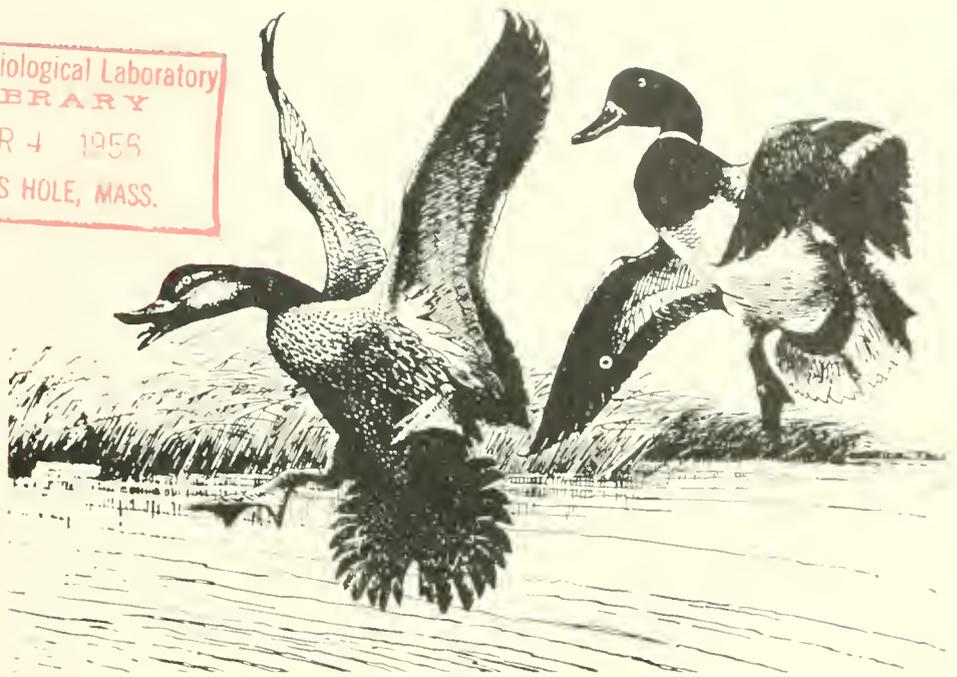
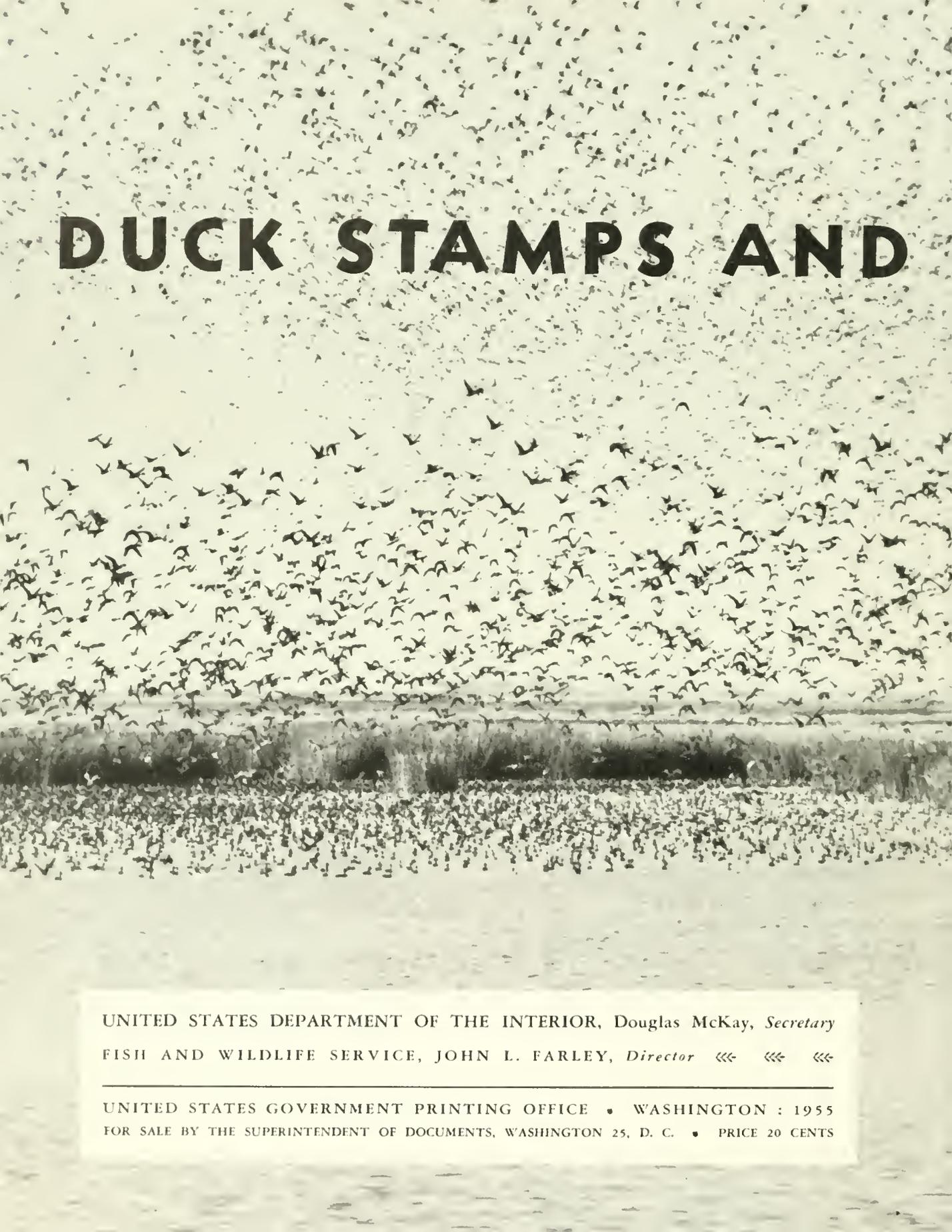


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DUCK STAMPS AND WILDLIFE REFUGES

UNITED STATES DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
CIRCULAR 37

A black and white photograph showing a vast flock of ducks in flight. The ducks are scattered across the sky and the ground, creating a dense pattern of dark shapes against a lighter background. The scene is captured from a low angle, looking across a field towards a distant horizon.

DUCK STAMPS AND

UNITED STATES DEPARTMENT OF THE INTERIOR, Douglas McKay, *Secretary*
FISH AND WILDLIFE SERVICE, JOHN L. FARLEY, *Director* <<< <<< <<<

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WILDLIFE REFUGES

By John L. Farley

The Fish and Wildlife Service has received many inquiries about the use of funds from Migratory Bird Hunting Stamps, or "Duck Stamps," in the national migratory waterfowl refuge program. This circular has been prepared to answer such inquiries. The circular is taken largely from a report by the Director of the Fish and Wildlife Service to the Subcommittee on Public Lands of the House Committee on Interior and Insular Affairs, July 30, 1954, with some additions of later information. This is the story of the importance of Duck Stamps in the development and maintenance of national waterfowl refuges, and of the importance of these refuges in the preservation of waterfowl hunting in this country.

Like many other worthwhile movements in the United States, the wildlife refuge program was conceived by a small group of people. Toward the end of the last century a few persons were intensely interested in protecting for the future the bird and animal life that was fast disappearing from the face of the continent.

One very active organization was the American Ornithologists' Union, which had its inception in 1883. Composed of a small band of professional ornithologists, the A. O. U. aroused official interest that led to the establishment of the first national bird reservation: on March 14, 1903, an Executive order of President Theodore Roosevelt provided protection for tiny Pelican Island in the Indian River, on the Florida east coast. This little 3-acre reef held rookeries of colonial birds that were being slaughtered for their plumage, which was sold to the millinery trade. Establishment of this Federal refuge put a stop to the killing of the birds and the robbing of their nests, with the A. O. U. supplying warden service.

This was the beginning of a series of Executive orders. By 1906, three more refuges of the same type in various parts of the country were set aside. These areas also were patrolled through the use of private funds, largely supplied by the National

Audubon Society, an organization allied to the Ornithologists' Union, and with similar ideals.

In 1908, 36 more of these small islands primarily for protection of colonial birds were set aside. Several of these were in Alaska.

Following this small beginning, interest grew until in June 1924 Congress authorized the appropriation of \$1,500,000 for the purchase of bottom lands along the upper Mississippi River, to establish what has become one of the very important waterfowl and wildlife refuges in the country. In 1928, an appropriation of \$350,000 was made to establish the Bear River Migratory Bird Refuge on the salt marshes at the mouth of Bear River, on Great Salt Lake in Utah.

Also during this period, the first refuges were established on reclamation reservoirs or drainage sumps. From 1908 to 1930, Executive orders established such waterfowl units as Malheur and Upper Klamath Lakes in Oregon, Tule and Lower Klamath in California, and Deer Flat and Minidoka in Idaho.

A few big-game refuges were brought under Federal protection during this period, either by special acts of Congress or through donations by conservation organizations. In this category was the National Elk Refuge in Jackson Hole, Wyo.;



Many early refuge areas were to protect colonial birds like these egrets from plume hunters.

the Izaak Walton League raised funds to acquire lands on which to feed the elk, which normally starved by the thousands during the severe Wyoming winters. The National Audubon Society and the Boone and Crockett Club raised funds to acquire the first unit of the Charles Sheldon Antelope Refuge in northern Nevada.

By 1929, public interest in the preservation and conservation of waterfowl resulted in the first real Federal legislative authority for a broad program of refuge acquisition and development. This act, based on the Migratory Bird Treaty with Great Britain (signed in 1916), was known as the Norbeck-Andresen Migratory Bird Conservation Act. Its declared purpose was—

to more effectively meet the obligations of the United States under the migratory bird treaty with Great Britain by lessening the dangers threatening migratory game birds from drainage and other causes, by the acquisition of areas of land and of water to furnish in perpetuity reservations for the adequate protection of such birds; and authorizing appropriations for the establishment of such areas, their maintenance and improvement, and for other purposes.

Section 12 of this act enlarges upon its intended purposes to include—

the acquisition . . . of suitable areas of land, water . . . for use as migratory bird reservations . . . and for the administration, maintenance, and development of such areas and other preserves, reservations, or breeding grounds frequented by migratory game birds . . . including the construction of dams, dikes, ditches, flumes, spillways, buildings, and other necessary improvements, and for the elimination of the loss of migratory birds from alkali poisoning, oil pollution of waters, or other causes, for cooperation with local authorities in wildlife conservation, for investigations and publications relating to North American birds, for personal service, printing, engraving, and issuance of circulars, posters, and other necessary matter and for the enforcement of the provisions of this act . . .

To carry out the acquisition of lands in a businesslike fashion, and to ensure close cooperation between the executive and the legislative branches of the Government, this act established the Migratory Bird Conservation Commission, composed of the Secretaries of Agriculture, Commerce, and Interior, and two Members each from the Senate and the House. The Commission has since that time passed upon all purchases of land made under the provisions of the act. The Biological Survey, a predecessor of the Fish and Wildlife Service, immediately started surveys of areas throughout the 48 States in an effort to locate lands suitable for purchase under the newly acquired authority of the Conservation Act.

During the next year, Congress passed a special bill which authorized \$250,000 for the purchase of the Cheyenne Bottoms Refuge in Kansas, a project never completed by the Federal Government because of a subsequent inflation in land prices due to an oil boom. This fine project has now been restored by the State of Kansas through the expenditure of \$1,741,000 of Pittman-Robertson funds. There also followed shortly the purchase of St. Marks Refuge in Florida, Salton Sea in California, Swanquarter in North Carolina, and Crescent Lake in Nebraska. By 1932, several other areas were added to the system, some by purchase, some by withdrawal of public lands, and one by gift.

The Frenzied Thirties

Then came the early thirties, with the great drought at its height. Water from prairie pot-holes, ponds, and marshes had disappeared; dust-storms raged, and farmers throughout the Dust



Snow geese at Sacramento Refuge.

Bowl were panic stricken and in poverty. Waterfowl had reached the lowest point in their history. Severe restrictions on the take were ordered, but control of the hunter kill was far from the answer to the basic problem of where the birds would find suitable nesting cover, food, and protection. The refuge program, which had seen an auspicious beginning with the passage of the Norbeck-Andresen Act, was also withering. Funds to implement the act were unavailable during the depression, and many conservationists predicted early extinction of the Nation's ducks and geese.

Then in January 1934, President Franklin D. Roosevelt appointed a special waterfowl committee consisting of Jay N. (Ding) Darling, famous cartoonist; Thomas Beck, magazine editor and avid duck hunter; and Aldo Leopold, one of the Nation's foremost biologists. This committee immediately set a goal of \$50 million for the purchase and restoration of submarginal and other lands for wildlife, with special emphasis on migratory waterfowl. Such breadth of imagination brought a public gasp, yet it fired the enthusiasm of conservationists everywhere. Ding Darling came in as Chief of the Biological Survey and changed the course of refuge history. More than any other single individual in conservation history he proclaimed the plight of drought-stricken and over-shot ducks with his eloquent tongue, his facile pen, and his pungent cartoons.

In a short time, \$8,500,000 of emergency funds were obtained to buy lands and construct fences, dikes, dams, and necessary buildings, as follows: A special fund of \$1,000,000 was set aside by the President for the purchase of migratory waterfowl refuges; \$1,500,000 was allocated from the submarginal land retirement fund; \$3,500,000 was allocated from drought-relief funds, for purchase and development of lands within drought stricken areas; \$2,500,000 was allotted from WPA funds, for engineering operations, to construct water-level controls and to improve the refuges.

It was in this setting of excited interest among sportsmen and conservationists that the Duck Stamp Act, formally known as the Migratory Bird Hunting Stamp Act, came into being; its purpose was—

to supplement and support the Migratory Bird Conservation Act by providing funds for the acquisition of areas for use as migratory-bird sanctuaries, refuges, and breeding grounds, for developing and administering such areas, for the protection of certain migratory birds, for the enforcement of the Migratory Bird Treaty Act and regulations thereunder, and for other purposes.

Ding Darling drew the design for the first Duck Stamp. During the first year, its sale added almost \$600,000 to the funds available for the national program.

Frenzied activity among the small staff of the Biological Survey under Darling's leadership, full



Water-control gate at Bear River Refuge.

cooperation of State conservation directors, and active participation by many sportsmen's groups brought astonishing results. Land negotiators, surveyors, engineers, draftsmen, biologists, and other skilled help were hastily recruited. Surveys and negotiations for lands went forward at a dizzy pace. Buildings, dikes, dams, and other structures were rushed to the construction stage. Many were aided by WPA labor, others through the use of workers in the Civilian Conservation Corps. Between July 1, 1934, and March 31, 1935, some 653,000 acres of land were optioned in time for letting construction contracts amounting to \$892,000.

Chautauqua Refuge in Illinois, Seney in Michigan, Squaw Creek in Missouri, Arrowwood, Des Laes, Lostwood, and Upper and Lower Souris Refuges in North Dakota, and Sand Lake, Lacreek, and Waubay in South Dakota, all came into being. Several areas were expanded by the addition of suitable lands. By June 30, 1935, 22 CCC camps were working on refuges where land purchase had gone forward far enough to warrant development.

By the end of 1935, White River Refuge in Arkansas, Sacramento in California, Delta, Lacassine, and Sabine in Louisiana, Mud and Rice Lakes in Minnesota, Medicine and Red Rock Lakes in Montana, Valentine in Nebraska, Mattamuskeet in North Carolina, Muleshoe in Texas, Turnbull

in Washington, and the Great P Ranch as an adjunct to Lake Malheur in Oregon, all fell into place on the national refuge map.

Later, Darling, with the aid of Senator Norbeck of South Dakota and other ardent conservationists in Congress, obtained another \$6 million for the waterfowl restoration program.

By the end of 1937, acquisition was in progress on 62 different refuges, old and new; construction of dikes, dams, and other facilities was proceeding on the newly purchased areas as rapidly as title passed to the Government. In the important breeding areas of North Dakota and Montana, landowners were cooperating wholeheartedly by granting perpetual easements for the flooding of their dried-up potholes, with the Government providing labor to construct dams designed to catch and hold the waters which were bound to return with a change in the water cycle.

During those years, increasing CCC, WPA, and other relief labor was available for the development program, but there was a dire shortage of Federal funds for the purchase of supplies and material to take advantage of the abundant supply of relief labor. Here the Duck Stamp funds were used to great advantage for purchasing fencing material, steel, cement, water-control gates, and other necessary items. These funds, though small in amount, became the key to the use of relief labor for the development of the thousands of acres of lands purchased with other funds. During succeeding years, as WPA workers returned to private industry and CCC camps were disbanded, the Duck Stamp funds and the all-too-inadequate regular annual appropriations became the sole source of support for the waterfowl refuge program.

Duck Stamp receipts in those early years, however, were only a drop in the bucket compared with the emergency funds that Darling was able to obtain. In the fiscal year 1935, Duck Stamp receipts were \$635,000; the next year they dropped to \$448,000. In 1937 they rose to \$604,000, and in 1938 to \$783,000. It was not until 1939 that they hit the \$1 million mark. Had it been necessary to depend entirely on such funds for land purchase, the Service's waterfowl refuges would be far short of the present 3¼ million acres.

As a part of the relief endeavor during the early thirties, the Government embarked on a purchase program to retire submarginal lands in



Malheur Refuge in Oregon.

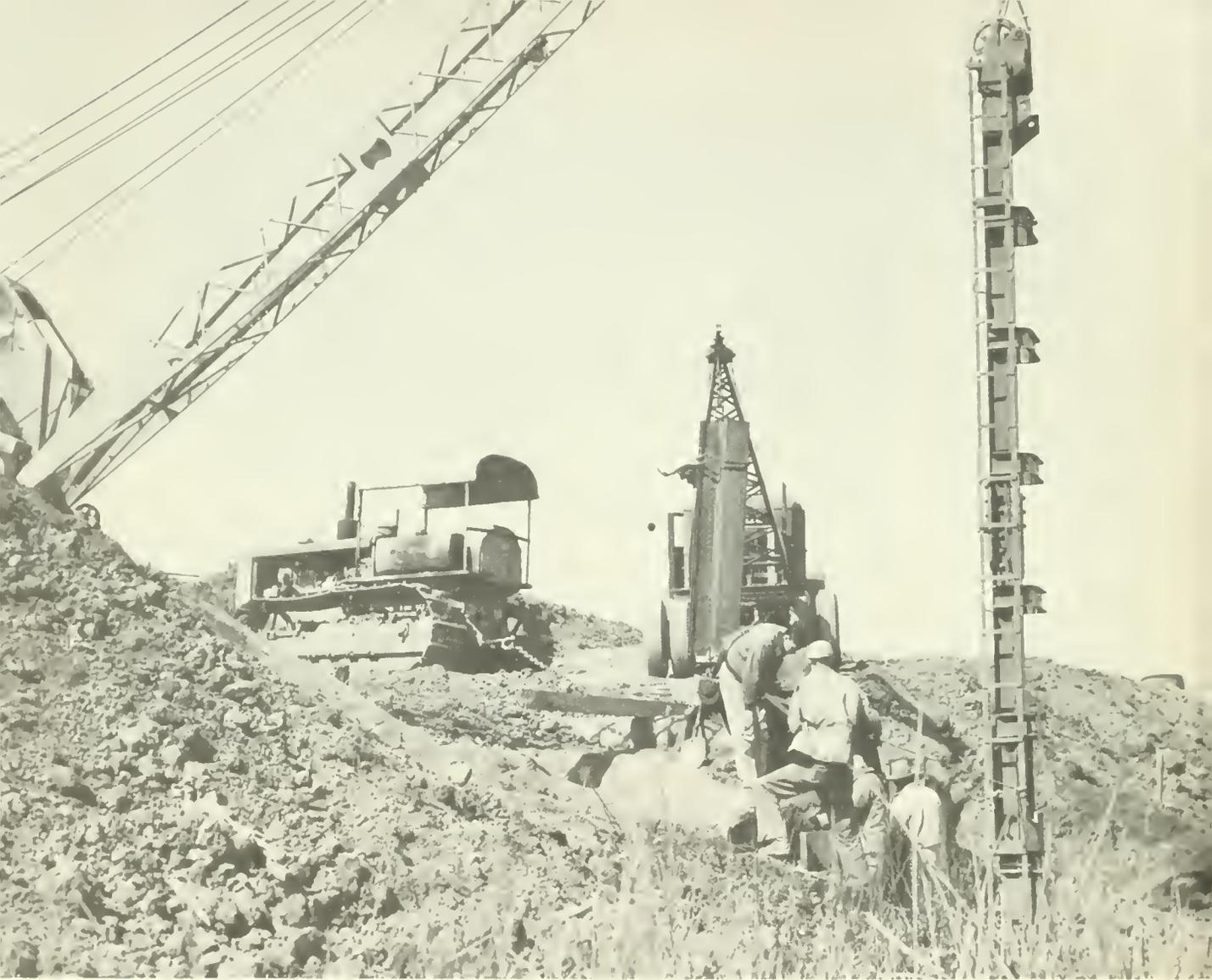
communities which were unable to maintain a living standard from their abused and wornout soils. In 1939 that policy changed, and areas acquired by the Resettlement and Farm Security Administrations were turned over to other agencies of the Government for administration. Five such units, totaling more than 200,000 acres, were transferred to the Service: The Carolina Sandhills in South Carolina, Little Pend Oreille in Washington, Piedmont in Georgia, Moosehorn in Maine, and Kentucky Woodlands in Kentucky. All were generally suited for wildlife and upland game, while the 40,000-acre Needah in Wisconsin, and a 65,000-acre addition to the St. Marks Refuge in Florida were important additions to the waterfowl program.

By 1939, all appropriated and emergency funds for the purchase of lands were obligated, and the Migratory Waterfowl Stamp receipts became the only funds available for land purchase. They also constituted a large part of the money available for development, operation, and maintenance of refuges previously acquired. The land-purchase program by necessity resolved itself into one of purchasing key tracts, either in areas where new

refuges were sorely needed, or to round out and complete refuges that had been partly acquired during the burst of activity in earlier days of refuge expansion.

Refuge Acquisition Since 1940

Since 1940 there has been little in the way of congressional appropriations specifically for the acquisition and development of lands for migratory birds. The principal exception has been in California. Here agricultural depredations were severe, and to meet a specific problem in the wintering grounds at the lower end of the Pacific Flyway, Congress in 1948 passed what is known as the Lea Act. The need was for croplands on which the birds might feed instead of raiding the farmers' rice and barley fields. The Lea Act, therefore, authorized the acquisition of wildlife-management areas on which feed could be grown. It also included a special provision permitting hunting at the discretion of the Secretary of the Interior. This plan proceeded regularly for a 5-year period, with congressional appropriations of \$250,000 annually to acquire, develop, and



Building a pump house at Colusa, in California.

manage specific waterfowl-management areas. Four separate units—Colusa, Sutter, Merced, and Salton Sea—a total of 6,927 acres, were acquired with those Lea Act moneys.

Congress also appropriated a total of \$450,000, spread over a 3-year period from 1951 to 1953, to supplement Duck Stamp funds for the restoration of water-control dikes on the Tule Lake-Lower Klamath Refuges in northern California. These dikes are essential to the proper management and control of waters to reduce the heavy botulism losses that had regularly occurred in this very valuable duck and goose concentration area.

Also, a special act of Congress in 1947 transferred to the Service jurisdiction of the Crab Orchard Ordnance Plant and adjoining Federal

lands in southern Illinois. Part of this 44,000-acre area had been acquired by the Government as a step toward improving a very unsatisfactory economic situation in the vicinity of the Herrin coalfields, and the balance as an addition to the ordnance plant. These lands formerly were under the jurisdiction of four separate Government agencies. The Fish and Wildlife Service was interested in acquiring a part of the area for waterfowl management, but before the bill passed the Congress it was amended to include all of the lands in the project, thus making one Federal agency responsible for its administration. At the time the Service took it over, it had practically no wildlife value. Today it is one of the finest wildlife refuges in the United States. Indicative of the phenomenal success of the development and

management program is this comparison: At the time of the transfer there was no waterfowl use of the area; in the fall of 1953, more than 48,000 Canada geese made Crab Orchard their headquarters. Incidentally, this area also has become the center for some of the Nation's most famous hunting-dog field trials.

Although there has been little in the way of special appropriations for the acquisition and development of new refuge areas since 1940, the Service has continued to make great strides in expanding the refuge system. This has been possible largely through the use of suitable areas acquired by other Government agencies for other public purposes.

Basic authority for Fish and Wildlife Service use of areas impounded by other agencies of the Government was first conceived in 1934 through what is known as the Coordination Act. This was greatly strengthened and improved in 1946 and has become an important element in refuge development. The act provides that—

Whenever the Federal Government through the Bureau of Reclamation or otherwise, impounds water for any use, opportunity shall be given to the Fish and Wildlife Service to make such uses of the impounded waters for fish-culture stations and migratory-bird resting and nesting areas as are not inconsistent with the primary use of the waters . . .

Under this authority some excellent areas have been made available to the Service without cost for land. Duck Stamp funds have been used for their development and for operation and maintenance. A few examples are worthy of specific mention.

When Denison Dam was constructed across the Red River, boundary between Texas and Oklahoma, it flooded several shallow bays with excellent waterfowl potentials. Two Federal refuges were created: Tishomingo, of about 13,500 acres in Oklahoma, and Hagerman, of about 11,500 acres in Texas. Subsequent farming and other developments for waterfowl have brought large numbers of wintering ducks and geese into the Red River Valley for the first time within the memory of local residents, and excellent shooting has resulted over a wide adjacent area.

The Santee Refuge on the Santee and Cooper Rivers in South Carolina is a similar area, made available to the Service for wildlife purposes as a part of the Santee-Cooper flood-control and hydroelectric project.

Two of the finest refuges in the South were developed on lands acquired and flooded by the Tennessee Valley Authority. The Wheeler Refuge of some 35,000 acres in northern Alabama

National Field Trials at Crab Orchard, in Illinois.





Stillwater Refuge in Nevada.

and the Tennessee Refuge of about 50,000 acres in western Tennessee have become two of the Nation's finest waterfowl wintering areas through the proper management of food and cover.

Below Boulder Dam on the Colorado River, two other refuge areas have been set aside on Reclamation projects—Havasu, of approximately 45,000 acres, and Imperial, about the same size. These refuge areas are the chief wintering grounds for the Great Basin Canada geese, and accommodate thousands of ducks which find this to be the only suitable marshland in the midst of desert that stretches in endless miles in all directions.

One of the finest areas in the entire refuge system was secured recently with only a small amount of Duck Stamp money needed to provide a few critical tracts. The bulk of the refuge—140,000 acres—was made available at no cost by the central and south Florida flood-control district. Known as the Loxahatchee Waterfowl Management Area, it is just west of Palm Beach, Fla. A few hundred acres outside the dike have been acquired or are being acquired with Duck Stamp funds, to provide farmland for waterfowl-food production and a headquarters site.

The Salt Plains Refuge in north-central Oklahoma, originally established on public-domain land by Executive order, is another good example

of this cooperative approach. Shortly before World War II, the Corps of Engineers became interested in the salt flats as a flood-control project. Agreement was reached with the corps, whereby the salt flats were used for a flood-control impoundment and the additional lands acquired for the project were transferred to the Fish and Wildlife Service for operation as part of the Salt Plains Refuge. Duck Stamp funds were used to acquire some 1,029 acres needed to round out the refuge. A diversion structure and ditch to supply water for a series of sub-impoundments, have been financed from Duck Stamp funds. The 31,000-acre Salt Plains Refuge is now one of the outstanding refuges of the south-central plains wintering area.

Mud Lake Refuge in Minnesota, an excellent waterfowl-breeding area of more than 60,000 acres, also came to the Service at practically no cost—a few acres had to be purchased to round out boundaries. These lands were originally acquired by the Resettlement Administration. This is one of the few Federal refuges on which moose are found: about 100 head make Mud Lake their home.

In Nevada the famous Carson Sink-Stillwater Slough area of almost 200,000 acres, known to western duck hunters since the beginning of irri-



"Multiple use" at Wichita Mountains Wildlife Refuge.

gation in Nevada, is now being extensively developed through a joint program by the State, with Pittman-Robertson funds, and the Fish and Wildlife Service, with Duck Stamp money. All the lands in this project are provided by the Truckee-Carson irrigation district. Draglines and dirt-moving equipment are creating new and improved pools and ditches and water-control structures for better water distribution, all of which will guarantee a perpetuation of the sport of duck hunting in one of the finest areas in the West.

Under the authority of the Coordination Act, and through cooperation between the Service and other agencies, the Service has had transferred to its administration a total of 2,167,926 acres of land suitable for waterfowl management since the Duck Stamp Act was passed. This, plus 209,329 acres acquired with Duck Stamp funds, 16,815 acres leased with those funds, and 11,835 acres now under contract for purchase, makes a total of 2,405,905 acres added, in part by Duck Stamp expenditures, to the national waterfowl refuge system. The costs of surveying, title clearance, administration, and all other expenditures incident thereto, have amounted to \$5,367,125 of Duck Stamp funds. These acquisitions, in addition to the lands acquired before the enactment

of the Duck Stamp law, bring the Service's present migratory-waterfowl refuge holdings to 3,269,549 acres.

Duck Stamp Price Increased in 1949

From 1935 through the fiscal year 1953, some \$8,500,000 of Duck Stamp funds were used for refuge development, and slightly more than \$10 million for operational maintenance. This course has been dictated by necessity. Over the years, as new areas came under administration, the Service has endeavored to secure funds for the development, operation, and maintenance of the new projects. The requirements for economy have resulted in reduced requests and appropriations, making necessary the use of Duck Stamp funds instead of regular appropriations.

This has forced the Service to take steps that have resulted in the present waterfowl program being carried practically in its entirety with Duck Stamp revenues and refuge receipts, and reversions of unexpended Pittman-Robertson funds, which are also available for carrying out the purposes of the Migratory Bird Conservation Act. Practically all of the regularly appropriated funds now available to the Service through the annual appropriations for refuge purposes are used for

the maintenance of big game and upland areas for which Duck Stamp funds cannot be used.

The situation became so desperate, owing to mounting costs and inadequate revenues, that by 1948 the Service was approaching the point of abandoning areas in order to stay within fiscal bounds. When this situation was understood by the sportsmen of America, they urged that Congress remedy it and on August 12, 1949, the price of the Duck Stamp was doubled—from \$1 to \$2. Concurrent with this increase, the Congress authorized the opening to public shooting of not to exceed 25 percent of certain refuge areas, at the discretion of the Secretary. A subsequent action, dated October 20, 1951, increased from 10 percent to 15 percent the amount of money available for administration, which includes law enforcement.

With the additional funds available, the Service expanded its land-purchase program, and the following sums have since been expended for that purpose: Fiscal year 1950, \$302,352; 1951, \$309,689; 1952, \$481,156; 1953, \$757,792; 1954, \$1,125,000; 1955, \$1,250,000. New areas have been acquired as rapidly as options could be taken and the purchases cleared through the Migratory Bird Conservation Commission.

It must be kept in mind that the high prices of land that plague the home buyer and businessman today are just as much of a problem to the Federal Government's agencies engaged in any

kind of land purchase. The market price for land suitable for refuges has increased many times over in the past 15 or 20 years, and less becomes available each year. Many potential refuge areas have been bought up by private gun clubs. In addition, the Service's criterion for suitable refuge lands has changed during the years. In the early days of the waterfowl refuge program, the accent was on the acquisition of marshlands; today the Service finds it necessary also to acquire adjacent farmlands on which to produce supplemental feeds.

Development a Necessary Part of the Refuge Program

Purchase of land is merely the initial step in the establishment of a public waterfowl refuge. Ducks and geese, like pigs and cattle, must have food—lots of it—as well as fresh water and other items, such as gravel, to meet their special living requirements.

Each area selected for a refuge presents different problems, but basically all require the provisions of water, food, protective cover, and headquarters buildings to ensure effective administration. Development must be directed toward providing the habitat that will make the refuges of maximum value to the greatest number of species, particularly during emergency periods. Very few of the

Restored marsh for waterfowl, Horicon Refuge in Wisconsin.



areas are in condition to be of maximum service to wildlife without considerable development. This was especially true of those acquired under the submarginal land-retirement act; all of those lands required restoration of water and vegetation for wildlife food and cover. Each area must be carefully studied to determine its peculiar deficiencies and the special measures needed to overcome them. Along the eastern coast where salt water is predominant, fresh-water ponds are developed to provide diversified habitat and to increase the utility of the refuges. In coastal marshes, water levels are stabilized to permit the growth of more desirable vegetation; in dry areas of the West, reservoirs are constructed to hold the spring runoff for maintenance of nesting and feeding marshes.

The development of the Souris Refuges in North Dakota provides a fine example of the steps needed to build a refuge literally from the ground up. By the early 1930's, when drought struck the Prairie States, practically all of the historic waterfowl marshes of the Souris River loop had been drained. The potholes scattered over the surrounding prairies which produced and cared for hundreds of thousands of waterfowl lost their lifegiving waters, and without the Souris River marshes the birds had no place to go.

The Souris area was selected as the first major waterfowl restoration project in Ding Darling's program, and restoration of the valley marshes was the initial step. CCC camps were moved into the area, and a series of dikes and water-control structures, five in all, were constructed across the valley floor to impound the river and form shallow-water pools and wide marshes. Waterfowl food plants were shipped in from other areas and planted by hand. The area was fenced. Abandoned farmlands were rehabilitated.

But this was not enough. A study of the stream-flow records of the Souris River showed that in some years the spring runoff was negligible, and that by late summer the river ceased to flow. These records indicated that such conditions had previously occurred for periods of two or more consecutive years. The answer was evident. Water storage must be provided above the marshes which were to be restored to their former productivity. So a high dam was constructed across the valley north of the shallow impoundments, and the needed storage was thus provided. This reservoir, since named Lake Darling, has a capacity



Burning the tops of brush to expose green shoots for geese at Mattamuskeet in North Carolina.

of 117,000 acre-feet, and the Service attempts to maintain a minimum of 90,000 acre-feet of water in storage. This will maintain the pools below the reservoir through 2 years of water shortage on the basis of a 45,000-acre-foot annual water requirement.

The Souris River refuges were acquired with emergency funds provided under the drought-relief program. Development costs of more than \$1,500,000 came partly from emergency funds and partly from Duck Stamp funds. The result was the most important waterfowl nesting and feeding concentration point in the Prairie States.

Another example: The famous 50,000-acre Mattamuskeet National Wildlife Refuge in North Carolina looks like a natural area. An abandoned drainage project reverted to its former status as a lake, is one's first impression. The real story is far from being that simple. Old outlet ditches had to be deepened and new ones dug to permit the lowering of water levels in summer to get increased growth of shoreline vegetation. In these moist shoreline flats, willow and other shrub growth had to be eliminated with bulldozers and disks to allow three-square bulrush, a top duck and



Clearing a field at Mattamuskeet to plant food crops for waterfowl.

goose food, to come in. And the disking has to be repeated every year or so to keep the willows from again taking over. Carp had so infested the lake that they had destroyed practically all of the aquatic food plants. Millions of these rough fish were trapped or seined, and sold, with the result that aquatics are coming back beyond the greatest expectations.

Mattamuskeet is now one of the most famous waterfowl wintering areas of the Atlantic coast. Here from 60,000 to 80,000 Canada geese, 80,000 to 150,000 pintails, mallards, black ducks, and teal trade back and forth to adjacent Pamlico Sound and Swanquarter Refuge while hundreds of stately whistling swans—rigidly protected—fly unconcernedly overhead.

About 10,000 acres of the 50,000-acre refuge have always been open to public shooting and hunters normally bag from 3,500 to 5,000 Canadas and a like number of ducks from blinds managed by the Conservation Department of the State of North Carolina. Hunters on farms surrounding Mattamuskeet account for as many geese, or more.

The Service's 205 refuges and management areas are used at some time of the season by about 20 percent of the continental population of waterfowl. Some use them as feeding and resting places during migration, some as winter homes, and some as suitable homes to bring off their broods of downy young.

To provide the food essential for this extensive use of the refuges, the Fish and Wildlife Service has become one of the Nation's largest farmers, and certainly it holds a record for diversification. Refuge personnel are now cultivating more than 17,000 acres, which produce such varied crops as rice, wheat, corn, clovers, barley, millets, buckwheat, and maize. In addition, they supervise sharecropping on 48,000 acres of refuge farmland, in which practically all of the Government's share is left in the fields for waterfowl. The total is more than 65,000 acres of highly developed cropland.

The totals of some of the refuge improvements are impressive: 1,136 miles of dikes, equivalent to a dike stretching from Washington, D. C., to New Orleans, La.; 1,657 miles of ditches and



Alfalfa, corn, and rye at Horicon.

canals, which would make a continuous canal from Washington to Denver, Colo.: more than 4,400 miles of fence, enough to stretch across the international boundaries between the United States and both Mexico and Canada (exclusive of the Great Lakes): more than 3,700 miles of access and patrol roads, equivalent to the mileage from Seattle, Wash., to Key West, Fla.; while telephone and power lines of 574 miles would provide a line from Washington to Indianapolis, Ind.

As a landowner, the Fish and Wildlife Service faces the same problems of mounting costs as the farmer does. Wages are higher, and equipment costs have skyrocketed. The problem facing the Nation today of finding funds to finance a system of adequate transcontinental highways to take care of the country's growing population and transportation needs is paralleled, in a lesser degree, by the problem the Service has of providing adequate access and patrol roads for the refuges.

Here are some examples of equipment costs. The Service operates 54 draglines on its refuge areas. In 1935 this equipment cost an average of less than \$10,000 a unit. The current average replacement value is \$25,000 a unit. One hundred and forty-nine construction type tractors are now in operation. In 1935 they cost approximately \$6,000 a unit. Today they cost \$13,000. A pickup truck—the basic refuge vehicle—cost \$575 in 1935; today it costs more than \$1,700.

Waterfowl-refuge activities do not stop when the construction work is completed and water impoundments filled. Marsh habitat never remains

stable; continual conditioning is a necessity. Cattail, maidencane, and other pest plants will continue to invade marsh areas. These invasions must be fought with herbicides, water manipulation, disking, and replanting with beneficial species. The maintenance of dikes and water-control structures, trails, buildings, and equip-



Heavy equipment.





Red Rock Lakes in Montana helped save the trumpeter swan from extinction.

ment is a problem that is always present. Fire protection is a major activity on most refuges.

Across the continent, flyway by flyway, adequate development can easily be demonstrated as the key to successful refuge management. Through the years the Congress has made very few direct appropriations for development of the refuge areas. The only major appropriation for this purpose was for the construction work needed to restore Lower Klamath National Wildlife Refuge in California, and even this had to be supplemented with Duck Stamp funds. Practically all of the development work has had to be financed either from emergency relief funds, which provided labor, or from Duck Stamp money supplemented in a small way by the use of refuge receipts and reverted Pittman-Robertson funds. Such Duck Stamp revenues as have been available for development of waterfowl refuges have been well spent.

The Future

The eventual fate of waterfowl on the North American Continent is uncertain, more so in fact than for any other game species. Despite all that has been done over the years, waterfowl find their needs in ever-growing competition with the requirements of an expanding human population. The draining of marshes for agricultural improvement, for metropolitan and community growth, for the construction of airports, landing strips, and new highways—yes, even for disposal dumps for refuse from our cities and towns, pose problems that will be most difficult to solve.

Today and for years past we have watched marshes and ponds disappear as agriculture has expanded. In the black prairie-pothole region of western and southern Minnesota and eastern North and South Dakota, agricultural drainage removed, in each of the years 1949 and 1950, about 22,000 potholes, amounting to some 63,000 acres. These areas were the most productive waterfowl lands in the United States, fully equal to the best producing areas in Canada. Similar drainage is occurring in many coastal sections, which are most important to the birds as wintering grounds. Most of the great natural marshes of the Gulf are being ruined or seriously damaged for waterfowl use by salt-water intrusion as a result of the Intra-coastal and connecting canals, and by exploration for sulfur and oil. Waterfowl of the Pacific Flyway are rapidly approaching a crisis because the lush marshes which once supported myriads of birds wintering in California and northern Mexico are being turned into cotton and rice fields, orchards, and urban developments.

Thus we see waterfowl facing a precarious and uncertain future, and in years to come the major reliance will probably have to be on lands dedicated to their needs—lands in the ownership of the Federal Government, the States, and private clubs. At the same time, acquisition of such lands will increasingly be in competition with other human uses, and therefore only at competitive prices. The need for an accelerated acquisition and development program faces us now.

There has been outlined the program of the Fish and Wildlife Service during the past years. To this must be added the work of the State fish and game departments, largely made possible by Pittman-Robertson funds. The history of State acquisition for waterfowl purposes parallels that of the Service in that, with a few exceptions, little was done before the late thirties, but after passage of the P.-R. Act in 1937, when appropriations became available for wildlife restoration, the States began to take an active interest. Since that time 46 States have acquired more than 410,000 acres of land costing \$9,336,000, specifically for waterfowl. The States have invested an additional \$13,500,000 to develop those areas, and in fact have been sufficiently interested in the waterfowl program to invest 21 percent of their total Pittman-Robertson cash in this line of endeavor.

Much has been accomplished, but much more needs to be accomplished in the future if wild-



Bulrush ready for geese.

fowling is to be the sport of our sons and our grandsons that it has been of the present generation.

From the foregoing, then, we have seen the effort and funds which went into the establishment of the Nation's present 205 waterfowl refuge areas, totaling 3,269,549 acres.

In 1934 a careful study of our waterfowl resource showed that originally we had approximately 120 million acres of marsh and wetlands. Fewer than 30 million acres of habitat of good quality for waterfowl remain today. In 1934, on the basis of the existing waterfowl population and future requirements of the waterfowl resource, it was felt that the Federal Government should own and develop 7,500,000 acres. That estimate has stood the test of time. We are almost halfway to that goal now. We still need about 4 million acres, and we need them very soon because of the greatly accelerated destruction of waterfowl habitat and the great increase in the number of waterfowl hunters.

Counting the restoration work that could be done by the States, a total of 12,500,000 acres of land managed primarily for waterfowl is considered the minimum acreage which will carry the present waterfowl population and permit its reasonable increase to a point where the waterfowl



The same area after geese have fed.

hunters of the future can be accommodated on a practical basis. It is expected that the States, through the opportunities provided by the Pittman-Robertson program, will be able to preserve not less than 5 million acres of waterfowl habitat. While the States will place a different emphasis on this restoration—with hunting the chief objective—still the waterfowl areas of the States will carry many waterfowl in the nonhunting season. It is only recently that the States have given more emphasis to waterfowl restoration work, and it is expected that this phase of State game administration will continue to receive popular support.

We already have, as a result of 20 years of waterfowl reconnaissance and the recent wetland survey of the Service, a knowledge of where these strategic areas are. In each of these areas there is a waterfowl management problem requiring Federal ownership to provide additional breeding grounds, wintering grounds, intermediate flyway refuges, endemic waterfowl disease abatement, and crop depredation reduction. There are generally one or more possible sites that can be acquired in each problem area. A number of these areas would be established jointly with States. More and more we are teaming up on this type of management, which we hold most desirable. Often the overall problem of land acquisition and development is



Pinioned birds have helped attract wild geese to Crab Orchard Refuge.

so costly that only by pooling our resources, State and Federal, can the project be undertaken. A noble example of this is the new Shiawassee project in Michigan now being jointly restored by the State of Michigan and the Service.

It is estimated, then, that the Federal Government should acquire and develop 4 million acres of the remaining waterfowl-management goal and the States collectively should acquire and develop a minimum of 5 million acres. It is entirely possible that the States may be able to do more than

that, but they, even more than the Service, are limited by the future maintenance problem. It is estimated that this land will average \$40 an acre in cost, or a total of \$160 million for the entire Federal program. This includes averaging in the use of Federal reservoir lands where they are suitable and available, as well as future gifts and State lands at a nominal lease or on a cooperative basis. In view of past experience, the future development will cost \$20 an acre, or a total of \$80 million for the 4 million acres (cost of developing the present

waterfowl acreage of 3,269,549 acres, averaged \$10 an acre, including the relatively low development costs of the 1930's).

In addition to the continental United States program, because of the increasing importance of Alaska as a breeding ground for the Pacific Flyway, approximately 25,000 square miles of public lands in Alaska should be designated for this purpose. This would be done in such a manner as not to prevent hunting, fishing, taking of furs, and development of minerals and other natural products from these lands for economic use and development, but would give the Service a voice in seeing that they did not lose their utility for waterfowl breeding.

It is all too evident that the Duck Stamp income alone would not be sufficient to complete this program. It is felt that the Congress should supplement the Duck Stamp funds by direct appropriations for an accelerated land-purchase program so that basic waterfowl-management lands necessary for the preservation of the re-

source can be acquired and developed within the next 25 years. This is most urgent because many of the areas now proposed for purchase and development will not be available if not obtained during the next 25 years, in view of the great destruction of waterfowl habitat by competing forces in our Nation's economic life. Furthermore, with rapid drainage of existing habitat, replacement habitat should be bought and developed as soon as possible.

Obviously the portion of the Duck Stamp income that can be allotted for land purchase in the future will not begin to carry such a program. Such a 25-year program would require \$6,400,000 annually for land purchase and \$3,200,000 for development. Moreover, at the present time, of the 205 waterfowl refuges developed to date, the basic maintenance of 203 is entirely on Duck Stamp funds, totaling \$2,800,000. Further, it must be realized that if this future program is consummated in the next 25 years, the ultimate annual maintenance cost will be about \$6 million.

In the fiscal year ending June 30, 1955, the Migratory Bird Conservation Commission approved purchase of 30,189 acres of land for refuges, at a cost of \$645,000, the largest expenditure of duck stamp funds for acquisition since 1945. Eight new Federal refuges have been established in the last three years, and three more refuges are in the process of being established. For the last fiscal year, wildlife refuges received \$6,614,200 for acquisition, development, and maintenance. Sales of Duck Stamps of the 1954-55 issue added \$4,363,698 to the Duck Stamp fund.

APPENDIX

Table 1.—Total expenditures from Duck Stamp funds, by activities, fiscal year 1935 through fiscal year 1955

Activity:	Amount
Post Office Department-----	\$745, 027
Acquisition of land-----	6, 061, 928
Enforcement and surveys-----	4,934,972
Investigations and research-----	2, 042, 384
Development and maintenance ¹ -----	23, 905, 822
Engineering-----	526, 944
Administration-----	1, 387, 867
River basin studies-----	466, 100
Total-----	40, 071, 044

¹ Includes development of waterfowl refuges acquired by gift, by reservation of public domain, by transfer from other Government agencies, and by purchase with Duck Stamp funds and other funds available for such purposes.

TABLE 2.—Expenditures by the Branch of Wildlife Refuges, 1935-55

For fiscal year—	From regular appropriations ¹	From Duck Stamp funds ²
1935-----	\$125, 536	\$23, 386
1936-----	136, 194	428, 696
1937-----	283, 172	260, 424
1938-----	472, 943	237, 314
1939-----	530, 200	437, 445
1940-----	652, 700	614, 855
1941-----	669, 700	720, 489
1942-----	856, 250	482, 478
1943-----	582, 015	484, 180
1944-----	665, 334	640, 509
1945-----	662, 475	577, 006
1946-----	648, 900	1, 079, 374
1947-----	810, 006	1, 288, 111
1948-----	895, 500	1, 434, 472
1949-----	1, 260, 500	1, 450, 416
1950-----	1, 707, 426	1, 492, 720
1951-----	1, 413, 602	2, 322, 477
1952-----	1, 528, 663	2, 204, 118
1953-----	1, 532, 164	1, 655, 670
1954-----	1, 582, 164	2, 295, 974
1955-----	836, 000	4, 111, 580

¹ For maintenance of mammal and bird reservations.

² For refuge development and operation; does not include engineering or administrative services.

TABLE 3.—Acreage of refuge lands under jurisdiction of Fish and Wildlife Service

As of June 30—	In Alaska	In continental United States	Total
1903-----		3	3
1904-----		3	3
1905-----		985	985
1906-----		1, 304	1, 304
1907-----		1, 304	1, 304
1908-----		21, 504	21, 504
1909-----	50, 519	383, 774	434, 293
1910-----	50, 519	383, 774	434, 293
1911-----	50, 519	383, 774	434, 293
1912-----	50, 519	383, 774	434, 293
1913-----	2, 954, 262	427, 106	3, 381, 368
1914-----	2, 954, 262	427, 406	3, 381, 668
1915-----	2, 954, 262	429, 735	3, 383, 997
1916-----	2, 954, 262	435, 355	3, 389, 617
1917-----	2, 954, 262	440, 742	3, 395, 004
1918-----	2, 954, 262	440, 742	3, 395, 004
1919-----	2, 954, 262	440, 742	3, 395, 004
1920-----	2, 954, 262	441, 251	3, 395, 513
1921-----	2, 954, 262	446, 206	3, 400, 468
1922-----	2, 954, 262	446, 866	3, 401, 128
1923-----	2, 954, 262	446, 906	3, 401, 168
1924-----	2, 954, 262	451, 565	3, 405, 827
1925-----	2, 954, 262	451, 565	3, 405, 827
1926-----	2, 954, 262	466, 577	3, 420, 839
1927-----	2, 967, 482	576, 957	3, 544, 439
1928-----	2, 967, 482	539, 065	3, 506, 547
1929-----	4, 078, 182	678, 943	4, 757, 425
1930-----	4, 078, 483	744, 294	4, 822, 777
1931-----	4, 078, 482	835, 863	4, 914, 345
1932-----	4, 087, 402	915, 141	5, 002, 543
1933-----	4, 087, 402	1, 625, 619	5, 713, 021
1934-----	4, 087, 402	1, 762, 801	5, 850, 206
1935-----	4, 087, 407	2, 012, 613	6, 100, 020
1936-----	4, 087, 408	5, 656, 615	9, 744, 023
1937-----	4, 287, 408	7, 144, 966	11, 432, 374
1938-----	4, 294, 208	7, 356, 150	11, 650, 358
1939-----	4, 294, 208	9, 235, 952	13, 530, 160
1940-----	4, 294, 202	9, 341, 163	13, 635, 365
1941-----	4, 294, 202	9, 446, 102	13, 740, 304
1942-----	7, 975, 797	9, 035, 915	17, 011, 712
1943-----	7, 986, 234	9, 368, 053	17, 354, 287
1944-----	7, 940, 597	9, 397, 976	17, 338, 573
1945-----	7, 940, 597	9, 354, 828	17, 295, 425
1946-----	7, 983, 637	9, 540, 350	17, 523, 987
1947-----	7, 983, 270	10, 316, 188	18, 299, 458
1948-----	7, 982, 491	10, 220, 723	18, 203, 214
1949-----	7, 985, 260	9, 299, 624	17, 284, 884
1950-----	7, 985, 260	9, 194, 733	17, 179, 993
1951-----	7, 976, 696	9, 277, 662	17, 254, 358
1952-----	7, 976, 697	9, 275, 571	17, 252, 268
1953-----	7, 936, 203	9, 288, 599	17, 224, 802

TABLE 4.—*Waterfowl refuges*

	<i>Acres</i>		<i>Acres</i>
Alabama: Wheeler.....	34,044	Michigan:	
Alaska: Hazen Bay.....	6,800	Lake St. Clair.....	4,200
Arizona:		Seney.....	93,835
Havasu Lake (also in California).....	45,761	Shiwassee.....	494
Imperial (also in California).....	46,791	Minnesota:	
Salt River.....	21,060	Mud Lake.....	60,744
Arkansas:		Rice Lake.....	15,240
Big Lake.....	9,522	Tamarac.....	29,108
White River.....	116,390	Upper Mississippi (also in Illinois, Iowa, and Wisconsin).....	117,273
California:		Missouri:	
Clear Lake.....	34,616	Mingo.....	21,609
Colusa.....	3,480	Squaw Creek.....	6,809
Lower Klamath (also in Oregon).....	22,800	Swan Lake.....	10,675
Merced.....	2,562	Montana:	
Sacramento.....	10,776	Benton Lake.....	12,235
Salton Sea.....	38,887	Black Coulee.....	1,480
Sutter.....	1,278	Bowdoin.....	15,437
Tule Lake.....	37,337	Hewitt Lake.....	1,360
Colorado: Monte Vista.....	4,378	Medicine Lake.....	31,457
Delaware: Bombay Hook.....	13,810	Nine-Pipe.....	2,020
Florida:		Pablo.....	2,868
Chassahowitzka.....	11,016	Pishkun.....	8,195
Loxahatchee.....	141,336	Red Rock Lakes.....	40,008
Sanibel.....	2,474	Willow Creek.....	3,119
St. Marks.....	65,100	Nebraska:	
Georgia:		Crescent Lake.....	46,540
Blackbeard Island.....	5,618	North Platte.....	5,107
Savannah (also in South Carolina).....	12,685	Valentine.....	70,401
Wolf Island.....	538	Nevada:	
Idaho:		Fallon.....	17,902
Camas.....	10,535	Ruby Lake.....	35,618
Deer Flat.....	10,267	Stillwater.....	204,633
Minidoka.....	22,123	Winnemucca.....	9,806
Snake River.....	355	New Jersey:	
Illinois:		Brigantine.....	12,094
Bateh town.....	4,140	Killbuck (also in Delaware).....	1,485
Calhoun.....	3,565	New Mexico:	
Chautauqua.....	4,471	Bitter Lake.....	23,923
Crab Orchard.....	44,000	Bosque del Apache.....	57,191
Flannigan Island.....	668	Burford Lake.....	1,845
Henderson.....	352	New York:	
Keithsburg.....	1,448	Montezuma.....	6,174
Iowa:		Wertheim.....	1,799
Louisa.....	3,890	North Carolina:	
Union Slough.....	2,075	Mattamuskeet.....	50,178
Kentucky: Kentucky Woodlands.....	64,829	Pea Island.....	5,880
Louisiana:		Swanquarter.....	15,501
Delta.....	48,789	North Dakota:	
LaCassine.....	31,125	Arrowwood.....	15,934
Sabine.....	142,717	Chase Lake.....	375
Maine: Moosehorn.....	22,526	Des Laes.....	18,841
Maryland:		Kellys Slough.....	1,620
Blackwater.....	11,216	Lake Ho.....	3,139
Susquehanna.....	16,410	Long Lake.....	22,732
Massachusetts:		Lostwood.....	26,107
Great Meadows.....	210	Lower Souris.....	58,571
Monomoy.....	2,946	Slade.....	3,000
Parker River.....	6,417	Tewaukon.....	4,710
		Upper Souris.....	32,045

TABLE 4.—*Waterfowl refuges*—Continued

	<i>Acres</i>
Oklahoma:	
Salt Plains	31,129
Tishomingo	13,449
Oregon:	
Cold Springs	2,618
Malheur	165,276
McKay Creek	1,813
Upper Klamath	8,140
South Carolina:	
Cape Romain	34,016
Santee	78,364
South Dakota:	
Belle Fourche	13,680
Laareek	9,442
Lake Andes	443
Sand Lake	21,451
Waubay	4,651
Tennessee:	
Lake Isom	1,850
Reelfoot	9,273
Tennessee	49,510
Texas:	
Aransas	47,261
Hagerman	11,429
Laguna Atascosa	38,759
Muleshoe	5,809
Utah:	
Bear River	64,899
Locomotive Springs	1,031
Strawberry Valley	14,080
Vermont: Missisquoi	1,941

	<i>Acres</i>
Virginia:	
Back Bay	4,589
Chincoteague (also in Maryland)	8,922
Presquile	1,250
Washington:	
Columbia	9,761
Columbia River	8
Conconully	933
Dungeness	235
Lenore Lake	6,201
Smith Island	65
Turnbull	15,964
Willapa	7,123
Wisconsin:	
Horicon	20,683
Long Tail Point	103
Necedah	39,672
Trempealeau	707
Wyoming:	
Bamforth	1,166
Hutton Lake	1,969
Pathfinder	46,341

The 137 waterfowl refuges listed are in most instances under active administration with permanent personnel assigned. In addition, there are 68 refuges on lands on which easements have been granted to the Service for use in protecting wildlife. Of these, 6, totaling 19,230 acres, are in Montana; 60, totaling 78,067 acres, are in North Dakota; 1, with 436 acres, is in South Dakota; and 1, with 360 acres, is in Wyoming.

	<i>Number</i>	<i>Acres</i>
SUMMARY:		
Waterfowl refuges	137	3,171,456
Eastment refuges	68	98,093
Total	205	3,269,549

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