

Rainforest Recovery in N.E. New South Wales

Mandy Sansom, New South Wales National Parks and Wildlife Service

The Australian Government, through the Endangered Species Program, has funded the NSW National Parks and Wildlife Service to implement Recovery Plans for four endangered rainforest plants occurring in north-east NSW.

North-east New South Wales is recognised as one of Australia's regions of highest biodiversity. Approximately half the plant species listed as endangered in New South Wales occur in the far north east. Threats to the unique rainforests of this area have been mainly land clearing for agriculture and development. This is still the main threat today due to rapid population growth and the resultant urban expansion.

The four species for which there is currently a recovery program are Coastal Fontainea, (*Fontainea oraria*), known from only ten trees at one location, Hairy Quandong, (*Elaeocarpus williamsianus*), known from approximately one hundred trees at three locations, Small-leaved Tamarind, (*Diploglottis campbellii*), known from approximately fifteen locations most of which are isolated paddock trees, and Scented Acronychia, (*Acronychia littoralis*), known from 18 locations, most consisting of one or two trees.

The major objectives of this recovery program are to

- (i) identify where the plants are and what is threatening them;
- (ii) undertake management actions at high priority locations, ie sites with potential for long term conservation of the target plants and their habitat; and
- (iii) answer questions about the species' biology and genetic relatedness between populations.

Most of the known plants occur outside of national parks or nature reserves. Long term protection is of high priority, as once dollars and many working hours have been spent restoring a site it is important that the risk of the area being further threatened is minimised. The Recovery Plans have identified the various ways that we could provide for the long-term protection of each remnant population.

For example, where the plants occur on private property, the Service may negotiate a voluntary conservation agreement with the landholder.

Many of the landholders encountered during this program are concerned about the endangered plants and have allowed management actions to be undertaken on their land, but all have

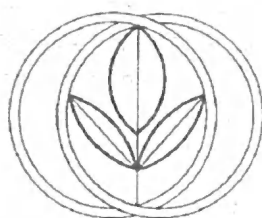
EDITORIAL

Our first national Conference will be taking place in Hobart during the first week of December. This is your opportunity to help map the future direction of our organisation. The Conference workshops will provide us with guidelines for the ANPC's conservation work and following the Conference these guidelines will be circulated to all ANPC members for comment. We look forward to a valuable and stimulating meeting and to meeting members in Hobart.

Welcome! to Vicki Bates, who has taken over from Isobel Crawford as the person responsible for the 'populating' of the ANPC database. Vicki studied Marine Biology and Museum Curatorship at James Cook University and is interested in the promotion of conservation through education.

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IT'S A RARE THING TO TOUR NATIONALLY

Melbourne artist Helen Leitch has accepted a commission to portray Australia's threatened flora in a new and exciting way. Helen's art has been described as "combining the humour of Edward Lear with the insight of Arthur Rackham and Earnest H Shepard (*Wind In The Willows*) in her enchanting watercolours for *It's a Rare Thing* opening in Yarrabee Gallery at the Adelaide Botanic Garden on 10 November and travelling nationally in 1994.

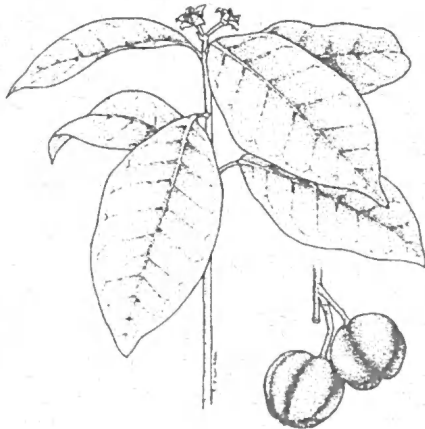
She has successfully depicted threatened Australian plants and the processes that are endangering their existence in a unique exhibition which is great fun and appeals to all ages.

Helen Leitch's watercolours may be seen at the following venues; Adelaide Botanic Garden, until 15 December 1993; Royal Botanic Gardens, Sydney, 1 January-6 March 1994; Australian National Botanic Gardens, Canberra, 12 March-15 May 1994; Darwin Botanic Garden, June 1994; Moree Plains gallery, July 1994; Kings Park and Botanic Garden, Perth, Sept/Oct, 1994; Royal Botanic Gardens, Melbourne, November/December, 1994.

It's A Rare Thing has attracted corporate sponsorship and assistance from the Federal Government's Endangered Species Program.

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been cautious of the idea of a permanent conservation



Fontainea oraria

agreement.

Most of the plants occur in habitats that have been disturbed to some degree. Their survival is threatened by weed invasion, soil erosion, grazing and in some circumstances, fire. More than half of the locations of these plants contain only one or two trees, often as isolated paddock trees, park specimens or roadside verge vegetation. These locations provide little opportunity for long term conservation. The Recovery Program is concentrating on managing sites where target trees occur within areas of natural habitat (although sometimes small). Consequently three *Diploglottis campbellii*, three *Elaeocarpus williamsianus*, one *Fontainea oraria* and three *Acronychia littoralis* sites are being managed.

Management involves monitoring, weeding, and planting of protective edge species, as well as other rainforest species and the target species. At some locations the habitat is being extended to cover larger areas.

Target plants are being propagated from seed and cut-

tings as at least two of the species have never been known to grow from seed, and the others fruit infrequently. *Fontainea oraria* is a dioecious species (that is, male and female flowers occur on separate, unisexual plants) known from only ten trees of which only one is female. Many cuttings of this species are being propagated as currently the future of the species rests on only one plant.

A number of botanic gardens and nurseries have specimens of these plants conserved ex-situ, and the recovery program is proposing to plant specimens from every known location at the NPWS-owned Mount Warning Endangered Plant Arboretum to ensure all genetic variation is conserved.

Research is currently being undertaken, using genetic analysis to determine degree of relatedness between and within populations. Seven of the ten known *Fontainea oraria* trees cluster tightly, and may even share common rootstock,

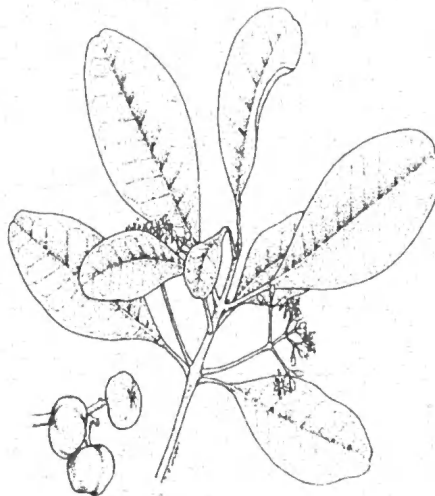
or may be seedlings of a single parent. Genetic analysis may indicate which individuals should be artificially crossed to increase genetic variability of offspring and to increase fruit production.

Genetic analysis will also determine the degree of natural mixing of populations. Results of this research will assist future management strategies. Until genetic relatedness between populations is known, planting of target species on site will only be undertaken using plants propagated from material collected from the site of planting.

Research into pollinators and seed dispersal will also shed light on the degree of natural mixing of populations and research into mycorrhizal associations may assist the raising of healthy nursery stock and ex-situ establishment of the species and might also identify limiting factors to the species' natural distribution.

The recovery program is expected to take approximately nine years. Intensive management of sites will be undertaken for three years and less intensive management for another four to six years. The research will be completed in approximately two years.

The long term goal of the recovery program is to increase the wild populations of these plants to a self-sustainable level. Scientists estimate a minimum of one thousand individuals is needed for survival of a species in the long term. With between ten and one hundred trees known for each species the NSW National Parks and Wildlife Service has an immense task ahead of it.



Acronychia littoralis

FOLLOW UP

Weeds and Botanic Gardens

In *Danthonia*, volume 2, number 1, Mark Richardson wrote of his concerns about weeds and their impact on rare plants, and in particular, the possibility of seeds distributed from botanic gardens becoming invasive pests in another environment.

Three papers presented at the Annual Meeting of the American Association of Botanical Gardens and Arboreta held in Orlando, Florida earlier this year also raised concerns. Sarah Reichard of the Center of Urban Horticulture, University of Washington presented a paper titled 'Invasive Introduced Plants: An Ounce of Prevention is Worth a Pound of Cure' in which she pointed out that invasive introduced plants have had an enormous impact on land biota. They are a form of global change and these changes are virtually impossible to reverse once set in motion. Non-native invasive species are capable of reducing alpha diversity (the number of species in a given community) through competition with natives, they may change ecosystem processes, affect wildlife abundance and distribution and increase disturbance frequencies in ecosystems.

Her research has revealed that 86% of the trees, shrubs and woody vines invading North America were introduced for landscape purposes.

It is time, she says, that botanic gardens, arboreta and other agencies that advocate and practice introduction of new plant species to North America recognised the potential environmental repercussions of their actions. It is time to take responsibility and become leaders in screening plants prior to release or risk having harsher restrictions imposed.

In his paper 'Pest Plant Invasions in Natural Ecosystems', Ted D Center of the USDA Aquatic Plant Research Station, Fort Lauderdale, reported that "even the largest natural reserves are vulnerable to invasion by aggressive exotic plants. While we presently know little about the effects of non-native plant invasions on natural ecosystems in Florida, comparable problems have been studied in Australia. Good examples are found in the Kakadu National Park in the Northern Territory, where escaped African grasses promote destructive late-season fires in eucalypt woodland and also where entire river drainage has been overwhelmed by an introduced *Mimosa* species.

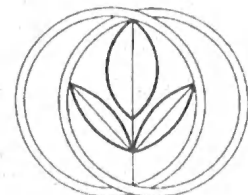
In Florida, the invasion of terrestrial ecosystems by paperbark, she-oak and Brazilian pepper, and the subversion of aquatic systems by water hyacinth and other plant pests threaten the integrity and, ultimately, the existence of natural ecosystems, even within the most protected areas."

Charles H Lamoureux of the Lyon Arboretum, Honolulu, in a paper titled 'Responsible horticulture', says, "concern about adverse impacts of alien plants on native ecosystems forces botanic gardens and arboreta to examine their

roles in alien plant introduction. Consumer demand for new horticultural materials is unlikely to diminish, but botanic gardens and arboreta should undertake educational and research programs to minimise impacts of invasive aliens, while providing mechanisms for environmentally 'benign' new plants to enter local horticulture.

Examples include: 1) Popularize the use of native species in horticulture, through education, research on propagation and provision of garden-grown native plants to curb unrestricted collecting from wild populations; 2) develop collection/accession policies incorporating study and analysis of growth habits, pollination, and seed dispersal mechanisms of all new alien accessions, followed by ruthless elimination of those judged to have significant potential to spread into native ecosystems; 3) encourage legislation to require pre-screening of all new alien imports before release to nurseries and the public; 4) develop sterile hybrids and vegetatively propagated clones for release and avoid outplanting aliens which form readily dispersible seeds.

By careful application of such policies, we can practice responsible horticulture, which will continue to offer gardeners new materials while minimising adverse effects of alien species."



Olearia flocktoniae

The New South Wales National Parks and Wildlife Service is currently implementing a recovery plan for the endangered *Olearia flocktoniae*, Dorrigo Daisy Bush.

This strikingly attractive daisy bush, restricted to the Dorrigo Plateau, is a short-lived shrub, each plant only growing for one to three years, and dying shortly after flowering. A survey in 1991 revealed a total population for Dorrigo Daisy Bush of about 920 plants. Disturbance of habitat, such as by routine logging operations, is not considered a threat to the species; in fact its seeds are wind dispersed without delay following flowering and survival is dependant upon chance colonization of sites with suitably disturbed soil.

Current threats to Dorrigo Daisy Bush are considered to be:

(i) ongoing loss of potential habitat, ie. further displacement of forest for agriculture or major public works;

(ii) premature loss of populations due to fire or inappropriately timed road maintenance - of particular concern would be the destruction of plants prior to flowering or seed set.

Implementation of the recovery plan involves both research and management. Research into the species' biology is planned and the extent of potential habitat is currently being mapped using computer modelling techniques. Management involves maintaining

disturbance history records and continued surveillance for new populations.

One management action which requires the assistance of members of the anpc is the monitoring of cultivation in botanic gardens and seed bank storage. The NSW NPWS wishes to know;

(i) which botanic gardens are currently cultivating or have ever attempted to propagate or cultivate *Olearia flocktoniae*;

(ii) which botanic gardens currently hold seed of *Olearia flocktoniae*;

(iii) whether any botanic gardens would like to receive seed of the species.

At this stage it is only botanic gardens, rather than nurseries or individuals, that can be provided with seed, as the recovery program requires strictly controlled ex-situ planting for conservation purposes only. As we do not understand why the species disappears and reappears over short time periods we do not want to risk confusing the pattern with garden escapes.

Please contact Mandy Sansom, Endangered Species Coordinator, NSW National Parks and Wildlife Service, Northern Region, PO Box 97, Grafton, NSW, 2460



Threatened Plant 'Promotions'

Two nurseries, both members of the Australian Network for Plant Conservation, are using different approaches to alert their customers to the plight of threatened plant species.

Native plant enthusiasts who buy plants from Kingfern Natives of Albion Park, New South Wales will find, that the pot may display two labels. In addition to the 'descriptive' label that gives details relevant to the horticulture of the plant, (height, type of soil preferred, aspect, water requirements etc.), there is a second label that indicates the rarity of the species and a brief description of the reason for its rarity. The label also states "Cultivation may help increase stock and seed supplies and the plant's preservation. For information write to: Australian Network for Plant Conservation, Box 1777, Canberra, 2601". The principal of Kingfern Natives is Egon Demuth.

Zieria prostrata, an endangered species that grows in very small numbers in the Coffs Harbour district of New South Wales is the subject of a promotion initiated by ANPC member Russell Costin of Limpinwood Nursery in northern New South Wales. *Z. prostrata* is the subject of a Recovery Plan and re-introduction by the New South Wales National Parks and Wildlife Service and the project involves the replanting of the species into areas where it originally

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CORCHORUS CUNNINGHAMII

Corchorus is a member of the Tiliaceae family, a family that includes several economically important plants, including the northern hemisphere limes. Two species of *Corchorus* that occur in India are the source of jute. There are some 100 species of *Corchorus* in the world and about 25 of these occur in Australia, mostly in the tropics or sub-tropics.

The origin of the generic name *Corchorus* seems obscure but the specific epithet, *cunninghamii*, honours Allan Cunningham, the 19th century botanist and explorer. *Corchorus cunninghamii* is described as an erect annual or perennial plant up to 150 cm high with smooth dark green leaves, which are ovate to lanceolate in shape, and quite deeply serrated. The small bright yellow flowers are borne in summer, followed in January to April by woody capsules containing several seeds. The plant grows on the margins of rainforests and according to the Bulletin of the SGAP, Queensland Region, it is now known from only one locality near Beenleigh, south of Brisbane.

Corchorus cunninghamii appears to have been quite common in the late 19th century in south-east Queensland and in

1944 it was reported to be 'moderately common at the edge of light rainforest' near Kyogle in north-east New South Wales. The species is listed as Endangered in Threatened Australian Flora (June 1993) the list compiled by the Endangered Flora Network for the Australian and New Zealand Environment and Conservation Council (ANZECC). Leigh et al (*Extinct and Endangered Plants of Australia*) state that land clearing for agriculture, and perhaps forestry operations in some areas, ap-



pear to have been the major threats to this species.

Corchorus cunninghamii is quite attractive in cultivation, particularly as a foliage plant. The SGAP Queensland Region Bulletin states that it will fare best in a semi-shaded position but that it will grow in full sun if given plenty of water in dry periods. The Preliminary Listing of the National Endangered Species Collection (January 1993) shows it to be in cultivation at the Botanic Gardens in Sydney, Canberra and Mt Coot-tha, Brisbane and in one private collection but the SGAP Bulletin suggests that it may be in wider, but still limited, cultivation.

GRANT FOR ARID LANDS BOTANIC GARDENS

The South Australian Tourism Minister, Mr Mike Rann, recently pledged \$300 000 to the Australian Arid Lands Botanic Gardens at Port Augusta.

Mr Rann said that the Arid Lands project would provide visitors with a unique education of Australia's native vegetation system and an understanding of the need for its conservation and restoration. He also described the Gardens as an important initiative for regional tourism which captures the beauty of the outback.

Earlier this year the Federal government promised \$300 000 to Port Augusta City Council for the staged development of the project

Western Mining Corporation and the Electricity Trust of South Australia are corporate sponsors of the Gardens, and negotiations are continuing for further funding support.

The Australian Arid Lands Botanic Garden is a member of the Australian Network for Plant Conservation.



BOTANIC GARDENS AND CONSERVATION GENETICS

Adapted from a paper prepared by Dr Stephen Hopper, Kings Park and Botanic Garden

The modern focus of botanic gardens on conservation and public education challenges many traditional modes of operation. Practical conservation and education demand quite different horticultural, landscaping and interpretation styles to those used to display horticultural specimens and curiosities in an aesthetically pleasing garden. It is in these new areas of activity that conservation genetics has worthwhile contributions to make.

1. Sampling wild plant populations for garden collections

Traditionally, botanic garden collectors have obtained material from wild plants for propagation of specimen plants, exchange with other gardens and for scientific study or teaching. Until recently, detailed documentation of the source material has rarely been seen as an important priority. However, a positive contribution to conservation requires more rigorous record keeping and a knowledge of conservation biology. The key questions facing the modern botanic gardens collector were succinctly presented by Brown and Briggs (1991): "What taxa? When and where to collect? What type of propagule? What type of individual? How many individ-

uals in the sample? How many populations should be sampled?" The powerful molecular tool-kit of conservation genetics clearly has a contribution to make in these fields of enquiry.

Underlying any conservation project is the assumption that genetic diversity is important for lasting success. It is recommended that all endangered species are worth recovery action (Hopper and Coates, 1990). In attempting to sample genetic variation for gardens' collections, Brown and Briggs (1991) advocate a logarithmic rather than a linear approach to sampling - go for small numbers of individuals across several populations rather than many individuals from one population.

The combined skills of taxonomists, ecologists, biologists, conservation geneticists and horticulturists are needed to ensure that the sampling of wild plants for botanic gardens' collections will capture adequate amounts of genetic variation for successful conservation programs. Prescriptions for doing so are outlined in some detail in Falk and Holsinger (1991) and Australian Network for Plant Conservation (1993).

2. Tracing and managing genetic variation in the garden collection.

Incoming wild material is managed in various ways in botanic gardens. If the ultimate aim is to have stock suitable for replanting back to the wild as part of the recovery process, keeping track of changes in genetic variation while material is stored or cultured is important. Again, the tools of conservation geneticists have great value here.

The identification of hybrids within collections and the provenance of stock are questions facing botanic gardens' curators. DNA fingerprinting offers new hope in dealing with previously intractable problems of this kind.

3. Designing seed orchards.

Botanic gardens and arboreta may and should use their cultivated plants as a source of seed, particularly with endangered species, to relieve the demand on wild sources. Inbreeding and hybridisation are two obvious problems that can arise. Success in producing high quality seed requires a knowledge of the mating system, pollination biology and appropriate genetic structuring of the orchard. Hence, it is important not to place clones of the same individual, nor sibs from the same maternal plant, close together in a seed orchard. DNA fingerprinting again offers a useful way of tracking pedigrees and enabling optimum planting designs for seed orchards.

4. Replanting back in the wild.

In the long run, the cheapest way to conserve endangered plants is to have self-maintaining populations conserved in the wild. Botanic gardens, with their established expertise in propagating and growing living plant collections, have a significant contribution to make in helping establish new populations or the recovery of depleted populations in the wild (Falk, 1992). To do so, they need to work closely with interested land managers.

Conservation genetics could and should be an integral part of restoration and recovery operations. It is clearly of little

value using traditionally acquired and grown botanic garden stock for such operations. Replanting wild populations with clones of the same stock or siblings from the same maternal parent will rarely yield a vigorously reproducing stand for outcrossing species. At the other extreme, planting individuals of the same taxonomic species from unknown provenances could end in complete failure or outbreeding depression (Hopper and Coates 1990). There is no substitute for clearly identified pedigrees and a sound knowledge of the appropriate population genetic architecture if restoration and recovery operations are to be successful.

Another concern involved in using stock from botanic gardens is the possible introduction of disease. In Western Australia, substantial components of the south-west flora are susceptible to *Phytophthora*. It is critical that botanic gardens exercise strict hygiene measures to minimise the risk of introducing such diseases into uninfected wild sites.

5. Providing educational resources.

The living and herbarium collections of botanic gardens are a valued educational and scientific resource, saving institutions and individuals, including conservation geneticists, the expense of having to travel to far-flung locations to observe, collect and then maintain plants for teaching and study.

6. Assisting taxonomic research.

Taxonomic research is a common function of some botanic gardens and an essential

tool in the successful implementation of conservation policy (Hopper, 1993). Large sums of money spent in applied conservation operations can be wasted if the taxonomic understanding of the plants considered endangered is wrong.

The study of living collections in botanic gardens materially assists taxonomists in their understanding of breeding systems, chromosome variation and compatibility relationships. Similarly, the methods used by conservation geneticists have a significant contribution to make. Allozyme and DNA techniques have helped define the biological units for conservation action and have improved taxonomic nomenclature and classification in diverse plant groups (Hopper and Coates 1990).

7. Setting Priorities for Bushland Management.

A small number of botanic gardens have management responsibility for bushland reserves as part of their charter. Kings Park and Botanic Garden is a case in point, with 260 ha of urban bushland to manage.

One of the fundamental requirements for such management is to determine priorities. It is impossible to manage positively for all species and communities due to contrasting ecological requirements. But which local species deserve priority?

Conservation geneticists can help by documenting the population genetic architecture and mating systems of species. Given that the aim of most conservation reserves these days is to maintain biodiversity, species that dis-

play pronounced geographical differences would have a higher probability of local variants existing on reserves than species with little geographic variation. Similarly, studies of mating systems can help bushland reserve managers identify species requiring supplementary planting to ensure ongoing high quality seed set and successful recruitment. Carefully designed experiments in this area are sorely needed.

Conclusions.

Although not widely involved at present, conservation genetics offers powerful tools and insights for the modern focus of mainstream conservation and educational activities of botanic gardens. As botanic gardens become much more involved in integrated activities with land managers seeking to conserve or recover threatened species or communities, conservation geneticists have worthwhile contributions to make. At the same time, botanic gardens, through their high public profiles, can help to promote an understanding of conservation genetics.

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- Brown, AHD & Briggs, JD (1991). Sampling Strategies for Genetic Variation in Ex situ Collections of Endangered Plant Species, in *Genetics and Conservation of Rare Plants*, ed by DA Falk and KE Holsinger, Oxford University Press, New York.

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THE NATIONAL THREATENED SPECIES NETWORK

The National Threatened Species Network (NTSN) is a non-government community based network which aims to increase support for protection of threatened species and their habitats throughout Australia.

The NTSN establishes regular links with government agencies, politicians, scientists, environmental, rural and other community groups, educators, journalists and others. By working with all these sectors the NTSN is attempting to overcome much of the polarisation and confrontation that can develop in relation to conservation issues.

Through education the NTSN enhances public awareness of our native endangered species and alerts the public to the threats posed to species. The NTSN provides information for the community to access resources and scientific data and link up with those involved in wildlife management.

The NTSN also assists with the setting up of 'Friends of Species' Groups and community action groups for particular endangered species.

The NTSN is in its fourth year of operation. The World Wide Fund for Nature (WWF) is under contract to the Australian Nature Conservation Agency to run the NTSN.

The NTSN National Co-ordinator is based in the Victorian office of WWF. There is a Network Co-ordinator hosted by a non-government environmental organisation within each state and the Northern Territory. The host organisa-

tions provide logistical and administrative support for their Network Co-ordinator.

Each of the Co-ordinators has an Advisory Committee, composed of wildlife scientists, government conservation agency officers and representatives of environmental organisations, which helps to set directions for the NTSN in their State. The Advisory Committees are also involved in the development of strategies for endangered species conservation and assist in the exchange of information between many of the different players involved with threatened species.

Danthonia readers who are interested in finding out more about the NTSN are invited to contact the National Co-ordinator, National Threatened Species Network, World Wide Fund for Nature, 20 Joseph Street, Blackburn North, Victoria, 3130, phone (03) 8990802, fax (03) 8989878

The National Co-ordinator of NTSN, Margaret Moore, is a member of the ANPC Advisory Committee. Margaret will present a paper at the *Cultivating Conservation* Conference in November outlining the complementary roles of NTSN and ANPC and will also provide an overview of NTSN activities.

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Conservation Genetics

references continued:

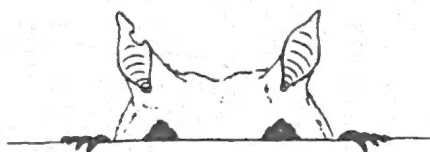
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A comprehensive list of references used in Dr Hopper's original paper is available on request from the ANPC office.



UPDATE

Grevillea wilkinsonii

The *Grevillea* illustrated on the cover of ANPC Newsletter, vol 1 number 3 and written up in the Summer 1991 issue of the Newsletter as *Grevillea* sp nov (Tumut) has now been named. Bob Makinson of the Australian National Botanic Gardens has formally published the name *Grevillea wilkinsonii* in *Telopea*, vol 5 (2). *Telopea* is the Journal of the Royal Botanic Gardens, Sydney. Makinson notes 'the epithet (*wilkinsonii*) is chosen in recognition of Mr Tom Wilkinson of Tumut, bush-walker and natural history enthusiast, who discovered the species'.

The Society for Growing Australian Plants (Canberra Region) Inc. has planted the first 90 plants as the basis for a new population of this species. These have not been planted into existing populations but have been established some 100 metres upstream. The area chosen is part of a travelling stock reserve. A recent visit to the site revealed that all the new plants were doing well and making good growth; many were in flower.

A further trip to the site this spring will enable all the plants at site one to be re-surveyed. This is because a '100-year flood' recently affected the valley, damaging some plants and destroying at least one. A large number of seedling recruitments have also been noted and these need to be recorded and tagged.

The recovery program also had some useful exposure on the 'Cross Country' program on Network 7 Television. This outlined the aims of the program and showed some magnificent shots of the plant in its natural habitat.

NEW BOOKS

Grevillea (Proteaceae); A Taxonomic Revision

by D J McGillivray, assisted by RO Makinson, Melbourne University Press.

This is the book on the genus *Grevillea*. Don McGillivray and Bob Makinson have spent many years on this publication, a large, almost coffee-table sized book, though by no means as shallow as that term might suggest. This is a botanical work, not perhaps for the amateur, and not due only to its price of \$225. It is dangerous to say that anything is 'the last word' in the dynamic world of botany, but this is certainly the state of our knowledge for now. It will be an essential text for botanical libraries and the (extremely) enthusiastic amateur.

Flora of New South Wales, volume 4

edited by Gwen Harden, NSW University Press.

This is the final volume in this State Flora and is the largest of the four, totalling more than 800 pages and including a cumulative index. The plants covered include the monocotyledons, with a total of 60 families, 394 genera and 1631 species. Included are grasses, sedges, rushes, orchids and many other smaller

families which in the past were included in the family Liliaceae. This again will be essential for professional botanical libraries and costs \$125.

Plant Promotions

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occurred. The species has been in cultivation at the Australian National Botanic Gardens for a number of years. It has developed into a dense prostrate shrub 100mm high and up to 1.5 metres wide.

This species of *Zieria* is being marketed under the name *Zieria* 'Carpet Star'. The promotional label describes the plant as 'a shiny carpet of rounded bright green leaves, offset by clusters of small pink star flowers from winter to late spring. It is extremely amenable to cultivation and incredibly hardy, being able to withstand direct salt spray, full sun, heavy frost and drought. Not palatable to insects due to five essential oils in the foliage, including safrole, which contributes to its scented foliage. Use as an attractive tub plant, in rockeries and landscaping groundcover in any soil, full sun to light shade.'

A percentage of the proceeds from the sale of *Zieria* 'Carpet Star' is being contributed to the Australian Network for Plant Conservation to assist it to continue its activities. It is believed that the initial 10 000 plants grown have all been sold.

Russell Costin, of Limpinwood Gardens Nursery will be a speaker at 'Cultivating Conservation', the Conference of the ANPC to be held in Hobart in December.

**THE AUSTRALIAN NETWORK
FOR PLANT CONSERVATION
MEMBERSHIP LIST**

The date (1994) indicates that the member has joined or renewed for that year.

Addresses and names of contact persons are available from the National Office.

ACT Parks & Conservation Service, ACT
Botanic Gardens of Adelaide, SA
Albury Botanic Gardens, NSW
Alcoa of Australia Ltd.; WA
Ian Anderson, ACT (1994)
APPM Forest Products; Tas
Arid Land Botanic Garden, SA
Association of Societies for Growing Australian Plants
Australian Association of Bush Regenerators
Australian Forestry Council, Tas
Australian Mining Industry Council, ACT
Australian National Botanic Gardens, ACT
Australian Nature Conservation Agency
Australian Tree Seed Centre, CSIRO, ACT
Peter Barrer, ACT (1994)
Mr Stephen Barry
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Dr AHD Brown; ACT
S Brunskill, Vic (1994)
Brunswick Valley Heritage Park, NSW
Miss Dulcie Buddee, NSW
Ms C Burke Qld
Mr R Burns; Tas
Burrendong Arboretum Trust; NSW
Center for Plant Conservation; USA
Irene Champion, Qld
Anne Coates; WA
J A Cochrane, WA
Coffs Harbour City Council; NSW
CSIRO, Division of Plant Industry; ACT
Conservation Commission of the Northern Territory
N & J Cowie, NSW (1994)
Deakin University, Rusden Campus Library, Vic
Department of Parks Wildlife and Heritage, Tas
Mr S Donaldson; ACT
Dulegal Arboretum; NSW
Max Elliott, NSW
Eurobodalla Botanic Gardens, NSW
Elizabeth Fenton, Vic
Flecker Botanic Gardens; Qld (1994)

Julie Foster, ACT (1994)
Friends of the North Coast Regional Botanic Garden; NSW
Friends of the Points; Vic
Mr Warren Ganter, ACT
Mrs E George; WA
George Caley Botanic Garden; NSW
Ms. L Gilfedder; Tas
Gladstone Tondoon Botanic Gardens; Qld
Roger Good, NSW
Mr David Gordon; Qld
Dr Janet Gorst; Tas
Joanne Green, NSW
Greening Australia (ACT)
Greening Australia (NSW)
Greening Australia (Vic)
Greening Australia (WA)
Mr Barrie Hadlow; ACT
Ms Laurel Hemming, Vic
Mr Peter Hind, NSW
Honiara Botanic Gardens; Solomon Islands
Hunter Region Botanic Gardens; NSW
Jan Heisler, NSW
Gregory Jackson, ACT
Ms Susan Johnston, ACT
Kebun Raya Indonesia
Kingfern Natives; NSW
Kings Park and Botanic Gardens; WA
J Landsberg, ACT (1994)
Limpinwood Gardens Nursery, NSW
Mr. WJF McDonald; Qld
Mr. David Mason; NSW
Mt Coot-tha Botanical Gardens; Qld
M Mathes, NSW
S Mattingley, ACT
J Meyer, TAS
G Mitchell, NSW
J Moffatt, Qld (1994)
Myall Park Botanic Garden, Qld
Sharon Nash, NSW
National Botanical Institute, South Africa
L Nieboer, Vic
M Noble, NSW
Norfolk Island Botanic Garden
NSW National Parks and Wildlife Service, Queanbeyan, NSW
NSW NPWS, Northern Region
Olive Pink Flora Reserve; NT
M Oxford, SA
Dr. Bob Parsons; Vic
K Querengasser, Qld
Mr Brian Quinn, Vic
Randwick City Council
Rare Plant Consortium, Canada
S Rempel, Canada
Mr. Brett Robinson NSW
Royal Australian Institute of Parks and Recreation, ACT
Royal Botanic Gardens, Melbourne, Vic

Royal Botanic Gardens, Sydney; NSW
Royal Tasmanian Botanical Gardens; Tas
Mrs Esma Salkin; Vic
Ms Marilyn Smith, NSW
H Smith, NSW
SGAP - Canberra Region Inc
SGAP - Dryandra Study Group
SGAP - East Hills Group
SGAP - Grampians Group; Vic
SGAP - Grevillea Study Group
SGAP - Maroondah Inc (1994)
SGAP - New South Wales Ltd.
SGAP - Newcastle; NSW
SGAP - North Coast; NSW
SGAP - North Shore; NSW
SGAP - North West; Tas
SGAP - Pine Rivers; Qld
SGAP - Queensland Region
SGAP - South Australia Region
SGAP - South West Slopes; NSW
SGAP - Tasmania Region
D Snape, Vic (1994)
Stony Range Flora Reserve, NSW
Sunraysia Oasis Botanical Garden, NSW
Suva Botanical Gardens; Fiji
D Swift, Tas (1994)
Jane Tarran, NSW
R Taylor, USA (1994)
P Thomas, RBG Edinburgh
Threatened Species Network (NT), Northern Territory
Townsville Botanic Gardens; Qld
Tumut Ecology Reserve Trust; NSW
R Turner, ACT
Vailima Botanic Gardens; Western Samoa
VCAH Library, Burnley, Vic
VCAH Dookie, Vic
B Vanzella, NSW
Waite Arboretum, Vic
D Wallace, Vic
B Wannan, NSW
Wildflower Society of Western Australia
Wildflower Society of WA - Mandurah Branch
T Wilkinson, NSW
J & A Willinck, NSW
Mr. John Wrigley; NSW
Wollongong City Council
WorldWide Fund for Nature Australia
Zoological Board of Victoria
Zoological Parks Board of New South Wales

THE AUSTRALIAN NETWORK FOR PLANT CONSERVATION

Just over 200 hundred years of European settlement has had a severe impact on Australia's natural ecosystems. The current estimate of extinct plant species in Australia is more than 70, with more than 175 species endangered and another 3200 under some degree of threat.

Fortunately, the community is becoming more conscious of the need to protect global environments from the threats facing them. It is universally recognised that the preservation of habitat is the most desirable means of conserving the biological diversity of all organisms. However, some of these organisms are so threatened that the only means of saving them will be to secure them outside of their natural habitat until suitable places can be located to establish them. Some may have to be maintained permanently in ex situ collections. This complementary role for ex situ conservation is now being referred to as *integrated conservation*.

In March 1991 the Australian National Botanic Gardens (ANBG), with support from the Federal Endangered Species Program, held a conference entitled "*Protective Custody*". The aim of the Conference was to involve organisations and individuals interested in plant conservation and to encourage co-operation between these organisations by the formation of a co-ordinating body for plant conservation. Delegates from Britain, Fiji, New Zealand, Indonesia, the Solomon Islands, the United States of America and Western Samoa also attended the Conference.

During the Conference, consensus was reached that the Australian region does need a body to co-ordinate integrated plant conservation. A proposal for the formation of the Australian Network for Plant Conservation (ANPC) was later produced and widely accepted.

The ANPC draws its membership from throughout Australia (in both public and private sectors) and has a national office at the Australian National Botanic Gardens. It will be the co-ordinating organisation for integrated plant conservation in Australia. It will:

- i) establish a multi-site National Endangered Species Collection for use in the practical recovery of endangered species as well as for research, education, display and general horticulture.
- ii) locate and bring together information on integrated plant conservation activities in Australia and provide access to this information for members.
- iii) assist in the national co-ordination of plant conservation projects to avoid duplication of effort.
- iv) provide advice to members and promote plant conservation activities.
- v) communicate on a regular basis by means of a newsletter.
- vi) organise workshops, training courses and conferences.

For further information on the ANPC please contact;
The Curator, Australian National Botanic Gardens,
PO Box 1777, Canberra, ACT 2601, Australia