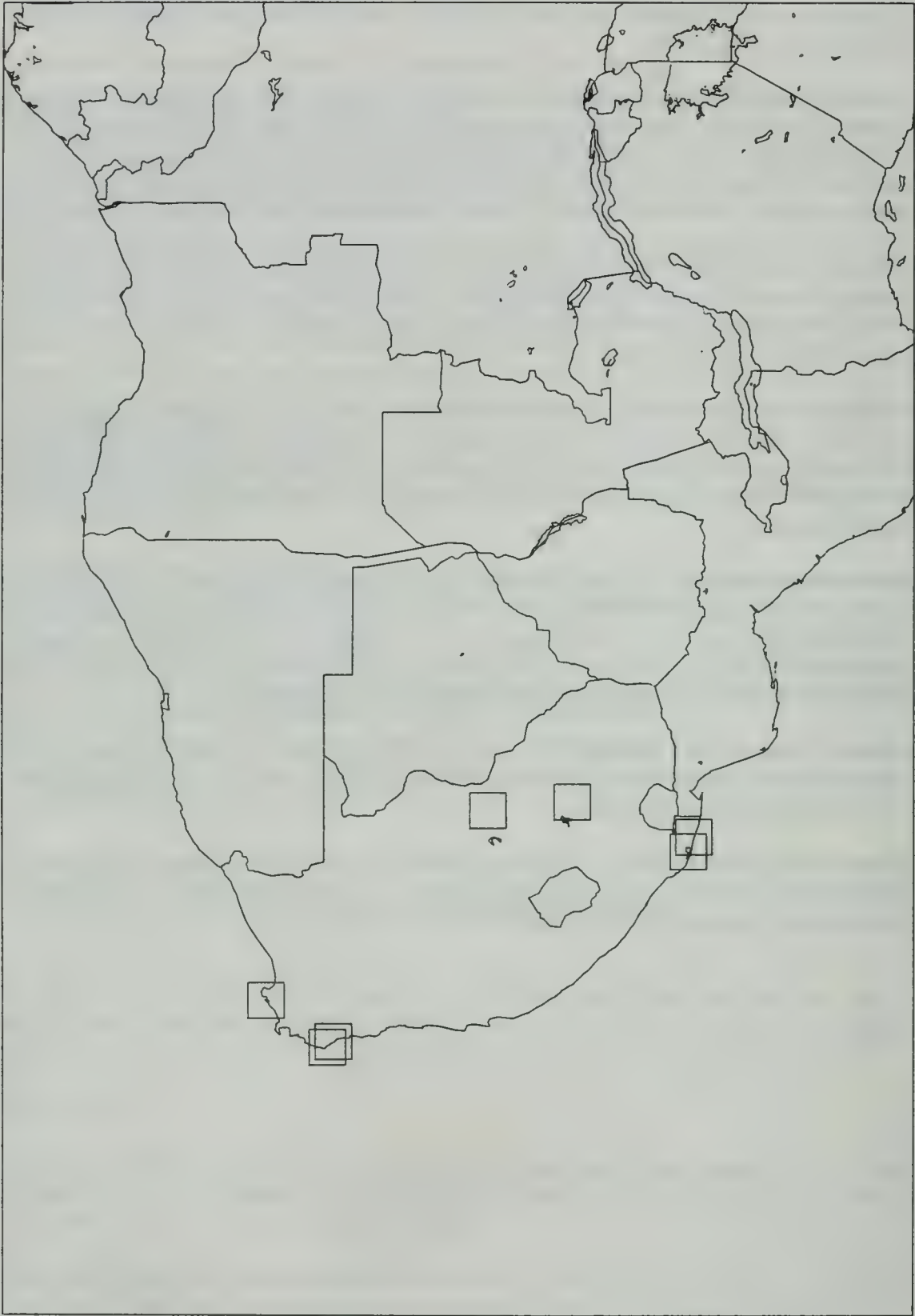
International and National Importance The site is an important wintering area for thousands of birds, particularly waders, the most important being avocet *Recurvirostra avosetta*, black-tailed godwit *Limosa limosa*, ruff *Philomachus pugnax*, greater flamingo *Phoenicopterus ruber*, grey plover *Pluvialis squatarola*, European spoonbill *Platalea leucorodia*, ringed plover *Charadrius hiaticula*, little ringed plover *C. dubius*, black-winged stilt *Himantopus himantopus*, curlew *Numenius phaeopus*, redshank *Tringa totanus* and little tern *Sterna albifrons*. Other well-represented species are African spoonbill *Platalea alba*, Kittlitz's sand plover *Charadrius pecuarius*, lesser flamingo *Phoeniconaias minor*, slender-billed gull *Larus genei*, pink-backed pelican *Pelecanus rufescens* and Senegal wattled plover *Vanellus senegallus*. Some species, including little terns, breed here.

Changes in Ecological Character The possible development for hydrological and agricultural purposes in the lower Senegal River valley may affect water quality and levels in the lagoon, and this is being investigated. The ministry responsible for water protection has considered the possibility of reintroducing animals which disappeared from this area long ago, including giraffe, gazelle and ostrich.

Management Practices Hunting, fishing and agriculture are prohibited, as are any other activities which might interfere with the environment, except when authorised by the National Parks Directorate and for scientific purposes or for disease prevention in human or animal populations. Overflying the reserve at an altitude of less than 300m is forbidden, to avoid disturbing bird flocks. Its boundaries are delimited by signs and fencing.

Scientific Research and Facilities The ringing of young little terns has been started. It is hoped that this site will add another link to the chain of reserves for migrant bird populations, and form another site for their study.

Principal Reference Material Material supplied by the Ministry of Nature Protection and National Parks of Senegal at the time of designation, and the national reports to the Ramsar conferences at Groningen 1984 and Regina 1987.



Ramsar Sites in South Africa

South Africa

Area 1,221,038 sq.km

Population 26,600,000 (1988)

Summary of Wetland Situation South Africa is a largely semi-arid country, with a mean annual rainfall of only 475mm (much of this falling on the eastern and southern coastal belts, and some of the inland mountain areas of the north). Most of the country consists of a high inland plateau with only a narrow coastal strip, and therefore there are few lowland wetland regions of any significance. Consequently, although there are 20 species of ducks and geese, this is more an indication of the variety of wetland types rather than the overall amount of wetland. Wetlands also tend to be strongly seasonal in most cases, and therefore wetlands of no apparent importance may become very significant at certain times. A direct result of the highly seasonal rainfall has been the creation of numerous artificial impoundments, many of which have become major habitats for waterfowl. Concentrations of anatids are not large by Holarctic standards, the largest only consisting of some 5,000 birds, but even these are rather unusual. The more common situation is small concentrations moving round restlessly.

Protected Areas Legislation Legislation pertaining to the establishment of conservation areas in the Republic of South Africa includes the National Parks Act of 1926 (for Kruger National Park and other national parks), the Financial Relations Consolidation and Amendment Act of 1945 (for provincial game and nature reserves) the National States Consolidation Act of 1971 (for game and nature reserves in national states), the Forest Act of 1968 and the Mountain Catchment Areas Act of 1970 (for nature reserves and wilderness areas administered by the Directorate of Forestry). The provisions of these Acts relate to the acquisition of land and the establishment and administration of various management categories of conservation area, the provision of facilities and control and prosecution of those not complying with specific regulations, etc. The numerous revisions and amendments to these acts and to provincial ordinances are reviewed by Fuggle and Rabie (1983). The Environment Conservation Act (No. 73 of 1989) makes provision for the Minister of Environment Affairs to determine the general policy to be applied with a view to protection of ecological processes and promotion of the sustained utilisation of species and ecosystems. Revision of the Water Act (No. 54 of 1956) is under consideration.

Protected Areas Administration Conservation areas in South Africa are administered by the National Parks Board, the Natal Parks Board, the Directorate of Forestry and the Nature Conservation Divisions of provincial administrations, National States and the Governments of Transkei, Bophuthatswana, Venda and Ciskei. In the Cape Province, some reserves are administered by Divisional Councils. Management objectives vary widely from area to area, but all fall within those of IUCN Management Categories I to V. The terminology used for these areas includes national park, nature reserve, game reserve, mountain reserve, public resort, nature reserve, game park, state forest, mountain catchment area and wilderness area. Due to the

continuum of differing management objectives relating to these areas, it is not possible to place individual areas into rigidly defined IUCN categories - the categories indicated should be regarded as the 'best fit' presently available. The Sub-Antarctic islands of Prince Edward and Marion are administered by the Department of Transport. Visits to the islands are only undertaken by members of research stations teams on the islands and by other visiting scientists and logistic personnel.

Sites designated under the Convention Signature without reservation as to ratification 12 March 1975, with 2 sites listed at signature, four sites added in October 1986 and one more in April 1988.

De Hoop Vlei (Cape Province)
Barberspan (Transvaal)
De Mond State Forest (Heuningnes Estuary) (Cape Province)
Blesbokspruit (Transvaal)
Turtle Beaches/Coral Reefs of Tongaland (Natal)
St Lucia System (Natal)
Langebaan National Park (Cape Province)

Government body responsible for administration of the Convention

Department of Environment Affairs, Chief Directorate: Environmental Conservation, Private Bag X447, Pretoria 0001

De Hoop Vlei

Location 34°24'-34°30'S, 20°18'-20°26'E. 56km from Bredasdorp in the Cape Province.

Area 750ha (within a provincial nature reserve of 5,168ha)

Degree of Protection An area originally established to breed game for the restocking of farms was established as De Hoop Nature Reserve in 1956, and is administered and managed by the Department of Nature and Environmental Conservation. A part of this, which includes most of the eastern shore of the vlei, some of the western bank and parts of the vlei itself, is known as De Hoop Wildproefplaas. The Ramsar site was expanded on 2 December 1986 to include "all of the vlei between the causeway at Apolsfontein in the north and Die Mond in the south".

Site Description The vlei is a coastal lake, formed when the mouth of the Sout River was blocked by coastal dunes, and it still contains some estuarine organisms. The river is more like a rivulet and only flows in the winter months (the wet season), when the area receives 40-50mm of rainfall, mostly between March and October. The lake is 16km long by 0.5km wide on average, with a surface area of 750ha when full. Its depth varies considerably from a maximum during periods of flooding (in 1906 and 1957) to drying out completely, which has happened at least once this century. Its salinity can also vary from salt to fresh eutrophic conditions, and changes may be very rapid, from 50 to 3 parts per 1,000 of salt in two months. During years of flooding, vast areas to the south-west of the vlei are inundated and flooded conditions may persist for several years. The northern end of the vlei lies in a gorge with high limestone sides which

extend as a low cliff along the eastern side of the southern part of the vlei. The southern portion of the western bank is a gradually shelving shore of sand.

Marginal vegetation is scarce due to the changing water levels, but a few areas of reedbeds of *Phragmites australis* are present, mostly around freshwater springs. There are extensive underwater beds of *Potamogeton pectinatus* and some areas of *Chara stachymorpha* and *Ruppia* spp. On the exposed bed of the vlei *Salicornia* species are dominant. The vegetation of the surrounding area is coastal macchia and white milkwood *Sideroxylon inerme* trees are common along the lake shore. Birds are the most prominent constituent of the fauna, and 228 species have been recorded from the whole of De Hoop Nature Reserve, at least 75 of which are dependent on wetlands. An abundance of zooplankton has been recorded in the lake with the small whelk *Tomichia ventricosa* in the benthos. There is one indigenous fish, Cape kurper *Sandelia capensis*, but tilapia *Oreochromis mossambicus* has been introduced and now occurs in large numbers. Cape clawed frog *Xenopus laevis* is common, but water turtles *Pelomedusa subrufa*, which were present in large numbers until the 1960s, have become a rarity. A variety of large mammals are present in the nature reserve as a whole.

International and National Importance The De Hoop Vlei area is well known as the only breeding site in South Africa of greater flamingo *Phoenicopterus ruber* in 1960 and 1963, during the recession of the 1957 floods. The nesting colonies were to the west and south-west of the vlei, outside the nature reserve, but associated with flood waters from the lake. Greater flamingo do, however, use the vlei as feeding habitat, and up to 1,473 individuals have been recorded. A number of other bird species which only breed at a few sites in South Africa use the vlei as feeding habitat and it is critical habitat for a number of other bird species (maximum numbers in brackets): white pelican *Pelecanus onocrotalus* (60), black stork *Ciconia nigra* (14), lesser flamingo *Phoeniconaias minor* (1,715), caspian tern *Hydroprogne caspia* (11) and occasional little bittern *Ixobrychus minutus* and chestnut-banded sand plover *Charadrius pallidus*. It is also of great value to a number of other wetland dependent birds, including yellow-billed duck *Anas undulata* (4,626), Cape shoveler *A. smithii* (3,004, over 6% of the world population), both of which also breed on the vlei, red-knobbed coot *Fulica cristata* (24,400 and more than 10,000 regularly present) and Egyptian goose *Alopochen aegyptiacus* (2,166). The number of birds visiting and breeding varies considerably with water levels and salinity, but the most numerous species at all times is red-knobbed coot.

Changes in Ecological Character The development of the Overberg Missile Testing Range is not likely to result in any significant disturbance to the avifauna of the vlei, and the impact of missile testing will be monitored and kept within the strict requirements that have been laid down. The upper part of the lake's catchment is not protected, and the possibility of increased eutrophication from polluted runoff containing fertilisers or pesticides needs investigation. Veld fires, which originate on adjacent farmland, are a further problem which is compounded by unsatisfactory boundary alignments.

Management Practices Until recently, only a part of the lake was included in De Hoop Nature Reserve, but protection has recently been extended to include the whole lake. Dykes built along its edge are to be removed. Facilities for conservation education were established in the area in 1982. A hiking trail of about 70km encircles the nature reserve and private vehicles can be driven in certain parts of this reserve, although access to other areas is restricted.

Scientific Research and Facilities A major research programme was begun in 1984 to monitor the effect of the Overberg Missile Testing Range on the flora and fauna, and also on the effects of possible pollution. Monthly counts of waterfowl have been made since May 1979. For De Hoop Nature Reserve as a whole, a complete fauna list of vertebrates is available, a floristic list is being compiled, and studies and classification of the vegetation have been completed or are in progress. No special research facilities are available, although there is accommodation for visiting scientists in the nature reserve.

Principal Reference Material The above information is taken from documents submitted by the Government of South Africa at the time of designation in 1975, and at the time of extension in 1986, and from the South African reports to Ramsar conferences. Supplemented by:

Greyling, T. and Huntley B.J. (Eds) (1984). Directory of southern African conservation areas. *South African National Scientific Programmes Report* No. 98. Council for Scientific and Industrial Research, Pretoria, South Africa.

Reader's Digest (1983). *Illustrated guide to the Game Parks and Reserves of Southern Africa.* Reader's Digest Association of South Africa, Cape Town.

Uys, C.J. and Macleod, J.G.R. (1967). The birds of the De Hoop vlei Region Bredasdorp, and the effect of the 1957 inundation over a 10-year period (1957-1966) on the distribution of species, bird numbers and breeding. *Ostrich* 38(4):233-254.

Barberspan

Location 26°33'-26°37'S, 25°32'-25°36'E. Situated 15km north-east of Delareyville in the Transvaal Province.

Area 3,118ha

Degree of Protection The designated site includes a provincial nature reserve of 3,118ha. The protected area includes land up to 1.6km from high water mark. The south-east of the pan is set aside for anglers. Designated as a Ramsar site in 1975.

Site Description Barberspan is a shallow depression (maximum depth 9.6m) in the fossil course of the Harts River, and was formed by the prevailing northerly winds and herds of springbok and other animals trampling the bottom of the waterhole. Water supply is supplemented by the Hart River along the fossil course. Overflow reaches the Vaal River via Schweizer-Reneke. Barberspan is a highly alkaline perennial lake subject to considerable fluctuations in water level due to its large area and shallowness. Annual average temperature range: minimum 9°C, maximum 27°C. Annual rainfall is 557mm, falling mainly in summer (October to April). The grassland landscape is characterised by absence of any marked physiographic features, and can be described as a great undulating plain. Marginal vegetation is normally unable to keep up with the advance and retreat of the water level. Aquatic surface vegetation is primarily rafts of *Potamogeton pectinatus*. The marginal vegetation is comprised of rushes (Juncaceae) and sedges (Cyperaceae). Karroid encroachment is notable on one shore. The lake has rich zooplankton and phytoplankton, but poor benthic levels due to a bare limestone substrate. Fauna occurring at the site include: mammals - blesbok *Damaliscus dorcas phillipsi*, red hartebeest *Alcelaphus buselaphus*, Burchell's zebra *Equus burchelli*, and black wildebeest

Connochaetes gnou; reptiles - striped long-tail lizard *Nucras taeniolata ornata*, Cape thick-toed gecko *Pachydactylus capensis capensis*, aurora housesnake *Lamprophis aurora*, leopard tortoise *Geochelone pardalis babcocki*, serrated tortoise *Psammobates oculifer*, and ring-necked spitting cobra *Hemachatus haemachatus*.

International and National Importance Barberspan is very important as a stopover site for waterfowl, with over 320 recorded species, including Palaearctic species red knot *Calidris canutus* and black-tailed godwit *Limosa limosa*. Species present include all indigenous waterfowl species except the tropical dwarf goose *Nattapus auritus*. Barberspan is the only locality in the Republic of South Africa where pintail *Anas acuta* has been recorded. Some waterfowl species breed in the wetland. Species found here which are regarded as endangered in South Africa include: South African hedgehog *Erinaceus frontalis*, striped weasel *Poecilogale albinucha*, Peregrine falcon *Falco peregrinus*, fish eagle *Haliaeetus vocifer*, openbilled stork *Anastomus lamelligerus*, goliath heron *Ardea goliath*, pink-backed pelican *Pelecanus rufescens*, white pelican *Pelecanus onocrotalus*, Caspian tern *Hydroprogne caspia*, and yellow-billed stork *Mycteria ibis*.

Changes in Ecological Character None reported

Management Practices There is an observation hide for visitors, and a bird-watcher's trail is being developed on the shore of the pan. There is one nature conservator and 16 labourers.

Scientific Research and Facilities Migration patterns are monitored by staff of the research station.

Principal Reference Material The above information is taken from the documents supplied at the time of designation in 1975 and from South African reports to Ramsar conferences, supplemented by:

Greyling, T. and Huntly B.J. (Eds) (1984). Directory of southern African conservation areas. *South African National Scientific Programmes Report No. 98*. Council for Scientific and Industrial Research, Pretoria, South Africa.

Hutchinson, G.E., et al. (1932). A contribution to the hydrobiology of pans and other inland waters of South Africa. *Arch Hydrobiology*, 24, 1-136.

Reader's Digest (1983). *Illustrated guide to the Game Parks and Reserves of Southern Africa*. Reader's Digest Association of South Africa, Cape Town.

De Mond State Forest (Heuningnes Estuary)

Location 34°41'-34°45'S, 20°05'-20°10'E. On the edge of the Indian Ocean, 25km from Bredasdorp, Cape Province.

Area 1,318ha (two adjacent sites of 918ha and 400ha)

Degree of Protection De Mond Nature Reserve was created on 27 March 1975 under Section 7 of the Forest Act 1968 from an area of the larger De Mond State Forest, to preserve the fauna

and the coastal macchia vegetation. The nature reserve includes Heuningnes Estuary and some of the dunes to either side, and forms the Ramsar site designated on 2 October 1986.

Site Description The site includes the southernmost estuary in Africa, formed where the Heuningnes River reaches the sea through a double ridge of sand dunes. It is situated on the flat coastal plain of Bredasdorp where many of the river channels are ill-defined, and long periods of heavy precipitation can cause extensive flooding. At other times river flow can be insufficient to keep the mouths open. This area has a Mediterranean type climate with a rainfall of about 500mm, mostly falling in winter (May to September). In January the daily temperature range is 15°C-28°C and in July 6°C-17°C. In its natural state, water in the lower estuary tended to dam up behind the dune barrier which was periodically breached during flood discharge from the Heuningnes river, and an elongated lagoon about 2.5km long used to form between the dune ridges. However, extensive flooding also occurred in the hinterland, which was becoming used for farming, and in 1937 the Department of Agriculture and Forestry began to take steps to keep the river mouth open. The sand dunes on either side of the estuary, and the dune spit to the north, are now artificially stabilised by planting exotic marram grass *Arenaria ammophila* which disappears as indigenous species take over. This prevents sand migrating across the mouth and blocking the channel. Dune areas and pebble slacks behind the beach are important for nesting terns. The landward face of the inner dune has become colonised by coastal macchia scrub, and there are some wooded areas. The mouth of the estuary comprises an extensive bay with sand and mudflats, and three areas of tidal salt marsh on sandy substrate dominated by *Limonium* spp., *Salicornia* spp. and *Sarcocornia* spp. However, through the construction of road protection levees, tidal activity has been reduced and these areas are becoming invaded by terrestrial species such as *Tetragonia decumbens* and *Chrysanthemodes monilifera*. Further upstream there are salt marshes on muddy substrate with species such as *Sarcocornia perennis*, *S. decumbens*, *Chenolea diffusa*, *Suaeda maritima*, *Limonium scabrum* and *Juncus kraussi*. There is a tidal influence 12km upstream but a causeway 1.3km from the sea obstructs the tidal flow considerably in the upper reaches. Patches of reedbeds *Phragmites australis* occur in places along the river banks. Flood plain vegetation above the marshes is heavily grazed. Owing to the turbidity of the water in the estuary aquatic plants are scarce, but a species of *Ruppia* does occur and there are a number of marine fish which are an important food source for terns, and seahorse *Hippocampus* sp. occurs here.

International and National Importance This area is one of the few confirmed breeding sites of Damara tern *Sterna balaenarum* in South Africa. This species breeds mainly in Angola and to a lesser extent in South Africa, in which there are only two breeding sites protected by nature reserves. An estimated 15% of the national population of the species can be found in this wetland including 5-7 breeding pairs. Several pairs of Caspian tern *Hydroprogne caspia* also breed regularly, and there is a large colony of kelp gull *Larus dominicanus* (about 300 pairs). Other breeding birds include black oystercatcher *Haematopus moquini*, blue crane *Tetrapteryx pardisea*, Kittlitz's sand plover *Charadrius pecuarius* and Egyptian goose *Alopochen aegyptiacus*. A small number of waders also use the lower estuary, with about 600 birds recorded in January 1981 of about ten migrant and three resident species. As the most southerly estuary in Africa, the site is scientifically important for species distribution extremities, including the southernmost records of tropical species like ginger prawn *Penaeus japonicus*, giant mud crab *Scylla serrata* and a gastropod *Nerita albicilla*.

Changes in Ecological Character The practice of artificial dune stabilisation has reduced the potential Damara tern nesting habitat, but this is being curtailed. There is increasing pollution

from agricultural activities upstream as pesticides and fertilisers are widely used on the farmland further inland. Recreational use and coastal development pressures are increasing, and the use of two, three and four-wheeled vehicles is an increasing problem in the dunes, and a severe threat to the nesting of Damara terns.

Management Practices The mouth of the estuary is kept open by dune stabilisation and also by brushwood abutments either side of the river channel. This prevents the ecosystem stagnating, prevents flooding of farmland further inland during periods of high rainfall, and also benefits Damara terns which feed on the marine fish of the estuary. However, dune stabilisation measures are now limited to maintenance work to allow the maximum area of bare ground for Damara tern nesting habitat. No areas are planted within 300m of tern nesting sites, which are mostly in the dunes immediately behind the beach. The breeding bird colonies are monitored. Public access for recreation and fishing is controlled by a permit system, but this does not extend below the high tide mark. No camping or power boating is allowed within the nature reserve. A burning system on a 8-15 year rotation may be introduced to encourage a diverse indigenous flora. The possibility of closing the estuary mouth in the event of an oilspill is envisaged. Stricter control of vehicles in the dunes is planned. The land upstream of the state forest has been declared a private nature reserve, and a local landowners' association, the Heuningnes Riparian Owners Association, has been formed which is sympathetic to the aims of conservation.

Scientific Research and Facilities Many aspects of the estuary's ecology have been studied, including the requirements of the Damara tern, and censuses of waterbirds have been undertaken. A detailed report (Bickerton, 1984) has been produced in the Estuaries and Coastal Research Unit (ECRU) series on this estuary.

Principal Reference Material The above information taken from documents supplied by the Government of South Africa at the time of designation and from South African national reports to Ramsar conferences, supplemented by:

Bickerton, I.B. (1984). *Estuaries of the Cape. Part II: Synopses of Available Information on Individual Systems. Report No.25 Heuningnes Estuary.* National Research Institute for Oceanology Council for Scientific and Industrial Research: Stellenbosch.

Blesbokspruit

Location 26°12'-26°23'S, 28°30'E. In Springs district, about 3km east of the town of Springs, province of Transvaal.

Area 1,858ha

Degree of Protection In the early 1970s an area of about 500ha of marshland at the southern end of the vlei was donated by Marievale Consolidated Mines to the Transvaal Division of Nature Conservation to be managed as a bird sanctuary (provincial nature reserve). A further 385ha was donated in 1976. An agreement entered into in the mid-1980s between the Anglo-American Corporation and the Transvaal Provincial Administration made an area of the farm Grootvaly, at the northern end, to be managed as a reserve. The area includes the entire Marievale Bird Sanctuary of 1,009ha, the remaining area being in private ownership. This is the only listed

wetland in South Africa which includes privately owned land. The Ramsar site was designated on 2 October 1986.

Site Description The Blesbokspruit is a typical highveld vlei at an altitude of 1,600m dominated by common reed *Phragmites australis* and greater reedmace *Typha latifolia*, with some *Juncus* and *Cyperus* species. To the north of Springs the spruit flows through a wide grassy valley which is probably the historical condition of the whole valley. Between Springs and Marievale Bird Sanctuary, water levels in the spruit are artificially maintained by embankments and by mining, industrial and municipal effluents. Pollution from these also produces highly eutrophic water conditions favoured by the vast reedbeds which provide habitat for a variety of birds. The permanently waterlogged parts are fringed by a band of *Paspalum dilatatum*, and the drier areas also have grasses but no trees. An important food plant for geese, *Alisma plantago*, also occurs, and there are patches of *Potamogeton* sp. in places.

International and National Importance No information

Changes in Ecological Character The natural condition of much of the vlei has been modified, although this has increased the site's suitability for a number of species. There is siltation from gold mining spoil, and pollution from industrial and domestic sources. Possible threats include excessive abstraction of water, and the channelling of additional water into the vlei via canals, both of which could alter water levels. Urban encroachment and low overflying by aircraft could also become problems.

Management Practices Water levels are largely controlled, mainly by the Ergo causeway sluice at Daggafontein. Some of the area is fenced and patrolled by game guards. Fire breaks are maintained by controlled burns and cutting. Herbicides are used on some of the vlei vegetation and for fence protection. Game are introduced, but alien animals and plants, including cats and dogs, are eradicated. Vlei water is used for irrigation. Hunting was once very popular along the spruit but is now prohibited over most of the land, although there is still an annual duck shoot at Daggafontein which is strictly controlled by the landowners. Some quarry pits are scheduled for rehabilitation. Urbanisation in the surrounding area is increasing and it has been recommended that the whole area should be fenced to control access. The popularity of Marievale Bird Sanctuary at the southern end attests to the vlei's potential for recreation and education. Here, there are bird-watching hides and picnic facilities. Similar developments are planned at Grootvaly at the northern end, and interpretive centres are proposed for both areas. The vlei is part of the proposed Blesbok hiking trail.

Scientific Research and Facilities Research has included a study of the capability of reedbeds to remove heavy metals and suspended solids over a distance of 20km. The site is within one hour's drive of South Africa's two largest universities. Scientists from these have produced a number of reports, particularly on waterbirds and the effects of mining activities on their habitat.

Principal Reference Material The above taken from documents supplied by the Government of South Africa at the time of designation and from South African national reports to Ramsar conferences.

Turtle Beaches/Coral Reefs of Tongaland

Location 25°51'-28°08'S, 32°33'-51'E. On the coast of Natal province, stretching from just south of Cape Vidal northwards to the border with Mozambique.

Area 39,500ha, being the area of St Lucia Marine Reserve

Degree of Protection State owned. The site consists of two contiguous areas, St Lucia Marine Reserve and proposed Maputaland Marine Reserve. Although it would appear that both sites will eventually be included in the list, only the area of St Lucia Marine Reserve has been given by the authorities. St Lucia Marine Reserve lies between low water and 5km offshore, along 79km of the Maputaland coastline. The reserve was proclaimed in Government Notice R312 of 23 February 1979 under the Sea Fisheries Act No. 58 of 1973 which defines the areas and lays down regulations for the control of the capture or disturbance of almost all marine life (excluding seals and sea birds). The other site runs from the northern boundary of the current reserve, some 51km north to the border with Mozambique and is also some 5km wide. Designated a Ramsar site in October 1986.

Site Description The site comprises an extensive area of coastal waters lying along the coast of Maputaland. This area is the only really subtropical part of the South African coastline. Conditions favour the growth of corals, reef fish and a variety of Indo-Pacific fauna and flora, but true reef formation does not occur to a marked degree this far south. Although virtually indistinguishable from true reefs, the coral communities consist of an encrustment of sandstone reefs. These are composed of a sandy calcarenite which represents lithified cores of former coastal sand dunes. They are abundantly colonised by corals and other groups of benthic and pelagic biota normally associated with true coral reefs, and are in particular found off Sodwana, Jesser Point, and at a further four localities, between Jesse Point and Leven Point, north of Lake St Lucia, and lie 1-2km offshore. The most extensive community is on Leadman shoals, north of Leven Point. The area is an important transition zone between true reef areas and areas where luxuriant reef communities occur on non-limestone substrates. In total 16 coral species are listed for St Lucia Marine Reserve. It is estimated that some 1,200 fish species are to be found off the Maputaland coast, five marine turtles (*Eretmochelys imbricata*, *Chelonia mydas*, *Lepidochelys olivacea*, *Caretta caretta* and *Dermochelys coriacea*) and sea snake *Pelamis platurus* are also recorded. Some 41 marine mammals are thought to occur in these waters, including possibly dugong *Dugong dugon*. Forty-nine species of bird have been identified. The littoral waters of Maputaland are generally clear with visibility up to 50m. Prevailing winds are mainly north-easterly and south-westerly, and the dominant current throughout the year is the Agulhas Current which flows southwards from Mozambique. Mean sea water temperature for Maputaland is 26.5°C, and temperatures rarely fall below 20°C.

International and National Importance Although only the sea below the low tide mark is listed, adjacent shorelines are protected and it is this coastline system as a whole, with its associated coral reefs, intertidal zone and turtle breeding areas, which is in a natural undisturbed state, and which is of particular importance. Several of the species which use the area are threatened, including some of the cetaceans, dugong, and all five turtle species.

Changes in Ecological Character The number of visitors to adjacent protected areas on the coast is increasing, particularly at Sodwana Bay, where there were some 36,000 visitors in 1982-83. Pressures from boating, fishing, diving and other water sports are increasing. The area is generally away from industrial development, although pollution from oils spills might be a possibility. The South African report to the Montreux Conference 1990 indicates that an application for an open cast dune mining operation is being considered by the Department of Mineral and Energy Affairs. The dunes to be mined are the coastal dunes which form the interface between the St. Lucia System and the Turtle Beaches and Coral Reefs of Tongaland. Besides the destruction of the biotic environment in the immediate area, possible major impacts will be made on the groundwater hydrology, which will adversely affect a far greater area of the wetlands than just the mine. The impacts of the necessary infrastructure might also be considerable.

Management Practices The Natal Parks Board manages the marine reserve, the boundaries of which are marked by beacons at each end. Within this reserve is a sanctuary area, indicated by notices. Access for vehicles to the beach is controlled by permit, which ensures that only suitable vehicles use the area, and gives staff an opportunity to give information. The management plan for St Lucia Marine Reserve includes a proposed system of zoning, but these and many other proposals refer to the coastal strip rather than to the designated wetland.

Scientific Research and Facilities Policy is to conduct such research as is necessary for the effective management of the reserve. Ongoing work includes turtle monitoring programmes, survey of marine benthic algae, and marine molluscs, and monitoring of shark movements. Research is carried out by a variety of organisations, including the National Parks Board.

Principal Reference Material This information is compiled from documents provided when the site was designated, and from South African reports to Ramsar conferences, supplemented by the *St Lucia Marine Reserve Management Plan*, and material collected during compilation of the *IUCN Directory of Coral Reefs of International Importance*.

Additional References:

- Bruton, M.N. and Cooper, K.H. (Eds) (1980).** *Studies on the Ecology of Maputaland*. Rhodes University Press, Grahamstown.
- Crass, R.S. (1976).** A historical review the of St Lucia system and its management problems. St Lucia Scientific Advisory Council Workshop Meeting, Charles Creek, February (1976). Natal Parks Board, Pietermaritzburg.
- Taylor, R.H. (Ed) (1982).** St Lucia research review. NPB publication.

St Lucia System

Location 27°37'-28°30'S, 32°22'-34°E. On the Natal coast, between the Umfolozi Swamps just south of the Mfolozi River in the south, to the Mkuze River in the north.

Area 155,000ha

Degree of Protection Mainly state owned. The site includes St Lucia Game Reserve (36,826ha), False Bay Nature Reserve (2,247ha), St Lucia Park (12,545ha), and all or part of several state forests. St Lucia Game Reserve has existed in some form or another for about 90 years, and there are proposals for its extension. Designated a Ramsar site in October 1986, and contiguous for some 25km with Tongaland Coast Ramsar site.

Site Description The site extends from the southern boundary of the Umfolozi Swamps, and includes the whole of the St Lucia lagoon system (including False Bay) and the swamps along the lower Mkuze River. Also included is the whole area between St Lucia Lake and the coast, and the coastal habitats south to the Umfolozi Swamps. The site therefore largely comprises flat to undulating sandy country around a lagoon-estuary complex, lying behind a system of coastal dunes with steep seaward slopes. Lake St Lucia covers some 30,000ha, and is separated from the sea by a strip of land between 2km and 11km in width. Recent wind-blown sands and alluvial sediments cover much of the area, while pans and vleis have high peat and clay content. Vegetation types consist primarily of coastal grassland dominated by *Themeda triandra*, *Aristida junciformis*, and hygrophilous species such as *Sporobolus subtilis* and *Acroceras macrum*. There is dune forest with *Mimusops caffra*, *Diospyrus natalensis* and *Ziziphus mucronata*, and the area includes the highest forested dune within South Africa. Marshland is dominated by *Phragmites australis* and *Cyperus papyrus*, groundwater forest by *Barringtonia racemosa*, *Ficus hippopotami* and *Syzygium cordatum*, and the woodland by *Terminalia sericea*, *Acacia* spp., and *Trichilia emetica*. Sections of the lake shore are lined by mangroves. Pans, reed and sedge swamp are dominated by *Eleocharis dregeana* and *Fuirena* spp. Mean annual temperature range minimum 12-20°C, maximum 20-30°C. Annual rainfall 2,000mm falling mainly in summer (October-April).

International and National Importance The St Lucia System is the largest estuarine system on the African continent, and the wetland forms a critical habitat for a large number of species and several communities. It contains, for example, the largest hippopotomus *Hippopotomus amphibius*, crocodile *Crocodylus niloticus*, white-backed pelican *Pelecanus onocrotalus* and pink-backed pelican *Pelecanus rufescens* populations in South Africa, as well as extensive *Cyperus papyrus* swamps, and *Barringtonia racemosa* swamp forest. The wetland has extremely high productivity, and is regarded as an outstanding area for wildlife. Over 350 species of bird have been recorded within the area, including at least 20 species of ducks and geese, two flamingo *Phoenicopterus ruber* and *Phoeniconaias minor*, and some 15 herons and egrets.

Changes in Ecological Character Development within the catchment area has had some effect on water quality and quantity. This, and the resulting increased salinity, has affected animal and bird populations to some extent. Other disturbances include poaching, and part of the Sodwana state forest is used for missile testing (which has led to problems with fires). On the shore, there has been some disturbance by off-road vehicles, but this is not thought to be a problem at this stage. The South African National Report to the Montreux Conference 1990 indicates that an application for an open cast dune mining operation is being considered by the Department of Mineral and Energy Affairs. The dunes to be mined are the coastal dunes which form the interface between the St. Lucia System and the Turtle Beaches and Coral Reefs of Tongaland. Besides the destruction of the biotic environment in the immediate area, possible major impacts will be made on the groundwater hydrology, which will adversely affect a far greater area of the wetlands than just the mine. The impacts of the necessary infrastructure might also be considerable.

Management Practices Attempts to counter the problems from changed use of water in the hinterland have resulted in various actions being taken over the years to maintain the St Lucia system, including digging and dredging channels and diverting river waters. Continued remedial action is still necessary to maintain the site in its present condition. There is a management plan covering this area, which discusses both management policy and needs within St Lucia.

Scientific Research and Facilities Extensive research has been carried out in this area over many years, and it would not be possible to describe this in detail. There are limited laboratory facilities within the area. Taylor (1982) provides a review of research activities within the St Lucia area.

Principal Reference Material This information is compiled from documents provided when the site was listed, and from South African national reports to Ramsar conferences, supplemented by the *St Lucia Marine Reserve Management Plan*, and:

Greyling, T. and Huntley, B.J. (1984). Directory of southern African conservation areas. South African National Scientific Programmes REport No. 98. CSIR, Pretoria.

Additional References:

Bruton, M.N. and Cooper, K.H. (Eds) (1980). *Studies of the Ecology of Maputaland*. Rhodes University Press, Grahamstown.

Taylor, R.H. (Ed) (1982). St Lucia research review. NPB publication.

Taylor, W.M. (1984). Recreational utilization of the greater St Lucia area. NPB report.

Langebaan

Location 33°06'S, 18°01'E. Situated 100km north of Cape Town on the west coast, adjoining the town of Langebaan.

Area 6,000ha

Degree of Protection The site is part of West Coast National Park and is protected through a series of use zones and catch restrictions. It was added to the Ramsar list on 25 April 1988.

Site Description The national park is composed of the following sites: (1) the islands Malgas (18ha), Jutten (43ha), Marcus (17ha) and Schaapen (29ha); (2) precincts of the lagoon (46ha); (3) the lagoon up to the high-water mark, and including the marshlands and Geelbex annex (5,700ha); (4) a section of Sixteen-mile Beach bordering the farm of Stofbergfontein (100ha) and an area of 10.8km on Sixteen-mile Beach between the high-water and low-water marks. The vegetation of the area can be divided into three main groups: (1) typical Benguela or West Coast marine algal flora; (2) typical saltmarsh communities; and (3) various terrestrial vegetation communities. The verges of the lagoon are always lush with blue-green salt marsh succulents and dense stands of bullrushes, reeds and freshwater bog vegetation. Introduced perennials are not often encountered and alien plants such as rooikrans *Acacia cyclops* are confined to the main access routes. Primary production of phytoplankton shows seasonal and spatial variations increasing from 261.6 mg C/m/day in winter to 675.4 mg C/m/day in summer. Production rates ranged from 611.0 mg C/m/day at the entrance of the lagoon to 162.6 mg C/m/day at the head

of the lagoon. Algal flora is basically of the South African west coast: modifications are imposed by protections from wave stress. Over 71 species of different marine algae have been recorded (13 of Chlorophyta, 10 of Phaeophyta and 48 of Rhodophyta).

Small mammals inhabit the area, including shrew, four-striped grass mouse *Rhabdomys pumilio*, Namaqua rock rat *Aethomys namaquensis*, gerbil, bush karoo rat *Otomys unicoloratus*, vleirat *O. irroratus*, Cape dune mole-rat *Bathyergus suillus*, blesmole (Cape mole) *Georchus capensis*, Cape golden mole *Chrysochloris asiatica*, and Grant's desert mole *Eremitalpa granti*. Other mammals include large-toothed rock hyrax *Procavia capensis*, scrub hare *Lepus saxatilis*, Cape hare *L. capensis*, caracal *Felis caracal*, Cape grey (Egyptian) mongoose *Herpestes ichneumon*, water (marsh) mongoose *Atilax paludinosus*, large-spotted genet *Genetta tigrina*, Cape fox *Vulpes chama*, black-backed jackal *Canis mesomelas*, Cape polecat (zorilla) *Ictonyx striatus*, Cape porcupine *Hystrix africae-australis*, grysbok *Raphicerus melanotis*, duiker *Sylvicapra grimmia* and steenbok *Raphicerus campestris*. At the northern entrance of the lagoon the intertidal sands have a poor (benthic) fauna, but the subtidal banks are very rich. The sandflats in the middle of the lagoon show an increased diversity in intertidal fauna with Upogebia (a gastropod) common in muddy areas, while Callipana (an anomurid crustacean) is abundant in the sandflats, as are polychaetes, crustacea and molluscs. The clear waters of the lagoon provide little protection for fish and they are therefore not abundant. Once haarders *Lizaramada* and maasbankers *Trachurus trachurus* were thought to breed in the weed beds of Langebaan Lagoon. It is now known that most of these fish spawn at sea and only a few, commercially less important, species spawn within the lagoon. The lagoon does play an important role as a nursery for the development of post-larval, juvenile fish. Gobies *Gobiidae*, klipfish *Clinidae*, pipefish *Syngnathidae* and silversides *Atherina breviceps* are more in evidence than popular angling fish like kabeljou *Johonius hololepidotus*, white steenbras *Lithognathus lithognathus*, dassie *Diplodus sargus* and red roman *Chrysoblephus laticeps*. Skate, ray and small shark are common in the lagoon. Langebaan is a well-documented fossil site and over the last 25 years a large number of fossils, representing over 200 invertebrate and vertebrate species, were discovered here. They provide an insight into the nature of African fauna during the early Pleiocene.

International and National Importance The marsh and sandflats of the bay support up to 50,000 waders of 23 species in summer, most of them long-distant migrants from the far north: Greenland, northern Europe and Siberia. Others, such as white-fronted sand plover *Charadrius marginatus* are resident and can be seen all year. Bird types include cormorants, gulls, common sandpipers, sanderlings, knots, turnstones, plovers, gannets and flamingos. North of the lagoon lie the five islands of Saldanha Bay, which provide a home for nearly a quarter of a million seabirds. Malagas Island, Jutten and Marcus all hold thousands of jackass penguins *Spheniscus demersus*. Schaapen Island, opposite Langebaan village, has the largest known breeding colony of kelp gull *Larus dominicanus* in southern Africa. Saldanha Bay-Langebaan is one of the best sites for bird-watching and bird study in the south-western Cape. It boasts the greatest number of birds. The area is also of historical importance as the bay became an early maritime stop-over and was the site of several naval encounters.

Changes in Ecological Character The area is threatened by large-scale pollution from industry, urbanisation and shipping. The site may be detrimentally affected by the red iron-rich dust from the nearby ore-loading terminal and with the heavy maritime traffic there is the possibility of a damaging oil spill. Recreation pressure is a factor which, if not properly regulated, may degrade the national park.

Management Practices Key management of the park is through a system of zonation. There are five management zones with varying degrees of controlling regulations: Zone A includes the third of the lagoon closest to the entrance to Saldanha Bay and is zoned as a multi-purpose recreational area in which the use of motorboats, sailboats and waterskis is permitted; Zone B is the middle third of the lagoon in which powerboats and angling are prohibited. The zone is chiefly used for sailing and windsurfing; Zone C is the head of the lagoon and is a wilderness area in which no visitors are allowed. Sixteen-mile Beach is also a wilderness area and no vehicles are allowed on the beach or adjacent dunes. Visitors to this area have to obtain prior permission from the park warden. The islands (Schaapen, Malgas, Jutten and Marcus) are also managed as wilderness areas in which unauthorised entry is prohibited. Six fish species are regulated by the minimum size catchable and three are protected through the maximum number which may be caught in one day. Similar restrictions relate to shellfish and rock lobster. Adjoining the park is Donkergat training area used by the South African Defence Force. This area is strictly restricted, not least due to training with live ammunition. Future management practices are stated to be the preservation and consolidation of the areas already under the control of the National Parks Board and the acquisition of surrounding areas to be incorporated within the national park, as part of the contractual national park concept.

Scientific Research and Facilities The site, especially the four islands, has been the subject of research programmes by the Fitzpatrick Institute, Zoology Department of the University of Cape Town and the Sea Fisheries Research Institute. Fitzpatrick Institute researchers were resident on Marcus Island from 1977 to 1984. Studies by the Institute included monitoring of jackass penguin reproduction success, assessments of anchovy and limpet recruitment, seabird ecology and diet analysis. The University of Cape Town Zoology Department has conducted undergraduate education in marine biology at the site and projects on mussel and algae interaction, intertidal meiofauna and subtidal community dynamics. The Sea Fisheries Research Institute has conducted surveys of pelagic fisheries and censuses of breeding seabirds.

Principal Reference Material

The above information has been supplied by the South African government.

Spain

Area 504,745 sq.km

Population 38,891,313 (1986 census)

Summary of Wetland Situation There are few natural water bodies in the interior, apart from the big rivers, and since the flow is very dependent on rainfall many of the smaller tributaries and streams dry out in summer. However, during the last three decades a large number of reservoirs have been built for irrigation purposes on most of the big rivers.

In the north, along the Galicia and Asturias coasts, the fiord-like 'rias bajas' are of importance to wintering and migrating waterfowl, and inshore waters are frequented by large concentrations of sea ducks in winter. Inland, the Pantano del Ebro holds similar concentrations of diving ducks, mainly during migration seasons but also in winter, and more occasionally some greylag and bean geese. However, the main wintering area of bean goose is in the central Duero basin, close to the Portuguese border where the Laguna de Villafafila and Embalse del Esla are the best-known sites.

On the east coast the lagoons just south of Rosas could well be of international importance, being the kind of wetland which has become scarce along the Spanish Mediterranean coast and therefore more vital as a staging post for migratory waterfowl. The Ebro delta, is of course precisely in that category, but two-thirds of the delta are now under cultivation and there are still threats of further urbanisation and establishment of marinas and similar tourist developments, not to mention off-shore oil-rigs. To the west of the delta, the Laguna de Gallocanta has recently become a major wintering area for ducks, coots and cranes, with more than 100,000 observed in December 1978, including some 3,000 cranes.

The great lagoon, La Albufera de Valencia, once a very important breeding and wintering place for waterfowl, has suffered severely from urban and industrial pollution as well as from inflow of agricultural pesticides and herbicides, although purification systems have now been made compulsory. Pola y Torrevieja and nearby Pantano de Elche on the coast of Alicante Province are important for migrating and wintering ducks and waders, the Santa Pola saltpans having also on two occasions in recent years provided a nesting site for greater flamingo, a species which visits similar pans at Cabo de Gata to the south-east and others to the south-west of Almeria. Flamingo also breed regularly in the Laguna de Fuente de Piedra, the only place where it does so in the north-west Mediterranean apart from the Camargue. This lagoon is the biggest of a number of scattered lakes of a rather variable character. Some of these lakes are of great value for two scarce and declining species, white-headed duck and crested coot.

The most important wetland in Spain, and indeed south-west Europe, comprises the still largely intact ecosystems of the Marismas del Guadalquivir. The Parque Nacional de Doñana covers 35,000ha of the marismas and of the tongue of land separating the marshes from the sea

(protecting some of the most interesting habitats of the area). Unfortunately, interference with the hydrology, agricultural development, and the use of pesticides in surrounding areas, still threaten the park. A more intractable problem is the end-of-summer outbreaks of botulism which have caused severe losses among waterfowl in recent years.

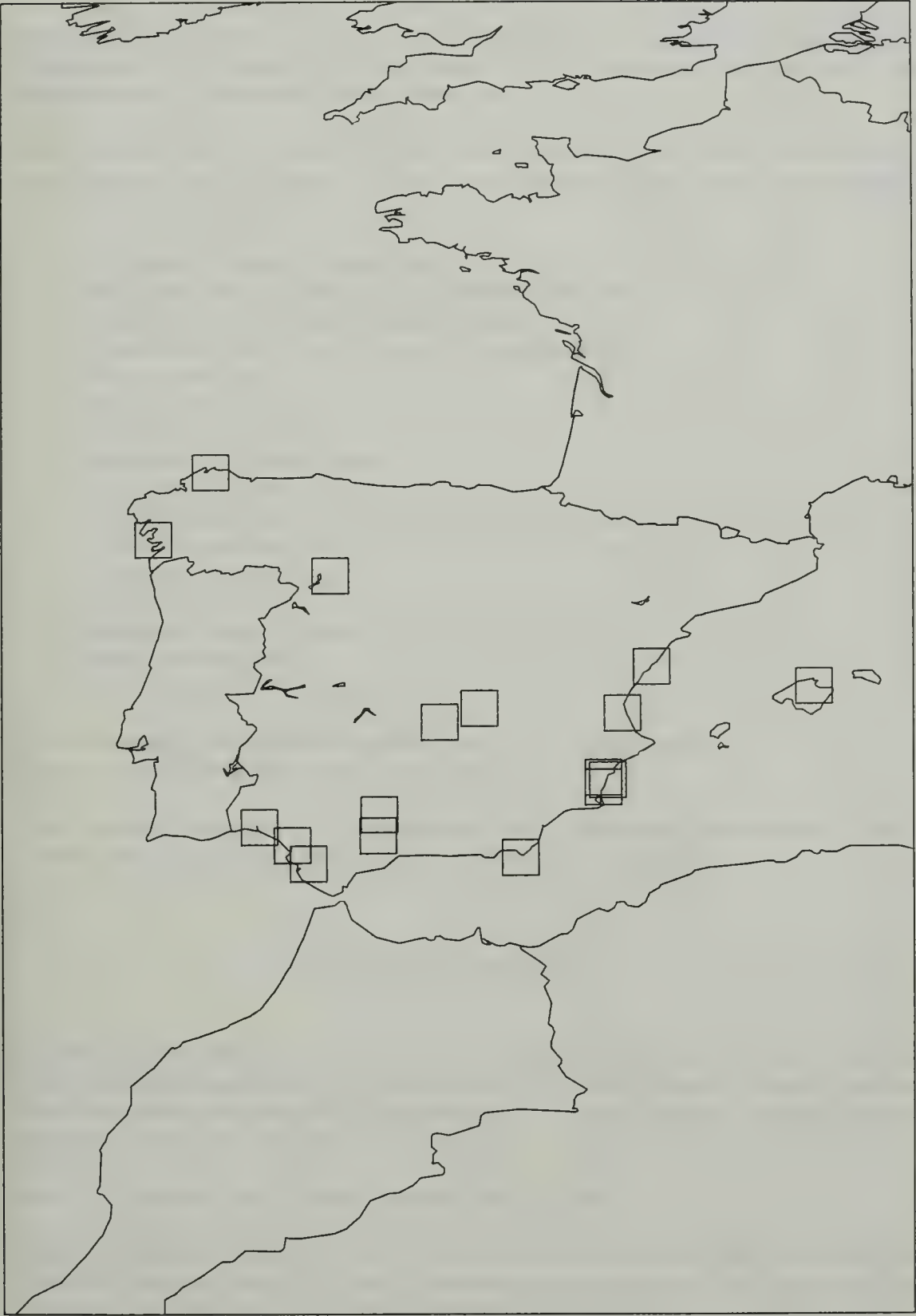
In central Spain, the Tablas de Daimiel, the marshy floodplain where the Cigüela and other tributaries join to form the Guadiana, is an important breeding area for ducks, especially red-crested pochard, good numbers of duck also being found in winter. An area of 1,875ha is protected in Parque Nacional de las Tablas de Daimiel, but drainage projects in the area surrounding the park are still a threat. The great reservoirs constructed along the Guadiana and Tajo rivers have become important wintering areas for grebes and cormorants as well as for ducks, and some of them serve as roosts for wintering cranes.

In Spanish islands, the major wetland of Mallorca, the Albufera de Alcudia, has been severely affected by urbanisation projects in the vicinity, but is still visited by ducks in winter. Purple heron and several other species of waterfowl breed in the reedbeds at the southern end of the site, and the small saltpan complex nearby (like those in the south of Mallorca) may have importance for migrating waders. Across the western arm of the Mediterranean the Islas Chafarinas, just off the Moroccan coast, harbour the largest known breeding colony of the scarce Audouin's Gull *Larus audouinii*.

Protected Areas Legislation Protected areas existing prior to 1975 were reclassified in the National Areas Protection Law (Under law 15/1975 of 15 May 1975), and given legal status under regulations introduced on 4 March 1977. The major defined categories are National Park, Natural Park, Natural Area of National Importance or Interest and Integral Reserve of Scientific Interest, although precise protection measures are not provided in the 1975 law. Each site is designated at the national level, with the exception of Natural Parks which can be established by decree of the State or Autonomous Regional Governments, or by private parties. The re-classification of national parks following the 1975 legislation provided an opportunity to extend existing park areas (from some 90,000ha to 156,000ha) but as a consequence required legal provisions with the 'Status of Bills' to be submitted to the State *Cortes* for approval.

Decree 3128/82 of 15 October, 1982 defines National Biological Reserves, and law 1/1984 of 14 March 1984 deals with "Designating and Protecting Areas of Special Natural Interest". The second National Hunting Reserves Act and Hunting Reserves Regulations, based on Law No. 37/1966 of 31 May 1966 and Act No. 2/1973 deal with the establishment and management of hunting reserves. Although hunting is authorised within these areas, control has been very strict and the legislation is aimed at habitat protection and game conservation. Areas defined within this legislation are National Hunting Reserves and National Hunting Sanctuaries. Sites listed under Law 6 of April 1987 on Regional Urban Standards for the Protection and Use of the Territory, include Natural Areas, and Partial Natural Reserves.

Protected Areas Administration The body responsible for administration is the National Institute for the Conservation of Nature (ICONA), set up in 1971 to be responsible for renewable resource use and maintenance of ecological balance, creation and administration of national parks, sites of national interest, development and exploitation of inland fishing and hunting assets. ICONA consists of a central service and provincial network. ICONA is part of the portfolio of the Ministry of Agriculture, Fisheries and Food. With increased regionalisation, the balance of activities within the national organizations is changing to some extent. Seventeen Autonomous



Ramsar Sites in Spain

Communities have been created, whose responsibilities include environmental protection, fishing, hunting, public monuments, tourism and recreation. The national parks are under central administration, whilst natural parks may be established by regions without enactment of the Natural Heritage Conservation and Restoration Act.

Sites designated under the Convention Accession 4 May 1982, with two sites listed at accession, one site added 8 August 1983 and a further fourteen sites added on 5 December 1989.

Doñana National Park
 Las Tablas de Daimiel National Park
 Refuge National de Chasse de la Lagune de Fuentapiedra
 Lagunas de Cadiz (Medina/Salada del Puerto)
 Lagunas del Sur de Cordoba (Zonar/Amarga/Rincon)
 Marismas del Odiel
 Salinas del Cabo de Gata
 S'Albufera de Mallorca
 Laguna de la Vega o del Pueblo
 Lagunas de Villafafila
 Complejo Intermareal O Umia-Grove, La Lanzada, Punta Carreiron y Lagoa Bodeira
 Rias de Ortigueira y Ladrado
 L'Albufera de Valencia
 Pantano de el Hondo
 Salinas de la Mata y Torre vieja
 Salinas de Santa Pola
 Prat de Cabanes - Torrealba

Government body responsible for administration of the Convention
 ICONA, Gran Via de San Francisco 35, Madrid 5

Note Information provided by ICONA for sites added to the list in December 1989 has yet to be translated, and therefore the descriptions for these sites are incomplete.

Doñana National Park

Location 36°57'N, 06°19'W. Situated south-west of Seville in the triangular area between the Atlantic coast (Cadiz Gulf) and the Guadalquivir River which forms the boundary between Huelva and Seville provinces and Cadiz to the east. The town of Sanlucar de Barrameda lies at the mouth of the river. South-west coast of Spain.

Area 49,225ha (included in Doñana National Park 50,720ha)

Degree of Protection More than 60% of the national park is local and state owned, and the surrounding areas are private property or owned by local communes. The designated site is included in Doñana National Park, which was first protected in 1969 and established as a national park on 28 December 1978 by Ley 91/1978. The park includes a 6,000ha biological reserve controlled by the Consejo Superior de Investigaciones Cientificas (Ministry of Educa-

tion). The whole area is administered by ICONA. Designated as a Ramsar Site at the time of accession on 4 May 1982.

Site Description The site comprises a variety of biologically diverse habitats: sparsely vegetated sandy beaches and marine tidal zone on the Atlantic seaboard; dunes and coastal slacks with poor cover of marram grass *Ammophila arenaria* on the seaward side; stabilised dune heath supporting stone pine *Pinus pinea*, prickly juniper *Juniperus oxycedrus* and Phoenician juniper *J. phoenecia* woodlands and clumps of shrubby *Halimium halimifolium*; mixed thickets of pine and cork oak *Quercus suber* and *H. halimifolium* fringing the scattered freshwater lagoons; and grasslands separated from the marshland by sedges (Cyperaceae), *Scirpus* sp. and saltwort *Salicornia* sp. with glasswort *Arthrocnemum glaucum* and shrubby glasswort *Limoniastrum monopetalum*. The Marisma area is fed by the Madre de las Marismas, which flows parallel with the Coto Doñana dune ridge. Ancient branches of the Guadalquivir River form canal-like depressions in the marshlands, and there are several shallow lakes that retain water even when the rest of the marismas dry out in late summer. These deltaic marshlands are flooded during spring and when water levels are at their highest, only the small elevated islands (vetas) remain dry. The shallow lakes of Marismas de Hinojos, Gallega, Las Nuevas, El Sapillo, Lucio Real, and Sanlucar are important wintering areas for birds. Mammals in the park include fox *Vulpes vulpes*, badger *Meles meles*, small-spotted genet *Genetta genetta*, wildcat *Felis sylvestris*, wild boar *Sus scrofa*, fallow deer *Dama dama* and red deer *Cervus elaphus*. Raptors such as imperial eagle *Aquila heliaca adalberti*, short-toed eagle *Circaetus gallicus*, booted eagle *Hieraetus pennatus*, buzzard *Buteo buteo*, black kite *Milvus migrans*, red kite *M. milvus*, kestrel *Falco tinnunculus*, and hobby *Falco subbuteo* predominate in the stabilised sands.

International and National Importance Doñana is probably the only large almost intact wetland ecosystem in southwest Europe. Large numbers of waders and Anatidae make use of the flat islands (vetas) during the winter floods. The most numerous species are gadwall *Anas strepera*, wigeon *A. penelope* (up to 60,000), teal *A. crecca* (up to 32,000), pintail *A. acuta*, shoveler *A. clypeata* (up to 22,000), pochard *Aythya ferina*, greylag *Anser anser* (20-30,000) and coot *Fulica atra* (10,000+). Breeding Anatidae include mallard *Anas platyrhynchos*, marbled teal *A. angustirostris*, red-crested pochard *Netta rufina* and pochard. White-headed duck *Oxyura leucocephala* probably no longer breeds here. Other species include purple gallinule *Porphyrio porphyrio* and crested coot *Fulica cristata* (declining). Important colonies of night heron, squacco heron, cattle egret, little egret, grey heron, purple heron, spoonbill and white stork (*Nycticorax nycticorax*, *Ardeola ralloides*, *Bubulcus ibis*, *Egretta garzetta*, *Ardea cinerea*, *Ardea purpurea*, *Platalea leucocordia* and *Ciconia ciconia*) nest in the Quercus-Halimium scrub. Greater flamingo *Phoenicopterus ruber* are present in the park throughout the year, but only nest occasionally. About 10 pairs of the endangered Spanish race of imperial eagle *Aquila heliaca adalberti* nest in the park. Threatened mammals include European otter *Lutra lutra* and Spanish lynx *Felis pardina*.

Changes in Ecological Character For centuries the delta area remained undisturbed and protected as a royal hunting reserve. However, the area is now threatened by: intensive rice cultivation in reclaimed delta areas just outside the park, which disturbs the local water regime; pollution by insecticides and fertilisers; and with improved access from major towns such as Huelva, increasing recreational pressure on the coastal area. Plans have been proposed to build a motorway between Huelva and the port of Cadiz, which would cut through the park. There have been several outbreaks of botulism in the park contracted from stagnant pools (in 1973

some 30,000 birds died). The original cause seemed to be, as it is also presumed for the 1986 disaster, the use of pesticides in the rice fields north of the park.

Management Practices Wells have been dug to provide sufficient freshwater to attract birds away from shallow pools where the risk of contracting botulism is greatest. The park management plan includes the creation of several new ponds with observation towers or hides to cater for increasing numbers of visitors, and a carefully planned network of access roads in a limited area of the park.

Scientific Research and Facilities Palacio de Doñana was converted into a biological research station in 1972. Ornithological field studies have been carried out in the wetland since the 1950s. Since 1978 there has been a research programme including studies of vertebrates, zoology, botany, plant ecology, geography, ethology, entomology, pesticides and infectious and contagious diseases.

Principal Reference Material The above information is taken from:

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

Duffey, E. (1982). *National Parks and Reserves of Western Europe*. Macdonald and Co., London.

Additional references:

Fernandez, J.A. (1975). *Guia del Parque Nacional de Doñana*. ICONA Madrid.

ICONA (1982). Donana. Prospeccion e inventario de ecosistemas. Monografias 18. Ministerio de Agricultura, Madrid.

Las Tablas de Daimiel National Park

Location 39°10'N, 03°39'W. Situated about 30km north-east of Ciudad Real and 10km north of Daimiel in Ciudad Real Province, south of Madrid in central Spain.

Area 1,812ha (included in the national park (2,232ha) which is protected by a 968ha buffer zone)

Degree of Protection Mainly state owned with some private ponds and lakes. The designated site is fully protected within Tablas de Daimiel National Park administered by ICONA in Ciudad Real. The area was established as a national hunting reserve in 1966 with national park status in 1973. The shallow reservoir in the west of the park (Embalse de Gasset) acts as a wildfowl refuge in which hunting is prohibited. Designated as a Ramsar Site at the time of accession on 4 May 1982.

Site Description The 'Tablas' (areas of shallow water) de Daimiel are extensive areas of marshland formed in the basin around the point where two rivers unite to form the Guadiana River which flows to the Embalse de Vicario east of Ciudad Real. The Cigüela River carries brackish water drained from the high Cabrejas moorland into the wetland. The freshwater Guadiana rises some 15km south of the park. The waters from both rivers mingle to produce a

distinctive hydrosere mire in which fresh and brackish water plants include freshwater reedbeds of *Phragmites communis* with *Typha* sp. and *Cladium* sp. fringing the water courses, and cut-sedge dominated by *Carex* sp. common in brackish areas (Daimiel is said to have the most extensive areas of cut-sedge in Europe). A large expanse of chara *Chara hispida* (the food supply for waterfowl, mainly Anatidae and coot *Fulica atra*) extends over almost all of the submerged surface. There are numerous small islands (up to 30ha) in the marshes. In the west of the park is a shallow reservoir - Embalse de Gasset - which is a major breeding area for waterfowl. The park is fringed by stands of *Tamarix gallica* (the only tree species on the Tablas). The water level of the wetland fluctuates considerably. The wetland area is surrounded by intensively cultivated areas with vines and cereals, much reclaimed from the Tablas by drainage. The mammal population comprises mainly smaller European species such as polecat, otter, water-vole, stoat, rabbit and hare, but wild boar *Sus scrofa* has been increasing in number. The most conspicuous raptor is marsh harrier *Circus aeruginosus*.

International and National Importance Las Tablas de Daimiel are renowned for large breeding population of ducks (Anatidae) including over 1,000 pairs of red-crested pochard *Netta rufina* (possibly the largest population in Europe), mallard *Anas platyrhynchos*, gadwall *A. strepera*, garganey *A. querquedula*, shoveler *A. clypeata*, marbled teal *A. angustirostris* and pochard *Aythya ferina*. Other breeding species are black-necked grebe *Podiceps nigricollis*, small colonies of night heron *Nycticorax nycticorax*, little egret *Egretta garzetta*, purple heron *Ardea purpurea* and bittern *Botaurus stellaris*. Non-breeding marsh birds include black-winged stilt *Himantopus himantopus*, avocet *Recurvirostris avosetta*, redshank *Tringa totanus*, ruff *Philomachus pugnax*, Kentish plover *Charadrius alexandrinus*, bearded tit *Panurus biarmicus* and Savi's warbler *Locustella luscinioides*. Large numbers of surface-feeding ducks such as mallard use the wetland as a moulting refuge, and large numbers of waterfowl overwinter here. Otter *Lutra lutra* occurs in the wetland.

Changes in Ecological Character The park was established to save the wetland from extensive land reclamation, but this is still a potential threat with intensive surrounding agricultural developments. Drainage of areas outside the park seriously affects the integrity of the park by affecting the regional hydrological regime. There is potential threat of pollution from small industrial factories on higher ground bordering the wetland basin.

Management Practices The management plan focuses mainly on restoration of the water level, at present very low (some metres under the surface) due to a combination of natural drought during the last decade and water extraction by local people (for irrigation). Recently, a comprehensive study of potential water regeneration has been made, and on the basis of this a project for the permanent supply of water to the park has been outlined.

Scientific Research and Facilities ICONA has undertaken some hydrological studies and bird surveys. There is a recuperation centre for Anatidae.

Principal Reference Material The above information is taken from:
Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.
Duffey, E. (1982). *National Parks and Reserves of Western Europe*. Macdonald and Co., London.

Additional references:

- Coronado, R., del Portillo, F. and Saez-Royuela, R. (1973). *Guia de las Anatidas en Espana*. ICONA, Madrid.
- Coronado, R., Leon Jimenez, F. and Morillo Fernandez, C. (1974). *Guia del Parque Nacional de las Tablas de Daimiel*. ICONA, Madrid.

Refuge National de Chasse de la Lagune de Fuentapiedra

Location 37°07'N, 04°46'W. Situated about 17km north-west of Antequera in Malaga Province, southern Spain.

Area 1,355ha (maximum area of the lake 3,000ha)

Degree of Protection The lake is state owned and at present protected as a reserve of scientific interest. Designated as a Ramsar Site on 8 August 1983.

Site Description Fuentapiedra is a shallow salt lake (average depth less than a metre) situated about 500m above sea level. It is fed by run-off from the surrounding hills, and during the dry summer months dries out almost completely. It is fringed by halophytic vegetation.

International and National Importance The lake harbours the only regular breeding colony of greater flamingo *Phoenicopterus ruber* in Spain. Other breeding waterfowl include black-winged stilt *Himantopus himantopus*, avocet *Recurvirostra avosetta* and gull-billed tern *Sterna nilotica*. In winter up to 50,000 coot *Fulica atra* and ducks (Anatidae), including up to 15,000 pochard *Aythya ferina*, may be present in the wetland.

Changes in Ecological Character The wetland is relatively undisturbed. There is a potential threat from increased use of pesticides on the surrounding agricultural land, which could contaminate the water and affect birds feeding outside the reserve.

Management Practices A pump has been installed near the deepest part of the lake to retain sufficient water in at least a small area for unfledged juvenile flamingos during the summer drought. Hunting is prohibited in the reserve.

Scientific Research and Facilities The flamingo colony has been studied in some detail by research teams from the University of Malaga. A study of the hydrological system of the whole area has been carried out.

Principal Reference Material The above information is taken from:

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

Several articles on Fuentapiedra have been published in the journal *Ardeola*.

Lagunas de Cadiz - Laguna de Medina

Location 06°02'E, 36°37'N. Situated in the central zone of the province of Cadiz, east of Jerez de la Frontera and entirely within its municipal boundary. Includes the state-owned estate Laguna de Medina and is bounded to the north by the Cejos del Inglés estate, to the east by the Rancho de San Antonio, to the south by Medina glen (or Lobo Pardo) and to the west by Colorada house.

Area 121ha, with a further 254ha included in the protection zone

Degree of Protection The lagoon is public property and declared an integral reserve by law of the Andalusian parliament in 1987. The General Plan of Urban Disposition classifies the area as a special protection zone where no urban development is permitted, and it is given integral protection classification in the Special Plan for the Protection of the Physical Environment. The lagoon was designated as a Ramsar site on 5 December 1989.

Site Description Located in Paterna, between the river Guadalete and the southern drainages of the Bay of Cadiz. The creation of the lagoon was determined by the short slopes characteristic of the area which interrupt the drainage of surface water and favour their stagnation by the existence of impermeable, shallow materials and the semi-arid local climate. Located on the Jerez de la Frontera aquifer with a 120 m³ subterranean reservoir. Soils are franco-arcillosa (clayey), where drainage is difficult, and franco-arenosa (sandy) where drainage is free because of very porous bedrock. Average depth of the lagoon is 1.5m over an area of 11.9ha. Its maximum width is 980m and total length 1,400m. Average annual precipitation is 646mm, with rains during November, December and March. Temperatures range from an average minimum of 12°C in January to 24°C maximum in August. The vegetation of the non-marshy area is mediterranean and comprises lentisco *Pistacia lentiscus*, gorse *Ulex* spp., jarales *Cistus* spp. and dwarf palm *Chamaerops humilis* etc. It is fairly degraded and restricted on the side of roads, cattle tracks, estate boundaries and hill tops. However, marshy vegetation is rich and provides excellent habitat for birds. Around the lagoon is a belt of typical halophytes such as reeds *Juncus maritimus* and *Phragmites australis*, with *Frankenia laevis* and *Tamarix canariensis* occurring on the outer edge but succeeded by saltwort *Salicornia* spp. in the most frequently flooded areas. Communities of fennel pondweed *Potamogeton pectinatus* and *Zannichellia palustris* are present, providing an important food source for Anatidae.

International and National Importance The lagoon is an important wintering ground for Anatidae as well as sheltering other non-breeding species which appear occasionally in the area, such as flamingo *Phoenicopterus ruber* which can be seen temporarily in groups of 250. The most representative species of Anatidae present include pochard *Aythya ferina*, shoveler *Anas clypeata* and red-crested pochard *Netta rufina* (425, 425 and 265 individuals recorded in 1980), respectively, with 850 coot *Fulica atra* also recorded. White-headed duck *Oxyura leucocephala* is present, but its population is declining rapidly, highlighting the necessity to protect these marshy enclaves. Tufted duck *Aythya fuligula* (40 recorded in 1973) and crested coot *Fulica cristata* (one single individual recorded in 1980) are in need of special protection. The presence

of sufficient numbers of wintering white-headed duck and breeding red-crested pochard justify the lagoon's designation as a Ramsar site.

Management Practices A Director of Conservation to be nominated will administer the area and control conservation and public use activities, according to a management and use plan to be elaborated with the help of the social sector and patronage. Basic activities to be taken into account are public use, research, acquisitions and extension, and supply regulation. The lagoon is situated in agricultural land where dry farming predominates, which has not prevented its waters being used for local irrigation and to water cattle directly. Hunting has traditionally been of great importance and recently various fish and crab species have been introduced with a view to local exploitation.

Principal Reference Material The above information is translated from documentation supplied by the Spanish government at the time of designation.

Lagunas de Cadiz - Laguna Salada

Location 6°14'E, 36°39'N. Situated in the eastern part of the province of Cadiz, north of the port of Santa Maria but within its municipal boundaries, between the main road from Santa Maria to Sanlucar de Barrameda and the road from Jerez to Rota.

Area 37ha

Degree of Protection The lagoon is public property and declared an integral reserve by law of the Andalusian parliament in 1987. A Director of Conservation and a board, comprised of representatives of the various sectors involved, will be nominated. The General Plan of Urban Disposition classifies the area as a special protection zone where no urban development is permitted, and it is given integral protection classification in the Special Plan for the Protection of the Physical Environment. The lagoon was designated a Ramsar site in December 1989.

Site Description The lagoon occupies part of the plain which extends north-west from the Sierra de San Cristobal. It comprises plot No. 10 of the Catastral Register of the port of Santa Cruz as well as a perimeter buffer zone 35m wide. It is bounded to the north by the Rancho de la Viruela estate, to the east by the Roma road and to the south and west by the drainage canal and Casino road. The area comprises a succession of hills and ridges averaging 30m in height. The lagoon occupies the bottom of a small depression approximately 20m above sea level. It is of pluvial origin and situated on the Chipiona-port of Santa Maria aquifer with subterranean reservoirs of approximately 120m³. Soils are sandy and franco-arenosa and established on calcareous or saline deposits. The climate is maritime mediterranean with average temperatures ranging from 10°C in the coldest month (February) to 23°C in August. Annual precipitation is between 600mm and 700mm (sub-arid) and there are nearly 3,000 hours of sunshine per year. Vegetation cover is minimal. In peripheral non-inundated areas there are small clumps of rosemary *Rosmarinus officinalis*, dwarf palm *Chamaerops humilis* and jarales *Cistus* spp., while beds of tamarisk *Tamarix* spp., reed *Juncus acutus*, *Atriplex* spp. and sea club rush *Scirpus maritimus* occur in 'fluctuation' zones. There are stands of eucalyptus *Eucalyptus* spp. in surrounding areas.

International and National Importance The site is of international importance for its wintering populations of white-headed duck *Oxyura leucocephala* and red-crested pochard *Netta rufina* and breeding population of crested coot *Fulica cristata*. Characteristic among other birds are greater flamingo *Phoenicopterus ruber* which come from nearby marshes during summer droughts. Among regular visitors are *Bubulcus ibis*, little egret *Egretta garzetta* and black-tailed godwit *Limosa limosa*. Wigeon *Anas penelope*, gadwall *A. strepera*, pintail *A. acuta*, shoveler *A. clypeata*, red-crested pochard *Netta rufina*, common pochard *Aythya ferina* and coot *Fulica atra* are present in winter.

Management Practices A Director of Conservation to be nominated will administer the area and control conservation and public use activities, according to a management and use plan to be elaborated with the help of the social sector and patronage. Basic activities to be taken into account are public use, research, acquisitions and extension, and supply regulation. The lagoon is situated in large areas of privately-owned agricultural land where irrigation is undertaken. Waters have also been used directly to water cattle. Hunting has traditionally been of great importance and recently various fish (eel and carp) and crab species have been introduced with a view to local exploitation. Traditional collection of reed *Typha dominguensis* has been undertaken sporadically.

Principal Reference Material The above information is translated from documentation supplied by the Spanish government at the time of designation.

Lagunas del Sur de Cordoba (Lagunas de Zonar, Amarga y Rincon)

Location 04°37'W, 37°30'N. Central southern part of Cordoba province.

Area 86ha

Degree of Protection Integral Reserve of Scientific Interest: most of the lagoons are protected, and hunting and visiting are prohibited at the reservoirs.

Site Description A complex of brackish lagoons, some permanent (Zonar, Amarga and Rincon), others seasonal (Salobral, Tiscar and Jarales), and two small reservoirs (Malpasillo and Cordobilla); generally with wide belts of emergent vegetation, and olive groves and dry cereal cultivation in the surrounding areas.

International and National Importance The main breeding area for white-headed duck *Oxyura leucocephala* in Spain (min. 45 pairs; with winter concentrations of 100+ birds). Also breeding purple heron *Ardea purpurea*, gallinule *Porphyrio porphyrio* and other interesting waterbirds.

Principal Reference Material

Grimmett, R.F.A. and Jones, T.A. (1989). *Important bird areas of Europe*. International Council for Bird Preservation. 888 pp.

Marismas del Odiel

Location 37°17'N, 06°55'W. North-west of Cadiz, at the mouth of the Odiel River, province of Huelva.

Area 7,185ha

Degree of Protection Protected under a decree of 1968. There are rights for limited salt exploitation on 1,300ha. Accepted as a biosphere reserve in 1983. Declared a natural area and integral reserve according to Law 12 of 19 October 1984 (under Andalusian parliament Law 15 of 2 May 1975). Designated as a Ramsar site on 5 December 1989.

Site Description This coastal area includes extensive marshland and the island of Enmedio. Much of the area has marsh vegetation. The transitional ecosystems, between land and sea, offer suitable habitats to a great number of species. Climate is Mediterranean tempered by the ocean. Average annual precipitation is 520mm.

International and National Importance The marshland of the reserve, particularly the island of Enmedio, is one of the most important sites in the whole Iberian Peninsula for nesting of bird species, notably spoonbill *Platalea leucorodia* (300+ pairs), grey heron *Ardea cinerea*, purple heron *A. purpurea*, little egret *Egretta garzetta*, black-winged stilt *Himantopus himantopus*, Kentish plover *Charadrius alexandrinus*, mallard *Anas platyrhynchos*, marsh harrier *Circus aeruginosus* and Sardinian warbler *Sylvia melanocephala*. Species feeding during winter include gulls *Larus fuscus*, *L. ridibundus* and *L. argentatus*, black-winged stilt and avocet, and Anatidae *Anas penelope*, *A. clypeata*, *A. platyrhynchos* and *Aythya ferina*. Important migrating species using the area include knot *Calidris canutus*, little ringed plover *Charadrius dubius*, black-tailed godwit *Limosa limosa*, bar-tailed godwit *Limosa lapponica* and redshank *Tringa totanus*. Threatened bird species recorded include black stork *Ciconia nigra*, purple gallinule *Porphyrio porphyrio*, pratincole *Glareola pratincola*, gull-billed tern *Gelochelidon nilotica*, slender-billed gull *Larus genei*, Audouin's gull *L. audouinii*, stork *Ciconia ciconia* (13 pairs nesting) and spoonbill.

Changes in Ecological Character Human activities consist mainly of salt extraction on more than 1,000ha in the northern part of the reserve, and forestry. Eucalyptus plantations particularly impoverish natural communities. Not more than 100 head of cattle are traditionally allowed to graze. On the Saltes islands, controlled sport and commercial fishing is allowed.

Management Practices A basic programme of activities is elaborated in the management plan including regulation of visitor access and use, especially of beaches in the summer, interpretative facilities, environmental education and information. Objectives for research in ecology, archaeology, history are set out in the research plan. The basic objectives of the forestry plan are the conservation and regeneration of natural ecosystems and the genetic rescue of threatened and endemic species.

Principal Reference Material The above includes information supplied by the Spanish government at the time of designation.

Salinas del Cabo de Gata

Location 02°12'W, 36°44'N

Area 300ha

Degree of Protection Included in a natural park (Cabo de Gata 26,000ha)

Site Description A coastal strip, about 15 km long, in the Bahía de Almería, with a wide depression occupied by saltpans. Supports interesting steppe vegetation, with clumps of *Tamarix* spp. and *Zyzyphus lotus*, and expanses of *Salicornia*. Threats include sand extraction, building and tourism.

International and National Importance The saltpans support flamingo *Pheonicopterus ruber* (max. 2,000 birds with nesting attempted), black-winged stilt *Himantopus himantopus*, and avocet *Recurvirostra avosetta* (max. 450 wintering), as well as passage waders and Audouin's gull *Larus audouinii*. In the steppe areas, little bustard *Tetrax tetrax*, stone-curlew *Burhinus oedicephalus*, black-bellied sand grouse *Pterocles orientalis* and lesser short-toed lark *Calandrella rufescens* (hundreds of pairs) occur.

Principal Reference Material

Grimmett, R.F.A. and Jones, T.A. (1989). *Important bird areas of Europe*. International Council for Bird Preservation. 888 pp.

S'Albufera de Mallorca

Location 39°49'N, 03°07'E. Within the municipal boundaries of Muro and Sa Pola, in the north-west sector of Alcudia Bay, on the island of Majorca.

Area 1,700ha

Degree of Protection 79% of the area is in public ownership. 833ha belong to the Autonomous Community of the Balearic Islands, 390ha to INCONA, 95ha to the authorities of Muro, and 335ha to 28 different owners. Declared a natural park on 28 January 1988 by the governor according to Law 15 of 2 May 1972 on protected natural areas. Designated as a Ramsar site on 5 December 1989.

Site Description The various vegetation communities are distributed according to soil type, quantity of water, salinity and human pressures. Psamphilic vegetation is not well represented because of pressure from tourism. *Ammophila* communities are not present in their characteristic formation, but rather in mosaic form over a few sq.m. Mediterranean sclerophilic forest

occurs on the first line of dunes facing the sea where *Juniperetum macrocarpae* is found. *Juniperus oxycedrus* ssp. *macrocarpa* is currently stabilising the dunes. Towards the interior, this association gives way to *Rosmarino-Ericion* association, represented by *Rosmarinus officinalis* and *Erica multiflora*, always accompanied by *Quercetalia ilicis*. Halophytic communities extend beyond the littoral bar in saline and clayey impermeable soils. Reed *Phragmites communis* dominates the permanently inundated areas. *Helosciadatum nodiflori* replaces *P. communis* in freshwater bodies. With the exception of birds, vertebrate fauna is not varied but of the 34 species recorded, there are 20 fish, 9 mammal and 3 reptile species. Climate is Mediterranean with hot, dry summers and mean annual temperatures not exceeding 16°C. Average annual precipitation is 500-600mm, the maximum in autumn and minimum in summer. Relative humidity is high and constant. In Albufera it reaches 100% at night and in the morning, but drops to 50-60% during midday hours. The Tramuntana winds from the north dominate on 150 days of the year, together with the Llebregat (south-west) in autumn and spring.

International and National Importance Because of the wide range of habitat and food sources and the site's location on the Mediterranean flyway, a high diversity of avifaunal species has been recorded (63 endemic, 57 wintering or migratory and 91 rare species), amongst them little bittern *Ixobrychus minutus*, purple heron *Ardea purpurea*, marsh harrier *Circus aeruginosus*, water rail *Rallus aquaticus*, spotted crane *Porzana porzana*, black-winged stilt *Himantopus himantopus*, osprey *Pandion halietus*, Eleonora's falcon *Falco eleonora*, glossy ibis *Plegadis falcinellus*, squacco heron *Ardeola ralloides*, spoonbill *Platalea leucorodia*, marbled teal *Marmaronetta angustirostris*, crane *Grus grus* etc.

Changes in Ecological Character Desalinisation and drainage of land for agricultural use occurred up to the middle of the 19th century. However, that land was later abandoned because it was unproductive. Rice production continues in a few marginal areas.

Management Practices A provisional management plan was prepared in 1988, together with an interpretation plan.

Principal Reference Material The above material is translated from the documentation supplied by the Spanish government at the time of designation.

Laguna de la Vega o del Pueblo

Location 39°25'N, 02°56'W. Within the municipality of Pedro Muñoz, province of Ciudad Real.

Area 34ha

Degree of Protection Owned by the communities of Castilla-La Mancha which bought the land from the Council of Pedro Muñoz in November 1987. Declared a hunting refuge on 17 May 1988 where hunting is prohibited permanently.

Site Description Part of the bed of the River Guadiana. Water levels are maintained by precipitation in spring. The lagoon is surrounded by a belt of *Phragmites australis*, *Scirpus*

maritimus and *Salicornia perennis* ssp. *alpini*. Where inundation is less *Suaeda maritima*, *S. splendens* and *Cressa cretica* occur. Aquatic macrophytes *Chara galioides*, *Ruppia drepanensis* and *Lamprothamnium papulosum* are present. The climate is extremely hard, with hot summers and very cold winters. Maximum temperature 44°C, absolute minimum -14°C. Annual precipitation is 400mm, most falling in spring and least in the months of July and August.

International and National Importance 23 species of waterfowl nest and breed in the area, including black-necked grebe *Podiceps nigricollis* (one of the most important nesting populations on the peninsula), black-winged stilt *Himantopus himantopus* (population increasing), avocet *Recurvirostra avosetta*, black-headed gull *Larus ridibundus*, and whiskered tern *Chlidonias hybrida*. Great crested grebe *Podiceps cristatus*, *P. ruficollis*, red-crested pochard *Netta rufina*, common pochard *Aythya ferina*, shoveler *Anas clypeata*, mallard *A. platyrhynchos*, gadwall *A. strepera*, garganey *A. querquedula*, coot *Fulica atra*, moorhen *Gallinula chloropus*, Kentish plover *Charadrius alexandrinus*, little ringed plover *C. dubius*, lapwing *Vanellus vanellus* and woodcock *Scolopax rusticola*.

Management Practices During 1989 the lagoon was cleared, the road removed, resting islands and a perimeter fence constructed to prevent the entry of animals which harm birds and the depositing of rubbish. Bird observation has been undertaken to prevent epidemics and a hide constructed for public use.

Principal Reference Material The above information has been translated from documentation provided by the Spanish government at the time of designation.

Lagunas de Villafafila

Location 41°49'N, 05°37'W

Area 2,854ha

Degree of Protection National Game Reserve (Villafafila 32,682ha). Designated as a Ramsar site on 5 December 1989.

Site Description An extensive, semi-arid, treeless plain typical of the Meseta Norte. An endorreic area, with some seasonal and brackish lagoons (Salinas de Villafafila). Mainly dry cultivation (wheat, barley lucerne) with grasslands between cultivated fields, in depressions, and surrounding the lagoons. The area is also used for extensive sheep-grazing and hunting; there are some villages.

International and National Importance Very important for steppe birds, being one of the best areas in the Iberian peninsular for great bustard *Otis tarda* (approximately 1,000 birds); also little bustard *Tetrax tetrax* (min. 200 pairs) and black-bellied sand grouse *Pterocles orientalis* (min. 50 pairs) breed.

Principal Reference Material

Grimmett, R.F.A. and Jones, T.A. (1989). *Important bird areas of Europe*. International Council for Bird Preservation. 888 pp.

Complejo Intermareal O Umia-Grove, La Lanzada, Punta Carreiron y Lagoa Bodeira

Location 42°29'N, 08°49'W. Within the municipalities of Vilagarcia de Arousa, Cambados, Ribadumia, Meano, Sanxenxo and O Grove, in the province of Pontevedra.

Area 2,561ha

Degree of Protection Designated as a hunting refuge. La Lanzada and Bodeira are unprotected and located within a private hunting area. Designated as a Ramsar site on 5 December 1989.

Site Description Comprises an immense mud plain with islets and a small coastal lagoon (Bodeira). Punta Carreiron is rocky, while La Lanzada is a large coastal sandy area. *Zostera marine* and *Z. noltii* are abundant on the intertidal plains. The islets present herbaceous and matoral vegetation with graminaceae, *Ulex europaeus* and *Erica umbellata* predominating. Dunal vegetation with species such as *Armeria pubigera*, *Pranocratium maritimum*, *Chrithmum maritimum* etc occurs in the zone between La Lanzada and la Ensenada del Bao. Higher up the dunes are colonised by *Otantho-Amphiletum arundinaceae* association which is adapted to wind action. Various floral endemics occur such as *Iberis procumbens*, *Echium rosatum*, *Linaria caesia* var. *decumbens*, *Helichrysum picardii*, *Phelipaca arenaria*.

International and National Importance Limicolae (more than 10,000 individuals) and anatidae (2,000) are abundant in passage (September-October, February-March) and over the winter (November-February), together with a large number of grey heron *Ardea cinerea* and little egret *Egretta garzetta*. Many rare species of diving birds such as *Gavia* spp., long-tailed duck *Clangula hyemalis*, and black-necked grebe *Podiceps nigricollis* stop over on the beach at La Lanzada, as well as a large number of common scoter *Melanitta nigra*. At the outlet of the Umia and Lago Bodeira mallard *Anas platyrhynchos*, coot *Fulica atra*, moorhen *Gallinula chloropus* and little grebe *Tachybaptus ruficollis* breed from March to July.

Changes in Ecological Character None reported, but the area is a favourite tourist destination.

Management Practices There is no management plan.

Principal Reference Material The above information has been translated from documentation supplied by the Spanish government at the time of designation.

Rias de Ortigueira y Ladrido

Location 43°42'N, 07°47'W

Area 2,920ha

Degree of Protection Designated as a Ramsar site on 5 December 1989.

Site Description An estuary between Cape Ortegal and the Estaca de Bares cape, with wide intertidal mud areas, a halophytic vegetation belt, and some islets. There is intense mollusc collecting. The cutting of marsh vegetation, building and poaching are current problems.

International and National Importance The estuary supports large numbers of a variety of wintering duck species, including wigeon *Anas penelope* (max. 7,500) and sanderling *Calidris alba* (min. 500).

Principal Reference Material

Grimmett, R.F.A. and Jones, T.A. (1989). *Important bird areas of Europe*. International Council for Bird Preservation. 888 pp.

L'Albuferia de Valencia

Location 39°20'N, 00°21'W. Situated about 12 km south of Valencia.

Area 21,000ha

Degree of Protection Established as a national park on 7 August 1986 by a Decree of the Valencian Inspectorate. The Albufera is owned by the municipality of Valencia. Designated as a Ramsar site on 5 December 1989.

Site Description The geology of the area is of recent sedimentary rocks (Holocene and Pleistocene) embedded with numerous fossils (e.g. *Cordium edule*), evidence of the areas marine geological history. This is a coastal lagoon, separated from the sea by a strip of dunes, with fresh or slightly brackish water and a maximum depth of 2m. There are some small islands and patches of reed in the lagoon. The area also includes some 14,000ha of paddyfields (flooded most of the year), sand beaches, dunes, and a wide coastal pinewood *Pinus halepensis*. The vegetation is dominated by reeds *Phragmites communis*, *Arundo donax*, *Potamogeton natans*, *Alisma plantago*, *Typha angustifolia* and submerged or floating species such as *Ranunculus confusus*, *Nitella hyalina*, *Chara ceratophylla*, *C. intermedia*, *C. hispida* and *Myriophyllum verticillatum*. The area has a Mediterranean climate, characterised by very high humidity (80%) due to the heavy evaporation of the lake. Mean annual temperature is 25°C with a winter average of 6°C and summer average of 33°C. Annual rainfall is 500mm. Human activities include rice cultivation, fishing, hunting and leisure activities.

International and National Importance An important breeding area for herons with night heron *Nycticorax nycticorax* (75 pairs), cattle egret *Bubulcus ibis* (1,450 pairs), little egret *Egretta garzetta* (650 pairs), and purple heron *Ardea purpurea* (91 pairs). Also red-crested pochard *Netta rufina* (200 pairs), black-winged stilt *Himantopus himantopus* (100 pairs), pratincole *Glareola pratincola* (100+ birds after the breeding season), Kentish plover *Charadrius alexandrinus* (100 pairs), and common tern *Sterna hirundo* (150 pairs). The third most important area in Spain for wintering wildfowl, with shoveler *Anas clypeata* (av. Jan. 8,700; max. 24,500) and red-crested pochard *Netta rufina* (av. Jan. 5,600; max. 12,200).

Changes in Ecological Character There has been irreversible deterioration of the natural ecosystem due to urbanisation following an expanding tourist industry, comprehensive drainage projects, and massive use of pesticides in the rice fields. There is intense pollution (agricultural, industrial and urban), illegal drying of paddyfields and over-hunting.

Management Practices The Albufera is managed by the Forestry Service of the Autonomous Community of Valencia. The ricefields or 'vedados' are flooded each autumn and winter and are provided with food to attract large numbers of waterfowl, the shooting of which is strictly regulated. Hunting rights in the vedados belong to the small neighbouring villages but those of the main Albufera are leased to the Valencia municipality.

Principal Reference Material

Carp, E. (1980). *A directory of Western Palearctic Wetlands*. IUCN, Gland.

Dafauce Ruiz, C. (1975). La Albufera de Valencia, Uno Estudio Piloto. Monografia 4, Ministerio de Agricultura, Instituto Nacional para la Conservacion de la Naturaleza (ICONA), Madrid.

Docavo Alberti, I. (1985). La Albufera de Valencia y su Entorno. In: Regione Campania, Assessorato per il Turismo. Atti del Convegno Internazionale I Parchi Costieri Meditteranei. Salerno, Castellabate. 18-22 Giugno 1973. Ente Provinciale per il Turismo, Salerno. Pp. 381-406

Excelentisima Diputacion Provincial de Valencia. Campaña de Defensa de la Naturaleza y Medio ambiente. Memoria 1973-1979.

Grimmett, R.F.A. and Jones, T.A. (1989). *Important bird areas of Europe*. International Council for Bird Preservation. 888 pp.

Pantano de el Hondo

Location 38°10'N, 00°42'W

Area 2,337ha

Degree of Protection Designated as a Ramsar site on 5 December 1989.

Site Description Two irrigation reservoirs (formerly a natural marsh) with a covering of reed *Phragmites* and emergent vegetation and surrounded by small brackish and freshwater lagoons. The area is used for hunting and fishing.

International and National Importance Very important for breeding purple heron *Ardea purpurea* (35 pairs), marbled teal *Marmaronetta angustirostris* (max. 15 pairs), red-crested pochard *Netta rufina* (max. 500 pairs), black-winged stilt *Himantopus himantopus* (80-100 pairs), little tern *Sterna albifrons* (100 pairs), and whiskered tern *Chlidonias hybrida* (110 pairs). Important also for passage and wintering red-crested pochard *Netta rufina* (av. 700+; max. 1,500+).

Changes in Ecological Character There is a project to increase the water-level which would destroy the vegetation. A study has been carried out in order to assist the appeal for its protection.

Principal Reference Material

Grimmett, R.F.A. and Jones, T.A. (1989). *Important bird areas of Europe*. International Council for Bird Preservation. 888 pp.

Salinas de la Mata y Torre vieja

Location 38°00'N, 00°42'W

Area 2,100ha

Degree of Protection Designated as a Ramsar site on 5 December 1989.

Site Description Two wide coastal lagoons which have been transformed for salt extraction, with a permanent saltwater supply from the sea. There is a narrow belt of reeds and halophytic vegetation.

International and National Importance Important for breeding shelduck *Tadorna tadorna* (max. 4 pairs), black-winged stilt *Himantopus himantopus* (60 pairs), Kentish plover *Charadrius alexandrinus* (100 pairs), and little tern *Sterna albifrons* (70 pairs). Also outstanding concentrations in winter or during passage of black-necked grebe *Podiceps nigricollis* (winter: av. 797; max 3,500), flamingo *Pheonicopterus ruber* (1,000-2,000 on passage), and red-crested pochard *Netta rufina* 2,000-3,000 in winter).

Changes in Ecological Character Problems include building nearby, water pollution and human disturbance.

Principal Reference Material

Grimmett, R.F.A. and Jones, T.A. (1989). *Important bird areas of Europe*. International Council for Bird Preservation. 888 pp.

Salinas de Santa Pola

Location 38°08'N, 00°37'W

Area 2,400ha

Degree of Protection Designated as a Ramsar site on 5 December 1989.

Site Description Saltworks which have replaced a natural coastal lagoon, surrounded by artificial freshwater and brackish ponds with dense plant cover.

International and National Importance An important area for breeding marbled teal *Mararonetta angustirostris* (3 pairs), red-crested pochard *Netta rufina* (60-120 pairs), black-winged stilt *Himantopus himantopus* (200-250 pairs), avocet *Recurvirostra avosetta* (500+ pairs), Kentish plover *Charadrius alexandrinus* (150+ pairs), common tern *Sterna hirundo* (100 pairs), and little tern *S. albigrons* (400 pairs). An important wintering area for avocet *Recurvirostris avosetta* (av. 440), and flamingo *Pheonicopterus ruber* occurs in variable numbers with breeding attempted.

Changes in Ecological Character There is great hunting pressure, a road crosses the middle of the area resulting in bird mortality, and the beach zone is subject to property development.

References

Grimmett, R.F.A. and Jones, T.A. (1989). *Important bird areas of Europe*. International Council for Bird Preservation. 888 pp.

Prat de Cabanes - Torreblanca

Location 40°10'N, 00°11'E

Area 860ha

Degree of Protection Designated as a Ramsar site on 5 December 1989.

Site Description A well-preserved, unpolluted coastal marsh, flooded only in winter, with emergent vegetation such as *Phragmites*, *Typha*, *Cladium*, salty meadows with rushes and halophytic vegetation, and a well-preserved gravel-dune range.

International and National Importance Included because of its colony of pratincole *Glareola pratincola* (minimum 40 pairs). Also marsh harrier *Circus aeruginosus* breeds.

Changes in Ecological Character The main disturbances are caused by cattle-grazing and peat extraction (which produced the lagoons). There is the threat of house building along 1 km of the coast, while eel fishing and over-grazing are additional current problems.

Principal Reference Material

Grimmett, R.F.A. and Jones, T.A. (1989). *Important bird areas of Europe*. International Council for Bird Preservation. 888 pp.

Suriname

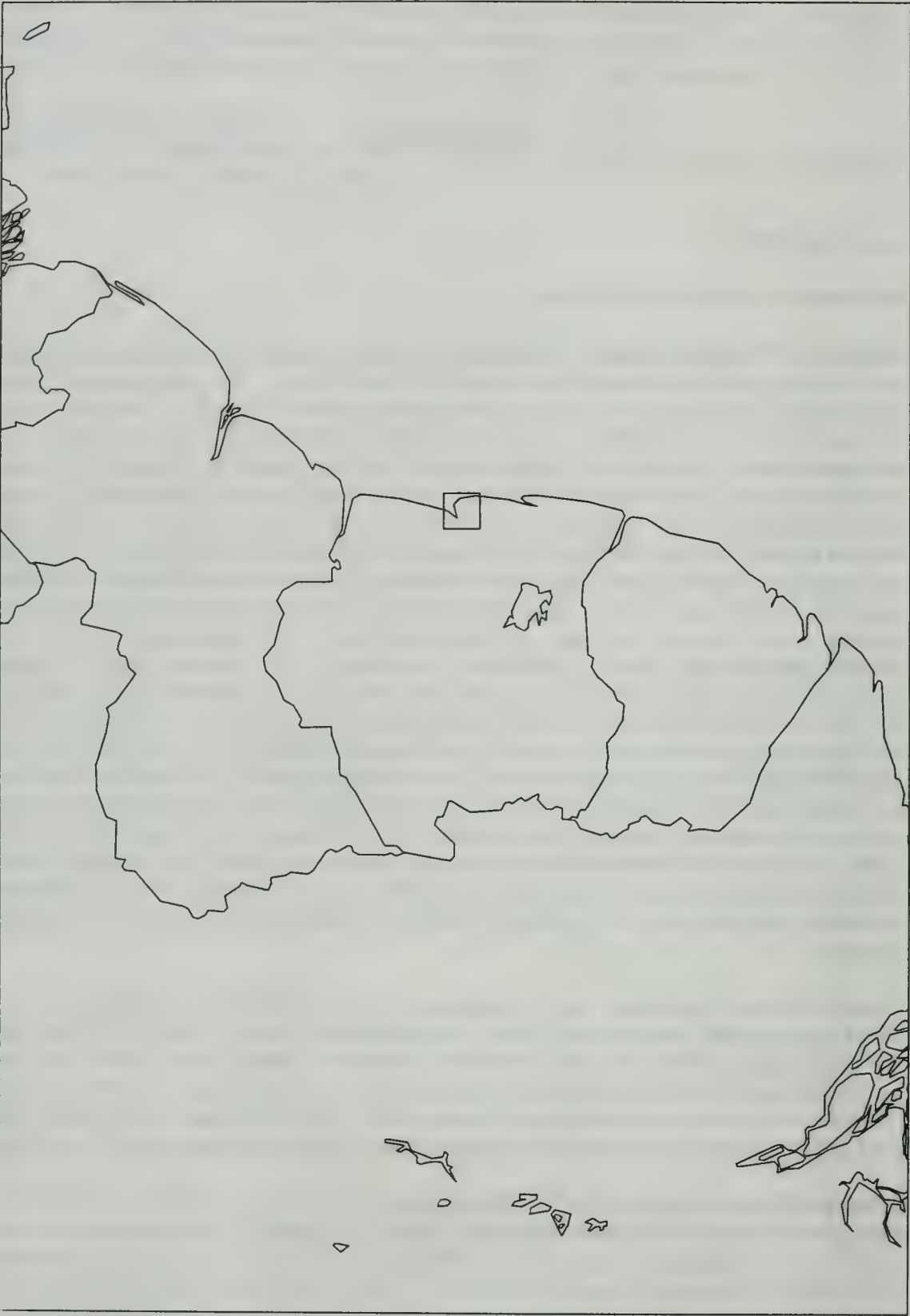
Area 163,800 sq.km

Population 415,000 (1987 estimate)

Summary of Wetland Situation Geologically the country can be divided into four regions: young coastal plain, old coastal plain, savanna belt and interior. The young coastal plain is approximately 8km wide in the east and broadens to 50km wide in the west. The coastal zone is comprised of vast tidal mudflats, some narrow sandy beaches and mangrove swamps. Inland, the coastal fringe is bordered by shallow saline and brackish lagoons and swamps, with some mangrove forests. Further inland the marshes become fresh, and there are patches of swamp forest dominated by *Erythrina glauca* and mixed dryland forests on sandy ridges. The five major wetland areas of this zone totalling 325,000ha, are all of international importance as wintering and staging areas for migratory shorebirds and breeding areas for herons Ardeidae and ducks Anatidae. The old coastal plain is approximately 20km wide. There are various types of grassy swamp, swamp forest and dryland forest similar to those of the young coastal plain, but in addition there are large areas of ombrogenous peat swamp. The extensive tracts of wetland habitat in this zone remain very poorly known. The savanna belt is a dissected plain consisting of coarse sands and loams, and is characterized by white sand savannas. The zone is covered with xerophytic and mesophytic dryland and swamp forests, and dry to very wet grass and shrub savannas. Wetland habitat occurs only in small scattered patches. In the interior the almost uninhabited lowlands are covered with primeval humid tropical forest, interrupted only by small patches of savanna, exposed rocky outcrops, and patches of marsh forest along the rivers and creeks. At higher elevations, sub-montane forests are found on deep soils, and xerophytic forests and shrubs on shallow soils. Apart from the riverine and creek systems, the only significant wetlands in this zone are the huge recently constructed Brokopondo Lake and the Sipaliwini Savanna.

Protected Areas Legislation The first game sanctuary was established by Resolution in 1953 based on the Police Penal Law of 1942. The principles of nature conservation were first formulated and embodied into law in the Nature Protection Law of 1954 (GB No. 26), and provide the legal basis for establishment of nature reserves by Resolution. The Forest Law of 1947 also allows for the establishment of forest reserves. Long-term lease areas (leased under the Lands' Law) can also be managed as protected areas; for example, Brownsberg Nature Park.

Protected Areas Administration The Forest Service of the Ministry of Natural Resources and Energy has a Nature Conservation Department which is responsible for managing the parks and reserves. The Department is assisted by the Foundation for Nature Preservation in Suriname (STINASU), a semi-governmental organization. Nature reserves are established on public lands, which are of scientific, aesthetic or cultural value. These may not necessarily be sites of exceptional interest, but will include areas which are regarded as representative samples of ecosystems or landscapes.



Ramsar Sites in Suriname

Sites designated under the Convention Accession 18 March 1985, with one site listed at accession.

Coppename Rivermouth Nature Reserve

Government body responsible for administration of the Convention

Suriname Forest Service, Head, Nature Conservation Division, PO Box 436, 10 Cornelis Jongbawstr., Paramaribo

Coppename Rivermouth Nature Reserve

Location 5°50'N, 55°50'W. Between the mouths of the Coppename River and Suriname River, Saramacca District, central coast.

Area 12,000 ha.

Degree of Protection Federally owned. Protected since 1953, but established as a reserve since 22 April 1966 and as a Ramsar site at the time of accession on 18 March 1985. Designated in 1989 as a western hemisphere shorebird reserve.

Site Description Wide tidal mud flats, lagoons and brackish herbaceous swamps, in the estuary of the Coppename and Suriname rivers and along the Atlantic coast. Sand beaches, coastal mudgrass vegetation with *Spartina brasiliensis*, various types of young and old stages of mangrove forest with *Avicennia germinans* and *Laguncularia racemosa*, salt water ponds and shallow lagoons with *Sesuvium portulacastrum*, *Batis maritima*, and *Sporobolus virginicus*. Coastal beach vegetation with *Hibiscus tiliaceus*, *Thespesia populnea* and *Avicennia germinans*, and littoral ridge wood with *Crataeva tapia* and *Cereus hexagonus*. In the estuary the species change because of the freshwater influence. The short grass and fern swamps include two species of sedge *Eleocharis mutata* and *Cyperus articulatus*, and in the estuarine mangroves *Avicennia* and *Laguncularia* species are joined by *Rhizophora mangle*, and palm *Euterpe oleracea*.

International and National Importance A very important area for breeding, passage and wintering waterfowl. Breeding birds include up to 250 pairs of black-crowned night heron *Nycticorax nycticorax*, 1,500 pairs of yellow-crowned night heron *Nyctanassa violacea*, 500 pairs of boat-billed heron *Cochlearius cochlearius*, 4,000 pairs of little blue heron *Egretta caerulea*, 3,000 pairs of tricoloured heron *E. tricolor*, and 1,000 pairs of snowy egret *E. thula*. Up to 4,000 pairs of scarlet ibis *Eudocimus ruber* have bred in recent years, with the exceptional total of 6,200 pairs in 1984. Non-breeding visitors include up to 200 greater flamingo *Phoenicopterus ruber*, 1,500 laughing gull *Larus atricilla* and 10,000 black skimmer *Rynchops niger*. The coastal mudflats are particularly important for passage and wintering Nearctic shorebirds. Peak estimates have included 2,500 black-bellied plover *Pluvialis squatarola*, 2,500 semipalmated plover *Charadrius semipalmatus*, 1,500 whimbrel *Numenius phaeopus*, 10,000 greater yellowlegs *Tringa melanoleuca*, 50,000 lesser yellowlegs *T. flavipes*, 10,000 willet *Catoptrophorus semipalmatus*, over 5,000 turnstones *Arenaria interpres*, 50,000 short-billed dowitcher *Limnodromus griseus* and 750,000 semipalmated sandpiper *Calidris pusilla*. Also listed: roseate spoonbill *Platalea ajaja* and the magnificent frigatebird *Fregata magnificans*.

Black spider monkey *Ateles paniscus* is also present, and Caribbean manatee *Trichechus manatus* has been reported.

Changes in Ecological Character There is some illegal hunting and contamination with pesticides. Urbanisation and the expansion of agricultural activities are the principal threats.

Management Practices One game warden and two guards

Scientific Research and Facilities Ornithological research, no facilities

Principal Reference Material The above information is taken from documents submitted by the Suriname government at the time of accession and from national reports to Ramsar conferences, supplemented by:

IUCN (1982). *IUCN Directory of Neotropical Protected Areas*. Tycooly, Dublin.

Scott, D.A. and Carbonell, M., (1986). *Directory of Neotropical Wetlands*. IUCN, Gland, Switzerland and Cambridge, U.K., and IWRB, Slimbridge, U.K.

Schulz, J.P., Mittermeier, R.A. and Reichart, H.A. (1977). Wildlife in Suriname. *Oryx* XIV(2): 133-144.

Spaans, A.L. and de Jong, B.H.J. (1982). Present status of some colonial waterbird species in Surinam, South America. *J. of Field Ornithology* 53(3):269-272.

Teunissen, P.A., (Ed.) (1972). Natuurreservaat Coppenamemonding. *Natuurgids Serie A*, 1. STINASU.

Sweden

Area 449,791 sq.km

Population 8,414,083 (1987 estimate)

Summary of Wetland Situation The wetlands of Sweden cover approximately 20% of the national territory and are very varied in type, including, for example, coastal marshes, rivers, lakes, fens, mires and peatbogs. Pressure on many of these sites is increasing, particularly along the coasts, but also inland where much swampy forest is being drained to increase timber production or to eliminate excess water in neighbouring agricultural areas. Excavation of mires to extract peat for agricultural or horticultural purposes continues incessantly, and peat could again become important as fuel in the not too distant future. The potential for exploitation for hydro-electric power may also pose a threat to certain wetland areas.

With regard to future economic and ecological needs, the Swedish Government in 1977 ordered a survey of all shallow waters, mires, moist grasslands and groundwater forest. This survey was carried out by the Swedish Environmental Protection Board (EPB) under the authority of the Ministry of Agriculture. Stage II comprises studies of various aspects of land use, conservation, recreation, water-management and scientific research, and is expected to last until 1988. The final report would serve as a basis for long-term management of the wetland nature resource.

Protected Areas Legislation The Nature Conservancy Act of 1964, as amended in 1973 and 1975, permits the setting aside of national parks, nature reserves, nature conservation areas and wildlife sanctuaries. The Royal Proclamation issued in 1964 lays down ways in which the Act must be implemented and administered. A further proclamation of 1965 deals with wildlife sanctuaries which have now also come under the Act. National parks are established by the government only on crown lands. Reserves, conservation areas and sanctuaries are designated by the County Administration (24 counties). Regulations for parks and reserves normally govern land use, industrial or rural activities, fishing and hunting (especially in parks) and access. In conservation areas regulations are less restrictive. In wildlife sanctuaries hunting and access may be restricted or prohibited during certain parts of the year. Several other legislative measures are of direct relevance to nature conservation in Sweden: the Beech Forest Law (1974), the Hunting Act (1938), the Fishing Act (1950), the Hunting Statute (1938) and the Deciduous Forest Law (1983).

Protected Areas Administration Formally, responsibility for the management of parks lies with the National Environmental Protection Board, which is an independent agency within the Ministry of Agriculture. The board has three main functions: provision of advice to bodies with executive responsibility for protected areas; financial control of purchase, compensation, facilities etc.; and fostering ecological research. The Swedish Forest Service provides day-to-day management in consultation with the Board. The responsibility for the management of protected areas rests with the appropriate County Administration, and is normally delegated to

the Regional Forestry Board (under the National Board of Forestry). The Forest Service manages state-owned areas.

The National Environmental Protection Board has recently completed a review of the current national park system. Twenty new parks have been proposed, seven existing parks would be amalgamated or expanded and four parks would be reclassified. The plan would result in an increase from 20 to 33 national parks, with a very significant increase in area covered from 618,000 hectares to 2.26 million hectares (5% of the land surface). The new proposed system was presented to the Parliament for approval during 1989.

Sites designated under the Convention Signature without reservation as to ratification 5 December 1974, with twenty sites listed at signature and a further ten sites added on 12 June 1989.

Falsterbo-Bay of Foteviken

Klingavälsan-Krankesjön

Helga River (Hammarsjön and Egeside sjö/Araslövssjön)

Ottenby

Coastal areas of Öland (Stora Ören-Gammalsbyören/Egby-Kapelludden/Södviken

Prior to 12 June 1989 this site only comprised Södviken)

Getterön

Store Mosse and Kävsjön

Isles off Götland

- Faludden (added to this site 12 June 1989)

- Grötlingboholme and Rone Ytterholme

- Laus holmar

- Skenholmen

Hornborgasjön

Täkern

Kvismaren

Hjälstaviken

Annsjön

Gammelstadsviken

Persöfjärden

Tärnasjön

Tjalmejaure-Laisdalen

Laidaure

Sjaunja-Kaitum

Tavvavuoma

Asnen

Träslövsläga - Morups Tange

Stigfjorden Bay

Dättern Bay

Lake Östen

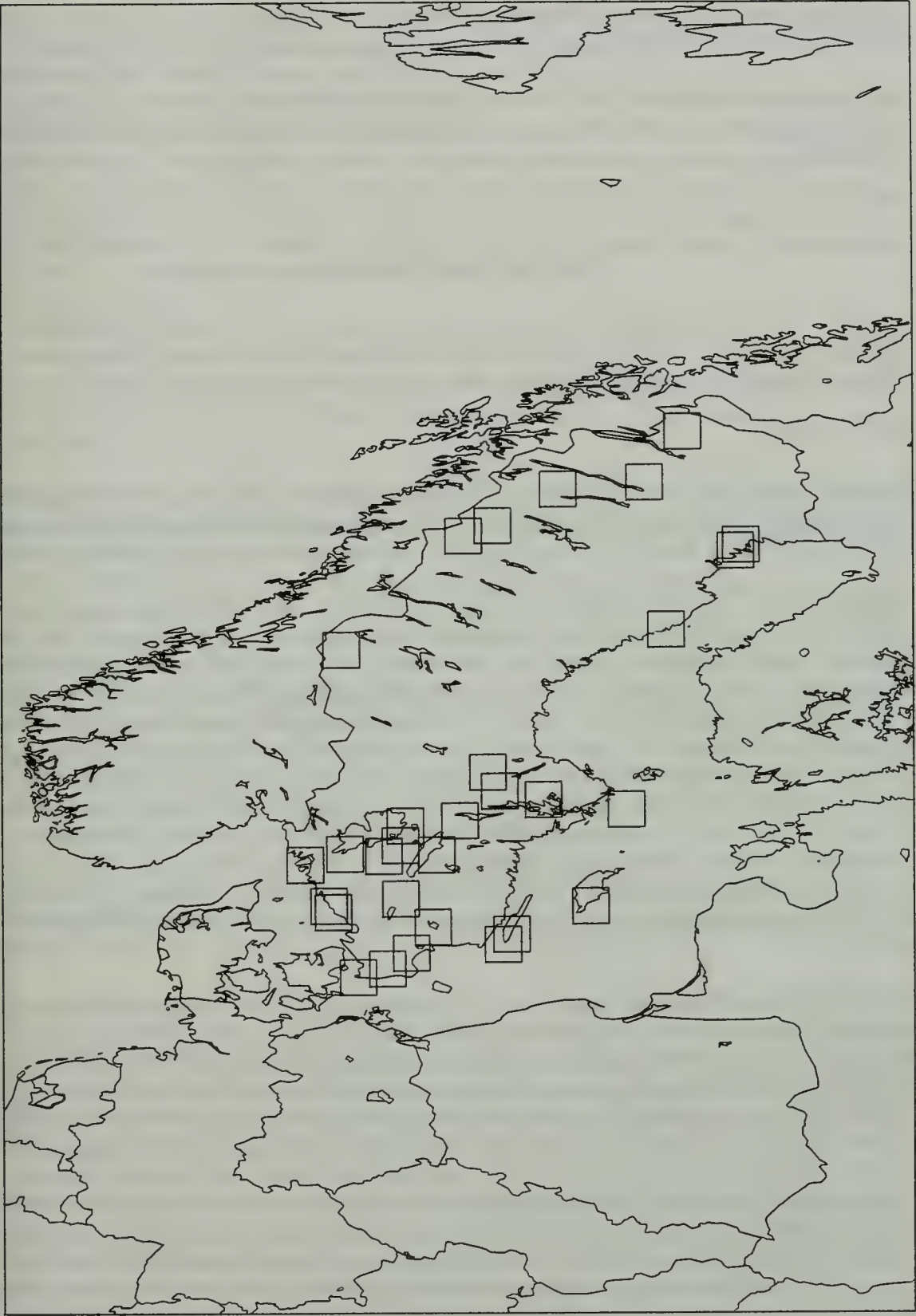
Kilsviken Bay

Outer Archipelago of Stockholm

River Svartan (Lake Gorgen-Nötmyran/Fläcksjön-Gussjön)

Hovran Area

River Umeälv Delta



Ramsar Sites in Sweden

Government body responsible for administration of the Convention
Naturvardsverket, Swedish Environmental Protection Agency, Box 1302, S-171 85 Solna

Note Information provided by the National Environmental Protection Board for sites added to the list in June 1989 has yet to be translated, and therefore the descriptions for these sites are incomplete.

Falsterbo-Bay of Foteviken

Location 55°25'N, 12°55'E Located in the extreme south-west of Sweden, 30km south of Malmö and less than 25km from the nearest point on the Danish coast.

Area 7,450ha

Degree of Protection Ownership is part private and part local authority. Parts of the designated site are protected as nature reserves: Maklappen, Skannors Ljung, Flommen and Hammars Nas, and Eskilstorp's Islets (total 2,045ha). Designated as a Ramsar site on 15 December 1974.

Site Description The site comprises shallow coastal waters, sandbanks, lagoons, sand and shingle beaches, grazed and ungrazed coastal meadows (influenced by salt spray and partly of marshland type), heather-clad moors and damp heaths, and some cultivated land. Soils are mainly sand, moraine clay and coastal meadow peat. The coastline is being continually changed by the processes of erosion and accumulation. The vegetation is influenced by geology, water and past/present land use. The sandy beaches, dunes and sandbanks are clad with lyme grass *Elymus arenarius*, marram grass *Ammophila arenaria* and *Rosa rugosa*. The coastal meadows contain sedges, arrow-grass, glasswort, seablite, aster, meadow grass, plantain, rush and sea milkwort (*Scirpus* sp., *Triglochin* spp., *Salicornia* spp., *Suaeda* sp., *Aster* sp., *Puccinellia* sp., *Plantago* sp., *Juncus* sp. (including *J. maritima*) and *Glaux maritima*. Where the pasture recedes there is an abundant growth of tufted vetch *Vicia cracca*, trefoil *Lotus* spp. and aster. The heaths are mainly heather *Calluna vulgaris*, cross-leaved heath *Erica tetralix* and sweet gale *Myrica gale*.

International and National Importance This site is an important breeding, resting and wintering area for waterfowl, and there is a spectacular gathering of many millions of birds in autumn. The concentrations of passage migrants, mainly birds of prey and waders, is without equal in northern Europe. The area is an important resting and wintering locality for ducks and waders. Mute swan *Cygnus olor*, goosander *Mergus merganser* and red-breasted merganser *M. serrator* occur in internationally important numbers in winter. Regular breeding species include mallard *Anas platyrhynchos*, eider *Somateria mollissima*, red breasted merganser *Mergus serrator*, shelduck *Tadorna tadorna*, moorhen *Gallinula chloropus*, coot *Fulica atra*, lapwing *Vanellus vanellus*, oystercatcher *Haematopus ostralegus*, redshank *Tringa totanus*, ringed plover *Charadrius hiaticula*, herring gull *Larus argentatus*, common gull *L. canus* and Arctic tern *Sterna paradisaea*. Other breeding birds include whinchat *Saxicola rubetra*, reed bunting *Emberiza schoeniclus*, yellow wagtail *Motacilla flava* and meadow pipit *Anthus pratensis*. There are permanent populations (unusual for Nordic countries) of avocet *Recurvirostra avosetta*, Kentish plover *Charadrius alexandrinus*, dunlin *Calidris alpina*, sandwich tern

Sterna sandvicensis and little tern *S. albifrons*. The sandy island of Maklappon is an important breeding area for grey seal *Halichoerus grypus* and common seal *Phoca vitulina*. Other important fauna include natterjack toad *Bufo calamita* and green toad *Bufo viridis*.

Changes in Ecological Character There has been a decline in the numbers of livestock grazing in the meadows. The area is very popular for recreation, with three golf courses and considerable swimming, boating and fishing. The municipality and National Road Administration have put forward a plan to build a new road which will occupy about 0.1% of the Ramsar site. The plan has been approved by the Government and the Water Rights Court of Appeal. An application to construct a marina for pleasure craft was rejected.

Management Practices Access is restricted in some parts of the reserves.

Scientific Research and Facilities A considerable amount of bird ringing and bird observation takes place at Falsterbo Bird Station, as part of the National Environmental Monitoring Programme.

Principal Reference Material The above information is taken from documents supplied by the Swedish Government for designation in 1974 and for the Cagliari Conference in November 1980. Supplemented by:

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

Additional reference:

Ulfstrand, S. et al. (1974). Visible bird migration at Falsterbo Station. Misc. Report of Falsterbo Bird Station. 189 pp.

Klingavälsån - Krankesjön

Location 55°37'N, 13°38'E About 40km east of Malmö in Malmöhus län in the extreme south of Sweden.

Area 3,975ha

Degree of Protection Ownership is part private and part local authority. The site includes two nature reserves totalling 2,181ha. Vomb meadowland has been protected by law since 1923, and the whole valley of the River Klingavälsån has been protected by law since 1968. Designated as a Ramsar site on 5 December 1974.

Site Description The site includes the areas around the River Klingavälsån and lake Krankesjön which consist of shallow nutrient-rich lakes, meandering streams, marshes, forests of alder *Alnus* sp. and willow *Salix* sp. thicket. Large areas are still used for grazing or hay cutting. Soil is mainly sand and shallow layers of peat. The meadows along the riverflood annually and consist of hummocky pasture of tufted hair-grass *Deschampsia cespitosa*, tall herbs and *Carex* sedges. In some places stands of alder and old peat layers overgrown with birch *Betula* spp. and willows dominate. South of Krankesjön is Silvakra marsh, formed when the lake level was lowered in

1892. The marsh and lake shores are overgrown with reeds *Phragmites australis*, great reedmace *Typha latifolia* and tall *Carex* sedges. Occasionally great fen sedge *Cladium mariscus* occurs around the lake. Lake Sövdesjön is mainly surrounded by grazing meadows and small areas of reed.

International and National Importance The open lands along the river Klingavälsån have few counterparts in Sweden. The meadows support a variety of breeding birds, are important during migration, and provide wintering areas for some species. The overgrown sections are of major importance to the large population of red deer *Cervus elaphus*. Birds breeding on the open meadowlands include lapwing *Vanellus vanellus*, curlew *Numenius arquata*, redshank *Tringa totanus*, snipe *Gallinago gallinago*, meadow pipit *Anthus pratensis*, yellow wagtail *Motacilla flava*, black-tailed godwit *Limosa limosa*, dunlin *Calidris alpina* and shelduck *Tadorna tadorna*. Krankesjön has long been one of Sweden's most well known bird lakes, with a rich population of breeding mallard *Anas platyrhynchos*, garganey *A. querquedula*, teal *A. crecca*, shoveler *A. clypeata*, pochard *Aythya ferina*, tufted duck *A. fuligula*, great-crested grebe *Podiceps cristatus*, little grebe *Tachybaptus ruficollis* and black-necked grebe *P. nigricollis*. Species in the reedbeds include bittern *Botaurus stellaris*, sedge warbler *Acrocephalus schoenobaenus*, great reed warbler *A. arundinaceus* and peduline tit *Remiz pendulinus*. Birds visiting on migration include white-fronted goose, ruff, wood sandpiper, greenshank, spotted redshank (*Anser albifrons*, *Philomachus pugnax*, *Tringa glareola*, *T. nebularia*, *T. erythropus*), and very occasionally white stork *Ciconia ciconia*. The area is a very important wintering site for bean goose *Anser fabalis*, and a winter locality for birds of prey such as white-tailed eagle, golden eagle, buzzard, rough-legged buzzard, red kite and hen harrier (*Haliaeetus albicilla*, *Aquila chrysaetos*, *Buteo buteo*, *B. lagopus*, *Milvus milvus* and *Circus cyaneus*).

Changes in Ecological Character The Vomb meadowlands were formerly used as irrigation meadows, and had a very diverse fauna and flora. However, since a drainage project in 1938-43, the meadows have become much drier with greatly impoverished fauna and flora. During the last few years a significant reduction in the waterfowl populations has occurred in Krankesjön due to a widespread disappearance in aquatic (submerged) plants.

Management Practices Flush irrigation has been resumed experimentally at Vomb meadows over a limited area. Access is restricted in the nature reserves. Some areas around Krankesjön are used for military training, and Sövdesjön and Vombsjön lakes are used for fishing, bathing and other recreation. A management plan is being prepared for the area.

Scientific Research and Facilities A field station on Krankesjön is the base for ecological research on the area.

Principal Reference Material The above information is taken from documents supplied by the Swedish Government for designation in 1974, for the Cagliari Conference in November 1980 and for the Groningen meeting in May 1984. Supplemented by:

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

Additional references:

Bengtsson, S. (1972) Vombs ängar-vegetation, fågelliv, markanvändning samt synpunkter på restaurering och skötsel (mimeo.).

Larsson, T. (1972). Fagelinventering. Vombs och Karups ängar, Klingavälsåns NR. *Env. Prot. Board.* (mimeo.).

Helga River

Location 56°00'N, 14°12'E. A section of the River Helga to the immediate north and south of Kristianstad, the chief town of Kristianstad län in the south of Sweden.

Area 4,600ha (Hammarsjön and Egeside sjö 4,250ha; Araslövssjön 1,200ha)

Degree of Protection Ownership is part state and part private. The designated site includes a nature reserve at Haslov meadows (166ha), adjacent to lake Hammarsjön. Designated as a Ramsar site on 5 December 1974.

Site Description The site comprises the lower River Helga and is in two sectors: 1,150ha including Lake Araslövssjön; and 3,450ha including most of Lake Hammarsjön and the former lakes Svarto sjö and Egeside. The River Helga is one of Scania's largest watercourses, and flows through a flat, arable valley. Most of the lakes along its course have been drained. Habitats include reedbeds, scrub land and large areas of damp hummocky pasture. Some areas are cut for hay.

International and National Importance The region, especially Haslov meadows at lake Hammarsjön, is one of Scania's most important breeding localities for birds. Breeding species include black-tailed godwit *Limosa limosa* (about 65 pairs: 1976), ruff *Philomachus pugnax* (50 pairs), dunlin *Calidris alpina* (15 pairs), black tern *Chlidonias niger* (100 pairs: 1978), black-headed gull *Larus ridibundus* (2,000-3,000 pairs), spotted crane *Porzana porzana*, corncrake *Crex crex* and 15-20 marsh harrier *Circus aeruginosus*. Regular annual visitors include grasshopper warbler *Locustella naevia* (about 100), river warbler *L. fluviatilis*, Savi's warbler *L. luscinoides* and common rose finch *Carpodacus erythrinus*. The site is also an important resting station for migrant waders, ducks and geese. During autumn and spring migrations thousands of ducks visit the lakes, and during March-April and October-November some 5,000-6,000 bean goose *Anser fabalis* graze at Araslövssjön, Hammarsjön and Yngsjön lakes. For some years, 2,000 Canada goose *Branta canadensis* have been overwintering at the lakes.

Changes in Ecological Character Some areas are in danger of becoming overgrown.

Management Practices Access is restricted to parts of the nature reserve. Reed cutting is practised.

Scientific Research and Facilities No information

Principal Reference Material The above information is taken from documents supplied by the Swedish Government for designation in 1974 and for the Cagliari Conference in November 1980. Supplemented by:

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

Additional references:

- Bengtsson, S. (1963). Hammarsjöns hachfagelfauna. (Breeding bird fauna of the Hammarsjön.) *Skånes Natur*.
- Bjork, S. (1971). Araslövsjön och Hammarsjön. Forslag til restaureringsatgärden (Restoration plan). Limn. Inst. Lunds University (mimeo)
- Lennerstedt, J. (1968). Hammarsjön-Araslövsjön. *Meddel. från Sk. O.F.*

Ottenby

Location 56°12'N, 16°24'E. Located at the southern tip of the island of Oland, off the eastern coast of southern Sweden.

Area 1,600ha

Degree of Protection The area is state owned. All land in the designated site and the sea area around the islands is included in a nature reserve of 995ha. Designated as a Ramsar site on 5 December 1974.

Site Description The site comprises the tongue of land south of 'Charles X's Wall' which was built in the 17th century to enclose the deer of Ottenby. The central area is covered by a large deciduous wood of birch *Betula* sp., aspen *Populus tremuloides* and oak *Quercus* sp. In the east and south are flat open sheep grazing pastures (Schaferiangarna), and west of the wood shrubby cinquefoil *Potentilla fruticosa* and juniper *Juniperus communis* are common. The coastal landforms include sand and pebble beaches, sandbanks and small bays. There are extensive shallows and long sections of beaches covered in banks of seaweed which are an important feeding site for resting waders. Fallow deer *Dama dama* live on the pasture and in the woods.

International and National Importance The site is famous for migrating birds, with birds passing through all year round to and from breeding areas. Many make only a short stopover, but species using the area for a longer stopover include small waders such as dunlin *Calidris alpina*, brent goose *Branta bernicla* and barnacle goose *B. leucopsis*. Breeding species include avocet *Recurvirostra avosetta*, which breed on the beaches and adjoining meadows, and breed in very few other parts of Sweden. Ottenby Wood is an important shelter for migrating passerine birds. Breeding birds in and around the wood include golden oriole *Oriolus oriolus*, barred warbler *Sylvia nisoria*, red-breasted flycatcher *Ficedula parva*, common rosefinch *Carpodacus erythrinus* and a dense population of icterine warbler *Hippolais icterina*.

Changes in Ecological Character Lack of grazing animals poses a threat to the open character of the pastures.

Management Practices There is some restriction on access to the nature reserve. Ottenby is one of Sweden's most visited conservation areas, but visitors must keep to the nature paths. A management plan is currently being prepared.

Scientific Research and Facilities Further out on Oland's southern tongue is Lange Jan lighthouse and Ottenby bird station, where ornithological studies, mainly bird ringing and

observation of bird migration, have been carried out since the 1940s. These studies are now part of the National Environmental Monitoring Programme. In 1741 the famous Swedish naturalist Linnaeus came here to record plants and birds.

Principal Reference Material The above information is taken from documents supplied by the Swedish Government for designation in 1974, for the Cagliari Conference in November 1980 and for the Groningen Meeting in May 1984. Supplemented by:

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

Duffey, E. (1982). *National Parks and Reserves of Western Europe*. Macdonald and Co., London.

Additional references:

Edelstam, C. (ed.) (1972). The visible migration of birds at Ottenby, Sweden. *Var Fagelvärld* suppl. 7.

Larsson, A. (1974). Ottenby naturreservat, vegetation och markanvändning. *Medd. Ekol. Bot. Lunds Universitet* 2:6.

Several other reports in *Var Fagelvärld*.

Coastal areas of Oland:

a) Stora Oren - Gammalsbyören, b) Egby-Kapelludden, c) Södviken

Location a) 56°27'N, 16°36'E, b) 56°51'N, 16°53'E, c) 57°02'N, 16°55'E. On the east coast of Öland Island off the eastern coast of southern Sweden.

Area a) 4,800ha, b) 2,600ha, c) 790ha

Degree of Protection Privately owned. Parts of Stora Oren-Gammalsbyören and Södviken are set aside as a bird sanctuaries (of 130ha and 300ha respectively). Södviken was designated as a Ramsar site on 5 December 1974 and renamed to include Stora Oren - Gammalsbyören and Egby-Kapelludden in June 1989.

Site Description The three sites are located on the east coast of Oland, and include shallow coastal waters with islands, and surrounding low-lying land. Habitats include sandy banks, low grassy holms, marshland, open coastal meadows and scrublands. The shores are sandy beaches or low chalk cliffs, and the shallow offshore waters contain many sandbanks.

International and National Importance Important breeding areas, especially for waders, with 11 species regularly breeding including black-tailed godwit *Limosa limosa*, dunlin *Calidris alpina schinzii* and a large colony of avocet *Recurvirostra avosetta*. Other breeding birds include scaup *Aythya marila*, little tern *Stern albifrons* and little gull *Larus minutus*. A major breeding ground on Öland for eider *Somateria mollissima* is also included. Barred warbler *Sylvia nisoria* is found in more scrubby parts of the coastal meadows. The area is much used by migrating waders, especially those from the Arctic. Wintering raptors include *Haliaeetus albicilla* and *Aquila chrysaetos*.

Changes in Ecological Character None reported

Management Practices Hunting is prohibited in the Bird Sanctuaries and visitors restricted for part of the year. There is some grazing in the coastal meadows.

Scientific Research and Facilities No information

Principal Reference Material The above information is taken from documents supplied by the Swedish Government for designation in 1974, for the Cagliari Conference in November 1980 and for the Groningen Meeting in May 1984. Supplemented by:

Carp, E. (1980) *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

Getterön

Location 57°08'N, 12°14'E. Located about 62km south of Göteborg and just north of Varberg in Halland län on the Kattegat shore of the west coast.

Area 340ha

Degree of Protection Ownership is divided between State, Local Authority and private. The whole area is a nature reserve established in 1970. Designated as a Ramsar site on 5 December 1974.

Site Description Before the 1930s Getterön was an island, but through the dumping of dredged material to form an embankment, and the construction of a road, it is now connected to the mainland. The main part of the nature reserve comprises Farehammarsviken Bay, an area which has become partly enclosed and desalinated following the embankment construction. The bay has a freshwater inflow, and consists of brackish water basins containing reed *Phragmites australis*, glaucous bulrush *Scirpus tabernae montani* and other higher plants. The surrounding coastal meadows are of varying degrees of wetness, and are grazed by cattle. Cattle also graze on the wide belts of *Scirpus* spp.

International and National Importance In the past few decades the area has become one of the most important bird localities on the west coast of Sweden. It has a very rich fauna of breeding waterfowl including avocet *Recurvirostra avosetta* (2 pairs 1978), black-tailed godwit *Limosa limosa* (7 pairs), redshank *Tringa totanus* (22 pairs), dunlin *Calidris alpina schinzii* (11 pairs), ruff *Philomachus pugnax* (9 pairs), teal, gadwall, shoveler, wigeon, eider, shelduck and spotted crane (*Anas crecca*, *A. strepera*, *A. clypeata*, *A. penelope*, *Somateria mollissima*, *Tadorna tadorna* and *Porzana porzana*). Several pairs of yellow wagtail *Motacilla flava* also breed here. Getterön is also one of the most important resting places for waterfowl on the west coast of Sweden. Large numbers of brent goose *Branta bernicla* winter here. The area is used regularly as a hunting ground by many birds of prey, including peregrine falcon *Falco peregrinus*, osprey *Pandion haliaetus*, marsh harrier *Circus aeruginosus* and short-eared owl *Asio flammeus*.

Changes in Ecological Character From time to time the site is threatened by the possible expansion of an adjacent airport. In the long term, the current revegetation with macrophytes will have adverse effects.

Management Practices Access is restricted to the reserve. Restoration measures have started on an experimental scale, and further activities are under consideration.

Scientific Research and Facilities Facilities for bird watchers include an observation tower and a new bird station, from which the bay and surrounding meadows can be surveyed without causing disturbance to the birds.

Principal Reference Material The above information is taken from documents supplied by the Government of Sweden for designation in 1974, for the Cagliari Conference in November 1980 and for the Groningen Meeting in May 1984. Supplemented by:

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

Duffey, E. (1982). *National Parks and Reserves of Western Europe*. Macdonald and Co., London.

Additional references:

Pehrsson, O. et al. (1973). *Getteröns fågelreservat*. Report to the Environmental Protection Board No. PM 423 (mimeo).

Pehrsson, O. et al. (1980). *Getteröns fågelreservat*. Investigations and proposals for management. PM 1264 (mimeo in Swedish).

Store Mosse and Kävsjön

Location 57°18'N, 13°57'E. Located about 70km south of Jonköping in southern Sweden.

Area 7,450ha

Degree of Protection State owned. The area has been protected as a nature reserve since 1971 and is now a national park established in 1982, and as such is protected from all forms of exploitation. Designated as a Ramsar site on 5 December 1974.

Site Description The site comprises a mosaic of raised bog, fen and open water. The fens are partly natural but also formed by artificial lowering of the lakes in the 1840s and 1870s. Now only Kävsjön and Kälvasjön remain as permanent lakes. Lakes Haradssjön and Horssjön only have open water at high-water periods. There are a number of smaller pools. The site contains typical mire vegetation interspersed with patches of Scots pine *Pinus sylvestris* and treeless areas of dwarf scrubs. The flora includes a number of Orchidaceae such as marsh helleborine *Epipactis palustris*, fragrant orchid *Gymnadenia conopsea* and meadow orchid *Dactylorhiza incarnata*. Conditions are very favourable for breeding and migratory birds especially waterfowl.

International and National Importance The site is important for its diverse bird community, having a remarkable mix of northern and southern bird species, and is Sweden's most extensive mire complex outside Norrland. The mire area is a breeding ground for Sweden's possibly largest population of crane *Grus grus* (tens of pairs). Other species include red-throated diver, black-throated diver, Slavonian grebe, red-necked grebe, teal, pintail, wigeon, shoveler, garganey, pochard, coot, water rail, spotted crake, wood sandpiper, redshank, golden plover, dunlin, ruff and short-eared owl (*Gavia stellata*, *G. arctica*, *Podiceps auritus*, *P. grisegena*, *Anas crecca*, *A. acuta*, *A. penelope*, *A. clypeata*, *A. querquedula*, *Aythya ferina*, *Fulica atra*, *Rallus aquaticus*, *Porzana porzana*, *Tringa glareola*, *Tringa totanus*, *Pluvialis apricaria*, *Calidris alpina*, *Philomachus pugnax* and *Asio flammeus*). The most common resident duck species are mallard *Anas platyrhynchos*, teal, tufted duck *Aythya fuligula* and goldeneye *Bucephala clangula*. Especially remarkable is the regular annual breeding of jack snipe *Lymnocyptes minimus* and whooper swan *Cygnus cygnus*, both of which occur mainly in northernmost Sweden. During spring and autumn, Kävsjön is a resting site for passage migratory waterfowl, including large numbers of whooper swan and bean goose *Anser fabalis*.

Changes in Ecological Character There has been invasion by scrub in areas where hay is no longer cut, or where cattle no longer graze. This has decreased the value of these areas for bird life. As the old ditches are filled, the water level of the surrounding land rises.

Management Practices A management plan for the area is currently being prepared. Access is restricted to parts of the park during the bird breeding season. Restoration measures, including rotary cultivation of some areas, have been undertaken.

Scientific Research and Facilities Hydrological, botanical, limnological and ornithological investigations have been undertaken as part of a project to restore some swamp and peatland which has been invaded by scrub.

Principal Reference Material The above information is taken from the documents supplied by the Swedish Government for designation in 1974, for the Cagliari Conference in November 1980 and for the Groningen Meeting in May 1984. Supplemented by:

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

IUCN (1977). *World Directory of National Parks and other Protected Areas*. IUCN, Gland, Switzerland.

Additional references:

Committee Reports on restoration, including results of botanical, ornithological, limnological and hydrological investigations. (Arbetsgruppen för Kävsjön restaurering). Jonköping, 1974.

Nilsson, L. *et al.*, (1976). Kävsjöns fågelfauna 1972-1975. *Fauna och Flora* 71: 242-253 (English summary).

Nilsson, L. *et al.*, (1982). Kävsjön som fågelsjö - hackande och rastande vattenfåglor 1972-1980, samt om restaureringen av strandöngsbiotoper. *Vai Fågelvärld* 41: 297-314 (English summary).

Isles off Götland

Location Faludden 57°00'N, 18°22'E; Grötlingboholme-Rone Ytterholme 57°07'N, 18°30'E; Laus Holmar 57°17'N, 18°45'E; and Skenholmen 57°48'N 19°03'E. In the Baltic Sea off the east coast of Götland.

Area Total 3,165ha. Faludden 1,300ha; Grötlingboholme-Rone Ytterholme 1,625ha; Laus Holmar 540ha; Skenholmen 700ha

Degree of Protection Ownership is part state and part private. In the part known as Grötlingboholme-Rone Ytterholme there are two nature reserves totalling 340ha. Laus Holmar is a bird sanctuary. Designated as a Ramsar site on 5 December 1974.

Site Description The site is in three sections surrounding a number of low-lying limestone islands which have long been used for sheep, cattle and horse grazing, and have a short grassy sward and gravelly soils with hardly any trees or bushes. Large parts of Grötlingboholme comprise beach gravel in marked ridges, especially at the southern end. There are long series of ridges on the beaches on Rone Ytterholme. Both islands are treeless. Close to Rone Ytterholme there are large shallow water areas with projecting banks. A few kilometres north of Grötlingboholme-Rone Ytterholme is the section known as Laus Holmar which consists of three islands: Storholmen, Skarpholmen and Gräsholmen. On the shores of these islands is a system of ridges, some of which consists of spurs formed by a rise in land level. Skarpholmen and Gräsholmen are ungrazed and to a certain extent have a well-developed plant vegetation. Storholmen is grazed by cattle, and the grass here is much shorter. There are some small wetlands on the islands. The most northerly of the three sections is Skenholmen, a flat, grassy, almost completely treeless island, which is used for sheep grazing and military target practice.

International and National Importance The main reason for the inclusion of these islands is their importance to flocks of migrating barnacle goose *Branta leucopsis* which breed in areas on the Arctic Ocean. Tens of thousands graze here during a spring stopover of almost two months (generally in April and May). In autumn their stopover (from the end of September) is much shorter. The area is probably the most important locality in the Baltic for barnacle goose. The islands are also important for migrating brent goose *B. bernicla* and greylag goose *Anser anser*. Grötlingboholme-Rone Ytterholme is considered to be the Baltic's most important moulting ground for greylag geese. This area also supports breeding colonies of black-headed gull *Larus ridibundus* and sandwich tern *Sterna sandvicensis*. There are also many species of ducks and waders including dunlin *Calidris alpina schinzii*. Laus Holmar has 35 breeding species including greylag goose, eider *Somateria mollissima*, dunlin, little tern *Sterna albifrons*, avocet *Recurvirostra avosetta* and turnstone *Arenaria interpres*. Periodically there are also large colonies of gulls. Skenholmen is an important breeding ground for eider, greylag, black-tailed godwit *Limosa limosa*, little gull *Larus minutus*, ruff *Philomachus pugnax*, dunlin, caspian tern *Sterna caspia*, little tern and black-headed gull. In winter the island is an important resting place for ducks, swans and birds

Changes in Ecological Character Possible overgrazing by sheep

Management Practices Skenholmen is used for target practice by the military except during the goose migration period. However, this use would appear to be favourable to nature conservation since military regulations forbid public access. Use of the islands for grazing is also reasonably compatible with the presence of the geese. Access is restricted to the two nature reserves at Grötlingboholme-Rone Ytterholme and Laus Holmer.

Scientific Research and Facilities No information

Principal Reference Material The above information is taken from the documents supplied by the Swedish Government for designation in 1974, for the Cagliari Conference in November 1980 and for the Groningen Meeting in May 1984. Supplemented by:

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

Hornborgasjön

Location 58°19'N, 13°33'E. Situated between lakes Vanern and Vättern in Skaraborg län.

Area 6,350ha

Degree of Protection Private and state ownership. The designated site includes two nature reserves. Designated as a Ramsar site on 5 December 1974.

Site Description Hornborgasjön is a shallow lake, originally 3m deep, but in which the water level has been lowered five times since 1802. After the last two lowerings in 1904-1911 and 1932-33 the lake was almost completely overgrown by emergent vegetation. By 1933 it had been completely canalised, with inflow being led directly to the outlet, and the lake used to dry up every summer until 1954 when a 1,200ha area in the north was enclosed by dykes. In 1965 the lake had become overgrown with reed *Phragmites australis*, slender tufted sedge *Carex acuta* and willow *Salix* sp., which led to some experimental clearing of reeds being carried out, and an investigation of the best method of preserving the area for waterfowl was instigated. In 1973 the final report was forwarded to the Government by the Environment Protection Board which proposed that the emergent vegetation be cleared over an area of 1,100ha and the water level raised. This was approved by the Swedish Parliament in 1977.

International and National Importance During the 1970s, breeding waterfowl included all of Sweden's five species of grebe, mute swan (20 pairs), greylag goose, crane, mallard, shoveler, teal, garganey, gadwall, pochard, tufted duck, coot (1,000 pairs), water rail, moorhen, spotted crake, lapwing, redshank, green sandpiper, wood sandpiper, ruff and black-headed gull (8,000 pairs) (*Cygnus olor*, *Anser anser*, *Grus grus*, *Anas platyrhynchos*, *A. clypeata*, *A. crecca*, *A. querquedula*, *A. strepera*, *Aythya ferina*, *A. fuligula*, *Fulica atra*, *Rallus aquaticus*, *Gallinula chloropus*, *Porzana porzana*, *Vanellus vanellus*, *Tringa totanus*, *T. ochropus*, *T. glareola*, *Philomachus pugnax* and *Larus ridibundus*). Other breeding species include grasshopper warbler *Locustella naevia* (60 pairs), thousands of sedge warbler *Acrocephalus schenobaenus* and reed warbler *A. scirpaceus*, and a few pairs of common rose finch *Carpodacus erythrinus*. Hornborgasjön supports the second largest population of marsh harrier *Circus aeruginosus* in

Sweden (20 pairs), and the only known remnant of the southern Swedish population of hen harrier *Circus cyaneus*. In the summer a number of osprey *Pandion haliaetus* are seen fishing here. The lake is of great importance as a stopover for migrants including mute swan, bean goose, ruff and wigeon. The area is particularly important for crane *Grus grus* with 4,000-6,000 individuals resting there April-May, some staying on to breed.

Changes in Ecological Character The area has been extensively modified by man over the past 200 years. It used to be famous as a resting and nesting site for waterfowl, and it is hoped that after restoration is completed it will once again become one of Sweden's finest waterfowl lakes. Experimental clearing has already had beneficial effects, with little gull, black tern, dunlin and ruff starting to breed here. Restoration is expected to increase the number of ducks in particular. In 1988, representatives of international organisations were invited to Lake Haraborga to receive information about the restoration plan. The Ramsar Bureau's Monitoring Procedure was applied at this time. The Swedish Parliament has recently decided to support the comprehensive plan elaborated by the Environmental Protection Agency. The administrative and judicial processes to obtain permits for raising the lake level have been started.

Management Practices Original plans were to raise the water level by 1m. However, in 1986 the Government commissioned the Board of Management to present a detailed restoration alternative which included a 0.8m raising of the water level, but with no or few embankments along the shores. It is believed this will create better habitats for wetland birds compared to the original plans. Lake restoration will include clearing vegetation over an area of 1,100ha, and should be completed by 1987. Public access has to be restricted during April-May when cranes are present. Some potatoes are grown as food for cranes.

Scientific Research and Facilities Avifaunal studies have been carried out for a long period. More recently there has been extensive research into lake restoration methods, especially on developing methods for reed eradication. A field station has been established and an information centre was opened in 1986. When lake restoration is complete, Hornborgasjön will provide valuable case study material for restoration of degraded wetlands.

Principal Reference Material The above information is taken from documents supplied by the Swedish Government for designation in 1974, for the Cagliari Conference in November 1980 and for the Groningen Meeting in May 1984. Supplemented by:

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

Gelin, C. (1978). The restoration of freshwater ecosystems in Sweden. In: Holdgate, M.W. and Woodman, M.J. (Eds). *The Breakdown and Restoration of Ecosystems*. *NATO Conference Series*, I Ecology.

Additional references:

Bjork, S. (1972). Swedish lake restoration program gets results. *Ambio* 1:153-165.

Environment Protection Board (1973). *Hornborgasjön utredningen*. 3 vols. (summary, limnological and ornithological aspects). Committee Report PM 280.

Several papers in *Var Fagelvarld* with English summaries.

Täkern

Location 58°21'N, 14°49'E. Located about 40km west of Linköping in Östergötland län.

Area 5,600ha

Degree of Protection Private ownership. Most of the designated site is included in a nature reserve of 5,420ha. Designated as a Ramsar site in December 1974.

Site Description Lake Täkern lies east of Lake Vättern in a region dominated by Cambrian-Silurian bedrock and cultivated clay plains. The lake is very eutrophic and shallow, with an average depth of 0.8m. In the last century the water level was permanently lowered, allowing vast reedbeds of *Phragmites* sp. to develop. These now cover about one-third of the lake's area. The shallows contain water milfoil *Myriophyllum* spp., stoneworts, *Chara* spp., pondweeds *Potamogeton* sp. and *Ranunculus* spp. which are a food source for waterfowl.

International and National Importance The lake has a large number of the birds common to central Swedish lakes, and also a number of unusual species. There are large numbers of birds dependent on reeds. The populations of marsh harrier *Circus aeruginosus* (40 pairs), bittern *Botaurus stellaris*, bearded tit *Panurus biarmicus* and great reed warbler *Acrocephalus arundinaceus* are probably the largest in Sweden. All five species of grebe breeding in Sweden occur here, including over 100 pairs of red-necked grebe *Podiceps grisegena*. A colony of black tern *Chlidonias niger* established in 1970 has become one of Sweden's largest, with about 30 pairs in 1979. Other breeding waterfowl include 10 species of duck. Lake Täkern also supports Sweden's largest population of black-headed gull *Larus ridibundus*. The breeding area for waders is limited at present due to lack of spring flooding and the small area of pasture. However, birds currently breeding here include dunlin *Calidris alpina*, ruff *Philomachus pugnax*, redshank *Tringa totanus* and oystercatcher *Haematopus ostralegus*. Migrant visitors include most of Sweden's wader species and large numbers of duck and geese including mallard *Anas platyrhynchos*, teal *A. crecca*, wigeon *A. penelope*, goosander *Mergus merganser* and all European species of geese (especially bean goose *Anser fabalis*) with about 40,000 pairs maximum in November. The area is also an important summering and moulting ground for ducks, greylag goose *Anser anser* and 2,000-3,000 mute swan *Cygnus olor*.

Changes in Ecological Character Certain bird species have declined in number.

Management Practices Some improvements in water level regulation have been achieved. Practices also include experimental removal of vegetation along the shores by means of amphibious vehicles. Access is restricted to most of the reserve.

Scientific Research and Facilities Some limnology-botanical studies have been made, and a bird ringing station has been in operation for some years and formed the basis for ornithological work.

Principal Reference Material The above information is taken from documents supplied by the Swedish Government for designation in 1974, for the Cagliari Conference in November 1980 and for the Groningen Meeting in May 1984. Supplemented by:

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

Duffey, E. (1982). *National Parks and Reserves of Western Europe*. Macdonald and Co., London.

Kvismaren

Location 59°10'N, 15°23'E. About 140km west of Stockholm, south of the town of Orebro.

Area 800ha

Degree of Protection Privately owned. The site includes a nature reserve (558ha). Designated as a Ramsar site on 5 December 1974.

Site Description Kvismaren valley is a mainly fertile and rather flat agricultural landscape. Formerly there were large areas of sedge and horsetail meadows surrounding two lakes. However, following a comprehensive lowering of the water level during the 1880s, the lakes dried out completely. They have now been replaced by extensive stretches of reeds *Phragmites* sp. interspersed with willow *Salix* sp. thickets and surrounded by marshy meadows, low-lying pasture, and arable land with many dense woods along the shores. The hydrology of the area is subject to strict control by canals and embankments to protect the surrounding arable land. However, a small area known as Bird Lake has been dyked so that the water level can be raised.

International and National Importance The area is a resting site for most of the wader and duck species passing through central Sweden. Species include a large number of bean goose *Anser fabalis* (100-200). Between two and four golden eagle *Aquila chrysaetos* winter in the valley. Annual summer visitors include quail *Coturnix coturnix*, corncrake *Crex crex*, little crane *Porzana parva*, little gull *Larus minutus*, black tern *Chlidonias niger*, golden oriole *Oriolus oriolus*, river warbler *Locustella fluviatilis*, short-eared owl *Asio flammeus*, long eared owl *A. otus* and hen harrier *Circus cyaneus*. Characteristic breeding birds at this site are marsh harrier *Circus aeruginosus* (5-7 pairs), bittern *Botaurus stellaris* (2-4 individuals), spotted crane *Porzana porzana*, gadwall *Anas strepera* (10-15 pairs), greylag goose *Anser anser* (a few pairs), little grebe *Tachybaptus ruficollis* (1-2 pairs), black-tailed godwit *Limosa limosa* (1-3 pairs), great reed warbler *Acrocephalus arundinaceus* (3 pairs), grasshopper warbler *Locustella naevia* (about 100 pairs), marsh warbler *Acrocephalus palustris*, common rosefinch *Carpodacus erythrinus* and thrush nightingale *Luscinia luscinia*.

Changes in Ecological Character Potential threats are increased drainage and cultivation, and decreasing grazing. Hen harrier, black-tailed godwit, short-eared owl and long-eared owl used to breed regularly in 1950s-early 1960s but are now rarely seen in the region.

Management Practices Restoration measures carried out since 1980 have included the burning of reed and scrub, rotary cultivation, and raising of the water level in an area of 85ha. Large-scale restoration measures will continue.

Scientific Research and Facilities Kvismaren bird station has been carrying out extensive research in the area since 1960. Work has concentrated on biocide problems, population studies, and, since the 1970s, on the development of various methods to control vegetation.

Principal Reference Material The above information is taken from the documents supplied by the Swedish Government for designation in 1974, for the Cagliari Conference in November 1980 and for the Groningen Meeting in May 1984. Supplemented by:

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

Sondell, J. *et al.* (1985). Kvismaren-och Fagelarna. Foreningen Kvismaren Fagelstation, Orebro. (In Swedish).

Hjälstaviken

Location 59°40'N, 17°23'E. Located 20km south of the town of Uppsala and 17km east of the town of Enkoping in Uppsala län.

Area 790ha

Degree of Protection Ownership is part private and part state. The area was established as a nature reserve in 1948. Designated as a Ramsar site on 5 December 1974.

Site Description Lake Hjälstaviken is a shallow almost completely enclosed bay of Lake Malaren, surrounded by tussocky meadows that merge into drier pasture and fields. The site includes two patches of deciduous trees overlooking the bay, and to the east a conifer-covered hill with exposed rocks. The average lake depth is 1m, and it is characterised by clear water and a very flocculant sediment. Only 30ha of the lake area is open water, with the remainder invaded by reed *Phragmites communis*, rushes *Scirpus* spp. and reedmace *Typha* spp. The reed belts are 200-400m wide. Submerged and floating vegetation has declined in recent years.

International and National Importance About 100 bird species breed in the area including 30 associated with the wetland. Species include bittern *Botaurus stellaris*, marsh harrier *Circus aeruginosus*, hobby *Falco subbuteo*, teal *Anas crecca*, gadwall *A. strepera*, garganey *A. querquedula*, shoveler *A. clypeata*, pochard *Aythya ferina*, tufted duck *A. fuligula*, water rail *Rallus aquaticus*, grasshopper warbler *Locustella naevia* and spotted crake *Porzana porzana*. There are regular sightings of Slavonian grebe *Podiceps auritus*, little crake *Porzana parva*, common rosefinch *Carpodacus erythrinus* and osprey *Pandion haliaetus*. Lake Hjälstaviken is a resting place for ducks, geese and waders during spring and autumn migration, including great snipe *Gallinago media*, jack snipe *Limnocryptes minimus*, black-tailed godwit *Limosa limosa*, crane *Grus grus*, bean goose *Anser fabalis*, Canada goose *Branta canadensis* and goosander *Mergus merganser*. In winter the lake and surrounding area are important for a number of birds of prey, notably golden eagle *Aquila chrysaetos*, rough-legged buzzard *Buteo lagopus* and goshawk

Accipiter gentilis. This lake has served as a base from which mute swan *Cygnus olor* has colonised Sweden.

Changes in Ecological Character Encroachment by marginal vegetation, and loss of submerged and floating macrophytes, has adversely affected the value of the area for birdlife, and the number of ducks using the site has declined in recent years. A further potential problem is the heavy use of fertilisers in surrounding farmland. This is one of Sweden's most popular bird reserves and has large numbers of visitors.

Management Practices The surrounding pastures are grazed. Public access is restricted to nature trails. A management plan has recently been prepared for this area. Minor restoration and management measures have been carried out in the lake and in some of the surrounding meadows.

Scientific Research and Facilities Research includes studies in ornithology, hydrology, vegetation and the potential effects of fertiliser contamination from surrounding fields.

Principal Reference Material The above information is taken from documents supplied by the Swedish Government for designation in 1974, for the Cagliari Conference in November 1980 and for the Groningen Meeting in May 1984. Supplemented by:

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

Annsjön

Location 63°16'N, 12°33'E. Located about 80km due west of Lake Storsjön in Jamtland län.

Area 11,300ha (including the lower River Handolan)

Degree of Protection Privately owned. Designated as a Ramsar site on 5 December 1974.

Site Description Annsjön is a very shallow, oligotrophic lake in the upper part of the Indal River drainage system and is surrounded by extensive mire. At the western end, the confluence of two rivers has formed the Handol Delta. There are also deltas in the north-west (Hara) and south-east (Jarpan). About half the lakeshore is marshy ground, with one sandy section about 2km long in the east forming a high narrow ridge. Some sections of the lakeshore are eroded peat in steps 3-4m high. The lower course of the River Handolan has many canyon features including torrent areas and magnificent waterfalls. The proximity of the lake to the wilderness-like forested areas in the south and east contribute to its varied animal life.

International and National Importance The mire delta areas and shallow open waters are important for migrating and breeding birds. Breeding species include at least 10 species of duck including wigeon *Anas penelope*, common scoter *Melanitta nigra*, velvet scoter *M. fusca*, long-tailed duck *Clangula hyemalis* and pintail *Anas acuta*, red-throated diver *Gavia stellata* and bean goose *Anser fabalis* (occasionally), and 14 species of wader including broad-billed sandpiper *Limicola falcinellus*, red-necked phalarope *Phalaropus lobatus*, Temminck's stint

Calidris temminckii and curlew *Numenius arquata*. Ninety bird species breed regularly in the area. Annsjön is very important as a resting station for wetland birds that breed further north. The mires are good examples of oceanically-influenced types and have a diverse flora. The lake has 35 species of vascular plants making it notably richer than lakes further downstream.

Changes in Ecological Character Lesser white-fronted geese *Anser erythropus* used to breed at the lake occasionally, but do so no longer.

Management Practices The lake is used for fishing and recreation, but access is restricted in some areas.

Scientific Research and Facilities Limnological studies were carried out in 1964 and 1966.

Principal Reference Material The above information is taken from documents supplied by the Swedish Government for designation in 1974 and for the Cagliari Conference in November 1980. Supplemented by:

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

Additional reference:

Persson, C. (1943). *Faglar vid Annsjön*.

Gammelstadsviken

Location 65°38'N, 22°00'E. Situated immediately north-west of the town of Lulea in Norrbotten län at the head of the Gulf of Bothnia.

Area 440ha

Degree of Protection Privately owned. The area was established as a nature reserve in 1969. Designated as a Ramsar site on 5 December 1974.

Site Description Lake Gammelstadsviken was formed when a 41km long coastal bay was isolated from the sea by land elevation. It is a shallow lake with large areas less than 1m in depth and a maximum depth of 4m. The floor consists of fine grained marine sediment, clay and fine sand, covered by an increasing depth of lake mud. The inflows are small in volume and consequently the water exchange is low. Along large stretches of the shores is a quagmire-like zone consisting of reed *Phragmites communis*, greater reedmace *Typha latifolia*, water horsetail *Equisetum fluviatile* and bogbean *Menyanthes trifoliata*. The floating vegetation is dominated by least waterlily *Nuphar pumila*, small waterlily *Nymphaea candida* and common duckweed *Lemna minor*.

International and National Importance As a eutrophic lake with a very northerly position it has become an outpost for many southern plant and animal species. It supports 190 bird species including an unusually large number of ducks. Breeding species include Slavonian grebe, Canada goose, teal, wigeon, shoveler, pochard, goldeneye, little gull, red-necked phalarope,

redshank, ruff, snipe, red-necked grebe and marsh harrier (breeds here regularly) (*Podiceps auritus*, *Branta canadensis*, *Anas crecca*, *A. penelope*, *A. clypeata*, *Aythya ferina*, *Bucephala clangula*, *Larus minutus*, *Phalaropus lobatus*, *Tringa totanus*, *Philomachus pugnax*, *Gallinago gallinago*, *Podiceps grisegena* and *Circus aeruginosus*), and probably wood sandpiper *T. glareola*. Occasional hen harrier *Circus cyaneus*, osprey *Pandion haliaetus* and little grebe *Tachybaptus ruficollis*. Visitors in spring and autumn migrations include crane *Grus grus*, smew *Mergus albellus*, spotted redshank *Tringa erythropus*, bar-tailed godwit *Limosa lapponica*, black-tailed godwit *L. limosa*, curlew sandpiper *Calidris ferruginea* and broad-billed sandpiper *Limicola falcinellus*.

Changes in Ecological Character A road was recently built across the northern section of the lake, but so far it has not been possible to estimate the effect on the area. The lake is close to the town of Lulea, and some urbanisation is taking place close to the shoreline. The Swedish National Report to the Montreux Conference of Contracting Parties in 1990 referred to a planned exploitation project due to urban growth. The Environmental Protection Agency has stressed the need to incorporate buffer zones into the planning process.

Management Practices Some areas of the nature reserve have restricted access.

Scientific Research and Facilities No information

Principal Reference Material The above information is taken from documents supplied by the Swedish Government for designation in 1974, for the Cagliari Conference in November 1980 and for the Groningen Meeting in May 1984. Supplemented by:

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

Duffey, E. (1982). *National Parks and Reserves of Western Europe*. Macdonald and Co., London.

Persöfjärden

Location 65°46'N, 22°08'E. Located about 30km north of the town of Lulea in Norrbotten län, at the head of the Gulf of Bothnia.

Area 3,350ha

Degree of Protection The site is privately owned and has no statutory conservation protection. Preparations for the area to be protected as a nature reserve have started. Designated as a Ramsar site on 5 December 1974.

Site Description Lake Persöfjärden was formed when part of a coastal bay was isolated from the sea by a rise in land level. It is about 15km long, and is shallow with flat shores. In 1937 the lake level was lowered by about 1.3m, which encouraged the spread of extensive belts of rushes and reeds into the lake (which almost divide the lake into two at one point). The spread

of floating vegetation is also extensive. Some areas in the south-west have been invaded by willows *Salix* sp. Before 1937 Persöfjärden was noted for its diverse fish and bird populations, but after the change in water level the fish largely disappeared though the number of bird species increased. Many sections of the shore still regularly flood and provide good conditions for wetland bird species. The bird fauna is not well known, mainly due to its large size, though it is probably similar to that of Lake Gammelstadsviken, another Ramsar site.

International and National Importance The site is probably of most importance as a resting area for ducks, geese and waders. Flocks of bean goose *Anser fabalis* are regular feeders at the lake. It is also an important locality for birds of prey during the migration period. Breeding species include red-necked phalarope *Phalaropus lobatus*, the lake being one of only two or three inland lakes in Norrbotten where this species breeds. Other probable breeding species include marsh harrier *Circus aeruginosus*, little gull *Larus minutus* and Slavonian grebe *Podiceps auritus*. 187 bird species have been recorded.

Changes in Ecological Character There are some indications that a decrease in the breeding bird population has occurred in the last few years. In recent years a decrease in the pH of the lake water has been recorded. The regular flooding, which still occurs, causes problems for local farmers, and has prompted requests for further drainage of the area. This could possibly threaten nature conservation in certain sections of the area.

Management Practices Raising the water level is being considered, and is already gradually taking place because the lake outlets have been allowed to become blocked by vegetation.

Scientific Research and Facilities No information

Principal Reference Material The above information is taken from documents supplied by the Swedish Government for designation in 1974 and for the Cagliari Conference in November 1980. Supplemented by:

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

Tärnasjön

Location 66°00'N, 15°29'E. Located about 40km south-west of the town of Ammarnäs in Vasterbotten län.

Area 11,800ha

Degree of Protection State owned. The whole area is a nature reserve. Designated as a Ramsar site on 5 December 1974.

Site Description Tärnasjön is a long, narrow lake occupying a stretch of the upper Ume river system. It is situated completely within the sub-alpine region, and lies in a flat marshy basin characterized by parallel moraine ridges. In the southern part of the lake these ridges form a distinctive landscape with a very indented marshy shoreline and numerous small islands.

Vegetation is mainly heathlike woods of birch *Betula* spp. with dwarf scrub often reaching down to the shore. Some tall *Carex* species occur. The area floods in spring. In the south towards Ankadalen are extensive mire areas and a mosaic of mires, small lakes and moraine ridges covered with birch woods. Most of the lakeshore is composed of moraine deposits with a rich flora. The River Tärna enters the lake in the north, forming a delta which has been modified by human activities. North-west of the delta are botanically important mires, and further north at Lake Laivajaure are the southernmost and probably the best developed 'Palsa' mires in Sweden.

International and National Importance The site is an important breeding area for 10 duck species and 10 wader species particularly in the delta to the north, the archipelago in the southern end of Tärnasjön, and the surrounding mires north of Lake Guttajaure and towards and in Ankadalen Valley. Breeding duck include wigeon *Anas penelope*, teal *A. crecca*, scaup *Aythya marila*, common scoter *Melanitta nigra* and velvet scoter *M. fusca*. Breeding waders include whimbrel *Numenius phaeopus*, ruff *Philomachus pugnax*, red-necked phalarope *Phalaropus lobatus* and great snipe *Gallinago media*. A number of birds of prey also breed. Other important fauna include European beaver *Castor fiber* which has been introduced to the area. The site is botanically important for its extensive mire complexes, and is one of the few areas in the region not yet affected by water regulation for hydro-electric schemes.

Changes in Ecological Character None reported

Management Practices Fishing is allowed on the lake.

Scientific Research and Facilities No information

Principal Reference Material The above information is taken from documents supplied by the Swedish Government for designation in 1974 and for the Cagliari Conference in November 1980. Supplemented by:

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

Tjalmejaure-Laisdalen

Location 66°15'N, 16°11'E. Near Peljekajse National Park (to the north) and the Norwegian border (to the west) in the south-west of Norrbotten län.

Area 22,200ha

Degree of Protection State owned. The designated site includes a nature reserve of 500ha in the Yraf Delta. Bird sanctuary regulations apply to a large part of the area. Designated as a Ramsar site on 5 December 1974.

Site Description The site comprises two mountain valleys which converge above Lake Yraf, and includes a delta formed in the lake by the combined rivers. The southern of the two valleys contains a series of lakes with wide flat shores: Bosjujaure - Tjalmejaure and Gavajaure. The northern valley, Laisdalen, is much narrower. Either side of the river is a marshy strip bordered

by birch *Betula* sp. woods (partly 'meadow' birch forest) with a sparse element of pine *Pinus* sp. Fauna includes wolverine *Gulo gulo*, brown bear *Ursus arctos*, lynx *Lynx lynx*, pine marten *Martes martes* and a diverse bird community.

International and National Importance The lake system in the southern valley is an important breeding and resting ground for waterfowl. Breeding birds include some 10 species of duck, broad-billed sandpiper *Limicola falcinellis*, purple sandpiper *Calidris maritima*, great snipe *Gallinago media*, snowy owl *Nyctea scandiaca* and red-throated pipit *Anthus cervinus*. Lais-dalen is one of the richest of all Swedish mountain valleys in animal species, and has long been known as an extremely productive region for willow grouse *Lagopus lagopus* and ducks. The woodland in the valley is important for waxwing *Bombycilla garrulus*, Siberian jay *Perisoreus infaustus* and capercaillie *Tetrao urogallus* (unusually abundant). Also numerous are various birds of prey including golden eagle *Aquila chrysaetus*, rough-legged buzzard *Buteo lagopus*, osprey *Pandion haliaetus* and merlin *Falco columbarius*. The valley is also unusual because the ranges of a number of species extend further into the mountains than has been observed elsewhere in Sweden. In spring it is visited by large numbers of migrating birds and is the last stopover before their breeding grounds.

Changes in Ecological Character In recent years, lesser white-fronted goose *Anser erythropus* has disappeared from the southern valley, where several pairs used to breed regularly.

Management Practices No information

Scientific Research and Facilities No information

Principal Reference Material The above information is taken from documents supplied by the Swedish Government for designation in 1974, for the Cagliari Conference in November 1980. Supplemented by:

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

Laidaure

Location 67°07'N, 17°45'E. About 86km north-west of the town of Jokkmokk and on the south-eastern border of Sarek National Park, Norrbotten län.

Area 4,150ha

Degree of Protection Ownership is divided between the State, the Swedish Society for the Conservation of Nature and private owners. Part of the designated site (300ha) in the region of the River Rapa delta is included in Sarek National Park. Designated as a Ramsar site on 5 December 1974.

Site Description The site lies between the mountainous region of Sarek National Park and a zone of coniferous forests. It comprises Lake Laidaure, into which the delta of the River Rapa

is rapidly expanding at the eastern end. It has a diverse bird community and other fauna include brown bear *Ursus arctos* and moose *Alces alces*.

International and National Importance The delta is the most important bird locality in the Sarek region and is especially important as a breeding ground for duck including wigeon, pintail, teal, tufted duck, scaup and goldeneye (*Anas penelope*, *A. acuta*, *A. crecca*, *Aythya fuligula*, *A. marila* and *Bucephala clangula*). Numerous waders also breed in the delta and along the shores of Lake Laidare, including common sandpiper *Tringa hypoleucos*, wood sandpiper *T. glareola* and red-necked phalarope *Phalaropus lobatus*. The area, particularly the delta, is an important resting and moulting ground for various species of duck and large numbers of whooper swan *Cygnus cygnus*, mainly following the break-up of the ice in spring. Numerous species of passerines are also found on the delta.

Changes in Ecological Character There is increasing tourist pressure in the area, mainly from canoeing. Proposals for water regulation for hydroelectrical purposes have so far been turned down.

Management Practices No information

Scientific Research and Facilities No information

Principal Reference Material The above information is taken from documents supplied by the Swedish Government for designation in 1974 and for the Cagliari Conference in November 1980. Supplemented by:

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

Thornback, J. and Jenkins, M. (1982). *IUCN Mammal Red Data Book Part I*. IUCN, Gland, Switzerland.

Sjaunja-Kaitum

Location 67°17'N, 19°49'E. Located about 50km south-west of Kiruna in West Norrbotten län.

Area 208,000ha

Degree of Protection State owned. Most of the area is included within the boundary of a nature reserve. Designated as a Ramsar site in December 1974.

Site Description The site comprises virgin wilderness with a wide range of habitats including open water, mire moraine ridges and mountain slopes. The mountain region has been included in the designation to cover the whole catchment area. Sjaunja district contains the most extensive mire in Europe outside the Soviet Union. It is characterised by a mixture of open marshes, shallow lakes and birch *Betula* sp. woods. In drier parts are virgin spruce *Picea* sp. and pine *Pinus* sp. forests. The area contains at least 25 mammal species including brown bear *Ursus arctos*, lynx *Lynx lynx*, wolverine *Gulo gulo* and otter *Lutra lutra* (all occurring regularly).

International and National Importance The area is important for its mires, and the Sjaunja region supports a greater number of vertebrate species than any other mountain region in Sweden, including over 150 bird species with 100 known to breed in the wetland (about 50 of which are dependent on wetland habitat). Permanently resident species include white-tailed eagle *Haliaeetus albicilla*, golden eagle *Aquila chrysaetos* and numerous species of waterfowl including whooper swan *Cygnus cygnus*. Other breeding birds include jack snipe *Lymnocyptes minimus*, spotted redshank *Tringa erythropus*, broad-billed sandpiper *Limicola falcinellus*, red-necked phalarope *Phalaropus lobatus*, short-eared owl *Asio flammeus*, red-throated pipit *Anthus cervinus*, rustic bunting *Emberiza rustica* and little bunting *E. pusilla*. Gyr falcon *Falco rusticolus* appears sporadically.

Changes in Ecological Character There is some disturbance in spring from the use of snowmobiles.

Management Practices Some hunting is allowed in the bird sanctuary.

Scientific Research and Facilities Research is largely confined to studies of the bird fauna.

Principal Reference Material The above information is taken from documents supplied by the Swedish Government for designation in 1974 and for the Cagliari Conference in November 1980. Supplemented by:

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

Additional references:

Curry-Lindahl, K. (1971). Sjaunja och Kaitum.

Reports of the Environment Protection Board and Botanical Survey and Draft Wildlife Management Plan.

Tavvavuoma

Location 68°30'N, 20°45'E. In Norbotten län, 85km north-north-east of the town of Kiruna, about 30km east of the border with Norway and 40km south of the border with Finland.

Area 28,400ha

Degree of Protection State owned. Designated as a Ramsar site on 5 December 1974.

Site Description The site consists of a mosaic of mires, watercourses, lakes and pools, lying in a depression in one of the northernmost plateau regions of Lapland (altitude 900-1,000m). It forms part of the catchment area for the River Lainio, which is one of the two main tributaries of the River Torne. The presence of permafrost has influenced the vegetation, creating unusually extensive formations of 'Palsas' mire which can reach a height of 6-7m. Its arctic and sub-arctic peatlands and lakes are of considerable botanical and zoological interest.

International and National Importance Particularly rich concentrations of birds occur along the River Taavaätno and on the lakes in the south, making this area one of the most ornithologically rich regions in Lapland. Breeding species of waterfowl include whooper swan, pintail, teal, long-tailed duck, smew, red-necked phalarope, wood sandpiper, spotted redshank, ringed plover, golden plover, dunlin, ruff and long-tailed skua (*Cygnus cygnus*, *Anas acuta*, *A. crecca*, *Clangula hyemalis*, *Mergus albellus*, *Phalaropus lobatus*, *Tringa glareola*, *T. erythropus*, *Charadrius hiaticula*, *Pluvialis apricaria*, *Calidris alpina*, *Philomachus pugnax* and *Stercorarius longicaudus*). Species of breeding passerines include red-throated pipit *Anthus cervinus*, Lapland bunting *Calcarius lapponicus* and arctic redpoll *Acanthis hornemanni*. Other birds include lesser white-fronted goose *Anser erythropus*, bean goose *A. fabalis*, broad-billed sandpiper *Limicola falcinellus*, golden eagle *Aquila chrysaetos*, Gyr falcon *Falco rusticolus* and hen harrier *Circus cyaneus*.

Principal Reference Material The above information is taken from documents supplied by the Swedish Government for designation in 1974 and for the Cagliari Conference in November 1980. Supplemented by:

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

Additional references:

Arvidsson, B. (1979). *Taavavouma*. Forum, Stockholm. (In Swedish).

Report on the avifauna (Fältbiologerna, Göteborg 1973, mimeo).

Asnen

Location 56°37'N, 14°43'E

Area 16,635ha

Degree of Protection Nature reserve (approximately 1,200ha) and bird sanctuary. Designated as a Ramsar site on 12 June 1989.

Site Description A large oligotrophic lake with many small bays, peninsulars and islands, surrounded by mainly coniferous forest (especially *Picea*). There is some deciduous woodland, particularly on the islands, which is important because of its great age. Further wetland habitats are found all around the lake including grazed wet meadows.

International and National Importance The lake holds one of the densest breeding populations in Europe of both Arctic diver *Gavia artica* (about 70 pairs) and osprey *Pandion haliaetus* (around 45 pairs). Other nesting species include marsh harrier *Circus aeruginosus* (1-2 pairs), hobby *Falco subbuteo* (8-10 pairs), spotted crane *Porzana porzana*, corncrake *Crex crex* (occasional), and yellow wagtail *Motacilla flava* (30-35 pairs).

Changes in Ecological Character Apart from grazing, human activities include regulation of the lake water-level, forestry and boating. There is a potential threat to species such as Arctic

diver *Gavia artica* from the inflow of nutrients used in agricultural fertilisers, which is causing eutrophication. There is disturbance from boating and clear-felling in some areas.

Principal Reference Material

Grimmett, R.F.A. and Jones, T.A. (1989). *Important bird areas of Europe*. International Council for Bird Preservation. 888 pp.

Träslövsläga - Morups Tange

Location 56°59'N, 12°20'E

Area 1,990ha

Degree of Protection Designated as a Ramsar Site on 12 June 1989.

Stigfjorden Bay

Location 58°07'N, 11°40'E

Area 5,185ha

Degree of Protection Four nature reserves (c. 1,515ha); remainder is a nature conservation area. Designated as a Ramsar site on 5 June 1989.

Site Description A fjord between two rather large islands off the west Swedish coast, with extensive shallow waters and a *Zostera*-covered clay sea-floor. The islands have well-managed coastal meadows with a saltmarsh character and some, mostly deciduous, forest dominated by *Quercus*. Of great interest botanically, with a number of rare species. Human activities include boating, swimming, fishing and grazing for conservation purposes.

International and National Importance An important area for large numbers of migrating birds, as well as for breeding and wintering species, notably wildfowl and waders. Breeding species include dunlin *Calidris alpina* and eagle owl *Bubo bubo*, whilst whooper swan *Cygnus cygnus* (a few hundred) is amongst the species using the area on passage.

Principal Reference Material

Grimmett, R.F.A. and Jones, T.A. (1989). *Important bird areas of Europe*. International Council for Bird Preservation. 888 pp.

Dättern Bay

Location 58°23'N, 12°37'E

Area 3,320ha

Degree of Protection Designated as a Ramsar site on 5 June 1989

Site Description Dättern is an almost enclosed bay of Lake Vanern with a *Phragmites*-dominated shoreline. Large areas of sand and clay are exposed when the water-level is low, forming important resting areas for waders. The sound connecting Dättern with the main lake becomes ice-free early in the spring. The area is surrounded by grazed meadows.

International and National Importance Approximately 45 wetland bird species have been recorded breeding at this site, including bittern *Botaurus stellaris* (7 males), marsh harrier *Circus aeruginosus*, osprey *Pandion haliaetus*, water rail *Rallus aquaticus*, little ringed plover *Charadrius dubius*, black-tailed godwit *Limosa limosa* (occasional), and bearded tit *Panurus biarmicus*. Wintering and passage birds include whooper swan *Cygnus cygnus*, white-tailed eagle *Haliaeetus albicilla*, and hen harrier *Circus cyaneus*.

Principal Reference Material

Grimmett, R.F.A. and Jones, T.A. (1989). *Important bird areas of Europe*. International Council for Bird Preservation. 888 pp.

Lake Osten

Location 58°35'N, 13°57'E

Area 1,020ha

Degree of Protection Mainly unprotected; small part (less than 25ha) included in Odensaker Nature Reserve. Designated as a Ramsar site on 12 June 1989.

Site Description A shallow eutrophic lake in a generally flat landscape, except for a few higher parts which are covered in coniferous forest. The lake was lowered three times by drainage projects in the 19th century and the reclaimed land, now grazed water-meadows, forms an important wader habitat. Rapid water exchange in the lake means that the period of ice-cover is quite short. Grazing of livestock is the main land use.

International and National Importance The site is very important for migrants including Slavonian grebe *Podiceps auritus*, bittern *Botaurus stellaris* (occasional), whooper swan *Cygnus cygnus* (1,000+ in spring), bean goose *Anser fabalis* (3,000-5,000), lesser white-fronted goose *A. erythropus* (occasional), barnacle goose *Branta leucopsis* (occasional), spotted crane *Porzana*

porzana (probably also breeds), corncrake *Crex crex*, ruff *Philomachus pugnax* (150-1,000), great snipe *Gallinago media* (occasional), and Caspian tern *Sterna caspia* (rare).

Changes in Ecological Character Invasion of scrub occurs in some areas where there is a lack of grazing.

Principal Reference Material

Grimmett, R.F.A. and Jones, T.A. (1989). *Important bird areas of Europe*. International Council for Bird Preservation. 888 pp.

Kilsviken Bay

Location 59°03'N, 14°04'E

Area 9,100ha

Degree of Protection Nature reserve (60ha); Nature conservation area (c. 2,400ha). Designated as a Ramsar site on 12 June 1989.

Site Description Kilsviken is a eutrophic bay off Lake Vanern, surrounded by agricultural areas. The shoreline is largely made up of reedbeds and water-meadows and there is a rich sub-aquatic vegetation. Associated with Kilsviken is Kolstrandsviken Bay, which is less eutrophic with mudflats, and Arasviken Bay, which contains many small islands some of which are wooded. The northern part of Arasviken is characterised by extensive areas of *Phragmites*, and islands with grazing meadows and damp forests. Human activities include recreation and agriculture.

International and National Importance Breeding birds include red-throated diver *Gavia stellata* (5-7 pairs), black-throated diver *G. arctica*, bittern *Botaurus stellaris* (5-8 pairs), marsh harrier *Circus aeruginosus* (5-8 pairs), osprey *Pandion haliaetus* (10 pairs), and spotted crane *Porzana porzana* (1-3 pairs). Slavonian grebe *Podiceps auritus*, whooper swan *Cygnus cygnus*, white-fronted eagle *Haliaeetus albicilla* (2-4), and hen harrier *Circus cyaneus* are amongst the birds passing through in spring and autumn. White-fronted eagle also occurs in winter.

Changes in Ecological Character Canoeing and other recreational activities may endanger important breeding areas and the bays' sediments still contain mercury (Hg) from a former paper factory.

Principal Reference Material

Grimmett, R.F.A. and Jones, T.A. (1989). *Important bird areas of Europe*. International Council for Bird Preservation. 888 pp.

Outer Archipelago of Stockholm

Location 59°26'N, 19°22'E

Area 14,500ha

Degree of Protection Nature reserve (3400ha); large parts are also bird sanctuaries.

Site Description The main area of interest belongs to the outer part of the Stockholm archipelago and it can be divided into four groups of islands. *Stora Nassa* - c. 400 closely spaced rocky islets with little or no vegetation. The largest island has maritime *Betula* forest whilst a few others have *Juniperus*. Wet grasslands are also present on some islands. *Lilla Nassa* - smaller area than Stora Nassa but with islands more spread out and with very little vegetation. *Gilloga* - very flat islands in shallow waters with abundant cover and offshore submerged reefs. *Svenska Hogarna* - a flat island with *Juniperus*, Graminae and *Calluna*.

International and National Importance An important breeding area, especially for seabirds, with eider *Somateria mollissima* (3,000 pairs), velvet scoter *Melanitta fusca* (700 pairs), turnstone *Arenaria interpres* (100 pairs), Arctic skua *Stercorarius parasiticus* (a few pairs), guillemot *Uria aalge* (a few pairs), razorbill *Alca torda* (300 pairs), black guillemot *Cephus grylle* (600 pairs), and short-eared owl *Asio flammeus*.

Changes in Ecological Character The archipelago is largely uninhabited but during the summer it is a very popular leisure (boating) area, which has the potential risk of disturbing breeding birds.

Principal Reference Material

Grimmett, R.F.A. and Jones, T.A. (1989). *Important bird areas of Europe*. International Council for Bird Preservation. 888 pp.

River Svarten: Lake Gorgen - Nötmyran, Fläcksjön - Gussjön

Location 59°57'N, 16°20'E

Area 1,990ha

Degree of Protection Designated as a Ramsar site on 12 June 1989.

Site Description The area contains three eutrophic lakes: Fläcksjön, Gussjön and Gorgen, all connected by the River Svarten and surrounded by low-lying water-meadows. Associated vegetation includes areas of *Phragmites australis* and *Scirpus lacustris*, as well as wet *Betula* forest. The land is used for stock-grazing and hay-making and is one of the largest areas remaining in Sweden where mowing still takes place.

International and National Importance Breeding birds include Slavonian grebe *Podiceps auritus* (10 pairs), mallard *Anas querquedula* (8-10 pairs), shoveler *A. clypeata* (10 pairs), marsh harrier *Circus aeruginosus* (1 pair), spotted corncrake *Porzana porzana*, corncrake *Crex crex* (1 pair), golden plover *Pluvialis apricaria*, little gull *Larus minutus* and black tern *Chlidonias niger*. Black-throated diver *Gavia arctica* and whooper swan *Cygnus cygnus* are amongst the wintering and passage species. The latter also include spotted crane and golden plover.

Changes in Ecological Character Leaching of fertilisers into the wetland areas has accelerated growth of reeds and rushes (especially in Lake Flacksjon). Mowing and grazing must be maintained if the area is not to be overgrown by *Salix* scrub. There has recently been a threat from proposed dyke construction for agricultural purposes.

Principal Reference Material

Grimmett, R.F.A. and Jones, T.A. (1989). *Important bird areas of Europe*. International Council for Bird Preservation. 888 pp.

Hovran Area

Location 60°20'N, 16°03'E

Area 4,600ha

Degree of Protection Nature reserve (40ha). Designated as a Ramsar site on 12 June 1989.

Site Description This site includes some broader stretches of the River Dalalven, notably 'Lake' Hovran (in fact, effectively part of the river) and some smaller lagoons alongside. It is surrounded by arable land, coniferous and deciduous forests, and there are also open areas around the lakes with *Salix/Phragmites* vegetation.

International and National Importance A total of 230 bird species has been recorded, with the following amongst the breeders: Slavonian grebe *Podiceps auritus*, whooper swan *Cygnus cygnus* (1 pair), osprey *Pandion haliaetus* (10 pairs), corncrake *Crex crex* (occasional), and *Dendrocopos leucotos*. Passage migrants include red-throated diver *Gavia stellata*, black-throated diver *G. arctica*, bittern *Botaurus stellaris* (occasional), whooper swan (1,000-1,500), red-necked phalarope *Phalaropus lobatus* (irregular), curlew sandpiper *Calidris ferruginea* (regular), spotted redshank *Tringa erythropus* (250), and Caspian tern *Sterna caspia* (irregular; 1-5).

Changes in Ecological Character Dramatic water-level fluctuations result in the destruction of nests.

Principal Reference Material

Grimmett, R.F.A. and Jones, T.A. (1989). *Important bird areas of Europe*. International Council for Bird Preservation. 888 pp.

River Umeälv Delta

Location 63°45'N, 20°20'E

Area 1,150ha

Degree of Protection Nature reserve (120ha). Designated as a Ramsar site on 12 June 1989.

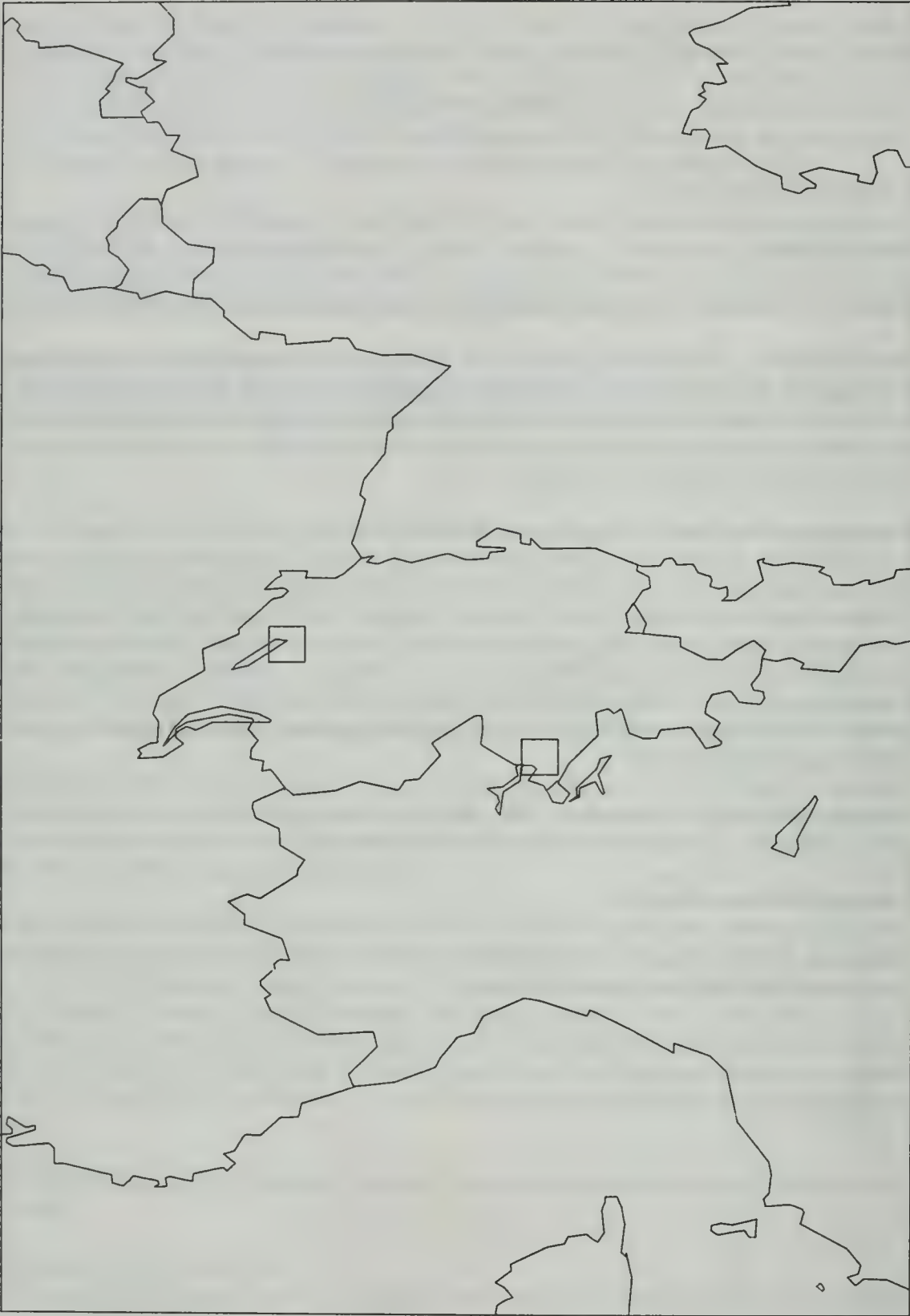
Site Description The delta of a river system flowing into the Gulf of Bothnia in north-east Sweden. The form of the delta is constantly changing, owing to the deposition of sediment, while the water level is very variable according to the flow of the river and tidal/sea-level factors. Much of the delta shoreline is surrounded by water-meadows but there is also deciduous forest with a few conifers. *Phragmites* is scarce.

International and National Importance Breeding species include little gull *Larus minutus* (c.10 pairs) and possibly black-tailed godwit *Limosa limosa*. An important staging area for migrants, especially waterfowl with the following species using the site: red-throated diver *Gavia stellata*, black-throated diver *G. arctica*, whooper swan *Cygnus cygnus*, white-fronted goose *Anser albifrons*, smew *Mergus albellus* (10-15), white-necked eagle *Haliaeetus albicilla*, Temminck's stint *Calidris temminckii* (125), ruff *Philomachus pugnax* (1,200), jack snipe *Lymnocyrtus minima*, black-tailed godwit *Limosa limosa*, whimbrel *Numenius phaeopus*, spotted redshank *Tringa erythropus* (150), red-necked phalarope *Phalaropus lobatus* (20), and little gull *Larus minutus* (10).

Changes in Ecological Character The area is used for commercial and leisure shipping, general recreation and forestry, which causes some disturbance.

Principal Reference Material

Grimmett, R.F.A. and Jones, T.A. (1989). *Important bird areas of Europe*. International Council for Bird Preservation. 888 pp.



Ramsar Sites in Switzerland

Switzerland

Area 41,287 sq.km

Population 6,566,900 (1987 estimate)

Summary of Wetland Situation Several important waterbodies are situated on the Swiss borders. The River Rhine having formed the frontier with Liechtenstein over a length of about 25km and with Austria over a length of about 30km, passes through Lake Constance (the northern shore of which is the territory of the Federal Republic of Germany) then forms the German frontier for the final 75km of its course in Switzerland. The border with Italy twice transects the Lago di Lugano and also the northern end of Lago Maggiore. Also, some 60km of the southern shore of Lake Geneva is French territory.

Lake Constance, Lake Geneva and Lake Neuchâtel are of special international importance as wintering or moulting places for very large numbers of waterfowl, as supported by data for 25 winters. For example, in January 1983 about 140,000 waterfowl (excluding gulls) were present on Lake Geneva alone, the most numerous being great crested grebe *Podiceps cristatus* (11,000), black-necked grebe *P. nigricollis* (4,700), tufted duck *Aythya fuligula* 59,000), pochard *A. ferina* (19,000), goldeneye *Bucephala clangula* (3,000), goosander *Mergus merganser* (1,650) and coot *Fulica atra* (31,000). These lakes and many other low-lying waterbodies are also of great limnological interest, as are several lakes in the Swiss mountains, most of which are oligotrophic and not remarkable for their waterfowl.

Numbers of diving duck wintering in Switzerland have increased since the spectacular increase of zebra mussel *Dreissena polymorpha* in the Swiss lakes. Concentration areas for wintering and migrating waterfowl include shallow reservoirs in the Canton Aargau (Stausee Klingnau) and in Canton Bern (Stausee Niederried). Eutrophication of the large lakes is quite heavy and pressures of urban development and recreation activities, including boating, are increasing.

Protected Areas Legislation There is no general provision in Swiss Federal legislation covering protection of areas for nature conservation, and areas are protected by ordinance on a case-by-case basis. The Federal Law of 1 July 1966 on Protection of Nature and Countryside forbids in a general way interference with riverine vegetation and authorisation is given to canton authorities to ensure the best protection possible or, if necessary, adequate restoration of vegetation. The Federal Law of 1986 on hunting and the protection of mammals and wild birds gives authority to the federal council to delimit faunal reserves including ones for migratory birds of international and national importance. The Swiss Forest Law (1902) requires that the area of forest within the country should not diminish, but has no control over silvicultural methods. Most other protection is assured either by planning controls or by the acquisition of land by cantons, private groups or individuals for creation of reserves.

Protected Areas Administration Responsibility for nature conservation and the national park is vested in the Department of the Interior, advised by the Federal commission for the Protection of Nature and Landscapes. The Federal Inspectorate of Forests and Landscape Conservation administers the programme and provides the Secretariat for the Commission. This pattern is repeated to some extent at a lower level in the cantons. The degree of management varies from reserve to reserve, and there is no standard approach to regulations applied in reserves. The policy in the national park is to allow the area to evolve naturally.

Sites designated under the Convention Signature subject to ratification 21 February 1974. Finally ratified on 16 January 1976, with one site listed at ratification and one site added on 18 February 1982

Fanel bay and le Chablis
Bolle di Magadino

Government body responsible for administration of the Convention

Office fédéral des forêts, Division de la Protection de la Nature et du Paysage, Postfach 1987, 3001 Bern

Fanel Bay and le Chablais

Location 46°59'N, 7°03'E. The two contiguous reserves are at the north-east end of Lake Neuchâtel in north-west Switzerland, separated from one another by the Canal de la Broye.

Area 1,155ha

Degree of Protection The site is situated in the cantons of Berne (530ha), Neuchâtel (410ha), and Vaud (410ha) and administered by the commission responsible for monitoring and management of the cantons' reserves. The combined wetland site is included in the Inventory of Landscapes and Natural Sites of National Importance. Designated as a Ramsar site at the time of ratification on 16 January 1976.

Site Description The Ramsar site comprises 630ha lake surface, 125ha reedbed and marshland, 325ha woodland and 75ha meadows. Fanel Reserve is bounded to the north by the Canal de la Thielle. Le Chablais Reserve extends southwards from the Canal de la Broye to Cudrefin village. Lake Neuchâtel is eutrophic and maintained at a constant level. Two islands in Fanel Reserve, one 120m long in Berne canton and one 40m long in Neuchâtel, are important nesting sites for birds and were modified to compensate for the erosion caused by changes in water level. The extensive reedbeds are fringed by deciduous woodland. The extensive marsh vegetation, comprising bogrush *Schoenus* sp., moorgrass *Molinia* sp., marsh helleborine *Epipactis palustris* and marsh gentian *Gentiana pneumonanthe*, supports an interesting and varied insect population.

International and National Importance The site is an important breeding area for many wetland species including over 2,000 pairs of black-headed gull *Larus ridibundus*, 200-300 pairs of great-crested grebe *Podiceps cristatus*, 200 pairs of common tern *Sterna hirundo* and 10-20 pairs of grey heron *Ardea cinerea*. Garganey *A. querquedula*, gadwall *A. strepera*, shoveler

A. clypeata, teal *A. crecca*, red-crested pochard *Netta rufina*, spotted crake *Porzana porzana*, little crake *P. parva*, common snipe *Gallinago gallinago*, herring gull *Larus argentatus*, Mediterranean gull *L. melanocephalus* and common gull *L. canus* all breed in small numbers and are Red-List species of Switzerland. Lapwing *Vanellus vanellus*, spotted redshank *Tringa erythropus* and ruff *Philomachus pugnax* also occur. The wetland is a moulting refuge for 2,000-3,000 mallard *Anas platyrhynchos* and 300 goosander *Mergus merganser* and an important resting place for many migrating waders. The site is of international importance for wintering waterfowl including up to 6,000 great-crested grebe, 2,000 mallard, 5,000 pochard *Aythya ferina*, 20,000 tufted duck *A. fuligula*, 100 goosander and 8,500 coot *Fulica atra*.

Changes in Ecological Character No information

Management Practices The canton ordinance prohibits hunting, fishing, boats and watersports on the lake area within the reserves. Under the ordinance access to marshland and reedbed areas is also restricted, visitors must not leave the access paths during the breeding season or disturb the wildlife at any time, and dogs must be kept on leads at all times. The state councils of Fribourg and Vaud cantons approved a Management Plan in 1983 for the southern shore of Lake Neuchâtel and the shoreline of Lake Morat. This is expected to be beneficial to the already protected Fanel and Chablais bays on the northern shore of Neuchâtel. The project for the ecological regeneration of Fanel Nature Reserve launched by Berne Canton in the autumn of 1986 was completed with full success. There are plans for a similar project for the part of the reserve situated in the territory of Neuchâtel Canton.

Scientific Research and Facilities No information

Principal Reference Material Above information was taken from the document deposited at the time of ratification (1976), and the National Report prepared for the Conference on the Conservation of Wetlands of International Importance especially as Waterfowl Habitat held in Cagliari, Italy in November 1980. Supplemented by:

Duffey, E. (1982). *National Parks and Reserves of Western Europe*. Macdonald and Co., London.

Bolle di Magadino

Location 46°10'N, 8°52'E. Situated on Lake Maggiore within the communes of Gordola, Locarno, Magadino and Tenero-Contra in the republic and canton of Tessin.

Area 661ha

Degree of Protection Established as a protected area by Canton Ordinance in 1974. The Canton de Tessin created a foundation in 1975, linked to the Confederation of the Swiss League for the Protection of Nature (LSPN) and WWF Switzerland, which is responsible for the financing and implementation of patrolling, conservation, management and maintenance of the protected area. The foundation has employed two full-time wardens for patrol and maintenance. The site is included in the Inventory of Landscapes and Natural Sites of National Importance. Designated as a Ramsar site on 18 February 1982.

Site Description The site comprises a delta area and part of the shore of Lake Maggiore, including an area of almost undisturbed virgin water edge vegetation, reedbed and forest, and a wide variety of marsh and aquatic plant associations. Some of the area is pasture where controlled grazing is allowed.

International and National Importance The area is one of the few intact river deltas in Switzerland, and the only one south of the Alps. It is particularly important for migratory birds.

Changes in Ecological Character Agricultural chemicals are used on surrounding lands.

Management Practices The Canton Ordinance defines three management zones. Zone A comprises the lake edge and immediate delta area with absolute protection status and all access prohibited except along a few official paths. Zone B comprising the pastureland and other agricultural land behind Zone A is a utility area with controlled traditional grazing permitted. Zone C comprises the areas bordering Zones A and B, with less restriction on access and camping and boating controlled by permits from the Department of the Environment. Agricultural practices in the site are controlled by the agricultural section of the Department of Public Economy in consultation with the Department of the Environment, and quantities of herbicide, pesticide and fertiliser used are fixed each year. A consultant commission was set up by the government to represent the organisations concerned with the site and to cooperate with the Department of the Environment on implementation of the protection ordinance. The Canton Ordinance prohibits construction of buildings or fences (unless to enclose pasture lands), excavation or dumping, introduction of plants and animals not native to the area, irresponsible fires, and release of pollutants into the environment. Under the ordinance dogs must be kept on the lead at all times.

Scientific Research and Facilities Permanent quadrats for investigation of vegetation changes were established during the 1970s. Bird observations and counts have continued for a number of years, and a ringing station was established in 1981. Since 1984 studies of the hydrology have begun, and a study on coleoptera was initiated in 1986.

Principal Reference Material Above information is from the document deposited at the time of designation. Additional references:

Antonietti, Aldo (Ed.) (1964). Le Bolle di Magadino. Società ticinese per la conservazione delle bellezze naturali e artistiche. *Quaderni Ticinesi* N. 7, Locarno, 43 pp. + Appendix

Antonietti, Aldo (1964). Le Bolle di Magadino. *Bollettino della Società Ticinese di Scienze Naturali* 57: 11-30.

Antonietti, Aldo (1977). Das Naturschutzgebiet der Bolle di Magadino. *Schweiz. Zeitschrift für Forstwesen* 128: 365-375.

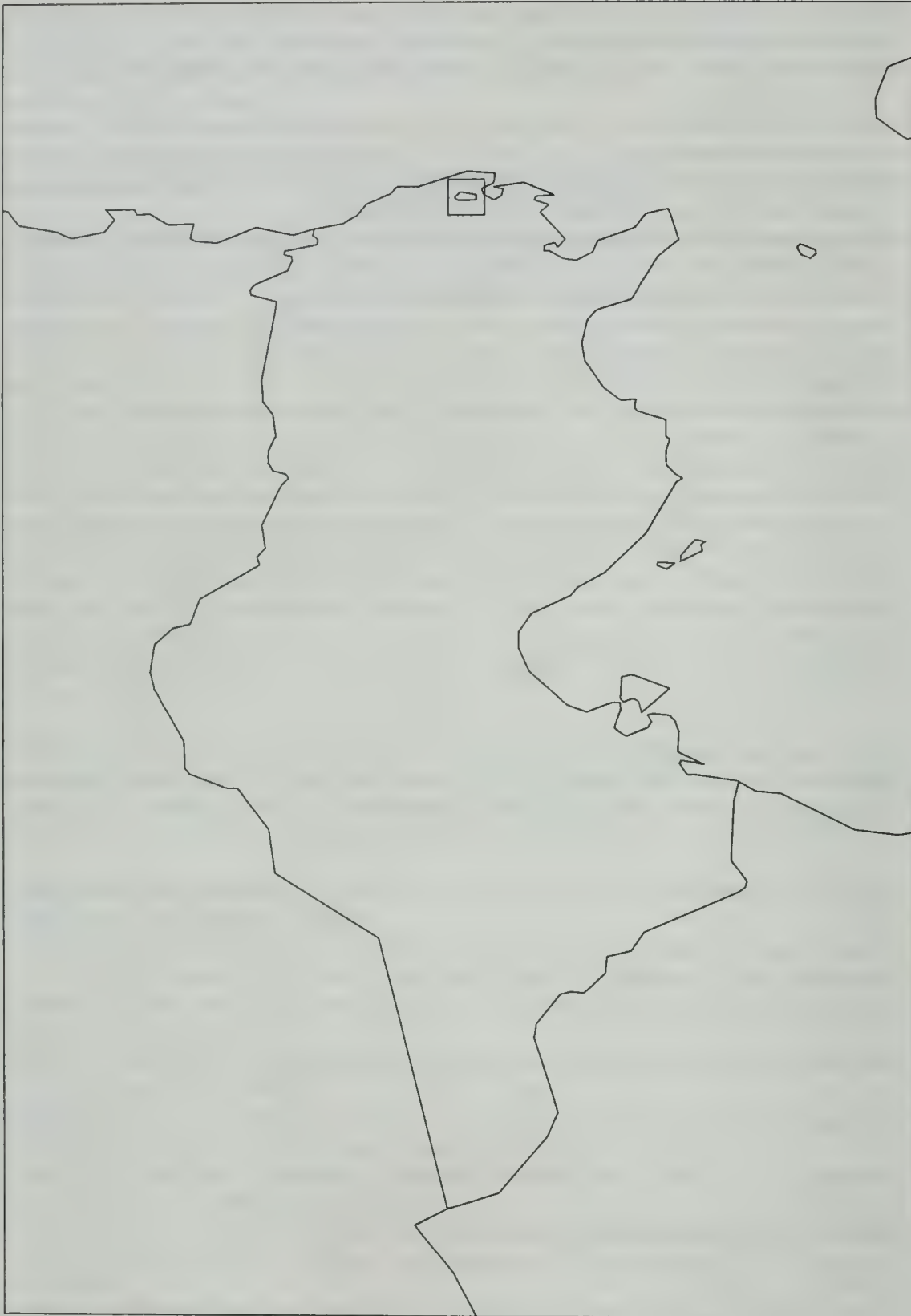
Buffi, Roberto (Ed.) (1983). Le Bolle di Magadino. Fondazione Bolle di Magadino e Dipartimento cantonale dell'ambiente. Bellinzona. 59pp.

Consiglio di Stato della Repubblica e Cantone del Ticino (1979). Ordinanze per la protezione delle Bolle di Magadino (del 30 marzo).

Laboratorio Studi Ambientali (Dipartimento cantonale dell'ambiente), (1985). Studio idrobiologico delle Bolle di Magadine. *Campagna* 1984. Bellinzona. 71 + 22 pp. (typescript)

Laboratorio Studi Ambientali (Dipartimento cantonale dell'ambiente), (1986). Studio idrobiologico delle Bolle di Magadine. *Campagna* 1985. Bellinzona. 62 + 13 pp. (typescript)

- Meyer, Martin (1981).** Bolle di Magadino. Anlage und Aufnahme von Dauerquadraten. Herrliberg. 67 pp. (typescript)
- Meyer, Martin (1982).** Bolle di Magadino. Rilievo dei quadrati permanenti 1982. Herrliberg. 33 pp. (typescript)
- Meyer, Martin (1985).** Bolle di Magadino. Rilievo dei quadrati permanenti 1985. Klosters-Dorf. 38 pp. (typescript)
- Schifferli, Alfred and D'alessandri, Pietri (1986).** Brutvorkommen der Wasservögel im Tessin und im Misox GR. *Ornith. Beob.* 1983, 159-167.
- Selldorf, Paolo (1980).** Elaborazione di nuovi criteri per uno sfruttamento migliore, adattato alle condizioni particolari di un'azienda agricola del Piano di Magadino. Lavora di diploma del Politecnico federale di Zurigo. 104 pp. (typescript)



Ramsar Sites in Tunisia

Tunisia

Area 164,148 sq.km

Population 7,317,000 (1986 estimate)

Summary of Wetland Situation The wetlands of Tunisia are of outstanding importance for huge numbers of migrating and wintering waterfowl. Numbers present in winter can increase considerably when severe cold spells affect the northern parts of the Mediterranean. Two scarce and declining species which are regularly observed on certain Tunisian wetlands are marbled teal *Anas angustirostris* and white-headed duck *Oxyura leucocephala*.

The Garaet Ichkeul to the south-west of Bizerte is comparable in importance to the Camargue in France and Marismas del Guadalquivir in Spain. The group of wetlands in the vicinity of Tunis (Lac de Tunis, Sebkhet Ariana, Sebkhet es Sedjoumi) is also extremely rich in waterfowl. The salt lakes in several parts of the country provide favourable habitat for large numbers of flamingos *Phoenicopterus ruber* and, in some years, depending on the amount of winter rainfall, they find conditions suitable for nesting in one or more of four sites, namely: Sebkhet Sidi el Hani, Chott el Fedjadj, Sebkhet el Hamma and Chott Djerid. However, some of the lakes can completely dry out if the rains are poor, leaving sites which were previously thought secondary with major populations of waterbirds. Mention should also be made of the reservoirs which can support reasonable numbers of waterbirds at certain times of the year. The Kneiss Islands, off the coast half-way between Sfax and Gabès, and the coast itself are in the only area of the Western Mediterranean which is markedly tidal and as such are of great importance as a feeding, roosting and breeding place for waders, gulls and terns.

Protected Areas Legislation There is provision for setting up national parks under the Forestry Code (Law No. 66-60). This was revised in 1988 and contains three articles (Art. 224-226) specifically related to wetlands. National Parks are declared by Presidential Decree based on recommendations submitted by the Ministry of Agriculture. Objectives in establishment of national parks are to protect and manage the physical and biological features, and to develop both education and the appreciation of nature with increased tourism. The Forestry Code is also used as a basis for the establishment of several reserves, and the Ministry of Agriculture has the power to establish hunting reserves. A number of wetland sites are protected from seasonal hunting.

Protected Areas Administration Protected areas are the responsibility of the Direction Générale des Forêts within the Ministry of Agriculture.

Sites designated under the Convention Accession 24 November 1980, with one site listed at accession

Ichkeul Wetland

Government body responsible for administration of the Convention

Ministère de l'Agriculture, Direction Générale des Forêts, 30 rue Alain Savary, Tunis

Ichkeul

Location 37°10'N, 9°40'E. Situated on the Mateur plain, 25km south-west of Bizerta and 15km north of Mateur in the governorate of Bizerta.

Area 12,600ha (comprising lake 8,900ha in summer to 11,500ha in winter, mountain 1,363ha and marshes 770ha)

Degree of Protection Classified as a national park on 12 December 1980 by Decree 80-1608 and gazetted in the Journal Officielle de la République Tunisienne No. 77. Hunting, fishing and grazing are prohibited or strictly controlled. The lake and mountain are state property, and the marsh is partly privately owned. The site is administered by the Ministry of Agriculture (Direction Générale des Forêts, 30 rue Alain Savary, Tunis). Approved as a biosphere reserve in January 1977. Inscribed as a World Heritage site in September 1980. Designated as a Ramsar site in June 1980.

Site Description The wetland site is part of Ichkeul National Park which includes Lake Ichkeul, the largest area of freshwater in the country, marshland; and Djebel Ichkeul, an isolated massif between the marshes and lake which was an island in Roman times. The lake's level and salinity varies on an annual cycle. From October to March it is fed by six oueds but in summer the level falls and salinity increases due to high evaporation rates and inflow of water from the sea for four months via Bizerte Lake and Tindja Oued, (which makes the north-east of the lake particularly saline). The lake and marsh are underlain by Quaternary alluvium, but Djebel Ichkeul is composed of Triassic and Jurassic dolomitic limestone which has been metamorphosed to form marble, and contains many fossils. Altitude ranges from -1.5m at the lake bed to 511m at the top of the Djebel. The mean monthly temperature is a minimum of 11.3°C in January and a maximum of 25.2°C in July. The annual temperature range is 0°C-48°C. Average annual rainfall is 625mm over 113 days, with only 4% falling in summer. About 300 million cu.m of rain water pour into the lake each year. Up to one-third of the lake's area, particularly in the west, is covered with fennel-leaved pondweed *Potamogeton pectinatus*. The marsh vegetation is dominated by *Scirpus maritimus*, *S. lacustris*, *Juncus subulatus* and *Zannichellia palustris*. The zoning of aquatic vegetation is complex and varies from year to year, related to lake levels and salinity. Reeds *Phragmites communis* fringe the lake and glasswort *Salicornia arabica* and seablite *Suaeda* sp. cover the most saline areas. Higher well-drained ridges are dominated by *Hordeum maritimum* with *Lolium multiflorum* and *Daucus carota*, or *Nerium oleander* and *Zizyphus lotus*. *Ranunculus ophioglossum*, recorded from only a few sites in Tunisia, also grows in the marshes. Stable populations have been reported of crested porcupine *Hystrix cristata*, mongoose *Herpestes ichneumon*, wild cat *Felis sylvestris lybica* and small-spotted genet *Genetta genetta*. Otter *Lutra lutra* is occasionally found on the shores of the lake and Ichkeul water buffalo *Bubalus bubalis* is being reintroduced into the marshes. Main fish species are eel *Anguilla anguilla*, mullet *Mugil cephalus*, *M. ramada*, bass *Dicentrarchus labrax*, barbel *Barbus barbus*, sole *Solea solea* and Twaite shad *Alosa fallax*. There are currently only

small populations of tooth-carp *Aphanius fasciatus* and pipefish *Sygnathus* sp. Marsh frog *Rana ridibunda* is abundant in the lake and *Clemys leprosa* occurs in the marsh.

International and National Importance Ichkeul is the most important site in North Africa for wintering waterfowl, with 300,000-400,000 birds passing through. Almost the whole central European population of greylag goose *Anser anser* (about 20,000) winter here, as do vast numbers of coot *Fulica atra* (70,000, with a maximum of 188,000). There are lesser numbers of wigeon *Anas penelope* (30,000-50,000, with a maximum of 110,000), teal *A. crecca* (11,000), shoveler *A. clypeata* (5,000) and pochard *Aythya ferina* (50,000-75,000, with a maximum of 120,000). The lake may also be the most important area west of the Caspian Sea for white-headed duck *Oxyura leucocephala* of which over 600 (or 4% of the known world population) have been recorded. Many waders and herons pass through on spring and autumn migration, including great white egret *Egretta alba*, glossy ibis *Plegadis falcinellus*, black stork *Ciconia nigra*, greater flamingo *Phoenicopterus ruber* and black-winged stilt *Himantopus himantopus*. Nesting birds are few and prefer the Djebel, including booted eagle *Hieraaetus pennatus*, Bonelli's eagle *H. fasciatus*, peregrine *Falco peregrinus*, Egyptian vulture *Neophron percnopterus* and the North African endemic Moussier's redstart *Phoenicurus moussieri*. Ichkeul is also a breeding ground for black-crowned night heron *Nycticorax nycticorax*. Over 185 bird species have been recorded.

Changes in Ecological Character This region of Tunisia is one of the most important for water supply in the country, and the Tunisian government's water resources plan envisages the building of six dams or rivers flowing into Ichkeul. Locally, around the lake, there is pressure for land and the water to irrigate it. Dams have been built on the Djoumine and Rhezala rivers, reducing the lake's supply of fresh water and changing water and salinity levels. A third dam, the biggest on the Sedjenane, is due to be completed in 1992. This has altered the vegetation composition; the area of *Potamogeton* on which many bird species feed was greatly reduced in 1986 due to high salinities and drought; *Scirpus maritimus* is being replaced in many places by *Ammi visnaga* and *Scolimus maculatus*. The construction of a sluice on the Oued Tindja to control seawater inflow and contain fresh water will not be an entirely satisfactory solution as it will increase summer evaporation and hence salinity in some areas, reducing the *Potamogeton* area and affecting many bird species' numbers; it is due to be completed in 1990. Drainage canals on the Djoumine and Melah marshes has still not been filled in. The lake has been silting up since Roman times, partly due to over-clearance of vegetation from hillsides. Overgrazing by domestic cattle on the marshes has probably led to death by malnutrition of the reintroduced water buffalo. Marble quarries on the Djebel are still in operation. Because of this situation, Ichkeul was included in Regina document C.3.6 as one of the 29 Ramsar sites where the likelihood of major ecological change seems greatest. The Ramsar Monitoring Procedure was operated at the site in 1988 and 1989. The report recommended completion of the Tindja sluice, filling of the Djoumine and Melah canals, training of staff for the eco-museum and sluice and development of integrated management measures and of structures for their application. An international seminar on Ichkeul in February 1990 heard that the Tunisian government's new policy was to take account of environmental issues in development. The seminar made a series of recommendations for the conservation of Ichkeul, on which the Tunisian government is now acting.

Management Practices There has been much research into how best to manage the lake now that dams have been built on streams which formerly supplied fresh water. University College London (UCL), in collaboration with the Tunisian authorities, has been contracted to investigate

this and produced computer models of the water and salinity balances (Warren *et al.* 1979). The most urgent management objectives are the building of a sluice on the Oued Tindja and infilling of a drainage canal on the Djoumine marsh (Hollis, 1986). Other objectives are to control sediment infill of the lake and to maintain *Potamogeton* and other vegetation types which are important food sources for birds. The EEC is funding a management study by UCL and French scientists which began in 1982.

Scientific Research and Facilities Studies of the biological environment of Lake Ichkeul have been made by the University of Tunis and Salambo Oceanographic Institute. Palaeontological excavations in 1947, 1948 and 1949 made it possible to study the Villafranchian (Calabrian) stratum of the lake and bring to the surface mammal fossils that are rare in North Africa. A phytoecological map of the region has been produced. Observation and censusing of waterfowl is being carried out with the collaboration of IWRB and La Tour du Valat Biological Station (France).

Principal Reference Material The above information is taken from documents submitted by the Tunisian government at the time of designation, from Tunisian national reports to Ramsar conferences, and from Ramsar Monitoring Reports. Supplemented by:

Baccar, H. (1982). The role of Ichkeul National Park in conserving genetic resources. Invited paper, coastal and marine workshop, 18-20 October 1982. Produced for IUCN's Commission on National Parks and Protected Areas in cooperation with UNEP.

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland.

Hollis, E., Wood, B. and Warren, A. (1980). Rare wetlands in a National Park. *Geographical Magazine* 32:331-334.

Hollis, G.E. (1986). The modelling and management of the internationally important wetland at Garaet El Ichkeul, Tunisia. IWRB Special Publication No. 4. 121 pp (lists many unpublished reports).

Skinner, J. (1985). Lake in the desert. *Birds* 10(7): 29-33.

Conservation Course, University College of London (1977). A management plan for the proposed parc national de l'Ichkeul, Tunisia. *Report Series* 10. (Contains a list of birds and an extensive bibliography.)

Warren, A., Hollis, G.E., Wood, J.B., Hooper, M.D. and Fisher, R.C. (1979). Ichkeul, the problems of a wet park in a dry country. *Parks* 4(3): 6-10.

Zaouali, J. (1976). Contribution à l'étude écologique du Lac Ichkeul. Institut National Scientifique et Technique d'Océanographie et de Pêche, Tunisie (INSTOP).

Uganda

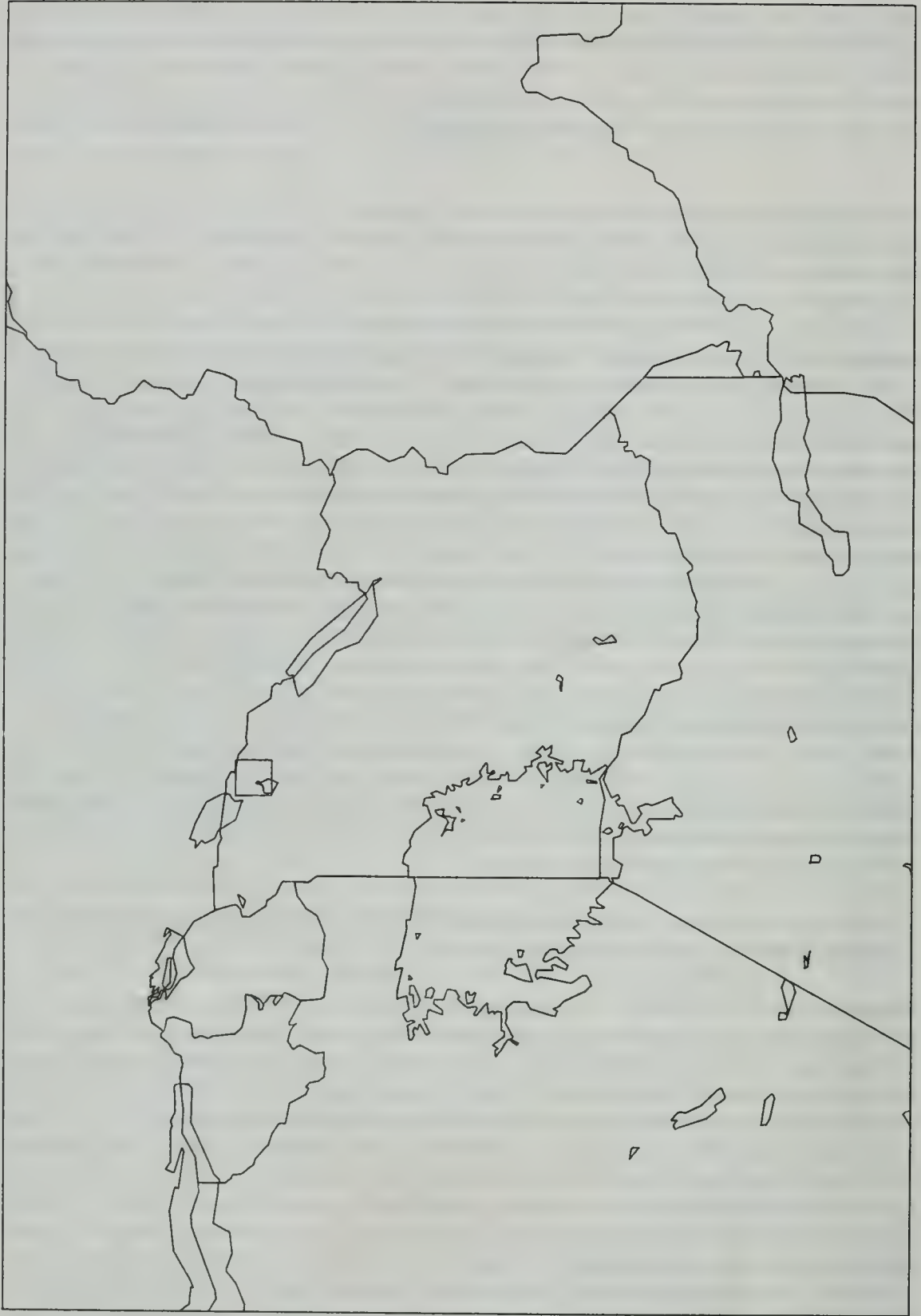
Area 236,036 sq.km

Population 15,500,000 (1987)

Summary of Wetland Situation Uganda is a land-locked plateau, with an average altitude of 1,100-1,300m and four peripheral highland areas. The whole of Uganda drains into the Nile. Climate is determined by the interplay of the south-east and north-east Trade Winds and the south-west monsoon. Mountainous areas receive up to 3000mm of rainfall per annum, the interior on average 1000-1500mm. The driest area in the north-east receives 625mm per annum. The wetlands may be divided into two categories: natural lakes and estuarine swamps; and riverine swamps and flood plains. Uganda's best-known wetland is of course Lake Victoria, the third largest lake in the world, 45% or 3 million ha of which is in Uganda. Lake Victoria receives more water from direct precipitation than from riverine inflow. Its lacustrine swamps are dominated by papyrus and it supports major fisheries; the outlet river, the Victoria Nile, is dammed at Owen Falls. The other major lake systems are lakes Kyoga/Kwania (560,000ha), Edward (234,200ha), Albert (565,915ha), Bisina and Opeata (120,000ha), Wamala (51,000ha) and George (22,850ha), Uganda's Ramsar site. Since lakes Victoria, Albert and Edward are all in transfrontier situations (Victoria is shared with Kenya and Tanzania, Albert and Edward with Zaïre), there is a clear need for international cooperation in their management and wise use. The principal riverine swamps and flood plains are the Okere and Kafu systems and the Nile. The Ugandan government, in cooperation with the IUCN, is at present undertaking a major project to prepare a national wetland policy, which will include an inventory of wetlands, their wildlife and waterfowl and their potential for wise use.

The above note is based on information provided by the Ugandan Government and on the draft Directory of African Wetlands (Mepham, R.H. and J.S., in press).

Protected Areas Legislation The National Parks Act of 3 April 1952 is a Parliamentary Act providing for the establishment of national parks for the purpose of preserving wild animal life and the natural vegetation. The Game (Preservation and Control) Act governs controlled hunting areas and game reserves and sanctuaries. National parks can only be created or abolished by an act of parliament, but all other conservation areas can be gazetted or degazetted by a minister of government responsible for wildlife. Settlement and other forms of land use are prohibited within national parks and game reserves, although human settlement, cultivation, and the grazing of domestic stock are all allowed in game sanctuaries and controlled hunting areas. Hunting, previously authorised in game sanctuaries (by special permit) and controlled hunting areas under certain circumstances, was banned for five years in 1979 due to diminishing animal populations. Travelling for any purpose inside a game reserve is permitted only if authorised by the Chief Game Warden. Areas can be gazetted as forest reserves or as nature reserves under the Forest Act (1962).



Ramsar Sites in Uganda

Protected Areas Administration A Board of Trustees (of nine to twelve officers) has full legal and administrative control over the national parks system. This board runs a parastatal organisation, Uganda National Parks, to which it appoints a director and wardens as full-time officers to run the parks. Responsibility for control and conservation of wildlife in the rest of the country is vested in the Game Department, under the Chief Game Warden. Both administrations come under the Ministry of Wildlife and Tourism. Forest reserves and nature reserves are the responsibility of the Forest Department, Ministry of Agriculture and Forestry, which is charged with the task of conservation and reafforestation of the country's indigenous forests.

Sites designated under the Convention Ratification on 4 March 1988 with one site listed

Lake George Wetland

Government body responsible for administration of the Convention

Ministry of Environment Protection, PO Box 9629, Kampala

Lake George

Location 0°02'S-0°20'N, 30°00'E-30°18'E. Situated on the northern shore of Lake George in Toro Province, western Uganda. Most of the wetland is within the borders of Queen Elizabeth (Rwenzori) National Park. A small north-eastern portion is located in Kibale Game Corridor (Game Reserve).

Area 15,000ha

Degree of Protection Protected as part of Queen Elizabeth (Rwenzori) National Park, formed in 1952, and part of Kibale Game Corridor, formed in 1964. The park was accepted as a biosphere reserve in 1979, and designated a Ramsar site on 4 March 1988. Protection in the national park is total, whereas in the game reserve no settlement is allowed. The site is state-owned.

Site Description The wetland lies within the western arm of the East African Rift Valley. It once underwent volcanic activity. The main drainage is from the Rwenzori Mountains, including the Dura, Komulikwezi, Rukoki, Mubuku, Ruimi, Hima, Mahoma, Nronge and Mpanga rivers. The underlying strata are Pleistocene sands and clays of the Semliki series. There are large quantities of material eroded from the south-east flank of the Rwenzori Massif. Five types of vegetation cover occur: (1) *Cyperus papyrus* swamp dominated by *Cyperus papyrus* and associated species including *Ipomoea rubers*, *Melanthera scandens*, *Cayratia ibuensis* and *Hibiscus diversifolius*. Found at lake margins and permanently wet swamps; (2) *Cyperus latifolius* swamp dominated by *Cyperus latifolius*, found in permanently wet swamps; (3) *Cladium mariscus* swamp dominated by *Cladium mariscus*, located in permanently wet swamps and exceptionally inaccessible due to its location in the centre of the swamp; (4) *Nymphaea* community dominated by *Nymphaea* (water lily), associated species include *Ceratophyllum demersum*, *Azolla africans* and *Pistia stratiotes*. This flora is found on clean water as at the mouth of the Nronge River; (5) tree and shrubland including *Aechynomene elaphroxylon* (Ambatch) and *Mimosa pigra*. Large mammals associated with the wetland include elephant *Loxodonta africana*, hippopotamus *Hippopotamus amphibius* and sitatunga *Tragelaphus spekei*

(aquatic antelope). Climate is equatorial, annual rainfall for the area is 700-1200mm, with two ill-defined rainy seasons per year; April-May, which is more marked than October-November. Mean range of temperature is 18-28°C.

International and National Importance The site is included within Queen Elizabeth (Rwenzori) Biosphere Reserve. It is well-known for the richness of its bird species due to the wide variety of habitat, including swamp and marsh. Winter migrants from the Palearctic include sandpipers, snipe and plover. These birds arrive in September/October and leave March/April. Marsh sandpiper *Tringa stagnatilis*, wood sandpiper *T. glareola*, green sandpiper *T. ochropus*, curlew sandpiper *Calidris ferruginea*, common sandpiper *Actitis hypoleucos*, greenshank *Tringa nebularia*, redshank *T. totanus*, spotted redshank *T. erythropus*, little stint *Calidris minuta* and ruff *Philomachus pugnax* inhabit marshes and the soft edges of lakes and wallows. Migratory ducks and geese appear mostly on lakes and pools, and include garganey *Anas querquedula* and the pintail *Anas acuta*. A resident species of special significance is the rare shoebill *Balaeniceps rex*, which dwells in the heart of swamps.

Changes in Ecological Character Most of the wetland is in its natural state. However, the fringes are being modified or utilised by man: (1) papyrus is cut for roofing; (2) burning occurs, although it is rare; (3) there is a seepage of copper from the Kilembe mines to the west; (4) agricultural chemicals are washed down the Mubuku River from the Mubuku Irrigation Scheme; (5) pollutants are washed in from the Hima Cement factory to the north-west and (6) fishing occurs on the lake itself. Encroachment by settlers has affected the vegetation of the Kibale Game Corridor to some extent.

Management Practices There is no management plan for the wetland or for the park as a whole. This situation is to be rectified, as is the implementation of the biosphere reserve concept. Some reed cutting and burning occurs at the periphery of the site. A substantial anti-poaching force is kept in the national park.

Scientific Research and Facilities The national park contains the oldest ecological research station in Tropical Africa, run by the Uganda Institute of Ecology. A survey has been carried out in Kibale Game Reserve and Game Corridor on the effects of settler encroachment and IBP survey of Lake George and Queen Elizabeth National Park.

Principal Reference Material The above information has been supplied by the Ugandan Government, supplemented by:

Burgis, M.J. and Symoens, J.J. (1987). *African wetlands and shallow water bodies*. Institut français de recherche scientifique pour le développement en coopération. Paris, France. 650 pp.

IUCN (1987). *Directory of Afrotropical Protected Areas*. IUCN, Gland, Switzerland and Cambridge, UK. 1034 pp.

Thorsell, J.W. and Jingu, R.A.C. (1983). Report of the joint UNDP/FAO mission to evaluate progress of project UFA/80/016. Assistant for anti-poaching in the national parks, Uganda.

Van Orsdol, K.G. (1986). Agricultural encroachment in Uganda's Kibale forest. *Oryx* 20: 115-117.

United Soviet Socialist Republics

Area 22,272,000 sq.km

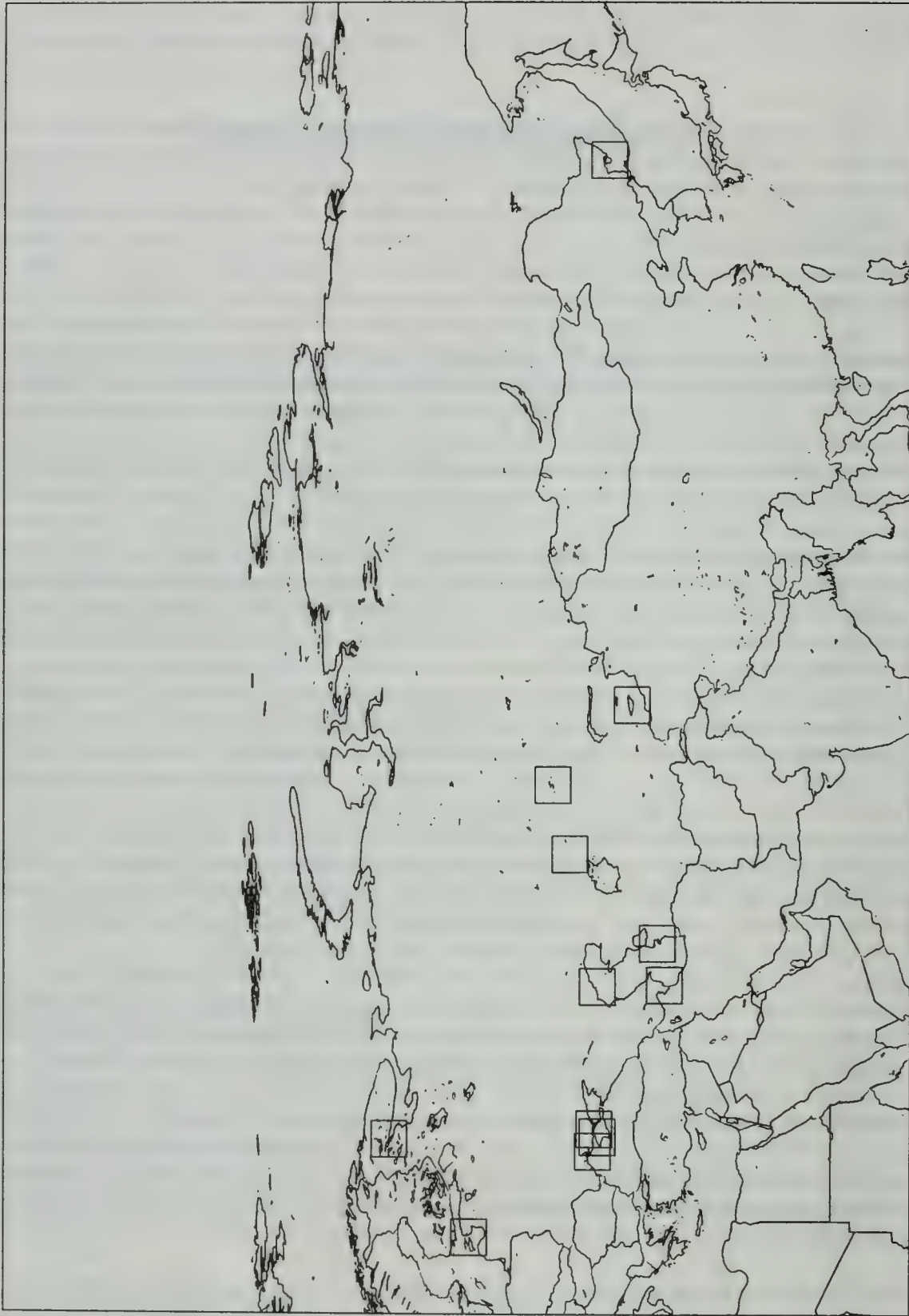
Population 281,700,000 (1987)

Summary of Wetland Situation The wetlands of the European part of the USSR and indeed most of those in the vast Asian sector, particularly to the west of the Mid-Siberian Plateau, provide the main breeding grounds for the majority of migrant waterfowl wintering in south-western Europe and the Mediterranean basin, south-west Asia and much of Africa. The eastern Siberian wetlands are similarly the principal station for the migrants which winter in the rest of southern Asia and, also in the case of waders, in Australasia.

The sites were selected as characteristic of particular vegetational or climatic zones or regions. The Gulf of Kandalaksha is characteristic of taiga, for example, Matsalu Bay of the mixed forest country; the Black Sea bays and Sivash Bay, and Sea of Azov, of the steppes; the Volga delta and eastern Caspian bays of desert country; and the Kirov bays (south-west Caspian coast) of the Caucasian region. Designated sites tend to be either broad expanses of shallow water, such as the various sea bays, or integrated wetland systems, such as those of the Volga delta or north of the Danube River mouth. They comprise both salt and fresh water sites with varying diversity of flora and fauna (especially of waterfowl), high biological productivity, and a protected status which enables them to sustain populations of waterfowl at different stages in their annual life cycle. Thus the most northerly site, Kandalaksha, serves mainly as a breeding-ground; Matsalu Bay on the Baltic both for breeding and as a stopover on migration; the Black Sea sites and Volga Delta for nesting, moulting, as migratory staging-posts and to a limited extent for wintering; and the southernmost sites of the eastern and south-western Caspian mainly as wintering grounds, notably of two species included in the USSR Red Data Book: greater flamingo *Phoenicopterus ruber* and red-breasted goose *Branta ruficollis*.

Protected Areas Legislation In 1972 a decree was passed by the Central Committee of the Communist Party of the Soviet Union and the USSR Council of Ministers to strengthen nature conservation and improve the use of natural resources. This led to the current legislation which is based on the State regulations of 25 June 1980 (coming into force on 1 January 1981) and entitled The Law on Wildlife Protection and Use and The Law on Air Protection. These USSR and Soviet Republics acts include regulations on protected natural areas and measures to ensure wildlife protection. The legislative status of state nature reserves (*zapovedniki*) is based on the 1981 act, but is similar to that established earlier by two acts of the Supreme Soviet passed in 1968 and 1970).

In the USSR there are approximately 60 different categories of protected land which provide for nature conservation to varying extents. They cover a total of more than 5 million sq.km, or one fifth of the USSR land surface. There are six main categories of nature conservation areas, represented both on the national and regional basis.



Ramsar Sites in The USSR

The principal category, and the most rigorously protected, is the state nature reserve or nature preserve (*zapovednik*). National park (*natsional'nyi park*) is a protected natural area established in natural and man-made landscapes (including arable land) mainly on state forest property. Nature sanctuary or partial reserve (*zakaznik*) is a natural area partly withdrawn from economic utilisation because it contains outstanding landscapes, rare plants, or breeding colonies of threatened species. Controlled hunting is sometimes allowed, and many *zakazniki* are only fully protected in certain seasons. Other designations include national hunting reserve (*zapovedno-okhotnich'ye khozyastvo*), nature monument or national monument (*natsional'nyi pamyatnik*), protected seashore areas, state forests and forest reserves.

Protected Areas Administration Until 1988 the supreme authority for broad and comprehensive environmental issues (executive and management roles in nature conservation) was the central government's Council of Ministers, represented by each republic. This was backed up by numerous government bodies including the State Committee for Hydrometeorology and Natural Environmental Control (concerned with nature conservation, forestry and game management), and the USSR Agro-Industrial Trust (formerly USSR Ministry of Agriculture) with committees at republic level. In January 1988 the administrative bureaucracy became streamlined and simplified by the creation of the USSR State Committee for Nature Conservation (*Goskompriroda*), which is now responsible for co-ordinating conservation activities throughout the whole of the USSR. *Goskompriroda* is based on the appropriate sub-divisions of numerous organisations including the USSR State Agro-Industrial Committee (*Agroprom*), USSR Ministry of Land Reclamation and Water Resources, USSR State Committee for Hydrometeorology, USSR State Committee for Forestry, USSR Ministry of the Fish Industry and the USSR Ministry of Geology. Its main tasks include management of nature protection activities, monitoring of the use and conservation of land, management of nature reserves, monitoring of hunting activities, registration of threatened fauna and production of the USSR red book, and dissemination of information about nature.

As of 1 January 1975 the 106 state nature reserves (*zapovedniki*) were under the direct or indirect supervision of the Department of Nature Conservation, *Zapovedniki* and Game Management of the USSR Ministry of Agriculture. The majority of *zapovedniki* are currently managed by the departments or committees of nature conservation in the republics, but some fall under the supervision of the USSR Academy of Sciences. By 1988 most *zapovedniki* have come under the administration of the Chief Administration for Nature Conservation, Nature Reserves, Forestry and Game Management (*Glavpriroda*). In the Russian Union Republic, national hunting reserves are administered by *Glavokhota*, the Chief Administration for Hunting and Nature Reserves. Rangers are responsible for controlling poaching.

Sites designated under the Convention Signature subject to ratification 13 February 1974. Finally ratified on 11 October 1976, with 12 sites listed at ratification.

Kandalaksha Bay (RSFSR)
 Matsalu Bay (Estonian SSR)
 Volga Delta (RSFSR)
 Kirov Bay (Azerbaijan SSR)
 Krasnovodsk and North-Cheleken Bays (Turkmenian SSR)
 Sivash Bay (Ukrainian SSR)
 Karkinitski Bay (Ukrainian SSR)
 Intertidal Areas of the Dounai/Yagorlits and Tendrov Bays (Ukrainian SSR)

Kourgaldzhin and Tengiz Lakes (Kazakhstan SSR)
Lakes of the lower Turgay and Irgiz (Kazakhstan SSR)
Issyk-kul Lake (Kirghiz SSR)
Lake Khanka (RSFSR)

Government body responsible for administration of the Convention

USSR State Committee for Environment Protection, 11 ul Nezhdanova, Moscow 103009

Kandalaksha Bay (RSFSR)

Location 66°57'N, 33°18'E. The north-west end of Kandalaksha Bay on the White Sea including the offshore islands. 2km south of Kandalaksha in the district of Murmansk, Russian SSR.

Area 208,000ha, comprising 191,100ha flooded and 16,900ha dry land

Degree of Protection The site is state owned and administered by the Main Department of Game Management and Zapovedniks by the RSFSR Council of Ministers. The designated wetland area contains three zones: an island archipelago and adjoining mainland coasts which are part of Kandalaksha Zapovednik (30,900ha) established in 1932 as a strict nature reserve with complete protection and all activities including tourism prohibited; the zakaznik (21,000ha) in which all hunting is prohibited and exploitation of natural resources is controlled to conserve the wetland as a wildfowl habitat; and an exploitation zone (113,000ha) in which all economic activity is controlled. Designated as a Ramsar site at the time of ratification on 11 October 1976.

Site Description The site is an 180km stretch at the head of Kandalaksha Bay, up to 50-60km wide. The terrain is a glacial landscape with outcrops of crystalline rocks of the Basaltic Shield and podzolic soils. The coastal vegetation is predominantly taiga consisting of coniferous forest of Scots pine *Pinus sylvestris*, spruce *Picea abies* and birch *Betula* sp. There are over 860 islands in the bay composed of sedimentary rock, chains of glacial erratics or rocky outcrops. The shore is mainly pebble and sand, and rarely exceeds 100m in width. It is rich in invertebrates (a food source for birds) including molluscs (mussels and winkles *Littorina* sp.), barnacles *Balanus* spp. and lugworm *Arenicola maritima*. Eel grass *Zostera* spp. grows on the sandy alluvial soil and algae such as *Fucus* spp. on the intertidal rocks. The mean monthly temperature is -10°C in January and 13-14°C in July. Mean annual rainfall is 400-500mm.

International and National Importance This site is particularly important as a nesting site with 16-17,000 breeding pairs including eider *Somateria mollissima* (2,000-9,500 pairs), red-breasted merganser *Mergus serrator*, herring gull *Larus argentatus*, common gull *L. canus*, Arctic tern *Sterna paradisaea*, oystercatcher *Haematopus ostralegus* and white-tailed eagle *Haliaeetus albicilla* (10 pairs). It is a moulting site for eider, velvet scoter *Melanitta fusca* and common scoter *M. niger*.

Changes in Ecological Character None reported

Management Practices A shipping channel is maintained, and the commercial fishery is controlled.

Scientific Research and Facilities Studies concern biology of eider, seabird colonies and other components of the ecosystem. There are equipped laboratories in Kandalaksha Zapovednik and Belomorskaya Biological Station belonging to Moscow State University.

Principal Reference Material The above information was taken from the USSR National Report prepared for the Conference on the Conservation of Wetlands of International Importance especially as Waterfowl Habitat held in Cagliari, Italy in November 1980. Supplemented by: **Biank, V. (1978).** Kandalaksha Bay. *Okhota i okhotn. Khozyaistvo* 12: 24-25.

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

Karpovitch, V. and Kester, B. (1970). Resources of eider on the Murman and White Sea. *Proc. Internat. Regional Meeting Conserv. Wildfowl Resources*. Leningrad, USSR. Pp.58-59.

Proceedings of the Kandalaksha State Nature Reserve Vol 1-9 (1960-1977).

Matsalu Bay (Estonian SSR)

Location 58°48'N, 23°22'E. Situated on the eastern Baltic shore in the north-west of the Estonian SSR, 25km south of the Kazari River mouth and 90km south-west of Tallinn.

Area 48,634ha, including 26,272ha water

Degree of Protection The site is state owned and administered by the Ministry of Forestry and Nature conservation of the Estonian SSR. The Ramsar site comprises Matsalu Zapovednik (36,697ha) established in 1957 with full protection; and a protected zone of 8,937ha managed by the Matsalu Zapovednik administration where hunting is prohibited, fishing is controlled and use of natural resources is managed in accordance with wetland and waterfowl conservation. Designated as a Ramsar site on 11 October 1976.

Site Description The wetland comprises the shallow Matsalu Bay enclosed on the seaward side by an archipelago of large rocky islands (including Saare Maa and Hiiu Maa); small shingly islands and spits in the western saline part of the bay; and the delta and floodlands of the River Kazari in the east. On the shores of the straits of Matsalu (only slightly above sea level) watermeadows (4,000ha) of sedges (Cyperaceae), marsh cinquefoil *Potentilla palustris* and red rattle *Sedicularis palustris*, and floodplain marshes with reedbeds of *Phragmites communis*, *Typha latifolia*, *T. angustifolia* and bulrush *Scirpus lacustris* predominate. Rocky marine coastline in the west supports only patchy short herbaceous vegetation. The freshwater fen areas comprise flowering rush *Butomus umbrellatus*, cornmint *Mentha arvensis*, loosestrifes *Lythrum salicaria* and *Naumburgia thyrsiflora*, spearwort *Ranunculus lingua* and many Orchidaceae. The freshwater floating aquatic vegetation is dominated by white waterlily *Nymphaea alba* and yellow waterlily *Nuphar lutea*, frogbits (Hydrocharitaceae) and butterworts (Lentibulariaceae). Coastal marine vegetation includes eelgrass *Zostera marina*. Other vegetation types include coastal pastures, inland hay meadows and woodlands. 44 mammal species, 255 bird species and 30 fish species have been recorded in the reserve area. There is a rich invertebrate fauna which is a major food source for the waterfowl population.

International and National Importance This site is important for breeding, migrating and moulting wildfowl. 40,000-45,000 birds nest in the area including mute swan *Cygnus olor* (30-40 pairs), greylag goose *Anser anser* (250-300 pairs), eider *Somateria mollissima* (1,400 pairs), tufted duck *Aythya fuligula* (over 400 pairs), goosander *Mergus merganser* (100-120 pairs), velvet scoter *Melanitta fusca* (100-125), coot *Fulica atra* (1,000-1,500 pairs), black-headed gull *Larus ridibundus* (12,500 pairs), common gull *L. canus* (2,500 pairs), Caspian tern *Sterna caspia* (100-200 pairs), great crested grebe *Podiceps cristatus*, red-necked grebe *P. grisegena*, gadwall *Anas strepera*, goldeneye *Bucephala clangula*, marsh harrier *Circus aeruginosus*, lanceolated warbler *Locustella lanceolata*, reed warbler *Acrocephalus scirpaceus* and white-tailed eagle *Haliaeetus albicilla*. About 950,000 birds stopover at the wetland during their spring migration including numerous whooper swan *Cygnus cygnus*, Bewick's swan *C. columbianus bewickii*, barnacle goose *Branta leucopsis* (about 80,000) and ruff *Philomachus pugnax* (75,000-100,000). The site is a moulting refuge in summer for mallard *Anas platyrhynchos* (17,000) and common pochard *Aythya ferina*. Other birds include pintail *Anas acuta*, scaup *Aythya marila*, red-breasted merganser *Mergus serrator*, Arctic tern *Sterna paradisaea* and bittern *Botaurus stellaris*.

Changes in Ecological Character This unique Baltic area of combined woodland and meadows has been formed by prolonged human activity.

Management Practices The authorities have implemented measures to conserve the natural wetland complex and reduce interference.

Scientific Research and Facilities The area has been extensively studied by ornithologists, botanists, hydrologists and ichthyologists from the Estonian Academy of Sciences. About 100,000 birds are ringed annually with the help of amateur volunteers. The reserve contains equipped laboratories and a museum with natural history study collections. Boats are available for scientific work. The majority of the annual 5,000 visitors to the reserve are scientists and ornithologists.

Principal Reference Material The above information was taken from the USSR National Report prepared for the Conference on the Conservation of Wetlands of International Importance especially as Waterfowl Habitat held in Cagliari, Italy in November 1980. Supplemented by: Anon (1968). *Bird life in Matsaly Bay*. Valgus, Tallinn. 58 pp.

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland.

Kumari, E.V. (1970). Changes in the bird fauna of Matsalu Bay during the last 100 years. *Ornis Fennica* 47(2): 45-51.

Kumari, E.V., Mihelson, H.A. and Ivanauskas, T.L. (1970). Wildfowl in Soviet Baltic Region. *Proc. Internat. Regional Meeting Conserv. Wildfowl Resources*. Leningrad, USSR.

Loodusevaatlusi (Nature observations - Proceeding of the Matsalu Reserve) 1978-1981. Valgus, Tallinn.

Volga Delta (RSFSR)

Location 45°54'N, 48°47'E. Situated in the northern part of the Caspian Sea in Astrakhan District of Russian SSR. Near Kazakhstan SSR in the east.

Area 650,000ha

Degree of Protection The site is state owned and administered by the Gosagroprom of the USSR (Astrakhan Zapovednik) and by the Main Department of Game Management and Zapovedniks by the RSFSR Council of Ministers. It contains Astrakhan Zapovednik (62,400ha) established in 1919 with total protection; a zakaznik (155,300ha) in which hunting is controlled; a general protection zone in which exploitation of natural resources is strictly controlled in accordance with wetland conservation; and a buffer zone (31,000ha) in which hunting is prohibited, fishing is controlled and boat or vehicle movement is restricted and under ranger supervision. Designated as a Ramsar site on 11 October 1976.

Site Description The wetland is a typical river delta on the northern coastal region of the Caspian sea, and comprises flat alluvial islands separated by a complex network of shallow distributary channels emptying into the fore-delta. The humid climate and high salinity of the delta water create exceptionally favourable conditions for aquatic vegetation and wildfowl. The vegetation types are a mosaic determined by waterflow, spring and autumn floods, topography and plant succession sequences. The natural zones include dense patches of *Vallisneria spiralis*, reedswamps of *Phragmites communis* and *Typha angustifolia*; willow *Salix triandra* forest areas along the lower reaches of the delta; salt meadows (declining in waters deeper than 1.5-2m); and bur reed *Sparganium* spp. predominant beyond the furthest alluvial islands of the submerged delta region. Other aquatic species along the branches of the river include water lettuce *Salvinia natans*, *Najas marina* and *N. minor*, white waterlily *Nymphaea alba*, pondweeds *Potamogeton perfoliatus* and *P. pectinatus*, liquorice plant *Glycyrrhiza glabra* and water chestnut *Trapa natans*. The large fish population includes pike, carp, catfish, perch and zander (*Esox lucius*, *Cyprinus carpio*, *Silvis glanis*, *Perca fluviatilis* and *Stizostedion lucioperca*). Mean temperature in January -6°C and in July 24°C. 100 days per year have temperatures below 0°C. Mean annual precipitation is 200mm. The area is characterised by prolonged periods of flooding.

International and National Importance The delta is important for breeding, migrating and moulting waterfowl due to a high carrying capacity (feeding/nesting resources) and its location on the migration route from European USSR, western Siberia and Kazakhstan. About 230,000 pairs breed on the islands and delta lowlands, including 180,000 pairs of Anatidae such as mute swan *Cygnus olor* (4,500 pairs), greylag goose *Anser anser* (14,000 pairs), coot *Fulica atra* (150,000 pairs) and red-crested pochard *Netta rufina* (5,000 pairs); cormorant *Phalacrocorax carbo sinensis* (30,000 pairs), the threatened Dalmatian pelican *Pelecanus crispus* (160 pairs), grey heron *Ardea cinerea* (2,000-2,800 pairs), purple heron *A. purpurea* (2,500 pairs), great white egret *Egretta alba* (4,500 pairs), little egret *E. garzetta* (3,500 pairs), squacco heron *Ardeola ralloides* (4,000 pairs), night heron *Nycticorax nycticorax* (4,000-4,200 pairs), spoonbill *Platalea leucorodia* (1,000-1,200 pairs) and glossy ibis *Plegadis falcinellus* (4,000-4,500 pairs). About 150 pairs of white-tailed eagles *Haliaeetus albicilla* breed. During spring and autumn

migration an estimated 5-7 million birds stopover at the delta taking advantage of the abundant food resources. These include whooper swan *Cygnus cygnus*, mallard *Anas platyrhynchos*, tufted duck *Aythya fuligula*, ferruginous duck *A. nyroca*, gadwall *Anas strepera*, teal *A. crecca* and pintail *A. acuta*. The shallow fore-delta (up to 1m deep) is a moulting site for 300,000-350,000 ducks including gadwall, teal, mallard, pintail and garganey *A. querquedula*. During warm winters up to 46,500 swans and 49,000 ducks stay here. Mammals in Astrakhan Zapovednik include wolf *Canis lupus*, fox *Vulpes vulpes* and wild pig *Sus scrofa*. The wetland also contains the endemic lotus *Nelumbo nucifera*, which is protected.

Changes in Ecological Character The water regime of the delta is influenced by large hydrotechnical installations in the Volga River and by land reclamation schemes, and there is some drainage from spring burning of reed vegetation. Some uncontrolled hunting.

Management Practices Navigation is restricted to the sea channel in the western part of the delta. Fishing is restricted to defined channels.

Scientific Research and Facilities Regular studies have been carried out since 1930 by research staff of the Astrakhan Zapovednik and since 1960 by the Caspian Ornithological Station. Research includes local zoogeography and fisheries science.

Principal Reference Material The above information was taken from the USSR National Report prepared for the Conference on the Conservation of Wetlands of International Importance especially as Waterfowl Habitat held in Cagliari, Italy in November 1980. Supplemented by: Anon (1977). *Waterfowl resources of the Caspian Sea coast and adjacent areas (protection, use and study)*. Astrakhan. 151 pp.

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

Krivososov, G. (1970). The Volga Delta as a Wildfowl Hunt. *Proc. Internat. Regional Meeting Conserv. Wildfowl Resources*. Leningrad, USSR. Pp. 70-72.

Krivososov, G. (1978). Project MAR and Volga Delta. *Okhota i okhotn. Khozyaistvo* 11: 16-18.

Proceedings of the Astrakahn State Reserve. Vol.1-13 (1939-1970).

Kirov Bays (Azerbaijan SSR)

Location 39°05'N, 48°57'E. Situated on the south-west Caspian coast about 133km south-south-west of Baku in Lenkoran, Masally and Neftechala Districts, Azerbaijan SSR.

Area 132,500ha, including 55,700ha of water

Degree of Protection The site is state owned and administered by the Gosagroprom of the USSR (Kyzyl-Agach Zapovednik) and by the Ministry of Forestry of Azerbaijan SSR. It contains Kyzyl-Agach Zapovednik (88,400ha) established in 1929 with full protection; and Malyi Kyzyl-Agach Zakaznik (10,700ha) in which hunting is prohibited, commercial fishing is controlled and exploitation of natural resources is strictly controlled in accordance with wetland

conservation. The remaining area has general protection status. Designated as a Ramsar site on 11 October 1976.

Site Description This coastal area is made up of bays, spits, alluvial deposits, a system of floodlands and lagoons, and marine terraces (evidence of a recent fall in sea level). The local hydrological regime is dependant on the water level of the Caspian Sea, the flow of water into the bay, and water consumption by local agriculture and rainfall. Water salinity is variable and highly seasonal due to the variable inflow of freshwater. The narrow Sara Peninsula divides the larger bay from the shallow small bay (average depth 1m) except for an impermanent channel, and the small bay is linked to the Caspian Sea by two impermanent channels. Soils are mainly saline or Sierozem. The waterbodies are shallow, eutrophic, and rich in surface macrophytes and submerged aquatic vegetation. Main vegetation types are reedbeds of *Phragmites communis* along the shore; floating macrophytes such as pondweeds *Potamogeton pectinatus*, *P. crispus*, *Ceratophyllum* sp., *Myriophyllum* sp., water chestnut *Trapa natans*, water lettuce *Salvinia natans* and *Lemna* sp.; and submerged vegetation of eelgrass *Zostera* sp. in the deeper water (2.5m). The terrestrial vegetation in the zapovednik ranges from semi-desert of wormwood *Artemisia fragrans* and glasswort *Salsola dendroides* to thickets of thorny scrub with *Rubus* spp. Mammals include Asiatic jackal *Canis aureus*, jungle cat *Felis chaus* and wild pig *Sus scrofa*. Mean temperature in January is 1-2°C and July 25°C. Mean annual precipitation is 200-300mm.

International and National Importance The coastal fringes and shallow bays are wintering grounds for some 300,000-400,000 waterfowl including swans *Cygnus* spp. (5,000); Anatidae: geese (38,000) and ducks (550,000); storks Ciconiidae (20,000-24,000); coot *Fulica atra* and two species listed in the USSR Red Data Book: greater flamingo *Phoenicopterus ruber* and red-breasted goose *Branta ruficollis*. Nesting species of 20,000-24,000 pairs include squacco heron *Ardeola ralloides* (8,000-9,600 pairs), night heron *Nycticorax nycticorax* (6,000-7,000 pairs), little egret *Egretta garzetta* (1,000-4,800 pairs), cattle egret *Bubulcus ibis*, glossy ibis *Plegadis falcinellus* (900 pairs), pygmy cormorant *Phalacrocorax pygmeus* (1,400-2,000 pairs), purple gallinule *Porphyrio porphyrio* (up to 500 pairs) and greater flamingo (up to 100 pairs).

Changes in Ecological Character The general level of the Caspian Sea is falling due to the use of river water for irrigation, and to fluctuations in local water levels due to irregular discharge or withdrawal of water by fish breeding enterprises. Some poaching occurs.

Management Practices Commercial fishing in the smaller bay is controlled. There are fish breeding and spawning installations. Measures are being taken by Azerbaijan SSR to improve the condition of the wetland.

Scientific Research and Facilities Research has been carried out on a regular basis since the 1950s by staff of the zapovednik.

Principal Reference Material The above information was taken from the USSR National Report prepared for the Conference on the Conservation of Wetlands of International Importance especially as Waterfowl Habitat held in Cagliari, Italy in November 1980. Supplemented by: Anon (1968; 1972). *Waterfowl Resources of the USSR; their reproduction and use*. Moscow. Anon (1977). *Waterfowl resources of the Caspian Sea coast and adjacent areas (protection, use and study)*. Astrakhan.

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

Proceedings of the Kyzyl-Agach State Reserve. Vol.1 (1979), Baku. 253 pp.

Krasnovodsk and North-Cheleken Bays (Turkmenian SSR)

Location 39°49'N, 53°10'E. Situated south-east of Krasnovodsk, the main port at the southern end of the east coast of the Caspian Sea in Turkmenian SSR.

Area 188,700ha, including 157,800ha water

Degree of Protection The site is state owned and administered by the Gosagroprom of the USSR. The designated site is surrounded by Krasnovodsk Zapovednik (192,300ha) established in 1968, in which all hunting, economic exploitation and tourism is prohibited. This total protection status also applies to the wetland site. Designated as a Ramsar site on 11 October 1976.

Site Description The site comprises extensive shallow saltwater bays (average depth 2-2.5m) bordered by a vast desert zone of aeolian sand dunes and plains extending to the east. The saline to brackish waters of the two bays are separated from the Caspian Sea by the low, sandy Krasnovodsk and North-Cheleken Islands, and a chain of smaller islands. Most of the coastal area lies below sea level. Soils vary from saline to heavy clay or sandy loam. The local hydrological regime is determined by the level of the Caspian Sea and the strength of prevailing winds. The productive bay waters support a rich submerged and aquatic vegetation of *Charophyta*, *Potamogeton*, *Ruppia* and *Zostera* species, and a rich zoobenthos of molluscs, crustacea and marine worms which provides a foodsource for waterfowl. The shoreline vegetation types are a mosaic dependent on salt tolerance and capacity to withstand the strong drying winds and soil erosion. It is characteristically composed of an arid scrub vegetation of desert ephemerals, interspersed along the shoreline with reedbeds of *Typha* spp. and *Phragmites communis* with halophytes such as saltwort *Salsola incanescens* on more saline soils. The watermeadow and floating aquatic vegetation includes meadowgrass *Poa bulbosa*, water chestnut *Trapa natans*, *Alhagi pseudoalhagi*, milkvetch *Astragalus* sp., *Tamarix* sp. and the monotypic genera *Halocnemum strobilaceum* and *Halostachys caspica*. Mammals in the area include wolf *Canis lupus* (V), crested porcupine *Hystrix cristata*, hare *Lepus talai*, jackal *Canis aureus*, fox *Vulpes vulpes*, honey badger *Mellivora indica*, wild pig *Sus scrofa* and goitred gazelle *Gazella subgutturosa*. Mean temperature in January is 4°C and July 28°C with 240-260 frost-free days. Mean annual precipitation is 100-200mm.

International and National Importance This wetland is the most important site in the eastern Caspian region for waterfowl during spring and autumn migrations and for overwintering. Up to one million ducks (Anatidae) pass through the area on migration. Between a half million and two million birds overwinter including coot *Fulica atra* (220,000), pochard *Aythya ferina*, tufted duck *A. fuligula* (10,000), red-crested pochard *Netta rufina*, mallard *Anas platyrhynchos*, pintail *A. acuta*, teal *A. crecca*, marbled teal *Marmaronetta angustirostris*, goldeneye *Bucephala clangula*, white-headed duck *Oxyura leucocephala*, whooper swan *Cygnus cygnus*, mute swan *C. olor*, greylag goose *Anser anser*, grey heron *Ardea cinerea* and the largest wintering population in the USSR of greater flamingo *Phoenicopterus ruber* (up to 18,000). White-tailed eagle *Haliaeetus albicilla* is also recorded from this area.

Changes in Ecological Character During recent years the Caspian sea level has risen causing changes in the aquatics of the wetland.

Management Practices In the late 1970s/early 1980s a series of measures were implemented as part of the Turkmenian policy of improved conservation in the Caspian Sea area to enhance habitat conditions for birds.

Scientific Research and Facilities Studies of the complex shallow water ecosystems and adjacent desert regions; research on wintering waterfowl including greater flamingo, ducks and coot; and an annual bird census conducted in cooperation with the Caspian Ornithological Station. Equipped laboratories and transport are available in the zapovednik.

Principal Reference Material The above information was taken from the USSR National Report prepared for the Conference on the Conservation of Wetlands of International Importance especially as Waterfowl Habitat held in Cagliari, Italy in November 1980. Supplemented by: Anon (1977). *Waterfowl resources of the Caspian Sea coast and adjacent areas (protection, use and study)*. Astrakhan.

Skokova, N.N., Vinokurov, A.A. (1982). Recent status and conservation perspectives for overwintering waterfowl in south-eastern coast of the Caspian Sea. *Reports Mosc. ob-va ispyt. prirody. zool. and botan.*, 1980, Moscow. Pp.13-16.

Sivash Bay (Ukrainian SSR)

Location 46°0'N, 34°21'E. Situated between Genichesk and the north-east coast of the Crimea Peninsula on the Sea of Azov, Kherson District, Ukrainian SSR.

Area 45,700ha, including 22,400ha water

Degree of Protection The site is state owned and administered by the Gosagroprom of the Ukrainian SSR. The Ramsar site comprises Azavo-Sivashskiy Zakaznik, with strictly controlled hunting. Designated as a Ramsar site on 11 October 1976.

Site Description The bay is largely isolated from the Sea of Azov by the Arabatskaya Strelka. The shallow saltwater bay (up to 3m depth) has an indented shoreline and contains several spits and islands, some originally part of the mainland. The water level fluctuates according to the prevailing wind which exposes the shallows. These shallows become subject to intense evaporation in summer, followed by wind erosion. The generally flat and windswept coastal area is covered with a halophytic sward. The site includes two alluvial islands on which desert/halophytic steppe scrub and halophilous meadow vegetation predominate. High salinity confines the aquatic flora and fauna to salt tolerant species. Their high productivity under the eutrophic conditions forms a valuable foodsource for birds.

International and National Importance This wetland is of great importance to nesting, moulting and migrating birds. Numerous ducks (Anatidae) and waders (Charadriiformes) migrate through the area including shelduck *Tadorna tadorna* (2-10,000) and ruff *Philomachus pugnax*. There are 17,000 nesting birds of 20 species including shelduck, great black-headed

gull *Larus ichthyaetus*, Mediterranean gull *L. melanocephalus*, herring gull *L. argentatus*, sandwich tern *Sterna sandvicensis*, little tern *S. albifrons* and Caspian tern *S. caspia*. It is one of the principal moulting sites in the USSR for mute swan *Cygnus olor* (3,000-4,000) and shelduck (2,000-3,000).

Changes in Ecological Character None reported

Management Practices The number of wardens in the hunting reserve has been increased and the site is being actively managed.

Scientific Research and Facilities Mid-winter counts of waterfowl have been carried out periodically since the 1960s but there has been no systematic research programme.

Principal Reference Material The above information was taken from the USSR National Report prepared for the Conference on the Conservation of Wetlands of International Importance especially as Waterfowl Habitat held in Cagliari, Italy in November 1980. Supplemented by: Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

Sabinevskiy, B.V. and Sevastjanov, V.I. (1975). Distribution of waterfowl on the north-western coast of the sea of Azov in Sivash and in Karkinitskiy and Dzarilgachskiy Bays of the Black Sea in January 1975. *Transactions of the All-Union Conference on Bird Migration* Part 1. Moscow.

Karkinitski Bay (Ukrainian SSR)

Location 45°51'N, 33°33'E. Situated in the north-west of the Crimea Peninsula opposite Sivash Bay, in the Crimean District of the Ukrainian SSR.

Area 37,300ha

Degree of Protection The site is state owned and administered for the Gosagroprom of the Ukrainian SSR. It contains Karkinitski Zakaznik and a protected section of the Crimean (Krimskoye) Zakaznik established in 1957, in which economic exploitation and recreational activities are prohibited. In the remaining area of the site, commercial fishing is regulated and recreational activities restricted to the seashore. Designated as a Ramsar site at the time of ratification on 11 October 1976.

Site Description Most of the site comprises water less than 8m deep to the north of the islands, and there is an extensive shallow coastal area (0.8-1m). The coastline is indented with a number of small bays and several sand spits and islands within the main saltwater Karkinitski Bay including the Lebiaji Islands 100ha (of great ecological interest). Several small islands are formed by shellfish colonies. The hinterland is mountainous. The vegetation is typical of the steppe zone bordering the Black Sea. Coastal vegetation in the bay is predominantly reedbeds of *Phragmites communis* with halophytes and grasses on salty soil. There are vast water-meadows of aquatic plants such as stoneworts *Charophyta* spp. and eelgrass *Zostera marina*,

with a rich zoobenthos. The vegetation of the islands consists of halophytes, steppe vegetation and reeds.

International and National Importance The bay is important for waterfowl in all seasons including up to 100,000 ducks (Anatidae) and waders (Charadriiformes) which pass through the area on their spring and autumn migrations. Spring flocks are dominated by whooper swan *Cygnus cygnus*, mute swan *C. olor*, greylag goose *Anser anser* and white-fronted goose *A. albifrons*. Autumn flocks are dominated by ruff *Philomachus pugnax* and sandpipers *Calidris* spp. The islands are the site of large seabird breeding colonies including herring gull *Larus argentatus* (65,000-68,000 pairs), Mediterranean gull *L. melanocephalus* (4,000-5,000 pairs), gull-billed tern *Sterna nilotica* (8,000-9,000 pairs), Caspian tern *S. caspia* (200-400 pairs), common tern *S. hirundo* (200-300 pairs), shelduck *Tadorna tadorna* (50 pairs) and red-breasted merganser *Mergus serrator* (50 pairs). There are specially protected colonies along the shore of little egret *Egretta garzetta* (50 pairs), great white egret *E. alba* (50 pairs), grey heron *Ardea cinerea* (100-150 pairs), squacco heron *Ardeola ralloides* (60 pairs) and glossy ibis *Plegadis falcinellus*. The bay is one of the most important summer moulting grounds for non-breeding mute swan *Cygnus olor* (3-5,000). Over 50,000 birds winter in the area including whooper swan, sea ducks, freshwater ducks, coot *Fulica atra* and gulls.

Changes in Ecological Character None reported

Management Practices There are bird ringing and census programmes.

Scientific Research and Facilities Systematic studies are carried out by the research staff of the zakaznik. There are annual counts of moulting mute swan and shelduck. Hydrobiological investigations have been conducted in the bay. The reserve participates in the international colour-marking programme of certain species of wild swan.

Principal Reference Material The above information was taken from the USSR National Report prepared for the Conference on the Conservation of Wetlands of International Importance especially as Waterfowl Habitat held in Cagliari, Italy in November 1980. Supplemented by: Ardamatskaya, T.B. (1970). Wildfowl of the Ukrainian Black Sea Coastal Region. *Proc. Internat. Regional Meeting Conserv. Wildfowl Resources*. Leningrad. Pp.57-69.

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

Kostin, Yu.V. (1961). Materials on ornithofauna of Lebiaji Islands and adjoining areas. *Sbornik rabot po lesovodstvu i okhotovedeniyu*, Vol.6, Simferopol. Pp.87-115.

Intertidal Areas of the Dounai, and Yagorlitski and Tendrovski Bays

Location The designated wetland comprises separated areas. a) Intertidal Areas of the Dounai 45°25'N, 29°40'E, 150km south-west of Odessa near the Rumanian border in Odessa District, and b) Yagorlitski and Tendrovski Bays 46°18'N, 32°05'E, 50-60km south-west of Kherson and east of Odessa in Nikolayev and Kherson districts. Both areas are situated in the Ukrainian SSR.

Area 128,051ha (enlarged from 121,000ha in 1978): Dounai 14,851ha and Yagorlitski and Tendrovski Bays 113,200ha.

Degree of Protection The site is state owned and administered by the Gosagroprom of the Ukrainian SSR and the Ukraine Academy of Science. The site contains (i) Dounaiskie plavni Zapovednik (14,851ha) established in 1981 and (ii) Chernomorski Zapovednik (50,000ha) on the Black Sea coast established in 1927 with total protection and all exploitation and recreational activities prohibited; and Yagorlitski Ornithological Refuge (30,300ha) in which all hunting is prohibited. The remaining area is under general protection, with exploitation of natural resources restricted. Designated as a Ramsar site at the time of ratification on 11 October 1976.

Site Description The Dounai (Danube) intertidal area is situated along the Black Sea near the main Dounai river mouth. This wetland area (including 4,600ha water) comprises channels, alluvial islands, freshwater lakes and low sandy spits which enclose bays on the seaward side of the delta. The estuarine islands support lake and marsh vegetation composed mainly of reedbeds of *Phragmites communis*, *Typha* spp. and sedges *Carex* spp., with thickets of *Salix* sp. in drier areas. The waters are rich in aquatic and submerged vegetation with extensive *Vallisneria spiralis* stands, sea lettuce *Salvinia natans*, water chestnut *Trapa natans* and hornwort Ceratophyllaceae; zoo- and phyto-plankton; and fish. Dune and salt-tolerant plants grow on the sandy soils which are extending by accretion into the sea.

Yagorlitski and Tendrovski Bays: two extensive shallow saltwater lagoons (up to 6m depth) separated from the Black Sea by narrow sandy spits and small islands. The vegetation of the low coast and islands is characterised by brackish and saltwater associations with a predominance of saltwort *Salsola soda* and marshgrass *Puccinellia* sp. On the steep sloping island shores kelp lies among sparse reedbeds of *Phragmites communis*. Behind the shore there is usually a strip of brackish marsh. Shallow water vegetation is characterised by large meadows of eelgrass *Zostera* sp. with tassel pondweed *Ruppia spiralis* and stoneworts *Charophyta*. The waters also support abundant benthos and fish including the small genus *Cottus*.

International and National Importance The wetland area is important for migrating, breeding, moulting and overwintering birds dependent on shallow waters. Spring and autumn migrants number several 100,000 including 20,000-30,000 geese including white-fronted goose *Anser albifrons*, greylag goose *A. anser* and red-breasted goose *Branta ruficollis*. Other birds include shelduck *Tadorna tadorna*, mallard *Anas platyrhynchos*, pintail *A. acuta*, tufted duck *Aythya fuligula*, scaup *A. marila*, red-crested pochard *Netta rufina*, mute swan *Cygnus olor* and whooper swan *C. cygnus*, ruff *Philomachus pugnax*, redshank *Tringa totanus*, black-tailed godwit *Limosa limosa*, curlew *Numenius arquata*, whimbrel *N. phaeopus*, avocet *Recurvirostra avosetta*, black-winged stilt *Himantopus himantopus*, oystercatcher *Haematopus ostralegus*, woodcock *Scolopax rusticola*, snipe *Gallinago gallinago*, sandpipers *Calidris* spp. and divers *Gavia* spp. 200,000-350,000 pairs of gulls (*Laridae*), ducks (*Anatidae*) and sandpipers breed in the wetlands including Mediterranean gull *Larus melanocephalus*, slender-billed gull *L. genei*, sandwich tern *Sterna sandvicensis*, red-breasted merganser *Mergus serrator*, gadwall *Anas strepera*, ferruginous duck *Aythya nyroca*, coot *Fulica atra*, shelduck, mallard, mute swan, redshank, avocet and a colony of herons including grey heron *Ardea cinerea*, great white egret *Egretta alba*, little egret *E. garzetta*, glossy ibis *Plegadis falcinellus* and night heron *Nycticorax nycticorax*. White pelican *Pelecanus onocrotalus*, spoonbill *Platalea leucorodia* and the threatened Dalmatian pelican *Pelecanus crispus* nest on the Dounai tidal flats. The wetlands are a major moulting site for mute swan *Cygnus olor* (7-8,000). Overwintering birds include

mute swan, greylag goose, red-breasted goose, mallard, whooper swan, curlew, ferruginous duck, coot, wigeon *Anas penelope*, teal *A. crecca* and pochard *Aythya ferina*.

Changes in Ecological Character None reported

Management Practices Reserve exploitation is controlled in accordance with the conservation requirements of the wetlands.

Scientific Research and Facilities The research staff of the reserve have been studying the area for many years. There are regular counts of wintering and nesting birds. The reserve participates in the international colour marking programme of swans to study their distribution and movements.

Principal Reference Material The above information was taken from the USSR National Report prepared for the Conference on the Conservation of Wetlands of International Importance especially as Waterfowl Habitat held in Cagliari, Italy in November 1980. Supplemented by: **Ardamatskaya, T.B. (1970).** Wildfowl of the Ukrainian Black Sea Coastal Region. *Proc. Internat. Regional Meeting Conserv. Wildfowl Resources*. Leningrad. Pp.67-69.

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

Proceedings (1978). 50 years of the Chenomorski State Reserve. 197pp.

Kourgal'dzhin and Tengiz Lakes (Kazakhstan SSR)

Location 50°27'N, 69°10'E. Situated north-east of the Aral Sea in Tselinograd District, northern Kazakhstan SSR.

Area 260,500ha

Degree of Protection The site is state owned and administered by the Main Department of Zapovedniks and game management of the Kazakh SSR. It contains Kourgal'dzhin Zapovednik (237,100ha) established in 1958 with full protection and all activities including tourism are prohibited; and a protection zone (23,400ha) in which hunting is restricted and exploitation of natural resources is controlled in accordance with conservation of the wetland as a waterfowl habitat. Designated as a Ramsar site at the time of ratification on 11 October 1976.

Site Description The two lakes lie at 300-400m altitude in an extensive group of depressions. These contain shallow lakes (3-4m depth) with no outflows and varied mineral composition (particularly sulphates and chlorides), and several waterbodies whose hydrological regime is determined by the amount of flooding, inflow from the Noura and Koulanou-Tpes rivers, sluices on the dams across the rivers and evaporation rates. Tengiz saltwater lake (156,000ha) is almost devoid of aquatic vegetation. The water level has fallen leaving vast mud and alluvial flats between the water and the original lake edge. The lake floor is covered with a thick layer of silt. Kourgal'dzhin Lake (39,600ha) comprises a network of deep water channels (0.5-2.5m depth) with varying degrees of salinity. It supports a rich aquatic vegetation, zoo- and phyto-plankton population and fish fauna. Reedbeds of *Phragmites communis* grow in the shallower waters and

on the shores. The lakeside vegetation is bunch-grass steppe with the grasses *Stipa lessingiana*, *Agropyron repens*, *Bromus inermis*, *Festuca sulcata* and *Calamagrostis epigeios* and the flowering plants *Pyrethrum achilleifolium*, *Spiraea hypericifolia*, wormwoods *Artemisia* spp., *Halocnemum strobilaceum* and orache *Atriplex cana*. Mean January temperature is -17°C and mean July temperature 20.5°C, with 150 days below 0°C. Annual precipitation is 250-300mm.

International and National Importance These lakes are of great importance as breeding, moulting and resting stations for wildfowl during their migration in the northern desert zone. The wetland is the main nesting site for 10-14,000 pairs of greater flamingo *Phoenicopterus ruber* (listed in the USSR Red Data Book). The 20,000 other breeding birds include black-headed gull *Larus ridibundis* (2,000 pairs), common gull *L. canus* (800-900 pairs), great black-headed gull *L. ichthyaetus* (350 pairs), common tern *Sterna hirundo* (1,500 pairs) and mute swan *Cygnus olor* (200 pairs in a summer population of 3,000 birds). Other non-breeding summer visitors include shelduck *Tadorna tadorna*, ruddy shelduck *T. ferruginea* and white-headed duck *Oxyura leucocephala*. The site is a moulting refuge for numerous non-breeding birds including greater flamingo (9,000), mute swan (3,000), and wigeon, pintail, gadwall, pochard and greylag goose (*Anas penelope*, *A. acuta*, *A. strepera*, *Aythya ferina* and *Anser anser*). Many thousands of birds (mainly wigeon and pintail) pass through the area on their spring and autumn migration.

Changes in Ecological Character In the past the lakeside areas were harvested for hay and some cultivation is still practised. The introduced muskrat *Ondatra zibethicus* has spread throughout the area.

Management Practices No information

Scientific Research and Facilities Studies have been made of the ecosystem and waterfowl populations. Laboratory facilities and boats are available.

Principal Reference Material The above information was taken from the USSR National Report prepared for the Conference on the Conservation of Wetlands of International Importance especially as Waterfowl Habitat held in Cagliari, Italy in November 1980.

Andrusenko, N., Zhulii, V. (1978). Riches of the Kourgal'dzhin Zapovednik. *Okhota i okhotn. khozyaistvo*, No.9, pp.2-4.

Kovshar, A. (1982). Kourgal'dzhin zapovednik. In *Zapovednoe delo v Kazakhstane*, Alma-Ata. Pp.57-63.

Lakes of the Lower Turgay and Irgiz

Location 48°42'N, 62°11'E. Situated near the town of Kouilis to the north-east of the Aral Sea, in Aktyubinsk District of Kazakhstan SSR.

Area 348,000ha

Degree of Protection The site is state owned and administered by the Main Department of Zapovedniks and game management of the Kazakhstan SSR. It contains Turgay Zapovednik

(348,000ha). Hunting is prohibited in the whole area, and exploitation of natural resources is controlled in accordance with conservation of the wetland as a waterfowl habitat. In areas where agriculture is permitted, restrictions are planned to conserve waterfowl habitat. Commercial fishing is restricted, motor boats are prohibited and state purchasing of rushes *Scirpus* spp. harvested from the wetland has stopped. Designated as a Ramsar site at the time of ratification on 11 October 1976.

Site Description The wetland comprises a large group of lakes (some with no outflows) formed in depressions on a plateau dissected by a number of drainage channels (some of which are disused and in a state of disrepair). The lakes are shallow with a natural hydrological cycle of several years. The close proximity of Kyzyl-Kum Desert and the large evaporative surface area of the waterbodies contribute towards fluctuating water levels and result in many lakes and streams drying up completely in the hot dry summer, leaving only stagnant pools among the sandbanks. The irrigation of the plateau is dependent on the intensity of the seasonal floods and river inflow. The mineral content and concentration of the lake and river water varies from flowing freshwater in hillside rivers to saline or brackish waters in closed depression lakes. The lakes on the floodplain of Turgai River and tributaries are fringed by reedbeds of *Phragmites communis*, and sedge associations predominate in the floodplain meadows. The changing succession of vegetation reflects the periodic fluctuation in the water level of the lakes. The waters are highly productive providing a valuable food source for visiting wildfowl.

International and National Importance In favourable years up to 1.5 million migrating waterfowl and waders have been recorded including some 200,000 Anatidae such as greylag goose *Anser anser*, white-fronted goose *A. albifrons*, lesser white-fronted goose *A. erythropus*, the less common red-breasted goose *Branta ruficollis*, several thousand wigeon *A. penelope*, mallard *A. platyrhynchos*, teal *A. crecca*, garganey *A. querquedula* and pintail *A. acuta*, and diving ducks such as pochard *Aythya ferina* and goldeneye *Bucephala clangula*. Other birds include Siberian crane *Grus leucogeranus*, spoonbill *Platalea leucorodia* and great white egret *Egretta alba*. There are up to 25,000 pairs of nesting birds including mute swan, shoveler, gadwall, tufted duck, shelduck, coot (*Cygnus olor*, *Anas clypeata*, *A. strepera*, *A. fuligula*, *Tadorna tadorna*, *Fulica atra*), teal and pochard. The wetland is a moulting site for several thousand birds including greylag goose, coot, greater flamingo *Phoenicopterus ruber* and Dalmatian pelican *Pelecanus crispus*.

Changes in Ecological Character The ecological conditions of the wetland are dependent on dry and wet seasons and years, and the balance is easily disturbed by variations in precipitation.

Management Practices Measures are being taken to improve conservation of the various habitats, particularly those important for birds.

Scientific Research and Facilities The biology and migration of birds has been studied by ornithologists from the Zoological Institute of the Academy of Sciences of the Kazakhstan SSR.

Principal Reference Material The above information was taken from the USSR National Report prepared for the Conference on the Conservation of Wetlands of International Importance especially as Waterfowl Habitat held in Cagliari, Italy in November 1980.

Berezovski, V. (1980). Spring migration of birds in the lower Turgai river. In *Migrantsii ptits v Azii* (Bird migration in Asia). Dushanbe. Pp. 140-153.

Issyk-kul Lake (Kirghiz SSR)

Location 42°27'N, 77°16'E. Situated about 100km due south of Alma Ata in Issyk-Kul District, Kirghiz SSR.

Area 629,800ha

Degree of Protection The site is state owned and administered by the State Committee of Forestry of the Kirghiz SSR. Issyk-kul Zapovednik (22,400ha) and protection zones include a considerable belt of land around the lakeshore. Commercial fishing is controlled. Designated as a Ramsar site at the time of ratification on 11 October 1976.

Site Description The lake is 182km by 60km, with an average depth of 280m (less in the east). It occupies a tectonic basin at 1,609m altitude between the ranges of Kungei Alatau to the north and Terskei Alatau to the south. The lake is fed by over 80 streams and minor channels but has no outflow and the water is brackish and oligotrophic. Water temperature in winter never falls below 2.75°C so the lake does not freeze. There are hot springs at Aksu on the lakeshore where there is a health resort. The shallow waters support a rich submerged and floating vegetation of *Charophyta*, *Potamogeton* and *Myriophyllum* species, and an abundant zoobenthos with over 150 species of Mollusca, Oligochaetae, Gammaridae and Chironomidae, which are an important food source for visiting birds. Lake fish include zander *Stizostedion lucioperca* and introduced carp *Cyprinus carpio*.

International and National Importance The lake area is of primary importance as an overwintering site for wildfowl and for migrating birds. Overwintering numbers vary greatly depending on the severity of the winter, the main species being whooper swan *Cygnus cygnus*, mute swan *C. olor*, pochard *Aythya ferina* and coot *Fulica atra*. The main migrant is pintail *Anas acuta*. There are small nesting colonies of storks Ciconiidae.

Changes in Ecological Character There may be changes in run-off and inflow into the lake due to afforestation of the surrounding mountain slopes.

Management Practices There is a fishery on the lake for zander and introduced carp.

Scientific Research and Facilities The lake is important for limnological research, and there is a special research ship. There are regular counts of wintering birds.

Principal Reference Material The above information was taken from the USSR National Report prepared for the Conference on the Conservation of Wetlands of International Importance especially as Waterfowl Habitat held in Cagliari, Italy in November 1980.

Baranov, I.V. (1961). *Limnological types of lakes of the USSR*. Hydrometeoizdat. Leningrad.
Luther, H. and Rzoska, J. (1971). Project Aqua. A source book of inland waters proposed for conservation. IBP Handbook No.21.

Proceedings of the Zapovednik Issyk-kul. (1976) Frunze. 124 pp.

Lake Khanka (RSFSR)

Location 44°53'N, 132°26'E. Situated about 160km north of Vladivostok in Primorski District of the RSFSR, north of the Sea of Japan. The northern border coincides with the border with China which crosses the lake.

Area 310,000ha

Degree of Protection The site is state owned and administered by the Main Department of Game Management and Zapovedniks by the RSFSR Council of Ministers of the USSR. It contains Khankaishki Zakaznik (49,000ha), in which exploitation of natural resources is strictly controlled and hunting, fishing, hay harvesting, burning and drainage prohibited. The remaining lake area is under general protection with fishing and other commercial activities permitted. Designated as a Ramsar site at the time of ratification on 11 October 1976.

Site Description The site includes part of an extensive lake in the basin of the Sungucha, one of the headwaters of the Ussuri river. The maximum depth of the lake is 10m, but the water level varies with changes in the prevailing wind and autumn inflows after heavy rains. Areas of the lake sheltered from the wind are dominated by aquatic vegetation mainly of *Potamogeton* spp. and vast expanses of *Myriophyllum*, *Utricularia*, *Trapa natans*, *Nuphar*, *Mynphaceae* and *Ceratophyllum* species occupy the bays. When the wetland is flooded, floating mats of peat rise to the surface in the southern area, and the sharp seasonal changes in the vegetation they support are dependent on the water level. There are extensive fringing reedbeds of *Phragmites communis* backed by flooded willow *Salix purpurea* thickets.

International and National Importance The lake contains relict plant species from the tertiary period, which are of great limnological interest. The wetland is of particular importance for migrating birds and as a summer moulting station. It lies on spring and autumn migration routes with 100,000-200,000 ducks passing through the area including pintail *Anas acuta* (27,000-32,000), teal *A. crecca* (41,000-50,000), mallard *A. platyrhynchos* (14,000-16,000), falcated duck *A. falcata* (7,000-9,000), spotbill *A. poecilorhyncha* (4,500-7,000), wigeon *A. penelope*, Heude's parrotbill *Paradoxornis heudei polivanovi*, goldeneye *Bucephala clangula* (9,000-11,000) and tufted duck *Aythya fuligula* (9,000-11,000). The summer moulting population is dominated by mallard (100,000), teal and coot *Fulica atra*. Cranes *Grus japonensis* and *G. vipio* are breeding here. The endangered Oriental white stork *Ciconia ciconia boyciana* and Japanese crested ibis *Nipponia nippon* have been recorded at this site, but there are no recent reports of their occurrence in the immediate vicinity.

Changes in Ecological Character Much of the area surrounding the lake is under rice cultivation. Commercial fisheries and lake navigation may disturb relict aquatic species.

Management Practices Fishing and hunting are controlled. Measures are being taken to conserve habitats particularly important for birds.

Scientific Research and Facilities The area has been studied by biologists from the Far East Science Centre, Academy of Sciences of the USSR.

Principal Reference Material The above information was taken from the USSR National Report prepared for the Conference on the Conservation of Wetlands of International Importance especially as Waterfowl Habitat held in Cagliari, Italy in November 1980.

Polivanova, N.N. (1971). The birds of the Khanka Lake (Hunting-game waterfowl and colony birds). Part 1. Proceedings of the reserve "*Kedrovaya Pad*", v.3. Vladivostok. 240 pp.

United Kingdom of Great Britain and Northern Ireland

Area 244,754 sq.km

Population 55,355,100 (1987 estimate)

Summary of Wetland Situation With a coastline exceeding 7,000km, numerous offshore islands, a wide variety of freshwater habitats, and a temperate climate, the British Isles provide refuge for many species of waterfowl, particularly on passage and in winter. The richest areas are found in and bordering the intertidal zone. Strangford Lough in the Irish Sea, and the extensive tidal flats on the northern Irish Sea coasts, from the Solway to north Wales, and the coasts of the North Sea and English Channel are particularly important. The shallower coastal waters of northern Scotland and offshore islands are significant for the numbers of wintering sea-ducks. Farmland and the coastal grazing marshes of east and southern Scotland, as well as certain localities in England (Ribble, Wash, Severn), support in winter a sizeable proportion of the world population of several species of geese. These geese also depend on estuaries and inland wetlands for roosting.

The larger inland waters, which are ice-free in all but the most exceptional winters, complement the coastal sites. They include natural lakes such as Lough Neagh in Northern Ireland and Loch Leven in south-east Scotland, as well as freshwater marshes, man-made reservoirs and gravel pits. Most of the areas of greatest importance for breeding waterfowl are in northern Scotland where human population pressures are less acute. Here, sea lochs, highland lakes and extensive tracts of peatland provide relatively undisturbed sites for both ducks and wading birds.

Over 100 wetlands of international importance have been identified in Great Britain and many are notified as Sites of Special Scientific Interest (SSSI). This should ensure that the Government's statutory advisor on nature conservation, the Nature Conservancy Council (NCC), is included in the planning consultation process and can draw attention to the likely ill effects of any proposed developments. Some key sites are owned by the NCC or voluntary bodies such as the Royal Society for the Protection of Birds (RSPB). Other sites are safeguarded by management agreements.

Protected Areas Legislation Until recently, the principal legislation on nature conservation in *Great Britain* were: The National Parks and Access to the Countryside Act 1949; The Civic Amenities Act 1968; and The Town and Country Planning Act 1971. The Wildlife and Countryside Act 1981 brought together much of the previous legislation covering nature conservation, which provided enhanced protection for wildlife habitats and a number of species not previously safeguarded by law. National nature reserves (NNRs) are designated by declaration of the Nature Conservancy Council pursuant to a Nature Reserve Agreement and purchase or lease, whichever method is most appropriate. This land has the same immunity from development as any other land held by a Government Department. Local nature reserves (LNRs) are set up by a local Government Authority, in consultation with the Nature Conservancy

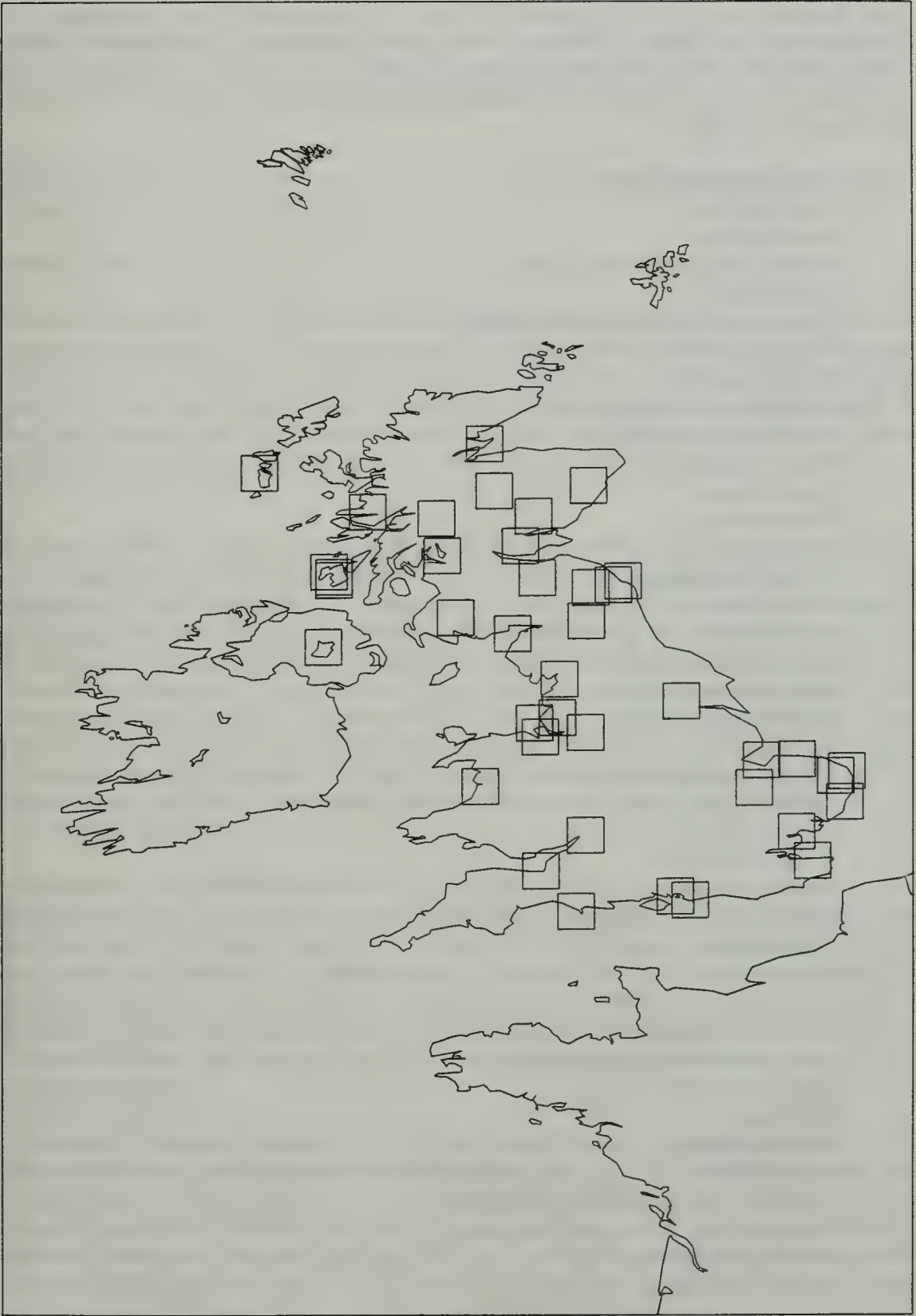
Council. Sites of special scientific interest (SSSIs) are areas notified by the Nature Conservancy Council to Local Planning Authorities as being of special interest. The Planning Authorities must consult the Council before giving permission to develop the sites. As a result of the 1981 Act, all SSSIs have to be renotified, work which is currently under way. In some cases where agreement has been reached with the owners, the land is managed for nature conservation purposes. More than 1,200 non-statutory reserves covering 68,000ha have been established chiefly by the Royal Society for the Protection of Birds, the Royal Society for Nature Conservation and the associated County Naturalists' Trusts. The Countryside Commission designates extensive areas of country as "national parks" by reason of their natural beauty and opportunities for outdoor recreation, but ownership of the land and rights of landowners are not affected. There are several NNRs within national parks. Although not meeting IUCN criteria for national parks, these areas have considerable social and scientific importance. The same applies to some of the properties acquired by the National Trust under specific Trust legislation; since these can be declared inalienable, or not to be disposed of without the express sanction of Parliament, permanent preservation is assured although management policies of the Trust have not always given wildlife and the preservation of natural ecosystems priority. There is a separate Countryside Act for Scotland (1967) and although there are no national parks, the Countryside Commission for Scotland has designated 40 National Scenic Areas where greater planning control can be exercised to conserve areas with particular natural beauty.

Northern Ireland Two Orders-in Council passed in 1985, the Nature Conservation and Amenity Lands (Northern Ireland) Order and the Wildlife (Northern Ireland) Order, replace and expand earlier measures. The Department of the Environment for Northern Ireland has power to establish national nature reserves (NNRs) similar to those in Great Britain. The Department also designates areas of special scientific interest (ASSIs) which are virtually identical in substance to SSSIs in Great Britain. Wildlife refuges may be established with the agreement of the landowner, giving protection from disturbance. The Department also has the power to establish national parks, but none has been designated. Non-statutory nature reserves are established by the Forest Service of the Department of Agriculture and by voluntary bodies. The department has the opportunity to make financial provision by means of grant-in-aid to certain aspects of management on these reserves.

Protected Areas Administration

Great Britain Responsibility for nature conservation is vested in the Nature Conservancy Council (which comes under the aegis of the Department of the Environment). Its functions are; (i) establishment, maintenance and management of nature reserves; (ii) provision of advice to government on the development and implementation of policies for or affecting nature conservation; (iii) provision of advice and dissemination of knowledge about nature conservation; and (iv) commissioning or support of relevant research. The Countryside Commission and the Countryside Commission for Scotland have an important role in the administration of many countryside areas. The Forestry Commission is the largest landowner in Britain, and has management interests in many areas of conservation value. Other responsible land owners include the National Trust, Local Authorities and the Ministry of Defence, as well as the RSNC, RSPB etc.

Northern Ireland The Department of the Environment for Northern Ireland is both the legislative and administrative body for nature and countryside conservation. It is advised by the Committee for Nature Conservation and by the Ulster Countryside Committee on both topics respectively. The Forest Service is part of the Department of Agriculture. Other responsible landowners are similar to those in Great Britain.



Ramsar Sites in the U.K.

Sites designated under the Convention Signature subject to ratification 6 September 1973. Finally ratified on 5 January 1976, with 13 sites listed at signature, six sites added on 24 July 1981, six sites on 17 July 1985, three added on 28 November 1985, three on 25 September 1986, one added on 4 November 1987, one added on 5 February 1988, two on 30 March 1988 and five added on 14 July 1988.

Cors Fochno and Dyfi
Bridgwater Bay
Bure Marshes
Hickling Broad and Horsey Mere
Lindisfarne
Lochs Druidibeg, a'Machair & Stilligary
Loch Leven
Loch Lomond
Lough Neagh and Lough Beg
Minsmere - Walberswick
North Norfolk Coast
Ouse Washes
Rannoch Moor
Cairngorm Lochs
Loch of Lintrathen
Claish Moss
Silver Flowe
Abberton Reservoir
Rostherne Mere
The Dee Estuary
The Swale
Chesil Beach and the Fleet
Derwent Ings
Holburn Moss
Irthinghead Mires
Leighton Moss
Martin Mere
Alt Estuary
Loch of Skene
Loch Eye
Rockcliffe Marshes
Chichester and Langstone Harbours
Upper Severn Estuary
The Wash
Pagham Harbour
Gruinart Flats
Eilean Na Muice Duibhe (Duich Moss)
Bridgend Flats
Gladhouse Reservoir
Din Moss - Hoselaw Loch

Government body responsible for administration of the Convention

Department of the Environment, Wildlife Division, Tollgate House, Houlton Street, Bristol BS2 0DJ

Cors Fochno and Dyfi

Location 52°31'N, 4°00'W. Situated on the coast of central Wales, north-north-east of Aberystwyth in the counties of Dyfed, Gwynedd and Powys.

Area 2,497ha

Degree of Protection 2,095ha is a national nature reserve (NNR) established in 1969 and extended since April 1980. The remainder is a site of special scientific interest (SSSI) under multiple ownership including the Royal Society for the Protection of Birds. 525ha of the NNR is owned by the Nature Conservancy Council (NCC). The remainder is leased and managed by the NCC under the 1949 Act. Leases are due to be renewed in 1989 and 1998. The NNR area was approved as a biosphere reserve in June 1976. Designated as a Ramsar site at the time of ratification in January 1976.

Site Description The Ramsar site has three components: the River Dyfi estuary, a sand dune system and part of the raised bog of Cors Fochno on the south side of the estuary. The estuary includes a full range of estuarine habitats with sand banks, mudflats, saltmarsh, river channels and creeks. The saltmarsh plant community has been modified by the introduction and spread of cordgrass *Spartina anglica*, a British hybrid form, but still retains considerable diversity. The dune system has a full complement of typical plant communities such as marram grass *Ammophila arenaria*, and Cors Fochno is an actively growing raised bog. Other plant communities include dwarf bog shrub with willow *Salix* sp., birch *Betula* sp., ling *Calluna* sp. and *Phragmites australis* reedbeds. The main faunistic interest is the waterfowl populations but there is also a very diverse invertebrate fauna in the estuary littoral zone. Cors Fochno is of considerable entomological value.

International and National Importance The estuary supports a migrant population of up to 2,500 waders, and a winter population of 4,000 Anatidae including about 2,000 wigeon *Anas penelope* and a small flock of about 60 Greenland white-fronted geese *Anser albifrons flavirostris*, the only one remaining in southern Britain. The central area of Cors Fochno contains the most extensive tract of unmodified lowland raised mire vegetation in Great Britain which is effectively buffered by a peripheral belt of modified raised mire communities. The mire is an important area for stratigraphical studies. Polecat *Mustela putorius*, now scarce in Britain, occurs in the dunes.

Changes in Ecological Character Part of Cors Fochno has been subjected to drainage works for agricultural improvement completed in November 1981. A 1.3km-long ditch has been cut across an area of peat cuttings and the resulting drainage extends 100m back into the bog. After negotiations with the owner the NCC has now purchased this area (29ha) and remedial work to block the ditches and arrest the damaging effects of drainage operations has been completed. The 29ha within the Ramsar Site was declared as part of Dyfi NNR last year. In addition, surface communities of the mire suffer occasional outbreaks of fire. The dunes and sandy shores attract large numbers of holiday visitors and the risk of human erosion is a major problem. There is an information centre at the dunes.

Management Practices Rehabilitation work on areas damaged by human erosion is done on a rotational basis. Access is unrestricted except to Cors Fochno which is by permit only. The eastern third of the estuary, which includes part of Ynyshir Reserve owned by the Royal Society for the Protection of Birds, is managed as a wildfowl refuge. Shooting at the western end of the estuary is controlled by a permit system.

Scientific Research and Facilities Past and current research projects by university workers concern the history, structure and biology of the area. The reserve is being used increasingly for educational purposes by schools, colleges and universities.

Principal Reference Material The above information is taken from documents supplied by the Government of the United Kingdom for designation in 1976, for the Cagliari Conference in November 1980 and for the Groningen Meeting in 1984. Supplemented by:

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

Bridgwater Bay

Location 51°13'N, 3°04'W. Adjoining the estuary of the River Parrett, about 9.5km north of Bridgwater in the county of Somerset, England.

Area 2,703ha

Degree of Protection The whole area is a national nature reserve established in 1954. Of this 36ha is owned by the Nature Conservancy Council (NCC), part is leased from the Crown Estate Commissioners; the remainder is managed by the NCC under a Nature Reserve Agreement due for renewal in 1993 with the owners, the Wessex Water Authority. Designated as a Ramsar Site at the time of ratification on 5 January 1976.

Site Description The site includes extensive intertidal mudflats to the west of the River Parrett, 41ha of saltmarsh pasture, a 4.8km strip of river bank south from the mouth, and a 9km stretch of the Huntspill River. An artificial waterway was built to help drain the Somerset Levels in the hinterland. The main habitats are mudflats, saltmarsh, shingle beach and sea wall. The principle botanical feature is the extensive sward of cord grass *Spartina anglica*. Over 100 species of flowering plants and over 200 species of birds, mainly migrants, have been recorded.

International and National Importance The site was the second known European moulting ground for shelduck *Tadorna tadorna* (maximum 3,000). It is now the largest of at least three such sites in the British Isles. Average winter peaks are mallard *Anas platyrhynchos* 2,400 (maximum 4,000), teal *A. crecca* 900 (maximum 2,150), wigeon *A. penelope* 4,800 (maximum 10,000) and black-tailed godwit *Limosa limosa islandica* 1,500 (maximum 5,000); and in April-May there are 2,000 whimbrel *Numenius phaeopus* on passage. Stert Island, 1km offshore, is a roosting ground for whimbrel and small numbers of white fronted geese *Anser albifrons*. Notable flora include bulbous foxtail *Alopecurus bulbosus* (rare in Britain), the local Ray's knot grass *Polygonum raii*, and sea spurge *Eurphorbia parolais*. The site contains one of the largest areas of clay and silt flats in Britain.

Changes in Ecological Character The major threat to the reserve at present is a nuclear power station proposed on the western margin of the site. This is not however expected to have any major lasting effect on the site. A Severn Barrage scheme is still under consideration, and could have serious deleterious effects on the reserve if constructed.

Management Practices Shooting by permit is allowed in parts of the reserve. Some areas are open to the public.

Scientific Research and Facilities Regular counts are made of the numbers of waterfowl as part of the national contribution to the IWRB census. Research has been undertaken on wigeon feeding preferences aimed at providing information necessary for management of the saltings. There have also been extensive studies of *Spartina* by the NCC and studies by university workers on coastal formation processes of erosion and accretion.

Principal Reference Material The above information is taken from the documents supplied by the Government of the United Kingdom for designation in 1976, for the Cagliari Conference in November 1980 and the Groningen Meeting in May 1984. Supplemented by:

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

In addition there are many scientific publications concerning the research carried out on the reserve in ornithology, botany and physiography.

Cadwallader, D.A. and Morley, J.V. (1974). Further experiments on the management of saltings pasture for wigeon *Anas penelope* conservation at Bridgwater Bay National Nature Reserve, Somerset. *J. Appl. Ecol.* 11: 461-466.

Morley, J.V. (1986). The birds of Bridgwater Bay. NCC internal report.

Bure Marshes

Location 52°41'N, 1°29'E. Floodplain of the River Bure about 10km north-east of Norwich in the county of Norfolk, England.

Area 412ha

Degree of Protection Bure Marshes were declared a national nature reserve in 1958. Managed by the Nature Conservancy Council under Nature Reserve Agreements and a lease with four separate land owners. These agreements are due for renewal in 2003 and 2004, and the lease in 1999. Designated as a Ramsar site at the time of ratification on 5 January 1976.

Site Description The reserve comprises most of the undrained fenland in the floodplain of the River Bure between Wroxham and Ranworth. The area is subject to small freshwater tidal changes and some salt water may reach the downstream river section and lakes (such as Ranworth) at high spring tides. There are four lakes or broads, thought to have been formed after extensive peat digging (prior to the 13th century) when a combination of change in climate and rise in sea level flooded the pits and they were abandoned. Sediment accumulation since the 13th century has resulted in these broads being quite shallow with a water depth of 0.5 to

1.5m. Peat digging continued after the 13th century but only shallow 80m pits (turf ponds) were dug. Most of the surrounding fen was managed for reed, sedge and marsh hay harvesting, with channels (dykes) cut for access and transport, and this extensive exploitation diversified the habitats. These traditional activities have declined since the 1900s and natural succession has resulted in the invasion of turf ponds by fen vegetation and the transition from fen to fen woodland. Some of the dykes have silted up and become overgrown. The reserve still contains a wide variety of fenland communities ranging from aquatic and open fen habitats to mature alder *Alnus* spp. woodland. The vegetation is influenced by the alkaline nutrient-rich condition of the water. Dominant species of open fen are common reed *Phragmites australis* and great fen sedge *Cladium mariscus*, often associated with milk parsley *Peucedanum palustris*; sweet gale *Myrica gale*; and alder buckthorn *Frangula alnus*. Other widespread species include royal fern *Osmundia regalis*, marsh fern *Thelypteris palustris*, fibrous tussock sedge *Carex appropinquata* and cowbane *Cicuta virosa*. Aquatic plants include yellow water lily *Nuphar lutea*, pondweeds *Potamogeton* spp. and water soldier *Statiotetes aloides*. The rivers and broads contain coarse fish including pike *Esox lucius*, eel *Anguilla anguilla* and roach *Rutilus rutilus*. Other fauna include otter *Lutra lutra*, introduced South American coypu *Myocaster coypus* and a diverse bird community.

International and National Importance The site is part of one of Britain's most important wetland areas. The diverse habitats support a wide variety of breeding birds including great crested grebe *Podiceps cristatus*, gadwall *Anas strepera*, teal *A. crecca* and shoveler *A. clypeata*. There are also a few common tern *Sterna hirundo* and grey heron *Ardea cinerea*. Ranworth and Cockshoot Broad form an important refuge for wintering geese and ducks (Anatidae). In 1963 the winter population was 1,000-2,000 but in 1984 there were only a few hundred. The area also supports a moderately strong breeding population of swallowtail butterfly *Papilio machaon britannica*, a subspecies now confined to the fens and broads of East Anglia.

Changes in Ecological Character The Norfolk Broads is a very popular tourist area, and the River Bure adjoining the reserve carries an exceptionally heavy traffic of pleasure craft (up to 1,000 boats per day, of which 70-75% are motor hire craft). The wash from the boats is eroding the land that separates the broads from the river, and damaging the riverside reedbeds which provide shelter and nesting areas for birds. The River Bure is very eutrophicated, with high levels of phosphorus and nitrogen derived from sewage effluent and agricultural runoff. These nutrients have encouraged high algal productivity resulting in high sedimentation rates (about 1.0cm per year) in the broads. Extensive reduction in the reedswamp area has been caused by boat damage, grazing by introduced coypu and waterfowl, and high nitrogen levels. There are regular outbreaks of avian botulism.

Management Practices The main management objective has been to maintain substantial areas of open fen, and to clear and maintain the dyke system. The upper phosphorus-rich sediment was removed from Cockshoot Broad, which had become very shallow due to sediment accumulation, and the broad was isolated by damming from the nutrient-rich River Bure in 1982. These works have produced an improvement in the ecology and water chemistry of the site, but, owing to heavy grazing by coot *Fulica atra* and other waterfowl, macrophytes were reintroduced to speed up the process of recovery. Boat traffic is prohibited on the broads in Bure Marshes National Nature Reserve and is subject to speed limits on the River Bure (governors are fitted to the engines of most hired boats). The reserve has a nature trail accessible only by boat at Hoveton Great Broad and a trail accessible by foot to Cockshoot Broad. Coypu are controlled by the Ministry of Agriculture, Fisheries and Food.

Scientific Research and Facilities Much of the work on the Broadland sequence of natural succession, alluvial stratigraphy of the broadland fens and the origin of the Norfolk Broads was carried out in the reserve. Recently completed or current work includes studies on water vole *Arvicola amphibius*, the ecology of the dykes, regression of marginal swamp communities and eutrophication studies at Hoveton Great Broad.

Principal Reference Material The above information is taken from the documents supplied by the Government of the United Kingdom for designation in 1976, and for the Cagliari Conference in November 1980. Supplemented by:

Broads Authority (1982). What Future for Broadland? Strategy and Management Plan for Broadland (draft). Broads Authority, Norwich.

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

Moss, B. (1983). The Norfolk Broadland: experiments in the restoration of a complex wetland. *Biol. Rev.* 58: 521-561.

IUCN (1977). *World Directory of National Parks and Protected Areas*. IUCN, Morges, Switzerland.

Hickling Broad and Horsey Mere

Location 52°45'N, 1°39'E. Situated in the county of Norfolk, England. Hickling is about 20km north-east of Norwich and Horsey is 3.5km further east.

Area 892ha

Degree of Protection A national nature reserve (487ha) which includes Hickling Broad was established in 1958. The reserve is owned by the Norfolk Naturalists Trust and a private landowner. The trust manages the privately owned land by agreement with the owner, and the whole is subject to a Nature Reserve Agreement with the Nature Conservancy Council. The remaining area is owned by the National Trust and managed as a nature reserve. Designated as a Ramsar Site at the time of ratification on 5 January 1976.

Site Description The area comprises four brackish shallow lakes: Hickling Broad, Heigham Sound, Horsey Mere and Martham Broad, and much of the marginal reedswamp and fen vegetation inside and outside the retaining floodbank. Like all the Norfolk Broads, these lakes are thought to have been formed after extensive peat digging (prior to the 13th century) when a combination of change in climate and rise in sea level flooded the pits so that they were abandoned. The topography has been extensively modified since by drainage of the surrounding marshland and embankment of the broads and associated waterways. These broads are in direct connection with the River Thurne. The range of habitats includes reedswamp dominated by common reed *Phragmites australis* or lesser reedmace *Typha angustifolia*; sedge beds dominated by great fen sedge *Cladium mariscus*; mixed communities of black bog rush *Schoenus nigricans*, tufted sedge *Carex elata*, milk parsley *Peucedanum palustris*, common valerian *Valeriana officinalis* and yellow loosestrife *Lysimachia vulgaris*; acidophilous communities containing crested buckler fern *Dryopteris cristata*, marsh cinquefoil *Potentilla palustris*, sharp-flowered rush *Juncus acutiflorus*, bogbean *Menyanthes trifoliata*, sphagnum mosses

Sphagnum palustre and *S. fimbriatum*; fen carr comprising alder *Alnus glutinosa*, downy birch *Betula pubescens* and grey willow *Salix cinerea*; mowing or grazing marshes; and neglected grazing marshes in various stages of reversion to mixed fen. Aquatic communities have been degraded through eutrophication, but the rare holly-leaved naiad *Najas mariana* persists. Horsey Mere has more extensive submerged vegetation although it is less species-rich than Hickling Broad. Species include spiked water milfoil *Myriophyllum spicatum*, fennel pondweed *Potamogeton pectinatus* and maretail *Hippuris vulgaris*. Fauna is characteristic of the Norfolk Broads, and includes the introduced South American coypu *Myocaster coypus*. The area is renowned for birdlife.

International and National Importance The site is of outstanding importance for characteristic marshland birds, some of which are very uncommon in Great Britain and have their principal populations in Broadland. Breeding species include pochard *Aythya ferina*, bittern *Botaurus stellaris*, bearded tit *Panurus biarmicus*, gadwall *Anas strepera*, garganey *A. querquedula* (1 pair), little tern *Sterna albifrons*, marsh harrier *Circus aeruginosus* and water rail *Rallus aquaticus*. Occurring regularly are black-tailed godwit *Limosa limosa*, ruff *Philomachus pugnax* and spotted redshank *Tringa erythropus*. In winter the reserve attracts 3,000-4,000 Anatidae, notably mallard *Anas platyrhynchos* (1,250), teal *A. crecca* and shoveler *A. clypeata*. The area is one of the principal strongholds of swallow-tail butterfly *Papilio machaon britannica*, a sub-species now confined to the fens and broads of East Anglia. Plants include crested buckler fern, which, although frequent in Norfolk, is decreasing locally and is listed as vulnerable in the British Red Data Book.

Changes in Ecological Character Water quality has been affected by nitrogen from agricultural runoff and phosphorus from sewage effluent, although, unlike the River Bure broads, some submerged plants have remained. There are no major sewage outfalls directly into these broads, but phosphorus may reach the area by movement upstream of effluent-laden water from the lower River Thurne or River Bure. In Hickling Broad an additional source of phosphorus is droppings from the large wintering population of black-headed gull *Larus ridibundus*. Aquatic plants are being damaged by boats passing too close or penetrating the marginal vegetation, and by the introduced coypu. Regular fish kills are caused by a dinoflagellate brackish water alga *Prymnesium* (which is stimulated by high nutrient levels). Drainage in the peaty catchment has resulted in the formation of acid water rich in particulate ferric compounds (ochre), with substantial quantities reaching Horsey Mere from drainage pumps at Brograve Mill and Eastfield Mill. A similar problem at Martham has now been solved by re-siting the drainage pump downstream.

Management Practices Water levels in the marshland are controlled to provide optimum conditions for birds throughout the year. Boating on the broads is unrestricted except at Martham, but a permit is required to visit surrounding marshland. Reed and sedge are harvested commercially which contributes to the running costs of the reserve. Coypu are controlled by the Ministry of Agriculture, Fisheries and Food.

Scientific Research and Facilities Some of the work on the origin of the Norfolk Broads was carried out at Hickling. The site has also been used for research on the ecology of the swallowtail butterfly, and for studies on eutrophication. It is currently part of an investigation into the regression of marginal swamp communities throughout the broadland.

Principal Reference Material The above information is taken from the documents supplied by the Government of the United Kingdom for designation in 1976 and for the Cagliari Conference in November 1980. Supplemented by:

Broads Authority (1982). What Future for Broadland? Strategy and Management plan for broadland (draft). Broads Authority, Norwich.

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

Moss, B. (1983). The Norfolk Broadland: experiments in the restoration of a complex wetland. *Biol. Rev.* 521-561.

Lindisfarne

Location 55°41'N, 1°48'W. On the coast, 15km south-east of Berwick upon Tweed, adjoining and including part of Lindisfarne (Holy Island); in the county of Northumberland, England.

Area 3,123ha

Degree of Protection Privately owned but managed under lease by the Nature Conservancy Council. Established as a national nature reserve in 1964, and extended in 1966, 1969 and 1974. The leases are due for renewal in 1985, 1986, 2014 and 2073. It is included within a stretch of coast scheduled as an area of outstanding natural beauty. Designated as a Ramsar site at the time of ratification on 5 January 1976.

Site Description The reserve includes two large areas of intertidal sand and silt, smaller areas of saltmarsh, and a moderately lime-rich dune system with well developed base-rich slacks (hollow areas within dunes). There are also low sandstone cliffs and wave cut platforms with rock pools. The tidal flats carry notable populations of *Enteromorpha* spp., seaweed and eelgrass *Zostera* spp., but the saltmarsh has been heavily invaded by cord-grass *Spartina anglica*. The dunes support a particularly varied flora combining northern and southern elements, with notable orchid and bryophyte populations including some rare species in the dune slacks. The dunes have a cover of marram grass *Ammophila arenaria*. Vegetation in the slacks includes creeping willow *Salix repens* which is locally abundant, wintergreen *Pyrola rotundifolia* and curved sedge *Carex maritima*. The hybrid small reed *Ammocalamagrostis baltica* occurs on the dunes. The site supports significant waterfowl populations.

International and National Importance The large areas of tidal sand and silt flats support internationally important populations of waterfowl. Of primary interest is the winter population of about 35,000 Anatidae and 40,000 (maximum) waders. Wigeon *Anas penelope* have increased from 10,000 in winters 1966-68 to 30,000 in 1978-79, whooper swan *Cygnus cygnus* formerly reached a peak in excess of 400 but now seldom exceed 150, and pale-bellied Brent goose *Branta bernicla hrota* varies between 350 and 2,100 (maximum recorded in 1978-79). Waders include 10,000 knot *Calidris canutus*, 30,000 dunlin *C. alpina* and 4,000 bar-tailed godwit *Limosa lapponica*. The flats are also fished by terns *Sterna* spp. when the tide is in. The dune slacks support a number of rare plant species including coralroot orchid *Corallorhiza trifida* and dune helleborine *Epipactis dunensis*.

Changes in Ecological Character The growth of cord-grass is accelerating the rate of natural accretion and is also encroaching into areas of eelgrass which are important for widgeon, whooper swan and Brent goose. The introduced Australasian pirri-pirri burr *Acaena novae-zealandae* is widely distributed. There is considerable tourist pressure in summer.

Management Practices Areas of cord-grass are being treated with dalapon in order to halt encroachment into eelgrass areas. Another management project is dune stabilisation. Shooting is allowed in parts of the reserve by a maximum of 750 permit holders but the remaining areas are maintained as a sanctuary. Access on foot is unrestricted.

Scientific Research and Facilities Recent projects have included studies of the feeding ecology of ringed plover *Charadrius hiaticula*, grey plover *Pluvialis squatarola*, bar-tailed godwit and curlew *Numenius arquata* by the University of Durham, and assessment of the effects of hunting on the local concentration of birds. There are routine counts of waterfowl.

Principal Reference Material The above information is taken from documents supplied by the Government of the United Kingdom for designation in 1976, for the Cagliari Conference in November 1980, and for the Groningen Meeting in 1984. Supplemented by:

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

IUCN (1977). *World Directory of National Parks and Protected Areas*. IUCN, Morges, Switzerland.

Additional references:

Cartwright, R.A. and D.B. (1976). *The Holy Island of Lindisfarne*. David and Charles.

Galliers, J.A. (1970). Geomorphology of Holy Island, Northumberland. Univ. of Newcastle upon Tyne Research Series 6.

Perry R.A. (1946). *Naturalist on Lindisfarne*. Lindsay Drummond.

Smith, P.C. and Evans, P.R. (1973). Studies of shorebirds at Lindisfarne, Northumberland: feeding, ecology and behaviour of the bar-tailed godwit. *Wildfowl* 24:135-139.

Magnusson, M. (1984). *Lindisfarne - The Cradle Island*. Oriel Press (Routledge and Kegan Paul).

Lochs Druidibeg, a'Machair and Stilligary

Location 57°21'N, 7°24'W. Situated on the western seaboard of the Isle of South Uist, Western Isles, north-west Scotland.

Area 1,780ha

Degree of Protection The whole area is a national nature reserve established in 1958. 1,030ha of this area is owned by the Nature Conservancy Council. The remainder is managed under a Nature Reserve Agreement with the owners (renewal date 1987). The national nature reserve area was approved as a biosphere reserve in June 1976. Designated as a Ramsar site at the time of ratification on 5 January 1976.

Site Description The whole area is underlain by Lewisian gneiss bedrock. The eastern section is a flat, moorland basin and contains Loch Druidibeg which is an oligotrophic loch of 316ha with average depth of 1.5m (maximum 4.0m). The loch has a sandy bottom, deeply indented shoreline, and many islands. The western (seaward) section is raised beach or 'machair' where the bedrock has a mantle of old beach deposits consisting of marine calcareous shellsands. The lochs in this section, which include Loch a'Machair and Loch Stilligary, are eutrophic. Both lochs are about 40ha in area with average depth of 1-2m (maximum 3.0). Because of proximity to the sea, all the lochs have relatively high sodium chloride levels from salt-laden sea-spray. The eastern section has moorland vegetation with blanket bog, dwarf shrub heath and deciduous scrub woodlands on loch islands. The largest British fern, the royal fern *Osmanda regalis*, is also found on the islands. The western section contains freshwater marsh, reedswamp, dune grasslands, dune slack mires and premanent pastureland. The lochs of the western section contain extensive beds of rooted aquatic vegetation including Characeae. The machair grasslands are rich in cultivated and uncultivated herbaceous species. The intertidal zone is mainly bare sand but larger stones bear short fucoid seaweeds. The reserve was primarily established for the breeding population of greylag goose *Anser anser*. Fauna include golden eagle *Aquila chrysaetos*, otter *Lutra lutra* in Loch Druidibeg, and short-tailed vole *Microtus agrestis*. Grey seal *Halichoerus grypus* occurs offshore. The lochs and running waters contain Atlantic salmon *Salmo salar*, both brown non-migratory and migratory trout *Salmo trutta* and nine-spined stickleback *Pungitius pungitius*. There are examples of brackish-water fauna in the lochs such as the mysid *Neomysis integer* and the amphipod *Gammarus duebeni*. Over 900 species of invertebrates have been identified, and the 'machair' lochs are particularly rich in zooplankton and benthos.

International and National Importance Loch Druidibeg regularly supports a substantial part of the native greylag goose breeding population in Britain. The geese also depend on the rich machair grasslands around Loch a'Machair and Loch Stilligary to rear their young. Some of the freshwater invertebrate species are uncommon or not found on the mainland. The machair lochs contain species of plants representative of shallow eutrophic lakes in the northern oceanic climate of north-west Scotland.

Changes in Ecological Character There is the possibility of agricultural reseedling of moorland vegetation and of drainage improvements which could result in lower water levels in Loch Druidibeg. Wild red deer *Cervus elaphus* have been introduced by the owners to the area managed under a Nature Reserve Agreement. The effects of the deer on the woodland of the islands in Loch Druidibeg are being monitored. There is some predation on the local wildlife by domestic dogs and cats belonging to crofters.

Management Practices The sandy machair grasslands contain plant communities modified by agriculture. Some of the area is permanent pasture that has been grazed for many centuries by cattle and sheep. Other parts including the ecotone between grassland and moorland are cultivated with oats, rye and potatoes. The moorland has been modified by fire and has extensive peat banks. The freshwaters are managed as a sea trout/salmon fishery, and wildfowling is allowed on the western section. Access to the eastern section of the reserve is restricted in the goose breeding season. Visitor pressure is generally quite low. The Nature Conservancy Council has established an experimental plantation of trees once native to this area. The management plan for the area is now under revision.

Scientific Research and Facilities Research projects include a study of the population dynamics of the greylag goose, and physical and botanical studies of the 'machair'.

Principal Reference Material The above information is taken from the documents supplied by the Government of the United Kingdom for designation in 1976 and for the Cagliari Conference in November 1980. Supplemented by:

Luther, H. and Rzoska, J. (1971). Project Aqua. *IBP Handbook* No. 21. Blackwell Scientific Publications.

Additional references:

Newton, L. (1969). Greylag geese *Anser anser* at Loch Druidibeg. *Wildfowl* 20: 156.

Loch Leven

Location 56°13'N, 3°23'W. Situated about 19km south of Perth in the district of Perth and Kinross, Tayside region, south-east Scotland.

Area 1,597ha

Degree of Protection Privately owned but declared a national nature reserve in 1964 under section 19 of the National Parks and Access to the Countryside Act 1949. Subject to a Nature Reserve Agreement with the Nature Conservancy Council due for renewal in 2004. Designated as a Ramsar site at the time of ratification on 5 January 1976.

Site Description A shallow loch of 13,350 sq.km at an altitude of 107m, with a maximum depth of 25m and mean depth of 3.9m. The loch fills two kettle holes in glacial sand and till which overlie Devonian sandstone. It is very exposed to west and east, and subject to strong wave action. The loch has partial or complete ice cover in most winters, though rarely complete cover for long periods. The shoreline is of sand or small stones, and 40% of the lake floor is covered with sand to 3m depth, below which the sediment is mud. There are seven islands, the largest 32ha and second largest 2ha. The loch is naturally base-rich, and subject to accelerated eutrophication due to high levels of phosphorous in sewage effluent and the increasing use of nitrate fertilisers in the catchment area (mainly arable and improved grassland). The high nutrient status of the loch has caused prolonged and dense algal blooms. The vegetation of the landward section of the reserve is old pine plantations, ungrazed grasslands and mesotrophic mire. There is an interesting range of ruderal species in the strand-line vegetation. Emergent vegetation is now confined to a few scattered areas, but sparse submerged macrophytes have shown considerable recovery since previous decline, with fennel-leaved pondweed *Potamogeton pectinatus* now dominant. Emergents include reed *Phragmites australis*, reedgrass *Phalaris arundinacea* and scattered common spike rush *Eleocharis palustris*. The fauna includes brown trout *Salmo trutta*, perch *Perca fluviatilis*, pike *Esox lucius*, three-spined stickleback *Gasterosteus aculeatus*, brook lamprey *Lampetra planeri* and many species of waterfowl.

International and National Importance Loch Leven's geographical position midway between the firths of Forth and Tay at the focus of migration routes, and its rich and extensive feeding grounds and large size, are significant in making the loch the most valuable inland

waterfowl lake in Great Britain. The loch has the largest numbers of breeding ducks in Britain, with over 500 pairs of mallard *Anas platyrhynchos* and tufted duck *Aythya fuligula*, and 50-60 pairs of gadwall *Anas strepera*. Also breeding here are 8,000 pairs of black-headed gull *Larus ridibundus*. The reserve is also an important moulting refuge and staging post on migration, with up to 15,000 pink-footed goose *Anser brachyrhynchus* arriving in autumn. Wintering species include mallard, teal *Anas crecca*, pochard *Aythya ferina*, shoveler *Anas clypeata*, goldeneye *Bucephala clangula*, whooper swan *Cygnus cygnus* and greylag goose *Anser anser*. The loch is renowned for trout fishing, and some 20,000kg are caught by anglers annually.

Changes in Ecological Character Although there was some improvement in the loch water (and recovery of submerged macrophytes) following controls on industrial effluent during the 1970s, high levels of nutrients continue to enter the loch (mainly from domestic sewage and agricultural run-off). The increasing phosphorous inputs, and concentrations in the loch are the worst problem, causing loss of aquatic plants and species diversity, and contributing to erosion of exposed shorelines which have suffered die-back of emergent vegetation. The lagoon areas which are duckling nursery habitat are threatened by shoreline erosion. A feasibility study of control by gabioning was implemented by the NCC (1982-4) and resulted in nearly 2,000m of the east shore of the loch being protected by a gabion reef, 20-30m offshore. A drop in the numbers of trout caught has led to a decision by the landowner to reopen the fish hatchery and restock the loch. A planning application for a helicopter landing pad on the boundary of the reserve has been refused. Helicopters using this pad would have flown out across part of the loch shore used by nesting duck and across flight lines used by wintering geese between their roosting and feeding areas. There may be future pressures from water abstraction, light industry and tourist/recreational activities.

Management Practices Access is restricted under byelaws and there are only three points of public access. Trout fishing by boat is permitted, under control of the landowner. In 1985-86 a major research contract was placed with the Institute of Terrestrial Ecology (Natural Environment Research Council). This was jointly funded by Tayside Regional Council (with financial assistance by EEC), the Nature Conservancy Council, and the Department of Agriculture and Fisheries for Scotland, and aims to provide a total phosphorus budget for Loch Leven. A preliminary report has been produced and discussed. It is hoped that these discussions will lead to Tayside Region installing phosphate stripping equipment at the sewage works.

Scientific Research and Facilities Loch Leven was the site of a major UK International Biological Programme (IBP) project on productivity and production processes in the food chain. This included projects on water circulation, nitrogen and phosphorus budgets, insecticides in fish, fluctuations in phytoplankton and benthic algae, macrophytes and duck population, biology and parasitology. Research is continuing on biotic fluctuations and related management problems, particularly a re-survey of aquatic macrophytes and utilisation of the water surface and shoreline by duckling broods.

Principal Reference Material The above information is taken from documents supplied by the Government of the United Kingdom for designation in 1976, for the Cagliari Conference in November 1980 and for the Groningen Meeting in 1984. Supplemented by:

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

Luther, H. and Rzoska, J. (1971). Project Aqua. *IBP Handbook* No. 21. Blackwell Scientific Publications.

Additional references:

- Allison, A., Newton, I. and Campbell, C. (1974). *Loch Leven National Nature Reserve: a study of waterfowl biology*. WAGBI Chester.
- IBP (1974). The Loch Leven Project. *Proc. Royal Soc. Edinburgh* B 74: 1-450.
- Le Cren (Ed.) (1976). The productivity of freshwater communities. *Phil. Trans. R. Soc. Lond.* B 274: 359-374.
- Morgan, N.C. (1972). Productivity studies at Loch Leven (a shallow nutrient-rich lowland lake). In Kajak, Z. and Hilbricht-Ilkowska, A. (eds). *Productivity problems of freshwaters*. Warsaw-Krakow. Pp. 183-205.
- Munro, W.R. and Balman K.H. (1956). Observations on the spawning runs of brown trout in the South Queich, Loch Leven. *Freshwater Salm. Fish. Res.* 13: 1-17.
- Newton, I. and Campbell, C.R.G. (1969). Geese at Loch Leven. *Wildfowl* 20: 156.
- Newton, I. and Campbell, C.R.G. (1975). Breeding of ducks at Loch Leven, Kinross. *Wildfowl* 26: 83-103.

Loch Lomond

Location 56°04'N, 4°35'W. Situated in the south-east corner of Loch Lomond in Dumbarton and Stirlingshire districts, Strathclyde and Central region, south-west Scotland.

Area 253ha

Degree of Protection The island of Inchcailloch within the site is owned by the Nature Conservancy Council and the remaining site area is privately owned and managed by the NCC under Nature Reserve Agreements (due for renewal in 1987 and 1991). The site is part of a national nature reserve of 416ha established in 1962 and extended in 1977. Designated as a Ramsar site at the time of ratification on 5 January 1976.

Site Description The site comprises five islands: Inchcailloch, Torrinch, Creinch, Clairinsh and the Aber Isle; part of the mainland shore; and marshy hinterland around the lower reaches of the River Endrick. The islands lie along the Highland Boundary Fault Line which is one of the major geological features of Scotland. The four larger islands have fine examples of semi-natural deciduous woodland with oak *Quercus* spp. dominant. Soil varies from acidic to base-rich with the acidic ground flora corresponding closely to a *Vaccinium*-rich type. There are areas of alder carr, and species-rich zones around the shores of the islands. The shore portion comprises large areas of low-lying, regularly flooded wetlands, woodland fringes and rough pasture. The rough pasture covers at least half of the mainland area of the site, with scattered areas of greater botanical interest. Ring Bog is a mesotrophic fen covered by a herb-rich flora, including sharp-flowered rush *Juncus acutiflorus*, with almost pure reed-canary grass *Phalaris arundinacea* in places. The slow-moving rivers and lagoons of the mainland are especially rich in aquatic invertebrates. The area is noted for waterfowl.

International and National Importance The area is a regionally important wintering refuge for waterfowl, holding over 100 Greenland white-fronted geese *Anser albifrons flavirostris* and 3,000 (maximum) greylag geese *Anser anser*. In summer the area holds one of the largest inland breeding populations of shelduck *Tadorna tadorna* in Scotland, and a regionally important

inland wader breeding population. The woodlands on the islands contain some of the highest recorded densities of breeding insectivorous birds in Britain. The shore wetlands contain several botanical rarities including eight-stamened waterwort *Elatine hydropiper*, thread rush *Juncus filiformis* and, at its only known locality in Britain, Scottish dock *Rumex aquaticus*.

Changes in Ecological Character The continuing apparent "drying out" of parts of the fen areas continues to give cause for concern. Colonisation of the area by shrub species is still occurring, particularly by willow *Salix* sp. This encroaching scrub is being cleared as it appears, but the underlying problem relating to changes in the hydrology of the area requires attention. The initial phases of a rehabilitation project have been completed with wide, deep canals having been dug around the periphery. This should enable the NCC to pump "clean" water into the fen but keep polluted water out. Further phases are planned. There is some illegal shooting of waterfowl.

Management Practices Open grasslands are maintained by the use of domestic stock such as sheep and cattle, and annual cutting following flowering. Access to Inchcailloch, where there is a nature trail and camping site, is unrestricted, but access to the mainland portion is by permission of the reserve warden.

Scientific Research and Facilities Much research has been carried out on the fauna and flora including bird counts, vegetation mapping, land-use history (particularly of the islands), soils and geology. Universities are encouraged to carry out research on certain areas.

Principal Reference Material The above information is taken from the documents supplied by the Government of the United Kingdom for designation in 1976 and for the Cagliari Conference in November 1980. Supplemented by:

Duffey, E. (1982). *National Parks and Reserves of Western Europe*. Macdonald and Co., London

Additional references:

Hunter, W.R. (1961). Annual variations in growth and diversity in natural populations of freshwater snails in the west of Scotland. *Proc. Zoo. Soc. Lond.* 136: 219-253.

Idle, E.T. (1974). *Botany. A natural history of Loch Lomond*. Univeristy of Glasgow Press. Pp 24-35.

Loch Lomond National Nature Reserve Management Plan and miscellaneous published and unpublished reports held by the Nature Conservancy Council, Dumbartonshire.

Slack, H.D. (1957). *Studies on Loch Lomond*. Glasgow. 133pp.

Lough Neagh and Lough Beg

Location 54°40'N, 6°25'W. Situated in the counties of Antrim, Londonderry, Tyrone, Armagh and Down in Northern Ireland.

Area 39,500ha

Degree of Protection Lough Neagh and Lough Beg are areas of special scientific interest (ASSI). Lough Neagh ASSI contains the following national nature reserves (NNRs) established under the Amenities Lands Act (Northern Ireland) 1965 and managed by the Department of the Environment: Randalstown Forest NNR owned by the Forest Service and managed by agreement; Farr's Bay NNR owned by Lord O'Neill (Shanes Castle) and managed by agreement; Rea's Wood Forest NNR owned by the Forest Service and managed by agreement; Oxford Island NNR owned by Craigavon Borough Council and managed by agreement; Lough Neagh Islands NNR (including most of the smaller islands) owned by Shaftsbury Estates and others and managed by agreement; and Annagariff and Mullenakill NNR owned and managed by the Department of the Environment. There are also two wildfowl refuges at Doss Bay and North-East Lough Neagh. Lough Neagh and Lough Beg are Category A sites on the Project MAR list. Designated as a Ramsar site at the time of ratification on 5 January 1976.

Site Description Lough Neagh is the largest lake in the British Isles covering some 38,300ha and is connected to the sea through Lough Beg and the Lower Bann River. It is shallow with an average depth of less than 9m. Lough Beg covers 640ha. The loughs lie in the western extension of the Bioland Valley of Central Scotland. The sedimentary basin which was formed in the Carboniferous period contains thick layers of Triassic, Rhaetic Liassic, Cretaceous and Tertiary rocks. Above this lies some 350m-thick Late Tertiary clays and sands. The vegetation around Lough Neagh is varied and includes mature woodland, scrub, fen, reed-swamp, water meadow and improved grassland. In the south away from the shore, are several peatland areas. Lough Beg to the north contains a diverse macrophyte flora. Lough Neagh is very eutrophic, with an extremely rich benthos (over 4,000 animals per sq.m), nekton and plankton. The fauna contains two relicts from glacial times which are at the western end of their distribution: pollan *Coregonus laurae* and a freshwater shrimp *Mysis relicta*. Eel, brown trout, salmon and perch (*Anguilla anguilla*, *Salmo trutta*, *Salmo salar* and *Perca fluviatilis* are common and are exploited commercially. These fish and several bird species are dependent on the rich insect life on the lough, and particularly on the species of *Chironomid* midge which spends its larval stage on the lough bed. Otter *Lutra lutra* also occurs in this site.

International and National Importance The loughs and adjoining grasslands are important wintering and passage areas for Bewick's swan *Cygnus columbianus bewickii* (250-500), whooper swan *C. cygnus* (400-700), teal *Anas crecca* (1,500-2,000), pochard *Aythya ferina* (17,000 but 41,000 maximum in the recent past), tufted duck *A. fuligula* (6,500-8,000 but with up to 20,000 in the recent past), scaup *A. marila* (600-1,200) and goldeneye *Bucephala clangula* (3000-5,000). The numbers of pochard constitute 4.9% of the north-west European population and tufted duck 1%. Other waterfowl species are mute swan *Cygnus olor* (300-400), wigeon *Anas penelope*, mallard *A. platyrhynchos*, shoveler *A. clypeata* and coot *Fulica atra*. In the breeding season the shores and islands provide nesting sites for several species of duck as well as gulls, terns waders and probably the largest population of great crested grebe *Podiceps cristatus* in the British Isles. The fauna also includes many rare invertebrates. The eel population is of international importance. The site contains a number of plant species listed in the Red Data Book including eight-stamened waterwort *Elatine hydropiper* (rare), summer snowflake *Leucojum aestivum* (rare), Irish ladies-tresses *Spiranthes romanzoffiana* (rare), holy-grass *Hierochloa odorata* (rare) and penny royal *Mentha pulegium* (vulnerable). Botanically important sites include the peatland areas to the south of Lough Neagh and also Lough Beg, where diversity of macrophytes is unparalleled elsewhere in Northern Ireland.

Changes in Ecological Character The water regime of Lough Neagh has been greatly changed from the natural state. Originally it was subject to considerable rise in water level during winter resulting in extensive inundation of the surrounding land especially in the south. The seasonal variation of water level has now been greatly reduced and the lough level has been lowered several times (the latest in 1959). There are several wetlands on the boundary of Lough Neagh ASSI which were formerly flooded but which now appear to be separated from the lough by dry land. The major threat to Lough Neagh would be a continual increase of eutrophication. Land reclamation is a major threat especially scrub clearance, which has resulted in degradation of some shoreline habitats. Away from the lough shore drainage is a threat to some of the smaller wetlands. Other problems include over-fishing, sand extraction, shooting pressure and scrub encroachment on some islands.

Management Practices The Department of the Environment (Northern Ireland) has recently implemented a capital programme for phosphate removal at the ten large sewage treatment works in the Lough Neagh catchment. Habitat management for breeding waterfowl is carried out in Lough Neagh Islands NNR and North-East Lough Neagh Wildfowl Refuge. Shooting is prohibited in North-East Lough Neagh and Dross Bay Wildfowl Refuges and Oxford Island NNR, and in a series of voluntary refuges established by the Wildfowlers clubs.

Scientific Research and Facilities Monthly wildfowl counts were carried out between 1965 and 1969 by a voluntary club and were re-commenced under Department of the Environment (Northern Ireland) control in 1985. Intermittent total counts were made in the intervening years. The joint departments of Agriculture and Environment Freshwater Biological Investigation Unit at Greenmount and the New University of Ulster Limnology Laboratory at Traad Point use Lough Neagh for most of their research.

Principal Reference Material The above information is taken from the documents supplied by the Government of the United Kingdom for designation in 1976 and for the Cagliari Conference in November 1980. Supplemented by:

Luther, H. and Rzoska, J. (1971). Project Aqua. *IBP Handbook* No. 21. Blackwell Scientific Publications.

Additional references:

Anon. (1968). Lough Neagh, Northern Ireland. OECD Symposium on large lakes and impoundments, Sweden. Government of Northern Ireland.

Dakin, W.J. and Latarche, M. (1913). The plankton of Lough Neagh. *Proc. Roy. Irish Acad.* B 30: 20-96.

Edwards, C. (1958). Gammarids of Lough Neagh. Unpublished Thesis, Queens University, Belfast.

Frost, W.E. (1950). The eel fisheries of the River Bann, Northern Ireland and observations on the age of silver eels. *J. Com. Internat. L'explor. Mer.* XVI (3).

Graham, T.R. (1970). The zooplankton of Lough Neagh 1968-69. *Irish Nat. J.* 16: 265-271.

Macan, T.T. and Lund J.W.G. (1954). Records from some Irish Lakes. Part 1. *Proc. Roy. Irish Acad.* B 56: 135-137.

Smith, R.V. (1977). Domestic and agricultural contributions to the inputs of phosphorus and nitrogen to Lough Neagh. *Water Research* II: 433-459.

Wood, R.B. and Gibson, C.E. (1973). Eutrophication and Lough Neagh Water. *Research* 7: 173-187.

Minsmere - Walberswick

Location 52°17'N, 1°37'E. Situated on the Suffolk coast in England. Walberswick is 20km south of Lowestoft. Minsmere is 3km south of Dunwich.

Area 1,697ha

Degree of Protection Ownership is divided: the Nature Conservancy council manage 514ha of Walberswick as a NNR and in 1986 leased another 42ha which will be included in the NNR. Walberswick was established as a National Nature Reserve in 1972, most of the reserve is managed by the Nature Conservancy Council under a Nature Reserve Agreement which is due for renewal in 1993 (the remainder being part leased and part owned by the Nature Conservancy Council). The Royal Society for the Protection of Birds (RSPB) own 588ha at Minsmere which has had nature reserve status since 1948 and is a RSPB non-statutory reserve. The National Trust owns and manages 85ha at Dunwich Heath. The remaining 452ha are in private ownership or owned by Walberswick Common Lands Charity. It is a site of special scientific interest and a Category A site on the Project MAB list. Designated as a Ramsar site at the time of ratification on 5 January 1976.

Site Description Minsmere is a river valley that was drained and reclaimed as a grazing marsh in the 19th century but flooded in 1940 as a war-time defence measure. There are now extensive reedbeds, freshwater meres (lakes) and an area (16ha) of man-made brackish lagoons and islets known as the Scrape. The land slopes down from high ground at Westleton in the north to Minsmere Valley in the south. The eastern boundary is protected from the North Sea by a shingle beach and clay embankment. The vegetation of the valley is dominated by common reed *Phragmites australis*. There is an expanding colony of marsh sowthistle *Sonchus palustris* but the marsh flora is poorly developed due to its recent origin. The higher ground has heathland comprising mainly heather *Calluna vulgaris*, with bell heather *Erica cinerea*, bracken *Pteridium aquilinum* and gorse *Ulex europaeus* locally dominant, and extensive woods of secondary origin with oak *Quercus robur* predominant but good representation of Scots pine *Pinus sylvestris*, silver birch *Betula pendula* and downy birch *B. pubescens*.

Walberswick, which is just north of Minsmere, consists of a gentle ridge between the tidal mudflats of the River Blythe to the north and extensive reedbeds and shallow meres of Westwood marshes to the south. The valleys were reclaimed for grazing but the river walls have either become derelict or have been breached for wartime defence so that the valleys have reverted to mudflats and reedbeds. There are extensive areas of acidic heathland on the high ground between the valleys, dominated by bracken with bell heather, gorse, broom *Cytisus scoparius* and grassheath of bent grass *Agrostis* sp. and sheep's fescue *Festuca ovina*. There is some carr woodland with some 19th century plantations of oak, Scots pine and silver/downy birch and also considerable natural regeneration on former heathland. The reedbeds are almost pure stands of common reed. The saltmarshes are dominated by sea purslane *Halimione portulacoides* with some sea aster *Aster tripolium*, sea lavender *Limonium vulgare* and glasswort *Salicornia* sp. The fauna of the site includes red deer *Cervus elaphus* and a diverse bird community. Adder *Vipera berus* and lizard *Lacerta vivipara* occur and over 250 species of Lepidoptera have been recorded.

International and National Importance The site is of prime ornithological importance with over 220 bird species recorded annually, including 99 breeding species such as marsh harrier *Circus aeruginosus*, nightjar *Caprimulgus europaeus*, nightingale *Luscinia megarhynchos*, bearded tit *Panurus biarmicus*, reed warbler *Acrocephalus scirpaceus*, sedge warbler *A. schoenobaenus*, cetti's warbler *Cettia cettia*, garganey *Anas querquedula*, Savi's warbler *Locustella luscinioides*, redstart *Phoenicurus phoenicurus*, bittern *Botaurus stellaris*, water rail *Rallus aquaticus*, gadwall *Anas strepera*, avocet *Recurvirostra avosetta*, common tern *Sterna hirundo*, little tern *S. albifrons* and sandwich tern *S. sandvicensis*. The site is an important staging point for migrant waterfowl particularly shelduck *Tadorna tadorna* of which there is a substantial breeding population, redshank *Tringa totanus*, black-tailed godwit *Limosa limosa* and dunlin *Calidris alpina*. There is a regular winter population of Bewick's swan *Cygnus columbianus bewickii*. White-mantled wainscot moth *Nonagria neurica*, which is scarce in Britain, also occurs.

Changes in Ecological Character Encroachment by bracken and scrub is a problem at both Minsmere and Walberswick. This is being tackled by management.

Management Practices The Scrape at Minsmere requires intensive management: mainly removal of encroaching vegetation by handpulling, mowing and spraying (although input into this management technique is being reduced) and removal of silt. Sprays are also used to control reed and bracken. Invading birch on the heathland is removed. There was intensive ditching work in the reedbeds in 1980. Water levels are carefully controlled to create optimum feeding conditions and prevent flooding after periods of heavy rain. Other management activities include control of the main pests: coypu *Myocastor coypus*, brown rat *Rattus norvegicus* and rabbit *Oryctolagus cuniculus*. At Walberswick the reeds are cut annually for thatching. Walberswick is partially open to the public, but access to Minsmere is by permit only and limited to six days per week from April to mid-September. The policy at Minsmere was to be reviewed late in 1986, but was likely to remain unchanged. There are two public hides overlooking the scrape which are open to the public every day.

Scientific Research and Facilities Research at Minsmere is concentrated on survey and monitoring work, particularly of breeding birds such as avocet, black-headed gull *Larus ridibundus*, nightjar, bittern, little tern, common tern and marsh harrier. Surveys have included the aquatic macrophytes of the newly excavated ditches and the marine molluscs of Minsmere. Since 1983 MAFF have been doing ecological studies on eel populations at Walberswick.

Principal Reference Material The above information is taken from the documents supplied by the Government of the United Kingdom for designation in 1976 and for the Cagliari Conference in November 1980. Supplemented by:

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

European Committee for the Conservation of Nature and Natural Resources (1982). Minsmere Nature Reserve, UK. Category A. Annual Report for 1981. Strasbourg 1982.
IUCN (1977). *World Directory of National Parks and Other Protected Areas*. IUCN, Morges, Switzerland.

Additional references:

Conder, P. (1964). Notes on the management of freshwater reed marsh of Minsmere and saltwater lagoons of Havergate Island, Suffolk, England. In Project MAR. Proceedings of

the Conference on conservation and management of temperate, marshes, bogs and other wetlands held at Les Saintes-Maries-de-la-Mer 1962. *IUCN Publ. New Series* 3: 302-317. Morges, Switzerland.

Regular reports in the RSPB Journal 'Birds' and occasional papers in 'British Birds'.

North Norfolk Coast

Location 52°30'N, 0°53'E. East Anglia, England.

Area 5,559ha

Degree of Protection The Ramsar site comprises four separate units: Scolt Head National Nature Reserve (737ha) established in 1954, owned by the National Trust and Norfolk Naturalists Trust and leased and managed by the Nature Conservancy Council; Holkham National Nature Reserve (3,953ha) established in 1967, part-managed by the NCC under a Nature Reserve Agreement with the owners (due for renewal in 1988) and the remainder leased by the NCC from the Crown Estate Commissioners; Blakeney Point declared as a Site of Special Scientific Interest in 1954, owned and managed by the National Trust under the National Trust Act 1907; and Cley and Salhouse Marshes SSSI which includes the former Cley Marshes Statutory Bird Sanctuary established in 1966, managed by the Norfolk Naturalists Trust, now incorporated in North Norfolk Coast SSSI in February 1986 as a composite site of 7,200ha, the whole of which will extend the Ramsar site. 5,497ha of the area was approved as a biosphere reserve in June 1976. An area of 5559ha were designated as a Ramsar site at the time of ratification on 5 January 1976.

Site Description The site comprises mainly intertidal sand and mud, shingle, sand-dunes and salt marshes. It includes a shingle spit at Blakeney which forms the foundation for extensive ridges of sand-dunes and is of considerable physiographical interest. An offshore shingle bank at Scolt Head capped by sand-dunes contains a succession of saltmarshes of varying ages on the landward side and one of the largest saltmarshes in England at Holkham. Dune grassland is dominated by sand couch grass *Elymus farctus*, marram grass *Ammophila arenaria* or sand sedge *Carex arenaria* depending on the height above high tide level and the degree of encroachment by fresh blown sand. On a dune area at Holkham, dense natural regeneration has occurred seaward to a plantation of Corsica pine *Pinus nigra* var. *maritima*. The pines were planted between 1853 and 1890 to assist stabilisation of the dunes. Holkham also contains a small area of deciduous woodland and large area of agricultural land (half arable/half pasture) derived from reclaimed saltmarsh. Maritime pasture at Cley and Salhouse Marshes includes jointed rush *Juncus articulatus*, silverweed *Potentilla anserina*, marsh foxtail *Alopecurus geniculatus* and annual beard-grass *Polypogon monspeliensis* - all plants of damp grazing areas. Shingle ridge colonists include shrubby seablight *Suaeda vera*, yellow-horned poppy *Glaucium flavum*, sea campion *Silene maritima*, stonecrop *Sedum acre*, curled dock *Rumex crispus* var. *triangulivalvis* and birdsfoot trefoil *Lotus corniculatus*. Sea wormwood *Artemisia maritima* and purslane *Halimione portulacoides* occur in the transition zone between shingle and marsh. The saltmarsh succession is typified by glassworts *Salicornia* spp., sea aster *Aster tripolium*, sea lavender *Limonium vulgare*, purslane (particularly fringing creeks), saltmarsh grass *Puccinellia maritima*, thrift *Armeria maritima* and sea wormwood. The intertidal flats mainly comprise unvegetated sand and shingle. Some mud flats have seasonal growths of eel grass *Zostera* sp.

and green algae *Enteromorpha* spp. and *Vaucheria* spp. There are extensive reedbeds of *Phragmites australis* at Cley and Salthouse Marshes due to brackish conditions caused by a spring and freshwater drain. Also present are mud rush *Juncus gerardi*, *Ranunculus baudottii*, false foxsedge *Carex otrubae*, sea clubrush *Scirpus maritimus*, bur-reed *Sparganium erectum* and great reedmace *Typha latifolia*. North Norfolk Coast is of great ornithological interest. Fauna also includes otter *Lutra lutra*, natterjack toad *Bufo calamita* and common lizard *Lacerta vivipara*. Red squirrel *Sciurus vulgaris* has not been reported since 1981. The mudflats and creeks have locally abundant concentrations of invertebrates which are important as a food source for waterfowl.

International and National Importance One of the largest breeding colonies (maximum 4,500 pairs) of Sandwich tern *Sterna sandvicensis* in the United Kingdom occurs at Scolt Head and Blakeney Point, constituting about 1/12 of the world population. Blakeney Point supports the largest colony of little tern *Sterna albifrons* in Western Europe. Other important breeding birds include common tern *Sterna hirundo*, bearded tit *Panurus biarmicus*, bittern *Botaurus stellaris*, marsh harrier *Circus aeruginosus* and avocet *Ecurvivostra avosetta*. The geographical position of the North Norfolk Coast, and the wide range of habitats, make it particularly valuable for migratory birds including numerous waders and, in winter, large numbers of Brent goose *Branta bernicla*, and smaller numbers of pink-footed goose *Anser brachyrhynchos* and white-fronted goose *Anser albifrons*. The site is also of great importance for coastal physiography, and classic studies of the processes of the formation of shingle, sand-dune and salt-marsh systems. It is of international interest for the distinctive age series of marshes enclosed by shingle spit recurves, as well as a great variety of marsh development.

Changes in Ecological Character At Holkham the ecological character has been changed by the planting of Corsican pine and by reclamation of 700ha of saltmarsh for agriculture during the 17th-19th centuries. Much of the old creek patterns and flora has been destroyed by cultivation. An attempt to reclaim another area of saltmarsh failed, but the canalised creeks still remain. Blakeney and parts of the west Holkholm have intensive tourist use during July-September. At Cley and Salthouse Marshes the remains of several saltwater broads are being reduced by the inexorable landward movement of shingle during storms, and the construction of sea walls in the 17th century has enabled part of the area to be grazed by cattle. At Blakeney a number of buildings have been constructed including a lifeboat house (now used for other purposes).

Management Practices The primary management objective is to allow the natural processes of physiographic evolution and vegetative succession to proceed with minimal interference. Positive management mainly concerns care and maintenance of the sand-dunes. Controlled flooding is practised over much of the bird sanctuary at Cley Marshes. Public access to Scolt is unrestricted except during the bird breeding season. Holkham has open access to all areas except farmland. Blakeney has unrestricted access except when the ternery is occupied (when visitors to this area must be accompanied by the warden). Some wildfowling is allowed at Cley and Salthouse Marshes and elsewhere at Holkham and Scolt Head.

Scientific Research and Facilities The Nature Conservancy Council and many universities use the area for research, and there is a wide range of past and current ecological studies. The flora and fauna of Blakeney Point has been studied since 1920, and the physical geography of Scolt Head Island.

Principal Reference Material The above information is taken from the documents supplied by the Government of the United Kingdom for designation in 1976 and for the Cagliari Conference in November 1980. Supplemented by:
IUCN (1977). *World Directory of National Parks and Other Protected Areas.* IUCN, Morges, Switzerland.

Ouse Washes

Location 52°30'N, 0°13'E. The washes begin 17km almost due north of Cambridge. The midway point is 7km north-west of Ely. Situated in the counties of Cambridgeshire and Norfolk, England.

Area 2,276ha

Degree of Protection 1,132.4ha is owned or leased by conservation agencies: Royal Society for the Protection of Birds 875ha; Wildfowl Trust 313ha; Cambridge and Isle of Ely Naturalist Trust Ltd 158ha; and Bedfordshire and Huntingdonshire Naturalist Trust 3.4ha maintained as a non-statutory reserve. The remaining area is divided among a large number of private owners. 2,106ha are classified as a national wildfowl refuge and the whole area is a site of special scientific interest. Designated as a Ramsar site at the time of ratification on 5 January 1976.

Site Description The Ouse Washes comprise a stretch of grassland about 30km long and 800m wide lying between two canalised watercourses, the New and Old Bedford Rivers. These rivers receive run-off from a large area of eastern England and carry it across the intensively cultivated East Anglian Fenland which in places is below sea level. The rivers are embanked on the outer side only and the grassland between them is used as a flood-relief reservoir. The depth and duration of the flooding varies with rainfall and season, and this is reflected in the vegetation. The wetter areas are dominated by reed sweetgrass *Glyceria maxima* and floating sweetgrass *G. fluitans*, and the drier parts by reed canary-grass *Phalaris arundinacea* and bent grasses *Agrostis* spp. Spike rushes *Eleocharis* spp. and sedges *Carex* spp. are abundant and provide important food for waterfowl. The genera *Juncus* (rushes), *Oenanthe* (water dropwort) and *Polygonum* are well represented. The ditches carry a great variety of aquatic plants, such as fringed water-lily *Nymphoides peltata*, water parsnip *Sium latifolium* and all four species of duckweed *Lemna*. Although the washes are about 20km from the sea, relicts of former marine flooding still occur such as sea aster *Aster tripolium*, wild celery *Apium graveolens* and sea rush *Scirpus maritimus*. Small stands of willow *Salix* spp. are also present. In the winter and spring the area attracts many species of waterfowl.

International and National Importance The Ouse Washes are of outstanding importance as the largest inland gathering for wildfowl in Britain. During winters 1975-84 the washes held peak numbers of about 30,000 Anatidae (maximum 62,400). Wigeon *Anas penelope* has reached an average level of 25,358 (maximum 42,500), teal *A. crecca* 3,182 (maximum 7,570), pintail *A. acuta* 1,342 (maximum 3,260) and Bewick's swan *Cygnus columbianus bewickii* 2,528 (maximum 5,227). The maximum numbers of other species recorded in the same period have been mallard *Anas platyrhynchos* 6,337, shoveler *A. clypeata* 685, pochard *Aythya ferina* 4,900, mute swan *Cygnus olor* 643 and whooper swan *Cygnus cygnus* 248. A further 14 species were

present in small numbers. In the summer the washes attract many breeding birds particularly common snipe *Gallinago gallinago*, lapwing *Vanellus vanellus* and redshank *Tringa totanus*. The area also supports one of the few breeding colonies of black-tailed godwit *Limosa limosa* (20 pairs) in Britain, and is an occasional breeding site of ruff *Philomachus pugnax*. The washes are also important as the largest area of regularly flooded freshwater grazing marshland left in Britain. The marshes are rich botanically with 44% of British aquatic species occurring here.

Changes in Ecological Character Late spring and summer flooding, probably due to increased upstream drainage, is detrimental to bird breeding and prevents essential grazing.

Management Practices The area is managed to provide optimum conditions for breeding and wintering waterfowl, and methods include controlled grazing, hay-cutting and, so far as possible, control of water levels. Shooting is restricted in places which are important primarily as breeding sites. Shooting rights over the area outside the refuges belong to the individual owners. Other management practices include coppicing of willow to provide osier wands, and double ditching to provide secure nesting sites.

Scientific Research and Facilities Research includes detailed investigations of wildfowl and waders, a study of the colonisation of the area by black-tailed godwit, and conservation methods in relation to increased flooding, research into management problems, an aquatic plant survey and detailed research into the biology of snipe.

Principal Reference Material The above information is taken from documents supplied by the Government of the United Kingdom for designation in 1976, for the Cagliari Conference in November 1980 and for the Groningen Meeting in 1984. Supplemented by:

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

Additional references:

Grose, M. and Allen, D. (1978). *A survey of Ouse Washes water plants*. R.S.P.B., Anglian Water Authority Report. 125pp.

Thomas, G.J. (1975). Ingested lead pellets in Ouse Washes water birds 1968-1973. *Wildfowl* 26: 43-48.

Thomas, G.J. (1976). Habitat usage of wintering ducks at the Ouse Washes, England. *Wildfowl* 27.

Thomas, G.J. (1978). Lead poisoning in wildfowl and ways of reducing it. *International Waterfowl Research Bureau Bulletin* 45: 27-31.

Thomas, G.J. (1978). Breeding and feeding ecology of waterfowl at the Ouse Washes, England. PhD Thesis. Council for National Academic Awards. 293 pp.

Rannoch Moor

Location 56°39'N, 4°40'W. Situated in Perth and Kinross District, Tayside Region in Scotland.

Area 1,499ha

Degree of Protection Part of Rannoch Moor was established as a National Nature Reserve in 1958 and is owned by the Nature Conservancy Council. Designated as a Ramsar site at the time of ratification on 5 January 1976.

Site Description A glaciated low-lying area surrounded by uplands. The area has a complex relief characterised by morainic and granitic knolls, peat-filled depressions and numerous lochs of varying size. Temperate moist oceanic climate. Altitude 300-500m. On the broad flats and more gentle slopes blanket bog of the western type, with deer sedge *Trichophorum cespitosum* (dominant), hare's tail cottongrass *Eriophorum vaginatum* and bog asphodel *Narthecium ossifragum* has developed. Water bogs are often drained by soaks, and where slight slopes or hollows occur there are patches of oligotrophic soligenous mire. Sometimes these seepage areas discharge into small peaty lochs with hydroseral swamps around their edges. The soligenous sites are commonly marked by an abundance of bottle sedge *Carex rostrata*, common sedge *C. nigra*, slender sedge *C. lasiocarpa*, mud sedge *C. limosa*, the rush *Juncus bulbosus*, greater bladderwort *Utricularia vulgaris*, intermediate bladderwort *U. intermedia* and lesser bladderwort *U. minor*, but those forming at the base of the moraines are dominated by purple moorgrass *Molinia caerulea*. The extent of marginal swamps and fen vegetation around the loch edges varies greatly, but typically there are open water communities dominated by sedge species, abundant bogbean *Menyanthes trifoliata*, common cottongrass *Eriophorum angustifolium* and sometimes waterlily *Nymphaea* sp. cf. *occidentalis*, marsh cinquefoil *Potentilla palustris* and common reed *Phragmites australis*. The *Carex* swamp usually passes into a shoreward zone of spongy *Sphagnum* flats often with well developed pool-hummock systems. The fauna includes red deer *Cervus elaphus* and a number of typical moorland species.

International and National Importance The site is important for its diverse complex of northern oligotrophic mire types, and Rannoch Moor is the only known location in Britain for Rannoch rush *Scheuchzeria palustris*. This species was common in Britain at the time of flooding of bog surfaces at the opening of the sub-Atlantic period, but has disappeared from its few other known localities during the past hundred years or so. The moor supports some notable breeding birds including red grouse *Lagopus scoticus*, golden plover *Pluvialis apricaria*, greenshank *Tringa nebularia*, dunlin *Calidris alpina*, short-eared owl *Asio flammeus* and merlin *Falco columbarius*.

Changes in Ecological Character A planning application for the development of a fish farm on the edge of this site has been refused, but there may be further pressures for fish-farming and fishing in the area. There is potential risk of pollution from pesticides and fertilisers used on the extensive commercial forests adjacent to the reserve. Red deer numbers have declined recently possibly due to adjacent fencing of land for afforestation.

Management Practices Active management is considered inappropriate at this stage; management objectives aim to maintain the *status quo* of factors influencing the reserve.

Scientific Research and Facilities Research is mainly directed toward maintenance of the existing range of bog structure and vegetation. There is also research in a small fenced enclosure into the establishment of Scots pine *Pinus sylvestris*, birch *Betula* spp. and alder *Alnus glutinosa*, together with hydrological research on the blanket bog.

Principal Reference Material The above information is taken from the documents supplied by the Government of the United Kingdom for designation in 1976 and for the Cagliari Conference in November 1980.

Additional references:

McVean, D.N. and Ratcliffe, D.A. (1962). Plant communities of the Scottish Highlands. A study of Scottish mountain, moorland and forest vegetation. *Monographs of the Nature Conservancy* No. 1., London HMSO.

Cairngorm Lochs

Location 58°04'N, 3°47'W. Situated in the districts of Moray, Kincardine and Deeside, Badenoch and Strathspey and Inverness of the Grampian and Highland regions, Scotland.

Area 179ha

Degree of Protection The Cairngorm Lochs are privately owned but are subject to a Nature Reserve Agreement with the Nature Conservancy Council. The lochs are part of Cairngorms National Nature Reserve (25,949ha) which was declared in 1954. Designated as a Ramsar site in July 1981.

Site Description The lochs include Avon, Etchachan, Uaine, Einich and Coire and Lochain. The highest are corrie lakes at about 1,000m and the larger glacial lakes occupy lower glens. The underlying rock is granite, and all the lochs are extremely oligotrophic. The shorelines comprise mainly ice-polished boulders. The lochs have a continuous ice cover from December to May in most winters.

International and National Importance These lochs are the highest standing waters in Britain and are of an Arctic-alpine nature. In winter specialised populations of phytoplankton and zooplankton develop below the ice.

Changes in Ecological Character No information

Management Practices Access to Cairngorm National Nature Reserve is unrestricted apart from visitors being asked to cooperate with the Nature Conservancy Council and estates during August, September and October when deer culling may be taking place.

Scientific Research and Facilities No information

Principal Reference Material The above information is taken from the document supplied by the Government of the United Kingdom for designation in 1981. Supplemented by: Nature Conservancy Council (1981). National Nature Reserves in Scotland. *Information Sheet* No. 4.

Loch of Lintrathen

Location 56°41'N, 3°11'W. Situated 11km west of Kirriemuir in the district of Angus, Tayside region, Scotland.

Area 218ha

Degree of Protection Loch Lintrathen is owned by Tayside Regional Council and is a site of special scientific interest. Part of the area is currently managed as a nature reserve by the Scottish Wildlife Trust - a voluntary conservation organisation. Designated as a Ramsar site in July 1981.

Site Description The loch occupies a glacial basin and is large and quite deep, having been deepened by being artificially dammed. It is used as a water supply reservoir and is oligotrophic/mesotrophic.

International and National Importance The loch is important for high numbers of greylag goose *Anser anser* with a winter average of 2,822 (3.1% of the UK and European population), and a peak count of 6,200 (6.9%) during 1980-85. Other regularly occurring wildfowl species include mallard *Anas platyrhynchos*, teal *A. crecca*, wigeon *A. penelope*, shoveler *A. clypeata*, tufted duck *Aythya fuligula*, pochard *A. ferina*, goosander *Mergus merganser* and whooper swan *Cygnus cygnus*.

Changes in Ecological Character None known.

Management Practices None known.

Scientific Research and Facilities The Loch of Lintrathen was studied as part of the Survey of Freshwaters of Tayside (1981). A viewing hide is provided for members of the Scottish Wildlife Trust and is opened to the general public periodically in spring and autumn.

Principal Reference Material The above information is taken from the document supplied by the Government of the United Kingdom for designation in 1981. Supplemented by:

Maitland, P.S., Smith, I.R., James, D.H., East, K., Morris, K.H. and Lyle, A.A. (1981). The Freshwaters of Tayside. Institute of Terrestrial Ecology report to the Nature Conservancy Council.

Scott, D.A. (1980). A preliminary inventory of wetlands of international importance for waterfowl in west Europe and north-west Africa. *IWRB Special Publication* No. 2. Glos, England. 127 pp.

Claish Moss

Location 56°45'N, 5°44'W. Situated in the district of Lochaber in western Scotland.

Area 563ha

Degree of Protection Claish Moss is owned by the Nature Conservancy Council and was declared a national nature reserve in 1979. The area was approved as a Biosphere Reserve in January 1977. Designated as a Ramsar site in July 1981.

Site Description The area represents a patterned raised mire typical of the hyper-oceanic climatic conditions of north west Scotland. The vegetation is typical of *Sphagno-Trichophoreto-Eriophoretum* (sphagnum moss - cotton grass) with well developed *Rhacomitrium* hummock facies. Many species characteristic of western blanket mire are present including purple moorgrass *Molinia caerulea*, liverwort *Pleurozia purpurea*, moss *Campylopus atrovirens*, many-stemmed spike-rush *Eleocharis multicaulis*, mud sedge *Carex limosa*, great sundew *Drosera anglica* and sweet gale *Myrica gale*. The fauna includes red deer *Cervus elaphus*, otter *Lutra lutra*, red grouse *Lagopus l. scoticus* and greenshank *Tringa nebularia*. The aquatic fauna includes eight species of dragonfly.

International and National Importance The site is an internationally important peatland. The large size and total scale of the raised mires is unparalleled in Britain. The brown beak-sedge *Rhynchospora fusca*, a plant of very restricted occurrence, is abundant in pools on some parts of the mire. Of particular importance is the community of sphagnum mosses, comprising 14 species, including several at the northern limit of their range. The site regularly supports a small population of wintering Greenland white-fronted goose *Anser albifrons*.

Changes in Ecological Character Although grazed by sheep until recently, the area has suffered little deterioration except by occasional uncontrolled fires which have resulted in some modification of the vegetation.

Management Practices Public access is restricted.

Scientific Research and Facilities The site has potential for research into stratigraphical and pollen analyses.

Principal Reference Material The above information is taken from the documents supplied by the Government of the United Kingdom for designation in 1981. Supplemented by: Biosphere Reserve proposal sent to Unesco-MAB secretariat.

Moore, P.D. (1977). Stratigraphy and pollen analysis of Claish Moss. *J. Ecol.* 65: 375-397.

Ratcliffe, D.A. (1977). *A Nature Conservation Review*. Cambridge University Press.

Silver Flowe

Location 55°07'N, 4°23'W. Situated 17km north of Newton Stewart in Wigtown and Stewartry districts, Dumfries and Galloway region, south-west Scotland.

Area 608ha

Degree of Protection Owned by the Forestry Commission, but 200ha is leased to the Nature Conservancy Council. 191ha of this was leased on 11 November 1955 for a term of 99 years and declared a national nature reserve in 1956. The remaining 9ha were leased on 11 November 1963 for a term of 91 years, but this area has not yet been declared. The site is part of the Silver Flowe - Merrick Kells Biosphere Reserve (3,088ha) which was approved by the MAB Bureau in June 1976. Designated as a Ramsar site in July 1981.

Site Description The upland area, at about 822m, is part of a glaciated plateau with extensive corries and well developed peri-glacial features. The broad glaciated valley, at about 228m, containing the Silver Flowe, is floored with a series of patterned blanket mires exhibiting a complete gradation from discrete valley mire to blanket mire. The mire is dominated by deer grass/cotton grass *Trichophoreto-Eriophoretum* with an oceanic element indicated by the abundance of the mosses *Campylopus atrovirens* and *Sphagnum plumulosum*, great sundew *Drosera anglica* and liverwort *Pleurozia purpurea*. The eastern slopes overlying granite support a sub-montane vegetation including *Molinietum* and damp *Callunetum*. The extensive north-facing cliffs support a few notable montane species. The fauna includes red deer *Cervus elaphus* and feral goats *Capra hircus*.

International and National Importance This series of patterned blanket mires constitutes the least disturbed and most varied extent of acid peatland in southern Scotland and is one of the most important systems of blanket mire in Britain. The considerable variety of surface pattern is remarkable, especially in view of the relatively small area of the series. The site is also of interest as the most southerly development of oceanic blanket mire vegetation. A few pairs of peregrine falcon *Falco peregrinus* and raven *Corvus corax* breed in the area. Blue dragonfly *Aeschna caerulea* occurs in the pools of the mire system.

Changes in Ecological Character The area has been grazed by sheep and burnt by man in the past, but is now largely undisturbed. Some past gravel extraction from rivers has taken place. There is extensive conifer afforestation outside the NNR.

Management Practices Public access is restricted. A walkway has been constructed to allow research workers access to experimental plots with minimum disturbance to the mire surface.

Scientific Research and Facilities Much past and current research on the stratigraphy, hydrology and phytosociology of the mire systems. There has also been extensive research on the contact metamorphism of the granite aureole. Universities are encouraged to utilise the site for research.

Principal Reference Material The above information is taken from documents supplied by the United Kingdom Government for designation in 1981. Supplemented by:

Boatman, D.J. (1983). The Silver Flowe National Nature Reserve, Galloway, Scotland. *J. Biogeogr.* 10: 163-274.

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland.

IUCN (1977). *World Directory of National Parks and Other Protected Areas*. IUCN, Morges, Switzerland.

Additional references:

Goode, D.A. (1970). Ecological studies on the Silver Flowe National Nature Reserve. PhD Thesis. University of Hull.

Abberton Reservoir

Location 51°49'N, 0°52'W. Situated some 8km south of Colchester in the county of Essex, England.

Area 770ha (originally 1,228ha, the site was reduced by 458ha in 1989)

Degree of Protection Abberton Reservoir is owned by the Essex Water Company. 1,188ha is a bird sanctuary established under the Wild Birds (Abberton Reservoir Sanctuary) Order in 1967 and protected under the Protection of Birds Act 1954. The reservoir is also notified as a site of special scientific interest and is included as a Category A wetland in the International MAR List. Designated as a Ramsar site in July 1981.

Site Description Abberton is a permanent lowland reservoir of 485ha with an average depth of 4.7m (maximum about 16m) and water volume of approximately 23,000 million litres, some from the dammed Layer Brook, but most extracted from the River Stour and pumped 18km to Abberton. The reservoir has been in use since 1941. The designated site includes all the open water and a surrounding area of land at least one field's distance from the shoreline. This encloses the entire catchment of the reservoir up to 30m above sea level. The reservoir is bordered by farmland, and a proportion of the land inside the catchment must be maintained as grassland. The lake is divided by causeways into three basins: the largest (about 400ha) has concrete banks, and the other two are fringed by a belt of greater reedmace *Typha latifolia*, reed canary grass *Phalaris arundinacea* and rushes *Juncus* spp. Summer draw-down exposes extensive mudflats in the two largest basins. The reservoir is highly eutrophic and subject to algal blooms. In the more natural sections there is a fairly typical invertebrate fauna for a eutrophic lake. A varied coarse-fish population is also present. The area is noted for waterfowl.

International and National Importance The reservoir is outstandingly important as an autumn arrival point and a wintering locality for migrant Anatidae including mute swan *Cygnus olor* which exceeds 500, coot *Fulica atra* up to 10,000, mallard *Anas platyrhynchos* 2,250 (5,240), teal *A. crecca* 2,250 (5,240), wigeon *A. penelope* 6,280 (11,830), shoveler *A. clypeata* 450 (850), pochard *Aythya ferina* 800 (1,410), tufted duck *A. fuligula* 1,520 (2,670) and goldeneye *Bucephala clangula* 485 (610) (first figure is average autumn winter peak, second figure in parenthesis is maximum peak for ten years up to 1986). It is an important moulting

area for 2,270 (4,000) pochard and 2,745 (3,390) tufted duck. Also occurring at the site are smew *Mergus albellus*, goosander *M. merganser*, gadwall *Anas strepera* and pintail *A. acuta*. It is one of very few inland breeding sites for cormorants *Phalacrocorax carbo* (150 nests in 1986). The site is also the main waterfowl ringing station in Great Britain.

Changes in Ecological Character No water sports are allowed at present, but there is an increasing demand throughout south-east England for recreational facilities, especially sailing.

Management Practices Coarse fishing by permit at four points and a limited number of permits for bird-watching. There are no footpaths away from the public roads, and access to much of the periphery is strictly controlled.

Scientific Research and Facilities 2-3,000 duck and a large number of other species are ringed annually at a ringing station run in cooperation with the Wildfowl Trust. An intensive bird-ringing programme has been in operation since 1949 and by 1986 a total of 80,000 Anatidae had been ringed, including 36,000 teal and 30,000 mallard. A decoy is manned throughout the year. Ringing activities are published by the Wildfowl Trust. There is a substantial hide at Double Gates Bay (Layer-de-la-Haye).

Principal Reference Material The above information is taken from the documents supplied by the Government of the United Kingdom for designation in 1981. Supplemented by:

Duffey, E. (1982). *National Parks and Reserves of Western Europe*. Macdonald and Co., London

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

Scott, D.A. (1980). A preliminary inventory of wetlands of international importance for waterfowl in west Europe and north-west Africa. *IWRB Special Publication* No. 2. 127 pp.

Additional references:

Wainwright, C.B. (1967). Results of wildfowl ringing at Abberton Reservoir, Essex 1949-1966. *Wildfowl Trust 18th Annual Report*. Pp. 28-35.

Rostherne Mere

Location 53°21'N, 2°23'W. Situated 16km south-west of the centre of Manchester in the county of Cheshire, England.

Area 79ha

Degree of Protection Rostherne Mere is part of a national nature reserve (NNR) established in 1961. The whole of the national nature reserve is notified as a site of special scientific interest (SSSI). The mere and some surrounding land is owned by the Nature Conservancy Council, but the NNR extends over a further 73ha managed under a Nature Reserve Agreement with the private owner. At the request of the owner this 73ha area is excluded from the site listed under the Ramsar Convention. Designated as a Ramsar site in July 1981.

Site Description The mere is situated in farmland despite the proximity of the Manchester conurbation. The site includes the mere and surrounding areas of marsh/woodland known as Old Hall Wood, Wood Bongs, Shaw Green Willows, Mere Covert, Gale Bog, Harpers Bank Wood, Boathouse Wood, Observatory Wood, about 280m of the inlet stream and 450m of the outlet, and a two metre strip of the surrounding farmland. The mere lies in a hollow surrounded by thick deposits of glacial drift overlying triassic marls and salt-beds. The shores shelf rapidly. Maximum depth is 30.4m, and about half the lake is over 15m in depth. Reedbeds of *Phragmites australis* encircle 50% of the mere, and beyond them tall fen vegetation grades into willow *Salix* spp. and alder *Alnus glutinosus* carr, and on drier ground to mixed deciduous woodland dominated by oak *Quercus robur*. The mere is calcareous and rich in minerals supporting very high phytoplankton populations (though the variety of species is relatively small). The site is also of some entomological interest.

International and National Importance Rostherne is a regional refuge used in winter by Anatidae as a daytime haven. Conditions are unsuitable for feeding due to the depth of water. The most abundant species in recent years have been pochard *Aythya ferina* (up to 2,000) and tufted duck *A. fuligula* (up to 1,500). Other species include mallard *Anas platyrhynchos*, teal *A. crecca*, wigeon *A. penelope*, shoveler *A. clypeata* and coot *Fulica atra*. Up to 20,000 gulls of the five common species use the mere for roosting. As well as being important to waterfowl the mere provides the only British record of the fish smelt *Osmerus eperlanus* in a freshwater locality, but this was in 1922 and it is probably now extinct in this area.

Changes in Ecological Character Three local sewage treatment plants discharge treated effluent into Rostherne Mere. These discharges are thought to be responsible for the major input of phosphates to the mere. The Nature Conservancy Council has asked the North West Water Authority to close these plants and to run the sewage into a main treatment works whose discharges do not affect Rostherne Mere's catchment. The Authority is apparently considering this proposal. Pollution by silage effluent is a recurrent problem which remains unresolved despite intervention by the Water Authority. Concern is also felt about the possibility of pesticide pollution from aerial spraying which is increasing locally, as well as fertiliser run-off into the mere.

Management Practices The reserve was established to maintain the mere as a strict wildlife refuge and to provide facilities for ornithology and freshwater biology research. A limited number of permits are issued to scientists with suitable projects. The woodlands are being managed to improve their general ecological interest.

Scientific Research and Facilities The mere is close to several centres of research, and work has been published on its chemistry, phytoplankton, organic geochemistry, zooplankton, fish and benthos. Detailed bird records have been kept for at least 60 years. It is, therefore, one of the most thoroughly studied of the British lowland lakes. Three observation hides overlook the mere and further development of its educational potential is being considered.

Principal Reference Material The above information is taken from the documents supplied by the Government of the United Kingdom for designation in 1981 and for the Groningen Meeting in May 1984. Supplemented by:

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

Luther, H. and Rzoska, J. (1971). Project Aqua. *IBP Handbook* No.21. Blackwell Scientific Publications.

Additional references:

- Badsha, K.S. and Goldspink C.R. (1982). Preliminary observations on the heavy metal content of four species of freshwater fish in NW England. *J. Fish Biol.* 21: 251-267.
- Banks, J.W. (1970). Observations on the fish population of Rostherne Mere, Cheshire. *Field Studies* 3(2): 357-379.
- Ellison, N.F. and Chubb, J.C. (1968). The smelt of Rostherne Mere, Cheshire Lanes and Cheshire. *Fauna Committee Publ.* 53: 7-16.
- Gaskell, S.J. and Eglinton, G. (1976). Sterols of a contemporary lacustrine sediment. *Geochimica et Cosmochimica Acta* 40: 1221-1228.
- Grimshaw, H.M. and Hudson, M.J. (1970). Some mineral nutrient studies of a lowland mere in Cheshire, England. *Hydrobiologia* 36:329-341.
- Harrison, R. and Rogers, D.A. (1977). The Birds of Rostherne Mere Naitonal Nature Reserve. Nature Conservancy Council, Banbury.
- Hincks, W.D. and Shaw, S. (1954). Faunal survey of Rostherne - insects, part 2. *Mem. and Proc. Manchester Lit. and Phil. Soc.* 96(9): 1-17.
- Livingstone, D. and Reynolds, C.S. (1981). Algal sedimentation in relation to phytoplankton periodicity in Rostherne Mere. *Br. phycol. J.* 16: 195-206.
- Pearsall, W.H. (1923). The phytoplankton of Rostherne Mere. *Mem. and Proc. Manchester Lit. and Phil. Soc.* 67(3): 45-55.
- Reynolds, C.S. (1978). Notes on the phytoplankton periodicity of Rostherne Mere, Cheshire, 1967-1977. *Br. Phycol. J.* 13: 329-335.
- Reynolds, C.S. (1979). The limnology of the eutrophic meres of the Shropshire-Cheshire plain. *Field Studies* 5(1): 93-173.
- Tattersall, W.M. and Coward T.A. (1914). Faunal survey of Rostherne Mere I. Introduction and Methods. *Mem. and Proc. Manch. Lit. and Phil. Soc.* 58(8): 1-21..
- Walsh, B. (1965). An investigation of the bottom fauna of Rostherne Mere, Cheshire. PhD Thesis. University of Liverpool.

The Dee Estuary

Location 53°17'N, 3°05'W. Situated between the Wirral peninsula and the North Wales coast in the counties of Clwyd (Wales), Cheshire and Merseyside, (England), 16km south-west of Liverpool.

Area 13,055ha

Degree of Protection Originally notified as a site of special scientific interest (SSSI) in 1954 and renotified in 1983. Hilbre Island is managed as a local nature reserve by Wirral Metropolitan Borough Council. The Royal Society for the Protection of Birds own 2,148ha at Gayton Sands. Designated as a Ramsar Site on 17 July 1985.

Site Description Large areas of intertidal sandflats and mud, with extensive saltmarshes at the head of the estuary and along the eastern coastline. The site includes the Hilbre islands: three

small low lying sandstone islands lying about two kilometres from the extreme north-west corner of the Wirral peninsula from which they are cut off at high tide. Hilbre islands support a neutral grassland vegetation with limited amounts of heath, and are a principal high-water roosting site for overwintering waders. The English side of the Dee has a very large saltmarsh system, much of it dominated by introduced common cord grass *Spartina anglica* which is spreading at a considerable rate. Behind this community is a large area of lightly grazed mature marsh. Of particular interest is sea purslane *Halimione portulacoides* dominant over large sections, but which is scarce or absent on many west coast marshes as a result of heavy grazing by cattle or sheep. At Neston there is a gradual transition into brackish marsh dominated by common reed *Phragmites communis*, a type of community uncommon in England and Wales because of reclamation of the upper marsh.

International and National Importance The Dee Estuary is one of the five most important estuaries in Britain for waders and wildfowl. It is a valuable staging post for migrating birds in both spring and autumn, and supports large numbers of waders throughout the winter. The birds feed on the rich invertebrate populations of the extensive intertidal alluvial sediments. The estuary supports internationally important concentrations of a number of waders including oystercatcher *Haematopus ostralegus* (2.6% of the European population), knot *Calidris canutus* (6.2%), bar-tailed godwit *Limosa lapponica* (5.6%) and redshank *Tringa totanus* (2.9%). The maximum monthly count of wildfowl exceeded 20,000 in both 1984/85 and 1983/84, the most recent years with complete records. The most important species are pintail *Anas acuta* (2.6% of the European population overwintering) and shelduck *Tadorna tadorna* (3.3%). Hilbre islands and the saltmarshes provide roosting areas for the waterfowl in the estuary, and breeding sites for a number of species. The saltmarshes in particular support breeding wader species including an especially large number of redshank. The seaweed-covered rocks of Hilbre Island are of interest in supporting a small winter population of purple sandpiper *Calidris maritima*, a species with a predominantly north-eastern distribution; as well as large flocks of dunlin *Calidris alpina* and knot. The presence of a large herd of grey seals *Halichoerus grypus* is of interest. These haul out on the West Hoyle Bank and represent 15% of the Welsh population. Other sea mammals occur occasionally: bottle-nosed and Risso's dolphin, common porpoise and killer whale may visit.

Changes in Ecological Character The eventual construction of a proposed bounded reservoir storage scheme would cause major changes. Their extent will depend on the location and shape of the reservoirs, and the uses to which the reclaimed land is put. Over the years, particularly on the Welsh side of the estuary, there has been considerable tipping onto the saltmarsh from the British Steel Corporation at Shotton, from the Central Electricity Generating Board at Connah's Quay, from Courtaulds at Flint and Greenfield, and from the National Coal Board at Point of Ayr. Much of this tipping has ceased or now occurs outside the SSSI boundary, with the exception of colliery spoil from Point of Ayr. Recent developments which could affect the SSSI include a proposed dock extension involving mudflat reclamation; increased drainage; intensification of grazing; channel deepening and groyne construction at Mostyn Dock; and new road developments like the Flint by-pass. *Spartina anglica* invasion threatens to destroy the normal saltmarsh succession and hasten the accretion of silt. Mosquito *Aedes detritus* breeds in massive numbers on the Cheshire saltmarsh and has caused a major problem in the Parkgate area. A programme of control using BTi is underway, but further drastic measures are being considered. Increased recreational pressure at West Kirby is forcing the waders to find alternative high tide roost sites from those traditionally used on the shoreline.

Management Practices The RSPB manages a nature reserve at Gayton Sands where wildfowling controls are exercised. The RSPB also has a licence for the land owned by the Welsh Water Authority and Haven Holidays at Point of Ayr, however, no management or wardening is undertaken here. Hilbre Island is managed as a local nature reserve by Wirral Metropolitan Borough Council. The Deeside Naturalists' Society has a Nature Reserve Agreement with the Central Electricity Generating Board over land they own within the Dee estuary at Connah's Quat. The Dee Wildfowling have shooting licences for much of the estuary, although they operate a system of sanctuary and shooting zones. Other management practices undertaken are permits to visit reserves, *Spartina* control, control over dog walking and horse riding in some parts of the estuary, maintenance of existing grazing levels and wildfowling management.

Scientific Research and Facilities Detailed studies of the progress of saltmarsh formation and of the invasion of *Spartina angelica* have been made over the past 20 years, and this is now monitored by the Nature Conservancy Council. Research into the birds and invertebrates is established near Hilbre Island and Hilbre Bird Observatory undertakes large-scale ringing of waders. Liverpool Polytechnic has initiated a study of *Calidris alpina*. Studies of possible disturbance by wildfowling, and monitoring of wildfowl and wader populations are also being undertaken.

Principal Reference Material The above information is taken from the documents supplied by the Government of the United Kingdom for designation in 1985. Supplemented by:

Carp, E. (Ed.) (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

Hywel-Davies, J. and Thom, V. (1984). *The Macmillan Guide to Britain's Nature Reserves*. Macmillan, London

Additional references:

Liverpool Bay Study Group papers and Dee Ins. Cons. Group list.

Cragg, J.D. (ed.) (1982). Hilbre: The Cheshire Island. *Hilbre Bird Observatory - annual reports*.

Ratcliffe, D.A. (Ed.) (1977). *A Nature Conservation Review*. Cambridge University Press.

The Swale

Location 51°22'N, 1°07'W. On the north Kent coast, England.

Area 5,790ha

Degree of Protection The Swale is a site of special scientific interest (SSSI) notified in 1968 and renotified in 1984. There is a national nature reserve and a local nature reserve within the site. The Royal Society for the Protection of Birds leases 282ha and holds the shooting rights (not exercised) over 1,080ha. Designated as a Ramsar site on 17 July 1985.

Site Description The Swale includes the largest remaining areas of freshwater grazing marsh in Kent, and is representative of the estuarine habitats found on the north Kent coast. The habitats comprise chiefly mudflats, saltmarsh and freshwater grazing marsh, the latter being intersected

by extensive dykes and fleets. Locally on the seaward side of the sea walls are smaller areas of harder substrates. Shingle below high water mark in places supports large mussel beds, which in turn attract different birds from those of the mudflats such as turnstone *Arenaria interpres*. There are several areas of shell, or shell sand beach, notably at Shellness on Sheppey and at Castle Coote west of Seasalter. These have an interesting calcareous flora, with plants characteristic of both sand and shingle beaches such as: sea kale *Crambe maritima*, yellow horned poppy *Glaucium flavum*, marram grass *Ammophila arenaria* and sea rocket *Cakile maritima*. The grazing marsh complexes provide a variety of wetland and grassland habitats; the ditches and fleets contain a good range of aquatic plants including the nationally scarce brackish water-crowfoot *Ranunculus baudottii* and soft hornwort *Ceratophyllum submersum*. A range of ditch types is present on the Swale from freshwater to saline; the abundance of saline water dykes and their distinctive plant and invertebrate communities are especially characteristic of the Swale grazing marshes. The grassland habitats range from damp muddy areas near the dykes, where characteristic plants include divided sedge *Carex divisa* and small goosefoot *Chenopodium botryodes*, to dry seawalls and couterwall which support several rarities in addition to many widespread plants, such as hog fennel *Peucedanum officinale*, slender hare's-ear *Bupleurum tenuissimum*, sea clover *Trifolium squamosum* and sea barley *Hordeum marinum*, all of which are more abundant in the North Kent Marshes than elsewhere in Britain. Other less extensive habitats in the Swale include water-filled disused clay-pits, and small patches of scrub and woodland.

International and National Importance Large numbers of waders and wildfowl use the area in winter, and during autumn and spring passage, and these are considered to be of national or international significance. Many of the birds utilise more than one habitat. For example, some feed on the mudflats at low tide and then move up to roost on the saltmarsh or on fields inland of the sea wall. There is a substantial breeding population of Anatidae including garganey *Anas querquedula*, shoveler *A. clypeata*, tufted duck *Aythya fuligula* and pochard *A. ferina*; colonies of common tern *Sterna hirundo* and black-headed gull *Larus ridibundus* are established along the Swale. In winter the area holds a total of about 7,500 Anatidae and 20,000 waders, with average peaks of 800 white-fronted goose *Anser albifrons*, 500 brent goose *Branta bernicla*, 900 shelduck *Tadorna tadorna* and 5,000 wigeon *Anas penelope*. The concentrations of oystercatcher *Haematopus ostralegus*, grey plover *Pluvialis squatarola*, knot *Calidris canutus*, redshank *Tringa totanus* and curlew *Numenius arquata* are regarded as internationally important. Also breeding on the site are coot, moorhen, lapwing, teal, gadwall, mallard, ruff and black-tailed godwit (*Fulica atra*, *Gallinula chloropus*, *Vanellus vanellus*, *Anas crecca*, *A. strepera*, *A. platyrhynchos*, *Philomachus pugnax* and *Limosa limosa*) and occasional small numbers of pintail *A. acuta*. Where undisturbed, the shell sand beaches attract breeding ringed plover *Charadrius hiaticula* and little tern *Sterna albifrons*. As well as providing feeding and roosting places for many birds, the saltmarshes are extremely rich in invertebrates, over 350 species having been recorded; some of these, such as the polychaete worm *Clymenella torquata* are unknown elsewhere in Britain. They are also of entomological interest especially for Coleoptera and are the main British habitat of the scarce ground lackey moth *Malacostoma castrensis*. The saltmarshes are among the richest for plant life in Britain, including most of the British species of saltmarsh-grass *Puccinellia* and glasswort *Salicornia*. Rarer plants include small cord-grass *Spartina maritima* and golden samphire *Inula crithmoides*.

Changes in Ecological Character The Swale is likely to be affected by increased disturbance, and by industrial pollution from sites outside the area. Some decrease in the populations of intertidal fauna has already been noted. The main recreational pressures in the Swale area are

boating and water sports, wildfowling, bait digging and general recreation (walking, picnicking, bird watching).

Management Practices The site has been significantly reduced in extent along the north bank of the Swale. Primary aims should be to retain the grazing regime on the freshwater marshes and to control the disturbance caused by sailing and power boating on the Swale. High water levels are monitored in conjunction with the grazing regime. Parts of the site are managed as nature reserves by the RSPB, Nature Conservancy Council and Kent Trust for Nature Conservation.

Scientific Research and Facilities The rich invertebrate fauna makes the area an important research and teaching area for marine biology, especially from the London colleges. The populations of waterfowl and freshwater invertebrates have been monitored for many years.

Principal Reference Material The above information is taken from the documents supplied by the Government of the United Kingdom for designation on 17 July 1985. Supplemented by: **Carp, E. (Ed.) (1980).** *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

Additional references:

Gilham, E.H. and Holmes, R.C. (1950). *The Birds of the North Kent Marshes*. London.

Harrison, J.G. (1972). *Wildfowl of the North Kent Marshes*. WAGBI Conservation Publication.

Hywel-Davies, J. and Thom, V. (1984). *The Macmillan Guide to Britain's Nature Reserves*. Macmillan, London

Ratcliffe, D.A. (Ed.) (1977). *A Nature Conservation Review*. Cambridge University Press.

Chesil Beach and the Fleet

Location 50°36'N, 2°32'W. Chesil Beach links the Isle of Portland to the mainland 5km west of Weymouth, Dorset, England.

Area 763ha

Degree of Protection Privately owned: the bed of the Fleet, two thirds of the Chesil Beach and much of the coastline at the western end belongs to one owner, the eastern coastland to numerous owners and the eastern end of the Beach to the Crown Estate Commissioners. The Fleet and Chesil Bank were notified as a site of special scientific interest in 1952 and also designated as an area of outstanding natural beauty. The Swannery at Abbotsbury has been designated a statutory bird sanctuary. Designated as a Ramsar site on 17 July 1985.

Site Description Chesil Beach is a linear storm beach which is exceptional for its size (150-200m wide and 28km long), systematic coarsening of pebbles eastwards, the variation in composition of the pebbles, and the extensive historical records of beach changes. Landward of the beach is the Fleet, a lagoon 13km long, 75-900m wide with a surface area of 4.9 sq.km at high tide. The water is mostly shallow, 1.5m deep on average although it reaches 5m in depth

at the Narrows. It opens at the eastern end into Portland Harbour, giving rise to a tidal flow which decreases in height from approximately 2m to almost nil midway along the lagoon, and to a salinity gradient which varies from marine at the eastern end to close to freshwater at the other. Sea water can also percolate through the bank. The bed of the lagoon is mostly composed of sand and silt, although in the vicinity of the Narrows it is very unusual, consisting of transitional patches of pebble, hard coralline rock and soft mud. The lagoon has extensive underwater meadows of eel-grasses *Zostera noltii* and *Z. angustifolia*, spiral tassel-weed *Ruppia cirrhosa* and beaked tassel-weed *R. maritima* particularly at the western end. The drift line is dominated in parts by shrubby sea-blite *Suaeda fruticosa*. The only woody plants are blackthorn *Prunus spinosa*, fen sallow *Salix cinerea* and *Tamarix anglica*. Sea campion *Silene maritima* and sea pea *Lathyrus japonicus* are abundant higher up on the Bank. In all, 167 flowering plants have been recorded on the shingle ridge, the margins of the Fleet, and the landward side of the Bank. On Chesil Beach, rare or nationally important populations of sea kale *Crambe maritima*, yellow-horned poppy *Glaucum flavum* and shrubby sea-blite *Suaeda fruticosa* also occur, and sea holly *Eryngium maritimum*, Portland spurge *Euphorbia portlandica* and little-robin *Geranium purpureum* (a Red Data Book species) are also present. The Fleet supports about 150 species of algae, and rarities include filamentous green algae *Cladophora battersia* and *C. retroflexa*. The invertebrate fauna is varied and interesting and has been studied in detail.

International and National Importance The shingle provides nesting habitat for up to 100 pairs of little tern *Sterna albifrons* (about 5% of the British breeding population). It is also an important site for common tern *S. hirundo* and ringed plover *Charadrius hiaticula* (about 50 pairs). The Fleet is notable for the diversity of waders and wildfowl in winter. In particular, it regularly supports at least 1% of the north-west European population of wigeon *Anas penelope*, with up to 7,500 birds being recorded in recent years. Good numbers of pochard, tufted duck, teal, pintail, mallard, shoveler and goldeneye (*Aythya ferina*, *A. fuligula*, *Anas crecca*, *A. acuta*, *A. platyrhynchos*, *A. clypeata* and *Bucephala clangula*) are also present. The site supports the largest resident mute swan *Cygnus olor* population in Britain (1,200+ birds with 60+ breeding), which predominantly graze the *Zostera* beds. Numbers of over-wintering dark-bellied brent geese *Branta bernicla* now exceed 1,000. The Fleet is an important nursery ground for bass *Dicentrarchus labrax*, and goby *Gobius couchii* only occurs here, in Portland Harbour and the Helford River. The shingle is the only British locality for scaly or wingless cricket *Mogoplistes squamiger*. It also supports at least three distinct and highly unusual mollusc associations. Looping snail *Truncatella subcylindrica* and a sea slug *Tenellia adspersa* are both only known from one other British site. Two other invertebrates present include sponge *Suberites massa* and burrowing anemone *Scolanthes callimorphus*, both which have only been found at two other British sites. Another rare anemone *Nematostella vectensis* is known only from a few other British sites and from nowhere else in Europe.

Changes in Ecological Character The appearance of Japanese seaweed *Sargassum muticum* in the Fleet over the past three years has caused concern, but there are no obvious adverse ecological changes as yet. Replacement of Ferry Bridge and the creation of a new mouth to the Fleet, 50m to the south, in 1984 may cause local redistribution of mud banks before the system is stable again. There is some concern over nutrient levels from adjoining agricultural land, but no obvious adverse effects are yet noticeable, and recreational use may become a threat in future. Despite excellent wardening and protection, tern numbers are experiencing some decline at present, perhaps part of a cyclical pattern affecting other south coast sites.

Management Practices The landowners treat the western end of the beach as a private nature reserve. There is limited wildfowling under their control. The Abbotsbury Swannery and historic decoy are popular features with visitors and there is a permanent wardening staff. The shingle beach is warded in summer to protect breeding tern colonies from disturbance and predators. A small sector of the Fleet and beach near the eastern end is leased to the Ministry of Defence and used by the adjoining bridging camp for training purposes.

Scientific Research and Facilities The area has been, and continues to be, the subject of detailed physiographic and biological studies.

Principal Reference Material The above information is taken from the documents supplied by the Government of the United Kingdom for designation on 17 July 1985. Supplemented by: Carp, E. (Ed.) (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. Hywel-Davies, J. and Thom, V. (1984). *The Macmillan Guide to Britain's Nature Reserves*. Macmillan, London

Additional references:

- Bird, E.C.F. (1970). The physiography of the Fleet. *Proc. Dorset Nat. Histo. Arch. Soc.*
Carr, A.P. (1971). Experiments on longshore transport and sorting of pebbles: Chesil Beach, England. *Jour. Sedimentary Petrology* 41:1084-1104
Spencer, B.E. (1965). Survey of the Fleet, near Weymouth, Dorset (Dec. 1964). Mimeo., Min. Ag. Fish and Food, Conway.
Whittaker, J.E. (1972). Recent brackish and marine Ostracoda from the Fleet and Weymouth Bay, Dorset: a study in ecology. Ph.D. thesis, Univ. of Aberystwyth.

Derwent Ings

Location 53°50'N, 0°54'W. Alongside the River Derwent between Sutton-upon-Derwent and Brighton in the counties of North Yorkshire and Humberside, England.

Area 783ha

Degree of Protection This is a site of special scientific interest (SSSI). First notified in 1975. Extended in 1981, revision date 1982. Part of the site is a statutory sanctuary under the Wild Birds (Wheldrake Ings Sanctuary) Order 1978, Statutory Instrument No. 1259. Designated as a Ramsar site on 17 July 1985.

Site Description The site comprises a series of floodlands along the River Derwent, with an excellent range of neutral alluvial grasslands. The character and species composition of the grasslands is mainly governed by the extent of winter flooding. In the wettest areas the vegetation is dominated by reed sweetgrass *Glyceria maxima*, reed canary-grass *Phalaris arundinacea* and slender tufted sedge *Carex acuta*, often associated with the rather local marsh stitchwort *Stellaria palustris*. On drier areas where winter flooding is very infrequent, a species-rich community with grasses such as meadow foxtail *Alopecurus pratensis*, meadow fescue *Festuca pratensis* and timothy *Phleum pratense* occurs. Herbs include great burnet *Sanguisorba officinalis*, meadowsweet *Filipendula ulmaria*, common sorrel *Rumex acetosa*,

pepper saxifrage *Silaum silaus*, common meadow-rue *Thalictrum flavum*, and important populations of the rare plant narrow-leaved water dropwort *Oenanthe silaifolia*.

International and National Importance The grasslands are important as a breeding habitat for a wide range of wetland bird species. In recent years up to fourteen species of wildfowl have bred. The site is nationally significant for shoveler *Anas clypeata*, supporting nearly 10% of the UK population (about 100 pairs). Other species include shelduck *Tadorna tadorna*, garganey *Anas querquedula*, mallard *Anas platyrhynchos*, teal *Anas crecca*, gadwall *Anas strepera*, pintail *Anas acuta*, pochard *Aythya ferina* and tufted duck *Aythya fuligula*. Breeding waders include curlew *Numenius arquata*, lapwing *Vanellus vanellus*, snipe *Gallinago gallinago* and redshank *Tringa totanus*, as well as smaller numbers of oystercatcher *Haematopus ostralegus*, common sandpiper *Tringa hypoleucos* and little ringed plover *Charadrius dubius*. In winter the Ings are of international importance, supporting populations of Bewick's swans *Cygnus columbianus bewickii* up to about 250), teal (up to 3000), and widgeon *Anas penelope* (up to 5,580), as well as significant numbers of mallard (up to 5,900), pochard (up to 3,115), tufted duck (up to 800), golden plover *Pluvialis apricaria* and lapwing. The Derwent also provides habitat for otter *Lutra lutra*, rare plants and 35 species of fish including burbot, trout, salmon grayling and barbel.

Changes in Ecological Character In the early 1980s grant aid was sought by an Internal Drainage Board for a pilot pump drainage scheme on one part of the Derwent Ings at North Duffield Carrs. This scheme would decrease the period of time over which water would stand on the Ings in spring. The request for grant aid was rejected by the Minister of Agriculture in November 1984. In 1984 the Yorkshire Derwent Trust Ltd, an organisation representing navigation interests, filed evidence in the High Court to try to prove existence of a public right of navigation upstream from Sutton to Malton. The High Court had yet to announce its decision in late 1986.

Management Practices Part of the site, Wheldrake Ings, is managed as a nature reserve by the Yorkshire Wildlife Trust Ltd. Maintenance of the botanical interest of the grasslands depends on the traditional management of hay cropping, which is often followed by late summer grazing by cattle or sheep.

Scientific Research and Facilities No information

Principal Reference Material The above information is taken from the documents supplied by the Government of the United Kingdom for designation on 17 July 1985.

Additional references:

Hywel-Davies, J. and Thom, V. (1984). *The Macmillan Guide to Britain's Nature Reserves*. Macmillan, London

Ratcliffe, D.A. (Ed.) (1977). *A Nature Conservation Review*. Cambridge University Press.

Holburn Moss

Location 55°37'N, 1°57'W. In the county of Northumberland, England.

Area 22ha

Degree of Protection The area is a site of special scientific interest (SSSI) first notified in 1964 and renotified in 1983. During the renotification the boundary of this site was reduced to exclude areas of moorland now afforested or of low biological interest. The area of wetland remains unaltered. Designated as a Ramsar site on 17 July 1985.

Site Description Holburn Lake was created in 1934 when the present outflow to the west was dammed. A large stand of great reedmace *Typha latifolia* grows on the island in the Lake, and a floating bog is present along its eastern shore. Several bogmosses *Sphagnum* spp. are found here including those of waterlogged hollows *S. cuspidatum* and those which favour drier hummocks of *S. squarrosum*, *S. fimbriatum*. Holburn Moss lies to the east of the lake, and is an example of mire at the dry end of the range of variation. The peat surface to the east is covered by bogmoss *Sphagnum papillosum* growing under a thick mantle of ling *Calluna vulgaris*. Large, damp hollows which are colonised by *C. cuspidatum* and soft rush *Juncus effusus* are found throughout this area, and are an unusual feature in British mires. Cranberry *Vaccinium oxycoccus* and sundew *Drosera rotundifolia* are common around the drier edges of the hollow, growing with *S. rubellum*. The centre of the moss is dominated by cross-leaved heath *Erica tetralix*, with ling *Calluna vulgaris*, and common cotton-grass *Eriophorum angustifolium* occurring widely. The drier slopes to the west are covered with bracken *Pteridium aquilinum* and occasional gorse *Ulex europaeus*, which grow on the freely draining acidic soil. Bracken gives way to ling *Calluna vulgaris* and occasional bell heather *Erica cinerea* around Copsey Hill.

International and National Importance The area is of international importance as a major roost for the Icelandic population of greylag goose *Anser anser*, holding more than 1% of the north-west European population (upwards of 2,000 birds). It is also regularly visited by large flocks of mallard *Anas platyrhynchos*, wigeon *Anas penelope* and teal *Anas crecca* and provides an inland roost for coastal wildfowl during unfavourable coastal weather conditions. There is a large breeding colony of up to 3,000 pairs of black-headed gulls *Larus ridibundus*. In addition, a few pairs of shelduck *Tadorna tadorna*, shoveler *Anas clypeata* and tufted duck *Aythya fuligula* regularly breed here.

Changes in Ecological Character Vegetation on the island has recently been suppressed by the impact of large numbers of greylag geese. This may reduce the availability of nest sites for the black-headed gulls.

Management Practices Grazing is excluded from the wetter areas of the Moss. There is occasional removal of pine seedlings from the Moss. There is also licensed collection of black-headed gulls eggs by the owner.

Scientific Research and Facilities Regular bird censuses are made during winter periods.

Principal Reference Material The above information is taken from the documents supplied by the Government of the United Kingdom for designation on 17 July 1985.

Irthinghead Mires

Location 55°04'N 2°22'W. Irthinghead Mires is a composite of seven sites: Gowany Knowe Moss, Felecia Moss, Coom Rigg Moss, Hummel Knowe Moss, Haining Head Moss, Grain Heads Moss and Butterburn Flow. The first six are in Northumberland, the last site is in Cumbria, in northern England.

Area Total 608ha; Gowany Knowe Moss 19.4 ha; Felecia Moss 33.47 ha; Grain Heads Moss 18.38ha; Coom Rigg Moss 39.6ha; Hummel Knowe Moss 59.35ha; Haining Head Moss 29.03ha; Butterburn Flow 409.3ha.

Degree of Protection Gowany Knowe Moss, Felecia Moss and Hummel Knowe Moss were each first notified as sites of special scientific interest (SSSIs) in 1969, Coom Rigg Moss in 1959, and Haining Head Moss in 1965. All were subsequently renotified in 1983. Grain Heads Moss was first notified as an SSSI in 1983, and is also a national nature reserve. Butterburn Flow was first notified as an SSSI in 1959/68, and renotified in 1982/84. Designated as a Ramsar Site on 17 July 1985.

Site Description Gowany Knowe Moss is a particularly fine example of the blanket mire vegetation which was once widespread in this area, but which has been reduced by afforestation to a series of isolated remnants. The domed surface of the mire is dominated by bog mosses *Sphagnum magellanicum*, *S. papillosum*, with cross-leaved heath *Erica tetralix* and ling *Calluna vulgaris* forming a sparse dwarf-shrub layer. Cranberry *Vaccinium oxycoccus*, bog rosemary *Andromeda polifolia*, bog asphodel *Narthecium ossifragum*, round-leaved sundew *Drosera rotundifolia* and cotton grass *Eriophorum angustifolium* are common. A significant feature at the western end of the site is an extensive area of flushed or soligenous mire, which receives water flowing down the steeply sloping moss boundary from the south. This flushed area supports a different vegetation type, with slender sedge *Carex lasiocarpa* becoming locally dominant at its lower and richer (NW) end with 'brown moss' species and marsh cinquefoil *Potentilla palustris* also present. At a higher level in the seepage are *Sphagnum recurvum*, carnation sedge *Carex panicea*, and rarer bog sedge *Carex limosa*, with marsh horsetail *Equisetum palustre*, common cotton-grass *Eriophorum angustifolium* and moss *Polytrichum commune*. The upper levels are occupied by *Sphagnum auriculatum* agg., with the bottle and common sedges *Carex rostrata* and *C. nigra*, and the herbs bogbean *Menyanthes trifoliata* and common butterwort *Pinguicula vulgaris*.

Felecia Moss is an example of blanket mire which is now one of a small number of unplanted areas within the extensive Wark Forest. It is noted for its variety of bog-mosses *Sphagnum papillosum*, *S. magellanicum*, *S. imbricatum*, *S. fuscum*, *S. cuspidatum* and *S. tenellum*. In the wetter areas active growth of bog-mosses produces an undulating surface of hummocks and hollows, the latter sometimes supporting temporary pools, and here great sundew *Drosera*

anglica is especially frequent. Two pools near the centre of the site are of note for the abundance of *Sphagnum subsecundum*. Interspersed within the bog-moss lawn are ling *Calluna vulgaris*, crowberry *Empetrum nigrum*, common cottongrass *Eriophorum angustifolium*, hare's-tail cottongrass *E. vaginatum*, bog rosemary *Andromeda polifolia*, bog asphodel *Narthecium ossifragum* and round-leaved sundew *Drosera rotundifolia*.

Grain Heads Moss is a raised-mire dominated by bog-mosses *Sphagnum* spp., the remains of which are continuing to form peat, thus promoting active growth of the mire surface. Bog-mosses, principally *S. magellanicum*, *S. uvellum*, *S. tenellum* and *S. papillosum*, form a continuous carpet, with *S. cuspidatum* growing in the wetter hollows; amongst the *Sphagna* there are abundant leafy liverworts. The remarkably undisturbed and natural condition of the mire surface over the greater part of the site is a feature identifying this as one of a series of internationally important mires. Upon the bog-moss carpet there is a sparse but even distribution of dwarf-shrubs which, as a consequence of the high water-table, are somewhat stunted in their growth. Cross-leaved heath *Erica tetralix* is particularly abundant, and bog rosemary *Andromeda polifolia* and cranberry *Vaccinium oxycoccus* are both common. The high water-table is further emphasised by the abundance of common cottongrass *Eriophorum angustifolium*, together with the herbs bog asphodel *Narthecium ossifragum* and sundew *Drosera rotundifolia*. On a central ridge the peat is thinner. Here, whilst the cover of *Sphagnum* carpet is still continuous, ling *Calluna vulgaris* and hare's-tail cotton-grass *E. vaginatum* occur.

Coom Rigg Moss is an important site, exemplifying blanket mire, and raised mire which has remained undamaged by grazing, burning, peat-cutting or drainage. A carpet of bog-mosses *Sphagnum papillosum* and *S. magellanicum* forms the active peat-forming surface. Widespread and generally abundant are heather *Calluna vulgaris*, hare's-tail cotton grass *Eriophorum vaginatum*, cross-leaved heath *Erica tetralix* and common cotton grass *Eriophorum angustifolium*. Also abundant on the moss surface are bog asphodel *Narthecium ossifragum* and the insectivorous round-leaved sundew *Drosera rotundifolia*. A series of mossy hummocks carries such species as *Sphagnum imbricatum* and *S. fuscum*, together with bilberry *Vaccinium myrtillus*, crowberry *Empetrum nigrum* and woolly hair moss *Rhacomitrium lanuginosum*. One open pool and several moss-filled hollows are present in the south-west portion of the site. At two separate locations the bog surface carries a depauperate growth of common reed *Phragmites australis* in a situation most unusual for this plant. This is thought to be a relict of the bog's formative stages when this species occupied wet hollows in the boulder clay substrate and initiated peat formation under fen conditions. Its persistence into the acid conditions of blanket bog is thus of great interest.

Hummel Knowe Moss is an example of raised and blanket mire formed by the accumulation of deep peat infilling first a lake and later the whole col between Hummel Knowe in the north and Hugh's Hill in the south. The maximum recorded peat depth is 10.7m. Whilst a small part of the site adjacent to Hummel Knowe itself comprises unafforested land within the extensive Wark Forest, it is separated by a fence and wall from the greater area which forms part of the extensive sheepwalk of Burndivot Common. As at Hainging Head Moss, the grazed moss surface is remarkably even, and consists of a carpet of various bog-mosses, notably *Sphagnum papillosum* and *S. magellanicum*, with little differentiation of hummock or hollow topography. Interspersed within this are common cottongrass *Eriophorum angustifolium*, hare's-tail cottongrass *Eriophorum vaginatum*, deer grass *Trichophorum cespitosum*, cross-leaved heath *Erica tetralix*, crowberry *Empetrum nigrum* and ling *Calluna vulgaris*, the latter being low growing as a result of the very wet conditions. Bog asphodel *Narthecium ossifragum*, bog rosemary *Andromeda*

polifolia, cranberry *Vaccinium oxycoccus* and round-leaved sundew *Drosera rotundifolia* are abundant. Also recorded from this site are great sundew *D. anglica*, white beak sedge *Rhynchospora alba* and tall bog-sedge *Carex paupercula*. Peripheral areas have a greater preponderance of ling and cross-leaved heath, with occasional isolated patches of bottle sedge *C. rostrata* which may mark the position of former pools in the moss surface. The southern and eastern boundaries are marked by steeper slopes, and a change to acidic grassland with wavy hair-grass *Deschampsia flexuosa*. To the south-west is an area flushed by drainage water from Hugh's Hill and here there are tussocks of hare's-tail cottongrass with tormentil *Potentilla erecta*. At the base of the hills to the north and south is a marginal lagg with soft rush *Juncus effusus* and *Sphagnum recurvum*.

Haining Head Moss is an extended basin mire developed in a shallow depression between the headwaters of the rivers Irthing and North Tyne. The condition of the vegetation differs markedly to either side of a fence-line along the site's east-west axis, dividing it into a large northern sector, which comprises part of an intensively grazed sheepwalk, and a relatively ungrazed smaller southern sector which is one of a small number of unplanted areas within the extensive Wark Forest. The southern sector was formerly crossed by four drainage ditches. These are now blocked, but their effect is still evident in the abundance of tall ling *Calluna vulgaris*, which dominates a hummocky carpet of bog-mosses *Sphagnum magellanicum*, *S. papillosum*, *S. rubellum*. Species associated with the include cranberry *Vaccinium oxycoccus*, bog rosemary *Andromeda polifolia*, bog asphodel *Narthecium ossifragum*, cross-leaved heath *Erica tetralix* and common cottongrass *Eriophorum angustifolium*. Between the bog-moss hummocks, tussocks of hare's-tail cottongrass *E. vaginatum* support cross-leaved heath and the mosses *Pleurozium schreberi* and *Aulacomnium palustre*. The site boundary in the southern sector has been reduced to conform with that of the adjacent plantation. In the northern sector, the effects of grazing, together with an absence of drainage, have resulted in a remarkably even-textured carpet of bog-mosses in contrast to the hummock-hollow structure of the southern sector. It consists of a mosaic of *Sphagnum magellanicum*, *S. papillosum*, *S. tenellum*, *S. rubellum* and *S. cuspidatum*. Growing among the bog-mosses, cross-leaved heath and common cottongrass are codominant and ling, in contrast to its abundance in the southern sector, occurs here only as extremely stunted individual stems. Associated species include cranberry, bog rosemary, bog asphodel and small scattered tussocks of deer-grass *Trichophorum cespitosum* and hare's-tail cottongrass.

Butterburn Flow is the most important blanket mire within England. The site lies 21km north-east of Bramton and abuts the Cumbria/Northumberland border at an altitude of 270m. The Flow represents a transition between hummock-hollow mire and true patterned mire typified by narrow ridges and open water pools. Similar transitional patterning is known at only three other sites in Britain and none is as undamaged as Butterburn. The Flow is noted for containing large, intact areas dominated by bog mosses *Sphagnum* spp. The bog moss dominated plant community forms a major component of the blanket mire vegetation of the Flow, to an extent rarely seen now in Britain. Constant species in the community are *Sphagnum magellanicum*, *S. papillosum*, cross-leaved heath *Erica tetralix* and cranberry *Vaccinium oxycoccus*. The hydrological unit extends down to the River Irthing around most of the northern and eastern boundaries. The marginal band of grass- and rush-dominated vegetation on the more mineral soils is included to protect the finely-balanced hydrology in the peat of the patterned mire. A number of local and rare mire species are present on Butterburn, notably tall bog sedge *Carex magellanica*, few-flowered sedge *C. pauciflora* and the bog mosses *Sphagnum pulchrum* and *S. imbricatum*. In addition, bog rosemary *Andromeda polifolia* is abundant and the vegetation

has certain affinities with that of the Solway raised mires association of *Sphagnum pulchrum* and white-beak sedge *Rhynchospora alba* accompanying bog rosemary. Cloudberry *Rubus chamaemorus* occurs at an unusually low altitude for England.

International and National Importance Coom Rigg Moss - a rare spider *Eboria caliginosa* has been recorded at this site. Haining Head Moss - rare plant species recorded from this sector include great sundew *Drosera anglica*, few-flowered sedge *Carex pauciflora*, tall bog-sedge *C. paupercula* and white-beak sedge *Rhynchospora alba*. Butterburn Flow - seven species of wader are known to breed on the Flow, together with other moorland species.

Changes in Ecological Character Gowany Knowe Moss is grazed by cattle and sheep, but their effect is concentrated on the acidic grassland in the north and east portions and no disturbance of the mire surface is as yet apparent. The boundary of Felecia Moss has been reduced to conform with that of the plantation edge during the 1983 revision (a subsidiary area formerly notified to the north-west has been deleted). Peripheral areas of Grain Heads Moss show signs of past disturbance and in the north of the site, in an area where hare's-tail cotton-grass is abundant, there is a small population of the unusual tall bog-sedge *Carex paupercula*. Some narrow drains across the southern part of the mire are marked by an increase in the height of the fringing ling, but they are becoming occluded by bog-mosses. Some erosion of the bog surface around the head of a former drain in Hummel Knowe Moss is apparent near the eastern boundary. In the northern sector of Haining Head Moss, the effects of grazing together with an absence of drainage, have resulted in a remarkably even-textured carpet of bog-mosses in contrast to the hummock-hollow structure of the southern sector.

Management Practices Coom Rigg Moss and Grain Heads Moss are managed by the Nature Conservancy Council as national nature reserves.

Scientific Research and Facilities No information

Principal Reference Material The above information is taken from the documents supplied by the Government of the United Kingdom for designation on 17 July 1985.

Additional reference

Ratcliffe, D.A. (Ed.) (1977). *A Nature Conservation Review*. Cambridge University Press.

Leighton Moss

Location 54°10'N, 2°47'W. Situated between Warton Crag and Silverdale on the edge of Morecambe Bay in the Arnside-Silverdale Area of Outstanding Natural Beauty, Lancashire, England.

Area 125ha

Degree of Protection Leighton Moss is a site of special scientific interest (SSSI). It was originally notified in 1951 as Storr's Moss and the boundary was revised by partial deletion at renotification. Most of the site is an RSPB reserve. Otter *Lutra lutra* and red squirrel *Sciurus*

vulgaris, protected species listed on Schedule 5 of the above Act, are resident. Designated as a Ramsar site on 28 November 1985.

Site Description There are extensive areas of open water in the reedbeds, and areas of willow scrub and mixed fen vegetation. A typical and varied fen flora has developed in some parts, and this shows all stages of transition from open water to woodland. The reedbeds are important as a northern outpost of broadland-type avifauna, with nationally important breeding populations of bittern *Botaurus stellaris* (about 12 pairs, i.e. about 25% of the current British population) and bearded tit *Panurus biarmicus* (about 30 pairs), but the diversity of habitat supports a wide range of birds with over 65 species breeding regularly. These include important populations of pochard *Aythya ferina* (about 8 pairs) and shoveler *Anas clypeata* (about 15 pairs), a large population of reed warbler *Acrocephalus scirpaceus* (one of the most northerly colonies in Britain), sedge warbler *A. schoenobaenus*, grasshopper warbler *Locustella naevia*, water rail *Rallus aquaticus* and a wide range of waterfowl.

International and National Importance Leighton Moss is a site of outstanding ornithological importance. It contains the largest reedbed in north-west England and the only large reedbed in Lancashire; the only other example of any significant size being the nearby Hawes Water Moss. The site also supports a variety of passage and wintering waterfowl and other birds, including nationally important numbers of teal (up to 1800), shoveler (up to 220), bittern (11-13 breeding pairs in 1977-82), bearded tit (20-40 breeding pairs in 1977-82) and gadwall (up to 35). The site is also of value for other fauna. It is one of the few places in Lancashire where otters regularly breed. Red squirrels, roe *Dama dama* and red deer *Cervus elaphus* occur, and a wide range of butterflies, have been recorded from the site.

Changes in Ecological Character The site was originally an extensive peat moss which was drained and brought into agricultural use as arable land in the 19th Century. In 1917, following cessation of pumped drainage, the valley flooded with base-rich water from the surrounding limestone hills and soon developed into a *Phragmites* reedbed.

Management Practices In 1964 Leighton Moss became an RSPB reserve, and has since been managed to maintain and diversify the habitats of wetland birds.

Scientific Research and Facilities Monitoring of bird and butterfly populations is carried out; in particular, research into the management of reed beds for bird populations, the effects of scrub cutting on warbler populations and studies of bittern biology.

Principal Reference Material The above information is taken from the documents supplied by the Government of the United Kingdom for designation on 28 November 1985.

Additional references:

Ratcliffe, D.A. (Ed.) (1977). *A Nature Conservation Review*. Cambridge University Press.

Martin Mere

Location 53°35'N, 2°49'W. Situated to the north of Burscough in Lancashire.

Area 119ha

Degree of Protection Martin Mere was notified as a site of special scientific interest (SSSI) in 1979 and and renotified in 1984. The site boundary has been amended by minor corrections. The area has also been corrected, as the acreage given on the 1979 notification was incorrect. This is a Wildfowl Trust Reserve, and was designated as a Ramsar site on 28 November 1985.

Site Description The Mere is a low-lying wetland complex of open-water, marsh and grassland habitats overlying deep peat. It is situated to the north of Burscough and occupies part of the site of the old Martin Mere which, prior to drainage, was probably the largest lake in Lancashire.

International and National Importance The principal interest of the site lies in the numbers of migrant birds which it supports during the winter months, with overall numbers of wildfowl regularly in excess of 10,000 and over 100 different species using the Mere as a wintering ground. Of particular importance are the wintering populations of pink-footed geese *Anser brachyrhynchos* (up to 18,000), teal *Anas crecca* (5,000-10,000), Bewick's swan *Cygnus columbianus bewickii* (up to 370) and pintail *A. acuta* (1,000-3,700) which, by representing more than 1% of their total NW European populations, reinforce the international status of this site. Martin Mere also supports nationally important numbers of gadwall *Anas strepera* and whooper swan *Cygnus cygnus*, with numbers regularly well in excess of 1% of the total British wintering population. Nationally important numbers of snipe *Gallinago gallinago*, lapwing *Vanellus vanellus* and black-tailed godwit *Limosa limosa* have been recorded, and the wintering flock of ruff *Philomachus pugnax* (250 on average) is believed to be the largest in Britain. Breeding birds total over 35 species, and include gadwall, mallard *Anas platyrhynchos* and snipe. In total, over 150 species of birds have been recorded at the site and this includes several unusual species, such as avocet *Recurvirostra avosetta*, lesser yellowlegs *Tringa flavipes*, marsh sandpiper *T. stagnatilis* and white-winged black tern *Chlidonias leucopterus* which have been recorded on passage. Martin Mere is, thus, of exceptional value for the wealth and diversity of its avifauna. Additional scientific interest is provided by the presence of two locally important plant species: water dropwort *Oenanthe fistulosa*, which is regionally scarce, and whorled caraway *Carum verticillatum*, found here in abundance in its only Lancashire locality (and one of very few sites in the north of England).

Changes in Ecological Character There has been an invasion of *Bidens* on the area known as Vinsons due to the management regime (flooding during winter), and presumably a change will also take place on Sunleys which was flooded for the first time during winter 1985/86. These changes are being monitored by the Nature Conservancy Council.

Management Practices Following acquisition by the Wildfowl Trust in 1974, the rough grazed pasture of a decade ago has been transformed by positive management techniques into a reserve of international importance for waterfowl.

Scientific Research and Facilities Monitoring of bird populations is carried out. There is also habitat monitoring by the Nature Conservancy Council.

Principal Reference Material The above information is taken from the documents supplied by the Government of the United Kingdom for designation on 28 November 1985.

Alt Estuary

Location 53°30'N, 3°10'W. Located 3-4km south-west of Formby, Merseyside, about 10km north of Liverpool, England.

Area 1,160ha

Degree of Protection The area designated as a Ramsar site lies within the Altcar Sand Dune and Foreshore Site of Special Scientific Interest (SSSI), notified in 1979 and renotified in 1983. Designated as a Ramsar site on 28 November 1985.

Site Description Salt marsh and reedbed are present on the east bank of the River Alt. The saltmarsh is characterised by the presence of common saltmarsh-grass, creeping bent, spear-leaved orache *Atriplex prostrata*, glasswort *Salicornia europaea* and sea arrow grass *Triglochia maritima*. Common cord-grass *Spartina anglica* is present in places. The reedbed is dominated by common reed *Phragmites australis*.

International and National Importance The Alt Estuary regularly supports more than 20,000 wintering waders (an average of over 35,000). The site supports in winter on average 25,700 knot *Calidris canutus* (over 7% of the European wintering population), 560 sanderling *C. alba* (4%) and 6,000 bar-tailed godwit *Limosa lapponica* (over 1%). Over 3,000 pink-footed goose *Anser brachyrhynchus* (over 3%) roost on the site at some stages of the winter. The site also provides roosts for many other species of wading birds and wildfowl including oystercatcher *Haematopus ostralegus*, grey plover *Pluvialis squatarola*, curlew *Numenius arquata*, redshank *Tringa totanus*, dunlin *Calidris alpina* and shelduck *Anas clypeata*.

Changes in Ecological Character Ongoing natural processes of erosion and accretion are modified by dredging activities in the Crosby channel leading to the Mersey and Liverpool docks. Other known threats to the ecological character and value include proposed coast protection works at Hightown adjacent to and within the Ramsar site, sewage dumping in Liverpool Bay, and possible increases in intensity of recreational uses.

Management Practices Informal public recreation (walking) occurs over 10% of the area of the site. Boat moorings are present and sailing takes place in the Alt Estuary. Bait digging occurs but affects less than 0.5% of the area. There is also sporadic commercial shrimping of about 5% of the site. Shooting rights on this site are not exercised.

Scientific Research and Facilities Research is carried out particularly in regard to coastal hydrological and sedimentological processes.

Principal Reference Material The above information is taken from the documents supplied by the Government of the United Kingdom for designation on 28 November 1985.

Additional reference:

Ratcliffe, D.A. (Ed.) (1977). *A Nature Conservation Review*. Cambridge University Press.

Loch of Skene

Location 57°09'N, 2°20'W. In Aberdeenshire, about 16km west of Aberdeen, Scotland.

Area 125ha

Degree of Protection This has been a site of special scientific interest since 1971, renotified in 1982. Designated a Ramsar site on 25 September 1986.

Site Description The site includes all of the shallow Loch of Skene and a narrow strip along most of the shoreline, widening to about 15m in the north-west corner. The submerged flora has been depleted by plankton blooms of blue-green algae caused by phosphorous enrichment. The fringing reedbed and birch-alder carr is, however, largely undisturbed. A regionally important range of breeding birds are present, with 69 species recorded.

International and National Importance There are nationally important concentrations of breeding and wintering wildfowl and gulls. It is an important breeding area for tufted duck *Aythya fuligula* (50-100 pairs). In winter, nationally important numbers of goosander *Mergus merganser* and goldeneye *Bucephala clangula* roost here, and regionally important numbers of mallard *Anas platyrhynchos*, teal *A. crecca*, wigeon *A. penelope* and pochard *Aythya ferina* also occur. In autumn it is a major roosting site for common gull *Larus canus* and large numbers of greylag goose *Anser anser* use the loch (peak: 4000-6500 birds). A number of uncommon plant species are present.

Changes in Ecological Character No information

Management Practices No information

Scientific Research and Facilities No information

Principal Reference Material The above information is taken from documents submitted by the Government of the United Kingdom for designation on 25 September 1986.

Loch Eye

Location 57°48'N, 3°56'W. In the Moray Firth lowlands, Ross and Cromarty district, Scotland.

Area 195ha

Degree of Protection The loch is a site of special scientific interest. Part of the site has been a statutory bird sanctuary since 1974. Designated a Ramsar site on 25 September 1986.

Site Description The site comprises a shallow inland loch about 2km long and a narrow strip of shoreline around it. The water chemistry is such as to allow the presence of plant communities characteristic of both nutrient-rich and nutrient-poor communities, resulting in great species diversity. Plants cover about 90% of the loch's bottom. The shore supports trees or fen and, at the eastern end, swamp with willow carr. The loch is not always free of ice in winter, which reduces bird populations during cold periods. There is a varied and rich invertebrate fauna.

International and National Importance This loch supports the greatest freshwater concentrations of wildfowl on the Highland mainland with large numbers of ducks and geese, particularly greylag goose *Anser anser*, of which over 30,000 have been recorded at one time. Large numbers of other species, some of which reach national significance in most winters, including mute swan *Cygnus olor*, whooper swan *C. cygnus*, wigeon *Anas penelope*, mallard *A. platyrhynchos*, teal *A. crecca*, and pochard *Aythya ferina*. The aquatic flora includes uncommon species and at least one national rarity.

Changes in Ecological Character No information

Management Practices No information

Scientific Research and Facilities No information

Principal Reference Material The above information is taken from documents submitted by the Government of the United Kingdom for designation on 25 September 1986.

Rockcliffe Marshes

Location 54°52'N, 3°30'W. In northern Cumbria, England, 10km north of Carlisle, on the border with Scotland. The site is in the estuary of the rivers Esk and Eden and adjacent to Burgh Marsh SSSI.

Area 1,897ha

Degree of Protection The site has been a site of special scientific interest since 1954, and was renotified in 1984. Rockcliffe Marsh is within Solway Firth Area of Outstanding Natural Beauty, and forms part of the Upper Solway Flats and Marshes proposed special protection area. Designated a Ramsar site on 25 September 1986.

Site Description The site includes the area of coastal marshes formed between the mouths of the rivers Eden and Esk at the head of Solway Firth, bordered on three sides by mud and sand flats above the level of mean high water. There is a seawall on the landward side. The saltmarsh contains numerous creeks, and can be divided into an eastern landward part which is older, with soils which are frequently gravelly and rarely submerged, and a newer marsh of recently accreted sand. In recent years, accretion on the seaward edge has been rapid. The saltmarsh vegetation reflects the age and substrate type, with a well-represented sequence of communities. The seaward edge is typified by pioneer species, notably common saltmarsh grass *Puccinellia maritima* with some glasswort *Salicornia europaea*. The invasive cordgrass *Spartina* spp. is so far absent. Inland, there is a transition to extensive grassy saltmarsh dominated by red fescue *Festuca rubra* with abundant thrift *Armeria maritima*. Further inland the grass creeping bent *Agrostis stolonifera* becomes more prominent, together with saltmarsh rush *Juncus gerardii*, sea plantain *Plantago maritima* and various sedges. A number of other salt-tolerant plants (halophytes) are locally abundant in these grasslands, for example sea milkwort *Glaux maritima*, common sea lavender *Limonium vulgare* and sea arrowgrass *Triglochin maritima*. Parsley water-dropwort *Oenanthe lachenalii* and sea club rush *Scirpus maritimus* are found in the creeks, sometimes with sea aster *Aster tripolium* and common scurvy grass *Cochleria officinalis* towards the edges. Towards the sea wall at the eastern edge of the marsh the proportion of halophytes gradually decreases, leaving a sward dominated by bent and fescue grasses with perennial species such as sea couch, Yorkshire fog, autumn hawkbit, white clover and even perennial rye-grass gaining importance. The grassland is grazed in summer by cattle and a few horses.

International and National Importance The site supports large numbers of waterfowl, especially pink-footed goose *Anser fabalis brachyrhynchus* (up to 4000 use the area in winter, about 50% of the Icelandic and Greenlandic populations) and barnacle goose *Branta leucopsis* (up to 3000 birds, 40% of the Svalbard population in winter and about 8000 birds, or 90% of this population, in spring). It regularly supports over 10,000 ducks, geese and swans; flocks of waders are numerous in winter. The Solway Firth as a whole supports very large numbers of wintering and passage wildfowl and waders, with the sand flats and marsh at Rockcliffe an important constituent. For the Solway as a whole, internationally important wintering populations include those of pink-footed goose, barnacle goose, oystercatcher *Haematopus ostralegus* and pintail *Anas acuta*, with sanderling *Calidris alba* in passage. It also supports large breeding populations of black-tailed godwit *Limosa limosa*, common tern *Sterna hirundo* and Arctic tern *S. paradisaea*. In a 1985 survey of 77 saltmarshes in Great Britain, part of the Rockcliffe Marshes held the highest density of breeding oystercatchers and the second highest density of all breeding waders combined. Oystercatcher, lapwing *Vanellus vanellus* and redshank *Tringa totanus* nests each number over 100, and there are consistently 10-20 ringed plover *Charadrius hiaticula* nests.

Changes in Ecological Character No information

Management Practices The marsh is managed for part of the year as a Nature Reserve by the Cumbria Trust for Nature Conservation.

Scientific Research and Facilities Bird populations have been studied, including winter censuses and nest counts.

Principal Reference Material The above information is taken from documents supplied by the Government of the United Kingdom for designation on 25 September 1986.

Chichester and Langstone Harbours

Location 50°50'N, 1°00'W. Situated to the east of Portsmouth in the boroughs of Havant, Hampshire and Chichester, West Sussex.

Area 5,749ha

Degree of Protection Both Chichester and Langstone harbours are SSSIs, notified in 1970 and 1958, respectively. Chichester Harbour was designated an area of outstanding natural beauty on 4 February 1964. The two harbours are also a joint EEC Bird Directive Special Protection Area. Chichester Harbour includes Nutbourne Marshes Local Nature Reserve, and Langstone Harbour contains Farlington Marshes Local Nature Reserve (119ha) owned by Portsmouth City Council and managed by the Hampshire and Isle of Wight Naturalists Trust; 550ha of this, including a series of salt marsh islands and extensive mud flats, are owned by the Royal Society for the Protection of Birds. The site was added to the Ramsar list on 4 November 1987.

Site Description Chichester Harbour is a large estuarine basin in which extensive mud and sand flats are exposed at low tide, drained by channels which unite to make a common exit to the sea. The intertidal area is fragmented in the upper harbour reaches by intruding tongues of land, giving a very long and varied coastline. The harbour exhibits a wide range of intertidal and associated terrestrial habitats, and is unusual in providing a large volume of sheltered saline water fed by a few streams of only low volume. Langstone Harbour is a tidal basin which resembles an almost land-locked lake at high water. At low water, extensive mud flats are exposed, drained by three main channels which join to make a narrow channel to the sea. The extensive intertidal mud flats of both harbours are important feeding grounds for birds. At Chichester Harbour, unimproved permanent pasture behind the sea wall provides alternative feeding sites for geese, and major high tide water roosts. Some of this pasture is floristically important, being a red fescue *Festuca rubra* sward with scarce species such as green-winged orchid *Orchis morio* and adder's tongue fern *Ophioglossum vulgatum*. The lower salt marsh habitat, fringing the mud flats, is dominated by cord grass *Spartina angelica*, and in some areas there is also sea lavender *Limonium vulgare*, sea aster *Aster tripolium* and other saltmarsh species.

The extensive sand dunes at East Head are dominated by marram grass *Ammophila arenaria*, although the degree of ground cover varies from 90% to 10% depending on the age of the dune. At the head of Fishbourne Channel, salt marsh grades through a *Phragmites australis* reed bed into freshwater marsh, influenced by a chalk spring. Most of the other fresh marshes behind the sea wall are small, but at Thorney Deeps reclaimed salt marsh has given way to extensive fresh water marsh vegetation influenced by salt water intrusion; here, the reed is fringed by extensive areas of rushes *Juncus* sp. and invasive willow *Salix* scrub. A number of small ponds occur,

one of which contains the rare annual beard grass *Polypogon monspeliensis*. Significant blocks of scrub, mainly hawthorn *Crataegus monogyna* and blackthorn *Prunus spinosa* occur, which are important for breeding and roosting birds. Hedgerows of oak *Quercus robur* are common and in some places the oak roots are influenced by salt water. Semi-natural broadleaved woodland associated with the harbour is important for breeding birds and supports two heronries. Oak is the major tree species, usually with hazel *Corylus avellana* coppice, as at Old Park Wood, although Tournembury Wood has well-spaced oaks with the occasional beech *Fagus sylvaticum*, holly *Ilex aquifolium* and yew *Taxus baccata*, with a fairly dense ground flora of bramble *Rubus fruticosus* and bracken *Pteridium aquilinum*. Farlington Marshes intrude into the north-west sector of Langstone Harbour. Its vegetation is strongly influenced by drainage water from the chalk and by brackish water infiltration. The marshes embrace a variety of habitats - brackish marsh, fresh water marsh, a large lagoon with associated reed *Phragmites* beds, *Agrostis stolonifera* grassland and scrub. It is a vital high-water wader roost and a major feeding ground for Brent geese *Branta bernicla* after the *Zostera* beds in the harbour have been covered by high tides. Grassland flora is especially rich for reclaimed silt, and includes over 50 species of grasses. Notable invertebrates include long-winged conehead *Conocephalus discolor* and moths, starwort shank *Cucullia asteris*, sand dart *Agrostis ripae*, shore wainscot *Mythimna litoralis* and lunar hornet *Sphecia bemeciformis*. At Langstone a number of mammals have been recorded on the islands including bats, common shrew *Sorex araneus*, field vole *Microtus agrestis*, fox *Vulpes vulpes*, grey seal *Halichoerus grypus* and even roe deer *Capreolus capreolus*.

International and National Importance The harbours are of international importance as a rich intertidal system supporting high densities of intertidal invertebrates and large populations of migrant and overwintering waders and wildfowl. Langstone Harbour and the adjoining and connected Portsmouth and Chichester Harbours form a single, coherent ecosystem which is among the ten most important intertidal areas in Britain. Langstone Harbour itself is among the 20 most important intertidal areas in Britain as a summer and autumn assembly ground for waders during the moult (when they require abundant high protein food) and as post-moult wintering ground. Dunlin *Calidris alpina* often exceed 30,000 individuals, or 6% of the British winter population, or 3% of the European and North African wintering population. Grey plover *Pluvialis squatarola* (1,400) and black-tailed godwit *Limosa limosa* (920) achieve numbers which represent 1-2% of the European and North African migration flyway populations; and redshank *Tringa totanus* (4,000) and ringed plover *Charadrius hiaticula* (520) do so periodically. At times, as many as 20% of the black-tailed godwit, 8% of the ringed plover and 8-10% of the grey plover wintering populations in Britain are present in the harbour. The total number of waders present sometimes exceeds 40,000. In the 1970s and 1980s, Langstone and Chichester harbours alone have consistently supported in excess of 5,000-15,000 wintering brent geese, or 5-10% of the world population, depending on fluctuating population levels. They have supported up to 2.5% of the European winter population of shelduck *Tadorna tadorna* (4,800-6,900) and regularly support substantial numbers of other ducks in autumn and winter. Other species of birds recorded at the site include: European wigeon *Anas penelope* (1,500), green-winged teal *A. crecca* (1,500), sanderling *Calidris alba* (330), bar-tailed godwit *Limosa lapponica* (1,100), spotted redshank *Tringa erythropus* and greenshank *T. nebularia* (1,500).

Changes in Ecological Character No information

Management Practices The site is managed through control brought about by AONB and SSSI designations and the local nature and RSPB reserves.

Scientific Research and Facilities Langstone Harbour has been the forum for important ecological research on estuarine eutrophication and the relationship with algal blanketing of the muds, changes in invertebrate communities and changes in the composition of vertebrate predator communities.

Principal Reference Material

The above information has been supplied by the government of the United Kingdom, supplemented by:

Grimmett, R.F.A. and Jones, T.A. (1989). *Important bird areas in Europe*. ICBP, Cambridge, United Kingdom. 888 pp.

RSPB (1984). *RSPB Nature Reserves*. Royal Society for the Protection of Birds, Sandy, UK. 189 pp.

Scott, D.A. (1980). *A preliminary inventory of wetlands of international importance for waterfowl in west Europe and north-west Africa*. IWRB, Slimbridge, England. 127 pp.

Upper Severn Estuary

Location 51°46'N, 2°23'W. Situated in the Forest of Dean/Stroud District, Gloucestershire, 18km south-west of Gloucester.

Area 1,437ha

Degree of Protection The area has been notified as a site of special scientific interest (SSSI), once in 1954, under the 1949 Wildlife and Countryside Act, and in 1987, under the 1981 Act. Much of the site is a wildlife refuge managed by the Wildfowl Trust and privately owned by Berkeley Estates. It was designated a Ramsar site on 5 February 1988 and qualifies as an EC special protection area, under EC directive 79/409 on the Conservation of Wild Birds.

Site Description The site consists of the uppermost part of the Severn Estuary and its marginal saltmarsh and pasture land. The wetlands include extensive areas of mud and sand flats in the estuary, bordered by saltmarsh, which grades through saltmarsh pasture to neutral grassland. Below high water mark, the saltmarsh is dominated by species such as common cord grass *Spartina anglica*, common saltmarsh-grass *Puccinellia maritima* and glasswort *Salicornia europaea*. Further up the shore, species such as red fescue *Festuca rubra* and creeping bent *Agrostis stolonifera* become evident as the land becomes drier and less subject to tidal inundation. The nationally-restricted marsh mallow *Althaea officinalis* occurs in this zone. Salt marsh pasture is particularly well represented at the Dumbles. Here, fescue and bent grasses become dominant along with meadow barley *Hordeum secalenum*, white clover *Trifolium repens*, common couch *Agropyron repens* and sea plantain *Plantago maritima*. Other salt tolerant species in the sward include sea milkwort *Glaux maritima*, sea arrowgrass *Triglochin maritima*, bulbous foxtail *Alopecurus bulbosus*, reflexed saltmarsh grass *Puccinellia diptans* and saltmarsh rush *Juncus gerardi*. The floodbank marks the inner boundary of the saltmarsh and land on the shoreward side is largely reclaimed grassland dominated by perennial rye grass *Lolium perenne* and used for stock grazing. One or two fields may occasionally be cultivated. However, these are used extensively by visiting wildfowl. Invertebrates such as lugworm

Arenicola marina, polychate annelid *Nereis diversicolor* and crustaceans such as *Bathyporeia pelagica* provide a rich source of food for waders.

International and National Importance The site regularly supports more than 10,000 wintering wildfowl. Amongst these are internationally significant numbers of Bewick's swan *Cygnus columbianus* (350), European white-fronted goose *Anser albifrons albifrons* (3,500) and wigeon *Anas penelope* (6,600). In addition, there are nationally important wintering populations of gadwall *A. strepera* (280), shoveler *A. clypeata* (100) and pochard *Aythya ferina* (840). Other wildfowl include lesser white-fronted geese *Anser erythropus* (K*) and pink-footed goose *A. brachyrhynchus*. Ducks include teal *Anas crecca*, pintail *A. acuta*, mallard *A. platyrhynchos* and tufted duck *Aythya fuligula*. The estuary provides feeding and roosting grounds for large numbers of gulls and waders particularly in the winter. Tens of thousands of common gull *Larus canus* and black-headed gull *L. ridibundus* congregate with other species such as lesser black-backed gull *L. fuscens* and herring gull *L. argentatus*. Waders include large numbers of redshank *Tringa totanus*, curlew *Numenius arquata* and dunlin *Calidris alpina*.

Changes in Ecological Character The character of the area is likely to change if plans for a tidal barrage downstream are implemented.

Management Practices Activities include grazing of cattle, sheep and horses; salmon fishing and recreation. The wildfowl refuge is managed by the Wildfowl Trust, which preserves a collection of waterfowl and maintains viewing facilities. The reserve is wardened and there is no public access to the fields, saltmarsh or estuary.

Scientific Research and Facilities Behaviour and ecology of the migratory waterfowl is studied.

Principal Reference Material The above information has been supplied by the British government. Supplemented by:

Carp, E. (1980). *A directory of Western Palaearctic wetlands*. UNEP/IUCN. 506 pp.

Scott, D.A. (1980). *A preliminary inventory of wetlands of international importance for waterfowl in West Europe and North-west Africa*. IWRB, Slimbridge, Gloucestershire, England. 127 pp.

The Wash

Location 52°55'N, 0°20'E. The site is 45km north-east of Peterborough and is situated in the counties of Norfolk and Lincolnshire.

Area 63,124ha

Degree of Protection The Wash is protected as a site of special scientific interest (66,050ha), notified under the 1949 Wildlife and Countryside Act in 1972 and under the 1981 Act in 1984. The SSSI includes the 1,317ha RSPB Snettisham Reserve. Part of the eastern shoreline of The Wash is an area of outstanding natural beauty (AONB). The site has also been designated as a Ramsar site and EC special protection area (EC directive 79/409 on the Conservation of Wild

Birds). Both designations came into force on 30 March 1988. The area is owned by the state and several private bodies.

Site Description The Wash is a vast, intertidal bay with extensive mudflats and sandbanks, saltmarshes and sandy beaches. The land adjoining the Wash is used intensively for agriculture, with localised industrial and residential areas. The saltmarshes bordering the Wash are extensive and support a range of communities with glasswort *Salicornia* spp. and cord grass *Spartina anglica* the principal colonisers of the mud. Sea aster *Aster trifolium* is abundant on the lower marsh and this zone grades into large areas of middle marsh dominated by common saltmarsh grass *Puccinellia maritima* and sea purslane *Halimione portulacoides*, with sea arrow-grass *Triglochin maritima* and annual seablite *Sueda maritima*. In places a zone of sea couch grass *Agropyron pungens* is present on the upper marsh in front of the sea walls. The saltmarsh vegetation is more uniform than that found on the North Norfolk coast. This reduced diversity is due to the absence of mature upper marsh and associated transition zones because the development of these communities has been curtailed as a result of the long history of agricultural reclamation.

The offshore sandbanks support populations of both grey and common seals, *Halichoerus grypus* and *Phoca vitulina*, respectively, although the former is present only in very small numbers. The breeding colony of common seals is the largest in Europe, with an estimated pre-virus population of over 6,000. The sub-tidal area is highly productive and this is reflected in its importance as a shell fishery for mussels, cockles and shrimps; and as a nursery ground for flatfish such as plaice, dabs and sole. The invertebrate fauna of the saltmarsh is very rich, with the most important areas being the older marshes at Frampton and Holbeach. Specialised salt-tolerant plants provide a suitable habitat for a variety of insects and mites which are adapted to life there, some of them being rare or local.

International and National Importance On average, The Wash supports 163,000 waders and also 51,000 wildfowl. The site supports internationally important numbers of certain species: 17,000 dark-bellied Brent geese *Branta bernicla bernicla* (12% of the European wintering population), 7,300 pink-footed geese *Anser brachyrhynchus* (7%), 16,000 shelducks *Tadorna tadorna* (12%), 1,700 pintail *Anas acuta* (2%), 24,000 oystercatchers *Haematopus ostralegus* (3%), 5,500 grey plovers *Pluvialis squatarola* (7%), 500 sanderlings *Calidris alba* (3%), 75,000 knots *C. canutus* (21%), 29,000 dunlins *C. alpina* (1%), 8,200 bar-tailed godwit *Limosa lapponica* (1%), 3,700 curlews *Numenius arquata* (1%), 4,300 redshanks *Tringa totanus* (2%) and 980 turnstones *Arenaria interpres* (2%). Nationally important species include 3,900 wigeon *Anas penelope* (2% of the British wintering population), 220 goldeneye *Bucephala clangula* (1%), 130 gadwall *Anas strepera* (3%), 830 common scoter *Melanitta nigra* and 260 black-tailed godwit *Limosa limosa* (6%).

Changes in Ecological Character The integrity of the site is threatened by reclamation, pesticide and fertiliser pollution from agricultural run-off and a proposed barrage scheme across the bay. The seal population suffered recently in the North Sea seal-virus epidemic.

Management Practices In Snettisham RSPB Reserve there is intensive wardening, the construction of hides, fences and screening banks, together with the construction of islands and other wildfowl management activities.

Scientific Research and Facilities Bird studying facilities are available at Snettisham RSPB Reserve.

Principal Reference Material

The above information has been supplied by the British government.

Pagham Harbour

Location 50°46'N, 00°46'W. The wetland is situated adjacent to and west of Pagham and 10km south of Chichester.

Area 616ha

Degree of Protection Pagham Harbour is a site of special scientific interest (SSSI), notified in 1954 under the 1949 Wildlife and Countryside Act, and in 1986 under the 1981 Act. Part of the site is a local nature reserve (under S21 of the National Parks and Access to the Countryside Act 1949). Pagham Harbour is a proposed nature conservation review site. This site contains Pagham Harbour Geological Review site and part of Bognor Regis (Palaeobotany) GCR site. The area was designated as a Ramsar site on 30 March 1988.

Site Description The site comprises an extensive central area of salt marsh and tidal mudflats with surrounding habitats including shingle, open water, reed swamp and wet permanent grassland. Pagham Harbour was reclaimed for agriculture in the late 19th century, but was flooded again by a storm in the early 20th century. The extensive intertidal mudflats are rich in algae and invertebrates and provide important feeding areas for birds.

The lower part of the salt marsh is dominated by the hybrid common cordgrass *Spartina anglica* with patches of glassworts *Salicornia* spp. Above this zone, sea purslane *Halimione portulacoides* covers large areas, with other species such as sea aster *Aster tripolium* in the periphery. At one part of the site, within a mixed salt marsh community, greater sea spurrey *Spergularia media* and sea lavender *Limonium vulgare* are found. The upper margin of the salt marsh has developed a narrow strip of grassland dominated by sea couch *Elymus pycnathus*. Vegetated shingle is a nationally rare community. At Pagham, the type and extent of plant cover is dictated by the shifting nature of the substrates, the sea defence works and by its relative exposure to the elements. In sheltered areas, a diverse grass sward has developed, with herbs such as early forget-me-not *Myosotis ramosissima*, biting stonecrop *Sedum acre* and nationally endangered childing pink *Petrorhagia nanteuilii*. This contrasts with the sparse vegetation of the shingle ridge where uncommon sea kale *Crambe maritima* and yellow vetch *Vicia lutea* are found.

Pagham Harbour has a wide variety of wetland habitats. Brackish drainage ditches dissect the land where common reed *Phragmites australis* dominates. This forms fairly extensive swamps in some areas, including the Severals to the west of the Harbour which are important for breeding and migrating reed and sedge warblers. Sidlesham Ferry to the north-west provides high water feeding and roosting areas for waders, while Pagham Lagoon in the west is a stormy weather sheltering site for sea duck. The nationally endangered scarlet sea anemone *Nematostella recrensis* may also be found here.

The small amount of woodland at Pagham Harbour is dominated by willow and oak. One of these areas supports a small heronry. Scrub is found both in the form of hedges and as more extensive patches with hawthorn *Crataegus monogyna* and gorse *Ulex europaeus* being the main constituents. The damp, unimproved grassland surrounding the Harbour is used as a major wader roost and is grazed by large numbers of Brent geese. Some fields of unimproved grassland are included in the site as they too support populations of birds.

Notable invertebrates include sand dart *Agrotis ripae*, Matthew's wainscot moth *Mythimna favicolor* and long-winged conehead grasshopper *Conocephalus discolor*.

Pagham Harbour is a key site for coastal geomorphology. It is significant both as a shingle spit landform and for the links that have been demonstrated between the coastal nearshore and offshore forms and sediments. The shingle spit system comprises a series of subparallel ridges and recurves marking different phases of extension and frontal accretion. Shingle reaches the beach *via* the intertidal zone, and so-called "Pagham Delta" and the behaviour of the spits and delta are intimately linked with water and sediment circulation around the Selsey Peninsula. This site includes, at the north-eastern end, part of a key site for plant fossils from London clay. It is the only locality in the Hampshire Basin to yield abundant London clay plants.

International and National Importance Pagham Harbour is an overwintering area for over 120 species of birds. The numbers of wintering pintail *Anas acuta* (3430), ringed and grey plover *Charadrius hiaticula* and *Pluvialis squatarola* (790) and black-tailed godwit *Limosa limosa* (620) regularly reach 1% of British populations, and the site is of international importance for wintering ruff *Philomachus pugnax* (300) and Brent geese *Branta bernicla* (3050). The mudflats also provide food for a diverse breeding community of birds, including oystercatcher *Haematopus ostralegus*, shelduck *Tadorna tadorna* and redshank *Tringa totanus* (2500). The average winter maximum for waders (1976-86) is 24,620.

Changes in Ecological Character A yacht marina has been proposed on the eastern beach of the site. This development will not be permitted to proceed unless nature conservation was not badly affected, pollution and erosion problems were not created and any conflicts with navigation were nullified.

Management Practices No information

Scientific Research and Facilities No information

Principal Reference Material

The above information has been supplied by the British government, supplemented by:
Chapman, M. (1989). Marina plans must not affect nature. *Bognor Regis Observer* 23 March. P. 1.
Grimmett, R.F.A., and Jones, T.A., (1989). *Important bird areas in Europe*. ICBP, Cambridge, United Kingdom. 888 pp.

Gruinart Flats

Location 55°50'N, 6°20'W. The flats are situated in Loch Gruinart on the northern coast of the Island of Islay, 110km west of Glasgow.

Area 3,170ha

Degree of Protection The site was notified as a site of special scientific interest in 1963 and designated as a Ramsar site and EC special protection area on 14 July 1988.

Site Description The site includes a wide range of coastal and intertidal habitat, raised shorelines and low level blanket peat and marsh. The area has a north-south alignment and Gruinart Loch opens to the sea. Coill à Chora Ghoirtein woodland is important for the nationally significant assemblage of lichens growing on the trees. Loch Gruinart and Nare Island are important areas for grey and common seals *Halichoerus grypus* and *Phoca vitulina* and the entire area is important for its general geomorphological features.

International and National Importance The site supports internationally important numbers of three species of geese. An average of about 29% (8,600) of the Greenland population of barnacle goose *Branta leucopsis* uses the area over winter for feeding and roosting and up to 67% (20,000) of this population uses the area during autumn passage. About 3% (500) of the Greenland subspecies of white-fronted goose *Anser albifrons flavirostris* uses the site for daytime feeding in autumn and mid-winter, as does at least 2% (300) of the north Canadian/Greenland population of the light-bellied brent goose *Branta bernicla hrota* during autumn migration. Other (non-breeding) species include wintering whooper swan *Cygnus cygnus* (70) and passage ringed plover *Charadrius hiaticula* (300).

Changes in Ecological Character No information

Management Practices The Scottish Office has allowed the shooting of the protected, under British and European law, barnacle goose. The official reason for the licences to kill unlimited numbers of geese was to prevent crop damage. However, in the past, some land owners have taken advantage of the licences for sporting purposes.

Scientific Research and Facilities No information

Principal Reference Material The above information has been supplied by the British government, supplemented by:

Caufield, C., (1985). Rape of Scotlands wilderness. *New Scientist*. 3 January. P. 6.

Eilean Na Muice Duibhe (Duich Moss)

Location 55°42'N, 6°15'W. The wetland is situated on the west of Islay, an island off the west coast of Scotland.

Area 574ha

Degree of Protection The area is a site of special scientific interest and was designated as a Ramsar site on 14 July 1988 and as an EC special protection area.

Site Description The site is an area of low-level blanket mire with scattered peaty pools and lochans. Hummocks of bog mosses *Sphagnum imbricatum* and *S. fuscum* are frequent on the extensive areas of level bog, as is the occurrence of white beak sedge *Rhynchospora alba*. The hydrology of the site is relatively undisturbed. However, an interesting feature is the local modification of vegetation communities both in structure and species by nesting colonies of lesser black-backed *Larus fuscus*, herring *L. argentatus* and common gull *L. canus*.

International and National Importance This site is internationally important by virtue of its supporting over 600 wintering Greenland white-fronted geese *Anser albifrons* which roost at the site. Many also use the area for nocturnal feeding. This number constitutes over 4% of the world population.

Breeding species include red-throated diver *Gavia stellata*, dunlin *Calidris alpina*, redshank *Tringa totanus*, common gull, herring gull, lesser black-backed gull and, probably, golden plover *Pluvialis apricaria*. Merlin *Falco columbarius* uses the area as a hunting ground in summer. Other non-breeding species include whooper swan *Cygnus cygnus*, hen harrier *Circus cyaneus*, peregrine falcon *Falco peregrinus* and short-eared owl *Asio flammeus*.

The area is an internationally important peatland habitat representing the largest area of 'patterned' mire at its south-west extremity in Britain. The range of patterns, including hummocks, ridges, hollows and deep watershed pools, not only provides the required conditions for Greenland white-fronted goose, but also characterises the site as highly oceanic mire. The site is particularly unusual in representing a transitional mire type, combined both blanket and raised elements. As such, its nearest equivalent is Silver Flowe in Galloway. However, Duich Moss is the only transitional mire known to support the extreme oceanic feature of watershed pools; all other known examples occur much further north on true blanket mire.

Changes in Ecological Character No information

Management Practices No information

Scientific Research and Facilities No information

Principal Reference Material The above information has been supplied by the British government.

Bridgend Flats

Location 55°45'N, 6°15'W. Situated on the north-eastern coast of Loch Indaal, on the Island of Islay, Strathclyde.

Area 331ha

Degree of Protection The wetland was notified in 1971 as a site of special scientific interest. It is also part of the Islay EC special protection area and was designated as a Ramsar site on 14 July 1988.

Site Description The area is represented by saltmarsh and intertidal flats of sand and silt. Some agricultural land is also included within the site which is frequently used by geese. The natural vegetation above mean high tide level supports high densities of breeding waders, gulls and terns.

International and National Importance The site supports internationally important numbers of the Greenland population of barnacle geese *Branta leucopsis*. An average of 22% (6,700) of the total population roosts in the area and an average of 3% (900) feeds within the site. Other wintering species include smaller numbers of whooper swan *Cygnus cygnus* and white-fronted goose *Anser albifrons*. Peregrine falcon *Falco peregrinus* also occurs in the area.

Changes in Ecological Character No information

Management Practices No information

Scientific Research and Facilities No information

Principal Reference Material

The above information has been supplied by the British government. Supplemented by: Grimmett, R.F.A. and Jones, T.A., (1989). *Important bird areas in Europe*. ICBP, Cambridge, United Kingdom. 888 pp.

Gladhouse Reservoir

Location 55°44'N, 3°07'W. Situated 20km south of Edinburgh in Midlothian, Scotland.

Area 186ha

Degree of Protection The wetland is a site of special scientific interest and was declared a local nature reserve on 1 November 1979 under Section 21 of the National Parks and Access to the Countryside Act 1949. It is designated under the Ramsar Convention as a wetland site of

international importance (14 July 1988) and as a special protection area under the terms of the EC Directive 79/409 on the conservation of wild birds.

Site Description The site is an artificial, mesotrophic freshwater body with limited development of aquatic and emergent vegetation.

International and National Importance Gladhouse Reservoir is of international importance as a roosting site for geese. Together with the alternate roost for these birds, Fala Flow, Gladhouse is the most important pink-footed goose *Anser brachyrhynchus* roost in the Lothians. On average, over 5,000 are present, but peaks of over 13,000 (12.5% of the world population) have been recorded. Smaller numbers of greylag geese *Anser anser* are also present, with an average of 500 birds. Breeding mallard *Anas platyrhynchos*, tufted duck *Aythya fuligula*, teal *Anas crecca*, coot *Fulica atra*, moorhen *Gallinula chloropus*, great crested grebe *Podiceps cristatus* and little grebe *Tachybaptus ruficollis* occur.

There are few freshwaters in Midlothian District and so Gladhouse is of local significance for its aquatic and emergent plants and aquatic invertebrates.

Changes in Ecological Character No information

Management Practices No information

Scientific Research and Facilities No information

Principal Reference Material

The above information has been supplied by the British government. Supplemented by: Grimmett, R.F.A. and Jones, T.A., (1989). *Important bird areas in Europe*. ICBP, Cambridge, United Kingdom. 888 pp.

Din Moss - Hoselaw Loch

Location 55°35'N, 2°18'W. Situated near the border of Scotland with England, approximately 12km south-east of Kelso, Borders Region.

Area 46ha

Degree of Protection The wetland is a site of special scientific interest and was designated as a Ramsar site and EC special protection area on 14 July 1988. Part of the site is a reserve of the Scottish Wildlife Trust.

Site Description The site is a mid-altitude loch. Associated with the loch is an area with fen lagg and raised bog which is the most complete in the District.

International and National Importance This site is internationally important by virtue of its providing a winter roost for an average 1,650 pink-footed geese *Anser brachyrhynchus* (over

1% of the Icelandic breeding population) and 3,500 greylag geese *Anser anser* (over 3% of the Icelandic breeding population). Within the Borders Region the site is an important stratigraphic study area.

Changes in Ecological Character No information

Management Practices No information

Scientific Research and Facilities No information

Principal Reference Material The above information has been supplied by the British government, supplemented by:

Grimmett, R.F.A. and Jones, T.A., (1989). *Important bird areas in Europe*. ICBP, Cambridge, United Kingdom. 888 pp.

United States of America

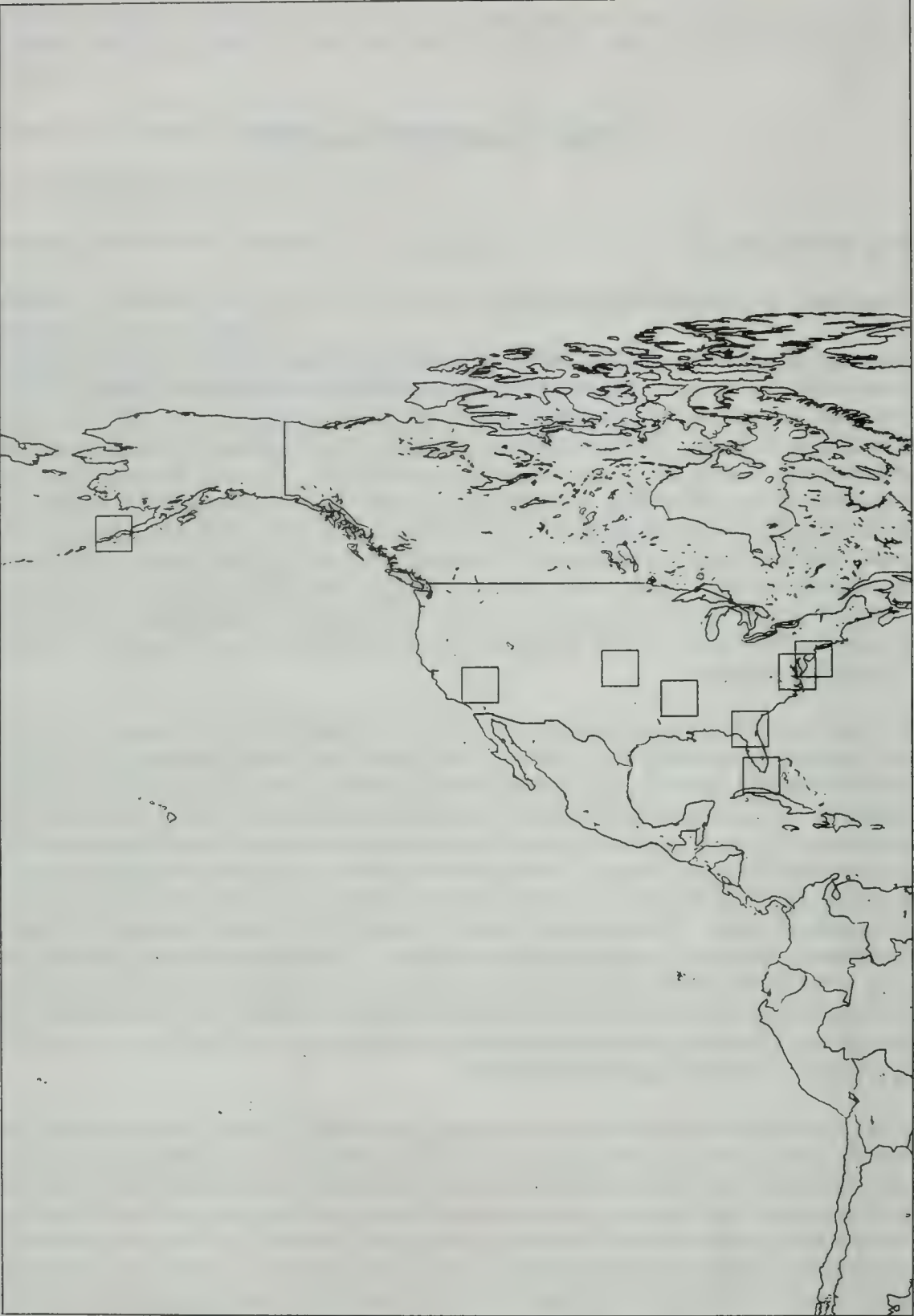
Area 9,539,130 sq.km

Population 238,740,000 (1985 estimate)

Summary of Wetland Situation The vast size of this country, and the variety of geology, climate, soils and land use, result in a wide range of freshwater and marine wetlands. In the mid-1970s there were an estimated 40 million ha of wetland in the conterminous US plus about 80 million ha in Alaska. Wetlands make up more than 25% of the area of the states of Alaska, Louisiana and Florida, but in most states this is under 5%. The most abundant types are freshwater marshes and swamps, while estuaries comprise about 5% of the total area. Over half of the wetlands present in the conterminous US when the first settlers arrived have disappeared, mostly through drainage for farming and forestry or construction but also due to natural causes such as sea level rise. Since the mid-1950s, small gains have occurred in some habitat types, notably in lake area which has increased by 566,000ha through the construction of reservoirs; in coastal open waters a gain of 81,000ha has occurred, largely due to flooding of coastal wetlands in Louisiana.

There are a number of major wetland regions in the US. Along the Atlantic coast, saltmarshes are important for breeding and wintering birds as well as forming stopovers for migrant waterfowl on the Atlantic Flyway. Chesapeake Bay is the largest estuary in the US and a primary waterfowl wintering ground, particularly important for canvasback *Aythya valisineria* and tundra swan *Cygnus columbianus*, but populations have declined partly due to a decrease in the sea grass beds and water pollution. Southern Florida contains a vast area of palustrine wetlands, dominated by the Everglades, which are important breeding areas for ducks, herons, egrets, spoonbills and ibises. The bottomland forested wetlands of the lower Mississippi are prime overwintering grounds for many waterfowl, including 2.5 million mallard *Anas platyrhynchos* (85% of the North American population) and 4 million wood duck *Aix sponsa*; numerous fish also spawn here. Louisiana contains one third of the coastal marshes in the conterminous US, but this area is declining as sediment accretion is not keeping up with the rise in sea level due to a complex of natural and man-made factors.

Inland, wetlands are noted for waterfowl breeding, particularly the Prairie Pothole region of the Dakotas in the north-west, which extends into Canada, where at least 15 species of waterfowl nest. The forest and scrub lands of the North Carolina pocosins are also important for waterfowl. In the north-east, red maple swamps are the most abundant wetland types, and wood duck plus 45 other bird species nest there. Wetlands of Nebraska's Sandhills and Rainwater Basin area are important to waterfowl on the Central Flyway, including sandhill crane *Grus canadensis pulla* plus 2.5 million ducks in spring. However, reduction of wetland area has forced ducks and geese to concentrate into remaining wetlands, and populations have declined through disease and food shortages. In the arid and semi-arid west, riparian forested wetlands are important nesting areas and stopover sites for migrant birds, and provide shelter for certain mammals.



Ramsar Sites in the USA

However, this habitat has suffered greatly from conversion to cropland and overgrazing; in Arizona, dam construction poses the greatest threat.

Alaskan and other tundra wetlands are the primary breeding grounds for most North American waders. Nearly the entire Pacific Flyway population of Canada goose *Branta canadensis* and white-fronted goose *Anser albifrons* nests in the Yukon-Kuskokwim delta, and the state is the most important breeding area for pintail *Anas acuta* in the US. Alaska's North Slope wetlands are important as a summer range and calving area for caribou. Hawaii's wetlands are particularly important for endangered birds including Hawaiian stilt *Himantopus himantopus knudensi*, Hawaiian coot *Fulica americana alai*, Hawaiian gallinule *Gallinula chloropus sandvicensis* and Hawaiian duck or koloa *Anas wyvilliana*.

Protected Areas Legislation There is legislation concerning protection of wetlands at both state and federal level. The foundation of federal wetland regulations is Section 10 of the River and Harbor Act of 1899 and Section 404 of the Clean Water Act of 1977, which relate to the need for permits to carry out changes in wetland areas. Permits have to be obtained from the US Army Corps of Engineers, although normal agricultural and silvicultural activities are exempt. However, changes in 1982 to Corps regulations reduced the federal government's role in protecting wetlands. This generated much controversy and prompted new proposals to increase federal protection of palustrine wetlands which are in danger of disappearing if legislation is not strengthened. Other important domestic legislation includes the Federal Land Policy and Management Act of 1976 which requires the inventory, assessment and planning of all federal lands including wetlands; the Fish and Wildlife Act of 1956; the Coastal Zone Management Act of 1972; the Endangered Species Act of 1973; the National Policy Act of 1969; and the Fish and Wildlife Improvement Act of 1978. Acquisition of wetlands at federal level is associated mainly with the Fish and Wildlife Service's National Wildfowl Refuge System and the Soil Conservation Service's Water Bank Program. The Migratory Bird Conservation Act of 1929, the Migratory Bird Hunting and Conservation Stamp Act of 1934, the Pittman-Robertson Act of 1937 and the Land and Water Conservation Fund Act of 1965 provide the authority and/or funds to purchase wetlands. The Dingell-Johnson Act of 1950 also provides 75% of the cost of fish restoration and management projects. The Fish and Wildlife Service currently controls nearly 13 million ha of estuarine wetlands, most of which are in Alaska. Since the 1960s, 24 states have passed laws to regulate wetland uses, although these relate mostly to estuarine wetlands along the seaboard and great lakes. However, wetland orders are authorised by the statutes of at least eight states to include inland sites, but they are more difficult to enforce than coastal ones partly due to their less easily identifiable physical characteristics. Local regulation of wetland activities has also been adopted in some states, strengthened by the National Flood Insurance Program which requires local regulation of the 100-year floodplain in order to qualify for federally subsidised flood insurance.

Protected Areas Administration The U.S. Fish and Wildlife Service is primarily responsible for wetland protection and its responsibility comes from the Fish and Wildlife Coordination Act 1958 and international treaties.

Sites designated under the Convention Ratification on 18 December 1986 with four sites listed, two sites added on 4 June 1987, one on 19 October 1988 and one on 21 November 1989.

Ash Meadows NWR
Edwin B Forsythe NWR

Izembek NWR and State Game Refuge
Okefenokee NWR
Everglades National Park
Chesapeake Bay Wetlands System
Cheyenne Bottoms Wildlife Area
Cache-Lower White Rivers Joint Venture Area

Government body responsible for administration of the Convention

Office of International Affairs, US Department of Fish and Wildlife, Department of the Interior, Washington, DC 20240

Ash Meadows National Wildlife Refuge

Location 36°21'-36°30'N, 116°15'-116°23'W. In southern Nye county, south-western Nevada, about 145km north-west of Las Vegas and 64km east of Death Valley National Monument

Area 9,509ha

Degree of Protection Devil's Hole was designated a national monument in 1952 and Ash Meadows National Wildlife Reserve formed in 1984; the whole area was designated a Ramsar site at the time of ratification on 18 December 1986. The United States Government currently owns 8,899ha (about 94%) of the total area, and is planning to acquire the remaining 610ha of privately owned land. Of the federally owned land, 5,106ha are owned and managed by the US Fish and Wildlife Service under the National Wildlife Refuge System; 3,794ha owned by the Bureau of Land Management are either co-managed with the Fish and Wildlife Service (2,709ha) or scheduled to be transferred to the Fish and Wildlife Service (1,085ha). A 16ha parcel, Devil's Hole National Monument, is owned by the National Park Service and co-managed with the Fish and Wildlife Service. Many of the threatened plant species are protected under Nevada State laws.

Site Description The site is part of the lowland plains area of the Amargosa Valley which altogether cover about 20,500ha of desert uplands and spring-fed oases. They are within the Mojave Desert region of the basin and range physiographic province of the south-west United States. The underlying rocks are predominantly calcareous (limestone and dolomite) forming mountains and hills with associated bajadas (colluvial slopes), arroyos (washes) and wetland areas. Soils are extremely fine-textured sands, silts and clays, with slow internal drainage. The water table is near the surface over much of the area, and the soils are mostly saline, often with a salt crust at the surface. Surface pavement is generally well-developed, especially in the bajadas, and caliche, a carbonate hardpan, is common. The area slopes from elevations of about 960m in the north-east to about 640m in the south-west. There are over 30 springs, in three main groups: Devil's Hole (732m), a series of small springs at about 710m, and many larger ones between 680m and 707m. In pluvial times surface waters of Ash Meadows discharged into the Amargosa River System, but now flows from larger springs discharge into remnants of Carson Slough, a tributary of the Amargosa River, and sink into desert soils or evaporate before leaving the meadows. Annual precipitation varies between 70mm and 100mm, most falling in winter. Annual evapotranspiration generally exceeds 2500mm. Over 200 species of vascular plant have

been identified. A creosote bush *Larrea tridentata* vegetation community dominates the desert uplands of the region. Important co-dominants include bur-sage *Ambrosia dumosa*, desert thorn *Lycium andersonii*, hop-sage *Grayia spinosa* and shadscale *Atriplex confertifolia*. Seasonally wet meadows of salt grass *Distycklis spicata* are common, often in association with species of *Atriplex* and *Suaeda*, while the drier uplands are dominated by shadscale and *Haplopappus acradenius*. Within spring and seepage areas, where water comes to the surface from deep underground aquifers, many small streams, pools and wet meadows are conspicuous features, with scattered groves of trees dominated by velvet ash *Fraxinus velutina* var. *coriacea* (which gives Ash Meadows its name), screwbean *Prosopis pubescens* and mesquite *P. juliflora*. The shrub layer in these groves is predominantly *Baccharis emoryi*. Herbaceous vegetation around the springs is frequently dominated by *Carex praegracilis*, bulrushes *Scirpus* spp., spike rushes *Eleocharis* spp., salt grass and *Anemopsis californica*.

International and National Importance This site is an unique desert oasis providing habitat for at least 25 species of rare, endangered or unusual plants and animals, including many endemic to the area (and most being associated with wetland or aquatic habitats). The concentration of endemic species is greater than in any other land area of the United States, and second greatest in all of North America. At least four of the springs contain native fish, four of which are listed as endangered under the Endangered Species Act of 1973: Devil's Hole pupfish *Cyprinodon diabolis*, Warm Springs pupfish *C. nevadensis pectoralis*, Ash Meadows Amargosa pupfish *C. nevadensis mionectes* and Ash Meadows speckled dace *Rhichthys osculus nevadensis*. Three of these inhabit several springs and pools, though fewer than in historical times, but Devil's Hole pupfish is restricted to a single limestone cave. Six plant species are listed as threatened species: Ash meadows blazing star *Mentzelia leucophylla*, Ash meadows milk-vetch *Astragalus phoenix*, Ash meadows sunray *Enceliopsis nudicaulis* var. *corrugata*, spring-loving centaury *Centaurium namophilum* var. *namophilum*, Ash Meadows gumplant *Grindelia fraxino-pratensis* and Ash Meadows ivesia *Ivesia eremica*. Amargosa niterwort *Nitrophila mohavensis*, the most localised of all the endemic plants in Ash Meadows, is listed as endangered. All of the aforementioned plants are endemic to Ash Meadows with the exception of *Centaurium namophilum*, which has historically been collected in a few other spring areas in the general region. An aquatic bug, the endangered Ash Meadows naucroid *Ambrysus amargosus*, only occurs in a single spring. Two species of plant, one mammal, one insect and twelve snail species are being considered for listing and protection under the endangered species act. This area, particularly Carson Slough, was important historically for waterfowl, and there are plans to restore this function. At present, three reservoirs are used by modest numbers of ducks and geese in autumn and winter, particularly mallard *Anas platyrhynchos*, pintail *A. acuta*, green-winged teal *A. crecca carolinensis*, cinnamon teal *A. cyanoptera*, canvasback *Aythya valisineria* and coot *Fulica americana*. Peak waterfowl numbers are usually between 2500 and 3500 birds.

Changes in Ecological Character Large-scale disturbance of Ash Meadows began in the early 1960s with marshland peat-mining, agricultural conversion of wetlands and uplands, alteration of spring systems for crop irrigation and cattle ranching purposes, and excessive groundwater pumping. Large herds of feral horses adversely affected spring morphology and plant populations. Exotic fish introductions have depleted native fish and aquatic invertebrate populations. There has also been disturbance from mining and off-road travel. Under present management as a wildlife refuge, no immediate threats of magnitude are anticipated. However, land use changes in the several privately-owned parcels of land within the refuge's boundaries could have adverse effects if these are not acquired by the federal government.

Management Practices The site is managed as a wetland, even though the wet areas occur within a desert ecosystem. Practices are in accordance with US Fish and Wildlife Service National Wildlife Refuge System policies, and with the policies and goals of the endangered species and migratory waterfowl programmes. Primary objectives include prevention of endangerment and extinction through habitat restoration; conservation of migratory waterfowl and population enhancement; and the preservation of the full complement of native ecological and biological diversity. A recovery plan for the entire Ash Meadows ecosystem and its threatened species is nearly complete, and a refuge master planning process for habitat restoration and improvement has been initiated. The US Government Bureau of Land Management is at present implementing a habitat management plan for lands owned or co-managed by them.

Water levels in three man-made reservoirs are manipulated to provide favourable water conditions for wintering and migratory waterfowl. The restoration of Carson Slough to its original wetland status and importance for waterfowl is being considered. Exotic species eradication is being actively undertaken by the Fish and Wildlife Service, Bureau of Land Management and Nevada Department of Wildlife, and includes removal of tamarisk *Tamarix spp.* and other alien plants, exotic fish and feral horses. Over 200 wild horses were removed from the refuge in 1985. Hunting of dove, quail and waterfowl and reservoir fishing of large-mouth bass are allowed on refuge lands, but are strictly controlled under federal and state regulations. There is close cooperation on several resource management issues between the various federal and state agencies involved.

Scientific Research and Facilities A number of significant studies have been conducted or are continuing, including research into the area's geology, groundwater hydrology, botany and relict fish and invertebrate populations. Institutions involved include the US Department of the Interior (Fish and Wildlife Service, Geological Survey, National Park Service) as well as many universities. There are no research facilities located at the refuge.

Principal Reference Material The above information is taken from the 1984 and 1985 Annual Narrative Reports of the Desert National Wildlife Refuge Complex and Agency Review Draft (1986) of the Recovery Plan for the Endangered and Threatened Species of Ash Meadows, prepared by the US Fish and Wildlife Service, Department of the Interior.

Additional references:

- Beatley, J.C. (1976). *Vascular Plants of the Nevada Test Site and Central-Southern Nevada: ecologic and geographic distributions*. US Energy Research and Development Administration. 308 pp.
- Beatley, J.C. (1977). *Endangered Plant Species of the Nevada Test Site, Ash Meadows, and Central-Southern Nevada*. US Energy Research and Development Administration. Contract E(11-1)-2307.
- Sada, D.W. (1984). *Land Protection Plan: Proposed Acquisition to Establish Ash Meadows National Wildlife Refuge, Nye County, Nevada*. US Department of the Interior, US Fish and Wildlife Service, Portland, Oregon. 40 pp.
- Smith, G.R. (1978). Biogeography of intermountain fishes. *Great Basin Naturalist Memoirs* 2:17-42.
- US Fish and Wildlife Service (1980). *Devil's Hole Pupfish Recovery Plan*. Unpubl. report, Portland, Oregon.
- Williams, J.E., Bowman, D.B., Brooks, J.E., Echelle, A.A., Edwards, R.J., Hendrickson, D.A. and Landye, J.J. (1985). *Endangered aquatic ecosystems in North American deserts*

with a list of vanishing fishes of the region. *Journal of the Arizona-Nevada Academy of Science* 20:41-43.

Winograd, I.J. and Thordarson, W. (1975). Hydrogeologic and Hydrochemical Framework, South-Central Great Basin, Nevada-California, with special reference to the Nevada Test Site. US Geol. Survey Prof. paper 712-c. 126 pp.

Edwin B. Forsythe National Wildlife Refuge

Location 39°26'-39°46'N, 74°07'-74°28'W. In south-eastern New Jersey in Atlantic, Burlington and Ocean counties, approximately 96km south-east of Philadelphia and 10km north-west of Atlantic City.

Area 13,080ha; comprising two management units, formerly two separate refuges, Barnegat Division (4,358ha) and Brigantine Division (8,722ha)

Degree of Protection Owned by the Federal Government. The State of New Jersey retains certain rights on most of the tidal area below mean high tide, though primary jurisdiction on refuge tidal lands remains with the federal government. Forsythe NWR was established and renamed in 1984 through the merging of Brigantine NWR (established 1939) and Barnegat NWR (established 1964). The whole area was designated a Ramsar site at the time of ratification on 18 December 1986. Under the Wilderness Act of 1964, 2,704ha (one fifth of the total refuge area) are designated and managed as wilderness, most of which is pristine saltmarsh. The refuge is managed by the Fish and Wildlife Service under the National Wildlife Refuge System.

Site Description The site is located along 29km of coastline and comprises several separate units. It is bounded to the east by the Atlantic Ocean and by several shallow bays, which separate the mainland from offshore barrier beaches and spits: Great Bay, Little Bay, Grassy Bay, Barnegat Bay, Manahawkin Bay and Little Egg Harbour Bay. The coastal plain of New Jersey in this region consists of geologically recent beaches, swamps, dunes and marshes overlying gently sloping to near level unconsolidated beds of sand, gravel, clay and marl. Elevations vary from 2m below to 15m above mean sea level, with an average elevation of 2m. Normal tidal amplitude is about 1.4m. The Mullica River, one of the major drainages in the region, traverses the refuge in Brigantine Division, and a number of smaller rivers flow into the shallow bays just eastward of the mainland refuge boundaries. Regularly and irregularly-flooded saltmarshes and meadows cover about 80% of the refuge (about 10,500ha). The dominant vegetation in these areas is cordgrass *Spartina alterniflora* and/or saltmarsh hay *S. patens*. Bays and tidal flats are the next most extensive features, covering about 1,800ha. The shallow tidal areas contain extensive beds of sea lettuce *Ulva lactuca*, eelgrass *Zostera marina*, and a marine alga, which are important foods for wintering birds, particularly brent geese *Branta bernicla*. Where freshwater exerts an influence, reed grass *Phragmites australis*, cattail *Typha latifolia* and bulrushes *Scirpus* spp. commonly occur. Upland vegetation is primarily pitch pine *Pinus rigida*, blackjack oak *Quercus marilandica*, holly *Ilex opaca*, scrub oak *Q. ilicifolia* and japanese honeysuckle *Lonicera japonica*. Bottomland swamps contain mostly red maple *Acer rubrum* with some Atlantic white cedar *Chamaecyparis thyoides*, sweetbay *Magnolia virginiana* and blackgum *Nyssa sylvatica* with a shrub layer of sweet pepperbush *Clethra alnifolia*, clammy azalea *Rhododendron viscosum* and blueberries *Vaccinium* spp. Parts of the upland areas are

planted with wildlife food plants, cover plants and grasslands. Approximately 650ha of saltmarsh have been dyked off and converted to freshwater impoundments fed by upland runoff and precipitation, and these have had aquatic food plants introduced. The mud flats and tidal channels are rich in invertebrates and are commercially important for clams and oysters in particular. Little Beach Island and Holgate Wilderness Area contain mostly saltmarshes, sandy beaches and dunes, with typical barrier island landforms and vegetation, including *Ammophila breviligulata* and *Myrica pennsylvanica*.

Over 289 species of birds have been observed on the refuge, and at least 200 are common. The main species are ducks, geese and marshbirds, including ten species of heron and 37 wader species. Clapper rails *Rallus longirostris* are abundant in the saltmarshes. There are gull and tern colonies, often extensive, in the sandy areas. About 38 mammals occur, including Eastern cottontail rabbit *Sylvilagus floridanus*, muskrat *Ondatra zibethicus*, racoon *Procyon lotor* and red fox *Vulpes fulva*. Eight amphibian and eleven reptile species inhabit the area, including northern diamondback terrapin *Malaclemys terrapin*, which is prominent here.

International and National Importance Both of the component refuges were originally established for the protection and management of waterfowl in the Atlantic flyway, with special emphasis on brent geese and black duck *Anas rubripes*. Brent geese find their major protection on waterfowl refuges, wintering on a small section of coastline from Massachusetts to South Carolina. They are most abundant along the coast of New Jersey, where wintering populations at Forsythe NWR often swell to over 60,000 birds, nearly one third of the total winter population. Numbers of black duck and greater snow goose *Anser caerulescens atlanticus* at times reach 60,000-70,000 birds. Other important migrants include mallard *Anas platyrhynchos*, gadwall *A. strepera*, American wigeon *A. americana*, common teal *A. crecca carolinensis*, pintail *A. acuta* and Canada goose *Branta canadensis*. The area is also important for breeding waterfowl, including mallard, black duck, gadwall, blue-winged teal *Anas discors* and Canada goose, over 3,000 ducklings being produced annually.

Changes in Ecological Character There are no immediate threats to the refuge itself, but much of the adjacent marshlands and uplands are threatened by burgeoning human development and population growth. These increased development pressures could potentially have significant adverse impacts on both habitat and wildlife value through changes in water and air quality, loss of surrounding habitat and by direct disturbance. The eelgrass beds are nearly completely recovered from the devastating eelgrass blight of the 1930s.

Management Practices Major management practices are directed toward protecting and improving the wetland environment for waterfowl, particularly brent geese and black ducks, but also for other migrating and wintering birds and to maintain existing habitat to benefit rare or endangered plant and animal species. Over 2,700ha are managed as wilderness. Environmental education, wildlife-orientated recreation and scientific research are also primary management objectives. Hunting and trapping are strictly controlled in accordance with state and federal regulations. Other public uses are managed in the refuge, including saltwater fishing, clamming and crabbing, boating and wildlife observation. Open water marsh management by ditching and impounding is practised over large areas of the marshlands for mosquito control purposes, and for the creation of waterfowl habitat. Water levels are manipulated seasonally to form the most favourable conditions. Forest management consists of controlled burning and replanting, particularly with Atlantic white cedar in its historical habitat. Herbicides are used along dykes and impoundments to control weeds, particularly the reed *Phragmites australis*. Pest control

includes water management, biological control and pesticides. Certain grasslands are regularly mowed to promote regrowth for deer and geese, and to improve nesting habitat for waterfowl. Upland areas are planted with perennial grasses to supplement natural food plants.

Scientific Research and Facilities Research studies are encouraged on the refuge and have been conducted on a variety of subjects for many years. Some of the more recent investigations include: survival and habitat use of wintering black duck; areas overgrazed by snow geese; evaluation of open marsh water management and its effect on black duck and other bird populations; mating strategies and larval habitats of the greenhead fly *Tabanus nigrovittatus*; laughing gull *Larus atricilla* behaviour; air quality monitoring; and the effects of groundwater withdrawal.

Principal Reference Material The above information is taken primarily from the 1984 Annual Wildlife Narrative Reports of the Edwin B. Forsythe National Wildlife Refuge (Barnegat and Brigantine Divisions) and Refuge Leaflet 40 of the US Fish and Wildlife Service, Department of the Interior.

Additional information:

Leck, C. (1975). *Birds of New Jersey*. Rutgers University Press, New Brunswick, New Jersey. Pp. 18-39.

Lewis, J.V. and Kummel, H.B. (1915). *The Geology of New Jersey*. Geological Survey of New Jersey, Bull. 14. 146 pp.

Izembek National Wildlife Refuge

Location 55°30'-56°00'N, 162°07'-163°15'W. Near the extreme western tip of the Alaskan Peninsula, approximately 1,000km south-west of Anchorage, between the Northern Pacific Ocean and the Bering Sea.

Area 168,433ha

Degree of Protection Ownership is part federal and part state government. Izembek NWR, established in 1960, is federal-owned, managed by the Fish and Wildlife Service and comprises 128,337ha of mainly terrestrial habitat. All of the site's tidelands, including Izembek Lagoon, cover about 39,000ha, and are owned by the State of Alaska under the Tide and Submerged Lands Act. They were established in 1972 as the Izembek State Game Refuge, jointly managed by the Alaska Departments of Natural Resources and Fish and Game in cooperation with the Fish and Wildlife Service. In 1980, 121,410ha of lands within the NWR were officially designated as wilderness under the Alaska National Interest Lands Conservation Act. The whole area was designated a Ramsar site at the time of ratification on 18 December 1986.

Site Description The site is about 77km long and between 8km and 40km wide, and includes about 130,000ha of upland, the remainder being intertidal areas and coastal lagoons, including Izembek Lagoon, the largest of its type in Alaska. The geology of the area has been much influenced by volcanism, glaciation and marine deposition with rugged volcanic pinnacles rising to 1,800m, and glaciers on the mountainous parts of the refuge. Most of the site is, however,

below 300m in elevation and glacial till covers much of the lowlands. The valleys contain westward-flowing streams which cross a low, rolling tundra area with scattered freshwater lakes and ponds. The shallow, extremely acid tundra soils are susceptible to erosion. Izembek Lagoon is only three to four metres deep, and separated from the Bering Sea by offshore islands and spits of marine origin. Lagoon sediments are mostly sand and clay derived from offshore shelf areas. The area is treeless, with typical subarctic-alpine vegetation in the mountains. On lower slopes and along waterways are alders *Alnus crispa* and sparse growths of willows *Salix* spp. The glacial outwash and coastal plains are dominated by a mixture of low ericaceous shrubs and graminoid tundra, including crowberry *Empetrum nigrum*, mountain cranberry *Vaccinium vitis-idaea*, bluejoint grass *Calamagrostis canadensis*, cottongrass *Eriophorum scheuchzeri*, arctic willow and other willows; reindeer mosses *Cladonia* spp. and several species of *Sphagnum* moss. Wet meadows and marshes are dominated by beach ryegrass *Elymus arenaria*. Sedges *Carex* spp. border the lagoon. About 87% of the terrestrial habitat is characterised as wetlands, comprising 81,000ha of moist tundra, 9,000ha of wet sedge and grass marsh and 24,300ha of pond, lake and riverine areas. An estimated 53% of Izembek Lagoon is vegetated with eelgrass *Zostera marina*, making it one of the largest eelgrass beds in the world. At least 142 species of bird and 23 of mammal are reported to be residents or migrants of the site, including large numbers of waterfowl and waders.

International and National Importance Izembek Lagoon and its vast eelgrass beds are of international importance to migratory birds, being the primary food of many geese and ducks. The site is particularly critical as a last staging post for many species of waterfowl and wader which make trans-oceanic flights to winter on the Pacific coast of the USA or on islands further south; the area is used by birds that nest and/or winter in countries along the Pacific Rim including the Soviet Union, Canada, Japan, Australia and Mexico, as well as the United States. The lagoon supports nearly the entire North American population of black brent goose *Branta bernicla nigricans* during spring and autumn migrations. In some years, substantial numbers (over 10,000) may overwinter in the lagoon. Additionally, tens of thousands of Taverner's Canada goose *B. canadensis taverneri* and emperor goose *Anser canagicus* migrate through the area, with moderate numbers of the latter overwintering. Tundra swan *Cygnus columbianus* are a key nesting waterfowl species on the refuge. Migrant populations of up to 300,000 dabbling ducks at a time use the area in spring and autumn migration periods: the most abundant ducks are pintail *Anas acuta* and mallard *A. platyrhynchos*. Others occurring in fairly large numbers include gadwall *A. strepera*, common teal *A. crecca* and American wigeon *A. americana*. Wintering populations of Steller's eider *Polysticta stelleri* may approach 100,000 birds on Izembek and adjacent lagoons, a major portion of the population of this species. Other sea ducks wintering in abundance here are long-tailed duck *Clangula hyemalis*, bufflehead *Bucephala albeola*, common goldeneye *B. clangula*, greater scaup *Aythya marila*, common eider *Somateria mollissima*, king eider *S. spectabilis*, black-winged scoter *Melanitta nigra* and white-winged scoter *M. fusca*.

Important upland species include Alaskan brown bear *Ursus arctos*, barren ground caribou *Rangifer tarandus*, wolverine *Gulo gulo*, mink *Mustela vison*, willow ptarmigan *Lagopus lagopus*, river otter *Lutra canadensis* and grey wolf *Canis lupus*. Bald eagle *Haliaeetus leucocephalus* and peregrine falcon *Falco peregrinus pealei* are year-round residents. The sand spits and barrier island beaches surrounding Izembek lagoon are haulout sites for harbor seals *Phoca vitulina* with up to 5,000 present at one time. An estimated 500-1,000 sea otters *Enhydra lutris* and 100 Steller's sea lions *Eumetopias jubatus* frequent the lagoon and nearby offshore areas for feeding and resting. Four species of pacific salmon *Oncorhynchus* spp. including

sockeye, chinook, pink salmon and chum, enter the Pacific Ocean to spawn. Dolly Varden trout *Salvelinus malma* and rainbow trout *Salmo gairdneri* also inhabit many of the streams and lakes. A minimum of 39 species of fish use the area as migratory, spawning or nursery habitat.

Changes in Ecological Character The area surrounding Cold Bay (refuge headquarters) was badly abused during World War Two and many land scars are still in evidence. The remainder of the refuge is wilderness or relatively undisturbed except for some access roads. Hunting is the most common recreational use of the refuge, particularly waterfowl hunting around the lagoons and upland hunting of caribou and brown bear. Direct threats to the resources of Izembek Lagoon are generally not imminent and of low intensity. Recently there has been a substantial increase in petroleum development activities in adjacent offshore areas. The possibility of a major oil spill entering the lagoon or the construction of oil pipelines and support facilities in the area are viewed as potential threats. The Alaska Department of Natural Resources has closed Izembek lagoon to oil and gas leasing in order to protect its wildlife resources and ecological values. Aircraft overflights, primarily helicopters associated with offshore petroleum activities, are a potential threat to staging and wintering waterfowl.

Management Practices Management is directed towards the preservation of the natural environment for all native species of wildlife. Most of the area is managed by the Fish and Wildlife Service as a wilderness area. Hunting, fishing and trapping are allowable uses, but strictly controlled under state and federal regulations. Wildlife habitats are generally not manipulated. Except for erosion control, road maintenance and landscaping at refuge headquarters in Cold Bay, no land management is foreseen.

Scientific Research and Facilities Most research is carried out from refuge headquarters in Cold Bay. Ongoing projects include individual studies on seasonal movements, distribution and productivity of brown bear, caribou, black brent geese, emperor geese, tundra swan, steller's eider and other species. Researchers from the Institute of Marine Science of the University of Alaska have carried out studies since 1963 on the dynamics of the eelgrass beds in Izembek lagoon and other aspects of the ecology of the estuary.

Principal Reference Material Most of the above information is taken from the 1983 and 1984 Annual Narrative Reports and 1969 Master Plan of Izembek National Wildlife Refuge, Cold Bay, Alaska, prepared by the US Fish and Wildlife Service, US Department of the Interior.

Additional information from:

- Alaska Department of Fish and Game (1982).** Alaska Dept. of Fish and Game Special Areas Program Document. Habitat Division, Alaska Dept. of Fish and Game. Anchorage, Alaska. 17 pp.
- Barsdate, R.J., Nebert, M. and McRoy, C.P. (1974).** Lagoon contributions to sediments and water and the Bering Sea. *Proc. of the Int. Symp. on Oceanography of the Bering Sea*. 34 pp.
- Frost, K.J., Lowry, L.F. and Burns J.J. (1982).** Distribution of marine mammals in the coastal zone of the Bering Sea during summer and autumn. Final report, Research Unit #613. Contract #NA 81 RAC 000 50. 188 pp.
- McKinney, F. (1958).** Waterfowl at Cold Bay, Alaska, with notes on the display of the black scoter. *Wildfowl Trust Annu. Rep.* 10: 133-140.
- McKinney, F. (1965).** The spring behaviour of wild Steller's eiders. *Condor* 67:273-290.

- McRoy, C.P. (1966).** The standing stock and ecology of eelgrass *Zostera marina* in Izembek Lagoon, Alaska. Unpubl. M.Sc. Thesis, Univ. of Washington. 138 pp.
- McRoy, C.P. (1970).** Standing stocks and other features of eelgrass *Zostera marina* populations on the coast of Alaska. *J. Fish Res. Bd. of Canada* 27:1811-1821.
- US Dept of the Interior. (1985).** The Bristol Bay regional management plan and final environmental impact statement Volume I. Bristol Bay Study Group and the Alaska Land Use Council. Anchorage, Alaska. 411 pp.

Okefenokee National Wildlife Refuge

Location 30°36'-31°02'N, 82°09'-82°31'W. In the south-east of the state of Georgia in Ware, Charlton and Clinch counties, extending a short distance into Baker County in north-eastern Florida. The northern boundary is about 19km south of Waycross, Georgia, and the eastern boundary about 64km north-west of Jacksonville, Florida.

Area 159,889ha

Degree of Protection The whole area is owned by the federal government. It was established by Executive Order in 1937 and is managed under the National Wildlife Refuge System by the Fish and Wildlife Service. The Okefenokee Wilderness Act of 1974 designated 143,260ha (nearly 90% of the refuge) as a wilderness area. The whole refuge is protected by numerous legislative acts. The refuge was designated as a Ramsar site at the time of ratification on 18 December 1986.

Site Description The site is a vast low-lying natural wilderness area dominated by the peat bog swamp forests of Okefenokee Swamp, the second largest wetland in the United States. This swamp covers about 177,260ha, of which nearly 85% is within the refuge boundaries. It occupies a huge saucer-shaped depression considered to have once been part of the ocean floor. The upland margin of the swamp varies in elevation from 39m on the north-east side to 32m above sea level on the south-west edge. The swamp is within the drainage divide between the Atlantic Ocean and the Gulf of Mexico. Inflows consist of several short streams which enter on the north-west side and drainage is sluggish towards the two outlets, the Suwannee River which is the larger and flows towards the Gulf of Mexico and St Mary's River, which flows into the Atlantic Ocean. Okefenokee is a mosaic of dense swamps, freshwater marshes, small lakes and ponds, upland islands and upland forests. Eight major habitat types and 20 plant communities have been identified, and about 94% of the refuge is classified as wetland. Approximately 80% of its area is swamp forest of bald cypress *Taxodium distichum*, pond cypress *T. ascendens*, black gum *Nyssa sylvatica*, loblolly bay *Gordonia lasianthus*, swamp bay *Persea palustris* and sweet bay *Magnolia virginiana*. Freshwater marshes, known locally as "prairies", are extensive shallow areas 0.3-1m deep of open water with areas of luxurious aquatic plants. Characteristic plants include white water lily *Nymphaea odorata*, bladderworts *Utricularia* spp., golden club *Orontium aquaticum*, maiden cane *Panicum hemitomon*, Virginia chain-fern *Woodwardia virginica*, yellow pond lily *Nuphar luteum*, floating heart *Nymphoides aquatica* and various species of grasses and sedges. Scattered throughout the prairies are tree islands which are similar in floristic composition to the swamp vegetation and often contain thick beds of *Sphagnum* mosses and carnivorous plants. There are about 60 small lakes and ponds, generally less than

100m wide, which have areas of open water or contain floating plants and are bordered by dense swamp underbrush. About 50 sandy islands are present, totalling some 6,685ha and these are dominated by longleaf pine *Pinus palustris* and slash pine *P. elliotii*. Upland pine forests adjacent to the swamplands cover about 6,155ha, and consist mostly of longleaf and slash pine, loblolly pine *P. taeda*, pond pine *P. serotina*, sweet gum *Liquidambar styraciflua* and several oaks *Quercus* spp. Understory plants include grasses, saw palmetto *Serenoa repens* and several species of ericaceous shrubs. The swamp and surrounding pinelands are a fire-dependent ecosystem in which wild fires have historically preserved the unique mosaic of plant communities. The variety of habitats supports a high diversity and abundance of typical coastal plain vertebrates, including 233 species of birds, 48 mammals, 66 reptiles, 37 amphibians and 36 fish. Black bear *Euarctos americanus* and white-tailed deer *Odocoileus virginianus* both have fairly large, stable populations.

International and National Importance Okefenokee has particular value as a refuge for rare or endangered animals and plants. Residents protected under the U.S. Endangered Species Act are American alligator *Alligator mississippiensis* (one of the largest concentrations in the US, estimated at 12,000 individuals), Florida panther *Felis concolor coryi* (very rarely sighted), eastern indigo snake *Drymarchon corais couperi* and red-cockaded woodpecker *Picoides borealis*. Migrant federally-protected species that visit the refuge on a regular or infrequent basis include Bachman's warbler *Vermivora bachmanii*, bald eagle *Haliaeetus leucocephalus* and wood stork *Mycteria americana*. One of the last strongholds of the ivory-billed woodpecker *Campephilus principalis* was Okefenokee swamp, but no confirmed sighting has been made here since the 1930s. Okefenokee was formerly of considerable importance as a wintering area for migratory waterfowl, even though the area is not within the major Atlantic flyway. Habitat change from open, grassy marshes to dense swamp shrublands may have contributed to its decline in significance. Peak wintering populations are estimated at 8,000-10,000 birds, with wood ducks *Aix sponsa* predominating and good numbers of mallard *Anas platyrhynchos*, ring-necked duck *Aythya collaris* and common teal *Anas crecca*. Common residents include white ibis *Eudocimus albus*, great white egret *Egretta alba*, sandhill crane *Grus canadensis*, anhinga *Anhinga anhinga* and great blue heron *Ardea herodias*.

Changes in Ecological Character There is a potential threat from adjacent commercial timber lands where felling results in increased flows of water into the swamp which may carry pesticides, herbicides or other chemical pollutants. In the future there could also be air pollution from urban areas or disturbance from low flying aircraft, but these impacts have not been investigated. Unfavourable changes in habitat could result from fire suppression activities in the area, though in general, fire management has been used to improve and maintain favourable wildlife habitat.

Management Practices The wilderness area of the refuge is a sanctuary for plant and animal communities indigenous to the swamp, and is managed in accordance with the Fish and Wildlife Service National Wildlife Refuge System policies. Public use is permitted within the area, and consists primarily of limited duration camping at designated camp sites, canoeing and boating along designated routes, wildlife observation, photography and fishing. There is emphasis on using the area as an outdoor classroom for students at all levels. Public access is limited to four points. Lands outside the wilderness area include 6,155ha of pine forests, where management includes prescribed burning to enhance pine forest upland habitat for the red-cockaded woodpecker and eastern indigo snake. Future management may include manipulation of water levels in conjunction with prescribed burning within the Okefenokee Swamp in an effort to perpetuate

the numerous unique vegetation characteristics of the refuge; research is being done to investigate these possibilities.

Scientific Research and Facilities The University of Georgia has been involved in studies for over 12 years, and is currently investigating the feasibility of establishing a permanent research station on the refuge. Its Institute of Ecology is involved in a long-term study of the swamp's ecosystem to develop a basic knowledge of interspecies relationships and hydrology which will help in the assessment of long-term effects of natural and human disturbance. Other institutions have made short-term studies of endangered species, vegetation and geology.

Principal Reference Material The above information is taken largely from the 1984 Annual Narrative Report of the Okefenokee National Wildlife Refuge prepared by the Fish and Wildlife Service, US Department of the Interior.

Additional references:

Cohen, A.D., Casagrande, J.D., Andreko, M.J. and Best, G.R. (1984). *The Okefenokee Swamp: its Natural History, Geology and Geochemistry*. Wetlands Surveys, Los Alamos, New Mexico.

Cypert, E. (1961). The effects of fires in the Okefenokee Swamp in 1954 and 1955. *American Midland Naturalist* 66(2):485-503.

Harper, R.M. (1909). Okefenokee Swamp. *Popular Science Monthly* 74: 596-614.

Wright, A.H. and Wright, A.A. (1932). The habitats and composition of the vegetation of Okefenokee Swamp, Georgia. *Ecol. Monogr.* 2:109-232.

Everglades

Location 24°50'-25°55'N, 80°20'-81°30'W. Situated on the southern tip of the Florida peninsula in Dade, Collier and Monroe counties, approximately 72km south-west of Miami. Park headquarters is located 17km south-west of Homestead, Florida.

Area 566,143ha

Degree of Protection Everglades National Park was authorised by Congress in May 1934 but not designated until 1947. Nearly all land is in Federal ownership. As of May 1987 all in-holdings within the park have either been acquired or are pending condemnation proceedings, except for a 2.35ha tract owned by the Boy Scouts of America. Outstanding mineral, oil and gas rights still apply to 26,397ha of Federal lands within the park and have not yet been acquired. National Park Service employees have legal authority, both State and Federal, to enforce regulations within the park. The approximately 200 people residing within the area are directly related to providing essential services, either as Federal employees or as staff of the park concessioner. A 1.24ha site along the park's northern boundary is retained by the Miccosukee Tribe of Florida Indians for community development purposes under the terms of a special-use permit. Direct access to the park is provided to the general public by a State road system linking all four districts. Water craft access is also provided through a system of marked and patrolled waterways. Strict natural and managed natural zones have been identified. 93% of the park is federally designated as wilderness. A series of designated preservation zones by Metropolitan

Dade County protect the park's east boundary from encroaching urbanization. Big Cypress National Preserve sits on the northwest boundary. Designated as a Biosphere reserve, June 1976; Accepted as a World Heritage Site in 1979 and added to the Ramsar list on 4 June 1987.

Site Description Everglades National Park is a shallow basin, tilted to the south-west, and underlain by extensive deposits of Pleistocene limestone consisting of oolitic and bryozoan facies, the latter predominant in the basement rock. These two components of the park's geologic foundations are of inorganic and organic origin, respectively. *Schizoporella floridana*, a multi-laminate bryozoan, is largely responsible for the production of that portion of the Miami limestone underlying the park. While peninsular Florida is geologically young, it is among the more stable portions of the continent, having undergone no significant structural change for many years. Temperatures are moderate, rarely freezing in winter, and reaching 23-35°C in summer, with annual precipitation often over 1270mm. Geographically, the Everglades are temperate, but biologically they are strikingly similar to the subtropical West Indies, having attracted hundreds of colonial forms. Many of the plant and animal species present are at the limit of their ranges. The biota has great variety and a mixture of rare and abundant life forms. Complexity, diversity, high numbers of species, and low entropy, generally indicators of environmental stability, further characterise the park.

Several factors are significant determinants of the vegetative composition, such as: naturally-caused fires, slight elevations or depressions in topography and water. The latter is perhaps the most important. The area often receives in excess of 1520mm of annual precipitation and has, from prehistorical time, received periodic overflows from Lake Okeechobee and its watershed to the north. The nature of the substrate has, in turn, had important effects on the water regime of the park. The ordinarily highly porous limestone is overlain with variable thicknesses of marl and peat which minimise water loss through seepage. Other elements altering the vegetative composition of the park include: inland penetration of sea water as a result of lowered water tables and canalisation, hurricanes, and the proliferation of exotic species such as Australian pine *Casuarina* and wild tamarind *Lysiloma latisilquum*. The park's great floral variety is one of the key reasons for its establishment. Among the more prominent and colourful plants are bromeliads and epiphytic orchids. As many as 25 orchid varieties are known to occur. There are over 1,000 kinds of seed-bearing plants and nearly 120 species of trees, both tropical (palms, gumbo limbo *Bursera simarouba*, and mangroves *Rhizophora mangle*, *Avicennia nitida*) and temperate (ash, mulberry and oaks). Even plants ordinarily associated with hot and arid deserts, such as cactus, yucca, *Agave* sp., or century plants, thrive in certain parts of the park. Woody and herbaceous vines are significant elements in the forest understory. Over 60 species encountered are endemic to south Florida. As the only large, totally preserved area in Florida, Everglades National Park may well be their ultimate refuge.

Within the park there are five discreet vegetative types: hammocks are tree islands that are generally composed of mature, mixed hardwoods; bayheads are tree islands generally consisting of isolated stands of specific species, such as bald cypress *Taxodium distichum* or willow *Salix caroliniana*; pinelands, consisting predominantly of a relict stand of south Florida slash pine, occupy elevated outcroppings of the Miami limestone; the coastal mangrove area, composed largely of black, red, or white mangrove or mixtures thereof, is one of the largest mangrove forests in the world; sawgrass *Claudium jamaicensis*, actually a sedge, covers extensive lowland prairies to the north and east. Hammocks, bayheads and pineland areas are generally elevated, or otherwise vary sufficiently from the datum plane, to be insulated from the effects of flooding and protected from fire. Bayheads, consisting predominantly of one or two species, occupy

either slight elevations or depressions (e.g. bay trees generally predominate in elevated deposits of peat and cypress trees in shallow ponds). Mangrove and sawgrass areas are periodically or perennially inundated by shallow water.

In addition to the terrestrial systems, there are at least four distinctively different aquatic community types within the park: inland fresh water areas, consisting of broad, shallow, grassy rivers, small scattered ponds and alligator holes; brackish water or estuarine areas where fresh and salt water merge; shallow shoreline and offshore embayments; and deeper gulf coastal waters. Fresh water and marine fishes and invertebrates abound in these areas. In addition, the area of transition from glade to mangrove - fresh to salt water - is an incredibly rich and productive zone, incubating great numbers of life forms. Florida Bay includes some 2,000 sq.km of very shallow embayment overlaying unconsolidated calcareous sediment on the surface of the oolitic facies of the Miami limestone. Its maximum depth varies from 8 to 9 feet and its average depth is 4 to 5 feet. The bottom is irregular, consisting of anastomosing mudbanks on some of which mangroves and other brackish water plants have pioneered to form small keys or islands.

The Everglades are home to about 25 species of terrestrial and two species of aquatic mammals, including the Florida variety of white-tailed deer *Odocoileus virginatus*, black bear *Ursus americanus floridanus*, Florida panther *Felis concolor coryi*, opossum *Didelphis virginina*, raccoon *Procyon lotor*, wild cat *Felis Rufus*, otter *Lutra canadensis*, porpoise *Phocoena phococena* and manatee *Trichechus manatus latirostris*. With the exception of one or two species of bats, all of the terrestrial mammals are of North American origin. Everglades is probably best known for its varied displays of bird life. Over 300 species of birds have been recorded in the park. One of the chief reasons for establishment of the park was the growing concern that rookeries of herons, ibis and other wading birds would be protected from commercial exploitation and other human impacts. Except for the crocodile and a few kinds of small frogs and lizards from the West Indies, the reptiles and amphibians reached the region by coming south from the continental mainland. Many species failed to penetrate as far south as south Florida, which has fewer representatives of these groups than do many other places in the south-eastern United States. The known fauna of the park includes three or four species of salamanders, six species of lizards, ten species of land and freshwater turtles and several kinds of sea turtles, 12 species of frogs and 23 species of snakes. Worthy of mention are loggerhead *Caretta caretta*, hawksbill *Eretmochelys imbricata* and green turtles *Chelonia mydas*; indigo snake *Drymarchon corais couperi*; American alligator *Alligator mississippiensis*; and American crocodile *Crocodylus acutus*.

International and National Importance Everglades National Park was designated an international biosphere reserve on 26 October 1976 and a World Heritage site on 26 October 1979, becoming the eighth area in the world to receive dual designation. A portion of the park, north-east Florida Bay, has been designated as Critical Habitat for two endangered species, the American crocodile and West Indian manatee.

The park's location in south Florida makes it a crossroads of migratory flight for West Indian and Central and South American birds, and the majority of the North American species of wading birds, shore birds and waterfowl are found here at one season or another. Many of the North American species are nesting residents, including some that seldom range farther north and others that have disappeared from other areas where they once occurred. One of the main reasons for the establishment of the park was to protect the nesting areas and feeding grounds of herons

and ibis including roseate spoonbill *Ajaia ajaja*, great white heron *Ardea herodias occidentalis*, reddish *Egretta rufescens*, great white *E. alba* and snowy egrets *E. thula*, louisiana *E. tricolor* and little blue herons *E. caerulea*, wood stork (wood 'ibis') *Mycteria americana* and white *Eudocimus albus* and glossy ibis *Plegadis falcinellus*. Other birds dependent on the park for permanent or seasonal refuge are sandhill crane *Grus canadensis*, limpkin *Aramus guarauna*, American darter *Anhinga anhinga*, cormorant *Phalacrocorax auritus*, brown *Pelecanus occidentalis* and white pelicans *P. erythrorhynchos* and frigate-bird (man-o-war bird) *Fregata magnificens*.

The park is a major public use area, with over three-quarters of a million visitors a year. Use of the Everglades, probably more so than any other park in the United States, is devoted to natural history interpretation, environmental education and limited wilderness exploration. Interpretative activities, offered by sensitive and highly skilled employees, offer visitors highly participatory activities through which they can come to understand and appreciate the fragility and complexity of the Everglades. Over 35,000 local schoolchildren each year participate in environmental education programmes, within and beyond the park boundary.

Changes in Ecological Character What was once a natural overland sheet flow of water into Everglades National Park has been altered. Lake Okeechobee, 90 miles north of the park, is the wellspring for this life-giving flow. To prevent flooding, levees were erected and canals dug to provide safe rapid run-off in the event of hurricane and for draining rich "muck-lands" south of the lake. Overland flow was further disrupted with the construction of the Tamiami Trail, a major east-west public transportation artery. Water now enters the park through point sources - four control structures - which act basically as water gates. During a severe drought in the early 1960s, water was stopped from entering the park in order to ensure sufficient quantity for the urban areas. This precipitated large-scale die-offs of park animals, which caused widespread and deep concern among many varied groups and individuals. The aftermath of these disastrous years was Public Law 91-282, authorising a minimum water delivery into the park and a provision for assuring good water quality of those delivered waters. With Congress having authorised minimum water deliveries through the control structures, the preservation of the Big Cypress watershed now assured, and the State acting to protect the east boundary buffer zone, the essential sources of water are reasonably secure. Assuring a water supply, however, does not mean conditions have returned to a natural state. Water now enters at an altered rate, quality, and time of flow. Because biological cycles of many species correlate directly with water cycles or hydro-periods, some species have shown a decline over the years. Even Florida Bay and mangrove estuaries are affected by the altered and reduced freshwater column, mixing in their saline waters. There has been a decline in some fish species over the last few years, and increased salinity may be a factor.

Management Practices Management of the park is directed toward the following objectives. To ensure that all existing and planned facilities and uses within the park will have as little adverse effect upon the water flow and the natural environmental quality as possible and to regulate use as necessary to protect park resources and the visitor. To establish and maintain cooperative efforts with other federal, state, and local agencies to control outside influences that may adversely affect the preservation of flora, fauna and other natural resources. To manage the park as an undeveloped natural area with only minimal facilities (including concessions) required for the health, safety and edification of park visitors. To secure, through research and other means, sufficient information to facilitate the development of informed resource management programmes for preservation of the park's native terrestrial and aquatic resources. To

promote and coordinate cooperative regional resource planning, protection, and management with priority given to quantity, quality, distribution and periodicity of a reasonable water supply. To the greatest degree possible, to perpetuate, free from the adverse effects of human disturbance, the park's diverse habitats and their associated plant, animal and fish communities. To control exotic plant and animal species when necessary, to prevent disruption to native communities. To manage the use of fire and other natural forces in resource management programmes, to perpetuate a viable and dynamic native ecosystem. To protect and promote recovery of all officially endangered or threatened animal and plant species within the park. To manage critical habitats to achieve an optimum ecological balance that ensures survival of all native species. To provide information essential for the safe and enjoyable utilisation of the park's resources and visitor facilities. To emphasise, through interpretation, the complex nature of the Everglades/Big Cypress ecosystems, acquainting visitors with their major living and non-living components and interrelationships. To introduce, through appropriate interpretive media, the concepts of nature as a process of dynamic equilibrium and man as a powerful biological force responsible for the acceleration of change in the natural systems of South Florida. To develop an understanding that complexity, high numbers of species and individuals, and low entropy are generally indicators of environmental stability and good health, emphasising the significant contrasts between natural diversity within the park and the tendency towards *synthetic uniformity* in the agricultural/urban complex beyond its boundaries. To implement a comprehensive environmental education programme designed to develop strong, positive environmental ties in the large student/teacher populations of neighbouring counties. There are 99 permanent full-time, 45 permanent part-time and 100 seasonal staff.

Scientific Research and Facilities The park has on site the South Florida Research Center (SFRC) which conducts research on the Everglades ecosystem. Other researchers conduct research on specific environmental issues, utilising park collection permits. A dormitory for visiting researchers was planned for construction in 1987. The research programme includes hydrology, wildlife, marine and plant ecology.

Principal Reference Material The above information has been supplied by the United States government.

Chesapeake Bay

Location 38°00'N, 76°20'W (centre of the bay system). The Bay is a large-scale feature on the eastern coast of the United States, its longitudinal axis being approximately 314km long. It is long and rectangular in shape, curving slightly westward from the southern Atlantic coast entrance, between Cape Charles and Cape Henry in Virginia, northward to a point near where the Susquehanna River enters the Bay. Several large cities are located on the Bay, including Baltimore, Maryland, on the western shore and Norfolk, Virginia, which, with several inter-cities, is near the southern terminus. Washington, DC, and Richmond, Virginia, are located on two major tributaries, the Potomac and James rivers, respectively.

Area 45,000ha (approximately). Five areas are administered by the U.S. Fish and Wildlife Service: Eastern Neck National Wildlife Refuge (418ha), Blackwater NWR (4,234ha), Martin NWR (1,782ha), Presquile NWR (416ha), Mason Neck NWR (146ha). Eight areas are admin-

istered by the Virginia Commision (Game and Inland Fisheries: Saxis Wildlife Management Area (2,135ha), Ragged Island WMA (622ha), Chickahominy WMA (162ha), Hog Island Wildlife Refuge (461ha), Pettigrew WMA (33ha), Lands End Refuge (30ha), Game Farm Marsh (174ha), and Kittewan Refuge (101ha). Three sites are adminstered by the College of William and Mary and Virginia Institute of Marine Science, Goodwin Island Complex (261ha), Oak Island (20ha), and Man-Made Marsh (0.1ha). Eight sites are administered by the Virginia Department of Conservation and Natural Resources: Mason Neck State Park (81ha), Chippokes Plantation SP (130ha), York River SP (101ha), Leesylvania SP (6ha), Westmoreland SP (33ha), Seashore SP (518ha), Caledon Natural Area (73ha), Parker's Marsh Natural Area (275ha). All the Maryland State Areas listed below are administered by the Department of Natural Resources' Forest, Parks and Wildlife Service: Pocomoke Sound Wildlife Management Area (790ha), Cedar Island WMA (1,166ha), James Island State Park (1,275ha), Fairmount WMA (1,571ha), Deal Island WMA (6,151ha), Ellis Bay WMA (847ha), Fishing Bay WMA (7,110ha), Taylor Island WMA (2,013ha), Lecompte WMA (196ha), Linkwood WMA (127ha), Idylwild WMA (1,330ha), Pocomoke River WMA (204ha), Wye Island Natural Resources Management area (1,416ha), Severn River Natural Environment Area (654ha), Millington WMA (1,756ha), Merkle WMA (660ha), Bowen WMA (127ha), Myrtle Grove NEA (336ha), Mattawoman NEA (1,239ha), Zeklah NEA (2,023ha), South Marsh Island WMA (1,214ha). Nine additional smaller (under 300ha) WMAs contain extra wetland acreages.

Degree of Protection Management of this large, natural estuarine complex involves a network of protective agencies, laws and regulations. The waters of the Bay are directly controlled by the states of Maryland and Virginia, with certain navigational aspects regulated by the US federal government. Federal, state and local jurisdiction owned wetland areas are usually actively managed for the primary purpose of protecting the living resources therein. Included in this category of listed government-controlled wetlands, are US-FWS National Wildlife Refuges (numbering five in the Bay area proper, with a total wetland area of 6,996ha), and various types of state-managed wildlife and other conservation areas and parks. These managed areas comprise the Chesapeake Bay Wetlands System listing, added to the Ramsar list on 4 June 1987. A special category in the two states is the Chesapeake Bay National Estuarine Research Reserve System, a proposed large expansion of the old National Oceanic Atmospheric Administration (NOAA) Estuarine Sanctuary Program, which until now consisted of just one Maryland site (1,335ha at Monie Bay). Ten to twenty additional sites in Maryland and Virginia will soon be added to this system. In addition to state areas, an undetermined number of county, city or town and small locality-owned restricted parks and areas, serve in effect as wetland protection areas where appropriately situated, but are not included in the listing. An additional category where habitat protection, for a somewhat different reason, ranks high is that of US military bases. About 26 of these installations are located in the area, and while not included in the listing, merit consideration. Totals of 5,762ha of wetlands in four major army bases, and approximately 3,907ha of wetland on a wide range of smaller navy bases, have been provided by military authorities. All the bases restrict public access, usage and development virtually completely for security reasons, and thus the lands are conserved in effect for living natural resources. Some of the bases maintain and operate wetland management plans. In 1984 the US Department of Defence signed a Memorandum of Understanding with the Environmental Protection Agency (EPA) Chesapeake Bay Program, under which its resources and some funding were pledged to restore and protect living Bay resources.

Wetland holdings of The Nature Conservancy in the Bay proper total 1,974ha, with several hundred additional hectares protected through easements, deed restrictions or similar agreements

with private landholders. The Chesapeake Bay Foundation owns 518ha, including two parts of two mid-Bay islands important to waterfowl. The protected islands and wetlands on the Atlantic Ocean side of the Lower Delmarva Peninsula are owned and managed largely for waterfowl protection by The Nature Conservancy. Although not technically part of the Bay Wetlands System, they are so close geographically and serve identical functions as waterfowl habitat to those on the Bay (western) side of the Peninsula that they are worth consideration as part of a greater Bay Wetlands System. Their area is 12,816ha. Also on the Ocean side of the Delmarva Peninsula are the US-FWS Chicoteague National Wildlife Refuge's wetland holdings, including the NOAA-NASA property at Wallops Island (3,559ha). The US-FWS has 1,458ha near Norfolk, fronting the ocean at Back Bay Refuge.

Site Description The Chesapeake Bay Wetlands System and area has as its westward boundary the transition between the Piedmont Plateau and Coastal Plain geological provinces. Therefore, by this delineation all Chesapeake Bay wetlands under consideration fall within the Coastal Plain, a relatively level, low (maximum elevation 91m) land area underlain by loose unconsolidated beds of clay or mineable sands and gravels near present rivers and streams. The sediments are originally derived from the igneous and metamorphic, often crystalline, rocks of the Piedmont Plateau, and other, more western and northern geological provinces. The soils overlying the Coastal Plain sediments have highly variable drainage characteristics. Extensive liming is often needed to neutralise their naturally acidic condition.

In geological terms the Bay System is young. Glaciers covering the northern North American continent began their most recent retreat approximately one million years ago, resulting in gradual sea level rise which eventually "flooded" the Bay area. The ancient Susquehanna River valley, and those of other tributary valleys, began to fill about 100,000 years ago. This resulted in the present dendritic system of shallow basins so favourable to wetland formation, which now form the Bay proper and its vast estuarine marshlands. The major rivers forming and "feeding" (with nutrients and freshwater) the main components of this estuarine wetland complex are: the Susquehanna, Potomac, Patuxent, Rappahannock, York and James on the western side of the Bay (these rivers supply about 90% of the freshwater input) and the Chester, Choptank, Nanticoke and Pocomoke rivers on the "eastern shore" side. The most sluggish eastern shore rivers are where the largest wetland expanses are located, particularly in the lower reaches.

Major habitats of the Bay include: typical vegetated wetland, sand beaches, mud flats and open water (which can contain valuable shallow-water submerged aquatic vegetation (SAV) habitat, useful to waterfowl and small invertebrates and fishes), upland fields, brushlands and woodlands. Agriculture is actively undertaken in the entire Coastal Plain region, more intensively in the eastern shore region than in the rapidly-developing western shore area. The principal emergent plants of the Chesapeake Wetlands are (from more saline to less, more flooded to higher elevations): smooth cordgrass *Spartina alterniflora*, meadow cordgrass *S. patens*, spikegrass *Distichlis spicata*, marsh elder *Iva frutescens*, groundsel bush *Baccharis halimifolia*, needle rush *Juncus roemerianus*, big cordgrass *Spartina cynosuroides*, switchgrass *Panicum virgatum*, threesquare *Scirpus* spp., cattail *Typha* spp., rosemallow *Hibiscus* spp., common reed *Phragmites australis*, wild rice *Zizania aquatica*, sweet flag *Acorus calamus*, pickerel weed/arrow arum *Pontederia cordata*/*Peltandra virginica*, spatterdock *Nuphar advena*, smartweed/rice cutgrass *Polygonum* spp./*Leersia oryzoides*, swamp rose *Rosa palustris*, smooth alder/black willow *Alnus serrulata*/*Salix nigra*, red maple/ash *Acer rubrum*/*Fraxinus* spp., bald cypress *Taxodium distichum* and loblolly pine *Pinus taeda*. Other, more upland tree species include sweet gum *Liquidambar styraciflua*, American holly *Ilex opaca* and various oaks *Quercus* spp.

and maples *Acer* spp. In addition, the understory of the shrub-scrub palustrine higher wetland regions often contains woody vines, such as greenbrier *Smilax* spp., poison ivy *Toxicodendron radicans*, Virginia creeper *Parthenocissus* spp., Japanese honeysuckle *Lonicera japonica* and trumpet creeper *Campsis radicans*. The principal SAV plants of Chesapeake Bay (from more saline to less saline waters) are: eelgrass *Zostera marina*, widgeon grass *Ruppia maritima*, redhead grass *Potamogeton perfoliatus*, Eurasian watermilfoil *Myriophyllum spicatum*, sago pondweed *Potamogeton pectinatus*, horned pondweed *Zannichellia palustris*, common waterweed *Elodea canadensis*, coontail *Ceratophyllum demersum*, musk grass *Chara* spp., southern naiad *Najas guadalupensis*, wild celery *Vallisneria americana*, water stargrass *Heteranthera dubia* and the recent invading exotic hydrilla *Hydrilla verticillata*.

Familiar, important mammals include white-tailed deer *Odocoileus gymnotis*, red fox *Vulpes vulpes*, grey squirrel *Sciuridae griseus*, opossum *Didelphis virginiana* (all in or near wetland-upland margins) and beaver *Aplodontia rufa*, otter *Lutra canadensis*, muskrat *Ondatra zibethicus* and marsh rabbit *Sylvilagus palustris* of the wetland proper.

International and National Importance Chesapeake wetlands have traditionally been a major region within the Atlantic migratory waterfowl flyway. Although total numbers of birds in the flyway are down, the Chesapeake region has maintained about the same proportion of flyway birds over the last 30 years as ducks, geese and swans breeding in the prairies and tundras of northern North America continue to make the Bay region a very important overwintering or stopping area. Some species changes have occurred over this 30-year period. In 1954, for example, diving ducks, such as canvasback *Aythya valisineria* and redhead *A. americana*, made up 53.8% of the total population of overwintering Bay waterfowl. In the 1980s, however, numbers of these ducks have declined to about one-seventh of the total number of waterfowl wintering in the Bay, while Canada geese alone make up nearly 60% of the total. It is believed that food habit changes, resulting from a decline in submerged aquatic vegetation beginning in the 1960s, caused some species of duck to shift to other overwintering areas, while the geese have adapted from SAV to corn left in agricultural fields near Bay waters.

The chief bird species are: tundra swan *Cygnus columbianus*, Canada goose *Branta canadensis*, black duck *Anas rubripes*, mallard *A. platyrhynchos*, widgeon *A. americana*, pintail *A. acuta*, canvasback, redhead and scaup *Aythya* spp., goldeneye *Bucephala clangula*, bufflehead *B. albeola*, ruddy duck *Oxyura jamaicensis* and scoter *Melanitta* spp. In addition, wood duck *Aix sponsa* commonly breeds in scrub-shrub wetlands and in upland boggy areas. Other important birds of the Bay wetlands are: great blue heron *Ardea herodias*, little blue heron *Egretta caerulea*, green-backed heron *Butorides striatus*, great white egret *Egretta alba* and snowy egret *E. thula*. Except for great blue heron, some of which are present in all seasons, these birds breed in the wetlands but migrate to the south for the winter. Two raptors are important in Bay wetlands, namely osprey *Pandion haliaetus* and bald eagle *Haliaeetus leucocephalus*, both of which breed there but winter to the south (although some eagles remain in the winter).

Estimated figures for chief species overwintering during the January 1986 US-FWS annual survey are as follows: dabbling ducks (largely mallard and black duck) 115,200; diving ducks, led by canvasback (34%), scaup (28%), goldeneye (13.3%) and ruddy duck (11.5%) 100,500; geese, led by Canada goose (87%) 721,000; sea ducks (scoter and oldsquaw) 10,500 and tundra swans 36,500.

US endangered species using the Bay wetlands include bald eagle, peregrine falcon *Falco peregrinus*, red-cockaded woodpecker *Picoides borealis*, piping plover *Charadrius melodus*, Delmarva fox squirrel *Sciurus niger cinereus*, Maryland darter *Ethostoma sellare*, short-nose sturgeon *Acipenser brevinostrum*, loggerhead turtle *Caretta caretta*, Atlantic ridley turtle *Lepidochelys kempii*, Dismal Swamp south-eastern shrew *Sorex longirostris fisheri* and Canby's dropwort *Oxypolis canbyi*.

Changes in Ecological Character The waters of Chesapeake Bay have been significantly degraded, especially over the last two decades as surrounding populations and land uses intensified. While it is believed that this has had a deleterious effect on submerged aquatic vegetation, direct and harmful impacts on emergent vegetation, the typical tidal marshes are seen as fairly minimally altered. Protected by legislation, regulation and enforcement, the vast wetland vegetation of the Chesapeake estuarine system remains largely intact. Non-tidal wetlands are at much greater risk, especially from development activities. The wetland vegetation serves a buffer function not only against water level surges and variation, but also in the sense of taking up excess nutrients and, significantly, potentially toxic substances such as heavy metals and chlorinated hydrocarbons. These latter materials tend to be consumed as part of vegetated tissue and then taken up into the food chain, which characterises the fauna of the wetlands. In this sense the ecological character of the wetlands has seen some changes. Some years ago a problem involving eggshell thinning in ospreys and bald eagles arose, with chlorinated hydrocarbons implicated as the cause of reduced hatching success. Fortunately, attention was paid and the toxicants' entry into the Bay environment decreased over time, such that osprey and bald eagle populations are once again on the rise. The general problem of pollution within the Chesapeake Bay system is a serious one which could eventually have a more pronounced and harmful impact, especially on the fauna of the wetlands, by impairing their reproductive success. In order to "restore" and to protect the Bay ecosystem (including wetlands) from future degradation, the EPA has supported for nearly ten years a comprehensive research programme looking at the causes and mechanisms of ecological and water quality changes. Since 1984 the EPA, the three states of Pennsylvania, Virginia and Maryland, the District of Columbia, plus six federal agencies, have joined in an implementation programme to "clean up the bay". Cooperation among the various agencies involved has been noteworthy and early results from monitoring and research activities have thus far added greatly to improved understanding of the vast bay ecosystem.

Management Practices For listed sites these are generally directed towards protecting and improving the wetland environment for waterfowl, shorebirds and other wildlife as production, migration and wintering habitat, and to maintain existing habitat to benefit rare or endangered plant and animal species. Environmental education, wildlife-oriented recreation, and scientific research are also primary management objectives. Predominant public uses managed by the refuges include limited mammal or waterfowl hunting, saltwater fishing, clamming and crabbing, fur-trapping, wildlife observation and boating. Hunting and trapping are strictly controlled in accordance with federal and state regulations. Destruction of Chesapeake Bay tidal wetlands had been steady and ominous. Now, however, they are vigorously protected. Maryland's Wetlands Protection Programme, enacted in 1970, puts all intended activities in state-owned and in periodically-flooded wetlands above Mean High Water (in private ownership) to rigorous review by both the state and by the US Army Corps of Engineers, with other federal agencies, such as the US Fish & Wildlife Service (US-FWS), also participating. Only limited activities, such as shore erosion control and dredging for navigational and wildlife enhancement purposes, are allowed. In addition, Maryland wetlands have received a new degree of protection by virtue

of the Critical Areas legislation of 1984, which will preserve from polluting activities the 305m inland from the wetlands or open coastal shoreline, in all the state's tidewater areas. In Virginia, thirty local governments operate wetland boards which oversee almost all non-government owned or controlled tidal wetlands. The Virginia Marine Resources Commission also reviews local board decisions. Joint reviews of proposed wetland activities by state and federal authorities also take place in Virginia. Open marsh water management (ditching and impounding) is conducted over large areas of some federal refuge marshlands for mosquito control purposes and to create beneficial waterfowl habitat. Water levels in the large freshwater compoundments are manipulated for shorebirds and waterfowl in order to provide the most favourable conditions on a seasonal basis. Forest management consists of both controlled burning and replanting. Certain grasslands are regularly mowed to promote regrowth for deer and geese and to improve nesting habitat for upland nesting waterfowl. Pest control practices include water management, biological control and approved pesticides. Upland areas are sometimes planted in perennial grasses to supplement natural food plants.

One of the benefits being gained by establishing the international importance of Chesapeake wetlands is to foster more international projects with Latin American countries to the south.

Scientific Research and Facilities The US-FWS Patuxent Wildlife Research Centre (PWRC) has traditionally been active in wetland habitat projects and also extends its activities to cover mutual projects in migratory waterfowl breeding areas to the north. Currently, amongst other activities, the PWRC is investigating contaminant body burdens in migrating oldsquaw ducks. Other contaminant studies, e.g. related to Bay raptors and colonial birds, have been a strong interest at PWRC in recent years. One of the region's most active academic institutions is the Virginia Institute of Marine Science (VIMS), affiliated to the College of William and Mary, where much research and monitoring of wetlands and SAV is currently being undertaken. Additionally, the University of Maryland Centres for Estuarine Environmental Studies (UM-CEES) at Horn Point, Maryland and Solomons Island, Maryland, have undertaken strong programmes studying SAV-water quality relationships and nutrient cycling, in Bay waters. The State of Maryland's Department of Natural Resources and VIMS, both funded through their state's Chesapeake Bay Restoration initiatives, have undertaken a number of projects studying aspects of transplanting or creating both SAV and emergent wetlands. Creating new marshlands is believed to be an effective way of reducing shoreline erosion. The Chesapeake Bay National Estuarine Research Reserve site at Monie Bay, Maryland, has supported two major research projects to date, as an Estuarine Sanctuary. One project has been assessing stability of marsh sediments and construction of man-made ponds as a wildlife management tool to increase waterfowl populations. The second project includes six different habitat objectives. The facilities available for Bay research range from the most simple field site locations and testing devices to large, completely-equipped laboratories containing such sophisticated apparatus as gas chromatographs and computers for data handling.

Principal Reference Material The above information has been supplied by the government of the United States.

Cheyenne Bottoms

Location 38°26'-38°31'N, 98°35'-98°44'W. Located in Barton County near the centre of Kansas, the site is approximately 11.3km north-east of Great Bend, Kansas. The area headquarters is located in the south-west corner of the area.

Area 8,036ha, including land associated with both inlet and outlet canals.

Degree of Protection State-owned, and managed by Kansas Department of Wildlife and Parks. Designated a Ramsar site on 19 October 1988.

Site Description Cheyenne Bottoms is a naturally-occurring, elliptically shaped basin totalling approximately 16,590ha. It is in the Plains border section of the Great Plains physiographic province and is bounded on the north, south and west by steep-sided bluffs composed of sandstone and clay or limestone. The bluffs attain a height of 30m or more above the basin floor. The east and south-east sides of Cheyenne Bottoms are surrounded by low walls composed of dune sand and unconsolidated sand and silt. Soils are predominantly silt loams with some accumulation of salts at the surface. Subsoils are firm clays. The basin formed between Mid Cretaceous and late Pliocene. For years this area has served as an important wetland upon Kansas' prairie landscape for resident and migrating wildfowl. Throughout the 1800s, written accounts from journals and historical documents describe the site and the vast amount of wildlife associated with it. In the late 1940s and early 1950s, the State acquired 8,036ha of the lower portion of the basin, and this area became known as Cheyenne Bottoms Wildlife Area. Development included construction of an inlet and outlet canal system and division of the marsh into five pools by a system of dykes. A permanent pump station and several water control gates were placed on the dykes to allow for water level management. Elevations range from 538m-542m, sloping from the north-west to the south-east. Blood and Deception creeks on the north-west and north, respectively, are the major streams draining into Cheyenne Bottoms. Both are intermittent. Additional water is obtained from the Arkansas River, Dry Walnut Creek, and Wet Walnut Creek, entering the basin through the inlet canal from the south-west. Annual rainfall is about 627mm with most falling in the spring and early summer. Evapotranspiration is approximately 1520mm annually.

Cheyenne Bottoms is situated in the mixed grass prairie. About 260 plant taxa have been identified, and five general plant communities have been described. The open water/mud flat community supports little submerged or floating leaved plants, but by late summer any exposed mud flats support stands of annual plants dominated by kochia *Kochia scoparia* and saltmarsh aster *Aster subulatus*. These flats are frequently seeded with Japanese millet *Echinochloa crusgalli* var. *frumentacea* or wheat *Triticum aestivum* to supplement food sources for migrating waterfowl in the fall. Cattail *Typha* spp. communities of varying extent are found in all pools. The perimeter uplands are dominated by a saltgrass *Distichlis* spp./wheatgrass *Agropyron* spp. community. The spike sedge *Eleocharis* spp. community is found, for the most part, in shallow depressions associated with the saltgrass/wheatgrass areas. They are dominated by *E. xyridiformis*. The dykes at Cheyenne Bottoms support a habitat for numerous plant species that would not otherwise be found in this depression wetland. These areas provide valuable cover for a

variety of upland animals such as eastern cottontail-rabbit *Sylvilagus floridanus* and pheasant *Phasianus colchicus*.

International and National Importance According to the International Shorebird Survey (Manomet Bird Observatory), Cheyenne Bottoms is one of the most important sites in the western hemisphere for migrating shorebirds. It has been estimated that 45% of the North American shorebird population stops here during migration, and 320 species of bird have been recorded. The survey further estimates that over 90% of the North American populations of white-rumped sandpiper *Calidris fuscicollis*, Baird's sandpiper *C. bairdii*, stilt sandpiper *Micro-palama himantopus*, long-billed dowitcher *Limnodromus scolopaceus*, and Wilson's phalarope *Steganopus tricolor* rest at the Bottoms while on migration. The area has been classified as critical habitat for whooping crane *Grus americana* by the US Fish and Wildlife Service. The area offers wintering habitat to bald eagle *Haliaeetus leucocephalus*. Peregrine falcon *Falco peregrinus*, listed as endangered by the US-FWS, is at least a migrant visitor to the area, as is the threatened piping plover *Charadrius melodus*. The least tern *Sterna antillarum* is known to nest at Cheyenne Bottoms. Snowy plover *C. alexandrinus* is currently placed for possible listing as a threatened species, and has also been known to nest at Cheyenne Bottoms, as is the occasional transient the long-billed curlew *Numenius americanus*.

Cheyenne Bottoms is one of eleven western hemisphere sites selected as a hemispheric reserve within the shorebird Sister Reserves concept as endorsed by the International Association of Fish and Wildlife Agencies, The Nature Conservancy and others. This is the highest reserve designation and indicates an area has in excess of 100,000 individuals or more than 30% of the known flyway population of a species.

The area has historically been of importance to migrating waterfowl. The development of the area 40 years ago was aimed at enhancing this bird use. Current management still focuses on efforts to maintain Cheyenne Bottoms as a vital migratory marsh in the Central Flyway. Duck numbers have been reported as high as 500,000, with goose numbers approaching 40,000. Twelve species of duck are known to breed at the Bottoms, including mallard *Anas platyrhynchos*, blue-winged teal *A. discors*, canvasback *Aythya valisineria* and mottled duck *Anas fulvigula*.

Changes in Ecological Character Historically, the area was dry two out of every five or six years. The development of the basin by the State wildlife agency was directed at making water for the marsh more reliable. The inlet system which was constructed allowed the importation of water into the basin. In recent years, this outside water source has decreased significantly due to irrigation, soil conservation practices and damming. The acquisition of the marsh by the State of Kansas has stopped most off-road travel, prevented the exploration and drilling for oil, and improved farming practices on the area to benefit the wildlife resource. Under its current management as a State wildlife area, no immediate threats of significance are evident. The exception to this, as stated above, is the lack of water available to the area from the Arkansas River, and the surrounding area. Efforts are underway to make the water handling capabilities at Cheyenne Bottoms more efficient, thus maximising what little water is available.

Management Practices These are directed toward one main goal, providing a diverse marsh habitat for the use of migrating and breeding waterfowl and shorebirds. Primary objectives to be met include: provision of supplemental food sources for migrating and upland birds; expansion of waterfowl and non-game nesting structure placement and development of more

areas throughout the marsh to enhance shorebird nesting efforts; provision of diverse waterfowl hunting opportunities without significantly reducing the birds' ability to obtain food and rest for migration; provision of as much access as possible to the marsh for birdwatching and other non-consumptive uses, without posing a threat to nesting birds; continuing the physical development and maintenance of the area to facilitate water movement and general operations. Tours of the area are available to the public. Department personnel are available to give presentations to groups concerning the management, status or bird use of the area.

Scientific Research and Facilities A number of research studies have been conducted involving the area's geology, water quality, surface and ground water hydrology, vegetation, animal populations and economic impact. Schools and agencies involved with these studies and field projects include: University of Missouri-Columbia, University of Kansas, Fort Hays State University, Saint Mary of the Plains College, Kansas Geological Survey, Kansas Biological Survey, US Fish & Wildlife Service. No research facilities are located on the site.

Principal Reference Material The above information has been supplied by the United States government.

Cache-Lower White Rivers Joint Venture Area

Location 33°42'-35°39'N, 90°52'-91°28'W. State and federally owned lands (NWRs and WMAs) are located along the Cache River, Bayou DeView and the lower White River from the vicinity of DesArc, Arkansas, to the confluence of the White, Arkansas and Mississippi rivers in eastern Arkansas. The entire area is located within the Mississippi Delta physiographic region of the lower Mississippi River valley. Little Rock, Arkansas, is approximately 83.7km to the west and Memphis, Tennessee, is approximately 112.7km to the east.

Area Approximately 145,690ha. White River National Wildlife Refuge: 45,546ha. Cache River NWR is presently 4,382ha but should ultimately encompass at least 14,164ha. Trusten Holder Wildlife Management Area: 4,155ha lies adjacent to the southern end of White River NWR. Dagmar WMA and Rex Hancock/Black Swamp WMA protect 3,195ha and 2,262ha, respectively. An additional 3,211ha of mitigation land owned by the US Army Corps of Engineers lie in the project area; transfer of this land to FWS or AGFC is being pursued.

Degree of Protection Presently, 59,522ha is in FWS or AGFC ownership or protection, an additional 58,680ha is sought for protection by AGFC and FWS under the Joint Venture Project, and the remaining 30,352ha is slated to remain in private ownership. Both national wildlife refuges are owned by the US Government, Department of Interior, Fish and Wildlife Service and are managed under the National Wildlife Refuge System. The three wildlife management areas are predominantly owned by Arkansas Game and Fish Commission (2,345ha are leased from other federal agencies) and are managed by master plans, written Commission policy and the Wildlife Code.

Site Description The five federal and state-owned units and the Joint Venture Area lie almost entirely within the 10-year flood plain of Cache River, Bayou DeView, and lower White River. Elevations range from approximately 36m to 68m. A varying percentage of the project area is

subject to annual overflow flooding, but at least 50% of floods, primarily in late winter and spring, during the majority of years. Permanent water, in the form of rivers, oxbow lakes, sloughs, swamps and beaver ponds, covers approximately 5% of the area. The area contains the largest continuous expanse of bottomland hardwoods in eastern Arkansas and the longest in the lower Mississippi River valley. Conservatively, over 111,291ha of bottomland hardwoods remain in the project area. This is approximately one-third of the total remaining in the Arkansas Delta. Because these woodlands are subject to periodic flooding, the majority of the area is classified as palustrine, forested wetlands in the National Wetlands Inventory series. Much smaller percentages of riverine, lacustrine and isolated non-wetland areas are found in the project area.

The composition of bottomland hardwood forests in the project is correlated to hydrologic conditions. Cypress *Taxodium distichum* or cypress-tupelo *Nyssa aquatica* associations are found in conjunction with permanent water (oxbow lakes, sloughs etc) and soils that are inundated for the majority of the year. Lowland moist soil areas are normally dominated by overcup oak *Quercus lyrata*-bitter pecan *Carya aquatica* associations. Soils at higher elevations are dominated by willow oak *Q. phellos*-Nuttall oak *Q. nuttallii*-sweetgum *Liquidambar styraciflua* associations. Swamp privet *Forestiera acuminata* and button bush *Cephalanthus occidentalis* are common understorey shrubs, particularly around permanent water areas. Smartweeds *Polygonum* spp., panic grasses *Panicum* spp., and sedges *Carex*, *Cyperus* spp., are common herbaceous components. A complete inventory of animals and plants has not been conducted. It is known that over 300 species of mammals, birds, reptiles and amphibians inhabit the area, however. The bottomland hardwood ecosystem is extremely important for many of these species because of their habitat requirements. Game and fur-bearing mammals common to the project area include white-tailed deer *Odocoileus virginianus*, eastern grey squirrel *Sciurus carolinensis*, eastern fox squirrel *S. niger*, beaver *Castor canadensis*, raccoon *Procyon lotor* and mink *Mustela vison*.

International and National Importance The five units represent extremely important wintering habitat for migratory waterfowl, particularly mallard *Anas platyrhynchos*. Midwinter aerial surveys indicate a 28-year average of 306,000 mallards, approximately one-third of those found in Arkansas and 10% of the Mississippi Flyway total, has been counted in the project area. These figures are undoubtedly under-estimates, due to the difficulties of censusing waterfowl in bottomland hardwood habitat. White River NWR alone normally harbours 200,000-300,000 ducks and 3,000-10,000 Canada geese *Branta canadensis* in winter. Ducks are predominately mallards but significant numbers of black duck *A. rubripes* and canvasbacks *Aythya valisineria* also winter here. Also significant is the amount of breeding and wintering habitat for wood duck *Aix sponsa* represented by the five protected areas and the remaining bottomland hardwoods found in the project area. The remnant status of bottomland hardwoods, the relatively unbroken expanse of bottomland hardwoods in the project area, and the extreme importance of this habitat type to wintering waterfowl and native wildlife qualify this area as an outstanding example of a wetland community characteristic of its biogeographic region. Endangered species on state or federal lists known to use the area include bald eagle *Haliaeetus leucocephalus*. From 50 to 100 normally winter on White River NWR and others winter on the project area. In addition, one pair of eagles has nested on the refuge since 1982, fledging a total of 10 young to date. This is the first documented eagle nest in Arkansas in several decades. Other endangered or threatened species known to use the five state or federal areas include American alligator *Alligator mississippiensis*, Arctic peregrine falcon *Falco peregrinus tundrius* and panthers, presumably Florida panther *Felis concolor coryi*. Interior least tern *Sterna antillarum athalassos*

is known to nest on sandbars along the lower Arkansas River within the project area, but none is found on lands presently protected. Fat pocketbook pearly mussel *Potamilus capax* was once found in the White River but no recent records are available. White River NWR and adjacent Trusten Holder WMA are home to approximately 150 black bear *Ursus americanus*. This is the only remaining population of black bears native to Arkansas; all other populations have been reintroduced from other states.

Three natural areas are located on protected lands. These include Cache River Natural Area on Rex Hancock/Black Swamp WMA (approximately 405ha), and Striplin Woods Natural Area (12ha) and Sugarberry Research Natural Area (394ha) on White River NWR. The lower 66km of the Arkansas River, part of which forms the southern boundary of the project area, has been registered by the Arkansas Natural and Scenic Rivers Commission. An area of several hundred hectares on White River NWR has been proposed for wilderness designation under the Wilderness Act of 1964, but no recent action has been taken on this proposal.

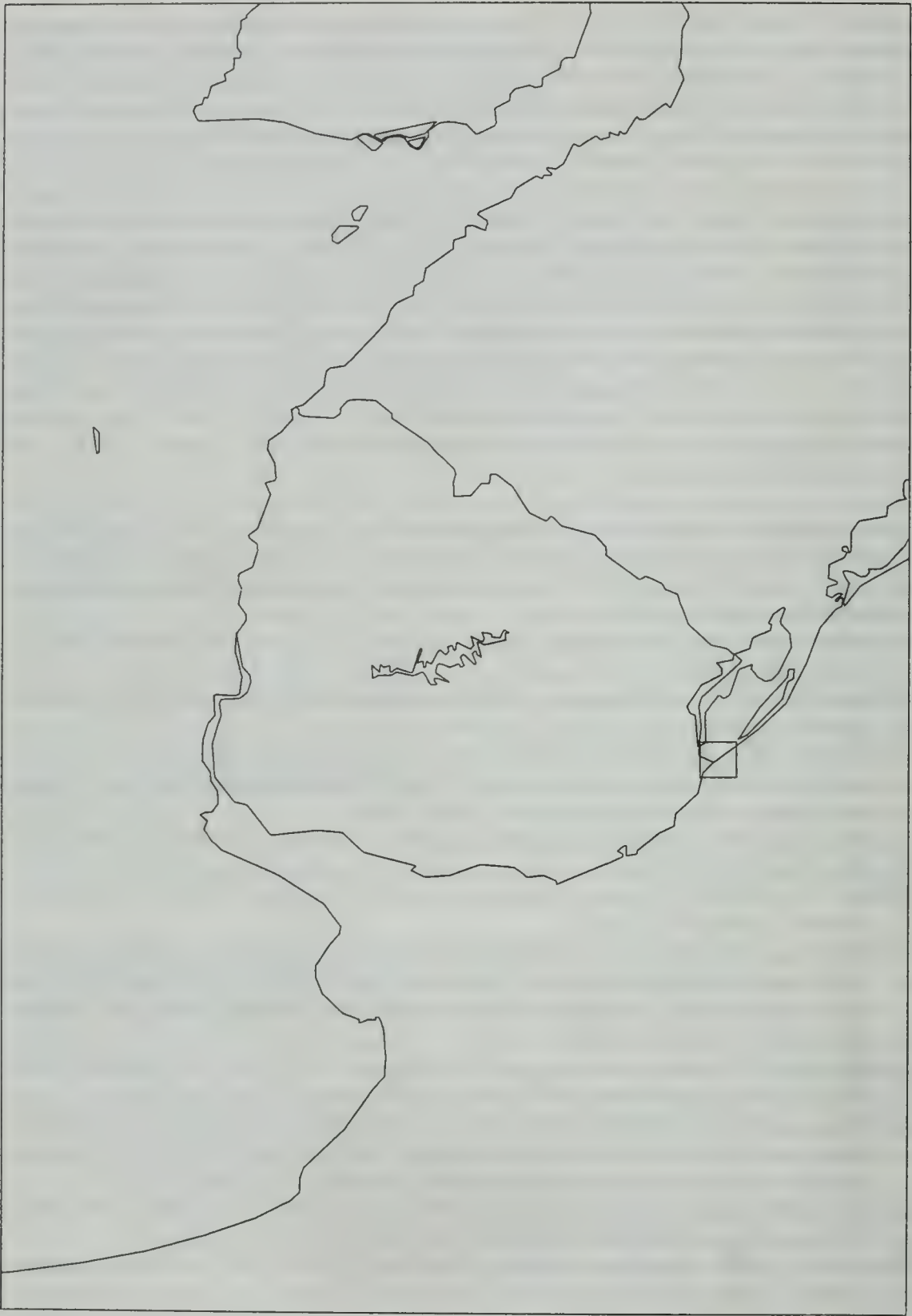
Changes in Ecological Character The most serious threat to the ecological character of the Cache-Lower White River area occurred during the 1970s when approximately 11.4km of the lower Cache River was channelised by the US Army Corps of Engineers under authority of the Flood Control Act of 1950. This project authorised construction of 372.7km of artificial channel, which would have destroyed or affected 21,449ha of bottomland hardwood habitat. The project was halted by federal court injunction after public reaction by conservationists across the nation. This interest in an area internationally important to waterfowl eventually led to the creation of Cache River NWR. Another potentially environmentally degrading project was deauthorised by the US Congress during 1988. The White River Navigation to Batesville, Arkansas, Project, increasing channel depth for barge traffic, would have affected White River NWR overflow conditions. The White River Entrance Channel Project, with a proposed lock and dam near the confluence of the White and Mississippi rivers, may also affect hydrology of a portion of the project area if funded and completed. Other changes in ecological character that have occurred relate to past timber harvest, conversion of bottomland hardwoods to cropland, upstream drainage projects (which contribute to downstream flooding), and siltation. Remaining bottomland hardwoods are representative of the ecosystem that once covered most of eastern Arkansas, however.

Management Practices Management practices for White River NWR and Cache River NWR are primarily directed toward wintering waterfowl. About 90% of White River NWR is a sanctuary area for waterfowl and sanctuary areas are presently provided on Cache River NWR. Dagmar WMA also has a sanctuary area of 202ha but the rest of Dagmar, Trusten Holder and Rex Hancock WMAs are open to recreational hunting of waterfowl and other game species. Other recreational activities allowed on NWRs and WMAs include fishing, fur-trapping, wildlife observation and boating. Hunting, fishing and trapping are strictly controlled in accordance with federal and state laws. Timber management practices are used on both state and federal areas to benefit waterfowl and other wildlife. Manipulation is primarily by single-stem selection and uneven-aged management. Approximately 1,619ha are reserved from any timber management or other disturbance. Other management practices used to benefit wildlife include green-tree reservoirs (White River NWR and Dagmar WMA), controlled burning, establishment of food plots, moist-soil units, and cooperative farming agreements. Other management objectives include protection of endangered species and their habitats, preservation of unique floral and faunal communities (e.g. old-growth cypress-tupelo swamps), and conservation of unique natural systems such as bottomland hardwoods.

Scientific Research and Facilities Several research projects have been completed on state and federal lands within the Joint Venture Project Area and other research is currently being conducted. The US Army Engineers Waterways Experiment Station is presently involved in long-term biological studies to determine wetland functions and values for bottomland forests on Rex Hancock WMA. Most other research is conducted on White River NWR where institutions and agencies involved include: Patuxent Wildlife Research Centre; Southeast Wildlife Disease Center in Athens, GA; the University of Tennessee, Knoxville; the University of Arkansas at Monticello; National Museum of Natural History-Smithsonian Institution; and the US Department of the Interior. Patuxent Wildlife Research Center currently maintains a field station on the refuge. The recently-established Cooperative Fish and Wildlife Research Unit at the University of Arkansas-Fayetteville has expressed an interest in bottomland hardwoods research and it is expected that the area will be a focus of this research. Limited facilities exist for research purposes on the five state and federal areas. Hampton Waterfowl Research Center on Bayou Meto WMA, approximately 64km west of White River NWR, has facilities for research and is available to use by cooperating agencies. The NWRs and WMAs protected within the project area provide an excellent outdoor laboratory for research of bottomland hardwood-wetland ecosystems.

Principal Reference Material The above information concerning Cache River NWR and White River NWR was taken from Annual Narrative Reports for those refuges. Information on Dagmar, Trusten Holder and Rex Hancock WMAs was taken primarily from master plans for those WMAs. Supplemented by:

- Arkansas Department of Planning (1974).** Arkansas natural area plan. State of Arkansas, Little Rock. 248 pp.
- Bellrose, F.C. (1976).** *Ducks, geese, and swans of North America*. Stackpole Books, Harrisburg, PA. 544 pp.
- Fredrickson, L.H. and Heitmeyer, M.E. (1988).** Waterfowl use of forested wetlands of the southern United States: an overview. In: Weller, M.W. (Ed.) *Waterfowl in Winter*. University of Minnesota Press, Minneapolis. Pp. 307-323.
- Holder, T.H. (1965).** Disappearing wetlands in eastern Arkansas. Arkansas Planning Commission, Little Rock. 72 pp.
- Holder, T.H. (1972?).** Progress in preservation of delta wetlands. Arkansas Department of Planning, Little Rock. 28 pp.
- Reinecke, K.J., Schaeffer, C.W. and Delnicki, D. (1987).** Winter survival of female mallards in the lower Mississippi valley. In: McCabe, R.E. (Ed.) Transactions of the fifty-second north american wildlife and natural resources conference. Wildlife Management Institute, Washington, DC. Pp. 258-263.
- Smith, T.R. (1983).** Status and ecology of black bears on the White River National Wildlife Refuge: final research report. The University of Tennessee, Knoxville. 82 pp.
- US Department of the Interior (1984).** Final environmental impact statement; *Cache River basin: a waterfowl habitat preservation proposal*, Jackson, Monroe, Prairie and Woodruff counties, Arkansas. Fish and Wildlife Service, Atlanta, GA. 115 pp.
- US Department of the Interior and Environment Canada (1986).** North American waterfowl management plan. Fish and Wildlife Service, Washington, DC. 19 pp.
- Yaich, S.C. (1988).** A proposal for the Cache/lower White Rivers joint venture project. Arkansas Game and Fish Commission, Little Rock. 11 pp.



Ramsar Sites in Uruguay

Uruguay

Area 186,925 sq.km

Population 3,080,000 (1988 estimate)

Summary of Wetland Situation The country borders on the Atlantic Ocean (220km of coastline), the Rio de la Plata (460km) and the Rio Uruguay (480km). There are some 3 500 sq.km of lakes, lagoons and dams, and some 3,500-4,000 sq.km of permanent and temporary marshes, the largest being those situated in the east and northeast of the country. Overall, it has been estimated that wetlands make up about 3.6% of the territory of Uruguay. Of the 400 or so species of birds occurring in Uruguay, 175 (44%) are aquatic or semi-aquatic; these include 28 species of Sphenisciformes and Procellariiformes. There are about 200 species of fish in the lakes, marshes and rivers; these belong mainly to the Siluriformes and Cypriniformes, and many are of commercial importance. All 36 species of amphibians known from Uruguay inhabit wetlands for at least a part of their life cycle, and several of the reptiles are dependent on wetlands, namely five species of freshwater turtle, three snakes and caiman *Caiman latirostris*. The latter is now in danger of extinction in Uruguay. Of the mammals associated with wetlands, three are trapped for their fur and constitute important natural resources. These are La Plata otter *Lutra platensis*, coypu *Myocastor coypus* and capybara *Hydrochoerus hydrochaeris*.

Protected Areas Legislation Protection of all parks and forests is apparently based on the Forestry Law (13.723) of 16 November 1968. This defines national parks and fiscal forests. Various other categories are used in practice, including national monument and wildlife refuge, but there would appear to be a degree of overlap in their application.

Protected Areas Administration Decree 269/967 of 27 April 1967 incorporates the National Park Department into the Ministry of Agriculture (Ministerio da Ganaderia y Agricultura) under the title Direccion Forestal, Parques y Fauna. This Department is in charge of all the national parks, apart from Santa Teresa and San Miguel, which come under the Ministerio de Defensa Nacional. The Department has the right to expropriate lands, and to inspect and seize vehicles, instruments and arms employed in illicit activities.

Sites designated under the Convention Accession 22 May 1984 with one site listed at accession

Bañados del Este y Franja Costera

Government body responsible for administration of the Convention

Ministerio de Educacion y Cultura, Institutio Nacional para la Preservacion del Medio Ambiente, Reconquista 535, 8 Piso, Montevideo

Bañados del Este y Franja Costera

Location 32°40'-33°50'S, 53°10'-53°45'W. In eastern Uruguay, on the Brazilian frontier.

Area 200,000ha

Degree of Protection 30% state property; 70% privately owned. This area is said to contain some 30,500ha in national parks that are governed by Law No. 9841 (4 July 1935) concerning the protection of flora and fauna. It is unclear to which areas this refers. Designated as a biosphere reserve in June 1976 and as a Ramsar site at the time of accession on 22 May 1984.

Site Description Four important rivers flow through Bañados del Este into the Merim Lagoon; the Yaguatón, Tacuari, Olimar and San Luis. Grey pansol fields, normally under water, produce a great floral variety. The soils are peaty with high acidity. Annual average rainfall in the zone is 1100mm, most abundant in winter, and the temperature ranges between 8°C and 28°C. This is the only area in the country where the "butia" palms *Butia yatay* growing in these soils are protected. They form an almost pure association. Dominant in the herbaceous community are Cyperaceae, Juncaceae, Gramineae (*Scirpus californicus*, *Typha* spp., *Zizaniopsis bonaerensis*, *Scirpus giganteus*, etc.). There are also a variety of psammophilous plants and extensive stands of conifer *Pinus atlantica* along the coast.

International and National Importance The indigenous fauna remains almost intact except that marsh deer *Blastocerus dichotomus* is now locally extinct. There are large colonies of coypu *Myocastor coypus* and capybara *Hydrochoerus hydrochaeris*, while giant otter *Pteronura brasiliensis* is less abundant. Perhaps more important, however, is the tremendous wealth of the avifauna, which includes species such as red-legged seriema *Caraima cristata*, black-necked swan *Cygnus melanocoryphus*, Coscoroba swan *Coscoroba coscoroba* and muscovy duck *Cairina moschata*. In addition, this zone is one of the most important in the southern hemisphere for the study of migratory birds in their movements from north to south. Examples are American golden plover *Pluvialis dominica* from the Arctic, albatross *Diomedea* sp., petrels (Procellariidae) and penguins (Spheniscidae).

Changes in Ecological Character The ecosystem is threatened with serious changes as stock raising gradually gives way to rice-growing. This has led to an attempt to dry the lake areas and alter the water levels in the flood zones. Uncontrolled tourism is also exerting increasing pressure. The implementation of a plan to channel the lagoons and marshes flowing into the sea would have irreversible consequences for the environment. Because of this situation Bañados del Este was included in Regina document C.3.6 as one of the 29 Ramsar sites where the likelihood of major ecological change seems greatest. The Ramsar Monitoring Procedure was operated at the site in 1988. The report noted the increasing concern for conservation of the site in Uruguay, and noted that reclassification of part of the area was necessary; detailed hydrological, faunal and floral studies should be carried out as part of this reclassification. Close liaison should be maintained with the InterAmerican Development Bank which is funding development projects in the area.

Management Practices A small technical staff is available for isolated studies. Among the basic problems, concerning which an ambitious plan for research has been undertaken, the following may be mentioned: a) dry-season pastures for the development of stock raising; b) water regulation in periods of flooding and drought; c) control of bird migration and reintroduction of extinct species; d) epidemiological research into furuncular myiasis. All this ecological research is important for the countries in the temperate zone having wetlands.

Scientific Research and Facilities The whole area of the eastern marshes is provided with a good road network and accommodation facilities for groups of scientists working there.

Principal Reference Material

The above information is taken from documents provided by the Uruguayan authorities at the time of accession, from national reports by Uruguay to Ramsar conferences, and from Ramsar Monitoring Reports, supplemented by:

Biosphere reserve nomination submitted to Unesco-MAB Secretariat.

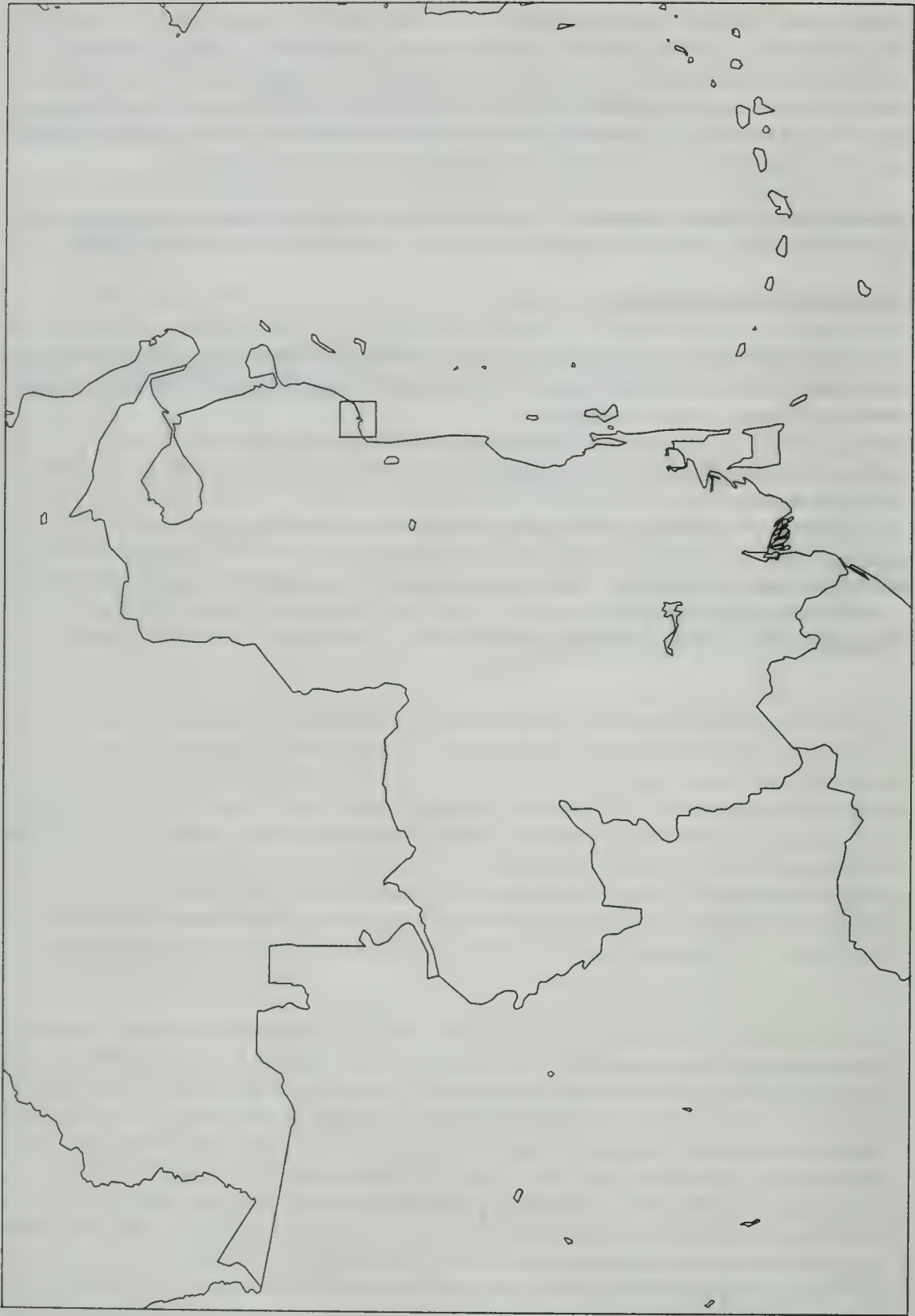
Instituto Nacional para la Preservacion del Medio Ambiente (1973). Informe sobre "Baños de Rocha".

IUCN (1982). *IUCN Directory of Neotropical Protected Areas*. Tycooly, Dublin.

Melendo, Mariano (1974). Informe Mision Espanola.

Scott, D.A. and Carbonell, M. (1986). *A Directory of Neotropical Wetlands*. IUCN, Gland and Cambridge. 684 pp.

Sombroek, W.G. (1969). Soil studies in the Merim Lagoon basin.



Ramsar Sites in Venezuela

Venezuela

Area 912,047 sq.km

Population 18,770,000 (1988)

Summary of Wetland Situation Topographically, Venezuela can be divided into four regions: (a) the highlands of the Sierra Nevada de Merida, an extension of the Andes, (b) the lowlands of Maracaibo, (c) the extensive plains of the Orinoco, and (d) the highlands of the Guyana shield in the south-east. The country contains a rich diversity of internationally important wetlands, the majority of which are found in the regions (c) and (d) above. Many of the most important wetlands are scattered along the long northern coastline in the form of extensive intertidal lagoons, mangroves and mudflats, including Cuare Wildlife Refuge, Venezuela's only site designated so far under the Ramsar Convention. These coastal wetlands are especially important for large numbers of migratory and resident waterfowl. The destruction of mangroves is perhaps the most serious threat to the future of many of these wetlands which provide valuable socio-economic services, as well as supporting internationally important bird populations. The central part of the country is dominated by the Orinoco River. The llanos are bounded to the south by the Guyana shield and to the west by the Sierra Nevada de Merida. The principal wetlands of this vast area are found in the southern llanos of Apure (characterised by extensive inundation during the rainy season), in the southern part of the llanos of Guarico and Cojedes, and in the alluvial plains of the western llanos of Portuguesa and Barinas. They comprise a complex of slow-flowing rivers and streams, associated permanent oxbow lakes, riverine marshes and swamp forest, permanent and seasonal freshwater lakes, ponds and marshes; and large areas of seasonally inundated grassland and palm savanna. The vast delta of the Orinoco lies to the east and comprises a mosaic of mangrove swamps, permanent fresh to brackish swamps, seasonally flooded grassland and palm savanna, swamp forest and an intricate network of river channels. A considerable amount of research has been conducted on the wetlands and waterfowl of Venezuela, particularly by the Servicio Nacional de Fauna Silvestre, the Instituto del Zoologia Tropical at the Universidad Central de Venezuela, the Universidad del Zulia, the Universidad Nacional Experimental de los Llanos Occidentales "Ezequiel Zamora", the Fundacion para la Defensa de la Naturaleza, and the Sociedad Conservacionista Audubon de Venezuela. Most of the work has focussed on the wetlands of the western and central coastal zones and the llanos, and very little work has been carried out in the Orinoco Delta and at wetlands in Amazonas and Bolivar states.

Protected Areas Legislation The conservation and utilisation of natural resources in Venezuela is controlled under the Forestry, Soils and Water Law of 14 December 1965. This gives the Council of Ministers the power to establish protected areas by Executive Decrees, which can only be reversed by Congressional Act. The law also includes a clause specifying procedures, penalties and sanctions. This law is regulated by Decree 1333 of 11 February 1969 (and the regulations partially reformed by Decree 2117 of 12 April 1977). The Organic Environment Law of 7 June 1976 established conservation as an important factor in the development of the

country, stating that conservation, defence and improvement of the environment will include "creation, protection, conservation and improvement of national parks, forest reserves, natural monuments, protected zones, virgin region reserves, watersheds, national hydrological reserves, refuges, sanctuaries and reserves of wildlife, recreation parks of open-air or intensive use, green areas in urban centres or any other land area subject to a special regime in benefit of the ecological equilibrium and of the collective well-being."

National parks are sites of natural scenic beauty of with an important flora and fauna which are utilised for recreation, education, tourism and/or scientific research. National monuments are regions, objects or animal or plant populations of aesthetic, scientific or historic value which are given absolute protection. Wildlife reserves are areas set aside specifically for management of wild animal populations, and may have controlled hunting. Other definitions include protective zones, forest reserves, wildlife refuges and sanctuaries, hydrological reserves and virgin region reserves.

Protected Areas Administration The Office of Management of Renewable Natural Resources within the Ministry of Agriculture is responsible for the running of the protected areas.

Sites designated under the Convention Accession on 23 November 1988 with one site listed.

Refugio de Fauna de Cuare

Government body responsible for administration of the Convention

Ministerio del Ambiente y de los Recursos Naturales Renovables, Edif. Camejo Piso 2, Centro Simon Bolivar, D6114 Caracas

Refugio de Fauna de Cuare

Location 10°55'N, 68°20'W. Situated in the municipality of Chichiriviche, district of Silva, in the state of Falcon.

Area 9,968ha

Degree of Protection Included within Cuare Faunal Refuge (11,825ha), established by Executive Decree 991 on 31 May 1972. The site is state-owned and was listed as a Ramsar site on the accession of Venezuela to the Convention on 23 November 1988.

Site Description The site is a coastal bay with a maximum depth of 2m, surrounded mostly by mangroves and an extensive area of lagoons and salt marshes which flood with brackish water to a level of 30cm during the rainy season and become completely dry during the dry season (January to March). Four distinct zones can be distinguished: 1) the Inlet of Cuare; 2) the salt water flats; 3) the islands and 4) the surrounding hills. The Inlet of Cuare is very shallow and surrounded by mangroves of distinctive composition which constitute refuge sites for numerous bird species. The salt water flats of Chichiriviche are subject to the flood and ebb of the sea and seasonal rainwater inundation. Principal vegetation is halophytic, dominated by *Batis maritima*. The islets are made of sand exposed to aeolian influences and have an area of 72ha. The hills

surrounding the site are covered with thorn scrub and forest. The northern part (681 ha) includes a steep cliff where some seabird species nest. The area is a refuge for American crocodile *Crocodylus acutus*, a species often found in brackish water.

International and National Importance The site is an extremely important wetland for a wide variety of both breeding and Nearctic migrant species. More than 85 species of waterfowl have been recorded. Maximum counts have included 100 pied-billed grebe *Podilymbus podiceps*, 340 brown pelican *Pelecanus occidentalis*, 500 olivaceous cormorant *Phalacrocorax olivaceus*, 600 cattle egret *Bubulcus ibis*, 260 little blue heron *Egretta caerulea*, 300 Louisiana heron *E. tricolor*, 1,200 snowy egret *E. thula*, 500 great white egret *E. alba*, 260 American wood ibis *Mycteria americana*, 400 scarlet ibis *Eudocimus ruber*, 100 glossy ibis *Plegadis falcinellus*, 2,000 American wigeon *Anas americana*, 60,000 blue-winged teal *A. discors*, 400 shoveler *A. clypeata*, 200 black-bellied plover *Pluvialis squatarola*, 100 semi-palmated plover *Charadrius semipalmatus*, 1,000 greater yellowlegs *Tringa melanoleuca*, 1,000 lesser yellowlegs *T. flavipes*, 1,200 semipalmated sandpiper *Calidris pusilla*, 800 western sandpiper *C. mauri*, 1,000 least sandpiper *C. minutilla*, 50 stilt sandpiper *Micropalama himantopus*, 500 black-winged stilt *Himantopus himantopus*, 55 black tern *Chlidonias nigra*, 165 gull-billed tern *Gelochilidon nilotica* and 570 black skimmer *Rynchops niger*. Greater flamingo *Phoenicopterus ruber* is a regular non-breeding visitor, numbering in the thousands (5,400 in January 1983). A species of note found at the site is plain-flanked rail *Rallus wetmorei*.

Changes in Ecological Character Principal threats to the area are: the expansion of Chichiriviche town; the construction of large hotels nearby; the dumping of domestic sewage into the bay; outwash of pesticides, especially DDT, from surrounding areas, and the discharge of mercury into the sea from a nearby petrochemical plant. Illegal hunting and tourist pressure, due to the number of roads crossing the area, may also be a problem.

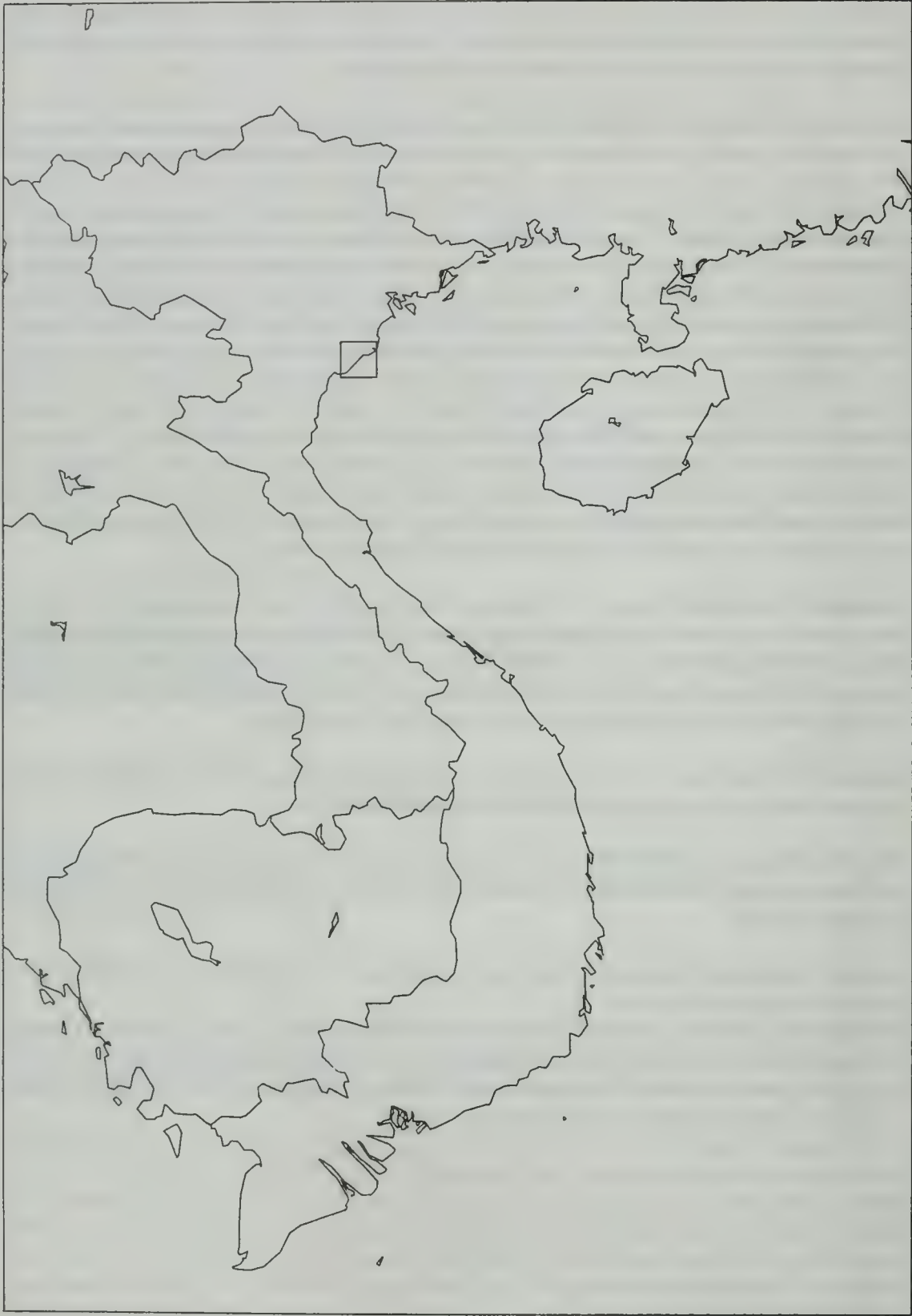
Management Practices There is no direct wardening. The site is used for some illegal hunting, fishing and harvesting of oysters, as well as for tourist activities.

Scientific Research and Facilities The avifauna of the area has been well documented and the flamingo population has received attention, particularly in theses from the Universidad de los Andes, Merida.

Principal Reference Material The above information was supplied by the Venezuelan government, supplemented by:

IUCN (1982). *Directory of Neotropical Protected Areas*. Commission on National Parks and Protected Areas. Tycooly International Publishing Limited, Dublin. 436 pp.

Scott, D.A. and Carbonell, M. (Compilers) (1986). *A Directory of Neotropical Wetlands*. IUCN, Cambridge and IWRB, Slimbridge. 684 pp.



Ramsar Sites in Viet Nam

Viet Nam

Population 65,200,000 (1988)

Summary of Wetland Situation Viet Nam possesses a great diversity of wetland habitats. Much the largest is the Mekong Delta in the south, with its elaborate network of river channels and vast areas of rice paddies, mangrove forests, *Melaleuca* forests, tidal mudflats, shrimp ponds and fish ponds. In the middle part of the country, most of the significant wetlands are coastal lagoons and water storage reservoirs, whilst in the north, there are numerous lakes and reservoirs in the basin of the Red River and extensive mudflats and mangrove swamps in its delta.

The wetlands of Viet Nam play a very important role in the national economy, and throughout the country the level of exploitation of wetlands is very high. A great proportion of the country's rice, fish, shrimp and other food production is derived from the wetland regions, particularly the Red River Delta in the north and the Mekong Delta in the south. Because of the great demand for food production, large areas of wetland have been drained for agricultural purposes. An estimated 124,000ha (some 40-50%) of the mangrove forests in the Mekong Delta were destroyed by herbicides during the war, and since then, mangrove and *Melaleuca* forests have been cut down for charcoal, firewood and timber for construction purposes, and cleared to make way for shrimp and fish ponds. Furthermore, the use of Agent Orange during the war has had a lasting effect on the vegetation, limiting the success of the reafforestation programmes.

Despite high human population density and intensive exploitation, the wetlands continue to support a great diversity of wildlife. The coastal wetlands, in particular, are of considerable importance for migratory waterfowl, providing rich staging and wintering areas for about 100 species. Many thousands of ducks and geese continue to winter in the wetlands of the Red River Delta, although numbers are reported to have decreased considerably during the last decade.

In April 1987 the Government produced a policy for the rational utilisation of wetland areas throughout the country. The first step was the declaration by the Government of eight protected areas in wetland regions. These included Ba Be Lake (450ha) and Nui Coc Reservoir (2,580ha) in the north, and six wetlands in the Mekong Delta: Tram Chin Crane Reserve at Dong Thap Muoi (9,000ha), the breeding colonies of large water birds at Bac Lieu (40ha), Cai Nuoc (20ha) and Dam Doi (119ha), Nam Can Mangrove Reserve (7,547ha) and Vo Doi *Melaleuca* Protected Forest (3,945ha). Management plans for the most important reserves are currently being prepared by several research institutes in the north and south. A short training course on the management of protected areas was held in Cat Ba National Park in 1987 for the directions of national parks and reserves and other key personnel, and the Working Group on Wetlands and Waterbirds (within the Natural Resources and Environment Programme) has conducted short training programmes at the waterbird colonies in Minh Hai Province and in the Crane Reserve in Dong Thap.

Protected Areas Legislation Article 5 of the Law on the Protection of Forests, promulgated 5 September 1972, makes provision for the establishment of protected areas. The Article states 'the government delimits forest preserves aimed at protecting flora and fauna, historical and cultural relics and public health, conducting scientific research or other special interests'. Within forest preserves it is not permitted to fell trees (other than for management purposes) or shoot birds and other wildlife (MoF, 1985). Some activities are allowed, with the permission of either the Minister of Forests or the Council of Ministers, for example erecting buildings and collecting fuelwood or scientific specimens. The current protected areas system is based on Council of Ministers decision No. 194/CT, promulgated 9 August 1986. This was made on the basis of Article 5, and the later decisions No 41/TTg of 24 January 1977, No 360/TTg of 7 July 1978 (which established Nam Cat Tien National Park), No. 65/HDBT of 7 April 1982, No. 85/CT of 1 March 1984 and No. 79/CT of 31 March 1986 (which established Cat Ba National Park). The Ministry of Forestry has set a target of 900,000ha to 1,000,000ha of forest to be set aside for the purpose of protecting gene pools, historic relics and for tourism and decision No. 194/CT lists 73 'forbidden forests' which are categorised as national parks, nature reserves and historical and cultural reserves.

Protected Areas Administration The main administrative body is the Department of Basic Inventory in the State Committee for Science and Technology. This department is responsible for submitting plans for the establishment of protected areas to the Government, requesting the ultimate decision from the Government, and implementing effective coordination between different research institutes. The Ministry of Forestry is responsible for the development and management of protected areas. The Ministry submits its outline master plans for protected areas both to the government and to the Department of Basic Inventory for their approval. The Department of Forest Management and Protection in the Ministry of Forests is responsible for the management of protected forests, while national parks, nature reserves and historic and cultural reserve, including protected waterbird colonies, are managed by the Forestry Officers of the local People's Committees

The Ministry of Water Resources and the Ministry of Agriculture are also involved in the establishment of protected wetland areas. The Division of Agricultural Water Supply in the Ministry of Water Resources plays an important role in the decision-making process, while the Ministry of Agriculture resolves any problems arising from a conflict between agricultural development and wetland conservation. The State Programme on the Rational Utilisation of Natural Resources and Environmental Protection plays an important role in the development and management of the protected area system by carrying out research and acting as a scientific advisory body.

A definition of the responsibilities of the Ministry of Forests and the People's Committees is given in Decision No. 194/CT. In particular, the Ministry of Forestry is responsible for coordinating State Committees, Ministries and People's Committees in the establishing, planning and protecting forbidden forests, as well as defining boundaries both on maps and on the ground. People's Committees that have forbidden forests within their area are responsible for providing information on the regulations to local residents, as well as organising law enforcement patrols. The Decision also sets out a five-year work plan (1986-1990) for the Ministry of Forests, to include natural resource surveys, provision of management plans, establishing rules for management of forbidden forests and investigating the potential of exploiting some sites for commercial or tourist uses.

Sites designated under the Convention Accession on 20 September 1988 with one site listed.

Red River Estuary

Government body responsible for administration of the Convention

State Committee for Science and Technology, Department of Resources and Environment,
Ramsar Convention Section, 39 Tran Hung Dao Street, Hanoi

Red River Estuary

Location 20°10'N, 106°20'E. The reserve is situated on the coastline of Xuan Thuy District, Ha Nam Ninh Province. It is 45km east-south-east of Nam Dinh Provincial Town and 110km south-east of Hanoi.

Area 12,000ha

Degree of Protection In 1987, the government gave protected status to the Red River Estuary. At present bird hunting, mangrove lumbering and other negative activities are prohibited in the reserve. This includes the extensive shrimp aquaculture. The site was added to the Ramsar list with the accession of Vietnam to the Convention on 20 September 1988. The site is state-owned.

Site Description The main part of the reserve comprises two islands named Con Lu and Con Ngan formed from siltation processes of the Red River mouth 20 years ago. The fine deposits of silt on the landward, protected side of the islands have been colonised by mangroves. The exposed seaward side of the islands consists of sandy beaches. The rest of the reserve consists of the marine water bodies between the two islands and the mainland, and the land belt along the seaward side of the sea dyke system. The coastal land includes extensive mudflats, mangrove swamps, salt marshes and sandy beaches. Large parts of the mudflats are impounded for shrimp ponds. Both deposition and erosion occur. However, the rate of deposition is twice that of erosion. The mudflats extend 500-600m per year, and the level of the land has risen by nearly 10cm per year. The maximum tidal range is approximately 4m. The climate is tropical monsoonal with maritime influences. Average annual rainfall is 1600-1800mm, of which 85% occurs during the summer (April to October). Extensive flooding occurs during August and September when rainfall is at its heaviest and the river levels are high. Winter mean monthly temperatures vary from 16.3°C to 20.9°C, but temperatures can be very low, and an absolute minimum -14.4°C has been recorded. The average monthly summer temperatures range from 27°C to 29°C with a maximum of 40°C. Winds are north and east in winter, and east and south-east in summer.

Natural mangrove vegetation of the area has been replaced by a simpler community dominated by *Sonneratia caeseolaris*, *Aegiceras corniculatum*, *Bruguiera gymnorrhiza* and *Acanthus ebracteatus*. Marsh vegetation includes *Phragmites* sp., *Cyperus* sp., and algae such as *Rhizosolenia*, *Chaetomorpha*, *Clenophora*, *Enteromorpha*, *Oedogonium*, *Crispum* and *Gracilaria*. In some places *Cyperus malaccensis* is grown as a crop for industrial purposes. One hundred and fifty species of fish are known to occur in the estuary. Ten species are represented in commercial catches and approximately 40 species are of economic value. There are at least 12

genera of Bivalva and two genera of Gastropoda in the area and many shrimp, including *Penaeus orientalis*, *P. merguensis*, *P. japonicus* and *Metapenaeus* sp. Brachyura include *Scylla serrata* and species of *Eriocheir*, *Neptunus*, *Mecerothainus*, *Uca* and *Hemigrapheus*. The area supports a total of 185 species of zooplankton, including 107 Copepods, 14 Cladocera, 8 Siphonophora, 8 Chaetognatha, 6 Amphipoda, 6 Tunicata, 5 Protozoa, 4 Ostracoda, 3 Pteropoda-Heteropoda, 2 Rotatoria, 2 Cumacea, 1 Sergestinae, 1 Euphausiidae and 18 Nauplius. During spring and early summer planktonic density varies from 1,600 to 267,450 individuals per cu.m (mean 15,470). During the rainy season, the mean density is 6,170 individuals per cu.m.

International and National Importance Red River Estuary Reserve is the most important staging and wintering area for migratory waterfowl in northern Viet Nam. The estuary holds more than 100,000 birds from October to April. Over 21,000 waterfowl were recorded in a brief survey during March 1988. Those counted included 300 Chinese pond heron *Ardeola bacchus*, 95 cattle egret *Bubulcus ibis*, 850 little egret *Egretta garzetta*, 150 great white egret *E. alba*, 500 grey heron *Ardea cinerea*, 32 black-faced spoonbill *Platalea minor*, 500 European wigeon *Anas penelope*, 2,500 green-winged teal *A. crecca*, 100 garganey *A. querquedula*, 400 shoveler *A. clypeata*, 1,000 black-tailed godwit *Limosa limosa*, 30 bar-tailed godwit *L. lapponica*, 300 curlew *Numenius arquata*, 1,500 spotted redshank *Tringa erythropus*, 110 redshank *T. totanus*, 300 marsh sandpiper *T. stagnatilis*, 250 greenshank *T. nebularia*, 130 common snipe *Gallinago gallinago*, 70 great knot *Calidris tenuirostris*, 230 broad-billed sandpiper *Limicola falcinellus*, over 10,000 small shorebirds, 750 black-headed gull *Larus ridibundus*, 200 Saunders' gull *L. saundersi* and 600 whiskered tern *Chlidonias hybrida*. The population of Saunders' gull is the largest wintering concentration of this species yet discovered. Swinhoe's egret *Egretta eulophotes* and Asian dowitcher *Limnodromus semipalmatus* have been sighted in the reserve. In the early part of the year up to 62 black-faced spoonbills and 200 greylag goose *Anser anser* have been recorded. In November and December a species of pelican, possibly Dalmatian pelican *Pelecanus crispus*, is a regular visitor. A survey in 1983 recorded 38 species of shorebirds in the estuary which included migrants such as little ringed plover *Charadrius dubius*, greater sand plover *C. leschenaultii*, wood sandpiper *Tringa glareola*, terek sandpiper *Xenus cinereus*, common sandpiper *Actitis hypoleucos*, pintail snipe *Gallinago stenura*, common snipe *G. gallinago*, rufous-necked stint *Calidris ruficollis*, long-toed stint *C. subminuta*, Pacific golden plover *Pluvialis fulva*, grey plover *P. squatarola*, long-billed plover *Charadrius placidus*, Kentish plover *C. alexandrius*, Mongolian plover *C. mongolus*, whimbrel *Numenius phaeopus*, curlew *N. arquata*, redshank *Tringa totanus*, greenshank *T. nebularia*, green sandpiper *T. ochropus*, grey-rumped sandpiper *Heteroscelus brevipes* and Temminck's stint *Calidris temminckii*.

Changes in Ecological Character The main disturbance and threat to the wetland is extensive shrimp aquaculture, and human encroachment to the sea with dike systems and mangrove cutting for fuelwood. In 1983 the local people built up shrimp ponds in the wetland of the estuary which led to the loss of approximately 500ha of mangrove forest in the region. Consequently, honey production decreased from 50 to 10 tons annually. The population of wintering waterfowl and shorebirds also declined. Some of the mangrove forest has been cleared for the cultivation of rushes *Cyperus malaccensis* used by local people and for export. Over-exploitation has depleted fish production and excessive hunting, along with habitat loss, has decreased waterfowl populations. The construction of Da Dam upstream on the Red River is likely to have a serious long-term effect on the estuarine system.

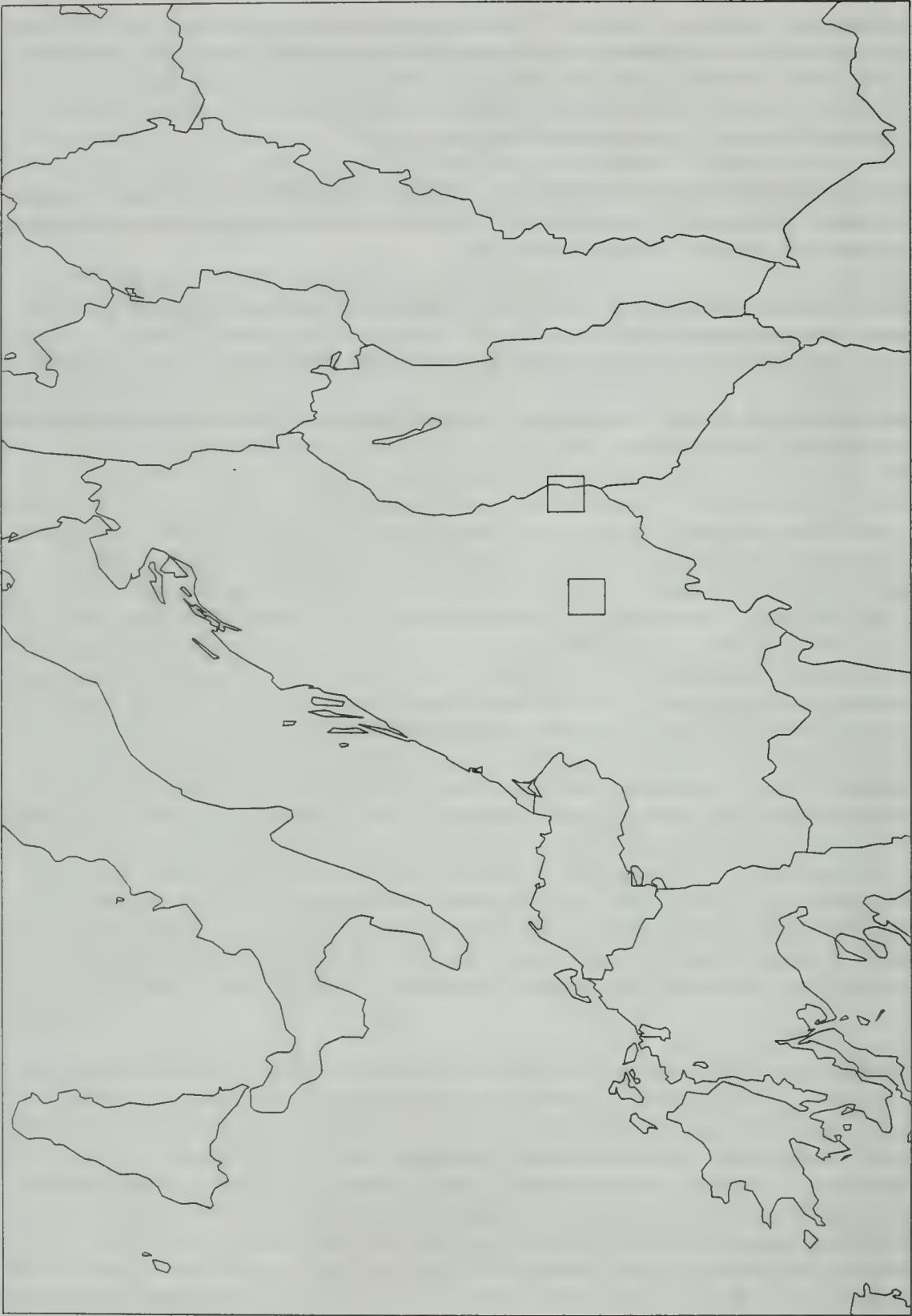
Management Practices The idea behind the reserve is that it be multi-purpose, to protect migratory waterfowl populations and to promote the conservation of aquatic resources for sustainable use. The wetland system is of great socio-economic value to the local community which depends on fish and shrimp production, firewood collection, the cultivation of rushes for weaving and the use of mangroves for honey production.

Scientific Research and Facilities Scientists from the State Programme on Rational Utilization of Natural Resources and Environmental Protection have been conducting studies on the natural resources of the Red River Estuary since 1982.

Principal Reference Material The above information was supplied by the Vietnamese Government, supplemented by:

Kempf, E. (1988). Indochina's bountiful wetlands. *WWF News* No. 55, September/October. Pp. 4-5.

Scott, D.A. (ed) (1989). *A Directory of Asian wetlands*. IUCN Gland, Switzerland and Cambridge, UK. 1181 pp.



Ramsar Sites in Yugoslavia

Yugoslavia

Area 255,834 sq.km

Population 23,411,000 (1988)

Summary of Wetland Situation Since the end of the War, the majority of the larger wetland complexes have been drained and put under cultivation or pastures. In several of the few wetlands that survive, suitable habitats for breeding waterfowl are seriously degraded, but conditions for roosting and wintering birds sometimes remain viable. Efforts are now being made to improve the situation for nesting birds, especially at sites which are still rich in species, and a number of reserves have been established since 1965. The Yugoslav Waterfowl Commission is also ensuring that adjacent feeding areas are included in reserves.

The Province of Vojvodina has a number of wetlands which at one time were among the finest in south-east Europe. Fishing and hunting have long been economically important activities, and the wetlands included many shallow lakes, ponds and marshes, and seasonally inundated plains and forests situated between the meanders of the Dunav (Danube), Theiss (Tisza) and Bega (Begej) rivers; belonging geographically to the great Pannonian plain. Between 1951 and 1970 five reserves of limnological, as well as zoological, importance were established in this area: Obedska bara (1,000ha), Ludosko Jezero (318ha), Vojtina Mlaka (50ha), Monostor (1,000ha) and Kozjak (44ha).

Obedska bara and a sixth site, Carska bara, near the confluence of the Bega and Theiss rivers, are perhaps the best known areas. Their typical breeding birds are bittern (sporadic), little bittern (common), night-heron, squacco heron (nesting commonly in riparian forests), little egret (common), great white egret (breeding in small numbers), purple heron (large colonies in reedbeds), white stork (common but slowly declining), black stork (breeding in small numbers), glossy ibis (common in 19th century but now only in small numbers at Obedska Bara) and spoonbill (nesting in small numbers at Obedska Bara but no longer near Pancevo nor near Novi Sad; where formerly common). Several species of gulls and terns also nest when conditions are suitable.

In the Republic of Croatia several reserves were established between 1965 and 1970, of which Kopacki rit (17,700ha) is undoubtedly of international importance for both limnological and zoological reasons. The waterfowl which nest in the area include cormorant, greylag goose and both egrets. Two reserves established in the Neretva delta serve to protect coastal saltmarshes of 1,200 and 700ha in extent. The delta region is certainly one of the most important sites for waterfowl in the Adriatic coastlands. Its breeding birds include several grebes, pygmy cormorant, herons, mallard, garganey, ferruginous duck and rails. The marshes, wet meadows, salt pans and sandbanks of the whole delta/valley complex also provide suitable habitat for migrating and wintering birds, although hunting pressure is severe. Further inland, the Neretva River rises in, and flows through, the Republic of Bosnia and Hercegovina which has also established two

reserves, Hutovo Blato (360ha) and Bardaca (700ha), in a lake and marshland area to the east of the lower Neretva.

In the Republic of Montenegro, eleven glacial lakes on Durmitor mountain and another on Biogradska Gora have been included in the national parks. The Yugoslav sector of the great Skadarsko jezero on the Albanian border is partly protected and contains a small colony of Dalmatian pelicans. Protection has also been given to some of the coastal wetlands and salt pans on the final 30km of the Bojana River which forms the border with Albania before it enters the sea.

The great lakes on the Albanian and Greek borders, Ohrid, Prespa and Dojran, have been declared natural monuments, implying some general measure of landscape protection. Some areas around these lakes and also the marshes of the Crna River, a tributary of the Vardar and known as a past nesting-place of pelicans, have been proposed as nature reserves.

Little is known of the exact status of the wetlands in the Republic of Slovenia, but about 5,000ha are protected as a nature reserve at Ljubljansko barje, and some 1,000ha of mudflats and coastal wetland in the bay of Portoroz, in the north-west corner of the Istra Peninsula. Finally, in the Province of Kosovo some small lakes, gorges and springs, believed to be of considerable limnological and hydrographic interest, have been protected as landscape reserves; but the only waterfowl habitat known to be important, about 300ha in the marshes of Radevo, is unprotected.

Protected Areas Legislation The principles of environmental conservation are embraced in the Constitution of 7 April 1963, where all natural resources are defined as social property (with the exception of private holdings up to 10ha). National parks can only be declared by the highest authority which is usually the Republic Assembly, under the law on Nature Protection, Article 27, Paragraph 1 (Norodne novine No. 53/76). National parks consist of a central strictly protected area surrounded by a less strictly protected zone. Each republic creates national parks and other protected areas under its own special laws within the national framework with nature reserves in Croatia declared under a decree for the Protection of Natural Rarity No. 21/48, for example, and in Bosnia and Herzegovina by decision of the National Institute for the Protection of Historic Monuments and Natural Beauty. The legal texts covering national parks exercise control over forestry, hunting, fishing and certain agricultural works whilst in nature reserves all activities are strictly controlled.

Protected Areas Administration The Federal Republic is composed of six republics and two socialist autonomous provinces with the resulting wide variety of administrative bodies covering nature conservation. Protected area administration is based on a decentralized public authority structure with an institute for nature protection in each of the six republics. The parks are managed by public administrative bodies, the actual authority varying from republic to republic. The parks may be managed by experimental farms under the Ministry of Agriculture, or by local self-administered committees or bodies under the Ministry of National Education or under a nature conservancy institute. Each national park must have by law its own administration, professional staff and funds for effective protection.

Sites designated under the Convention Accession on 28 March 1977, with two sites listed at accession.

Nature Reserve Obedska Bara
Nature Reserve Ludasko Lake

Government body responsible for administration of the Convention

Federal Executive Council, Commission for the Environment, Bulevar Lenjina 2, 11070 NOVI Beograd

Nature Reserve Obedska Bara

Location 44°43'N, 20°04'E. Situated in the Commune of Pecinci in Srem Region, Vojvodina Province.

Area 17,501ha

Degree of Protection The designated site contains three zones with different degrees of protection: a region of particular natural beauty completely surrounding a strict nature reserve and scientific research reserve (combined area of SNR and SRR about 2,400ha). Designated as a Ramsar site in March 1977.

Site Description The SNR and SRR are situated between the villages of Obriez and Kupinovo and comprise part of an old meander of the River Sava and some of the enclosed land. The meander is now only connected to the river at medium and high water levels. The SNR comprises the north and east of the horse-shoe shaped meander, and the SRR includes part of the area enclosed by the meander and a portion of the meander near the village of Kupinovo. The region of particular natural beauty extends to the banks of the River Sava in the south, and to and including the villages of Ogar and Asanja in the north. Habitats include ponds, marshes, reedbeds, peatbogs and woodland.

International and National Importance The site has a wide range of habitats, and is reported to be of great scientific, cultural and educational importance. It is important for breeding waterfowl including glossy ibis *Plegadis falcinellus*, spoonbill *Platalea leucorodia*, bittern *Botaurus stellaris* (irregular), little bittern *Ixobrychus minutus*, night heron *Nycticorax nycticorax*, squacco heron *Ardeola ralloides*, purple heron *Ardea purpurea*, little egret *Egretta garzetta*, great white egret *Egretta alba*, white stork *Ciconia ciconia* and black stork *Ciconia nigra*.

Changes in Ecological Character It was reported at the Second European Meeting on Wildfowl Conservation in 1966 that there were possible plans for felling of the oak woodlands surrounding the site. The waterfowl are less numerous than in the mid-19th century.

Management Practices No information

Scientific Research and Facilities No information

Principal Reference Material The above information is taken from maps and documents submitted by the Government of Yugoslavia at the time of ratification of the Ramsar Convention.

Supplemented by:

Carp, E. (1980). *A Directory of Western Palearctic Wetlands*. IUCN, Gland, Switzerland. 506 pp.

Proceedings of the Second European Meeting on Wildfowl Conservation (1966). Noordwijk ann Zee, Netherlands.

Scott, D.A. (1980). A preliminary inventory of wetlands of international importance for waterfowl in west Europe and northwest Africa. *IWRB Special Publication* No. 2. 127 pp.

Nature Reserve Ludasko Lake

Location 46°04'N, 19°48'E. Situated 12km east of the town of Subotica in the region of Backa, Vojvodina Province.

Area 593ha

Degree of Protection Part of the north-east area of the lake and some surrounding land is a strict nature reserve. The whole lake and a band of surrounding land (of varying width) is a regional park which in the northeast acts as an outer protective zone to the strict nature reserve. Designated as a Ramsar site in March 1977.

Site Description Ludasko Lake (221ha) lies in a north-south direction between the Danube and Tisa rivers. The lake is about 5km long, 2km wide in the north but only about 200m wide in the south. It is shallow and has extensive reedbeds. The area is a natural refuge for most types of waterfowl and many other water-associated fauna.

International and National Importance The lake is an important breeding area for many herons and egrets (Ardeidae) and white-headed duck *Oxyura leucocephala*. It is situated on a bird migration route used in various seasons, and is a wintering area for large numbers of waterfowl.

Changes in Ecological Character None reported

Management Practices No information

Scientific Research and Facilities No information

Principal Reference Material The above information is taken from maps and documents submitted by the Government of Yugoslavia at the time of ratification of the Ramsar Convention.

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