

ANNUAL REPORT

Scientific Report
of the
Science and
Public Programs Branch

2005 – 2006



Inspiring the appreciation and conservation
of plants through exciting,
innovative and relevant research



Botanic Gardens Trust
SYDNEY

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Cover photograph: 'Fire and Fungi' (*Armillaria luteobubulina* growing at the base of a burnt eucalypt.) taken at Mt Oberon, Wilsons Promontory National Park, Victoria, Australia.

Photograph by: Gillian Towler

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Highlights of the Year

- End of employment of staff here on Stage 1 of Australia's Virtual Herbarium, a five-year \$10 million national project to database and make available on the Internet specimen information from all major State and Territory herbaria. During this period over 374,000 specimens have been data-processed here, including nearly all specimens from New South Wales. This enhances distribution details for the *NSW Flora Online* and is an invaluable information source for our stakeholders.
- Publication of 'The *Fusarium* Laboratory Manual' by Professor John Leslie, Kansas State University and Dr Brett Summerell of the Trust and published by Blackwell Publishing. This book provides information on techniques and descriptions of 70 species of this important plant pathogenic and mycotoxigenic group of fungi.
- The publication of the first section – for the Western Plains – of the NSW Native Vegetation Classification and Assessment project in *Cunninghamia*. This comprehensive review of the ecological vegetation communities recognised across the State is a major contribution to a systematic understanding of our native vegetation, and will become a standard reference for conservation planning in this State.
- Participation of 5 staff members and one Hon. Research Associate in the International Botanical Congress, held in Vienna in July 2005 – staff presented 7 talks and 4 posters with a range of collaborators. They also played an active role

in the Nomenclature Sessions discussing changes to the *International Code of Botanical Nomenclature*.

- Co-supervision of 45 students from 11 universities including 12 students based fulltime at the Trust, and a continuing commitment to tertiary teaching at several universities, including the University of New England Biosystematics Course.
- Grant and enhancement funding of \$1.2 million (including Australia's Virtual Herbarium \$400,000) to the Trust for 31 projects.
- Maintenance of diverse and high quality research programs, with 85 publications for scientific audiences.
- Publication of 24 taxonomic papers in *Telopea* volumes issues 11(1)) and 11(2) and continued growth in the number of manuscripts submitted to *Cunninghamia*.
- Successful series of exhibitions in the Red Box Gallery, with exhibitions on botanical art and the Margaret Flockton Prize in botanical illustration.
- Recognition and celebration of our role in biodiversity research through the sponsorship of our fifth Eureka Prize (awarded to Professor Mark Burgman, University of Melbourne).
- Continued growth in the requests for information from the Botanical Information Service and the Plant Disease Diagnostic Unit.
- Science staff were integral to the successful sales launch of the Wollemi pine , helping to organise and support the world-wide auction by Sothebys in October 2005, with subsequent launches around the world. Our staff also coordinated the rewriting of the Wollemi pine Recovery Plan, which includes actions for conservation and new and on-going research and use of the sales royalties.

Part 1: Introduction

The BGT Science Annual Report is structured around the *Three Year Vision for Plant Sciences Branch (2000–2003)*, prepared in response to the 1999 review of Plant Sciences. The Branch was reviewed again in March 2004. The following introductory material is taken from the Vision document.

Our Environment

The Science Program of the Royal Botanic Gardens and Domain Trust is:

- Obligated first and foremost to the Trust through the relevant Acts and corporate planning.
- Funded primarily by the State Government of NSW and its programs must contribute to that government's policies and goals.
- Obligated under all treaties and strategies to which the State and Federal governments are signatories (e.g. NSW Biodiversity Strategy, National Strategy for the Conservation of Australia's Biological Diversity, Convention for Biological Diversity).
- The oldest and one of the most highly respected scientific units in Australia. (Science in Australia began at the Trust and has always been a strong focus for the discovery, documentation and study of Australian plants).
- Recognised and valued internationally, nationally and within the State for its science programs (with different programs relevant at different levels).
- A critical component for the Trust is to remain one of the worlds leading botanic gardens.

- Accepted as a leading organisation in the conservation and management of NSW's plant biodiversity.
- Part of a national and international collection of herbaria and botanic gardens (and other organisations) contributing to the understanding, appreciation and conservation of Australia's flora.

Vision for Science at the Botanic Gardens Trust

The Botanic Gardens Trust will have exciting, innovative and relevant scientific research programs. It will be recognised throughout New South Wales, Australia and the world as making a major contribution to the discovery and conservation of biodiversity. It will work with the horticultural industry and botanic gardens in plant development and disease diagnosis. Research results and biodiversity data will be communicated using the best available means. The Trust will work in partnership with government agencies, universities, botanic gardens and herbaria to achieve these aims.

All scientific programs will be widely recognised within New South Wales as important and appropriate, with no reduction in the Gardens' international reputation for high quality, progressive science.

Objectives for Science at the Botanic Gardens Trust

- To undertake original research on the plants of New South Wales and neighbouring areas.
- To effectively disseminate the results of research through publications, products and services.

- To play a leading role in the conservation of biodiversity in New South Wales and neighbouring areas.
- To be the primary source of plant diversity information in New South Wales.
- To lead and contribute to the understanding and appreciation of plant diversity.
- To assist in the sustainable management of the botanic gardens and the horticultural industry.
- To contribute to the development of State, national and international policies and legislation.

Priority-setting Criteria

All new programs and projects must be evaluated against the following criteria. Some criteria are deliberately open to interpretation and should be used as a starting point for discussion about a particular program/project. The geographical focus for any program will usually be New South Wales or 'neighbouring' region (in a scientific, geographic or economic-political sense).

The program or project should:

1. Be consistent with the implicit and explicit directions and policies of the State Government of New South Wales
2. Be of scientific merit: i.e. methodologically sound and scientific in approach. The research should 'change the way we do or think about things'
3. Contribute to a sense of wonder and excitement about plants and their biology
4. Be innovative and/or use the best available methodology
5. Result in better conservation and management of biodiversity

6. Provide a service or knowledge not readily available elsewhere (may be part of a coordinated interagency program)
7. Make best use of our resources, including people, facilities, and preserved and living collections
8. Contribute to, complement, or initiate other programs in the Trust
9. Effectively communicate outcomes to the appropriate audience
10. Raise or maintain the profile of the Trust
11. Preferably attract external funding or result in income to the Trust
12. If consistent with the above criteria, be targeted to meet the greatest needs of the identified stakeholders.

Science Promotion

The Trust's sciences program continued to receive excellent media coverage and staff publicised their work in print, radio and television wherever the opportunities arose.

Other publications and presentations for general audiences are included in the detailed reports for each section, and in the reference list at the end.

Botanic Gardens Trust Eureka Prize for Biodiversity Research

The Trust's Eureka Prize is awarded to 'an individual, team or organisation for innovative scientific research that makes an outstanding contribution to the conservation of Australia's biodiversity'. The annual Eureka Prize Award ceremony was held in August, in Sydney. Over 700 scientists, science journalists, politicians and 'celebrities' were

present when Director Tim Entwisle presented our fifth Eureka Prize to Professor Mark Burgman, of the University of Melbourne, for developing and applying quantitative methods of risk assessment to conservation. Professor Burgman's statistical and mathematical modeling provides a way of making decisions that are better informed by science and less affected by arbitrary interpretations, preferences and motivations of participants, at the same time as providing a way for stakeholder opinions to social outcomes to be considered.

Runners-up were Professor David Bowman (University of Darwin), for making major contributions to ecologically sustainable bushfire management, and Dr Colin Limpus and Mr Duncan Limpus (Wildlife Ecology unit, Environmental Protection Agency, Queensland) for their research into the conservation biology of long lived migratory marine turtles.

Teaching

The number of students supervised was 45 this year. Staff also delivered guest lectures at various universities, sometimes presenting blocks of key lectures (e.g. Dr Brett Summerell and Dr Alan Millar at The University of Sydney, and Dr Tim Entwisle at The University of Technology Sydney). Dr Maurizio Rossetto has continued his involvement in the Biological Conservation course at the School of Rural Sciences and Natural Resources (University of New England), coordinated by Associate Professor Caroline Gross. A number of our staff have adjunct appointments at a number of universities.

Biosystematics course

The Trust continued its strong involvement in the Biosystematics units for tertiary students run in conjunction with the University of New England and the Australian Museum. It has been decided to run the course-specific subjects every second year, and 2006 has been one of those years.

Honorary research associates

Dr Alistair Hay and Lyn McDougall were appointed as new Honorary Research Associates. The Honorary Research Associates continued to be major contributors to our research program and their key research achievements are included within the relevant programs below.

Scientific Committee of the Trust

The members of the committee are the chair, Professor Sue Serjeantson (Australian Academy of Science), and Associate Professor Jeremy Bruhl (University of New England), Dr Dan Faith (Australian Museum), Fleur Kreeel (lawyer and writer - Paddington), Dr Jane Tarran (University of Technology, Sydney) and Dr Klaus Koop (Policy and Science Division, Department of Environment and Conservation).

The committee met three times during 2005/06, usually coinciding with the Trust meetings. Through the provision of general advice and feedback, and the review of scientific projects and programs, the committee continued to have an important role in the management of the Science Program. Ms Kreeel resigned from the committee when she moved overseas after the meeting in February.

Part 2: Conservation & Horticultural Research Section

This Section brings together the Trust's broad expertise in ecology, conservation biology, research horticulture, population genetics and plant pathology, creating opportunities for multidisciplinary projects and collaboration.

The New South Wales Vegetation Theme includes the survey, mapping and classification of plant communities in the State, as well as long-term research into particular communities and the dynamics of species, populations and vegetation assemblages. It also includes publications on the vegetation of New South Wales for general audiences, and the scientific journal *Cunninghamia*.

The Horticultural Research and Development Theme encompass innovative horticultural research to assist the cultivation of Australian plants, with reference to goals of both the horticultural industry and the conservation sector.

The Fungi and Plant Theme has as its major focus plant health. The research focuses on the nature, classification and control of fungi, both disease-causing and beneficial, and in cultivated and wild situations. The Plant Disease Diagnostic Unit complements services provided by the Department of Agriculture by focussing on pests and diseases of plants in natural ecosystems and amenity horticulture. It also plays an important role in the Gardens' integrated pest management programs.

New South Wales Vegetation Theme

Aquatic vascular plants

A program of Wetland Assessments continues under Surrey Jacobs. Jo Green (Southern Cross University) started a PhD on assessing saltmarsh rehabilitation. PhD student Jo Ling continued her investigation and comparison of techniques for wetland assessment using microphyte and macroinvertebrate assemblages.

Classification and status assessment of the vegetation of NSW

The year saw the publication of the first section – for the Western Plains – of John Benson’s *NSW Native Vegetation Classification and Assessment* project. This comprehensive review and typology of the ecological vegetation communities recognised across the State is a major contribution to a systematic understanding of our native vegetation, and will become a standard reference for conservation planning in this State.

It involved a complete review of literature and survey data, and field checking. The project mirrored similar work in the United States, Canada and Europe. A database with 89 fields has been established to store information on each listed plant community including scientific name, common name, characteristic species, distribution by various regional boundaries, physiography, estimated or measured areas for pre-European and current extents, threat codes based on IUCN criteria, reservation codes, photographs and a general description.

Senior Technical Officer Chris Allen and former Project Officer Jedda Lemmon assisted on the project (GIS, figures, statistics, maps, file and database structure). Separate funding was secured from the Natural Heritage Trust for extension of the NVCA project to the South-West Slopes Bioregion, and this component was brought to an advanced level during the reporting period.

Conservation committees

The Trust is represented on a number of inter-agency standing committees and *ad hoc* working groups in the conservation area. Membership on government conservation committees includes:

- NSW Scientific Committee: Bob Makinson.
- NSW Fisheries Scientific Committee: Alan Millar
- NSW Cut-flower Advisory committee: Cathy Offord
- Wollemi Pine Management and Recovery Committee: The Trust was represented by Patricia Meagher, Cathy Offord, John Benson, Brett Summerell, Rusty Worsman and Bob Makinson.

- Border Ranges Multi Species Recovery committee: the Trust was represented by Maurizio Rossetto and Robert Kooyman.
- North Head Sanctuary Scientific Committee: Doug Benson.
- Goobarragandra Valley Reserves Trust: Bob Makinson.
- Continuing membership on non-government conservation committees includes:
- Australian Network for Plant Conservation (National Management Committee): Bob Makinson (Vice-President).

Internationally, John Benson is a member of the IUCN (World Conservation Union) Commission on Ecosystem Management, and the Species Survival Commission Red-List Committee; and Maurizio Rossetto is a member of the IUCN Species Survival Commission Reintroduction Specialist Group.

Ecology of Sydney plant species

With the publication in *Cunninghamia* of the final instalment of the *Ecology of Sydney Plant Species* project in 2004/05, attention has been focussed on the development of more interactive ways to upgrade the provision of plant ecological information. The **Ecology of Cumberland Plain Woodland Plants Web Pages** was commenced to bring together ecological data from a number of projects and make it accessible to a wide audience, from students to bushland managers. Cumberland Plain Woodland is a listed Endangered Ecological Community under the NSW Threatened Species Conservation Act. The project involves data from the long-term monitoring program in the woodland sites at Mount Annan Botanic Garden, seed dispersal and germination results from other research programs, as well as data on vertebrate and invertebrate interaction with the woodland ecology. As well as images of flowers, fruits and seeds of nearly 250 Cumberland Plain Woodland plant species, image galleries will include seed, seedling, and rootstocks images as well as mosses, lichens, fungi and invertebrates recorded in the Annan woodlands. Ecological interactions are being highlighted to integrate and communicate the diversity of organisms present in a typical woodland remnant.

Ecological monitoring

Ecological scientists continue to contribute to long-term monitoring projects, providing information of importance to vegetation management and conservation. The long-term monitoring program of Cumberland Plain Woodland vegetation started in 1988 is being continued by Doug Benson and Lotte von Richter. The monitoring component, based in the Conservation Woodland areas at Mount Annan Botanic Garden, includes monthly assessments of plant species abundance as they respond to seasonal changes, and an overall annual assessment of sites annually.

Additionally this year sites in grassland adjacent to the woodland areas were recorded as a prelude to a grassland regeneration program. These grassland areas, formerly agricultural sites, are very weedy and have been slow to recruit populations of native species, despite their proximity to the woodland. The program involves an ecological burn, followed by spot weed spraying or hand removal of major weed grasses. Recruitment of native species is dependent on adequate rainfall; seasonal conditions in 2005/06 were not favourable.

Data from the ecological monitoring is being included in the **Ecology of Cumberland Plain Woodland Web Pages** project.

Cumberland Plain seed biology

Cumberland Plain Woodland is one of a number of Endangered Ecological Communities occurring in the Sydney region. Many of these communities are degraded and further threatened by proximity to and further expansion of urban Sydney. To achieve success, recovery plans for Cumberland Plain species need information on the seed germination, dormancy and longevity and other ecological characteristics of the species. Lotte von Richter and Doug Benson have been focussing on *in situ* seed ecology, working with students and staff collecting, germinating seeds from the conserved bushland area at Mount Annan and setting up ongoing field experiments. More than 150 species have been studied and the results are being summarized for publications, as well as being made available through the developing **Ecology of Cumberland Plain Woodland Web Pages** project

Sydney Region vegetation studies

Ecologist Doug Benson continued a series of observational studies on vegetation dynamics at various sites in the Sydney Basin Bioregion. These include wetland and riparian communities on the Hawkesbury-Nepean floodplain and Kurnell Dune Forest at Kurnell. Kurnell has particular scientific and historical significance as the site of the first plant collections on the east coast of Australia by Banks and Solander in 1770. Threats to the site by the invasion of native sclerophyll woodland and heath by naturalising Tallowood trees (*Eucalyptus microcorys*) were documented and published. To assist management and interpretation of the Historic Landing Site site, a detailed description of the original vegetation of the site, and a list of species collected at Botany Bay by Banks and Solander, based on collections held in the British Museum of Natural History and the National Herbarium of NSW, has been prepared. This includes an assessment of Cook and Banks' exploration of different parts of Botany Bay, based on specimens collected, and their ecological distribution and habitat. As well as formal publication the results form part of the **Botany of Botany Bay Web Pages** being prepared by Plant Sciences and Public Programs Division.

Freshwater macroalgal ecology

Lucy Nairn has completed her PhD project on the ecology of macroalgal communities in the Southern Highlands of NSW. The project was funded as part of a large ARC grant held by co-supervisors Dr Barbara Downes, The University of Melbourne, and Dr Tim Entwisle. Temporal and spatial variation in stream macroalgal and bryophyte communities was investigated at a variety of scales. Land-use was found to be a major determinant of macroalgal distribution at the regional scale. Most variation was found at the smallest scales examined for macroalgae, with bryophytes showing longer term changes at broader spatial scales. Substrate heterogeneity, light availability, drought and scouring through floods were tested experimentally and through surveys, and were found to be significant contributors to temporal and spatial variation.

Aquatic Plants and Flows

Lucy Nairn has commenced work on a postdoctoral position funded by Land and Water Australia as part of a large grant awarded to herself, Dr Tim Entwisle and Associate Professors Barbara Downes and Ian Rutherford from the University of Melbourne. The project aims to examine changes in in-stream vegetation with regard to flow regimes and is utilising historic data from herbarium records as well as field-based studies tied in with environmental flow allocations in Victoria and NSW.

Liverpool Plains native grassland survey

Chris Allen and John Benson continued a project to survey the native grasslands of the Liverpool Plains. These grasslands are listed as an endangered ecological community under the NSW Threatened Species Conservation Act and less than 3% of the community remains – most of having been ploughed for crops and improved pasture. GIS layers on soils, woody vegetation, salinity, cadastre, soils, slope and travelling stock routes have been obtained and a stratified sampling program based on soils, slope, and distribution has been developed. Six monthly sampling commenced in spring 2002 providing insights into the effects of drought and “normal” conditions on the distribution of plant species. In the meantime mapping of the current and pre-European extents of the grasslands is underway and a set of 82 permanent plots for sampling and monitoring have been placed across the remnant and derived grasslands.

Conservation genetic research

Dr Maurizio Rossetto’s studies in conservation genetics aim to fulfil two main objectives:

- to provide useful information for rare species management; and
- to better understand the evolutionary and environmental processes leading to rarity (or endemism) and identify the traits that influence species survival.

The strength of this research is in its innovativeness and resource effectiveness, and in the ability to disseminate the findings directly to the agencies / community groups interested. This area of research is essential to the long term conservation and

management of rare flora and biodiversity in general, and its effectiveness relies on the use of appropriate approaches and techniques.

A number of rare species we are researching are extensively clonal. These include *Hakea pulvinifera* and *Elaeocarpus williamsianus* (concluded projects) and *Davidsonia johnsonii* (current PhD project – F. Elliot, SCU in collaboration with Prof R. Henry). These studies show that while extensive clonality can be an effective mechanism providing resilience to disturbance and a competitive edge towards the surrounding vegetation, it can become a limiting factor when coupled with a preferential outcrossed mating system. This research is showing that clonal species are often more threatened and vulnerable than initially anticipated, and need to be managed accordingly. A study on *Wilsonia backhousei* (current PhD project – K. Sommerville, UTS in collaboration with Dr A. Pulkownik), an important member of the Sydney salt-marsh ecological communities, is also showing that an understanding of the implications of clonality is essential for re-habilitation and re-introduction projects. Excessive clonality within planted propagules can result in population sterility, and prevent the re-establishment of self-sustaining populations. These concepts are being carefully considered in current re-introduction plans for two rainforest species from Northern NSW with very low levels of genetic variability: *Fontainea oraria* and *Elaeocarpus williamsianus*.

Inefficient dispersal can also negatively affect the distribution of species. Combined molecular and ecological studies (in collaboration with R. Kooyman and with the support of J. Hunter, R. Jones and C. Porter) on rare paleo-endemic rainforest trees (*Eidothea hardeniana*) showed that the lack of efficient fruit dispersal mechanisms was the basis of its rarity. A DNA-based comparison between two related rainforest trees, one widespread (*Elaeocarpus grandis*) and one endemic (*Elaeocarpus* sp. 'Rocky Creek') corroborated these findings by showing that small morphological differences in fruit result in very different dispersal-driven genetic structure patterns.

Evolutionary Ecology research

The research of Dr Maurizio Rossetto and his collaborators focus on a range of ecological and evolutionary issues that aim at exploring how a range of functional traits that are driving evolutionary and adaptational patterns. One of the objectives is to use genetic and genomic approaches to investigate the historical sources of the different ecological adaptations, and how these affect the current distribution of biodiversity. The integration of functional genomics, population genetics and comparative ecology is an exciting emerging field of research that is evolving rapidly with the development of novel technological and theoretical approaches.

The current research projects include the investigation of factors effecting evolutionary patterns of a large number of related and co-distributed rainforest trees (*Elaeocarpus*) in the Wet Tropics of Queensland. Preliminary results suggest that among related species, minor factors related to dispersal traits, growth rates and habitat preferences can have a substantial impact on distribution, gene flow patterns and evolutionary potential.

Similar approaches are being used to identify trait specific groupings that can guide conservation and management of threatened flora (in collaboration with R. Kooyman) and genomic-based approaches that enable the fine scale detection of adaptational shifts (in collaboration with Prof. R. Henry, SCU).

Wollemi Pine ecological studies

John Benson prepared papers on the field ecology of the Wollemi Pine, covering correlated flora, stem growth and regeneration dynamics, and seedling recruitment (the last two topics in collaboration with Tony Auld of DEC).

Horticultural Research and Development Theme

Horticultural improvement of waratahs

The Waratah (*Telopea speciosissima*, family Proteaceae) is grown as a cut flower crop, and has been a research focus at Mount Annan for some years. Current work is aimed at improving flower quality, especially the browning of the floral bracts prior to harvest. The physiological cause of bract browning in waratahs has been investigated in detail by Dr Amelia Martyn, who has prepared a series of papers for publication relating to this work. Experiments conducted at Mount Annan Botanic Garden and with commercial growers found that high intensity light leads to chronic photoinhibition, pigment destruction and the development of brown and necrotic areas on bracts. Bract browning was reduced and flower quality increased by growing waratahs under 50% shade cloth. This method of reducing browning is being implemented by commercial growers in new and existing plantations.

Other aspects of quality improvement through breeding were presented by Dr Cathy Offord during the International Protea Conference (San Diego) via posters and articles to be published in *Acta Horticulturae*.

A paper by Cathy Offord on the analysis of characters and germplasm of significance to improvement of Australian native waratahs for cut flower production was published in *Genetic Resources and Crop Evolution*.

Flannel flower development

A project commenced, funded by the Rural Industries Research and Development Corporation, which aims to improve the cultivation of Flannel flower (*Actinotus helianthi*, Apiaceae). It continues from previous research led by Cathy Offord and Lotte von Richter that established the potential of this species as a cut flower, garden and pot plant, and now focuses on the development of intensive cultivation and breeding of vigorous, disease resistant, high yielding varieties. The work is in collaboration with NSW Agriculture and contributing cut flower growers.

Seed biology

Research for the SeedQuest NSW collaborative project between the NSW Seedbank, Horticultural Research at Mount Annan Botanic Garden and the Millennium Seedbank of the Royal Botanic Gardens, Kew (UK) continued in 2005-06. Progress is being made on research which aims to improve the quality of seed collections to ensure optimal long term storage; determine the best methods to germinate seed by mimicking environmental cues experienced by seed in the field, including breaking dormancy in some species; and to estimate how long seeds are likely to survive in storage and in the field.

Germination data has been collated for more than 500 species since the SeedQuest NSW project began and is being prepared for publication. Dormancy studies have focused on *Actinotus helianthi* (Apiaceae) with the aim of increasing germination and examining sources of variation in germination and viability results; and on the family Rutaceae, which has been notoriously difficult to propagate, with the aim of overcoming seed dormancy and providing information for threatened species management. Studies on dormancy in *Boronia* species are conducted in collaboration with Tony Auld and Mark Ooi, Department of Environment and Conservation. Seed longevity (rapid ageing) studies continue in collaboration with scientists at the Millennium Seed Bank in the UK, Kings Park and Botanic Gardens in Western Australia and the South Australian Seed Conservation Centre.

The application of research outcomes have led to improved practices at the NSW Seedbank. A study of seed ageing and viability of four serotinous species in the Sydney region has ensured high quality collections are made for the seedbank. An examination of desiccation tolerance in the endangered fleshy-fruited species *Myrsine richmondensis* (Myrsinaceae) indicates that seeds may be able to be dried and stored as they exhibit orthodox seed behaviour. Seed longevity data has been used to prioritise cleaning, processing and banking of short-lived species (Asteraceae, *Telopea*, *Blandfordia*).

Horticultural research staff hosted a three day workshop on seed morphology presented by Dr Wolfgang Stuppy of the Millennium Seed Bank in March 2006 and have assisted with training Australian partners of the Millennium Seed Bank.

Orchid research

The Hermon Slade Foundation has continued to fund a three year project examining the storage, germination and growth of seeds of NSW orchid species. Mount Annan Staff involved are John Siemon, Cathy Offord and Margaret Heslewood. Viability of orchid seed was ascertained by staining the seed with fluorescein diacetate (FDA). Freshly collected seed of *Pterostylis saxicola* and *Calochilus campestris* and seed of *Thelymitra* sp., *Cryptostylis subulata* and *Diuris arenaria*, stored in sealed containers at ambient temperature for several years, were stained using FDA and viability was confirmed through attempting to germinate seeds via symbiotic (fungal baiting) and asymbiotic (tissue culture) techniques. Interestingly seeds taken from herbarium specimens from 1924 and 1973 of *C. subulata* and *C. campestris* 1926 and 1975 fluoresced suggesting viability. Attempts to germinate this seed to confirm viability will be conducted in future studies. Seeds of the endangered *P. saxicola* and *Calochilus campestris* progressed to protocorms in approx. 35 days and to the green leaf stage in about 65 days, while *C. subulata* progressed to protocorms within 75 days and took a total of five months to the green leaf stage. Seeds of *P. saxicola*, grown asymbiotically on a 'W3' media (Western Orchid Laboratories, South Australia), took a further 4 to 8 weeks to reach the protocorm stage than those grown using the fungal baiting technique. The protocorms grown asymbiotically appeared somewhat deformed when compared with the rounded nature of the protocorms grown via fungal baiting. Given that *P. saxicola* seed could be germinated without the need for asymbiotic techniques future seed germination will be undertaken using fungal baiting.

Current studies are examining encapsulation of orchid seed and fungal symbionts in an alginate bead to store long-term in the NSW Seedbank. Information arising from the project has been used to develop Department of Environment and Conservation (NSW) Priority Action Statements for Rare and Threatened Species. In addition the International newsletter of the partners of the Millennium Seed Bank Project recently published an article in their newsletter Samara entitled *Strengthening seed cryo-biology research* (Issue 9, July-December 2005, p 6). The article highlights our research into storage of orchid seed and our collaboration with the Millennium Seedbank Project through Royal Botanic Gardens, Kew.

Wollemi pine research

Patricia Meagher completed the coordination of the writing of the second draft of the Wollemi pine Recovery Plan, which was released for public comment, with input from science staff across the organisation. She was also been involved with the organisation of the world-wide launch of the Wollemi pine commercialisation program, commencing with a charity auction and display in October 2005. This event publicised research findings on the horticulture and conservation of the Wollemi pine so that this information is available for home gardeners and anyone else who wants to grow a Wollemi pine. Work on the biology of the Wollemi pine will continue for some years and will in part be funded through royalties from worldwide plant sales. Currently, publications are being prepared with Cathy Offord and other collaborators on seed storage, the effects of light and soil pH on growth, frost hardiness, embryology and anatomical features of the branches of this species.

Volunteer programs

The volunteer program continued strongly in Horticultural Research at Mount Annan Botanic Garden. Several small teams are assisting with tissue culture of a variety of species, mainly for use in other horticultural areas of the BGT and Friends activities, as well as two other volunteers involved in archiving.

Fungi and Plants Theme

Fungi causing leaf-spot diseases of the Myrtaceae and Proteaceae

Work continued on a major study documenting and describing the species of fungi causing leaf spot diseases on plants in the families Proteaceae and Myrtaceae in collaboration with Professor Pedro Crous, of the Centraalbureau voor Schimmelcultures, The Netherlands. A number of new species of fungi have been identified and documented during this project including several on economically important species of Proteaceae grown for cut flower production. Studies on fungi associated with leaf spots of *Eucalyptus* have resulted in the discovery of a wide diversity of species previously unknown to science. In the first paper resulting from these studies three new genera of fungi, *Alysiidiella*, *Fusculina* and *Phlogicylindrium* were described, as well as another 7 species of fungi in already known genera.

PhD student Sophie Peterson completed studies on the biology of *Phyllosticta telopeae*, a fungus that causes a leaf spot of the waratah. Sophie investigated the population genetics of this fungus in natural and cultivated ecosystems using several different molecular markers, and showed that there was remarkably little genetic diversity in this fungus in natural ecosystems. Sophie has also confirmed that another species of *Phyllosticta*, *P. capitalensis*, is capable of inhabiting the leaf spots caused by *P. telopeae*, complicating diagnosis of the disease.

Fusarium

Professor John Leslie, Kansas State University, and Dr Brett Summerell completed a major new book "The Fusarium Laboratory Manual" published by Blackwells Scientific Press. Brett Summerell also taught at a workshop on *Fusarium* identification at the University of Bari with funding provided by the Consiglio Nazionale delle Ricerche, Italy with over a 40 participants from all parts of the world trained in identifying all of the major *Fusarium* species that are important in agriculture and horticulture.

Work continued on studies investigating various aspects of *Fusarium* spp. and associated hosts and substrates. Five new species of *Fusarium* have been discovered associated with indigenous *Sorghum* spp. in savanna ecosystems. Formal descriptions

are in progress. Results from three separate projects on *Fusarium thapsinum* and *F. pseudograminearum* indicate that these agriculturally important pathogens on grain sorghum and wheat, respectively, can survive on native grasses in natural ecosystems. High levels of gene flow between populations of the same species have been detected. These results have important implications on disease management of the cultivated crops. Both of these cereal pathogens have also been found to be genetically highly diverse, with high genetic recombination potential, throughout sorghum and wheat growing regions in Australia. The presence of *F. thapsinum*, also a pathogen of grain sorghum, was confirmed for the first time in Australia.

Dr Edward Liew initiated three new projects focussing on various forme speciales of *F. oxysporum*. The wilt pathogen of peas and snow peas, *F. oxysporum* f.sp. *pisi*, and the stem rot pathogen of vanilla, *F. oxysporum* f.sp. *vanillae*, are both being investigated in terms of their population genetics and disease management. Disease surveys for snow pea wilt throughout eastern Australia and for vanilla stem rot throughout Indonesia have confirmed the wide-spread and devastating nature of these diseases in the growing regions of the respective hosts. Non-host associated strains of *F. oxysporum* from non-agricultural soils throughout Australia are also being investigated to determine the evolutionary potential of this group of *Fusarium* in this region.

A manual was published outlining the diagnostic protocols for *F. oxysporum* f.sp. *cubense* Tropical race 4, a banana pathogen of immense economic and quarantine significance in Australia.

Phytophthora

Phytophthora cinnamomi causes root rot and dieback in several National Parks throughout New South Wales as well as important bushland reserves in Sydney Harbour foreshores. PhD student Chris Howard completed his studies on the genetic diversity and population dynamics of *Phytophthora cinnamomi* in Barrington Tops National Park, Werrikimbee NP, Royal NP and Becroft Peninsula Reserve. Both mating types have been found. Some areas have multiple genetic strains while a common strain was found in all sites surveyed. A good correlation was found between sites with high human activities and number of strains presence as well as incidence of the pathogen. While

these results have major implications on disease management strategies, a more extensive survey to cover a wider area of NSW National Parks, is being planned.

Following the discovery of *Phytophthora cinnamomi* at the Wollemi Pine grove in Wollemi National Park, Dr Edward Liew has initiated research to investigate the efficacy of phosphonate and metalaxyl in controlling *Phytophthora* root rot on Wollemi pines. The optimum concentrations and mode of application will be determined. On-going soil surveys at the Wollemi National Park are being conducted to determine the spread of *P. cinnamomi*.

Other *Phytophthora* diseases investigated are pineapple heart rot (*P. nicotianae* and *P. cinnamomi*) and black pepper wilt (*P. capsici*). Both of these studies are based in Vietnam as part of an international collaborative project funded by the Australian Centre for International Agricultural Research (ACIAR). Both diseases were found to be widespread and severe throughout all growing areas in Vietnam. The main species causing pineapple heart rot is *P. nicotianae* and the presence of *P. cinnamomi* was only detected in one province. Only one mating type of either species has been detected. Disease control experiments so far showed that all commercial cultivars were susceptible to the disease, and the application of phosphonate as a soil drench gave effective control of the disease on young plants. On the other hand, both mating types of *P. capsici* were found in Vietnam. Moreover, isolates from chilli plants were also found to be highly pathogenic on black pepper. Preliminary control experiments showed phosphonate applied as a soil drench to be effective, although showed phytotoxicity when sprayed. Another recently initiated project involves investigating into the population genetics of *P. palmivora* which causes cocoa pod rot in PNG.

Root rot of hydroponic lettuce

PhD student Khalaf Al Hussaen, co-supervised by Dr Jane Tarran, University of Technology Sydney and Brett Summerell, completed a study examining the causes of root rot of lettuce in hydroponic production systems in New South Wales. Khalaf has shown that *Pythium* and *Phytophthora* species are associated with this disease and that the symptoms of the disease are dependent on temperature with the disease more severe when temperatures are above 30°C.

Diseases in North Sulawesi, Indonesia

The second phase of the ACIAR-funded project is still on-going. Research into the aetiology of vanilla stem rot and clove decline has progressed to further understanding of the biology of the diseases and management strategies. *Fusarium oxysporum* f.sp. *vanillae* was shown to have an endophytic phase in healthy vanilla vines. This has important implication on disease management as vanilla is vegetatively propagated from visually “healthy” vines. Although the newly described pathogen of clove decline, *Ceratocystis polychroma*, is associated with the galleries of the trunk borer insect, *Hexamitodera semivelutina*, the association is not an intimate one. It was observed that other insects, mites and nematodes inhabiting the borer galleries were capable of disseminating spores produced by the pathogen. Control experiments on these two diseases are currently being conducted. Extension workshops for growers are also planned. Vanilla and cloves are two of the main cash-crops in North Sulawesi, Indonesia, and increased production by alleviating disease damage would contribute to economic stability in this region.

Communication and Services

Cunninghamia

Cunninghamia: a journal of plant ecology for eastern Australia is a leading scientific journal for the publication of original research papers on all aspects of plant ecology with particular emphasis on the vegetation and flora of eastern Australia. Descriptive, experimental and historical studies of plant communities, populations, individuals, their interactions with other organisms and their management are published. All papers are peer-reviewed.

Cunninghamia volumes 9(2) and 9(3) were published in 2005/06. Both issues included CD-ROMs with additional technical information.

Highlights include:

- A major survey of the native vegetation of the Southern Forests: covering the South-east Highlands, Australian Alps, South-west Slopes and SE Corner bioregions
- Vegetation surveys of Warra National Park and *Wattleridge*, Northern Tablelands, and Culgoa National Park, central northern New South Wales.
- The New South Wales Vegetation Classification and Assessment:
 - ◆ Introduction - the classification, database, assessment of protected areas and threat status of plant communities, and
 - ◆ Part 1 Plant communities of the NSW Western Plains

Plant Disease Diagnostic Unit

The Plant Disease Diagnostic Unit, as part of the Plant Pathology section, offers a commercial service for the detection, diagnosis and control of plant diseases. It is used by both external clients and the sites of the Botanic Gardens Trust, to promote plant

health and appropriate horticultural practices and to minimise pathogen spread through environmentally safe treatments.

This year has seen an overall increase in the number of samples processed to 270 from that of last year's 253. Of these, 208 were from external clients (208 last year) and 45 were from within the Trust. The majority of the enquiries (38%) came from commercial consultancy companies (soil-testing laboratories, arborists and horticultural advisors). Private gardeners in the Sydney region were the next most frequent users of the service (29%), while other Government Departments and Local Councils made up 15% of enquiries. The latter, however, tended to be large surveys requiring a greater percentage of time and effort. The remaining 18% were internal BGT enquiries.

The majority (39%) of enquiries from external clients and BGT staff involved soil-testing for major soil-borne fungal pathogens, in particular *Phytophthora cinnamomi*, the cause of die-back disease. Eleven large-scale surveys to identify the presence and spread of *P. cinnamomi* were carried out for a number of National Parks in NSW and Local Councils in the Sydney region. As public awareness of the problems caused by this pathogen increases, and the need for its management becomes more important, it is necessary to map its occurrence and distribution. Our Unit is now recognised as the leading laboratory in Sydney capable of performing such surveys.

The Unit is also recognised as a centre for the identification of *Armillaria* (16% of enquiries), a serious fungal pathogen of many woody plant species. This pathogen can be detected with a molecular assay, providing an invaluable identification tool in the absence of the fungal fruiting bodies. The spread of this disease through Sydney, including Hyde Park, has been mapped largely using our services.

Of the total enquiries, 28% were for foliar diseases, while the remaining enquiries consisted of mushroom identification, *Fusarium* species identification and butt rots.

Centre for Plant Conservation

The Centre has continued to facilitate linkages between the Trust's activities and external clients, comprising other sections of DEC, other State and Federal Departments, a range of non-governmental organisations, and a wider community constituency interested in plant conservation issues.

During the year, input has been made to relevant DEC units on the Priority Action Statement for threatened species, on the draft Biodiversity Strategy, and on priorities for environmental funding. The Trust is now represented by the CPC Coordinator on the newly formed Biodiversity Conservation Managers group, which focuses on threatened species and ecosystems.

Contributions have also been made to interagency discussions aimed at developing more momentum towards unified systems of ecosystem classification and data management for NSW.

Close involvement has been maintained with the Australian Network for Plant Conservation (ANPC) Inc., a national organisation of plant conservation scientists and practitioners from government, industry, and community sectors. The CPC Coordinator Bob Makinson is a member in individual capacity of the ANPC national committee.

Collaboration has been maintained with the Australian Association of Bush Regenerators, with a number of events hosted. The CPC also hosted a workshop for the CRC for Weed Management, to develop a weeds training course for community colleges.

Conservation Information Systems

Progress in the digital capture of scientific data, and in the development of our database structures and tools, is leading to an increasing focus on conservation-related information systems. These include records of historic and current mapping of vegetation cover, species distributions, survey records, living collections, habitat physical and biological features and Geographical Information Systems (GIS). GIS includes any electronic data and data layers that have a spatial component. Whilst many consider a GIS to be a specialised area for ecologists, mathematicians and IT specialists, it forms integral part of conservation management and also of many taxonomic studies, field

surveys, and the maintenance of living collections of conservation significance. Increasingly our information outputs in the taxonomic and specimen records areas must be informed by and compatible with GIS tools (e.g. *the Australia's Virtual Herbarium* project).

We currently maintain data on location of origin of plant voucher specimens, plants identified in surveys and plants kept as living specimens in the BGT gardens. However, we also display and analyse these data in relation to other species to help describe taxonomic distributions and characterise ecological communities. We further use these data in conjunction with abiotic data like rainfall, temperature, soil type, rock type, topography, salinity, fire history, etc. to detect correlations and information gaps.

Whilst we produce much of our own data, we also source much (e.g. legal boundary, survey, other state and abiotic data) from other agencies and NGOs, to enhance the variables available to us, for analyses and the production of maps and figures for publication and on the web. The capture, cataloguing and use of plant images is another on-going task.

These data are constantly changing and is currently being exchanged, sourced, maintained and updated by Chris Allen. Many new data layers are becoming available and can make decision-making less arbitrary. For example electronic copies of aerial photography of the Trust's estate, accurate to 15cm, will allow horticultural staff to plan beds and know exactly where specific plants or infrastructure can be found. Combined with new differential Geographical Positioning Systems (GPS), a staff member could walk directly to a specific plant and look up its history on the spot.

There are and will be many new sets of data for us to obtain, and to integrate with our own systems. Demand for integrated products is also rising rapidly. Key factors affecting this demand include:

- the rapid evolution of the State's departmental arrangements for Natural Resource Management
- the implementation of catchment management plans
- changes to the Threatened Species Act
- the loss of vegetation mapping in NSW

The Trust frequently exchanges data with other work-units within the DEC, other State agencies, and with some NGOs. Data exchange requires ongoing discussions on custodianship protocols, and the necessary data formats to enable efficient and safe transfers, storage and archiving of data. We now have enhanced GIS software and new printing capabilities, to streamline analysis and production of outputs in more timely and economic ways.

Part 3: Plant Diversity Section

This Section includes research on the diversity, classification and relationships of plants, and the management and application of our botanical collections and the data associated with these collections. The custodianship of collections in the National Herbarium of New South Wales and the provision of systematics research and information are two core legislative drivers for the Trust. Three key research themes have been established, and ready access to data has been identified as the major communication objective.

The **Flora of Australia Theme** focuses on discovering and documenting the plants and related biota in Australia. Plant systematists throughout Australia and overseas, work together to document our flora. The Trust is part of this collaborative effort, with a long-standing expertise in flowering plant groups such as eucalypts, grasses, sedges and wattles, but also a wide range of expertise in other important groups that are well represented in New South Wales.

The **Origins and Evolution Theme** focuses on the study of plant relationships, as part of international efforts to unravel the history of Australia's biota. Fossils give us tantalising glimpses of the past but the full story of plant evolution is contained within the morphology and genes of current day species. We are focusing our research on key questions in the history of Australia, before and after the splitting of Gondwana over 80 million years ago.

The **Asia-Pacific Biodiversity Initiative** is a theme that builds on the Trust's long-term contribution to the discovery and documentation of plants in our local region outside Australia. As part of our national responsibilities under the Convention for Biological Diversity, we are assisting neighbouring countries to gain the knowledge to manage and conserve their vegetation. Sydney, as Australia's 'gateway to the Pacific', has always looked outward to the Asia-Pacific region. Many countries in this region have been identified as lacking the most fundamental biodiversity information. The Trust is one of the region's chief providers of the expertise and experience needed to address this gap. The emphasis is on training, knowledge exchange and collaborative projects with the host countries.

The **National Herbarium of New South Wales** holds the State of New South Wales' reference collection of approximately 1.2 million preserved plant specimens. The herbarium collection represents a comprehensive and accurate biodiversity record through time (as the flora changes) and space (representing the variation and distribution of species). The maintenance and use of this vital scientific heritage requires expert scientific and technical curation skills. A key objective over recent years has been to unlock the rich store of information in the herbarium through data processing the collection information as part of the National "Australia's Virtual Herbarium" project.

The Plant Diversity Section also provides a Botanical Information Service. This Service now includes electronic delivery of information, through the internet site *PlantNET*, as well as a plant identification service and self-help reference collection. The scientific journal *Telopea* is published by the Plant Diversity Section.

XVII International Botanical Congress

More than 4,000 delegates from all regions of the world attended the congress, held in Vienna 18-23 July 2005. Fourteen sessions were spread over five and a half days, each session made up of 13-17 simultaneous symposia, each symposium including 13-17 individual talks. In addition, 2700 posters were presented in two poster sessions, each of two days, occupying most of one floor of the conference centre. As usual, the subject matter included fungi as well as higher plants, with an extremely diverse range of talks and posters on genetics, cell biology, systematics, population biology, ecology, conservation, databases, biotechnology, and global change impacts.

Five staff members – Dr Darren Crayn, Dr Maurizio Rossetto, Dr Peter Weston, Mrs Karen Wilson and Dr Peter Wilson – presented 7 talks and 4 posters in their fields of interest, as either principal author or co-author with collaborators from many parts of the world. In addition, Honorary Research Associate Dr Barbara Briggs presented a poster.

Prior to the main congress, Drs Briggs and Wilson and Mrs Wilson took part in extensive discussions in the week-long Nomenclature Sessions (12-16 July) and voted, both as individuals and on behalf of the Trust, to decide a wide range of proposed changes to the rules for naming plants through the *International Code of Botanical Nomenclature*.

The most contentious matter, attracting wide public attention in Australia, was a proposal to avoid having to change the name of all Australian wattle species from *Acacia* to *Racosperma*. Such action was necessary because DNA studies clearly indicate that the genus, as previously understood, is made up of at least five similar, but mostly unrelated, groups of species. This proposal was narrowly passed, but caused great upset amongst African and Latin American botanists since their *Acacia* species now have to be re-named in other genera. For us, this decision avoids the need for time-consuming and expensive re-curation of the herbarium as well as the need to change species listings in, for example, the schedules of the NSW Threatened Species Conservation Act.

Another contentious matter was whether to allow electronic publication of new plant names as well as publication in hard-copy. Mrs Wilson had chaired a Special Committee to consider this matter, and various proposals were finally passed that take the first step towards accepting electronic publication as a mature, stable technology.

The next IBC will be held in Melbourne in 2011; the Executive Director BGT will chair the scientific committee of the congress.

Drs Crayn, Rossetto and Weston also took advantage of being in Europe to visit collaborators in their respective research projects, in Italy and France (Rossetto), and in England (Crayn and Weston).

Workshops

Peter Wilson and Bob Makinson delivered a one-day plant identification workshop for the Friends of the Gardens, focusing on the families Myrtaceae and Proteaceae.

Karen Wilson spoke on progress with putting together the Species 2000 and ITIS *Catalogue of Life* at the International Workshop on Integrated Biodiversity and Natural Specimens Databases and Forum of Species 2000 Asia–Oceania held in Taichung, Taiwan, 30 September –2 October 2005.

Flora of Australia Theme

Aquatic Plants

Dr Surrey Jacobs continued studies on aquatic plants with papers published on DNA sequences in *Aponogeton* and *Zostera*, and further studies on *Nymphaea* and *Vallisneria*. As a result of the studies on *Zostera* and *Aponogeton*, new combinations were made for species in the former genus and new species described in the latter. A treatment of the genus *Nymphaea* for the *Flora of Australia* had to be completely revised after being first submitted 15 years ago.

Bryophytes

Dr Elizabeth Brown and Margaret Heslewood continued work on phylogenetic analyses of the Lepidoziaceae (Hepaticae), based on chloroplast and ribosomal DNA data. The first in a series of papers was submitted for publication. The research is partially funded by the Hermon Slade Foundation. Dr Brown undertook two sessions of fieldwork in New Caledonia as part of two projects on that country's fascinating flora. The first project is in collaboration with Professors Jeff Palmer and Eric Knox of Department of Biology, Indiana University, Indiana, USA on the evolution of genes in plants and the occurrence of horizontal gene transfer (the transfer of genes between non-mating species) in plants. The second project is a collaboration with Dr Jérôme Munzinger of the Institut de Recherche pour le Développement (IRD) in Noumea that will attempt to quantify some of the differences in bryophytes found in the range of habitats throughout New Caledonia and neighbouring countries such as Australia.

Matt Renner, a PhD student at the University of Sydney, has continued using the Lejeuneaceae to investigate questions on ecological aspects of speciation as well as investigating infraspecific developmental variation and its relevance to species concepts. He and Dr Brown submitted a paper for publication analysing two new species of *Zoopsis* (Lepidoziaceae) and their relationships within the subfamily Zoopsidioideae.

Honorary Research Associate Dr Helen Ramsay saw the fruition of many years effort with the publication of her contributions to the first of three moss volumes for *Flora of Australia*. Dr Ramsay has had one paper accepted and also continued finalising work

on several other papers, which will complete her chromosome studies of Australian, New Zealand and Papua New Guinea mosses.

Cyperaceae

Karen Wilson continued studies of various genera in the family Cyperaceae, largely in collaboration with Dr Jeremy Bruhl (University of New England) and students whom they jointly supervise. The study of morphology and anatomy of the large widespread genus *Fimbristylis* and its allies by PhD student Ms Kerri Clarke has been submitted for examination. Some of the results of these various studies were presented at the IBC in Vienna in July 2005, and papers were accepted for publication on *Lepidosperma*, *Carpha* and the inflorescence structure of *Exocarya*.

Kerri Clarke (under the supervision of Jeremy Bruhl and N. Prakash, UNE Armidale, and Karen Wilson) submitted her PhD thesis on tribe Abildgaardieae (Cyperaceae). A paper was published reporting the results of the study of *Lepidosperma laterale* (Cyperaceae) by John Hodgson as his BSc (Hons) project, supervised by Jeremy Bruhl and Karen Wilson. Another paper has been submitted.

Elaeocarpaceae/Tremandraceae

Current research by Drs Darren Crayn and Maurizio Rossetto has resolved a molecular phylogeny of all extant genera in Elaeocarpaceae and Tremandraceae (accepted for publication in American Journal of Botany). This phylogeny indicates that the Australian endemic family Tremandraceae, which consists of small, dry-adapted shrubs, has its ancestry within Elaeocarpaceae, a much more widespread family dominated by rainforest trees. More precisely, Tremandraceae is the sister group of a lineage comprising *Elaeocarpus*, *Aceratium* and *Sericolea*. Students (David Maynard, UNSW and Hannah McPherson, UNE) have focused on detailed phylogenies of *Elaeocarpus* and *Tetratheca*, genera which are species rich in Australia and which represent opposite ends of the spectra of ecological preference and vegetative morphology found in this group. A *Flora of Australia* treatment of *Tetratheca*, *Tremandra* and *Platytheca* is a planned output of this study.

Ericaceae: Styphelioideae

In collaboration with Honorary Research Associate Dr Chris Quinn, Margaret Heslewood and Dr Darren Crayn, Dr Elizabeth Brown has continued revision of the systematics of subfamily Styphelioideae. An analysis of the *Cyathodes* group was published and combined molecular and morphological analyses of *Epacris* are under review.

Darren Crayn and Mike Hislop (Western Australian Herbarium) have described two new species in the endemic Australian genus *Lissanthe*. Results of a morphometric analysis of variation in *Leucopogon lanceolatus*, undertaken by 2003 Janet Cosh studentship recipient Bryony Horton and supervised by Drs Crayn and Brown, are currently being prepared for publication. Furthermore, several putative new species of *Leucopogon* from northeastern NSW are under study.

Fabaceae

Indigofera: Dr Peter Wilson and Dr Aniuska Kazandjian, formerly a PhD student at James Cook University, Townsville, published a paper clarifying the position of two varietal taxa in the *Indigofera pratensis* species complex. One variety was dismissed as a minor variant of the typical form of the species but the other was recognised as a new species.

Acacia: Recent morphological and molecular studies showed that the genus *Acacia*, in a broad sense, is polyphyletic and should be divided into a number of genera. As a result of this, a proposal was made that would keep the generic name *Acacia* for the numerous Australian species. This required changing the type species of the genus from an African species to an Australian species. This proposal was recently accepted and ratified at the International Botanical Congress in Vienna in July. As a result of this, name changes were necessary for ten Australian species of *Acacia*. Dr Phillip Kodela, with assistance from Dr Peter Wilson, published a paper making new combinations for these taxa in the genus *Vachellia*.

Freshwater Algae

Dr Tim Entwisle and Dr Morgan Vis (Ohio University, USA) continued taxonomic research on the red algal family Batrachospermaceae in Australia and New Zealand. A Master of Science student at Ohio University, Sarah Stewart, used molecular and

morphological analyses to try and resolve two species complexes that occur in both countries. Further morphological study is needed to interpret the phylogeny based on molecular data, and a paper on this is in preparation.

Dr Stephen Skinner, funded (half-time) by Australian Biological Resources Study, and Dr Entwisle continue to prepare a guide on the non-planktonic freshwater (and soil) Cyanobacteria in Australia. Intended as a aid to initial identification to the genus, as well as a record of common species, this work will complement the already available guides to coccoid and filamentous planktonic freshwater Cyanobacteria prepared by Dr Baker at SAWater, Dr Fabbro at Central Queensland University, and Dr McGregor at Queensland government Aquatic Ecosystems Health Unit. It is hoped also to produce some floristic reviews of families and genera as part of this work.

Other projects have been completed and some publications arising from these have appeared including seventeen new taxa or new combinations in *Oedogonium* and *Bulbochaete*, and a colligate *Spirogyra* from the South Coast region, and a new species of *Zygnemopsis* from the North Western Slopes. Our contributions to the reports on the macroalgal floristics of the Dumaresq and Gwydir Rivers (for the Hermon Slade Foundation) and the *Spirogyra* species in the Daly River (for the Department of Natural Resources, Environment and the Arts, N.T.) have been completed.

Haloragaceae

Haloragodendron: Dr Peter Wilson and Dr Michael Moody (University of Connecticut – now at Indiana University) described a new species, *Haloragodendron gibsonii*, from the Blue Mountains. This new species is a close relative of the endangered species, *H. lucasii*.

Lamiaceae

During this period Greg Guerin (University of Adelaide) submitted his PhD thesis on the systematics of *Microcorys* and *Hemigenia* (Lamiaceae). He was supervised by Drs Barry Conn, Bob Hill (University of Adelaide) and Bill Barker (State Herbarium of South Australia).

Lichens

Dr Alan Archer, Honorary Research Associate has continued his research into the Australian Graphidaceae with a major review of the Australian members of the family in *Bibliotheca Lichenologica*.

Marine Algae

Dr Millar took on the office of Editor-in-chief for the International Phycological Society's journal *Phycologia* and has expanded the stable of Associate Editors to 28 to ensure coverage of all possible disciplines.

Dr Alan Millar and Dr George Wilson (Australian Museum) have expanded their collaborative study of marine algae and their associated invertebrates to include Dr Dan Faith, who will help analyse the raw data for identifying possible surrogates for predicting biodiversity hot spots along the coastal regions. This project was initially funded by the Hermon Slade Foundation.

Mr Nick Yee's research on the molecular phylogeny of the brown algal order, Sporochneales (supervised by Dr Millar), is near completion and he hopes to submit his thesis by December 2006. Mrs Yola Metti (also supervised by Dr Millar) has converted her research on the molecular phylogeny of the red algal genus *Laurencia* to a PhD project.

Myrtaceae

Babingtonia: Dr Peter Wilson, Dr Chris Quinn and Margaret Heslewood completed an ABRS funded study of Eastern Australian species currently referred to the genus *Babingtonia*. In this project, both DNA sequence data and morphological information were analysed; these analyses indicate conclusively that *Babingtonia* species from the eastern states are not closely related to the type species from Western Australia. Nor are these species closely related to each other; they fall into at least three distinct groups. A paper, that will publish these results and describe two new genera, is in the final stages of preparation.

Poaceae

Joy Everett, Dr Surrey Jacobs and Elizabeth Norris have continued their research into the morphology of the Australian native species of *Austrostipa* and all other genera in the grass tribe Stipeae. Further data using Scanning Electron Microscopy have also been recorded and tested on selected material to estimate variation and establish scoring systems to enhance the molecular analyses. Trevor Hodkinson (Trinity College, Dublin) was here for six months sabbatical working with Surrey Jacobs as part of an ongoing study to assemble 'super trees' using a range of genes to study grass phylogeny.

Asia-Pacific Biodiversity Initiative Theme

Elaeocarpaceae

As part of a project investigating phylogeny, biogeography and evolution in the family Elaeocarpaceae, Drs Darren Crayn and Maurizio Rossetto have established a collaboration with Dr. Mark Coode at RBG Kew (a world authority on Elaeocarpaceae), as well as other collaborators throughout Asia and the Pacific region. Considerable insight has been already gained into the phylogenetic relationships and evolutionary origins of the genera of the family (accepted for publication in *American Journal of Botany*). The focus is now shifting to expanding sampling of Asia–Pacific taxa to further explore historical biogeography and patterns of diversification in this region as part of collaborative ARC-funded research into the role of long distance dispersal in the evolution of SW Pacific floras with Andrew Lowe (University of Adelaide), Mike Pole (University of Queensland) and others. Dr Crayn visited RBG Kew in July 2005 to study collections with Dr Mark Coode, and to sample herbarium material for DNA studies.

Juncaceae

PhD student John Hodgson completed and submitted his thesis into sectional and species limits, as well as hybridization, within *Juncus*. This research was supervised by Associate Professor Jeremy Bruhl (UNE), Dr Adam Marchant and Mrs Karen Wilson.

Myrtaceae

Xanthostemon: Dr Peter Wilson has been working for some time to get specimens of a rare and threatened species of *Xanthostemon* that is found only on ultramafic substrates in the Solomon Islands. Dr Wilson has been liaising with Dr Lex Thomson and Bronwyn Clarke from the SPRIG (South Pacific Regional Initiative on Forest Genetic Resources) Project, which is managed by CSIRO Forestry and Forest Products, who are involved with the SPRIG programme in the Solomons. Good specimens were received, collected by Mr Fred Pitisopa of the Solomon Islands Forestry Department, who will be a coauthor of a paper that will formally name this species.

Metrosideros: Dr Wilson has submitted a short paper clarifying the correct application of an early *Metrosideros* name, described from New Guinea, and discussing its relationships. This arose from Dr Wilson's earlier visit to the Royal Botanic Gardens, Kew, for a workshop on the family Myrtaceae.

Urticaceae

Research into the phylogeny of the Urticales, based on chloroplast DNA data, was continued by Julisasi Hadijah (Kebun Raya Bogor, Indonesia), Barry Conn, Christopher Quinn, and Margaret Heslewood, with emphasis on the phylogenetic status of the tribe Lecantheae and infrageneric relationships within *Elatostema*.

During this period, Esti Aryianti (Kebun Raya Purwodadi, Indonesia) was awarded her MSc for her studies into the systematics of *Procris sensu stricto*. She was supervised by Barry Conn and Dr Murray Henwood (University of Sydney). Ms Aryianti and Dr Conn published a paper on their research into the usefulness of morphological characters for phylogenetic evaluation. They presented this work at the 'Wallace in Sarawak – 150 years later' conference in Sarawak, Malaysia.

Management of Plant Diversity Information

The Trust has established high level contact with the Global Taxonomy Initiative of the Conference of the Parties to the Convention, on Biological Diversity and other international groups, to further the Asia-Pacific objectives.

The Trust continued its contribution to national and international committees related to the management and dissemination of plant diversity data. The Trust is a member of the IUBS *International Working Group on Taxonomic Databases* and the Australian *Herbarium Information Committee* (HISCOM), and is represented on the Executive Committees of key international database groups (particularly, members of staff are the Chair of the *Global Plant Checklist Committee of International Organization for Plant Information*; member of *GBIF Electronic Catalogue of Names Subcommittee* and chair of the project team of *Species 2000*). Karen Wilson was one of the editors of the Species 2000/ITIS Catalogue of Life Annual Checklist 2005 on CD-ROM, and Helen Stevenson (Graphic Designer) designed the booklet to accompany the CDs.

The Trust is also a member of the *Species 2000 Asia-Oceania* group and the *Pacific Biodiversity Information Forum*. These groups encourage international and national biodiversity activities in the broad region. They were involved in organising the Second Global Taxonomy Initiative Regional Workshop in Asia–Oceania, held in Wellington, New Zealand, in October 2004; Karen Wilson was senior editor of the report of that workshop, published in 2005.

Grevillea images inventory

Contract funding from ABRS enabled the databasing during the year of some 3,204 images from photographic collections held at BGT and elsewhere, representing 457 taxa. This inventory forms stage two of ongoing work towards an interactive LucID identification and information system for *Grevillea*, being jointly developed by Bob Makinson for the Trust, and the Centre for Plant Biodiversity Research, Canberra.

Guide to the Trees of Papua New Guinea

The first phase of this three-year joint project by Barry Conn and Kipiro Damas (Papua New Guinea National Herbarium) has developed descriptions and images of 440 tree species that occur in Papua New Guinea. The focus is on commercial timber trees that grow to at least 20 m high, but several non-timber species have also been included. During the research into the trees of Papua New Guinea, several new records for the country have been discovered. The information is available via the Trust's *PlantNET* website and printed publications are being prepared. This project is partially supported by the *Australian & Pacific Biological Foundation*.

Origins and Evolution Theme

Dr Peter Weston has continued to develop international collaborations with North American and European botanists investigating the floral and reproductive biology of relictual basal angiosperms, with the aim of contributing to the reconstruction of ancestral character states of the flowering plants. Australia is home to several lineages of this disparate assemblage, including endemic genera of Austrobaileyales, Laurales, Magnoliales and Canellales. Most recently, he has teamed up with Swiss postgraduate research student, Yannick Staedler and his supervisor, Professor Peter Endress

(Institute of Systematic Botany, University of Zurich) to investigate floral phyllotaxis, architecture and development in the Calycanthaceae, a family represented in the southern hemisphere by just one Australian species, *Idiospermum australiense*. *I. australiense* is a rare, large, canopy tree restricted in the wild to a few pockets of lowland tropical rainforest between Innisfail and Cape Tribulation. Fortunately, two healthy young trees of *Idiospermum* are growing in the Royal Botanic Gardens Sydney and one of these has been flowering annually since the late 1980's, making it a more convenient source of material for floral developmental study than wild trees. Staedler, Weston and Endress were able to show that all genera of the Calycanthaceae are characterised by flowers with spiral phyllotaxis and a gradual transition between floral organ classes, features that are found in many other basal-relictual angiosperms. A paper describing these results has been accepted for publication in the *International Journal of Plant Sciences*.

Elaeocarpaceae/Tremandraceae

Drs Darren Crayn and Maurizio Rossetto have continued to investigate the phylogeny, biogeography and within-species diversity of the plant family Elaeocarpaceae (including Tremandraceae) in order to understand some of the evolutionary mechanisms that have influenced speciation and distribution patterns within the Australian flora. Analysis of DNA sequence data, using newly developed techniques that allow for variations in the rate of 'ticking' of the 'molecular clock', calibrated using carefully selected fossil data, (*Elaeocarpus* endocarps dating from the Oligocene, approx. 30 million years ago) allowed a conservative estimate of the time of origin and rate of evolution of the major clades within Elaeocarpaceae (accepted for publication in *American Journal of Botany*). Of particular interest was the inferred Paleocene origin of the 'Tremandraceae' lineage with a major radiation of *Tetratheca* during the Miocene in Australia, a period in which the general Tertiary aridification of the continent underwent a major intensification. Within the phylogenetic framework, analyses of population-level genetic diversity are being undertaken for more than ten species of *Elaeocarpus* (by Paul Rymer and students Michael Whitehead and Peter Ridgeway) and *Tetratheca* (by student Hannah McPherson) to provide insights into comparative evolutionary responses and speciation mechanisms in closely related rainforest tree species and dry-adapted shrubs.

Freshwater red algae

Following a workshop held at the International Phycological Congress in South Africa in July 2005, a major synthesis on the systematics of the red algal order Batrachospermales is in preparation. The work builds on a long-standing collaboration between Dr Tim Entwisle and Dr Morgan Vis (Ohio University, USA), and with colleagues from Brazil (Orlando Necchi Jr) and USA (Alison Sherwood, Wayne Chaisson). Additional samples from Europe, South America and Australia have been sequenced, helping to resolve the currently paraphyletic genus *Batrachospermum*. A number of critical taxonomic changes are likely.

Myrtaceae

Dr Peter Wilson continued a study with collaborators Dr Jim Basinger (University of Saskatchewan), Dr David Greenwood (Brandon University, Manitoba) and Dr David Christophel (University of Denver, Colorado) to describe a fossilised fruit of capsular Myrtaceae. Specimens of this taxon were recovered from a clay deposit in South Australia dating from the Middle Eocene and were able to be examined by Scanning Electron Microscopy. Fossil flowers and fruits of Myrtaceae are rare, and these fossils establish a record of the tribe Kanieae within what is likely to have been Eocene coastal rainforest vegetation at a paleolatitude of 55–58°S during a time of global warmth. A paper that will name this fossil species is at an advanced stage of preparation.

Dr Wilson, Dr Chris Quinn and Margaret Heslewood completed the DNA sequencing for a detailed analysis of the Tribe Chamelaucieae (Geraldton Wax group—Myrtaceae) in a project funded by the Australian Biological Resources Study. In all, over 170 species from this Tribe were sequenced for both chloroplast and nuclear regions. Sequencing of the nuclear region known as the external transcribed spacer (ETS) encountered some difficulties due to sequence polymorphism. A poster on this issue was presented at the International Botanical Congress in Vienna in July.

Dr Peter Wilson and Dr Chris Quinn received a two year ABRS grant to investigate the generic position of *Leptospermum* species with non persistent-fruits. An earlier student project on the genus *Leptospermum* and related genera found evidence that the species of this genus that have non persistent-fruits may not be closely related to those species with woody, persistent fruits. This project, also involving Margaret Heslewood, aims to

sample the non persistent-fruited group more broadly with the intention of reassessing generic limits in *Leptospermum*.

Orchidaceae

The majority of orchid species are deceptively pollinated by animals that are lured to the orchids' flowers by "false advertising" – the promise, but not delivery, of food, brood sites or sex. For example, most species of the genus *Diuris* seem to mimic various kinds of pea flowers, but unlike them, they offer neither nectar nor edible pollen. Postgraduate student James Indsto and his co-supervisors, including Principal Research Scientist, Dr Peter Weston, have been investigating the evolution of this relationship by phylogenetically analysing *Diuris* and determining the pollinators of several Sydney species. Indsto and his colleagues have shown that nectarless *Diuris maculata* is pollinated in Scheyville National Park, Western Sydney, by *Trichocolletes venustus*, a bee that also gathers pollen and nectar from co-blooming pees, *Daviesia ulicifolia* subsp. *ulicifolia* and *Hardenbergia violacea*. *Diuris maculata* closely resembles the "egg and bacon" flowers of the *Daviesia* in both the human visible range and in UV, part of the spectrum that is visible to bees but not to humans. A paper describing these results has been accepted for publication in *Australian Journal of Botany*. At Lake Munmorah, Indsto and his colleagues have also investigated the pollination of *Diuris alba*, a species that produces small quantities of nectar and does not closely resemble flowers of any co-blooming plants. Here *D. alba* is pollinated primarily by female *Exoneura* bees, which are generalized foragers of nectar and pollen. Phylogenetic analysis of *Diuris*, based on both molecular and morphological characters, suggests that this genus was ancestrally specialized as a pea-mimic and that lineages with more generalized pollination systems evolved from such specialized ancestors.

Principal Research Scientist, Dr Peter Weston integrated the discoveries of his research students James Indsto, Jim Mant and Andrew Perkins, with a phylogenetic analysis of the orchid tribe Diurideae in a presentation titled "Food is good but sex is better: the evolution of deceptive pollination systems in the tribe Diurideae", given at the International Botanical Congress in Vienna, Austria, in July 2005. Weston argued that food mimicry is ancestral in the Diurideae and that food rewards and sexual deception have evolved repeatedly in different diurid lineages.

Proteaceae

Principal Research Scientist Dr Peter Weston has been working since 1979 on the phylogeny and historical biogeography of various groups in the Gondwanic family Proteaceae, establishing an international reputation as a taxonomic authority on the family. In 1998 Professor Klaus Kubitzki, editor of the encyclopedic *Families and Genera of Vascular Plants*, invited Dr Weston to write an account of the Proteaceae for this series. In addition to descriptions of all infrafamilial taxa down to genus and a key to genera, he also wrote an introductory essay on diverse topics from morphology, anatomy and phytochemistry to reproductive biology and cytology – almost “Everything you ever wanted to know about the Proteaceae but were too afraid to ask”. Dr Weston finally delivered the completed manuscript to Kubitzki in September 2005, thus removing a big weight off his mind and off his back.

The treatment for Families and Genera of Vascular Plants required a classification and molecular phylogenetic analyses had indicated that the intrafamilial classification of Johnson and Briggs, published in 1975, needed revision. Dr Weston and his colleague Associate Professor Nigel Barker (Rhodes University, Grahamstown, South Africa) synthesized the results of available published and unpublished phylogenetic analyses in the form of a supertree, produced using matrix representation and parsimony (an “MRP supertree”). They revised the classification of the Proteaceae above generic level on the basis of this supertree, ensuring that only putatively monophyletic groups were recognized as higher taxa. A paper establishing the new classification has been accepted for publication in *Telopea*.

Drs Weston and Barker completed their work on this manuscript while Dr Weston was working as an invited visiting lecturer at Rhodes University for six weeks in February and March 2006. During this visit, they also worked on two other manuscripts reporting the results of molecular phylogenetic analyses: a molecular dating analysis based on chloroplast DNA sequences and an analysis of *rbcL* and ITS sequences.

Dr Hervé Sauquet is a Marie Curie Outgoing International Postdoctoral Fellow, funded by the European Union, who arrived in May 2006 to work with Dr Weston for 12 months on the Proteaceae. Their collaborative project, titled “Evolutionary origin of biodiversity hotspots with a Mediterranean climate (HOTMED)” involves the integration of morphological and molecular characters in phylogenetic in a phylogenetic analysis of the

Proteaceae. This will allow them to identify the clades to which proteaceous fossils belong, with estimates of precision. Dr Sauquet will return to his “incoming” institution, Royal Botanic Gardens Kew, in April 2007, to continue working on this project with his other co-supervisor, Dr Vincent Savolainen.

Dr Weston and Mr Bob Makinson also continued collaboration with Dr Austin Mast (Florida State University, USA) on phylogeny within the family and particularly tribe Grevilleae (*Grevillea*, *Hakea*, *Finschia*). Mr Makinson contributed samples for DNA study from fieldwork in tropical Australia in 2005.

Hon. Research Associate Dr Barbara Briggs continued her collaboration with Dr R.L. Bielecki of the Horticulture and Food Research Institute of New Zealand Ltd. on an investigation of the complex sugars, polyols, of Proteaceae. A paper reporting the polyols of 82 species and discussing the taxonomic significance of the findings was published.

Poales

Continuing from their studies on Restionaceae, Dr Adam Marchant and Honorary Research Associate Dr Barbara Briggs studied families related to Poaceae and Restionaceae. Sequence data on chloroplast DNA was obtained from further taxa. There is robust support for the small Western Australian family Ecdeiocoleaceae, with Joinvilleaceae of the Old World tropics, as the closest living relatives of Poaceae. A paper reporting these findings and presenting additional sequence data has been submitted.

In cooperation with Dr Paula Rudall of the Jodrell laboratory, Royal Botanic Gardens, Kew, and other authors, the floral development of Ecdeiocoleaceae was investigated and compared with that of Poaceae. The study, published in the *American Journal of Botany*, shows new insights into the structures of grass flowers.

Dr Briggs presented a poster on the reproductive biology of Ecdeiocoleaceae at the International Botanical Congress in Vienna.

Studies of the Hydatellaceae, which had been referred to Poales, led to cooperation by Dr Marchant and Dr Briggs with J. Saarela and Dr S.W. Graham of the University of

British Columbia, Vancouver, Canada. This work has shown unexpected and interesting relationships for this family, which will be investigated further.

Scrophulariaceae

Dr Barbara Briggs collaborated with Professor Emeritus Friedrich Ehrendorfer of Vienna and submitted papers reporting chromosome number records and describing three new species of *Veronica* from New South Wales and one from Tasmania. She also collaborated with Professor Philip Garnock-Jones (New Zealand) and Dr Dirk Albach (Germany) in a reclassification of the *Hebe*, *Detzneria* and *Derwentia* sections of an enlarged genus *Veronica*.

Vitaceae

Previous published research by Dr Maurizio Rossetto showed that *Cissus*, the most species rich genus of Vitaceae, is not monophyletic in Australia (and most likely worldwide). This means that more accurate phylogenies will need to be developed for this important family (that include *Vitis*), but also that a new genus is likely to be soon named in Australia (in collaboration with Assoc. Prof. B. Jackes from JCU). Dr Rossetto was invited to the XVII International Botanical Congress (Vienna July 2005) to present this work and to contribute a book chapter and a manuscript on these findings. Further investigations including more genera, particularly *Nothocissus* and *Rhoicissus* from Malaysia and Southern Africa respectively and selected South American *Cissus*, show the unexpected close relationship between *Cissus tweediana* and *Cissus striata* (from South America) and *Clematicissus* (an endemic Australian genus). The new molecular data also showed that *Nothocissus* and a number of endemic Australian *Cissus* (likely to be eventually included within a new genus) are not closely related as suggested by other authors. With the help of Dr Darren Crayn, it has been possible to calculate molecular evolutionary rates and estimate the divergence time of genera within the family. This molecular dating showed that the major radiation of non-rainforest taxa within Australia coincided with the drying of the continent during the Miocene, similar to results found for other Australian groups.

Management of the Preserved Collection

Australia's Virtual Herbarium

The herbaria of Australia – held in botanic gardens, environment agencies and CSIRO – hold a vast source of largely untapped information about the plants of this country. In particular, only half of the more than 6 million preserved plant collections are databased, and there is no 'one-stop shop' for accessing the nation's plant information. During 2001-2002, the Council of Heads of Australian Herbaria, supported by Commonwealth and State environment ministers, unanimously agreed to database the remaining half of the collections and make them available across the Internet. All new plant species and scientific discoveries will then be posted directly onto the Australia's Virtual Herbarium site (mirrored on all herbarium websites), the specimens themselves remaining under the custodianship of each regional herbarium. Funding of \$10 million over five years was secured to complete Australia's Virtual Herbarium: the Commonwealth Government matching \$4 million of State and Territory funds, with an additional \$2 million to be raised from private donors.

In New South Wales, the total number of specimens data-processed is about 630,000 (about 370,000 databased by AVH temporary staff), representing about 53% of the total collections. Although it will prove difficult for the Branch to fully data-process the Australian material held by our herbarium, this financial year saw the near-completion of databasing all specimens collected in New South Wales before the AVH funding ran out in February. Once these data are fully available to the broader community, these collections' records will increase efficiency and accuracy in handling data within the Trust as well as open up new opportunities for delivering plant information to the wider community. Access to these data continues to be made available via the PlantNET website, e.g. providing more detailed spot maps for taxa in the *NSW Flora Online*.

In addition to data-processing thousands of specimens the AVH project has resulted in many curatorial benefits to the collections. In particular, identifications of thousands of specimens have been checked, and numerous nomenclatural changes from the literature have been incorporated. There have also been improvements in the physical curation of many specimens, including correct annotation, allocation of geocode information (such as, botanical divisions), and securing of the material to archival papers

for long-term preservation. Type specimens have been singled out for special treatment, including conservation treatments and digital photography. The images of types are available on the PlantNET website.

NSW Collections Management System

Gary Chapple, Chris Ward and other members of staff continued to work with KE Software to enhance the *NSW Collections* database for the Gardens. This incorporates herbarium, horticultural, and floristic survey data into a single database system. Images of plants, including herbarium collections are being included in the database. Plans for a 5-7 year review of the system were developed, with the first fact-finding workshop to be held early in 2006-07.

Communication and Services

Botanical Information Service

PlantNET

The electronic version of the *Flora of New South Wales, Flora Online*, was developed by Ken Hill as part of the Trust's *PlantNET* website (<http://plantnet.rbgsyd.nsw.gov.au>). It provides nomenclatural information, botanical descriptions, illustrations, distribution maps, images of herbarium specimens and other plant images. These data are managed by the Trust's *NSW Collections* database. *PlantNET* continues to be enhanced so that plant information, identification keys and images from any region of New South Wales will be available, as well as information on other groups of plants.

Aussie Algae

Dr Alan Millar and Ms Linn Linn Lee set up the *Aussie Algae* webpage, a subset of *PlantNet*, to deliver information on Australian marine algae. The William Harvey collection of Australian marine algae on semi-permanent loan from the Mitchell Library (SLNSW) have been remounted, re-determined, databased and digitally photographed through the efforts of Dr Alan Millar, Julie Taylor and Katherine Downs. Along with the 1800 additional Harvey specimens already in the NSW National Herbarium collection, and all the type specimens are now searchable via *Aussie Algae*. Linking the databases

from Ireland, Belgium and the United States, *Aussie Algae* also gives historical, nomenclatural and in situ photographs where available of many species in the NSW collection.

PNGplants

Dr Barry Conn and Linn Linn Lee developed the *PNGplants* website which is linked to *PlantNET*. This website provides access to the *PNGplants Collections* database that contains approximately 156,000 herbarium records from the Australian National Herbarium (CANB), National Herbarium of New South Wales (NSW), National Herbarium of Victoria (MEL), Papua New Guinea National Herbarium (LAE) and the Queensland Herbarium (BRI). The *PNGplants* website also provides access to the 'Guide to the trees of Papua New Guinea' (*PNGtrees*) project and to web pages that list the plant collectors of Papua New Guinea.

Forensic Identification

Government analysts identified forensic material (*Cannabis*) in 13 cases for the Police Service.

Public Reference Collection

Environmental consultants, students, government agencies, and the general community spent more than 260 hours using the Public Reference Collection to identify plants that they had collected.

Telopea

Telopea is New South Wales' leading scientific journal for the publication of plant diversity information. The focus of the journal is the discovery and documentation of plant species, and the study of their origins and relationships. The geographical focus is New South Wales, but papers cover other Australian States as well as neighbouring regions of the world. *Telopea* is an internationally recognised journal and all papers are peer-reviewed.

After serving as editor for 5 years Joy Everett handed on the job to Elizabeth Brown with the completion of issue 11(1).

Telopea issues 11(1) and 11(2) were published: 24 papers in total. Highlights include:

- The description of the new daisy genus *Paenula* (Asteraceae: Gnaphalieae).
- A major review of the orchid complex *Dendrobium speciosum*.
- Further research results on the waterplants, lichens and orchids of Australia.
- New freshwater algal species described in families Oedogoniaceae and Zygnemataceae
- New angiosperm species described in Aponogetonaceae, Asteraceae, Fabaceae, Goodeniaceae, Haloragaceae, Lamiaceae, Nymphaeaceae, Orchidaceae, Rhamnaceae, Rutaceae, Thymelaeaceae, and Violaceae
- Morphological and ontogenetic studies on the gynostemium of some Australian orchids

Part 4: Resources Section

The Resources Section provides infrastructure and support for the Plant Sciences Branch. The section comprises the Library, Botanical Illustration Service, Herbarium Specimen Preparation Facility, Volunteer Program, and Electron Microscopy and Molecular Systematics Laboratories. The section is also responsible for the management of the Branch's vehicles and field-work equipment and in collaboration with the Gardens' Property Coordinator, for issues relating to the Brown Building, which houses the National Herbarium of New South Wales. The Resources Manager also oversees Branch occupational and general health and safety issues, provides agency wide services in managing various capital and other projects and coordinates Critical Incident Planning for the Sydney site.

Library

The Botanic Gardens Library continues its long-term redevelopment program to protect and develop its world-class collection of botanic, taxonomic and horticultural literature. Various projects continue to review and rehouse the Library's extensive heritage historical collections (including books, journals, manuscripts, photographs, illustrations, maps, archives and realia). Funds are being sought for the conservation of selected items most in need.

Major space and storage issues are being identified and solutions sought. Work on contemporary collections is ongoing.

Developments

Several projects have been completed in the library over the last 12 months, the main ones being –

- Major work was undertaken on the rare book storage room (the Annexe), to resolve problem areas, re-organise and re-shelve books and install new purpose-designed shelves for the manuscripts, botanical illustration collection, mounted & framed images and posters & plans.

- Work on the south/west corner of the Sydney Library was completed. This area now houses the Quarto collection, two new work/study areas and a new Folio collection of books. The continuing reorganisation of the Library has eased many problems but not resolved space issues that raise serious challenges, particularly the compactus which presents a variety of OH&S hazards.
- The Manuscript Collection has been relocated to the Annexe, each item now in archival boxes or sleeves.
- The Flockton Collection and works of other illustrators have each been enclosed in Mylar sleeves for long-term preservation.
- Work in the Annexe uncovered a set of Flockton prints thought to be long lost. Also uncovered (in 10 separate locations) were parts of three 1904 panoramic photos of the Domain. A pencil drawing of a view of Farm Cove across to Government House was tentatively identified as an 1850's Edward Turner drawing. These works have now been conserved and restored with funds donated by generous donors. The same donors also funded the purchase of a J.H. Maiden manuscript, written in the early 1900's as a proposed centennial history of the Gardens.
- Funds raised by the Friends of the Gardens and the Australian Garden History Society have led to the conservation of a number of works. The Friends have also funded the scanning of the Maiden manuscript and selected photographs. Their funding of a major conservation assessment report of the Library environment and the collections has given Library staff additional guidance in their ongoing efforts to restructure the Library and protect its valuable assets.

Volunteer Projects

Volunteer teams continue to work on the historical collections and to assist in the reorganisation of the Library's collections. The dedication and hard work of the Library's volunteers have enabled much of the progress achieved in recent years.

Largely fuelled by volunteer enthusiasm, the new Oral History Project is a major undertaking. It aims to capture the memories of many people associated with the Gardens over the years – from those who lived in the cottages when they were 6 years old, to recollections of former Directors. The project will provide material for the 2016 Bicentenary, as well as a record of Garden history that has never been written down.

Mount Annan and Mount Tomah Libraries

A stock take was undertaken at Mount Tomah and Mount Annan. Many problems have been identified at Mount Tomah, particularly a splintered collection and poor storage conditions. The stock takes have also identified many collection cataloguing problems that will need to be addressed.

Exhibitions, Talks and Tours

Library staff also have been involved throughout the year in writing articles, assisting in exhibitions and displays of heritage materials in the Red Box Gallery, staff inductions, student tours and presenting public lectures.

Botanical Illustration

Major Taxonomic Projects

Ongoing taxonomic work has been completed for publication primarily in *Telopea*, but also *Curtis's Botanical Magazine* and *Scientia Horticulturae* for botanists, honorary research associates and students.

Major projects completed include –

- A total of 63 *Cycas* illustrations (primarily full-plates, others composite illustrations to finish or update) were completed for *Telopea* and an upcoming monograph on the genus by Ken Hill and Leonie Stanberg.
- Other illustrations completed for publication include the genera: *Teucrium*, *Lysimachia*, *Wollemia*, *Veronica*, *Prostanthera*, *Leucopogon*, *Blechnum*, *Dicranoloma*, and *Telopea*.
- Illustrations of 32 full trees were completed for a collaborative project between the Australian Museum and Community Education. The project, "AusBiota in a Box", provides a visual time-line of the evolution of Australian plant species since Gondwana.
- Illustrations for Community Education including illustration requests for children's exploration trails at Mt Tomah, designs for two plant seedlings and cuttings posters for the Community Greening Project, and three large landscape drawings for signage at Mt Tomah.

- Five plates were created to illustrate the floral structure of major Australian plant families.
- The Illustrators raised a total of \$2156 through the electronic outsourcing of scientific illustrations from the Illustration Archive. Primarily images sought were from the Flora of NSW collection, with some full-plate illustrations also required, for organisations as varied as the Dept of Defence, Dept of Water Land and Biodiversity in SA, Dept Natural Resources, Environment and the Arts in NT and The University of NSW for booklets, identification guides and signage.
- Business Development requested a card to be designed for the birth of a major donor's daughter. The illustrations of Margaret Flockton were used for this once-off design.

Digital Imaging Project

Illustrations are scanned as they are completed, added to the multimedia module of Emu and linked to the taxonomy and catalogue modules. The remaining works, namely illustrations completed in the last two years, approx 1/3 Margaret Flockton's drawings and approximately 100 *Eucalyptus* and *Corymbia* illustrations and a collection of Epacridaceae illustrations, are yet to be scanned and added to NSW Collections.

Output from this project has been reduced due to staff absences, with Lesley Elkan on leave until June 2007 and more time devoted to the major works listed above.

Endangered and Vulnerable Plants

The current focus of this project is to illustrate New South Wales species being listed as endangered nationally. This project been delayed due to the absence of Lesley Elkan on leave.

Volunteers and Training

- Regular assistance is given to the staff frequently requiring help when scanning images.
- Christine Rockley, a student enrolled in the Natural History Degree at the University of Newcastle, has been doing work experience for one day per week since July. She is currently completing a plate of the rare *Acacia terminalis*.

- The illustrators gave impromptu talks and demonstrations in the Illustration Room to students from Universities and TAFE's as well as BGT Volunteers on the role of scientific illustration and the Illustration Archive.

Scanning

- Scanning of black and white illustrations for publication in external journals continues to be undertaken by the illustrators to ease the workload in the Design and Editorial section.

Exhibitions and Awards

- As members of the Artist in Residence Committee, the illustrators assisted in the Artist in Residence Program 2006. Gaye Chapman was appointed Artist in Residence following interviews held December 2005.
- The illustrators represented the Botanic Gardens at Sydney in Bloom, demonstrating their illustrating skill and talking to the public about the Gardens, the Herbarium and illustration classes on offer through Education and The Friends of The Gardens
- As members of the Red Box Gallery Committee, the illustrators assisted in the hanging and supervision of the 2005 Margaret Flockton Award for Botanical Illustration exhibition in the Red Box Gallery.
- Lesley and Catherine both received Highly Commended awards in the 2005 Margaret Flockton Award.
- Catherine and Lesley were both featured in articles outlining their careers as botanical illustrators, in the publications *9-5*, *City Weekly* and *The Manly Daily*.

Herbarium Specimen Preparation Facility

All plant specimens coming into the Herbarium are processed and prepared in the Preparation Room before being incorporated into the collection. As part of our Integrated Pest Management Program (IPM) specimens collected in the field are pressed, dried and frozen (at $< -18^{\circ}\text{C}$) prior to mounting. This ensures specimens are free from pests before they are incorporated into the collection. In-coming and out-going loans and exchange are also frozen to ensure that pests are not transmitted between herbaria.

The Preparation Facility is a checkpoint where all specimens entering and leaving the Herbarium are recorded. The Herbarium again received accreditation as an approved Quarantine Approved Premise through the Australian Quarantine and Inspection Service. This enables us to process specimens received from overseas, and provide a quarantine service for other Australian herbaria.

Ingram and Burrendong Herbarium Collections.

Two large donated collections of pressed specimens, the Keith Ingram Herbarium and the Burrendong Herbarium, about 25,000 specimens in total, were frozen and moved into the Herbarium where they have been sorted, and are being curated and databased before being fully incorporated into the herbarium.

Volunteer Programs

The mounting program has as its central goal to have the pressed plant specimens securely mounted on archival quality materials, clearly and correctly labelled, and catalogued in the collection data-base. A major priority is to ensure that all out-going loan material is mounted before being sent out. The program relies on a group of dedicated volunteers, who each give one day per week.

Although most volunteers assist in the mounting program, some work with specific research or curation projects, including scanning and data checking type specimens, and curation of the algae and lichen collections.

In October 2005, Mary Stewart was appointed as the Scientific Volunteer Coordinator to oversee the program. Mary has forged links with the Friends and Community Education volunteer programs and after a successful advertising campaign and information session, followed up by interviews and training sessions in the early part of 2006, 15 new Scientific Volunteers have now settled happily into the mounting program in the Herbarium.

Specimen mounting program

Volunteers mounted approximately 21,000 specimens on archival paper. Outgoing loans, incoming exchange, specimens data based by the AVH and fragile or vulnerable groups within the Herbarium collection were given highest priority.

Scanning Electron Microscope Laboratory

The Electron Microscopy Laboratory provides facilities for Scanning Electron Microscopy (SEM) including freeze and critical point drying. These techniques are used in research and plant identification. Equipment includes a Cambridge S360 Scanning Electron microscope (SEM) and associated preparation equipment.

The Cambridge S360 SEM has reached the end of its useful life, is no longer supported by the manufacturer or being maintained under a maintenance contract. Enquiries were made with the Australian Museum about purchasing time on their microscopes in the event of the failure of the Cambridge S360.

SEM Projects

Honorary Research Associate Christopher Quinn is continuing his SEM studies within the family Ericaceae. He has completed a study of surface micromorphology of the leaves, pollen and floral parts (sepals, petals, anthers and ovary) of all species of *Monotoca*, *Cyathodes dealbata* and related genera in the tribe Styphelieae (Ericaceae), plus all species in the tribe Oligarrheneae, including three species previously assigned to *Monotoca* and two new species. Observations made have contributed to the definition of a set of non-molecular characters that have been scored for all the taxa. Cladistic analyses of this database, alone and in combination with chloroplast sequence data, are providing a new set of generic concepts. He is presently engaged on a study of pollen and ovary surface micro-morphology in the tribe Epacreae, in particular *Budawangia*, *Epacris* and *Rupicola*. Variations observed will be used to test an estimate of the phylogeny of the tribe based on chloroplast sequence data.

Elizabeth Norris together with Joy Everett and Surrey Jacobs has been continuing with the leaf and epidermes study of *Piptochaetium*, *Achnatherum* and *Stipa* s. str. using SEM and light microscopy. This work forms part of an international collaborative project concerning the tribe Stipeae. From her results she is building a matrix with respect to the relationships of these three genera.

Molecular Systematics Laboratory

The Molecular Systematics Laboratory provides facilities for DNA-based studies of plant relationships, to supplement whole plant and anatomical comparisons.

Laboratory staff collaborated with students and researchers on the various projects, provided technical support and trained staff and students in laboratory procedures.

Laboratory Occupational Health and Safety

A new Safe Working Methods Statement (SWMS) register was established for the laboratory.

Equipment and Laboratory Services

In 2005/6, the Laboratory acquired equipment for high throughput DNA extraction and handling; a new Qiagen TissueLyser for grinding leaf samples; a Sigma 4-15C centrifuge capable of spinning 2 x 96-well plates to 6000 x g and a Matrix Impact2 electronic multi-channel pipettor for large liquid volumes.

The water main under the floor of the laboratory caused major disruption again this year, with the leak re-occurring under the laboratory floor. This necessitated the laboratory being shut down for several weeks whilst the leak was repaired.

Students

Graduate students utilising the laboratory included: Yolanda Metti (*Laurencia*, Rhodophyta – the “coral plant”); Karen Sommerville (*Wilsonia*, Convolvulaceae); Hannah McPherson (*Tetralthea*, Tremandraceae); Nicholas Yee (Sporochnales, Phaeophyta); George Orel (Juglandaceae) and Frances Elliot (*Davidsonia*, Davidsoniaceae).

Yola Metti converted her MSc to a PhD at UNSW (supervised by Alan Millar and Peter Steinberg)

Hannah McPherson converted her MSc to a PhD at UNE (supervised by Maurizio Rossetto, Darren Crayn and Caroline Gross).

Frances Elliot PhD UNE (supervised by Maurizio Rossetto and Caroline Gross) developed a microsatellite library on Davidson’s Plum (*Davidsonia*, Davidsoniaceae).

Staff and Honorary Research Projects

Dr Adam Marchant continued molecular systematics studies on Australian Solanaceae and *Ipomoea costata* together with colleagues in Broome and Japan. Adam is continuing work on Restionaceae with Dr Barbara Briggs and is also working on the DNA fingerprinting of *Camellia* in conjunction with George Orel and Tony Curry, University of Western Sydney.

Carolyn Porter is continuing her collaboration on the development of a microsatellite library of *Pteridium* (bracken) with Professor John Thomson using new enrichment and cloning techniques. Carolyn also developed a microsatellite library and genotyped populations for pilot studies on *Telopea* and completed sequencing Australian Vitaceae with Maurizio Rossetto in collaboration with researchers in the USA.

Dr Andrew Perkins is continuing molecular studies of Apiaceae in collaboration with Dr Murray Henwood, University of Sydney.

Red Box Gallery

The Red Box Gallery aims to promote the Trust's scientific work by mounting exhibitions that promote the Trust's scientific work and enable the Trust to display the many historic and educational items from its Library and Herbarium collections.

The gallery has had a very busy and successful year with an extensive exhibition program. Visitation to exhibitions in the gallery during 2005/06 exceeded 3,000 whilst visitation to the gallery since its opening in 2003 has passed 10,000.

Exhibition Program

2005 Margaret Flockton Award 07/05/05 to 15/07/05

An exhibition of selected works from The Margaret Flockton Award.

plant + paper. 18/07/05 to 12/08/05

The first Artist in Residence exhibition, featuring works executed by the 2005 artist, Chris Gentle.

*Beijing Botanicals** 15/08/05 to 07/09/05

Selected works by Chinese students from Capital Normal University in Beijing, in collaboration with CoFA

Margaret Preston

10/09/05 to 09/10/05

An exhibition of Margaret Preston works with accompanying floral arrangements by students from Pearson's School of Floristry. In collaboration with the AGNSW.

*Woodbine Art**

11/10/05 to 17/10/09

A private exhibition of botanical art by well known Victorian artists.

*Domain Trees**

19/10/05 to 08/11/05

Photographic essay on the trees in the Domain.

*Flora Tasmanica**

14/11/05 to 03/12/05

An exhibition of paintings of Tasmanian flora by Lauren Black with ceramic plates by Les Blakebrough.

Our Hidden Talents - BGT Staff exhibition

05/12/05 to 21/12/05

Art works produced by Botanic Gardens Trust staff.

Botanic Gardens Treasures

09/01/06 to 30/06/06

Ongoing exhibition displaying items from the BGT collections including rare Banks and Solander specimens and prints from the *Banks Florilegium*.

* Externally organised exhibition

Artist in Residence Program

Following the successful Artist in Residence (AIR) arrangement with Robyn Stacey in 2004, it was decided to formalise an AIR Program and advertise for potential artists. The AIR provides practising artists the opportunity to work at the Royal Botanic Gardens, Sydney from March to December in the year it is offered.

The program culminates with an exhibition of the artist's work held in the Red Box Gallery or other suitable venue at the Royal Botanic Gardens, Sydney for a period of about ten weeks.

The 2005 Artist in residence was Chris Gentle, who worked in the Herbarium and Gardens and produced an exciting series of paintings which were exhibited in the exhibition - *plant + paper* in the Red Box Gallery in July/August 2005.

The 2006 Artist in Residence is Gaye Chapman, who is working closely with Community Education on a project called the *The Secret Garden* where the artist has chosen native and exotic plants in the collection that are specifically associated with childhood, as revealed by research into their associated folklore, fables, legends, myths and histories.

Critical Incident Planning and Implementation.

The Resources Manager is responsible for the updating and implementation of the Critical Incident Plan (CIP) at the Sydney site.

During the year, there were 17 major incidents in the Sydney Gardens.

Achievements throughout the year include:

- ongoing training of staff in emergency procedures
- up-date of evacuation procedures on the Sydney site

Infrastructure

Energy Performance Contract

The Manager Resources also oversees the Energy Performance Contracts (EPC's) currently arranged through DEUS. The EPC's were implemented in two stages from 2002 to 2005. The energy savings for the year are far higher than for 2004 -2005 (see table), mainly due to the finalisation of the upgrades under Phase 2 of the Energy Performance Contract. The savings are calculated against base readings in 2001/02 (electricity) and 2003/04 (gas). Minor modifications to the Brown Building to improve air conditioning controls are planned for 06/07, which will result in further savings.

YEAR	ELECTRICITY (kWh)	GAS (MJ)	CO ₂ (TONNES)	\$
2004/2005	496,045	998,332	>300	>30,000
2005/2006	703,445	4,580,397	>850	>64,000

Capital Program

As part of the 2005/06 Capital Works Program, several infrastructural projects were completed.

- **Brown Building Water Leaks.** Work has continued on rectifying leaks in the roof of the Brown Building as part of the 2005/06 Capital Works Program. Remedial work on the membrane on the perimeter of the roof and rectification work in the Level 4 Plant Room has all but fixed the leaks.
- **New Herbarium Shelving.** 16 columns of shelving were installed on Level 3 of the Brown Building. This will increase herbarium storage by 464 boxes.
- **Library Shelving.** New shelving was installed in the Library and Library Annex.

Part 5: Appendices

Appendix A: STAFF, HONORARY ASSOCIATES, VOLUNTEERS AND STUDENTS IN PLANT SCIENCES BRANCH

Director Science and Public Programs

Brett Summerell BScAgr(Hons), PhD(Syd)

Executive Assistant

Sheryl Saban (from 23.8.2006)

Administrative Assistant

Kristina McColl BSc(Hons)(UNSW), BushRegenCert

Ifeanna Tooth BSc (Syd), Adv Cert Urb Hort (OTEN) (temp)

CENTRE FOR PLANT CONSERVATION

Coordinator

Bob Makinson BA (Biology) Macq

CONSERVATION AND HORTICULTURAL RESEARCH

Manager

Bob Makinson BA (Biology) Macq (Acting) (to 23.6.06)

NSW Vegetation

Special Botanists

Doug Benson BSc(Hons)(UNSW)

John Benson BSc(Macq)

Senior Research Scientist

Maurizio Rossetto BSc (Hons) (La Trobe), MSc, PhD (UWA)

Scientific Officer

Lucy Nairn BSc (Hons) (Monash) (temp)

Senior Technical Officers

Chris Allen BEng, BSc(Biology)(Syd), PhD (Syd)

Technical Officer

Jedda Lemmon BA(Sociology)(UNSW)BushRegenCert II (LDD 8.7.05)

Technical Assistant

Lyn McDougall BushRegenCert (LDD 11.8.05)

Fungi and Plants

Plant Pathologist/Mycologist

Edward Liew BSc(Hons), PhD(Qld) (commenced 20.3.06)

Senior Technical Officers

Suzanne Bullock NZCS, MSc(UNSW)

Technical Officers

Julie Bates, AssDipAppSc(Ultimo TAFE) (temp)

Horticultural Research and Development**Senior Research Scientist**

Catherine Offord BScAgr(Syd), MScAgr(Syd), PhD(Syd)

Scientific Officer

Amelia Martyn BScAgr(Hons), PhD(Syd)

Technical Officers

Lotte von Richter BScAgr(Syd), MScAgr(Syd)

Patricia Meagher BScUrbanHort(Hons)(UTS) (temp)

Senior Technical Officer

John Siemon, BHortSc(Hons) (Uni Qld)

Horticulturalist

Faye Cairncross AdvCertUrbanHort (LDD 31.3.06)

Veronica Kuziow HortCert 1.10.05 – 31.12.05

Amanda Rolloston

Technical Officers

Mishy McKensy (LDD 1.7.05)

Leahwyn Seed BSc(Hons)(UNE) (temp), transferred to Seedquest 12.12.05

PLANT DIVERSITY**Manager**

Karen Wilson BScAgr(Syd), MSc(UNSW) (Special Botanist) (acting)

Research and Curation**Principal Research Scientist**

Peter Weston BSc(Hons), PhD(Syd)

Alan Millar BSc(Hons), PhD(Melb)

Surrey Jacobs, BScAgr, PhD(Syd)

Senior Research Scientist

Barry Conn BScEd, MSc(Melb), MBA (CSturt), PhD(Adel)

Research Scientist

Darren Crayn BSc(Hons), PhD (UNSW)

Peter Wilson BSc(Hons), PhD(UNSW)

Senior Systematic Botanist

Joy Everett BioTechCert (Syd TAFE), BSc(Hons), MSc(Syd)

Botanists

Elizabeth Brown BSc, MSc(Hons), PhD(Auk) (editor of Telopea)

Stephen Skinner BSc(Hons), MSc, PhD(Adel), GradDipEd(Sec.) (temp)

Senior Technical Officer

Louisa Murray BAppSc(CCAE)

Technical Officers

Clare Herscovitch BSc(Hons)(Syd)

Gillian Towler BSc(Macq), AssDipAppSc (HortParkMgt), TreeSurgCert

Hannah McPherson BSc (Hons) (UNSW)

Katherine Downs, BA (UNSW), BSc(Hons) (Syd)

Leonie Stanberg BSc(Syd), DipEd(SCAE)

Linn Linn Lee, BA, BSc(Hons)(Syd) (temp) (LDD 30.6.06)

Liz Norris BSc(Hons) (Macquarie) (temp)

Margaret Heslewood BSc(Hons) (Syd) (temp)

Paul Rymer BSc (Hons) (UWS) (temp) (LDD 14.10.05)

Wayne Cherry BScAgr(Syd), GradDipBioSc(UNSW)

Herbarium Assistant

Zonda Erskine AssDip in FAP(Sydney TAFE)

Australia's Virtual Herbarium**Co-ordinator**

Phillip Kodela BSc(Hons), PhD(UNSW) (temp) (LDD 28.2.06)

Database staff

Carmen Bennett (temp) started 7.2.05 (LDD ??)

Karen Biddle (temp) (LDD 30.6.06)

Rachael Gallagher (temp) (LDD 30.6.06)

Carmel Hunt (temp) (LDD 31.8.05)

Brooke McCarthy (temp) (1.8.05 - 19.10.05)

Chanele Moss (temp) (LDD 30.1.06)

Rhiannon Ward (temp) (LDD 31.1.06)

Megan Webb (temp) (LDD 9.1.06)

Lisa Woods (temp) (LDD 30.1.06)

Botanical Information Service**Botanist**

Barbara Wiecek BSc(Syd)

Senior Technical Officer

Seanna McCune BAppSc(Hawkes), BushRegenCert

Technical Officers

Gary Chapple BSc(Syd), DipAg(Hawkes)

Robert Coveny HortCert

PlantNET Officer

Peter Hind HortCert

RESOURCES

Manager

Anthony Martin, BioTechCert, BioTechHigherCert, BAppSc(Riverina)

Technical Officer

Alex Newman CertAmenHort(SA), AdvCertHort(SA), BScAg(Hons)(Adel), BMus(Adel), PhD(Macq)

Laboratories

Senior Technical Officer

Adam Marchant BSc(Hons), PhD(ANU)

Technical Officer

Carolyn Porter BAppSc(Hons)(UTS)

Library

Senior Librarian

Judy Blood BA, Dip Ed (LaT) DipLib (RMIT) BushRegenCert, ArboricultureCert, Multimedia Cert IV

Library Technician

Miguel Garcia AssocDipLibPrac(STC)

Botanical Illustration

Illustrators

Lesley Elkan BSc(UTS), PostGradDipIllus(Newc) (1 year mat leave from 3.5.06)

Catherine Wardrop BA(Vis)(ANU), PostGradDipIllus(Newc)

Volunteer Program

Volunteer Program Supervisor

Mary Stewart BSc(Syd) (commenced 10.10.05)

HONORARY RESEARCH ASSOCIATES

Alan Archer PhD(City Lond), CChem, FRSC

Peter Bernhardt BA, MA(SUNY), PhD(Melb)

Don Blaxell BSc(UNSW), DipAgr(Vic)

Barbara Briggs BSc(Hons), PhD(Syd), PSM

Carrick Chambers AM, MSc(NZ & Melb), PhD(Syd), Hon.LLD(Melb), Hon.DSc(UNSW), AHRIH

Mike Dingley BioTechCert (STC)

Lionel Gilbert, OAM, BA (Hons) PhD(UNE), LCP(Lond)

Gwen Harden MSc(UNE)

Ken Hill BSc(Hons), MSc(UNE)

Jocelyn Howell BPharm(Syd), BSc(Macq)

Robert Kooyman

Alan Leishman PhotoengravingEtchingCert

John Leslie BA(Dall), MS(UWisc), PhD(UWisc)

David Mabberley MA, PhD(Cambridge), DPhil(Oxon)

Lyn McDougall BushRegenCert
Peter Michael BAgSc(Hons)PhD(Adel)
Christopher Quinn, BSc (Hons) (Tas), PhD (Auk)
Helen Ramsay MSc, PhD(Syd)
Bettye Rees BSc(Hons)(Qld), PhD(UNSW)
Rod Rice Higher UrbCertHort
Geoffrey Sainty DipAgr(WAC), GradDipExt(Hawkes)
Phil Spence
Terry Tame DiplIndArts(STC), DipEd(Syd)
Joy Thompson BScAgr, MSc(Syd)
John Thomson MSc, MAgrSc, PhD(Melb)
Mary Tindale MSc, DSc(Syd)
Edwin Wilson BSc (UNSW)

VOLUNTEERS

Beverley Allen, Mike Atkinson, Lydia Bell, Margaret Bell, Pamela Bell, Chris Belshaw, Carol Bentley, Rosemary Blakeney, Wayne Brailey, Harry Brian, Ellen Brien, Louise Broadhead, Kathryn Brown, Dawn Bunce, Lynette Burns, Mary Cail, Diane Calder, Judith Calder, Margaret Carrigg, Kathryn Chapman, Margot Child, Linda Chu, Silas Clifford-Smith, Anne Collins, Barbara Darmanin, Mien de Hass, Jane D'Olier, David Drage, Helen Flinn, Gladys Foster, Pat Harris, Jane Helsham, Janet Heywood, Rachel Hill, Peta Hinton, Alick Hobbes, Beverley Honey, Lesia Hrubyj, Mike Isbell, Zia Kahn, Trevor Kruger, Fred Langshaw, Gwenda Levy, Marie Lovett, Anne Lucas, David Mackay, Nicole Mason, Ann McCallum, Lorraine McCarthy, Malcolm McDonald, Ena Middleton, Matthew Nash, Jenna Nielsen, Barbara Page, Jill Pain, Sally Paton, John Pearce, Duc Phan, Aileen Phipps, Fresa Poot, Dorothy Pye, Beth Radford, Cecilia Raffaele, Ann Rahaley, John Richards, Ben Ross, Betty Ruthven, Theresa Sergeant, Evelyn Shervington, Graham Shields, Lucas Shuttleworth, Carol Sinclair, Lois Stewart, Julie Taylor, Betty Thurley, Ruth Toop, Shelagh Trengove, Valerie Trigg, Deidre Tronson, Kim Tronson, Sybil Unsworth, Rosemary Varley, Ann Wilcher, Jean Williams, Lisa Woods, Xiaojie Yuan.

STUDENTS

Student	Degree	University	Supervisors	Project Title
Alison Bentley	PhD	University of Sydney	+Prof. L. Burgess, Dr B. Summerell	Population biology of <i>Fusarium</i> <i>pseudograminearum</i>
Emma Burns	PhD	University of New South Wales	+Dr R. Brooks, +Dr B. Houlden, Dr D. Crayn, +Dr M. Eldridge	Phylogeography, population history and conservation genetics of the endangered Green and Golden Bell Frog (<i>Litoria aurea</i>)
Jonathon Carbrera		Mainz University (Germany)	+Dr Gudrun Kadereit, +Prof. Joachim Kadereit, Dr S. Jacobs	Studies in Australian Camphorosmeae (Chenopodiaceae).
Kerri Clarke	PhD	University of New England	+Assoc. Prof. J. Bruhl, +Dr N. Prakash, K. Wilson	Systematic studies in Abildgaardieae (Cyperaceae)
Yvonne Davila	PhD	University of Sydney	+Dr G.M. Wardle, Dr M. Rossetto	Ecological and evolutionary implications of variation in pollinator assemblages on <i>Trachymene incisa</i> (Apiaceae)
Jim Dellow	MScAgr	University of Sydney	Prof. D. Kemp +Dr W. King + Dr S. Jacobs	Weedy Brassicaceae of NSW Wheat areas
Frances Elliot	PhD	Southern Cross University	+Prof. R. Henry, Dr. M. Rossetto	Extent of clonality and taxonomic relationships in <i>Davidsonia</i>
Heather England	BSc(Hons)	University of New South Wales	+Assoc .. P. Adam, Dr C. Allen	Invasion of weeds in Blue Gum High Forest
Cassia Ferguson	BHort Sc	University of Sydney	+Dr Robyn McConchie., Dr Cathy Offord	Effect of the addition of rock dust to potting mixes on the health of potted plants
Alex Freebairn	PhD	University of Sydney	+Dr P. Martin, Dr C. Offord	Reproductive biology and breeding of <i>Grevillea</i>
Robert Gibson	PhD	University of New England	+Assoc. Prof. J. Bruhl, +Dr G. Vaughton, Dr B. Conn	Systematics of <i>Drosera</i> <i>peltata</i> complex
Adele Harvey	PhD	La Trobe University	+Dr Wm J. Woelkerling, Dr A. Millar	The crustose coralline algae of NSW

Student	Degree	University	Supervisors	Project Title
Gavin Hinten	PhD	Southern Cross University	Prof. P. Baverstock, Dr. M. Rossetto	Patterns of mutation of microsatellite loci - a study using island populations of the Australian bush rat
John Hodgson	PhD	University of New England	+Assoc. Prof. J. Bruhl, Mrs K. Wilson, Dr A. Marchant	Systematics of <i>Juncus</i> (Juncaceae)
Chris Howard	PhD	University of Sydney	+Prof. L. Burgess, Dr B. Summerell	Population genetics of <i>Phytophthora cinnamomi</i>
Khalaf Al Hussaen	PhD	University of Technology	Dr B. Summerell, +Dr J. Tarran, +L. Tesoriero	Diseases of Lettuce in hydroponics
James Indsto	MSc	University of Wollongong	Dr P. Weston, +Prof. R. Whelan, +Dr M. Clements	Species relationships and pollination ecology of <i>Diuris</i> (Orchidaceae) of the Sydney region
Peter Jobson	PhD	University of Technology	Ken Brown, Dr P. Weston	A taxonomic revision of <i>Dillwynia</i> (Fabaceae: Sydney Faboideae: Mirbelieae)
Aniuska A. Kazandjian	PhD	James Cook University	+Assoc. Prof. B. Jackes, Dr P. Wilson	Systematics of the <i>Indigofera pratensis</i> complex (Fabaceae): A Morphological and Molecular Approach
Matthew Laurence	PhD	University of Sydney	Dr Edward Liew, Dr B. Summerell, +Prof. L. Burgess	The evolutionary and pathogenic potential of <i>Fusarium oxysporum</i> from native soils in Australia
Joanne Ling	PhD	University of Western Sydney	+Dr J Bavor, Dr S. Jacobs	Development of a Wetland Assessment protocol using biological techniques
David McKenna	PhD	University of Wollongong	+ Prof. R. Whelan, +Assoc Prof. D. Ayre, +Dr T. Auld, Dr P. Weston	Ecology of fire-sensitive <i>Persoonia</i> species: threatened Species recovery and Management
Hannah McPherson	MSc	University of New England	Dr D. Crayn, Dr M. Rossetto, +Dr C. Gross	Phylogenetics and evolutionary dynamics of the 'Tremandroid' Elaeocarpaceae
Yola Metti	MSc	University of New South Wales	Dr A. Millar, +Prof. P. Steinberg	Morphology and molecular phylogeny of the red algal <i>Laurencia</i> in NSW

Student	Degree	University	Supervisors	Project Title
Lucy Nairn	PhD	University of Melbourne	+Dr B. Downes, Dr T. Entwisle	Ecology of freshwater macroalgae in sandstone streams of the Southern Highlands, NSW
Jennie Nelson	MSc(Hons)	University of Western Sydney	+Assoc. Prof. S. Burgin, Dr T. Entwisle	Desmids of Western Sydney
Sophie Peterson	PhD	University of Sydney	+Prof. L. Burgess, Dr B. Summerell	Biology of <i>Phyllosticta telopeae</i>
Tijana Petrovic	PhD	University of Sydney	Dr Edward Liew, +Prof. L. Burgess, Dr B. Summerell	Taxonomy and Biogeography of <i>Fusarium</i> species associated with cultivated Sorghum in Australia
Arthur Pinaria	PhD	University of Sydney	Dr E. Liew, +Prof. L. Burgess	Vanilla Stem Rot In Indonesia: Host Diversity and Pathogen Population Genetics
Matt Renner	PhD	University of Sydney	Dr Elizabeth Brown, +Dr Glenda Wardell	Relationships of the Austral family Lepidoziaceae
Peter Ridgeway	BSc(Hons)	University of New South Wales	Dr. D. Crayn, Dr. M. Rossetto & Dr. +S. Bonser	Phylogeography of <i>Elaeocarpus largiflorens</i> across a putative geophysical barrier
Karin Rutten	PhD	University of Wollongong	Dr A. Millar	Macro-algal blooms and Management
Josie Saul	PhD	University of Sydney	+Prof. D. Guest, Dr E. Liew	Diversity of <i>Phytophthora palmivora</i> in PNG
Jennifer Smith	PhD	University of New England	Assoc Prof C Gross, Assoc Prof N Prakash, Dr M Rossetto	Ecology, biology and conservation of <i>Hakea pulvinifera</i>
Karen Sommerville	PhD	University of Technology, Sydney	+Dr Alex Pulkownik, +Prof M. Burchett, Dr. M. Rossetto	Ecological conditions for biodiversity conservation of saltmarsh at Sydney Olympic Park
Len Tesoriero	PhD	University of Sydney	+Prof. L. Burgess, Dr B. Summerell	Control of soil borne diseases in glasshouse crops Plant
Nguyen Vinh Truong	PhD	University of Sydney	Dr E. Liew, Dr B. Summerell, +Prof. L Burgess	Biology, Epidemiology and Population Structure of <i>Phytophthora capsici</i> , pathogen of Black Pepper Wilt in Vietnam

Student	Degree	University	Supervisors	Project Title
Jillian Walsh	PhD	University of Sydney	Dr E. Liew, Dr B. Summerell, +Prof. L Burgess	<i>Fusarium</i> species associated with native sorghum in Australia
Andrew Watson	MScAgr	University of Sydney	Dr B. Summerell, +Prof. L Burgess	<i>Fusarium</i> species causing cob rot of maize in New South Wales
Sabine Wilkins	PhD	University of Berlin	+Prof. W. Greuter, Dr S. Jacobs	Taxonomic studies in the Floating leaved species of <i>Potamogeton</i> (Potamogetonaceae) in Australia
Paul Wynn	PhD	University of Sydney	+Dr Bruce Sutton, Dr Cathy Offord	Water use efficiency of Australian plants
Nick Yee	PhD	University of New South Wales	Dr A. Millar, Dr A. Marchant, +Prof. G. Craft	Molecular phylogeny of the algal order Sporochneales
Ameera Yousiph	PhD	University of Sydney	Edward Liew; Andrew Watson (NSW DPI); Lester Burgess	Fusarium Wilt of Snow Peas

Appendix B: REPRESENTATION ON EXTERNAL COMMITTEES

Doug Benson

Member, North Head Sanctuary Scientific Committee (Sydney Harbour Federation Trust); Member, Institute of Wildlife Research, University of Sydney; Member, National Trust Bush Management Advisory Committee

Dr Barbara Briggs (Honorary Research Associate)

Member, Editorial Advisory Board, Nordic Journal of Botany; Committee Member, NSW Division of Australian & New Zealand Association for the Advancement of Science (ANZAAS)

Professor Carrick Chambers (Honorary Research Associate)

Member, Research Committee of Australia Pacific Science Foundation and Pacific Biological Foundation and The Hermon Slade Foundation until 30 May 2006; Member Griffin Reserves Advisory Committee for Willoughby City Council; Patron, Walter Burley Griffin Society Inc.

Dr Darren Crayn

Chair, Hansjorg Eichler Scientific Research Fund Committee; Member, Editorial Committee, Telopea; Vice President, Australian Systematic Botany Society; Councillor, Society of Australian Systematic Biologists

Dr Barry Conn

Editor, Handbooks of the Flora of Papua New Guinea; Member, Editor, 'HISPID – Herbarium; Information Standards and Protocols for Interchange of Data', version 3; Member, International Working Group on Taxonomic Databases for Plant Sciences; Coordinator, Flora Malesiana Urticaceae Working Group.

Joy Everett

Member of DEC Restructure committee

Dr Tim Entwisle

Chair, NSW Biodiversity Research Network; Member, International Organising Committee for Eighth International Phycological Congress; Member, Australian Academy of Science National Committee for Plant and Animal Sciences; Member, NSW Agricultural Scientific Collections Trust; Scientific Program Coordinator, International Botanical Congress 2011; Judge, East Darling Harbour Sydney Urban Design Competition; Member, Scientific Committee for 3rd Global Botanic Gardens Congress; Member, International Advisory Committee for Botanic Gardens Conservation International; Member, Steering Committee for National Collaborative Research Infrastructure (NCRIS) bid.

Peter Hind

Member, Management Committee, Vale of Avoca Recreational Reserve Trust; Leader, Society for Growing Australian Plants Fern Study Group.

Dr Surrey Jacobs

Member, Animal Care and Ethics Committee, Australian Museum; Member, State Wetlands Scientific Advisory Panel for the Shoalhaven River, DEC Wetlands Initiatives.

Dr Edward Liew

Member, Australasian Plant Pathology Society; Member, Australasian Mycological Society; Associate Researcher, Faculty of Agriculture, Food and Natural Resources, The University of Sydney

Professor David Mabberley (Honorary Research Associate)

Director, University of Washington Botanic Gardens, Seattle, Washington, USA; Extraordinary Professor, Nationaal Herbarium Nederland, Faculty of Natural Sciences, University of Leiden, The Netherlands; Adjunct Professor, University of Western Sydney; Honorary Director and Trustee, Joseph Banks Archive Project, Royal Society and The Natural History Museum, London; President, International Association for Plant Taxonomy; Member, Scientific Committee, International Dendrology Society

Bob Makinson

Member, NSW [Threatened Species] Scientific Committee; Member, Species Recovery Team for *Grevillea wilkinsonii*; Member, Goobarragandra Valley Reserves Trust (Crown Lands Trust under Dept of Lands); Vice-president, Australian Network for Plant Conservation Inc.; Member, Wollemi Pine Conservation Management (Recovery) Team; Secretary, NSW Biodiversity Research Network

Adam Marchant

Member of Board of Directors of the Workers' Educational Association (Sydney).

Tony Martin

Committee member, Microscopical Society of Australia.

Amelia Martyn

Member, Australian Society of Plant Scientists; Member, Women In Science Enquiry Network; Spokeswoman, Mount Annan Botanic Garden; Mentor, Willing and Able Mentoring (WAM) program

Patricia Meagher

Member, Wollemi Conservation Management (Recovery) Team.

Peter Michael (Honorary Research Associate)

Member, National Trust Bush Management Committee.

Dr Alan Millar

Editor-in-chief, Journal of the International Phycological Society - Phycologia; Deputy Chair, NSW; Fisheries Scientific Committee, Fisheries Management Act; Adjunct Professor of University of New South Wales and University of Melbourne; Member, International Organising Committee, International Phycological Congresses; Member, Nominations Committee, International Phycological Society; Member - International Marine Experts Group; Algal Consultant for International Union for the Conservation of Nature (IUCN); Consultant for Conservation International, Washington DC.

Cathy Offord

Member, NSW Cut-flower Consultative Committee; Program Committee member, International Protea Conference, Melbourne, April 2004; Member, Wollemi Pine Conservation Management Committee, member.

Dr Maurizio Rossetto

Member, IUCN/SSC Reintroduction Specialist Group; Member, *Fontainea oraria* Recovery Team; Member, *Elaeocarpus williamsianus* Recovery Team; Member, Genetic Society of Australia; Member, The Society for Conservation Biology Team.

Dr Brett Summerell

Chair, Council of Heads of Australian Herbaria; Member, Australian Museum, Research and Curation Advisory Committee; Member, International Society of Plant Pathology Committee on *Fusarium*; Vice-President, International Mycological Association; Member, Forest Health Advisory Committee, NSW; Member, Organising Committee for International Mycological Congress 2006; Adjunct Professor, Faculty of Agriculture, Food and Natural Resources, University of Sydney; Adjunct Professor, Department of Plant Pathology, Kansas State University.

Dr Peter Weston

Member, Editorial Advisory Board, Kew Bulletin; Community Representative, Bushland Management Advisory Committee of Lane Cove Municipal Council

Karen Wilson

Convener, Global Plant Checklist Committee, International Organization for Plant Information; member of IOPI Species Plantarum Committee; Council member, Linnean Society of New South Wales; Convener, Special Committee on Electronic Publishing, International Association for Plant Taxonomy; Co-Convener, Global Species Data Network Task Group, CODATA; Member, ICSU/CODATA ad hoc Group on Data and Information; Team chair, Species 2000; Chair, Taxonomy Group, Species 2000; Member, Electronic Catalogue of Names of Known Organisms Subcommittee, GBIF; Member, Species 2000 Asia-Oceania Committee.

Dr Peter Wilson

Member, International Advisory Board, *Candollea* (Geneva) and *Boissiera*; Member, Committee of the Heads of Australian Herbaria Australian Plant Census Working Group; Member

Rusty Worsman

Member, Wollemi Pine Management and Recovery Committee.

Appendix C: RESEARCH GRANTS

FUNDING TO TRUST

The Australia & Pacific Science Foundation

Dr Adam Marchant and Dr George Orel - Genetic and horticultural assessment of the Australian native 'bush potato' (*Ipomoea costata*). \$11,000 (3rd year of a 3-year \$42,000 grant) (extended beyond 30 June 2006)

Australia Flora Foundation

Dr Adam Marchant, Dr George Orel, Gillian Towler, Andrew Perkins - Exploring the horticultural potential of native Australian flowering shrubs in the *Solanum brownii* Group \$3,500 (3rd year of a 3-year \$11,000 grant)

Australian Biological Resources Study

Bob Makinson - Grevillea Project \$31,000

Dr Tim Entwisle and Dr Stephen Skinner - A Guide to Identification of benthic non-marine Cyanobacteria of Australia \$26,400 (3rd year of a 3-year \$74,000 grant)

Dr Peter Wilson and Dr Chris Quinn – Generic position of the non persistent-fruited species of *Leptospermum* (Myrtaceae) \$22,000 (2nd year of a 2 year \$44,000 grant)

Australian Research Council – Discovery Grant

Dr Maurizio Rossetto, Dr Darren Crayn with Dr M.S. Pole & Dr A. Lowe - Developing biogeographical know-how: improving species divergence and dispersal estimations to examine geological and climatic evolutionary drivers \$282,000 shared with the University of Queensland. \$35,695 to BGT (1st year of a 3 year \$58,609 grant)

Department of Education, Science & Training (DEST)

Dr Brett Summerell - Australia-Europe Symposium in Mycotoxins and Food Safety, 15-17th February 2006 \$5,000

Department of Environment and Conservation (DEC) Parks and Wildlife Division, Northern Directorate

Dr Maurizio Rossetto – Border Ranges multi-species Recovery Plans \$22,000

Department of Environment and Heritage – Natural Heritage Trust & National Action Plan on Salinity

John Benson and Bob Makinson NSW Native Vegetation Classification and Assessment \$200,000 (1st year of a 2 year \$400,000 grant)

Friends of the Royal Botanic Gardens Sydney Inc.

Research Grants

Dr Alan Millar - Underwater Communication System \$5,000

BGT NSW Herbarium Internship Program \$14,000

Karen Wilson – Botany Bay Website [PlantNET] \$10,000

Mount Annan Botanic Garden - Weather Station \$31,000

Travel Grants

Dr Barry Conn – ‘Wallace in Sarawak – 150 Years Later’ Conference \$5,000

Dr Darren Crayn - 2005 International Botanical Congress \$5,000

Scholarships

Hannah McPherson - Understanding past climate change: implications for the Australian flora.

Laboratory technique training in Italy \$2,000

Donna Osland – To attend and present at *The 6th International Congress on Education in Botanic Gardens* (Botanic Gardens Conservation International (BGCI) in association with the University of Oxford Botanic Gardens: Oxford UK, 10–14 September 2006) *More than a Plant Label: Creatively Engaging the Public* \$7,000

Global Biodiversity Information Facility (GBIF)

Dr Barry Conn - Repatriation of electronic data to the Papua New Guinea National Herbarium (Lae) \$36,454 (2nd part of a 12 month \$75,751 grant)

Hermon Slade Foundation

Dr Elizabeth Brown – Relationships of the Austral family Lepidoziaceae \$18,767 (delayed start – 3rd year of 3-year \$56,000 grant) (extended beyond 30 June 2006)

Edwin Wilson and Phil Spence – Establishment of a breeding and propagation program of *Latouria* type high-altitude hybrids of New Guinea dendrobiums \$20,000 (3rd year of 3-year \$61,550 grant) (extended beyond 30 June 2006)

Dr Darren Crayn & Dr Maurizio Rossetto – Evolution and conservation genetics of Australasian Eleocarpaceae \$29,490 (3rd year of 3-year \$90,000 grant) (extended beyond 30 June 2006 to 31 Oct 2006))

Dr Cathy Offord - Storage of NSW rare and threatened NSW orchid species and their associated mycorrhizae \$30,000 (3rd year of a 3 year \$90,000 grant) (extended beyond 30 June 2006)

Italian Embassy in Australia

Dr Brett Summerell - Australia-Europe Symposium in Mycotoxins and Food Safety, 15-17th February 2006 \$10,000

Land and Water Australia

Prof. B. Downes, Prof. I Rutherford, J. Catford (Uni Melb), Dr Tim Entwisle, L. Nairn (BGT) Flows and aquatic plants: an historical and experimental approach. \$355,624 in total, \$59,120 to BGT. (1st year of a 2 year \$118,240 grant)

Linnean Society of NSW: Joyce W. Vickery Scientific Research Fund

Prof. John Thomson - Microsatellite genome markers for evolutionary studies of bracken fern (Genus *Pteridium*) \$700

Murray Irrigation Ltd - Murray Land & Water Mgt Plan (LWMP) Research and Development Program

Assoc Prof Brett Neilan (UNSW), Dr Brett Summerell & Will Cuddy - Amelioration of soil salinity for crop cultivation using cyanobacteria and mycorrhizal fungi \$25,000

Pacific Biological Foundation

Dr Barry Conn – Interactive identification keys to the common trees of PNG \$15,000 (3rd year of 3-year \$45,000 grant) (extended beyond 30 June 2006)

UK Millennium Commission

Seed Quest NSW partnership to supply 250 seedbank collections per year of threatened species of NSW \$240,000 (3rd year of 3-year \$730,000 grant)

FUNDING TO PARTNER ORGANISATIONS

Australian Biological Resources Study

A/Prof Paul Gadek, Dr Chris Quinn & Dr Judy West – Evolution and radiation of Australian hophushes and allied genera. (3rd year of a 3 year grant to James Cook University).

Australian Centre for International Agricultural Research (ACIAR)

Dr Brett Summerell (with The University of Sydney) – Diagnosis and control of soil borne diseases in Indonesia. Extension of existing grant above \$150,000 (2nd year of 2-year \$300,000 grant to The University of Sydney)

Dr Brett Summerell (with The University of Sydney and Hanoi Agricultural University) - Development of provincial and district level diagnosis and control of crop fungal diseases in Vietnam \$166,000 (2nd year of a 3 year \$500,000 grant to The University of Sydney)

Australian Research Council – Linkage

Dr Brett Summerell (with The University of Sydney) - Why does phosphite protect some plants against Phytophthora but not others? \$29,665 (delayed start 3rd year of a 3 year \$88,604 grant to The University of Sydney, plus shared \$136,928)

Australian Research Council - Research Networks

Macquarie University (administrative body) along with RBGT [B. Summerell, T. Entwisle, D. Crayn, P. Weston, M. Rossetto] and 40 other partners.

Australian – New Zealand Research Network for vegetation function (2nd year of sharing in \$2,500,000 over 5 years)

Grains Research & Development Corporation

Dr Brett Summerell (with Department Primary Industries, Qld); University of Sydney and EnTox - Managing Mycotoxin Contamination of Maize (3rd year of a 3-year \$226,000 grant to Department of Primary Industries, Qld)

European Commission

(Institute of Sciences of Food Production CNR, Cranfield University, International Institute of Tropical Agriculture, United States Department of Agriculture, Kansas State University, Royal Botanic Gardens and Domain Trust, The National University of Rio Cuarto, International Crops Research Institute for the semi-arid Tropics).

Integration of Mycotoxin and Toxigenic Fungi Research for Food Safety in Global System (euros\$300,000 in total, c. euros\$8,000 to Dr Brett Summerell for travel)

UNESCO; International Basic Sciences Programme

Dr Juli Hadiah (Centre for Plant Conservation, Bogor Botanic Gardens) & Dr Barry Conn (BGT) Diversity and Phylogeny of *Elatostema* (Urticaceae) of Thailand and Peninsula Malaysia. (2nd year of a 2 year \$US70,000 = \$AUD91,525 grant, around \$20,000 to BGT)

APPENDIX D:– OVERSEAS TRAVEL JULY 2005 – JUNE 2006

Name & Position	Countries / Cities visited	Purpose of visit	Duration	Total Cost	Cost to Trust	Source of Other Funds
Dr Maurizio Rossetto, Senior Research Scientist	Florence Italy Montpellier and Grenoble France Vienna Austria	Collaborate on data analysis with Dr G Vendramin and CNR Florence Collaborate with Dr I Olivieri University of Montpellier Participate in IBC, presenting talk Collaborate with Dr P Taberlet University of Grenoble	5 – 28 July 2005	\$6,400	\$6,400	N/A
Dr Darren Crayn, Research Scientist	Oxford and Kew England Vienna Austria	Collaborate on data analysis and manuscript preparation with Dr M Coode (RBG Kew) and Prof A Smith (Oxford University) Participate in IBC, presenting two talks Research at the Herbarium at Royal Botanic Gardens Kew	10 – 29 July 2005	\$6,400	\$1,400	Friends of the Gardens scholarship

APPENDIX D:– OVERSEAS TRAVEL JULY 2005 – JUNE 2006

Name & Position	Countries / Cities visited	Purpose of visit	Duration	Total Cost	Cost to Trust	Source of Other Funds
Dr Peter Wilson, Research Scientist	Vienna Austria	Participate in Nomenclature sessions of the IBC Present poster on ETS sequence polymorphism in the tribe Chamelaucieae (Myrtaceae)	12 – 23 July 2005	\$5,450	\$5,450	N/A
Mrs Karen Wilson, Acting Manager Plant Diversity	Vienna Austria	Participate in Nomenclature sessions of the IBC Present /co-author three talks in symposia on Floras and Cyperaceae and 1 poster	13 – 23 July 2005	\$5,200	\$2,200	Australian Biological Resources Study
Dr Peter Weston, Principal Research Scientist	Vienna Austria Kew England	Participate in IBC, presenting one talk and co-authoring two talks Research at the Herbarium at Royal Botanic Gardens Kew	15 July – 4 August 2005	\$6,700	No cost	Slade Orchid Fund
Dr Alan Millar, Principal Research Scientist	Washington DC United States of America	International workshop on global key biodiversity areas	30 July – 5 August 2005	\$2,500	No cost	Conservation International, Washington DC
Dr Alan Millar, Principal Research Scientist	Durban South Africa	Participate in 8 th International Phycological Congress	12 – 21 August 2005	\$3,500	\$3,500	N/A

APPENDIX D:– OVERSEAS TRAVEL JULY 2005 – JUNE 2006

Name & Position	Countries / Cities visited	Purpose of visit	Duration	Total Cost	Cost to Trust	Source of Other Funds
Dr Tim Entwisle, Executive Director	Durban and Cape Town South Africa	To attend the 8 th International Phycological Congress and associated workshop and to visit botanic gardens in the Cape Town region	12 – 26 August 2005	\$6,700	\$2,700	Research grants, lecture and magazine article payments
Dr Barry Conn, Senior Research Scientist	Papua New Guinea	To conduct field research for the Interactive Tools to Timber trees of Papua New Guinea Evaluation of Data Repatriation Project	15 – 27 August 2005	\$4,800	No cost	Pacific Biological Foundation Global Biodiversity Information Facility
Mr John Benson, Senior Plant Ecologist	Selfoss Iceland	Attend Soil Conservation and Protection for Europe (SCAPE) giving paper and meeting with 20 global experts	5 – 26 September 2005	\$3,200	\$1,700	Soil Conservation and Protection for Europe
Dr Maurizio Rossetto, Research Scientist	Pune India	Teach and participate in International Rare Plant Translocation workshop	16 – 24 September 2005	\$3,500	No cost	Botanic Gardens Conservation International (BGCI)
Dr Alan Millar, Principal Research Scientist	Lawrence Kansas United States of America	Visit Allen Press	19 – 23 September 2005	\$2,800	No cost	Allen Press, International Phycological Society

APPENDIX D:– OVERSEAS TRAVEL JULY 2005 – JUNE 2006

Name & Position	Countries / Cities visited	Purpose of visit	Duration	Total Cost	Cost to Trust	Source of Other Funds
Mrs Karen Wilson, Special Botanist	Taiwan Kew England Stockholm Sweden	Participate in biodiversity meeting and visit herbaria	30 September – 18 October 2005	\$6,300	\$3,700	Species 2000 Asia-Oceania; Species 2000; personal contribution
Dr Barry Conn, Senior Research Scientist	Myanmar	Visit Department of Nature and Wildlife and National Kandawgyi Gardens	18 – 21 October 2005	\$1,500	No cost	Private
Dr Elizabeth Brown, Systematic Bryologist	New Caledonia	Survey bryophytes associated with <i>Amborella</i>	20 October – 11 November 2005	\$5,500	No cost	Grant funds of USA researchers at Indiana University
Dr Alan Millar, Principal Research Scientist	Lord Howe Island	Research collecting and fieldwork	24 – 29 October 2005	\$4,000	No cost	Australian Biological Resource Study
Dr Barry Conn, Senior Research Scientist	Hong Kong China	To lecture to the 6 th National Training Workshop on Biodiversity Conservation for Botanic Gardens	13 – 20 November 2005	\$5,000	No cost	Botanic Gardens Conservation International (China Programme, Singapore)
Dr Peter Weston, Principal Research Scientist	Grahamstown South Africa	Teach in the Botany Department, Rhodes University, present public lecture, conduct field work	20 February – 31 March 2006	\$9,164	No cost	Rhodes University

APPENDIX D:– OVERSEAS TRAVEL JULY 2005 – JUNE 2006

Name & Position	Countries / Cities visited	Purpose of visit	Duration	Total Cost	Cost to Trust	Source of Other Funds
Dr Adam Marchant, DNA Project Officer	Japan	To participate in Australian Academy of Science / Japan Society for the Promotion of Science bilateral exchange program	29 March – 5 May 2006	\$8,600	No cost	Australian Academy of Science and Japan Society for the Promotion of Science
Dr Elizabeth Brown, Systematic Bryologist	New Caledonia	Survey bryophytes associated with high altitude vegetation on Mt Kouakoué	25 April – 15 May 2006	\$5,500	No cost	National Geographic Society grant funds to ORSTOM
Mrs Karen Wilson, Specialist Botanist	France	Participate in Species 2000 and Catalogue of Life partnership meetings	21 – 28 May 2006	\$4,000	No cost	Species 2000 and CODATA; personal contribution Mrs Wilson
Dr Brett Summerell, Director Science and Public Programs	Bari Italy	Teach and participate in International Fusarium Training workshop	2 – 13 June 2006	\$5,000	No cost	Consiglio Nazionale delle Ricerche, Bari, Italy

Appendix E: COOPERATIVE RESEARCH

Chris Allen

- Sydney Harbour foreshore vegetation mapping 1:2,000 scale with Maritime.

Dr Alan Archer

- Chemotaxonomy of species of the lichen genus *Graphidaceae* with Prof. J.A. Elix of the Australian National University.

Doug Benson

- Assessment of 1770 native vegetation, Historic Cook landing site, Kurnell with G Eldershaw (Parks & Wildlife Div. DEC)

Dr Barbara Briggs

- Phylogeny of *Restionaceae* with Prof. H.P. Linder, Zurich University, Switzerland.
- Systematics and karyology of Australian *Veronica* with Emeritus Prof. F. Ehrendorfer, University of Vienna, Austria.
- Systematics of Southern Hemisphere *Veronica* with Prof. P.J. Garnock-Jones, Victoria University of Wellington, New Zealand and D. Albach, Johannes Gutenberg-Universität Mainz, Germany.
- Distribution of polyols in *Proteaceae* with Dr R.L. Bielecki, Horticulture and Food Research Institute of New Zealand Ltd.
- Classification of *Veronica* with Prof. F. Ehrendorfer, University of Vienna, Austria, Prof. P.J. Garnock-Jones, School of Biological Sciences, Victoria University of Wellington, New Zealand and Dr. Dirk Albach, Johannes Gutenberg-Universität Mainz, Germany.
- Phylogenetic position of *Hydatellaceae* with Dr A.D. Marchant, Jeffery M. Saarela and Dr. Sean W. Graham, University of British Columbia, Vancouver, Canada.
- Reproductive morphology of families of *Poales* with Dr P.J. Rudall, Jodrell Laboratory, Royal Botanic Gardens, Kew.

Dr Elizabeth Brown

- Systematics of *Asterella* (*Aytoniaceae*) with Dr. C. Cargill, Centre for Plant Diversity, Canberra.
- Molecular Phylogeny and Systematics of *Fossombronia* in NSW with W. Cuddy, H. McPherson and with Dr. C. Cargill, Centre for Plant Diversity, Canberra.
- Bryoflora of New Caledonia with Dr Jerome Munzinger, IRD, Noumea.
- IBISCA Queensland and SANTO2006 an international project to study biodiversity.
- HGT between bryophytes and *Amborella* with Prof. Jeffrey Palmer and Dr. Eric Knox of Indiana University.

Professor Carrick Chambers

- Classification and description of a new species of fern in the genus *Blechnum* recently collected in mountain areas near Mt Jaya in eastern Papua in collaboration with P. Edwards and R. Johns at the Royal Botanic Gardens Kew, England.

Dr Barry Conn

- Phylogeny of *Westringia* (Lamiaceae) with Dr R. de Koh, Royal Botanic Gardens, Kew, UK.
- Phylogeny of Urticaceae with Dr Chris Quinn, Margaret Heslewood, Julisasi T. Hadiyah and Esti Ariyanti (both Kebun Raya Indonesia)
- Phylogeny of Chloanthaeae (Lamiaceae) with Dr Murray Henwood, Dr Nikola Streiber (both University of Sydney) and Dr Elizabeth Brown
- Systematics of *Logania albiflora* complex (Loganiaceae) with Anthony Whalen (Department of Environment and Heritage, Canberra)
- Guide to trees of Papua New Guinea with Kipiro Damas (Papua New Guinea National Herbarium)

Dr Darren Crayn

- Systematics and the evolution of ecophysiological traits in Bromeliaceae and relatives with Prof. J. Andrew C. Smith, University of Oxford, UK and Dr. K. Winter, Smithsonian Tropical Research Institute, Republic of Panama.
- Systematics, classification and evolution of the Ericaceae sens. lat. with Dr. C. Quinn, Dr. E. Brown and M. Heslewood, BGT, M. Hislop, Western Australian Herbarium, Prof. K.A. Kron, Wake Forest University, NC, USA.
- Systematics and evolutionary dynamics of Elaeocarpaceae with Dr M. Rossetto, BGT and M. Coode, Royal Botanic Gardens, Kew, UK.
- Spatial analysis of taxonomic and genetic diversity in Australian Ericaceae with Dr S. Bickford, CSIRO, Canberra.
- Evolution of leaf size in the Australian flora with Prof. M Westoby, T. Lenz and R. Gallagher, Macquarie University, Dr. P. Weston, BGT, Dr. A. Mast, Florida State University, FL, USA.
- Developing biogeographic know-how: Improving species divergence and dispersal estimations to examine geological and climatic evolutionary drivers, with Dr A. Lowe, University of Adelaide, Dr M. Pole, University of Queensland, Dr M. Rossetto, BGT, Prof. D. Lambert, Massey University, Palmerston North, NZ.

Dr Tim Entwisle

- Molecular systematics, biology and biogeography of freshwater red algae with Dr M. Vis (USA), Dr Alison Sherwood (USA) and Dr Orlando Necchi Jr (Brazil).
- Ecology of stream macroalgae and bryophytes with Dr B. Downes of The University of Melbourne, Victoria.

Joy Everett and Dr Surrey Jacobs

- Continuing studies in the grass tribe Stipeae with the Stipoid Grasses Working Group, including Dr M. Barkworth, Utah State University, USA; Dr R. Bayer, CSIRO, Canberra;
- C. Hsiao, USDA, USA; Dr M. Arriaga, Buenos Aires; Dr A. Torres, Buenos Aires and Dr F. Vasquez, Spain.

Ken Hill

- The Cycad Pages Internet site with Dr D. Stevenson, New York Botanical Garden, USA.
- Taxonomy of Asian cycads with A. Lindstrom, Nong Nooch Tropical Garden, Sattahip, Thailand.
- Systematics of the genus *Cycas* with Leonie Stanberg, Botanic Gardens Trust.

Dr Surrey Jacobs

- Macrophytes as indicators of stream health with G. Sainty, Sainty and Associates.
- Aponogetonaceae, Zosteraceae and Hydrocharitaceae with D. Les, University of Connecticut, USA.

- Nymphaeaceae with Drs T. Borsch, Germany, Khidir Hilu, Virginia, USA and C.B. Hellquist, North Adams, Massachusetts, USA.
- Chenopodiaceae with Dr. G. Kadereit, Prof. H. Freitag, Germany.

Dr Edward Liew

- Fusarium wilt of snow peas in Australia with Andrew Watson, Yanko Agricultural Institute, NSW Department of Primary Industries.
- Aetiology, epidemiology and control of Fusarium stem and root rot of vanilla in North Sulawesi, Indonesia with Professor Lester Burgess, The University of Sydney and Prof. Dan Sembel, Sam Ratulangi University, Indonesia.
- Population genetic structure of *Fusarium oxysporum* f.sp. *vanillae*, causal agent of vanilla stem and root rot throughout Indonesia with Professor Lester Burgess, The University of Sydney and Prof. Dan Sembel, Sam Ratulangi University, Indonesia.
- Clove decline caused by *Ceratocystis polychroma* in North Sulawesi, Indonesia with Professor Lester Burgess, The University of Sydney; Professor Michael Wingfield, Forestry and Agricultural Biotechnology Institute, Pretoria, South Africa and Prof. Dan Sembel, Sam Ratulangi University, Indonesia.
- Pathogen population structure, disease incidence and management of pineapple heart rot and black pepper wilt in Vietnam with Professor Lester Burgess, The University of Sydney.
- Ecology of *Fusarium* species associated with cultivated crops and native grasses in Australia with Professor Lester Burgess, The University of Sydney.
- Diversity of *Phytophthora palmivora* on cocoa in Papua New Guinea with Professor David Guest, The University of Sydney.
- Fungal endophytes of cocoa (defensive mutualists or antagonistic parasites) with Professor David Guest, The University of Sydney.
- Evolutionary and pathogenic potential of *Fusarium oxysporum* from native soil and endophytic associations in Australia with Professor Lester Burgess, The University of Sydney.

Professor David Mabberley

- Molecular systematics of Labiatae (Viticoideae, Teucroideae), esp. *Clerodendrum*, with Dr. Dr D.L. Steane, Dept. Plant Science, University of Tasmania, Dr R.J.P. de Kok & Dr A.Paton, Royal Botanic Gardens, Kew, and Dr R.G. Olmstead, University of Washington.
- Molecular systematics of *Citrus*, with Dr R. Bayer, CSIRO Canberra, & Professor G. Andrew Beattie, University of Western Sydney
- Systematics of *Vitex* (Labiatae) in Sri Lanka with Dr B.M.P. Singhakumara, University of Jayawardenepura, Colombo.
- Systematics of Malesian Meliaceae, with Dr E. Soepdamo. FRIM, Kuala Lumpur & Dr C.M. Pannell, Oxford, UK.
- Revision of *Grewia* in Madagascar with Prof. P. Morat, Natural History Museum, Paris (with Marion Westmacott)
- Study of Ferdinand Bauer colour-code for plant illustration with Dr E. Pignatti-Wikus, Trieste and Dr C. Riedl-Dorn, Vienna
- Effect of fire on Borneo rainforests with Karl Eichhorn, University of Leiden, The Netherlands.

Bob Makinson

- Taxonomy of *Astrotricha* with M.J. Henwood, University of Sydney, monograph and Flora of Australia treatment.
- Phylogeny of Proteaceae tribe Grevilleae, with Austin Mast (University of Florida)

Dr Adam Marchant

- Genetic and horticultural assessment of the Australian native “Bush Potato” (*Ipomoea costata*) with G. Orel, UWS; A. Hill, independent consultant; K. Courtenay, TAFE-WA Kimberley; Dr M. Henwood, University of Sydney; Assoc. Prof. P. Matthews, Museum of Ethnology, Osaka, Japan; Prof. Y.Sato, Research Institute for Humanities and Nature, Kyoto, Japan.
- Relationships of South Eastern Asian *Camellia* species, with G. Orel, UWS; Assoc. Prof. R. Spooner-Hart, UWS, Prof. G. Fuyang Research Institute of Sub-Tropical Forestry, China; R. Cherry, Proprietor, Paradise Plants wholesale nursery, Kulnura; J. Rob, Paradise Plants wholesale nursery, Kulnura; Dr J. McLeod, UWS; Prof. L. Legendre, Laboratoire de Biotechnologies Végétales appliquées aux Plantes Aromatiques et Médicinales, Université Jean Monnet, Saint Etienne, France;
- Relationship of Restionaceae with Dr B. Briggs (BGT), Dr A. Perkins; Prof. P. Linder (Zurich), Dr C. Hardy (Millersville University, USA), Dr E. Sinclair, Murdoch University.
- Relationships within Australian Apiales with Dr M. Henwood, University of Sydney; Dr A. Perkins, BGT and University of Sydney; P. Lu-Irving, recently graduated student of the University of Sydney.
- Molecular systematics in Cyperaceae with Assoc. Prof. J. Bruhl, University of New England; K. Wilson, Botanic Gardens and Domain Trust; Dr K. Ghamkhar, Centre for Legumes in Mediterranean Agriculture, University of Western Australia; and other members internationally of the “Cyperaceae Phylogeny Group”
- Cultivar identification and genetics of essential oil production in Lavenders, with P. Stiles, President of Australian Lavender Industry, Dr J. McLeod, G. Orel, and Prof B. McGlasson, UWS, Prof. D. Leach, Southern Cross University, and Prof. L. Legendre, Laboratoire de Biotechnologies Végétales appliquées aux Plantes Aromatiques et Médicinales, Université Jean Monnet, Saint Etienne, France.
- Exploring the horticultural potential of native Australian flowering shrubs in the *Solanum brownii* Group with Dr A. Perkins, G. Towler, S. Bartlett, and G. Orel (UWS).
- Thesis advisor to John Hodgson, studying relationships within *Juncus*, under Assoc. Prof. J. Bruhl (UNE) and Karen Wilson
- Thesis advisor to Robert Gibson (NSW Department of Infrastructure, Planning and Natural Resources), studying relationships within *Drosera*, under Assoc. Prof. J. Bruhl (UNE) and Dr B. Conn

Amelia Martyn and Cathy Offord

- Research on seed viability and germination of *Actinotus helianthi* (Apiaceae) with Dr F. Hay and Dr R. Probert (Millennium Seed Bank, Royal Botanic Gardens Kew).
- Research on seed dormancy in Rutaceae species with Dr Tony Auld and Mark Ooi, NSW Department of Environment and Conservation.
- Seed longevity studies for Australian species with Dr R. Probert (Millennium Seed Bank, Royal Botanic Gardens Kew) and Australian Millennium Seedbank partners.
- Germination and dormancy breaking for Australian species with Dr R. Probert and Dr J. Dickie (Millennium Seed Bank, Royal Botanic Gardens Kew) and Australian Millennium Seedbank partners.

Dr Alan Millar

- DNA research on Sporochneales with Nick Yee, and Dr G.T. Kraft, University of Melbourne and Dr Adam Marchant.
- Systematics of coralline algae of the east coast of Australia with Dr Wm J. Woelkerling, La Trobe University, Victoria.
- New Zealand representatives of the red algal family Delesseriaceae with Dr W. Nelson, Museum of New Zealand, Wellington.

- Marine floristics of East African coast with Prof. E. Coppejens and Dr O. De Clerck, University of Gent, Belgium.
- Molecular phylogeny of red algal order Gelidiales with Dr Wilson Freshwater, University of North Carolina.
- Marine algae of New Caledonia with Prof. C. Payri, University of French Polynesia and Dr W. Prud'homme van Reine (University of Leiden)
- Biogeographical similarities between South Africa and eastern Australia with Prof. J. Bolton (University of Cape Town).
- Invertebrate epifauna of macroalgae - with Dr G. Wilson and Dr D. Faith (Australian Museum)
- DNA research on the red algal genus *Laurencia* with Yola Metti and Prof. P. Steinberg (UNSW).

Dr Cathy Offord

- Reproductive biology and breeding of *Grevillea* with Dr P. Martin & Ms A. Freebairn of the University of Sydney.
- Pollination and seed set in *Wollemia nobilis* (Araucariaceae) with Prof. N. Prakash, University of New England.
- Causes of bract browning in *Telopea* species with Dr R. McConchie and Dr A. Martyn, University of Sydney.
- Flannel flower development with Dr R. Worrall, Dr N. Wade and L. Tesoreiro, NSW Agriculture and Dr L. Campbell, University of Sydney
- Lipid characterization of Araucariaceae seeds with Dr C. Duke and Dr R. Duke, University of Sydney.

Dr Chris Quinn

- Systematics and biogeography of the *Vittadinia* group of Astereae (Asteraceae) with Dr T.K. Lowrey, University of New Mexico, Albuquerque, USA.
- Molecular systematics of hopbushes and their allies (Sapindaceae) with A/Prof P.A. Gadek, James Cook University, Cairns.

Dr Helen Ramsay

- Bryaceae revision for the Flora of Australia vol. 51 (2006) with J. Spence, National Park Service, Page Arizona U.S.A.
- Sematophyllaceae revision for Australia (2002,2004) published with W.B. Schofield, University of British Columbia, Vancouver, Canada and B.C. Tan, University of Singapore, Singapore.
- Distribution and phytogeography of the mosses of north-east Queensland (2004) published with A. Cairns, James Cook University, Townsville, Qld

Dr Maurizio Rossetto

- Developing biogeographic know-how: improving species divergence and dispersal estimations to examine geological and climatic evolutionary drivers, with A Lowe (University of Adelaide), DM Crayn, MS Pole (UQ), D Lambert (Massey University, NZ) and PM Hollingsworth (Royal Botanic Gardens, Edinburgh).
- Phylogeographic studies on *Elaeocarpus* in northern Queensland, with A. Ford (CSIRO Atherton) and D Crayn.
- Phylogenetic studies on the Australian Vitaceae, with Assoc. Prof. B. Jackes, James Cook University and Assoc Prof J. Wen (Smithsonian Institute, Washington DC, USA).
- Developing a multi-species recovery plan approach for threatened plants of the Border Ranges, with R. Kooyman, S Ferrier (DEC), L Baker (DEC).

- Variability theory - new applications for Shannon's index, with Assoc. Prof. W. Sherwin (UNSW).
- □ Population studies on clonal saltmarsh herb, with Karen Somerville and Dr A. Pulkownik (UTS).
- Genetic diversity in fragmented populations of *Davidsonia* (Cunoniaceae), with Prof. R. Henry and F. Elliot (SCU).
- Population and conservation genetics of *Elaeocarpus holopetalus* (Elaeocarpaceae), with Assoc. Prof. C. Gross (UNE).
- Population genetics of *Elaeocarpus reticulatus*, with M Whitehead (UNSW), W. Sherwin (UNSW).
- Evolutionary and ecological studies of *Trachymene* (Apiaceae), with Dr G. Wardle and Y. Davila (University of Sydney).

John Siemon and Cathy Offord

- Germination and seed storage of NSW orchid species with Dr C. Wood (Millennium Seed Bank, Royal Botanic Gardens Kew, UK), Ms L. Darley (University of Western Sydney) and Australian Millennium Seedbank partners.

Dr Brett Summerell

- Ecology and taxonomy of *Fusarium* and related fungi, soilborne diseases of plants caused by fungi, and fungal diseases in Vietnam and Indonesia with Professor Lester Burgess, University of Sydney.
- Diseases in hydroponic systems with Dr Jane Tarran, University of Technology Sydney
- Genetics of *Fusarium* with Professor John Leslie, Kansas State University.
- Diseases of trees with Professor Michael Wingfield, FABI, University of Pretoria.
- Biosystematics of fungi on Proteaceae and Myrtaceae with Prof. Pedro Crous, CBS Netherlands.
- *Phytophthora* root rot in NSW National Parks with Dr Keith McDougall from DEC.
- Biology and control of *Phytophthora* root rot with Professor David Guest, University of Sydney.

Karen Wilson

- Systematic studies in Juncaceae with Assoc.Prof. J. Bruhl and Mr J. Hodgson.
- Systematic studies in Abildgaardieae (Cyperaceae) with Assoc. Prof. J. Bruhl, Ms K. Clarke and Dr K. Ghamkhar, University of New England.
- Systematics of *Carpha* (Cyperaceae) with Assoc. Prof. J. Bruhl and Dr Xiufu Zhang, University of New England.
- Systematics of *Lepidosperma laterale* (Cyperaceae) with Assoc. Prof. J. Bruhl and Mr J. Hodgson, University of New England.
- Phylogenetic study of Casuarinaceae with Dr D. Steane, University of Tasmania and Prof. R. Hill, University of Adelaide.
- Spikelet structure in Cyperaceae, esp. *Exocarya*, with Dr J. Richards (Florida International University, Florida) and Assoc.Prof. J. Bruhl
- Systematics of Schoenoplectus sens. lat. with Dr A. Muasya (University of Cape Town), Assoc. Prof. J. Bruhl et al.

Dr Peter Wilson

- Systematics of the *Indigofera pratensis* complex with Dr A. Kazandjian, Simon Bolivar University, Caracas, Venezuela; and Dr M. Waycott and Adjunct Associate Professor B. Jackes, School of Tropical Biology, James Cook University, Townsville.

- Relationships and generic concepts in the *Chamelaucium* alliance, particularly *Baeckea* sens. lat. and *Micromyrtus*, with Dr B.L. Rye and Mr M. Trudgen, Western Australian Herbarium.
- Fossil fruit of Myrtaceae from the Eocene of South Australia with Dr J. Basinger, University of Saskatchewan, Canada; Dr David Greenwood, Brandon University, Manitoba, Canada; and Dr D. Christophel, University of Denver, Colorado, USA.
- Description of new species of *Xanthostemon* (Myrtaceae) from the Solomon Islands, with F. Pitsoa, Solomon Islands Forestry Department.

Dr Peter Weston

- Systematics, biogeography and comparative biology of the Proteaceae, with Associate Professor N.P. Barker, Rhodes University, South Africa, Dr D. Cantrill, Swedish Museum of Natural History, Dr G. Jordan, University of Tasmania, Dr A. Mast, Florida State University, USA, Mr F. Rutschmann, University of Zurich, Switzerland, Dr H. Sauquet, Royal Botanic Gardens, Kew.
- Systematics, biogeography and comparative biology of the Diurideae (Orchidaceae) with Dr M.A. Clements, CSIRO Division of Plant Industry, Dr M. Henwood and Dr A. Perkins, University of Sydney, Mr J. Indsto, Westmead Institute for Cancer Research, Dr J. Mant and Dr R. Peakall, Australian National University, Professor R. Whelan (University of Wollongong).
- Floral development in the Calycanthaceae, with Mr Yannick Staedler and Professor Peter Endress (University of Zurich, Switzerland)
- Phylogeny of the Goodeniaceae with Dr Siegfried Krauss, Kings Park and Botanic Garden, Perth.

Appendix F: PLANT SCIENCES PUBLICATIONS

Archer, A.W. (2005) New combinations and synonymies in the Australian Graphidaceae *Telopea* 11: 59-78.

Ariyanti, E.E. and **Conn, B.J.** (2005) Phylogeny of *Procris* (Urticaceae) using Gap-weighting techniques. In A.A.Tuen and I. Das (eds) Wallace in Sarawak-150 years later, pp. 106-122.

Arriaga, M.O. and **Jacobs, S.W.L.** (2006) An anatomo-ecological experiment in *Austrostipa aristiglumis*, a lowland Stipoid species. *Telopea* 11(2): 161-170.

Benson, D. and **McDougall, L.** (2005) Ecology of the Sydney Plant species Part 10: Monocotyledon families: Lemnaceae to Zosteraceae *Cunninghamia* 9(1): 16-210.

Benson, D. and Eldershaw, G. (2005) Naturalizing non-local native trees at Botany Bay: The long-term impact of historical plantings. *Ecological Management and Restoration* 6(3): 163-171.

Benson J.S. (2006) New South Wales Vegetation Classification and Assessment: Introduction – the classification, database, assessment of protected areas and threat status of plant communities. *Cunninghamia* 9(3): 331-382

Benson, J.S., Allen, C.B., Togher, C. and **Lemmon, J.** (2006) New South Wales Vegetation Classification and Assessment: Part 1 Plant Communities of the NSW Western Plains. *Cunninghamia* 9(3): 383-450.

Bieleski, R.L. & **Briggs, B.G.** (2005) Taxonomic patterns in distribution of polyols within the Proteaceae. *Australian Journal of Botany* 53: 205-217.

Briggs, B.G. (2005) Switching sex along the spike: synchronised monoecy in Ecdiocolaceae, sister of Poaceae. XVII International Botanical Congress Abstracts 299-300.

Briggs, B.G. (2005) Lectotypification of *Schoenodum tenax* (Restionaceae) and a note on the type of *Lyginia imberbis* (Anarthriaceae) *Telopea* 11: 53-58.

Bruhl, J.J., Richards, J. and **Wilson, K.L.** (2005) It's a flower, it's a spikelet: the guessing game in Cyperaceae – How do we resolve floral homology in the sedges? Abstract and talk 13.7.7, XVII International Botanical Congress, Vienna, July 2005

Chambers, T.C., Edwards, P.J. and **Johns, R.J.** (2005) *Blechnum puniceum* (Pterophyta: Blechnaceae), a new species from Papua, Indonesia. Contributions to the Flora of Mount Jaya, XVI. *Kew Bulletin* 60(4): 597-601.

Cieslak, T., Polepalli, J.S., White, A., Muller, K., Borsch T., Barthlott, W., Steiger, J., **Marchant, A.** and Legendre, L. (2005) Phylogenetic analysis of *Pinguicula* (Lentibulariaceae): chloroplast DNA sequences and morphology support several geographically distinct radiations. *American Journal of Botany* 92: 1723-1736.

Crayn, D.M., Hislop, M. and **Heslewood, M.M.** (2005) Additions to *Lissanthe* (Stephelioidae: Ericaceae) in Western Australia: *L. synandra* sp. nov. and *L. pleurandroides* comb. nov. *Australian Systematic Botany* 18(6): 555-561.

Conn, B.J. (2006) *Teucrium thieleanum* (Labiatae), a new species from Victoria, Australia. *Telopea* 11(2): 135-140.

Flanagan N.S., Ebert, D., **Porter, C., Rossetto, M.,** Peakall, R. (2006) Microsatellite markers of evolutionary studies in the sexually deceptive orchid genus *Chiloglottis*. *Molecular Ecology Notes* 6: 123-126

Hill, K.D. (2005) *Eucalyptus*, in The Garden Flora of Hawaii, G.W. Staples and D. R. Herbst (eds.) (Bishop Museum Press, Honolulu, Hawaii).

Howell, J. and Benson, D. (2005) Seasonal year to year changes in vegetation of freshwater wetlands on the Hawkesbury-Nepean floodplain. *Wetlands* (Australia) 23(1): 20-36.

Hunter, J.T., Williams, J.B. and **Conn, B.** (2006) Rediscovery of *Prostanthera staurophylla* F.Muell. and reinstatement of *P. teretifolia* Maiden and Betche (Lamiaceae) *Telopea* Vol 11(2): 117-126.

Indsto, O.I., **Weston, P.H.,** Clements, M.A. and Whelan, R.J. (2005) Corrigendum to: Highly sensitive DNA fingerprinting of orchid pollinaria remnants using AFLP *Australian Systematic Botany* 18(5): 473-473.

Jacobs, S.W.L. and Les, D.H., Moody, M.L. and Hellquist, C.B. (2006) Two new species of *Aponogeton* (Aponogetonaceae), and a key to species from Australia. *Telopea* 11(2): 129-134.

Jacobs, S.W.L. and Les, D.H., Moody, M.L. (2006) New combinations in Australasian *Zostera* (Zosteraceae). *Telopea* 11(2): 127-128.

Jacobs S.W.L. and Hellquist, C.B. (2006) Three new species of *Nymphaea* (Nymphaeaceae) in Australia. *Telopea* 11(2): 155-160.

Kadereit, G., Gotzek, D., **Jacobs, S.,** and Freitag, H. (2005) Origin and age of Australian Chenopodiaceae. *Organisms, Diversity and Evolution* 5: 59-80.

Kariuki, M. and **Kooyman, R.M.** (2005) Floristic changes and regeneration patterns for a 12-year period during the 3rd and 4th decades following selection logging in a subtropical rainforest. *Austral Ecology* 30: 844-855.

Kariuki, W., Rolfe, M., Smith, R.G.B., Vanclay, J.K. and **Kooyman, R.M.** (2006) Diameter performance varies with species functional-group and habitat characteristics in subtropical rainforests. *Forest Ecology and Management* 225: 1-14

Kazandjian, A.A. and **Wilson, P.G.** (2005) Reassessment of *Indigofera pratensis* var. *coriacea* Domin (Fabaceae: Faboideae) with the recognition of a new species. *Telopea* 11: 43-51

Kodala, P.G. (2006) *Lysimachia* (Myrsinaceae) in New South Wales. *Telopea* 11(2): 147.

Kodala, P.G. and Wilson, P.G. (2006) New combinations in the genus *Vachellia* (Fabaceae: Mimosoideae) from Australia. *Telopea* 11(2): 233-240.

Kurzweil, H., **Weston, P.H. and Perkins, A.J.** (2005) Morphological and otogenetic studies on the gynostemium of some Australian members of Diurideae and Cranichideae (Orchidaceae) *Telopea* 11: 11-33

Les, D.H., Moody, M.L. and **Jacobs, S.W.L.** (2005) Phylogeny and systematics of *Aponogeton* (Aponogetonaceae): the Australian species. *Systematic Botany* 30: (3) 503-519.

Leslie, J.F. and Summerell, B.A. (2006) The *Fusarium* Laboratory Manual. Blackwell Publishing, Ames, IA, USA. 388 pp.

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- McConchie, R., Martyn, A. and **Offord, C.** (2005). Effect of shade on bract browning of waratahs (*Telopea* spp.) *Acta Horticulturae* 694: 439-443
- McDougall, K.L. and **Summerell, B.A.** (2005) Unusual 'outbreak' of a diatom (*Tabellaria flocculosa*) in the Australian Alps. *The Victorian Naturalist* 122: 202-203.
- Mabberley D.J.** (2005) The plant-book. A portable dictionary of vascular plants. Second ed. (South Asian edition). Pp. xvi + 858. Cambridge University Press
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- Makinson, R.O.** (2006) Vale David Given – plant conservation pioneer. *Australasian Plant Conservation* 14(3): 26-27.
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- Offord, C.A.** (2006). Analysis of characters and germplasm of significance to improvement of Australian native waratahs (*Telopea* spp., family Proteaceae) for cut flower production. *Genetic Resources and Crop Evolution On line*: 1-10.
- Offord, C.** and Meagher, P. (2006) *Wollemi* pine: from the wild to the world. *Chronica Horticulturae* 46 (2): 10-13.
- Porter, C., P.D. Rymer and M. Rossetto (2006)** Isolation and characterization of microsatellite markers for the waratah *Telopea speciosissima* (Proteaceae). *Molecular Ecology Notes* 6: 446-448.
- Quinn, C.J., Brown, E.A., Heslewood, M.M. and Crayn, D.C.** (2005) Generic concepts in Styphelieae (Ericaceae): the *Cyathodes* group *Australian Systematic Botany* 18(5): 439-454.
- Rees, B.J., Taeker, F. and Coveny, R.G.** (2005) *Myriostoma coliforme* in Australia *Australasian Mycologist* 24(2): 25-28.
- Rice, N., Henry, R. and **Rossetto, M.** (2006) DNA banks: a primary resource for conservation research. Chapter 6 pp. 41-48 in MC de Vicente ed. *DNA banks -providing novel options for Genebanks?* Topical Reviews in Agricultural Biodiversity, International Plant Genetic Resources Institute, Rome, Italy.
- Rossetto, M** (2005) A simple molecular approach for identifying a rare *Acronychia* (Rutaceae) provides new insights on its multiple hybrid origins. *Biological Conservation* 121(1): 35-43.
- Rossetto, M.** and **Porter C.** (2005) Isolation and characterisation of microsatellite loci from *Eidothea hardeniana*, an early Proteaceae. *Molecular Ecology Notes* 5: 106-108.
- Rossetto, M.** and **Kooyman, R.M.** (2005) The tension between dispersal and persistence regulates the current distribution of rare paleo-endemic rainforest flora: a case study. *Journal of Ecology* 93: 906-917.
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- Rossetto, M.** and **Kooyman, R.** (2006) Pre-reintroduction planning: assessing the suitability of plant material and planting sites in rainforest remnants of northern NSW (Australia). *Re-Introduction News* 25: 49-50.
- Ruddall, P.J., Stuppy, W., Kellog, E.A. and **Briggs, B.G.** (2005) Evolution of reproductive structures in grasses (Poaceae) inferred by sister-group comparison with their putative closest living relatives, Ectodiocoleaceae. *Amer. J. Bot.* 92: 1432-1443.
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- Seed, L., Vaughton, G. and Ramsey, M.** 2006. Delayed autonomous selfing and inbreeding depression in the Australian annual *Hibiscus trionum* var. *vesicarius* (Malvaceae). *Australian Journal of Botany*, 54: 27-34.
- Simpson, D., Muasya, A.M., Zhang, X., Ghamkhar, K., Bruhl, J.J., **Wilson, K.L., Marchant, A.** and Chase, M.W. (2005) Phylogeny of Cyperaceae based on DNA sequence data: current progress and future prospects. Abstract and talk 13.7.2, XVII International Botanical Congress, Vienna, July 2005.

- Skinner, S. and Entwisle, T.J.** (2005) A colligate Spirogyra (Zygnemataceae, Zygnematophyceae) in Australia. *Telopea* 11: 87-89
- Skinner, S., McPherson, H. and Towler, G.M.** (2005) A new *Zygnemopsis* species (Zygnemataceae, Zygnematophyceae), with mature zygospores, from Australia. *Telopea* 11: 91-93
- Skinner, S. and Entwisle, T.J.** (2006) New taxa and combinations for *Oedogonium* and *Bulbochaete* (Oedogoniales, Chlorophyceae) in Australia *Telopea* 11(2): 171-194.
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- Weston, P.H., Perkins, A.J., Entwisle, T.J.** (2005) More than symbioses: orchid ecology, with examples from the Sydney region *Cunninghamia* 9(1): 1-15.
- Weston, P.H.** (2004) Proteaceae. Pp. 313-316 in N. Smith, S.A. Mori, A. Henderson, D.W. Stevenson and S.V. Heald (eds.) *Flowering Plants of the Neotropics* (The New York Botanical Garden and Princeton University Press: Princeton).
- Wilson K.** and Wilson, A. (2005) Different scales, different constraints (or not?). Abstract and talk 3.8.2, XVII International Botanical Congress, Vienna, July 2005.
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- Wilson, K.L.**, Gordon, D., Sastroutomo, S.S. and Shimura, J. (2005) Taxonomy for Biodiversity in Asia–Oceania. Report from 2nd Global Taxonomy Initiative Regional Workshop in Asia–Oceania, Wellington, New Zealand, 9-10 October 2004. (Tokay University Press: Japan)

Wilson, K.L., Bisby, F.A., Ruggiero, M.A. et al. (2005) Progress with the Species 2000 and ITIS Catalogue of Life. Proceedings of 2005 International Workshop on Integrated Biodiversity and Natural Specimens Databases and Forum of Species 2000 Asia–Oceania. Taichung, Taiwan, 30 September –2 October 2 2005: 9-17.

Wilson, P.G. and Moody, M.L. (2006) *Haloragodendron gibsonii* (Haloragaceae), a new species from the Blue Mountains, New South Wales. *Telopea* 11(2): 141-146.

Wilson P.G., O'Brien, M.M., **Heslewood, M.M.** and **Quinn, C.J.** (2005) Relationships within Myrtaceae sensu lato based on a matK phylogeny. *Plant Systematics and Evolution* 251: 3-19.

General Audience

Crayn, D.M. (2004) A quandong quandary. *The Gardens* 63: 5

Conn, B.J. (2005) Friends funds a jungle journey. *The Gardens* 67: 5

Entwisle, T.J. (2005) The seasonal spectacle of frangipanis *The Garden* 66: 8.

Entwisle T., (2005) Old seeds – dead or alive? *The Gardens* 67: 8

Entwisle, T. (2005) Immortal Plants: Long-lived clones dwarf previous estimates for oldest living plants. *Nature Australia* 28(7): 72-73

Entwisle, T. (2005) She-oak up in smoke. *Nature Australia* 28(6): 72-73

Mabberley D.J. (2005, with R. KIEW) A particularly important de Alwis watercolour: *Citrus halimii*. *Gardenwise* July 2005: 306

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Martyn, A. (2005) “SeedQuest NSW project up and running”. In Australia Flora Foundation Newsletter (November 2005), reprinted with permission in Australian Plants Society Newsletter (September 2005) and Australian Flower Industry magazine (January 2006).

Martyn, A. (31 August 2005) “The science behind the plants” including seedbank and MSB collaboration. *Camden Advertiser*

Martyn, A. (2006) “A Passion for Australian Plants: Finding my way to the NSW Seedbank” *Wisenet (Women in Science Enquiry Network) Journal* March 2006

Meagher, P. and **Offord, C.** (2006). Survivor: The tree that survived the dinosaurs. *Australian Age of Dinosaurs* 4: 46-59.

Offord, C. and **Meagher, P.** (2006). Wollemi pine: from the wild to the world. *Chronica Horticulturae* 46 (2): 10-13.

Weston, P.H. (2005) Sex and Death in the Sydney Tropical Centre. *The Gardens* 65: 6-7.

Williams W.J., and **Skinner, S.** (2005) Cyanobacteria: life in environments under stress. *Australasian Plant Conservation* 14: 26–28.

Summerell, B.A. (2005) Fighting *Phytophthora*. *National Parks Journal* 49(4): 17.

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Wilson, K., Wilson, P., and Crayn, D. (2005) International Botanical Congress, Vienna, Austria. *Australian Systematic Botany Society Newsletter* no. 124: 20-22

SCIENTIFIC PUBLICATIONS AVAILABLE FOR SALE

SCIENCE

Telopea (a journal of systematic research) and **Cunninghamia** (a journal of plant ecology for eastern Australia) are published by the Gardens in March and September (Telopea) and July and December (Cunninghamia). They are available from the Gardens Shops or by subscription, or on exchange to other organisations. Copies of most back issues are still available for sale from the Gardens Shop in Sydney.

Collection, Preparation and Preservation of Plant Specimens (Royal Botanic Gardens Sydney 2nd edition, 1995) \$6.85.

Rare Bushland Plants of Western Sydney (1999) Revised edition, by Teresa James, Lyn McDougall and Doug Benson (Royal Botanic Gardens Sydney) \$13.15.

Sydney's Bushland: More than meets the eye by J. Howell & D. Benson (Royal Botanic Gardens Sydney, 2000) \$27.95

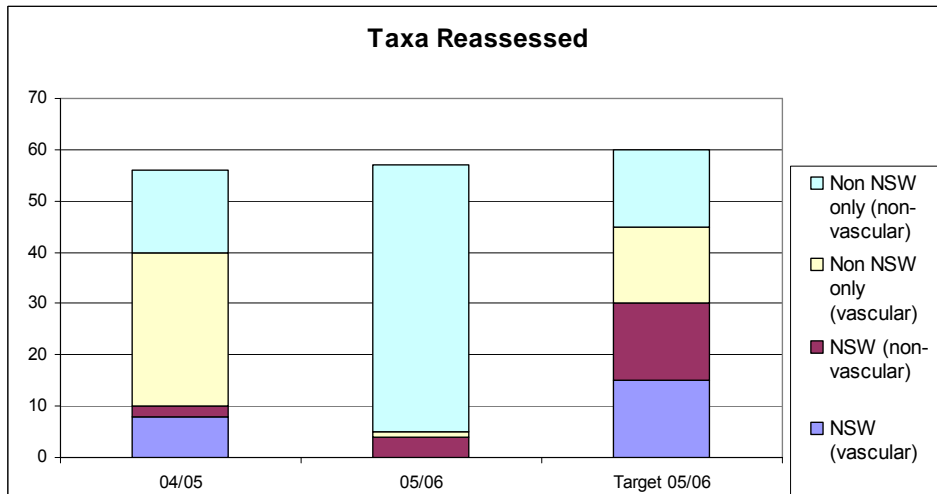
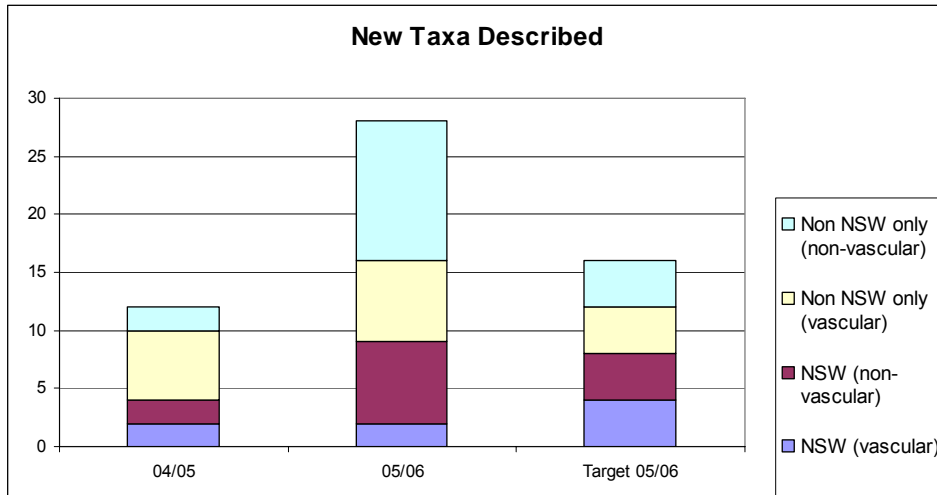
Mountain Devil to Mangrove: a Guide to Natural Vegetation of the Hawkesbury*Nepean Catchment by D. Benson, J. Howell and L. McDougall (Royal Botanic Gardens Sydney, 1996) \$21.95.

Missing Jigsaw Pieces: the Bushland Plants of the Cooks River Valley by D. Benson, D. Ondinea & V. Bear (Royal Botanic Gardens Sydney, 1999) \$13.15.

Appendix G: PERFORMANCE INDICATORS

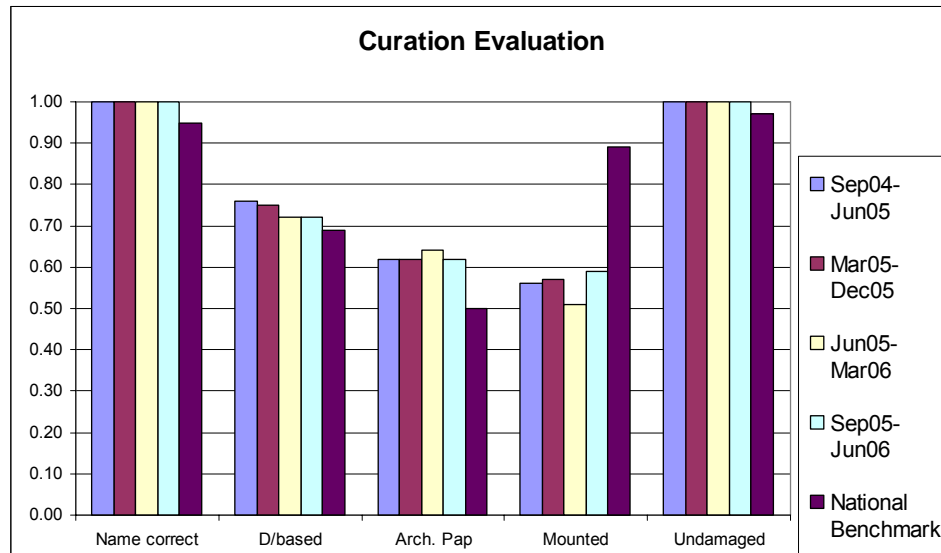
New taxa described or reassessed

There were 28 new species described by Trust scientists, double the previous year and well exceeding the target set for this year. This target is an inspirational one given that much of the discovery of new species is incidental and cannot be planned. A number of projects focused on the documentation of new species, especially non-vascular plants; algae and fungi have a large number of species still to be formally described.



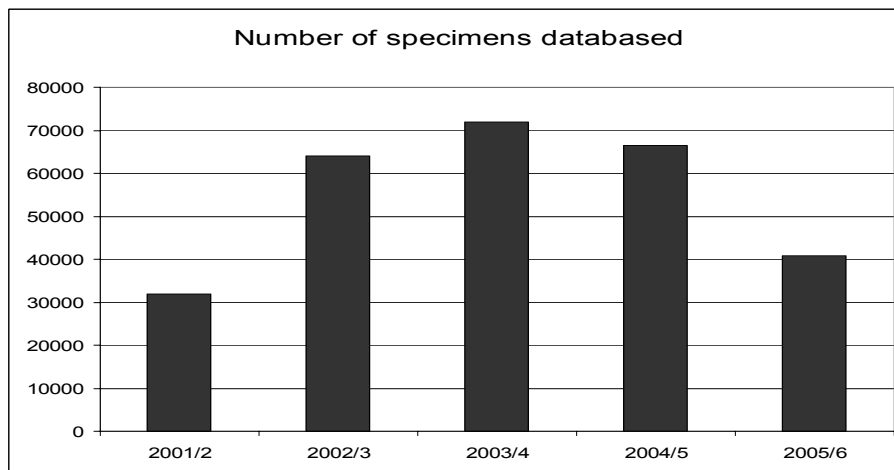
Curation evaluation

Curation of herbarium specimens in the National Herbarium of NSW in most cases meet or exceed the national benchmark for Australian herbaria. The exception is for mounting of specimens where there are still a large number of specimens unmounted in the collection. This reflects the age and large volume of the Trust's collection. Our mounting program, staffed by volunteers, continues to make significant inroads into mounting the collection, especially new accessions. Note the year-to-year fluctuations are due to inadequacies in the current sampling techniques which reflect the small number that can be assessed compared to the vast size of the collection.



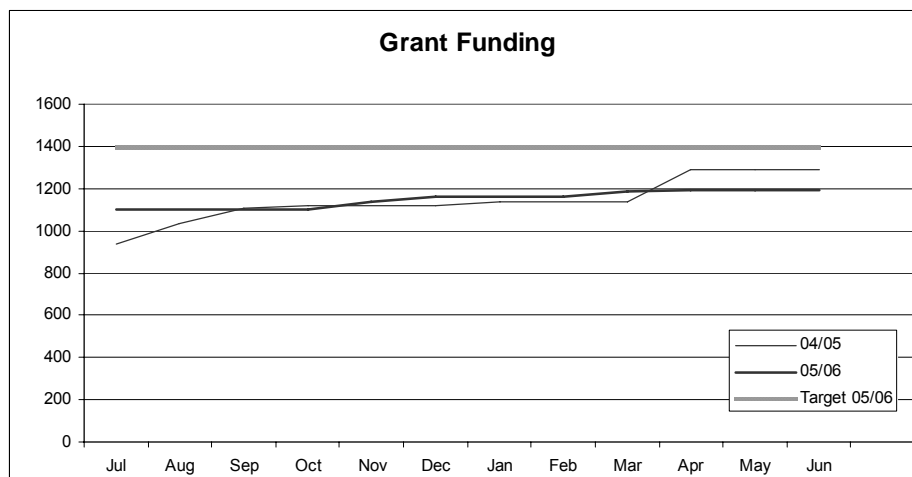
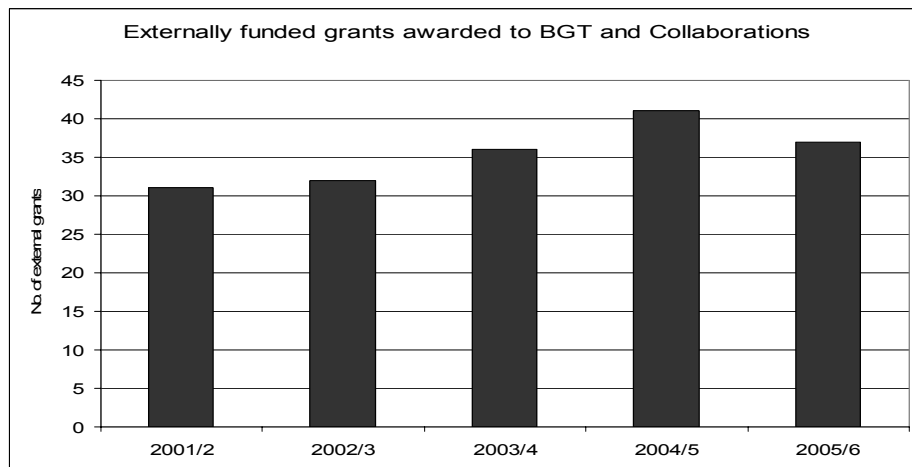
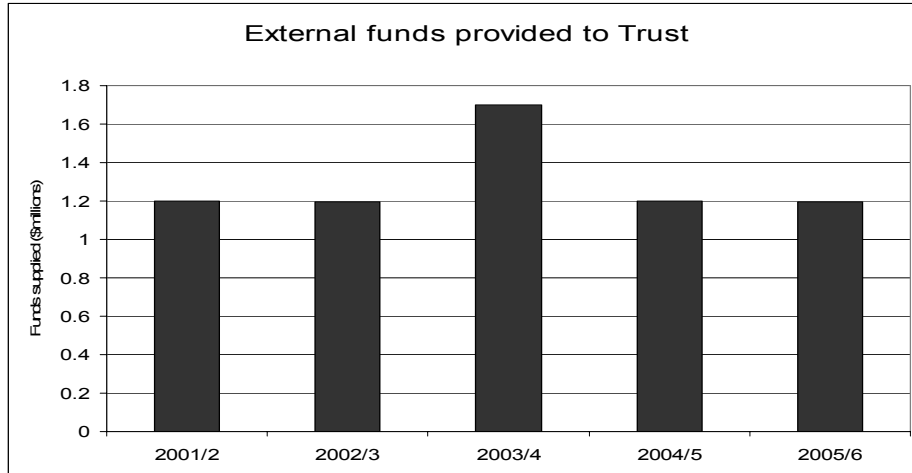
Numbers of specimens databased

The level of databasing was considerably lower than the previous year due to a shortfall in the funds available for the Australia's Virtual Herbarium project. A number of funding proposals are being developed to continue databasing the herbarium collection.



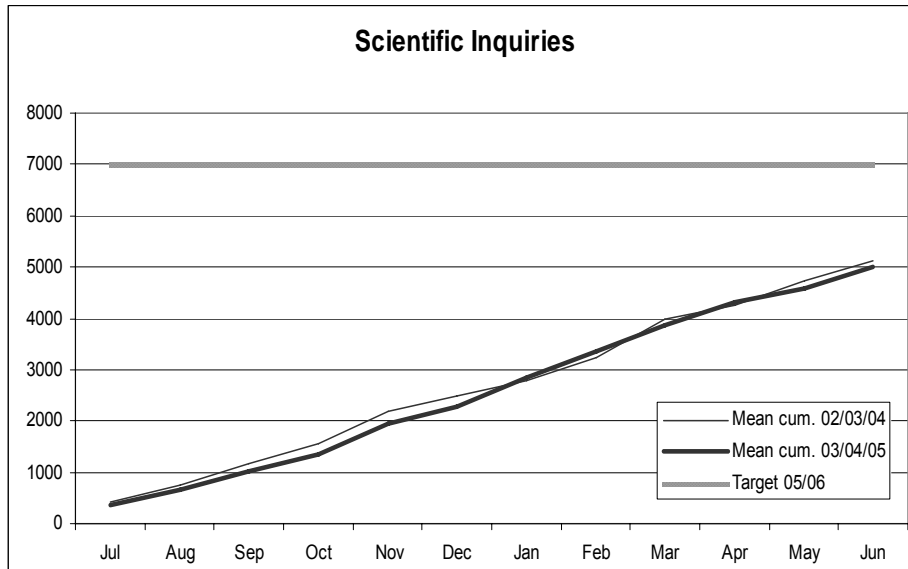
Grant Funding

The total value of grants was maintained at the same level as last year and the number of grants was maintained at a similar level to that of the past three years. Note that this includes grants awarded directly to BGT as well as those awarded to other institutions where Trust staff are co-investigators.



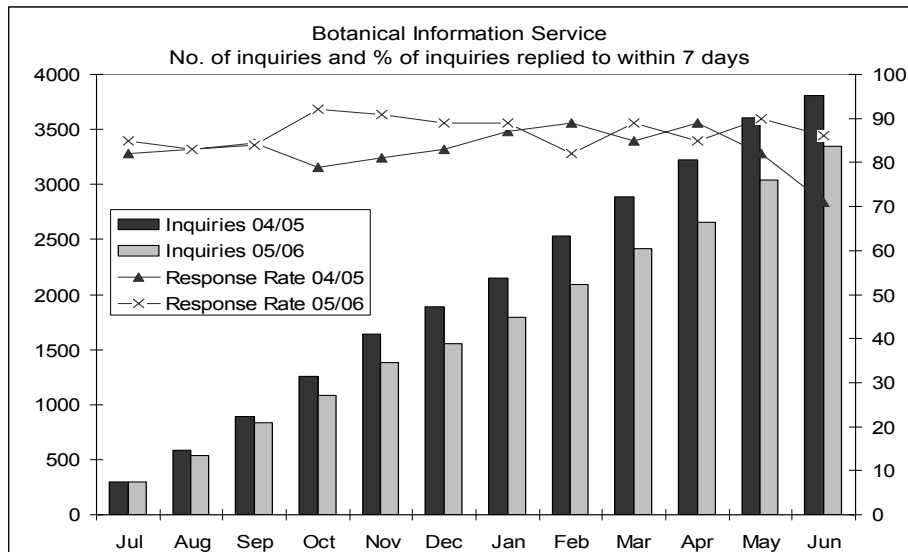
Scientific Inquiries

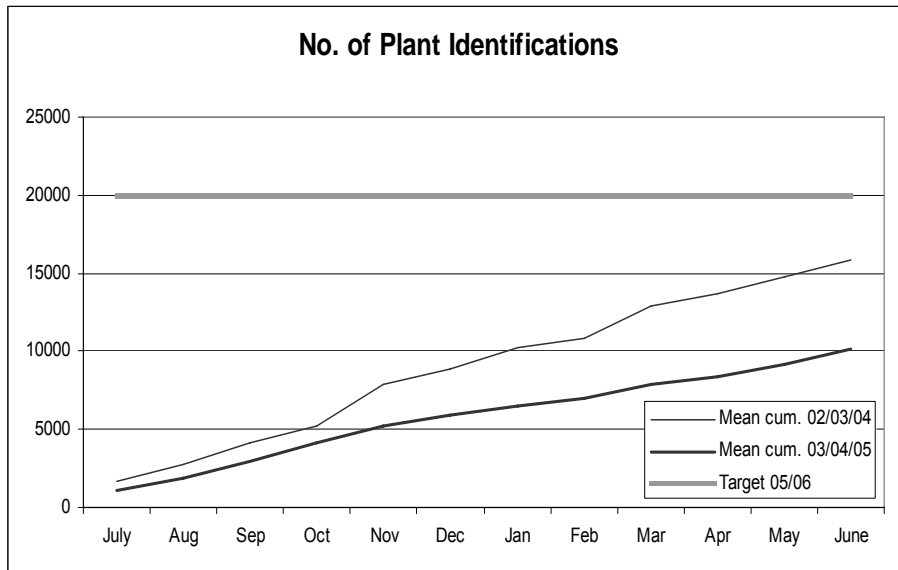
The majority of scientific inquiries are directed through either the Botanical Information Service or the Plant Disease Diagnostic Unit. However all members of the scientific staff receive a variety of inquiries dealing with their own area of expertise. In addition our internet information portal, PlantNET, elicits a variety of inquiries.



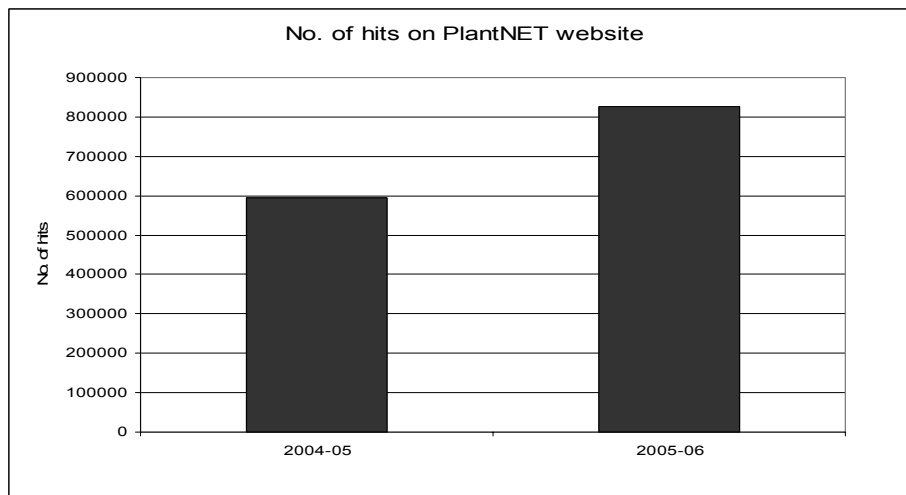
Inquiries for plant identification

The Trust's target for service delivery was 70% of inquiries to be answered within 7 days. This target was exceeded this year with 87% of inquiries answered within 7 days.



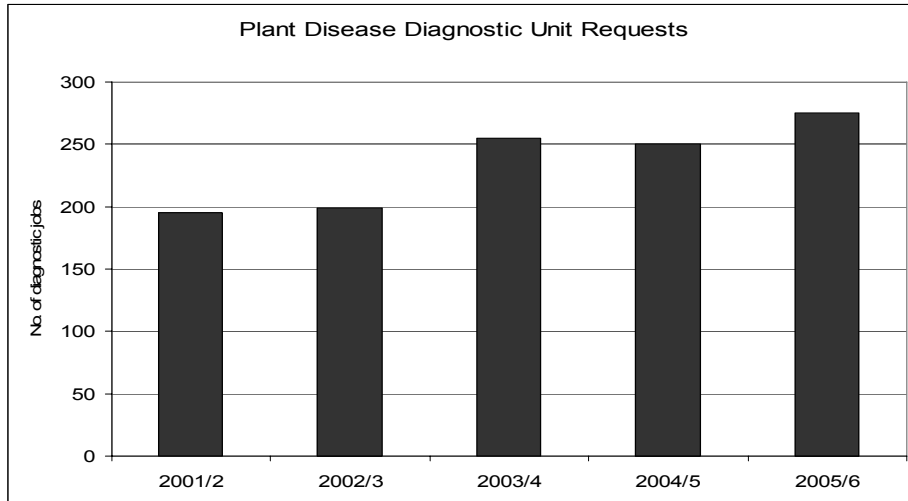


PlantNET, including the NSW Flora On-line website, is the Trust's on-line plant information service. Patronage continues to grow. It was available to a limited extent in previous years and was formally launched early in 2004–05.



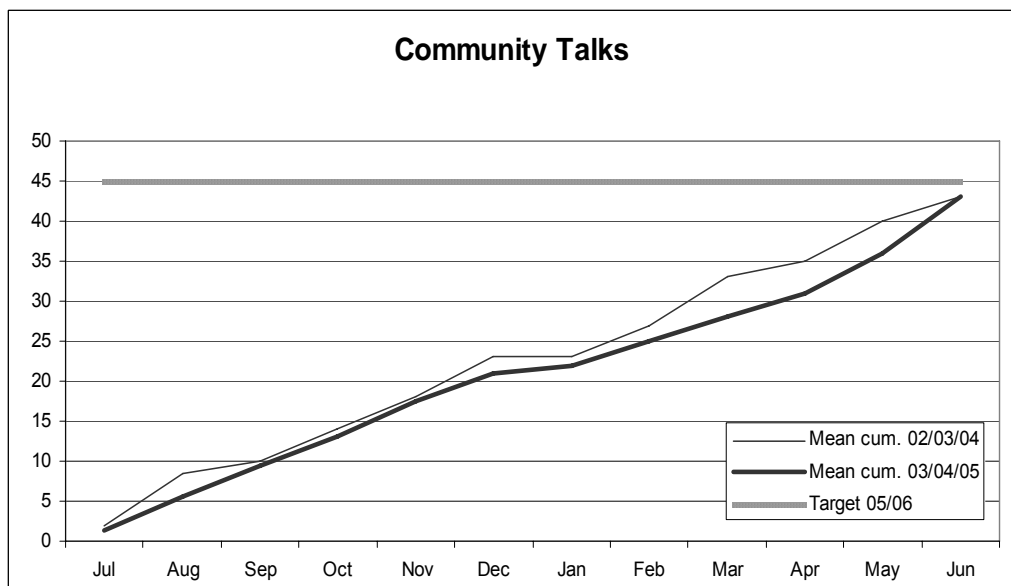
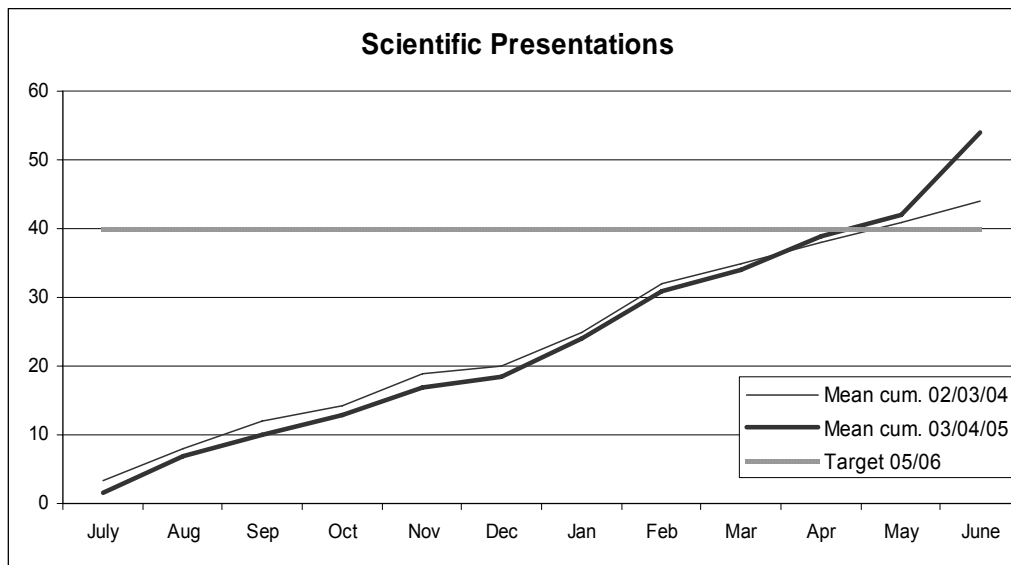
Plant Disease Diagnostic Unit

The number of requests for diagnosis at the PDDU increased the high levels achieved in 2003–04 and 2005-05. Most diagnoses were for detection of soilborne pathogens.



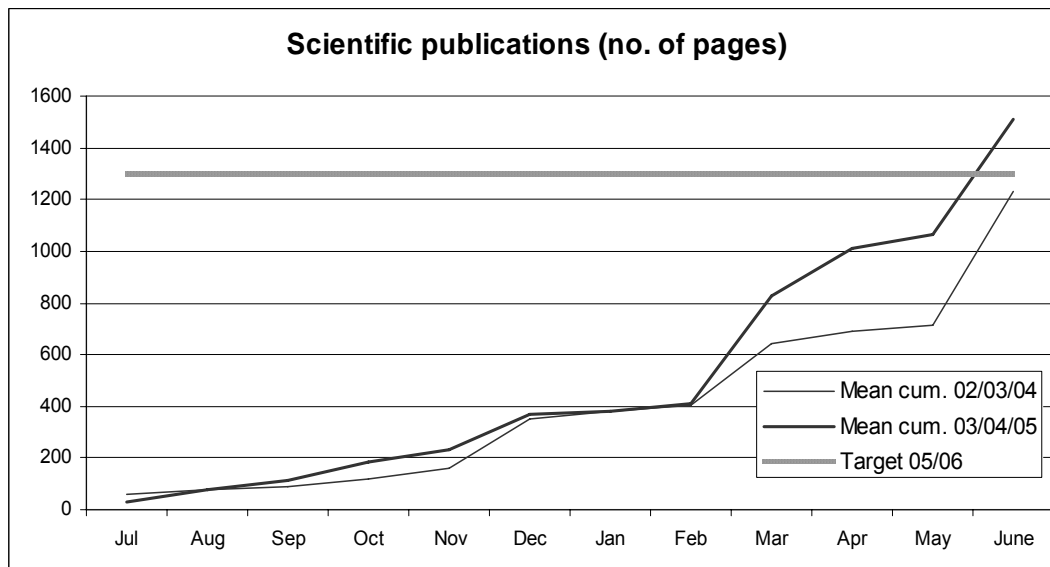
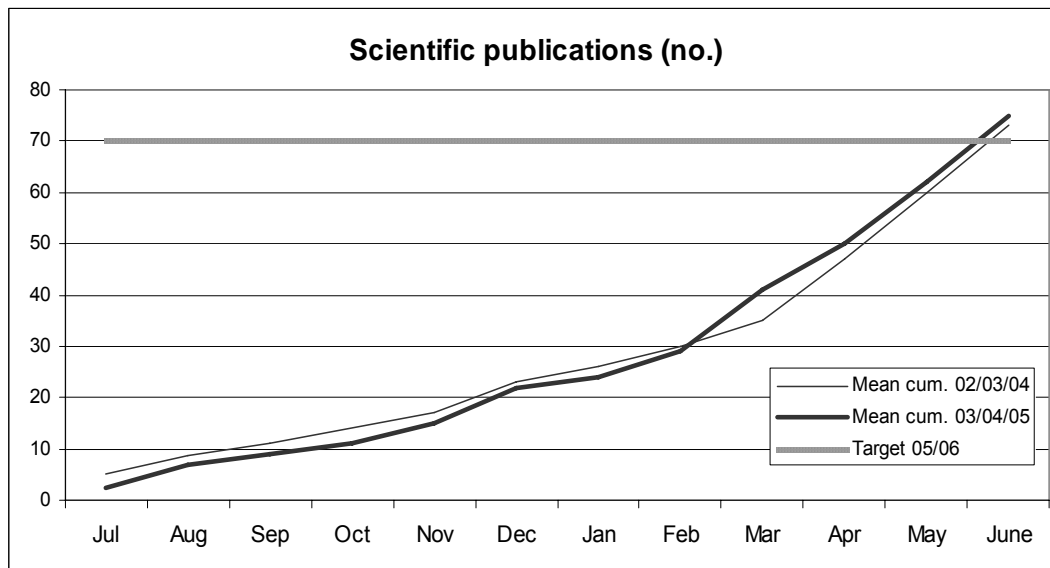
Presentations

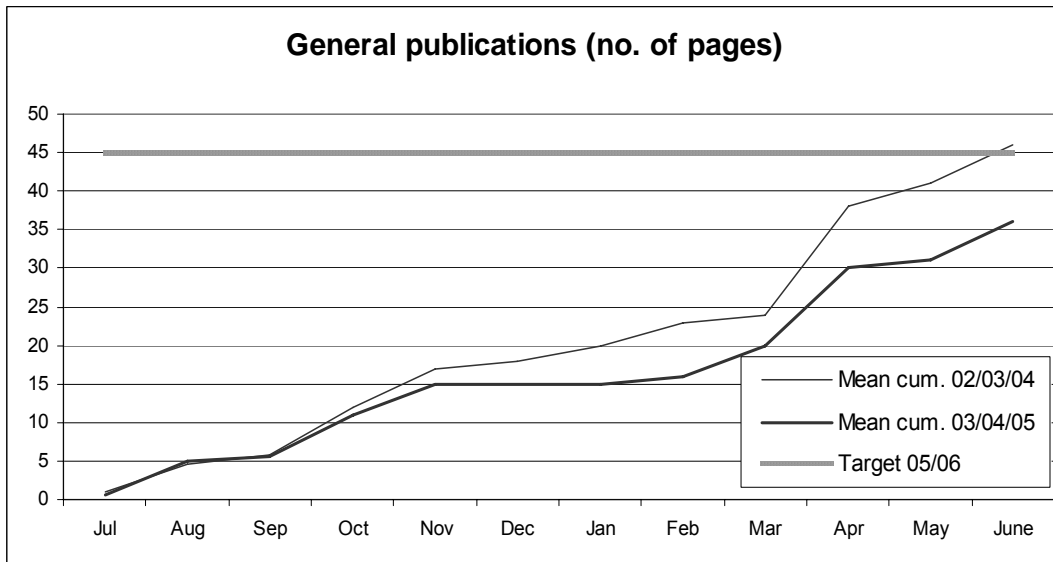
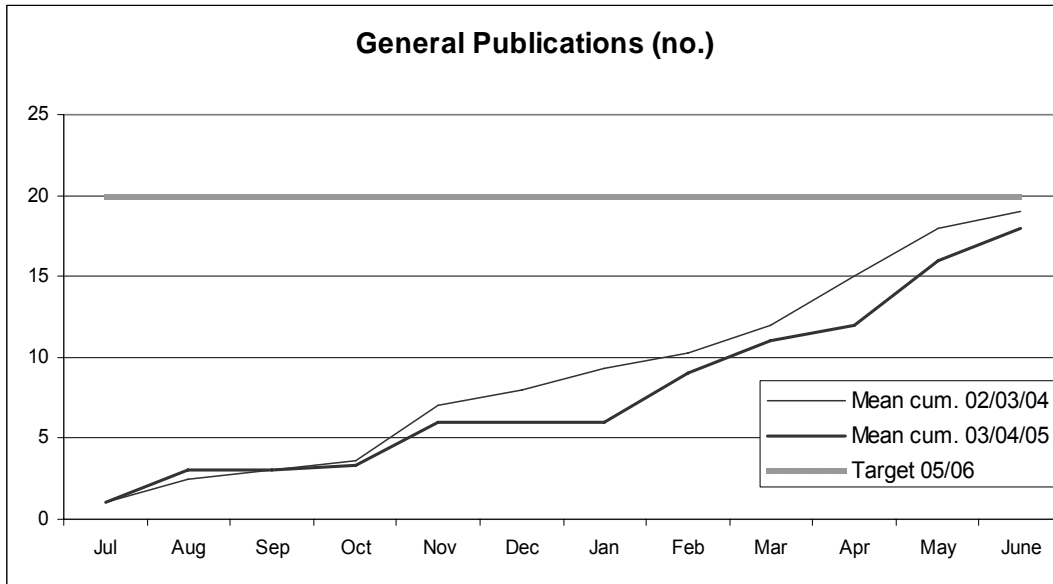
Trust scientists give a range of talks, not only at national and international scientific conferences, but also to a range of community groups, professional organisations and the public.



Publications

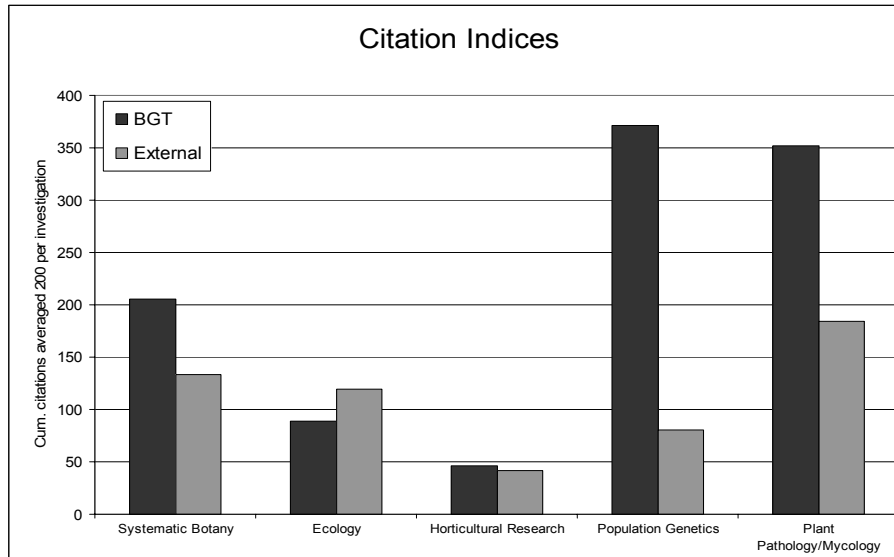
The Trust's goal is to publish a mix of papers for general and scientific audiences, with a target of 20 papers per year for general audiences and 70 for scientific audiences (averaged over the last three years). This 3-year cycle, the Trust was slightly under target (20) for this indicator, and above for the next. There were 80 scientific publications produced by Trust staff in 2005-06, an increase over the previous year and above the target (70) for the year. These papers are published in a range of international journals.





Citation indices

This graph compares the number of times scientific papers by groups of our researchers are cited in international journals with a comparative group of researchers from other Australian institutions. Note that this is not the complete number of times papers have been cited as the International Scientific Index does not collate information from all journals.



Students supervised

The 44 students supervised this year is a slight drop on the previous year but maintains the high level of student supervision built up over the last five years. This is close to capacity for supervision with existing staff levels.

