Visit to the Royal Botanic Gardens, Melbourne, Victoria, Australia

18th May 2007

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Bill Bampton & Peter Symes

Background

I visited the Royal Botanic Gardens, Melbourne (RBGM) as part of the B3 IO3.5 Expatriate Plant Communities project and met with Peter Symes (Senior Curator – Horticulture) and Bill Bampton (Curator – New Zealand collection).

They were happy to make time in their busy schedules to show me around the NZ plant collection and talk about any pests or diseases observed. They were also very pleased that it had started to rain and the drought they were experiencing may have broken at last!

Royal Botanic Gardens, Melbourne

The gardens were established in 1846 after Lieutenant Governor Charles La Trobe selected the site on the southern bank of the Yarra River. However the present layout was created when William Guilfoyle became director in the 1870's. The sweeping lawns, meandering paths, themed gardens and beautiful views of ornamental ponds and stately trees are designed in the 'picturesque' landscape style of the Victorian period. There are over 10,000 species and approximately 50,000 individual plants, many of which are extinct or endangered. The birdlife is diverse including black swans on the lake and bell miners 'chiming' in the eucalypts. During my visit I spotted a 'pukeko' (Australian 'Purple swamphen) strutting through the New Zealand

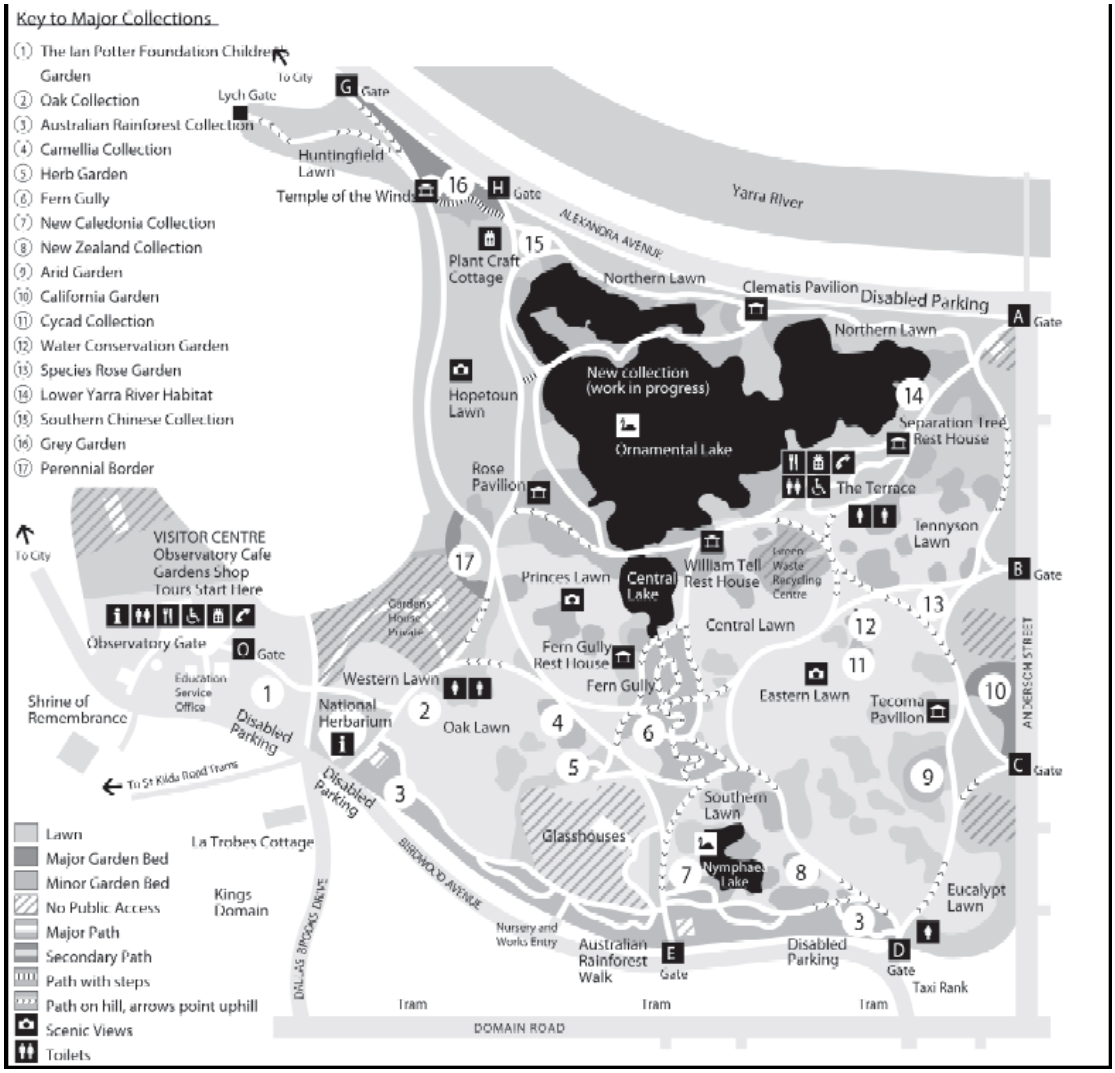
garden, looking quite at home, and one cleaning up the scraps on the outdoor tables of the tearooms!

From the website:
http://www.rbg.vic.gov.au/rbg_melbourne/living_collections

"The mild climate of this city, combined with a long history of plant collection from around the world, has allowed an immense range of plants from across Australia and the world to be brought together at the Royal Botanic Gardens.

Plants are displayed in major groupings, or "collections". The Botanic Gardens' major plant collections include the Australian Rainforest Walk, Cacti & Succulents, Californian Collection, Camellia Collection, Cycads, Eucalypts, Fern Gully, Grey Garden, Herb Garden, Long Island, Oaks, New Zealand Collection, Perennial Border, Species rose, Tropical Display Glasshouse, Viburnum Collection and the Water Conservation Garden."

Site Map



New Zealand collection location - 8 'Southern lawn'


NZ plantings in the Southern lawn

History of the New Zealand plant collection

The diverse and unique New Zealand plant collection, of approximately 242 species, is grown in sweeping beds surrounding the Southern lawn and is one of the oldest collections in Australia. Total area is approx. 3600m^2.

The collection was established and landscaped by William Guilfoyle (1840-1912), Director of the RBGM and a keen botanist and plant collector (Wikipedia 2007). The original planting was completed in 1906.
See Appendix 'Living Plant Collection Management Plan – New Zealand 2006' for the history, priorities and current status of the collection.

Many of the New Zealand taxa are also found throughout the 38 hectare gardens. Guilfoyle used the spiky foliage of flaxes and cabbage trees to provide focal points for the garden's shrubberies and flower beds. Distinctive species such as *Pseudopanax ferox*, *Cordyline australis* 'Purpurea' and unique divaricating shrubs have been planted as feature plants in the delightful new Ian Potter Children's Garden.

Site conditions

Microclimate – dry and wet (Note: the pond levels were noticeably low at the time of my visit and some plants were showing signs of stress due to the drought conditions)

Soil type

Shallow loamy yellow Duplex soil of sandy clay loams, silty loams and loams.
Highly organic topsoils - typically 400-800mm topsoil depth (sodic clay subsoil)

Drainage – Southern lawn is generally poorly drained
Aspects – Mostly southwest with some important northeasterly aspects
Light – Deep shade to full shade

Rainfall and temperature

Mean annual rainfall
564mm (2000-2005) (as sourced from RBG Automatic Weather Station)
Supplementary irrigation amounts would be around 400-500mm per annum

Mean annual maximum and minimum temperatures [as sourced from Bureau of Meterology – Melbourne Regional Office. The database of the RBG Automatic Weather Station requires a query written to calculate annual values such as these]
Mean annual maximum temperatures are 19.8 degrees celsius
Mean annual minimum temperatures are 10.1 degrees celsius

While Melbourne's climate is suited to many of the New Zealand plants the RBGM recognises that climate change and increasing water restrictions may threaten the survival of some species in the future (Symes 2007). E.g. their large specimen Rimu (*Dacrydium cupressinium*) would probably not survive in warmer and drier conditions and the sub alpine species would also die out as they don't have the elevation to provide the cooler conditions required in the gardens location. The region has recently had the driest period since records began in 1855.

Management and Maintenance

The New Zealand plants are well established and mostly in good health, despite the present drought conditions, with large specimen trees featuring, e.g. *Pittosporum* 'Garnettii', *Libocedrus plumosa* (Karaka) and large groups of *Cordyline australis.* Peter and Bill are finding that the grasses such as carex spp. are prone to 'escaping' and are difficult to manage. Other shrubs seed very well too. E.g.a *Meryta sinclairii* (Puka) had many *Meryta* seedlings and *Cordyline* babies beneath its canopy. These require constant monitoring as the invasiveness of our plants could pose a threat to Australian indigenous ecosystems. Bill apologised for the condition of the 'Ellis Stones Rock Garden' (created in the 1960's), containing *Astelia, Carex, Pseudopanax,* prostrate *Hebe* etc., however plans are in place to replant and inject new life into this garden.

Views of the 'Ellis Stones Rock Garden'

From the website:
http://www.rbg.vic.gov.au/gardening_info/weed_strategy

"In 2004, the Royal Botanic Gardens Melbourne developed a Weed Strategic Plan to link education opportunities, management requirements and current scientific knowledge to minimise infestations and risk of weed spread both within and outside its managed lands."

Results

Peter Symes had previously completed the grower's questionnaire – details available in the expat plants location database. A spreadsheet of the NZ plant accessions, as at 2006, has also been made available to us.
Contact Karen Cousins at: karen.cousins@agresearch.co.nz

Peter and Bill located plants where they had observed insects and disease and talked about some that they would not like to see attacking the NZ plants (see Pest and Diseases listed below). Their strict requirements for sampling plant material meant that when I was exploring the gardens on my own I could only photograph symptoms I found (see examples in worksheet). However they are very interested in our project and will be happy to collaborate with researchers and investigate further if required.

Various plants showed signs of drought stress, defoliation, leaf drop, browning on edges of leaves and sun scorch. Water conservation is high priority in the gardens and irrigation is restricted. Peter and Bill were concerned about some of the mature *Cordylines* showing signs of loss of vigour but overall they appeared to be in reasonable condition.

Pests and Diseases

Phenacaspis sp. (Armoured scale) is found on the backs of Phormium tenax leaves. This also affects *Doryanthes palmeri* (Queensland Spear Lily) an Australian native of the Liliaceae family

Cordylines have been affected by yellow mottling and samples were sent for identification of the pathogen. However the cause was not identified.

Botryosphaeria (australis?) is a broad pathogen giving rise to cankers which affect the Sequoia (*Sequoiadendron giganteum*) and many other trees and shrubs in the gardens. It is most likely to be present in the NZ collection, though we couldn't find any examples during the visit.

Peter thought that the two-spotted mite (*Tetranychus urticae Koch*) had been observed on *Clianthus puniceus* in the past. Unfortunately many of their specimens have died off.

Pyralid moth larvae (species unknown) has been observed on *Cortaderia richardii* (toe-toe)

Phytophthora (undescribed), (Cunnington 2005) is a major problem in the Agavaceae collections (*Agave*, *Yucca* and *Furcraea* species). This fungus causes decimation of the plants and they would not want to see this occurring in the NZ Agavaceae (*Phormium*, *Cordyline*).

Puccinia psidii, Eucalyptus rust would be devastating on *Metrosideros spp.* if it entered New Zealand

Possums are a constant pest but due to their protected status can't be destroyed. Most of the larger trees and palms had protective plastic girdles around their trunks. English foxes, dingoes also roam the gardens at night. The extensive birdlife contributes to the spread of weedy plants such as the *Carex* grasses.

For additional information see *Pest problems* and *Diseases* in the Appendix 'Living Plant Collection Management Plan – New Zealand 2006'

Purple Swamphen sampling the tearooms wares!

Worksheet

Garden location: Royal Botanic Garden, Melbourne
Collectors name: Karen Cousins
Date Collected: 18th May 2007
Contact names: Peter Symes, Bill Bampton

General notes: Peter assisted in collecting samples of a woolly scale (*Phenacaspis sp.*) infesting *Phormium tenax* leaves (preserved in Phenol Glycol) and leaf squashes of fungi from *Brachyglottis repanda* leaves showing signs of die back. I also took photos of examples of chewing damage and leaf spotting etc. in other plants after my meeting with Peter and Bill.

Plant species	**Location in garden**	**Insect / Pest /Disease**	**Damage symptom (fungal, bacteria, viral)**	**Photo**	**Specimen taken/collector**
Phormium tenax	19518942 Phormium bed. EC 42	Armoured scale (white woolly covering)	Yellow mottling on leaves.	Yes	Yes. Insects in PG
Brachyglottis repanda	Podocarpus bed. Accession number would need to be looked up in Peter Syme's database		Fungal disease? Brown edges to leaves an dieback of stems	Yes	Yes Leaf squash onto FTA card
Hebe spp.			Leaf spotting	Yes	
Libocedrus plumosa			Drought stress?	Yes	
Pittosporum 'Garnettii'			Fungal disease? Brown edges to leaves	Yes	
Pseudopanax lessonii			Dieback of stems	Yes	
Sophora prostrata			Defoliation – environmental stress?	Yes	
Meryta sinclairii		Possums, rats?	Chewing and rasping damage to leaves	Yes	


Phormium tenax - scale with woolly coating

Brachyglottis repanda – dieback

Hebe spp. - leaf spotting and chewing damage


Meryta sinclairii – chewing and rasping damage

Pittosporum garnettii – brown edges to leaves

Libocedrus plumosa - drought stress?

Pseudopanax lessonii – dieback

Sophora prostrata – defoliation

Note: Plants are not labelled with accession numbers and beds are unnamed. The Master plan will need to be consulted to confirm location and ID number.

Recommendations

This is a useful site to study NZ native plants because:

- It is easily accessible – close to Melbourne's CBD and Southbank precincts
- Curators are very keen to collaborate and exchange information
- The climate is mild and likely to be similar to some warm climate NZ sites
- Many plants are mature specimens and some are planted in groups

Negatives of the site:

- Climate change leading to drought conditions – survival of some NZ plants could be in doubt.
- Plants are not labelled in situ – Identification requires consultation with curators

Education and research at the Royal Botanic Gardens, Melbourne

Education

The RBGM aims to encourage interaction with the public. Seminars, guided tours behind the scenes and informative signs placed throughout the gardens make a visit a learning experience for all.
http://www.rbg.vic.gov.au/education

Water conservation is clearly a focus of these gardens and a special garden has been created to educate the public. This includes plants suited to the Melbourne environment and practical water saving ideas to explore.
http://www.rbg.vic.gov.au/rbg_melbourne/living_collections/water_conservation_garden

As well as creating a unique landscaped children's garden the Ian Potter Foundation covers the cost of transport for eligible schools to travel to participate in the Children's Garden programmes.

From the website:
http://www.rbg.vic.gov.au/education/ipf_childrens_garden

"The Ian Potter Foundation Children's Garden is a place where children of all ages and abilities are able to explore and discover in an interactive, hands-on environment, the wonders of plants and their importance in our lives. Delight in plants-spaces that will stimulate children's senses, broaden their knowledge and invite exploration and adventure."

Scientific research

The **National Herbarium of Victoria** is located in the gardens and its collections are used in scientific research.

From the website:
http://www.rbg.vic.gov.au/research_and_conservation/herbarium

"The National Herbarium of Victoria, founded in 1853, houses approximately 1.2 million preserved specimens of flowering plants, gymnosperms, algae, moss, liverworts, hornworts, lichen and fungi. It contains representatives of the world's flora including many Australian species. The Herbarium is particularly rich in nineteenth century collections, including material from Cook's voyages in the Pacific, Robert Brown's Australian travels, Livingstone's journeys in Africa, and Bourke and Wills' ill-fated expedition to northern Australia."

The **library** at the RBGM has the most comprehensive collection of botanical literature in Australia.

Plant research into the indigenous flora involves classification, molecular and morphological systematics, plant conservation, biodiversity and horticultural research. A partnership has been formed with the Royal Botanic Gardens Kew, and Victoria's Department of Sustainability and Environment to develop a **Victorian Conservation Seedbank** which aims to collect and preserve seeds of Victoria's endemic plants.

Royal Botanic Gardens, Melbourne

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http://www.rbg.vic.gov.au/rbg_melbourne/visitorinfo/getting_here

References

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Accessed 22/05/2007

Appendix

ROYAL BOTANIC GARDENS
LIVING PLANT COLLECTION
MANAGEMENT PLAN

NAME OF COLLECTION New Zealand

LOCATION Southern Lawn **AREA (approx m2)** 3600 m2

(see attached map)

PRIMARY COLLECTION CATEGORY (as per collections policy)

Geographical

OBJECTIVES OF COLLECTION

To display a diverse range of N.Z. taxa.
To maintain and enhance the use of diverse plant form, foliage and colour.
To maintain the historic significance of the collection on the landscape.

INTERPRETATION (key messages to be interpreted from collection)

The unique and isolated flora and fauna of New Zealand is under threat from foreign invaders.
Developed in isolation, New Zealand plants have unique characteristics that must be seen to be believed. Conservation of rare and threatened species is an ongoing battle.
This collection was the last major landscape development of William Guilfoyle.

CURRENT STATUS vs OBJECTIVES (assessment of gap between current status and identified objectives)

The collection currently contains a diverse range of New Zealand taxa.
Opportunities exist to enhance the aesthetics of the collection by small-scale development works in several areas of the collection.
Maintenance of the historic landscape is ongoing.

PRIORITIES FOR COLLECTION DEVELOPMENT (genera, taxa, plant type, collecting zone, rare & threatened etc.)

Improve landscape aesthetics in several areas of the collection.
To increase taxa that have rare and threatened status and are endemic to New Zealand.
To develop the ornamental qualities of the collection, using the diverse range of plant form and character.

STRATEGIES (broadly, how will we achieve the collection development aims?)

Assess beds and identify areas for landscape developments.
Research suitable plant species for introduction into landscape.
Build information resources relating to New Zealand flora for future reference.

ACTIONS (concise statement of action with nominal timeframes)

Site assessment with landscape architect to identify and document areas and tasks associated with development.
Research and develop plant lists to increase taxa represented.
Remove inappropriate plants and plants that are over represented.
Reduce canopies where appropriate.
Obtain suitable plant material and introduce into the landscape to rejuvenate beds and ensure historic significance of the site is maintained.

CURRENT SITE CONDITIONS

Soil type/s	Shallow loamy yellow Duplex soil of Sandy clay loams, silty loams and loams.
Drainage	In general Southern Lawn is poorly drained. Drainage in beds is variable.
Aspects	Mostly southwest with some important Northeasterly aspects.
Light	Deep shade to full. Light levels in beds are variable.
Microclimate	Dry and wet shade.

STRATEGIES FOR SITE IMPROVEMENT (if appropriate)

In general plant species should be selected to match the conditions of the beds, rather than modify bed structures.

BRIEF HISTORY OF COLLECTION

Collection origins, major donors or collectors, age of specimens, periods of major development etc,

1906 Last major landscape development of William Guilfoyles completed.
1980's A number of plants were brought into the R.B.G. from Mt. Lofty, Melbourne nurseries and the index seminum.
1990's Donations received from Alistair Watt and John Feruglio
1991 Major donation of plant material received from Wellington Botanic Gardens.
1991 Redevelopment proposal submitted and approved. Planting plan prepared and additional species obtained and progressively planted.
1995 Plant material obtained from Index Semina and Mt. Tomah Botanic Gardens. (Don Schoefield).
1998 Collection placed on priority list for redevelopment. Detailed planning and costing carried out.
1997 Major donation of plant material sent to Gisborne Botanic Gardens.
1998 RBG sources XX Rhapalostylis sapida (Nikau Palm) from XXX.
1999 planting plans for stage one, beds 1,2, and 3 are completed.
2000 Funds not sourced for collection development. Organisation shift in project priorities leads to collection development being 'put on hold'.

HORTICULTURAL MANAGEMENT NOTES

Brief summary of information re; timing of operations, fertilising requirements, irrigation requirements, pest or disease problems and indicators, propagation of particular taxa etc.

Pruning and plant divisions
Some plants like *Hebes* and *Clianthus* require annual pruning to maintain vigour and form. *Phormiums and Arthropodiums* require dividing every 4 years but timing is dependant on vigour.

Pest problems
Woolly scale infest *Phormium* growing in shade, treat with white oil or Folimat.
Aphid attack *Brachyglottis* growing in shady conditions, treat with Pyrethrum.
Possums and rats affect *Clianthus, Meryta, Cordyline australis* and *Metrosiderous spp.* over winter months. They chew bark and leaves, which kill or dramatically reduces plant vigour.

Diseases
Phytophthora has been identified in the Divaricating Bed. This testing was done in 1995. More tests carried out in 1997 found no Phytophthora present in Divaricating or Podocarpus Beds.

Tree senescence
Sophora spp. Griselinia littoralis, Pittosporum spp. Myrsine australis, Cordyline australis and *Libocedrus plumose* are all showing signs senescence and should be monitored annually.

Difficult taxa
The heathland plants such as *Gaultheria spp.* grow in soils of very low fertility and low pH. When planted out they die within a period of 3 to 12 months, although they appear quite successful in the nursery even after 2 or more seasons of growth. They have been tried in various areas within the New Zealand collection with no success

Propagation
Agathis australis requires fresh seed or cuttings from young plants. *Nothofagus spp.* (do not always set seed reliably) and germination can take up to 3 - 5 years.
Conifers require semi-hardwood cuttings wounded to induce root growth.
Chionochloa seed is difficult to propagate.

REFERENCE MATERIAL
(List of the most useful references - literature, people, organisations, etc. for access of information regarding this collection.

Literature

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Great Britain.

People and Organisations

Landcare Research of New Zealand, Timaru Botanic Gardens, The New Zealand Botanical Society, Wellington Botanical Gardens. Southern Connection of the University of Tasmania, Associate Professor R.S. Hill, Brent Torrens, Auckland Botanic Gardens, Rob Lucas at natural resources centre the open polytechnic of N.Z. pb31914 Lower Hutt ph. 0011 64 4 560 5728

MANAGEMENT PLAN COMPILED BY	Bill Bampton, Andrew Laidlaw, Steve Clancy and Michael Mc Nabb.
DATE	2006
SUGGESTED REVIEW PERIOD	2008