THE CONSERVATION AND RESEARCH GARDEN, ANBG

Handbook for Guides

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TABLE OF CONTENTS

THE CONSERVATION AND RESEARCH GARDEN
Handbook for Guides

(1) INTRODUCTION

The establishment of the Conservation and Research Garden (C&R Garden) in Section 189b of the Australian National Botanic Gardens (ANBG) came at a time when the ANBG had reached a most ambitious and exciting level of commitment to the conservation of Australia's flora. A myriad of partnerships, formal and informal, have boosted opportunities for building genetically diverse insurance populations of endangered species, particularly those that have not lent themselves to seed storage. The commitment to conservation also involves researching such factors as genetic diversity, seed production, cultivation and germination requirements.

The unprecedented extent and the intensity of bushfires over the 2019/2020 fire season has brought into sharp focus the importance of conservation efforts as climate change progresses.

The Conservation and Research Garden was opened on 4 May 2018 by Costa Georgiadis, of Gardening Australia television fame, who at the same time launched the BGANZ (Botanic Gardens Australia and New Zealand) Botanic Gardens Day 2018. To the delight of the audience and participants, Costa helped the VIPs, five young children, plant out some tube stock of *Asterolasia elegans* and two of *Pomaderris walshii.*

Shortly before the opening, the Garden had been planted out with specimens of many of the 26 species described on pages 13-25. (Photo: M. Bush)

(2) THE ANBG, CONSERVATION AND RESEARCH

The ANBG, of course, has always been committed to conservation and research, these being prominent in the ANBG's eight goals:

- "Goal 2: *Champion the conservation of Australian plants and the role of ex situ conservation in integrated conservation management".* and
- "Goal 5: *Increase knowledge of Australian flora through outstanding research activities."* (ANBG Management Plan 2012-2022, Summary, p.iv)

The ANBG's living collection policy 2016-2022 further states (p.6):

> *"National biodiversity conservation priorities and environmental sustainability will inform the management and development of the living collections."*

Threatened species in the ANBG

There are at least 300 species in the ANBG listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999. Their presence in the living collection helps to protect them from extinction and allows for study in order to help their reintroduction to the wild (ANBG website). This collection has been built up over many years as illustrated, for example, by its Biodiversity Conservation Policy document of May 1998 (See Addendum 1).

As well as extensive research on the propagation of rare and endangered species in the nursery, the fenced Section 189a has long been used for outdoor research.

In 2016 the ANBG established the ANBG Threatened Species Project which aimed among other things to strengthen partnerships leading to a coordinated development of *ex situ* collections of a number of

species from southern NSW and northern Victoria to improve the outcomes of species recovery programs (Henery, 2016).

(3) COLLABORATION BETWEEN THE ANBG AND OTHER ORGANISATIONS

A) At National and International Level

While some conservation and research projects are unique to the ANBG, the ANBG values highly cooperation with other organisations in Australia and elsewhere. It played a large part in setting up the Australian Network for Plant Conservation (ANPC). It was prominent in the establishment in 1987 of Botanic Gardens Conservation International (BGCI) (of which BGANZ is a part).

> *"BGCI is 'a global network of botanic gardens ... working together to preserve the world's plant diversity'."* (ANBG Biodiversity Conservation Policy document, 1998, Background)

Across the world and promoted by the BGCI, seed collecting for conservation is widespread.

The ANBG is prominent in the 12 member Australian Seed Bank Partnership, comprising major botanic gardens, State environment agencies and organisations such as Greening Australia, developing *"strategic solutions to deal with the multitude of threats facing our biodiversity" (*Australian Seed Bank Partnership, About us). The Partnership is governed by The Council of Heads of Australian Botanic Gardens Inc.

The ANBG cooperates with strategies developed under the Australian Government Environment Protection and Biodiversity Conservation Act and the NSW Department of Planning, Industry and Environment's (formerly the Office of Environment and Heritage) Saving our Species program which is now part of the Biodiversity Conservation Program under the NSW Biodiversity Conservation Act 2016.

The Centre for Australian National Biodiversity Research (CANBR), jointly managed with the CSIRO Division of Plant Industry next door and incorporating the Australian National Herbarium, is a major research body.

B) Co-operative Local Arrangements

At a less formal level, co-operative relationships have been established with regional botanic gardens, private landholders, people in State environment agencies, members of organisations such as the Australian Native Plants Society (ANPS) and scientists in CSIRO, ANU and other universities etc.

The South-east NSW Bioregion Partnership involving the NSW Department of Planning, Industry and Environment (which includes the NSW National Parks and Wildlife Service), botanic gardens including the ANBG and also local councils, shares expertise to assist a number of threatened species in this region (Taylor et al, 2016).

That this group is an active collaboration was illustrated for us after the bushfires which burnt out the Eurobodalla Regional Botanic Garden. A meeting of this partnership including representatives of the ANBG, Wollongong, Booderee, Sydney and Mt Tomah Botanic Gardens, Illawarra Grevillea Park, Panboola Wetlands, Forestry and the NSW Department was held at the Eurobodalla RBG at which the hosts planned to request help from the group with their recovery and urge greater roles for the group in conservation of threatened species in the region. (Update email from the manager of the Eurobodalla Garden forwarded via the Guides googlegroup on 17/02/2020)

C) Examples of collaboration

i) Alpine seed ecology project

An example of collaboration in plant conservation is provided by the Alpine seed ecology project. Studies on dormancy and germination of seeds and on seedling ecology of alpine plants have been undertaken in relation to climate change by the ANBG in conjunction with the Research Council, the ANU and the University of Queensland. (The ANBG and Partnerships: Australian Alpine Seed Ecology)

ii) Pomaderris
For the genus *Pomaderris*, whose 65 Australian species are found on the east coast, largely in NSW and Victoria, *"The Australian National Botanic Gardens (ANBG) is leading a collaborative partnership of government bodies, research institutions, national parks, land managers, custodians and botanic gardens who are contributing to a Pomaderris conservation project funded by the NSW Environment Trust. The three-year project will involve the collection of seed and cutting material from Pomaderris populations across NSW and the ACT."* (Plight of the Pomaderris)
Please refer to the Guides' Pomaderris Handbook on the Guidesweb for further information.

The methods formalised for taking cuttings in the *Pomaderris* project can be applied to other threatened plants with low seed production where collection of plant material is the best option. It is interesting to note that the taking of cuttings from the wild is unusual in world terms.

iii) Bush Blitz
In November 2015 the ANBG, along with the NSW National Parks and Wildlife Service and others including a botanist from the University of New England, joined a Bush Blitz (itself a partnership between the Australian government, BHP Billiton's Sustainable Communities and Earthwatch Australia) expedition to the Oxley Wild Rivers National Park on the NSW Northern Tablelands. David Taylor brought back to the ANBG cuttings from 15 species. Plants grown from cuttings of four of these species, *Leionema westonii, Prostanthera sp.aff. howelliae, Grevillea beadleana and Grevillea guthrieana* are now in the Conservation and Research Garden. (Taylor, David, 2015; de Blas, Alexandra, 2016) See also the Bush Blitz website.

iv) *Banksia vincentia*
The fenced area, Section 189a, has been prepared for dozens of plants of *Banksia vincentia*, an extremely rare species from Vincentia, Jervis Bay. Found in 2008 and described in 2014, it is known from just one small area which had been wanted for a supermarket car park. That area was saved and cuttings were taken by the local nursery owner who discovered the species. Now a second generation of cuttings has been taken and the ANBG, the Booderee Botanic Gardens and others in south eastern NSW are helping to build up a considerable number for introduction to areas near the original site. The population of 14 plants originally found there was reduced to four by 2018 through both fire and infection by *Phytophthora cinnamomi*. A team involving staff from the NSW Department of Planning, Industry and Environment (in practice, probably the NSW National Parks and Wildlife Service), botanic gardens from the South-east NSW Bioregion Partnership, private land holders and volunteers are all working together as part of *Saving our Species* to ensure its survival. (David Taylor, pers. comm.; Foden, 2018, NSW Government Department of Planning, Industry and Environment: *Banksia vincentia*. See also comment in References p. 28 under Clarke, Dan, 2018)

(4) THE CONSERVATION AND RESEARCH GARDEN - ESTABLISHMENT AND ROLES

A) Reason for establishing a special Conservation and Research Garden
The ANBG decided that to have open to the public an area dedicated to threatened species would be educational and promote interest in conservation, in keeping with ANBG Conservation Strategies listed in the ANBG's Biodiversity Conservation Policy document, 1998:

> *"1. Influence public opinion and attitudes on environmental issues.*
> *...*
> *1.2 Develop interpreted outdoor horticultural displays by:*
> *1.2.1 introducing a program of interpreted garden displays on conservation of plant biodiversity, individual taxa, plant communities, ecosystems and landscapes, integrated with the wider ANBG thematic structure. Themes to focus on are rare, threatened, and particularly endangered species, threatened communities, and recovery programs."*

It is worth including here the text of the explanatory sign in the Garden:

> ***Welcome to the Conservation and Research Garden***
> *The plants grown here are all threatened species grown from seeds or cuttings collected in the wild.*
>
> *The Garden contributes to the conservation of many species that are not easily stored as seed. Together with seeds collected for long-term storage in the National Seed Bank, these plants are an insurance backup for the remaining plants surviving in the wild.*
>
> *The plants in the garden will be used to grow new plants for reintroduction into their natural home. Staff at the ANBG maintain detailed information that links each plant growing here to its parent plant in the wild. This gives us knowledge about the genetic diversity within our collection which is vital for research and better safeguarding our threatened plants.*
>
> *The Conservation and Research Garden is made possible by multiple partners working together to bring expertise in horticulture, science and seed production to secure the future of some of Australia's rare and unique plants.*

B) Selection of species

For this garden the ANBG has concentrated initially on threatened plants that are endemic to areas of NSW or which are relatively local.
They are also plants where seeds are not at all or not often produced in the wild or are unsuitable for seed banking (e.g. unable to survive the drying and freezing process used).
Species initially included plus a few extra ones planted later in 2018 and in 2019 are shown on the site map below and dealt with in detail under the heading SPECIES IN THE CONSERVATION AND RESEARCH GARDEN (as at January 2020).

i) Changes over time
More species will be added to the C&R Garden from time to time and some withdrawn.

For example, the *Dampiera fusca* pictured on the Conservation and Research Garden sign is found in the Tinderry range and the Corin Dam road area. In partnership with Namadgi National Park, the ANBG took cuttings from many plants which appeared *en masse* after a fire along the Corin Dam road. They are proving difficult to propagate so there is work to do before the species can be added to 189b (David Taylor, pers. comm., June 2018).

On the other hand one of the initial species in the Garden, the Nalbaugh nematolepis*, Nematolepis rhytidophylla* (Rutaceae), was targeted by a local swamp wallaby for grazing. The sole remaining plant was removed to the nursery in 2019. Given Vulnerable status, the main threats were said to be fire occurring too frequently and its narrow range and small populations.
A dense shrub growing to 3 m tall, it has thick, warty, heart shaped leaves and grows in shrubby areas and open forests at a few sites in the South-East Forests National Park on the Nalbaugh Plateau, southeast of Bombala, NSW.

C) Field collections
For many of the species collected, taking cuttings was a necessity, not an option, but there is a benefit: taking cuttings allows resultant plants (grown in the ANBG nursery) to reach flowering much sooner compared with plants grown from seed. The latter could take as long as five years compared to, say, 18 months from cuttings.
Cuttings were taken from plants in as wide a range as possible of populations in the wild to provide the basis for a living conservation bank.

Pomaderris delicata is not in the Conservation and Research Garden but is an interesting example of the benefits of collections. No seeds were found in the wild, yet when plants were grown in the nursery from cuttings, 9,000 seeds were obtained from the first flowering. This guides management in the wild - what is preventing seeding? At the ANBG, staff are going on with germination testing.

D) The role of these plants in conservation of the species
Once the new plants reach maturity, seeds that they produce can be used to grow new generations for replanting in the wild. Alternatively, cuttings can be taken from the ANBG ones and grown on for reintroduction to the wild.
Keeping track of individual clones allows return to the wild at an appropriate spot. Reintroduction must be done in consultation with the other responsible bodies for each species.

i) Advanced project:
Grevillea beadleana grew so well in the nursery that there had already been a return (translocation) to the Oxley Wild Rivers National Park by mid 2019.

ii) Additional plants in the ANBG
There are insurance plants of almost all of these species grown elsewhere in the Gardens, mostly derived from the same or at least a contemporary collection. In a few cases such plants are both larger and easy to find. These include *Grevillea beadleana*, *Grevillea guthrieana* and *Pimelea venosa* in Section 331, several *Pomaderris* species in the Pomaderris garden (Section 338) and, just slightly larger as at March 2019, *Prostanthera askania* in 191d. In addition to Section 331, there are several plants of *Pimelea venosa* in Section 174 along Banks Walk.
There is an older shrub of the tiny *Zieria citriodora* in Section 15d and two of *Rhaphidospora bonneyana* in Section 220.
Details can be obtained from the ANBG Living Plants database and the ANBG's Find a Plant website.

E) Research on these plants
Research covers both horticultural and scientific projects. These include investigation of germination and plant requirements etc. and genetics.
The presence of plants in the garden that are accurately identified can provide a considerable saving in time and resources compared with making field trips for research.

F) Partnerships in Research
Apart from horticultural research, there is little in the way of resources for research on these plants within the ANBG and so partnerships, both opportunistic and formal, are proving valuable.

Examples
i) *Zieria citriodora*, found near Numeralla, is a rare plant that could potentially be bred in large enough numbers to be released to nurseries, providing money for conservation. It was collected from various sites with the help of threatened species officer John Briggs of the NSW Office of Environment and Heritage's (OEH) South East Region in Queanbeyan (NSW Department of Planning, Industry and Environment). Now, someone at CSIRO next door could do genetic analysis on the plants here: do they all

have the same number of chromosomes, for instance? Research could, say, work out if cross breeding is possible.

(The endangered Button Wrinklewort, *Rutidosis leptorrhynchoides,* present in the ANBG Asteraceae and Grassy Woodland Gardens but not in the Conservation and Research Garden, is another example of the value of genetic testing. CSIRO research determined that Victorian populations are tetraploid (i.e. their cells have four sets of chromosomes) while NSW/ACT ones are the usual diploid (two sets, one from each parent) and so advised against attempts to cross breed.)

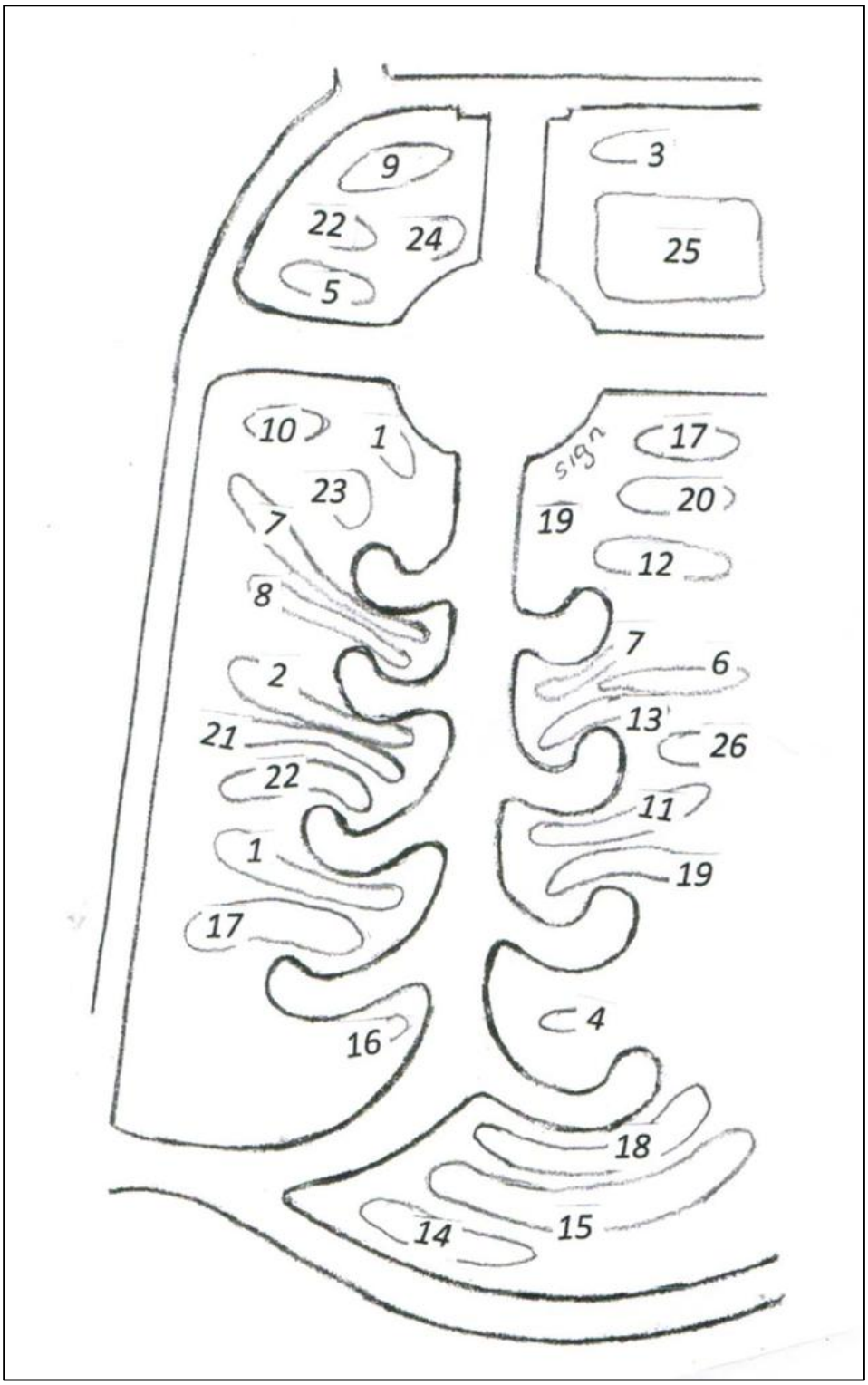
ii) *Pimelea venosa*, the Bolivia Hill Pimelea. According to an article in the Tenterfield Star of July 2018, nine plants were germinated from the last remaining known population of this species in the wild. These were cloned and progeny were distributed to the Royal Botanic Gardens Sydney and the ANBG. They are to be tested genetically to determine the degree of genetic variation amongst them. The hope is that, eventually, a genetically diverse population can be successfully re-established in the wild.

iii)*Correa lawrenceana* var. *genoensis* was collected from the Genoa River area with Keith McDougal, of Regional Operations and Heritage, NSW OEH, Queanbeyan. There are just a few small populations of this plant, one in NSW. A bushfire could destroy the population and may well have done so in January 2020. Seed germination conditions - temperature requirements - need to be assessed.

iv)Several species of *Pomaderris* provide more examples. Genetic analysis of populations of several species to reveal polyploidy etc and investigation of seed germination to find which have the poorest germination ability are being conducted by the collaborative research team from the ANBG, CSIRO, The Australian Botanic Garden Mount Annan and the University of Wollongong. See Taylor, David, 2017 and Chen, Guja and Schmidt-Lebuhn, 2019.

(5) THE SITE, SECTION 189b

A) Site map



1. Asterolasia elegans Rutaceae
2. Boronia deanei Rutaceae
3. Commersonia prostrata Malvaceae
4. Correa lawrenceana var. genoensis Rutaceae
5. Dillwynia crispii Fabaceae
6. Grevillea acanthifolia subsp paludosa Proteaceae
7. Grevillea beadleana Proteaceae
8. Grevillea guthrieana Proteaceae
9. Grevillea renwickiana Proteaceae
10. Leionema westonii Rutaceae
11. Pimelea venosa Thymelaeaceae
12. Pomaderris adnata Rhamnaceae
13. Pomaderris bodalla Rhamnaceae
14. Pomaderris brunnea Rhamnaceae
15. Pomaderris cotoneaster Rhamnaceae
16. Pomaderris elliptica v elliptica Rhamnaceae
17. Pomaderris pallida Rhamnaceae
18. Pomaderris reperta Rhamnaceae
19. Pomaderris walshii Rhamnaceae
20. Prostanthera askania Lamiaceae
21. Prostanthera sp. aff. howelliae Lamiaceae

22. Pultenaea baeuerlenii Fabaceae
23. Rhaphidospora bonneyana, Acanthaceae
24. Westringia kydrensis Lamiaceae
25. Zieria citriodora Rutaceae
26. Zieria obcordata Rutaceae

B) Location
The site of the Conservation and Research Garden, Section 189b, on the far side of the Sydney gully, is readily accessible to the public.
It is conveniently located next door to the old fenced research area (Section 189a). Beyond that there is another area, designated Section 189c, of undeveloped bushland that could be cleared to make way for any future expansion of the Conservation and Research Garden.

C) Environment
Draughts of air flow down from Black Mountain through the site, reducing the danger of frost. Much of the site is protected by numerous *Eucalyptus mannifera* trees providing light shading and further frost protection. The upper part is open and so more suitable for species requiring sunnier conditions.

D) Site preparation
Sandstone and rocky patches were introduced at the top of the site where it is sunny.
For the rest, the naturally present silty clay and Black Mountain rock weren retained. The soil was modified where required for specific plants. There were no funds available for soil analysis.
In the garden beds, low areas and mounds were created to help retain surface runoff and to create conditions of differing soil moisture and drainage to suit each species.

E) Plantings
Within the plantings of each species, specimens have been arranged in clonal groupings: plants grown from cuttings taken from the same parent plant are said to constitute a clone. For the species here, the number of clones ranges from one to 26. Providing links to parentage is of benefit for researchers and for eventual restoration of communities in the wild.

(6) SPECIES IN THE CONSERVATION AND RESEARCH GARDEN (as at January 2020)

The original list of 19 threatened species has grown so far to 26 with the addition of eight species - *Dillwynia crispii, Grevillea acanthifolia subsp paludosa, Leionema westonii*, *Pomaderris adnata, Pomaderris elliptica var. elliptica, Prostanthera askania, Pultenaea baeuerlenii* and *Rhaphidospora bonneyana* - and removal of *Nematolepis rhytidophylla.*

A) Threatened status
The level of threat for each species is noted. Nearly all the current species are listed as threatened species under both the NSW Biodiversity Conservation Act 2016 and the Australian Government Environment Protection and Biodiversity Conservation Act 1999. Species are designated as threatened on the basis of:

- reduced population size,
- restricted geographical distribution or
- the presence of few mature individuals.

A link to a table showing details of criteria for designation appears in the Australian Government Federal register of legislation, listed in the references below under "Australian Government Environment Protection and Biodiversity Conservation Regulations 2000".

The levels of threat are officially described under the NSW system (NSW Government Office of Environment and Heritage: Species Listing Categories) as:

- vulnerable
- endangered
- critically endangered
- extinct in the wild
- extinct.

The Commonwealth (Australian Government Department of Environment and Energy: Biodiversity, Threatened Species And Ecological Communities, Threatened species under the EPBC [Environment Protection and Biodiversity Conservation] Act) has a similar list with the addition of "conservation dependent":

- conservation dependent
- vulnerable
- endangered
- critically endangered
- extinct in the wild
- extinct.

B) Threats faced by these species

Most of these species suffer multiple threats including:

- Fires - too frequent (e.g. if a new generation of plants are killed by fire before they can produce seed, seed stocks are depleted), too severe, inappropriate regimes;
- Grazing and trampling by domestic stock, feral animals such as goats and grazing by macropods;
- Weed invasion;
- Loss of habitat due to expansion of suburbia, agriculture, infrastructure etc.;
- Restricted distribution;
- Small population size, adding to dangers of being wiped out physically and inherent in having a restricted gene pool;
- Climate change.

C) After the 2019/2020 Fires

The threatened status given for each species in subsection E) below is correct according to published details. However, the extensive bushfires over spring and summer of 2019/2020 have impacted the known ranges of many of the species in the C&R garden. The Australian Government Department of Agriculture, Water and the Environment has published (See Wildlife and threatened species bushfire recovery research and resources) the results of a survey of threatened species listed under the EPBC Act 1999 showing the proportion of the range of each species that was affected by fires between 1 August 2019 and 13 January 2020.

Those for which at least 80% of their range was affected include *Nematolepis rhytidophylla* (temporarily removed from the garden, see section 4Bi) and *Pultenaea baeuerlenii;*

50 to <80%: *Boronia deanei*, *Correa lawrenceana var. genoensis, Grevillea beadleana, Grevillea guthreana* and *Pomaderris brunnea;*

30 to <50%: *Pomaderris cotoneaster* and *Zieria citriodora;*

10 to <30%: *Asterolasia elegans* and *Grevillea acanthifolia subsp. paludosa*.

Of course, this does not necessarily mean that these percentages of the occurrence of these species have been completely lost. As the publication put it,

"The vulnerability of each species to fire and the on-ground pattern and intensity of fire have not been incorporated into this analysis. Some species are more tolerant to fire than others or have a greater capacity to recover from fire. The fires will not have impacted all areas within the mapped extent equally."

On the other hand, bushfires continued beyond 13 January so more of the C&R garden's species may have been impacted.

D) Finding out more - Saving our Species program, Recovery plans etc
Full botanical descriptions of each species can be found through the PlantNET FloraOnline website but may be more easily accessed by searching the web using the species name and choosing the PlantNET entry.

The NSW Department of Planning, Industry and Environment provides a wealth of information on threatened plants (and animals) including botanical descriptions, distribution, habitat and ecology, threats, recovery strategies etc which can be accessed through the Threatened biodiversity profile search on the website http://www.environment.nsw.gov.au/threatenedSpeciesApp/. Typing in *Asterolasia elegans*, for example, leads in two steps to the profile for that species at https://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10072. Again, though, it's probably easier simply to search the web for the species directly and choose the relevant Profile, NSW Environment and Heritage website. Most of the species here are included in the *Saving our Species* program. See Addendum 2. Exceptions include *Dillwynia crispii, Leionema westonii* (recently identified)*, Pomaderris elliptica var. elliptic*a and *Prostanthera sp. aff. howelliae* (which has not yet received a taxonomic identification).

The Australian Government Department of Agriculture, Water and the Environment website at http://www.environment.gov.au/biodiversity/threatened/recovery-plans is a valuable resource. Recovery plans (see Addendum 3) for each species can be accessed by searching for the species at the top RHS of the page. A summary of that for *Asterolasia elegans*, for instance, would then appear at http://www.environment.gov.au/resource/recovery-plan-asterolasia-elegans (visited 02/2020), from which the full Recovery plan can be downloaded: http://www.environment.gov.au/system/files/resources/9434e13b-4498-48f4-8f74-39455c83e5e7/files/asterolasia-elegans-recovery-plan.pdf (Visited 02/2020) This gives a lot of detailed information on the plant, the locations and current states of populations, threats and management options etc.
Looking up that Department's website at http://www.environment.gov.au/biodiversity allows one to browse through various topics of general interest. For example, choosing "National Reserve System" and on to "Bush Blitz" provides information on that partnership.

The Australian Government's Department of Agriculture, Water and the Environment website on the Environment Protection and Biodiversity Conservation Act, 1999 is worth a look.

The Canberra Nature Map site gives information on sightings of rare plants in and around the ACT. For example, it shows various recent sightings of *Westringia kydrensis*, expanding on the information provided elsewhere. See https://www.google.com/search?client=firefox-b-d&q=Canberra+Nature+Map

The Bush Blitz organisation website has a lot of interesting information. See http://bushblitz.org.au/

E) Notes on each species

Asterolasia elegans **(No common name)** **Rutaceae**

Status: Endangered (NSW and Commonwealth)
Threats: Fires are a problem: they can be too cool to break seed dormancy or too hot, killing soil-stored seed. Being so close to Sydney, threats are posed by such activities as bush rock removal and rubbish dumping, run off from a sewage treatment plant and storm water. Lack of knowledge of plant. Small, fragmented populations and human activities make the species more vulnerable to climate change.
Distribution: Just to the north of Sydney - Hornsby, Baulkham Hills and Hawkesbury areas. Of seven populations known, only one is wholly within a conservation reserve.
Habitat: Grows on Hawkesbury sandstone in wet sclerophyll forests on moist hillsides.
Description: A slender, erect shrub to 3 m with young branches covered in rust coloured hairs. Long narrow leaves are also hairy, especially on the lower surface. White, densely hairy flowers in clusters of up to nine are prominent.
Notes: The species was first found in 1979 but not documented until 1990.
Specimens initially planted out in the C&R Garden: 17 plants representing 4 clones
Photo: M. Fagg

Boronia deanei **Deane's Boronia** **Rutaceae**

Status: Vulnerable (NSW and Commonwealth)
Threats: The swamps and stream banks of this boronia's habitat are under multiple threats: damage by feral pigs rooting for food; coal and coal seam gas exploration and extraction which are causing subsidence and changes in hydrology; drought and climate change. Invasion of weeds and development of trails and tracks are also threats.
Distribution: From Lithgow, NSW to Nalbangle National Park near the Victorian border.
Habitat: The species grows on the margins of high altitude swamps, in wet heath and in drier open forest on low nutrient, poorly drained peaty soils on sandstone or granite.
Description: Erect shrub to 1.5 m high with warty branchlets. Foliage is aromatic, the lower surfaces of the small narrow leaves are also warty. Flowers in spring with small white to bright pink flowers having petals 4–5mm long, separately or in groups of two or three.
Note: This species is well established in cultivation.
Specimens initially planted out in the C&R Garden: 28 plants representing 6 clones
Photo: M. Fagg

Commersonia prostrata **Dwarf Kerrawang** **Malvaceae**

Status: Endangered (NSW, Victoria and Commonwealth)
Threats: Road works, although disturbance in an area can promote germination and growth; mining operations; trampling by walkers as well as stock; a multitude of weeds including blackberry, lantana and radiata pine; lack of fire which may be needed to stimulate germination and open the canopy; potential spread of *Phytophthora.* Not enough is known about its response to environmental conditions etc to enable good management.
Distribution: In NSW, mainly on the Southern Tablelands but also near Newcastle. In Victoria it is found in central Gippsland.
Habitat: Occurs on sandy and sometimes peaty soils in a wide variety of habitats including woodland and ephemeral wetland.
Description: Prostrate shrub forming dense mats about 30–50 cm diameter and up to 5 cm high, sparsely covered with stellate hairs. Leaves with notched or lobed margins. Flowers in October and November with small pinkish petals in inflorescences of up to 12 flowers.
Specimens initially planted out in the C&R Garden: 15 plants representing 15 clones
Photo: M. Fagg

Correa lawrenceana var. genoensis **Genoa River Correa** **Rutaceae**

Status: Endangered (NSW and Commonwealth), Threatened (Victoria)
Threats: There is risk from floods as well as fires: with few known populations of this species in Victoria and only one in NSW, all small, they could easily be wiped out. Potential blackberry infestation. More needs to be known about its abundance and distribution.
Distribution: Along the lower Genoa River and its tributaries inland from Mallacoota, Victoria. One population only in NSW, in South East Forests National Park near the Victorian border.
Habitat: Riparian forest on a narrow alluvial terrace in sandy soil derived from sandstone or riparian scrub.
Description: A shrub to 2 m high. The oval leaves have thick brown hairs on the lower surface. Flowers are a yellowish green that tend to become reddish with age. Generally flowers in spring.
Specimens initially planted out in the C&R Garden: 29 plants representing 6 clones
Photo: David Cash, ©Copyright Royal Botanic Gardens, Melbourne

Dillwynia crispii **(Crisp's Parrot Pea)** **Fabaceae**

Status: Yet to be classified. Being found within the Morton National Park which has wilderness classification it has a level of protection.
Threats: The narrow distribution renders it vulnerable to fire and other catastrophic events.
Distribution: Mainly in the Budawang Range, with a few records south to Kybeyan, south east of Cooma.
Habitat: Dry sclerophyll woodland, heath and in sandstone crevices.
Description: An erect shrub up to 2.5 m high with smooth red-brown bark. Flowers in Spring and fruits in late December to early January. Flowers have yellow petals with red markings. In all species of *Dillwynia* the standard petal is much broader than long.
Specimens initially planted out in the C&R Garden: 5 plants representing 1 clone
Photo: M Fagg

Grevillea acanthifolia subsp. paludosa **Bog Grevillea** **Proteaceae**

Status: Endangered (NSW and Commonwealth)
Threats: High risk of extinction in the wild as the small range and population size makes it vulnerable to local extinction from catastrophic events. Trampling and grazing by stray domestic horses, disturbance by deer as well as breakage and collection by humans.
Distribution: The species *G. acanthifolia* has three disjunct populations on the Great Dividing Range of New South Wales. The subspecies *paludosa* is a relatively recent discovery from the Nalbaugh National Park south-east of Bombala and the Bega Swamp, New South Wales.
Habitat: Found with other vegetation on low hummocks within peaty swamps.
Description: A large prickly spreading shrub up to 3 m high and around 5 m across. Ridges run along the branchlets. Flowers are pink to purple in colour and the bright green leaves are lobed with sharp pointed tips. Flowers from spring to early summer.
Specimens initially planted out in the C&R Garden: 9 plants representing 5 clones
Photo: Brian Walters

Grevillea beadleana **Beadle's Grevillea** **Proteaceae**

Status: Endangered (NSW and Commonwealth)
Threats: Although hot fires are needed for germination, too-frequent fires inhibit regeneration ; small populations; habitat being cleared for development; grazing and trampling by domestic stock and feral goats; trampling by people and illegal collection of plants.
Distribution: Known from four separate areas of north eastern NSW: west of Tenterfield, south-west of Grafton, Oxley Wild Rivers National Park, Guy Fawkes River NP. Originally found near Walcha in the late nineteenth century.
Habitat: Collected from granitic soils on the edge of escarpments in dappled open woodland. Usually found on steep slopes at high altitudes.
Description: Spreading shrub up to 2.5 m high and wide. Soft leaves are mostly large and dissected with the lower surface densely hairy. Scarlet flowers on a "toothbrush" inflorescence appear mainly in winter and spring.
Notes: Named only in 1986 after its rediscovery in 1982. Named after Professor Beadle, foundation professor of Botany at the University of New England. Excellent as an ornamental, it quickly made its way into nurseries (hence illegal collection). (See Australian Plants Society NSW *Grevillea beadleana*)
Specimens initially planted out in the C&R Garden: 9 plants representing 9 clones
Photo: M. Fagg

Grevillea guthrieana **Guthrie's Grevillea** **Proteaceae**

Status: Endangered (NSW and Commonwealth)
Threats: Too-frequent fires can inhibit regeneration; root rot fungus (*Phytophthora cinnamomi*); competition from infestation of privet; inappropriate land management; changes in land use.
Distribution: North coast of NSW, in the Booral - Bulahdelah area and on the Carrai Plateau, SW of Kempsey. Also Oxley Wild Rivers National Park.
Habitat: Collected from granitic soils on the edge of escarpments in dappled open woodland. It is also found on sandstone based loams near creeks in moist forest.
Description: Shrub usually 1.5–2 m high. Young branchlets and underside of leaves hairy, leaves up to 60x9 mm. Green flowers in small inflorescences drooping on a long peduncle. Flowers in spring.
Notes: See Fronds No.83, August 2016. Cuttings were collected on a Bush Blitz trip to Oxley Wild Rivers National Park, excellent cutting material being found on new growth of plants that had been burnt two years previously. More than 800 plants were propagated from them There was no seed.
Specimens initially planted out in the C&R Garden: 17 plants representing 17 clones
Photo: M. Fagg

Grevillea renwickiana **Nerriga Grevillea** **Proteaceae**

Status: Endangered (NSW), not listed (Commonwealth)
Threats: Response to fire is unknown but lack of seed production could make the species more vulnerable; potential for *Phytophthora cinnamomi* infestation; pigs; roadworks and fire suppression activities; land management practices.
Distribution: Restricted to a small area between Mongarlowe (Nettletons Creek) and Nerriga, NSW.
Habitat: Low dry sclerophyll woodland or heath, particularly on sandy or loamy soils near damp areas. Sample collected by roadside on sandstone in dry sclerophyll forest.
Description: A prostrate, root-suckering shrub forming very large mats. Flowers are cream to pale pink, appearing in summer. Fruits have not been found.
Notes: Seed production is unknown in this species. Samples of this local, threatened, species were collected on Nerriga road. Rather than an example of collaboration, it is a collection unique to the ANBG but even so, the NSW Office of Environment and Heritage (Keith McDougall) knows, for possible future use, that it is available in the ANBG.
Specimens initially planted out in the C&R Garden: 2 plants representing one clone
Photo: R. Hotchkiss

Leionema westonii **(No common name)** **Rutaceae**

Status: Satisfies IUCN (2016) criteria as Critically endangered. Recommended as such to NSW and Commonwealth bodies.
Threats: Extremely restricted distribution thus vulnerable to stochastic events such as fire; grazing by feral goats.
Distribution: One known small population of fewer than 50 plants, near the rim of a gorge in the Macleay Gorges area of Oxley Wild Rivers National Park about 40km ENE of Walcha on the NSW Northern Tablelands.
Habitat: Grows on a fairly flat area with loamy soil in woodland with *Eucalyptus campanulata*, *Allocasuarina littoralis* and *Poa sieberiana* at an altitude of ca 1000 m
Description: Much branched, rhizomatous shrub to 70cm tall. Stems and leaves softly hairy. Leaves narrowly elliptic or linear with revolute margins, 6 - 16 mm long. Flowers in terminal cymose inflorescences have white, spreading petals 4 - 4.6mm long . Flowers have been seen in February and May, but no fruits have been seen.
Notes: This species was discovered in 2004. It was first thought of as being similar to *Leionema gracile* but in 2018 was given the new species name *L. westonii* (see Copeland and Telford, 2018).
Specimens initially planted out in the C&R Garden: 27 plants representing 8 clones
Photo: J.J. Bruhl

Pimelea venosa **Bolivia Hill Pimelea** **Thymelaeaceae**

Status: Endangered (NSW and Commonwealth)
Threats: Any existing populations in the wild could easily be wiped out by clearing, by fire or by the depradations of grazing or browsing animals, while stems may be attacked by caterpillars.
Distribution: This rice-flower species is known only from the Bolivia Hill area south of Tenterfield, NSW. Surveys at known sites and potential habitat conducted in 1999 found no plants. Sites that were burned by wildfire were re-surveyed in 2012 in hopes of post-fire sprouting but no plants were seen. One new population of the species was discovered in that year.
Habitat: Bolivia Hill Pimelea has been recorded on deep granite soils or black sandy soils between granite boulders in open woodland.
Description: This upright shrub has stems and leaves densely covered with whitish, soft, spreading hairs. The dull green leaves are narrowly oval-shaped or slightly wider at the end. Veins on the leaves are prominent and brown. The small white flowers are bisexual and are covered in coarse hairs. Flowers grow in heads of two to six. Leaf clusters are often terminal on straggly bare stems. Flowers typically from October to December.
Notes: Although listed as Endangered, this species appears to be on the verge of extinction in the wild, especially since the population discovered in 2012 has apparently since died out. See paragraph under Section (4)Fii on page 7.
Specimens initially planted out in the C&R Garden: 19 plants representing 4 clones
Photo: M. Fagg

Pomaderris adnata **Sublime Point Pomaderris** **Rhamnaceae**

Status: Endangered (NSW), not listed (Commonwealth)
Threats: Due to the small population size and very limited distribution, the species is susceptible to catastrophic events. It is killed by fire. It is also subject to invasion by weeds and to disturbance by roadside maintenance, vehicles and the dumping of rubbish.
Distribution: Found only at Sublime Point on the Illawarra escarpment, north of Wollongong.
Habitat: This species grows in heathy woodland and dry sclerophyll forest dominated by *Eucalyptus sieberi* and *Corymbia gummifera* with occasional *Hakea salicifolia* and an understorey of *Acacia suaveolens*.
Description: A spreading shrub 1–2 m high, new growth pubescent with greyish starry hairs. The leaves are narrow oval to an extended oval shape, 1.5–3 cm long, 3–8 mm wide; upper surface smooth and lower surface hairy with greyish starry hairs and prominent secondary veins. The flowers are pale yellow, in short clusters forming narrow panicles. Unlike similar *Pomaderris* species, petals are usually present on most flowers. The capsule and ovary are hairy.
Specimens initially planted out in the C&R Garden: 11 plants representing 4 clones
Photo: A.E. Orme

Pomaderris bodalla **Bodalla Pomaderris** **Rhamnaceae**

Status: Vulnerable (NSW), not listed (Commonwealth)
Threats: If fires occur at high frequency seed stores would be depleted. Two populations occur on private land and potentially suffer from stock damage or clearing operations. Several populations are small and so could easily become locally extinct. Residential development, road maintenance and logging operations also threaten this species.
Distribution: *Pomaderris bodalla* is endemic to NSW and known to occur in two areas: the south coast between Bodalla and Merimbula, and the upper Hunter valley near Muswellbrook and Murrurundi. There are ten populations definitely known. The largest is in Wollemi National Park and is unlikely to include more than one thousand plants.
Habitat: On the NSW south coast, it occurs in moist open forest in sheltered gullies or along stream banks. In the upper Hunter valley, it occurs in open forest or woodland on open slopes.
Description: *Pomaderris bodalla* is a shrub 2–4 m tall. The young stems have both rusty and greyish hairs. The broad leaves are mostly 2–3 cm long with entire margins. The upper surface is dark green and glabrous while the lower surface has sparse, spreading rusty hairs above short greyish stellate hairs. The flowers, which have no petals, are cream and occur in dense panicles.
Specimens initially planted out in the C&R Garden: 9 plants representing 9 clones
Photo: PlantNet NSW FloraOnline

Pomaderris brunnea **Brown Pomaderris** **Rhamnaceae**

Status: Endangered (NSW and Victoria), Vulnerable (Commonwealth)
Threats: Variously forestry activities, clearing for residential development, frequent burning because of proximity to this and trampling by people; grazing and other damage by deer and grazing by cattle and macropods. Invasion by weeds such as African lovegrass and canopy thickening in areas of the southern Cumberland Plain are also threats.
Distribution: Brown Pomaderris is found in a very limited area around the Colo, Nepean and Hawkesbury Rivers, including the Bargo area and near Camden. It also occurs near Walcha on the New England tablelands and in far eastern Gippsland in Victoria.
Habitat: Brown Pomaderris grows in moist woodland or forest on clay and alluvial soils of flood plains and creek lines.
Description: A shrub 2–3 m tall. The stems have long brownish hairs above a short white hairy layer. The leaves are up to 4 cm long and 1.5 cm wide and have toothed margins. The upper leaf surface is dark green and glabrous; the lower surface is hairy like the stem. The small, yellowish flowers have no petals and form dense clusters at the ends of the branches. Flowers appear in September and October.
Note: Life expectancy for plants is 10–20 years while time to maturity is 4–6 years.
Specimens initially planted out in the C&R Garden: 17 plants representing 17 clones
Photo: NSW OE&H Threatened Species App. Brown Pomaderris profile

Pomaderris cotoneaster **Cotoneaster Pomaderris** **Rhamnaceae**

Status: Endangered (NSW, Vic. and Commonwealth)
Threats: It is thought that catastrophic events such as fire could have led to the fragmentation of its distribution. Reduction or elimination of fuel reduction fires near populations have been recommended. Other threats include trampling by people and invasion by weeds.
Distribution: Small isolated populations have been found, mostly in National Parks (NPs), in the NSW central and southern coasts and tablelands. These include Kosciuszko NP near Tumut, the Tantawangalo area of the South East Forests NP, Bungonia State Conservation area and Kanangra-Boyd NP. It has also been recorded along the Genoa River in Victoria.
Habitat: Cotoneaster pomaderris is found in forest, in rocky areas near creeks or in steep gullies; also on deep friable soil.
Description: Cotoneaster pomaderris is a shrub which grows to 4 m tall. The young stems are covered with short, white, radiating hairs. Its leaves are oval, to 3 cm long with a sometimes indented tip. The upper leaf surface is bristly while the lower has a fine white mat of hairs. Its creamish petal-less flowers, clustered in short panicles, appear between October and November.
Notes: Little is known about the ecology of the species. Plants seemingly dead due to drought have been found to re-sprout from the stem.
Specimens initially planted out in the C&R Garden: 26 plants representing 26 clones
Photo: © John Briggs

Pomaderris elliptica var. elliptica **Smooth Pomaderris** **Rhamnaceae**

Status: The smooth pomaderris does not appear to be listed as threatened on either State or Commonwealth sites.
Distribution: Coast and tablelands of NSW, Victoria and Tasmania.
Habitat: Moist forests
Description: Shrub to 4 m high. Branchlets are covered in fine, short hairs. Leaves are ovate, elliptic or narrow elliptic, 30 to 90 mm long. The upper surface is glabrous, the lower surface densely covered in tiny hairs. Pale yellow flowers occur in September to December.
Specimens initially planted out in the C&R Garden: 2 plants representing 1 clone
Photo: Murray Fagg

Pomaderris pallida **Pale Pomaderris** **Rhamnaceae**

Status: Vulnerable (NSW and Commonwealth)
Threats: The Queanbeyan River population is threatened by rural residential development.
Isolated small populations are likely to have low genetic diversity, and be at higher risk of loss from random events. Browsing and grazing by feral animals - deer, goats and potentially horses (brumbies!) as well as grazing by stock. It is also threatened by fire, flood and invasion by weeds.
Distribution: Pale Pomaderris has been found in and around the ACT near the Murrumbidgee, Cotter, Paddy's, Queanbeyan and Shoalhaven rivers, in the Byadbo area of Kosciusko National Park and in eastern Victoria
Habitat: This species usually grows in shrub communities surrounded by Brittle Gum (*Eucalyptus mannifera*) and Red Stringybark (*E. macrorhyncha*) or *Callitris* spp. woodland.
Description: Pale pomaderris is a small, compact, rounded shrub to 1.5 m tall. It has small, softly hairy narrow or oval leaves up to 18 mm long. The upper surface is pale green and the lower surface, greyish-white. The small flowers are pale yellow with five sepals but no petals. They occur in clusters towards the ends of the outer branchlets. Flowering occurs from mid September to December.
Notes: There is a lack of knowledge regarding dormancy thresholds, seed vigour and seedling and plant performance for this species, which is known to be triploid.
Specimens initially planted out in the C&R Garden: 7 plants representing 7 clones
Photo: NSW OE&H Threatened Species App. Pale Pomaderris profile.

Pomaderris reperta **Denman Pomaderris** **Rhamnaceae**

Status: **C**ritically endangered (NSW and Commonwealth)
Threats: Despite the production of abundant seed, low population numbers and restricted distribution make the species susceptible to extinction. The largest population of *Pomaderris reperta* may be threatened by impacts associated with open cut coal mining, such as clearing of native vegetation, changes in hydrology and road maintenance or widening.
Distribution: *Pomaderris reperta* is currently known from three populations on a single ridgeline in the Denman area in the upper Hunter Valley, New South Wales. It is not currently known to occur in any conservation reserves. Moreover, one population occurs on land that is the subject of an approved open cut coal mine.
Habitat: Dry sclerophyll woodland with sandy loam soils on sandstone or conglomerate.
Description: *Pomaderris reperta* is a shrub growing 1–3 m high. The young stems have rusty hairs. Leaves are oval, 1.3–5 cm long, 8–20 mm wide with a rounded apex. The upper surface is green and velvety while the lower surface has both rusty and dense white or greyish hairs. The veins are raised and prominent on the lower surface. Flowers are creamy, in short dense panicles and may occasionally have 1–3 petals. They occur around October–November.
Specimens initially planted out in the C&R Garden: 20 plants representing 7 clones
Photo: PlantNet Flora Online

Pomaderris walshii **Carrington Falls Pomaderris** **Rhamnaceae**

Status: Critically endangered (NSW), not listed (Commonwealth)
Threats: Being in the riparian zone of a high rainfall area, floods are an important threat, as are changes in rainfall patterns etc in ongoing climate change. Altered fire regimes could also threaten survival. The tiny population size imposes genetic problems. Grazing and the potential for changed land use are additional threats for the population on private land.
Distribution: Upper Kangaroo River and its tributaries, above Carrington Falls, south-east of Robertson, NSW. There are only two populations known, one in Budderoo National Park and the other, within a few kilometres, on private land.
Habitat: Riparian shrubland dominated by Black wattle, Coachwood and *Grevillea rivularis* and open grassy forest.
Description: A shrub or small tree up to 3 m tall with young stems and petioles hairy. Leaves up to 60 mm long and 22 mm wide, green and glabrous on the upper surface, hairy below. Flowers July to November with an inflorescence of ca. 20–100 cream to yellow flowers.
Notes: Costa Georgiadis, who helped children plant two specimens of this species, had been on the early 2017 collecting trip to the Budderoo National Park where they took cuttings and collected seeds. See video of this entitled "Costa and the Plight of the Pomaderris - Saving Pomaderris walshii" at https://www.youtube.com/watch?v=eYG-9mgusxY
Specimens initially planted out in the C&R Garden: 20 plants representing 7 clones
Photo: M. Bush. Two plants growing in the Pomaderris Garden.

Prostanthera askania **Tranquility Mintbush** **Lamiaceae**

Status: Endangered (NSW and Commonwealth)
Threats: This species is threatened by urban development, with habitat loss due to clearing and roadside maintenance, competition with weeds especially lantana, dumping of rubbish, removal of rocks and altered drainage flows, trampling by people and damage from trail bikes etc. Other threats include fire, the effects of climate change and dieback resulting from *Phytophthora cinnamomi*.
Distribution: Ten populations are known, all within a very limited range around the upper reaches of several creeks in the Wyong and Gosford area on the NSW central coast.
Habitat: On flat to moderate slopes found on Narrabeen sandstone in moist sclerophyll forest and warm temperate rainforest communities.
Description: A shrub up to 3m tall with ovate leaves 12–20 mm long and 8–18 mm wide. Leaves are a dull dusty green and densely covered with long hairs. Flowers are pale mauve to mauve. Flowering occurs mainly in spring.
Specimens initially planted out in the C&R Garden: 10 plants representing 2 clones
Photo: T.M. Tame ©The Royal Botanic Gardens & Domain Trust

Prostanthera sp. aff. howelliae **(No common name)** **Lamiaceae**

Status: Yet to be classified
Threats: Susceptible to extinction due to its small known population size and limited distribution.
Distribution: As distinct from *P. howelliae*, this plant is known only from the Oxley Wild Rivers National park.
Habitat: Collected from granitic soils on the edge of an escarpment in dappled open woodlands.
Description*: Prostanthera howelliae,* similar to this plant, is described as an erect or low spreading shrub to 1 m high with branches densely covered with short hairs. It has small, fragrant leaves. It flowers in spring, the petal tube being pink to purple-mauve and spotted inside the tube.
In this as yet un-named species, the leaves in the Conservation and Research garden examples appear to be longer than those of *P. howelliae*, narrow and almost sickle shaped rather than the narrow egg-shaped leaves of *P. howelliae*. Also, whereas *P. howelliae* flowers are found singly in leaf axils, these flowers seem, from the photograph and observation of plants in the C&R Garden, to occur in small clusters or spikes.
Notes: This plant was discovered by Patrick Lupica in 2007 in the Oxley Wild Rivers National Park on the Northern Tablelands of NSW. Initially thought close to *Prostanthera howelliae,* it is now considered closer to *P. hirtula*. For the present, though, until given a new species name, we were advised that it could remain as *Prostanthera sp. aff. howelliae.* It may still appear on plant labels and on ANBG websites as simply *P. howelliae*.
Specimens initially planted out in the C&R Garden: 27 plants representing 9 clones
Photo: Lachlan Copeland. It appeared in a Parks Australia blog posted on 21 December 2015 and in Fronds 83, August 2016.

Pultenaea baeuerlenii **Budawangs Bush pea** **Fabaceae**

Status: Vulnerable (NSW and Commonwealth)
Threats: *Phytophthora cinnamomi* and *Armillaria spp*. are considered likely to cause reduced vigour and death. In prolonged absence of fire, species such as Coral fern can dominate.
Distribution: Found at a few sites only in Morton and Budawang National Parks
Habitat: Swampy heathland on sandstone.
Description: A small erect shrub, usually less than 1 m tall. Narrow leaves 10-15 mm long and warty. Flowering is usually in Spring, with orange and yellow 'egg-and-bacon' pea shaped flowers in dense terminal inflorescences.
Specimens initially planted out in the C&R Garden: Three plants representing one clone
Photo: J. Plaza, Botanic Gardens Trust

Rhaphidospora bonneyana **(No common name)** **Acanthaceae**

Status: Presumed extinct **(**NSW), Vulnerable (Queensland)
Threats: "Habitat loss, disturbance and modification" (NSW Government), **"**Overgrazing by feral goats and macropods." (Australian Government)
Distribution: Darling River system region. In far north western NSW, two populations had been found in the 19th century near Mt. Murchison and towards the Paroo-Darling National Park; several populations are known in south western and central Qld.
Habitat: Can be found in gullies but mainly on rocky ground on hilltops and escarpments in association with several *Acacia* species.
Description: A small, very open shrub to 40 cm high with spine-like branchlets. The largely stalkless leaves are small and narrow, up to 8 mmx1 mm. The flowers, which occur in clusters of up to five on long axillary stalks, have pale lilac or white petals forming a tube and red spots on the lower lip. Flowers have been found from March to October, probably following good rainfall.
Notes: Seed was collected by Rosemary Purdie in April 1984 in the Gowan Range between Charleville and Longreach in central Qld. Since then, plants have been maintained in the nursery permanent pot collection. A number of plants have been thriving in Section 220 over the past ten and five years. All current plants are derived from cuttings from the one lineage.
Specimens initially planted out in the C&R Garden: 10 specimens representing one clone
Photo: M. Fagg

Westringia kydrensis **Kydra Westringia** **Lamiaceae**

Status: Endangered (NSW and Commonwealth)
Threats: Burning of *Allocasuarina nana* heathland and too-frequent fires may have an impact on this species. Restricted distribution and small population sizes.
Distribution: Occurs in the southern tablelands of NSW, east and south-east of Cooma at Kydra Reefs, Coolumbooka Nature Reserve, Dangelong Nature Reserve, Coolangubra State Forest, and Countegany, NSW.
Habitat: Grows in heathland with larger shrubs of *Allocasuarina nana* and *Banksia canei*. Grows on shallow rocky granite or quartzite soils.
Description: An erect shrub to 40 cm tall. The leaves occur in whorls of three around the stems. The leaves are hairy when young. The flowers are like mint-bush flowers; white with a few reddish dots at the base of lobes. Fruit are unknown.
Specimens initially planted out in the C&R Garden: 19 plants representing 9 clones
Photo: M. Fagg

Zieria citriodora **Lemon Zieria** **Rutaceae**

Status: Endangered (NSW), Vulnerable (Vic. and Commonwealth)
Threats: One of the sites is on private land and the interest of the owners in protecting this species is currently unknown. Also there is potential for rural-residential development to adversely impact the populations near Numeralla. Browsing by native herbivores and domestic stock occurs. Too-frequent fires could be a problem, reducing seed stocks, however mature plants have been found to sprout well after a fire.
Distribution: This species is known from small populations at just two sites in NSW - Numeralla and Kybean Trig - east of Cooma and one in Victoria. All sites are at altitudes of 800–1,000 m.
Habitat: Lemon Zieria grows in low woodland of *Eucalyptus mannifera, E. macrorhyncha and E. dives* with a shrub understorey.
Description: Like the genus *Boronia, Zieria* species have four-petalled flowers and aromatic foliage, although *Zieria* species differ in having leaves with three leaflets. Lemon Zieria has small hairy leaves. It is a low, lemon-scented shrub, no more than 15 cm tall. It develops rhizomes. The one to three pink or white flowers are produced in leaf axils. Flowering occurs from late winter to summer.
Note: This species is thought to have been rare even prior to European settlement.(see Sutter, Geoff)
Specimens initially planted out in the C&R Garden: 79 plants representing 26 clones
Photo: M. Fagg

Zieria obcordata **Granite Zieria** **Rutaceae**

Status: Endangered (NSW and Commonwealth)
Threats: Disturbance, grazing and browsing by domestic stock and goats, grazing by wallabies, weed invasion (numerous exotic forbs, grasses and Tree of Heaven), degradation of habitat.
Distribution: Occurs on a total of seven sites, all on private land, near Wellington, NSW and 100km away NW of Bathurst. Horticulturists at the ANBG developed a successful propagation meth od and 46 plants derived from cuttings were established in the wild in 2011. (News at the ANBG)
Habitat: Grows in eucalypt woodland or shrubland dominated by species of *Acacia* on rocky hillsides. Also occurs in *Eucalyptus* and *Callitris* dominated woodland with an open, low shrub understorey on moderately steep, mainly west to north-facing slopes in sandy loam amongst granite boulders. The altitude range of sites is 500–830 m.
Description: Dense, rounded, perennial shrub to 50 cm high. Leaves have 3 wedge-shaped leaflets and are covered with small warts on the upper surface. Flowers have 4 petals, pale pink rapidly fading to white. The main flowering period is in spring (September-October), but plants tend to have flowers present throughout the year.
Note: Authorities were alerted by a landowner to reduced plant numbers on his property.
Specimens initially planted out in the C&R Garden: 8 plants representing 8 clones
Photo: M. Fagg

ADDENDUM 1 - THE ANBG's BIODIVERSITY CONSERVATION POLICY

As you would know, Australia has a large and diverse flora and a huge percentage of species endemic to the country. While the many other botanic gardens in Australia play a significant role in conservation, the ANBG with *"perhaps the most comprehensive display in existence of living Australian native plants... is thus in a unique position to play a leading role in the conservation of Australia's native flora and vegetation."* (ANBG Biodiversity Conservation Policy document, 1998, Introduction)

The ANBG Biodiversity Conservation Policy document, May 1998 is well worth exploring. The Background section includes the statement:
"A conservation collection has been developed at the ANBG, initially focusing on Australia's rare or threatened plants but more recently geared towards interpretation and education programs which reflect and advance the ANBG's commitment to its conservation role. The collection has also focused more recently on genetic diversity research to provide the stock needed for endangered species recovery program."

ADDENDUM 2 - NSW GOVERNMENT SAVING OUR SPECIES PROGRAM

The *Saving our Species* program is a statewide program under the NSW Department of Planning, Industry and Environment that aims to secure threatened plants and animals in the wild in NSW. The program:

- *consults extensively with experts and applies independent peer reviewed science to species, populations of a species and ecological communities projects*
- *takes a rigorous and transparent approach to prioritising investment in projects that ensure benefit to the maximum number of species*
- *provides targeted conservation projects that set out the actions required to save specific plants and animals on mapped management sites*
- *regularly monitors the effectiveness of projects so they can be improved over time*
- *provides annual report cards on threatened species where actions are underway*
- *encourages community, corporate and government participation in threatened species conservation by providing a website and a database with information on project sites, volunteering and research opportunities.*

(NSW Government Department of Planning, Industry and Environment: Saving Our Species Program, The Program)

ADDENDUM 3 - RECOVERY PLANS - AUSTRALIAN GOVERNMENT AND NSW GOVERNMENT

Recovery plans are prepared under the Environment Protection and Biodiversity Conservation Act 1999 on behalf of the Commonwealth Government and are administered and approved by the Commonwealth Minister.

Recovery plans set out the research and management actions necessary to stop the decline of, and support the recovery of, listed threatened species or threatened ecological communities. The aim of a recovery plan is to maximise the long term survival in the wild of a threatened species or ecological community. (http://www.environment.gov.au/biodiversity/threatened/recovery-plans)

The NSW Biodiversity Conservation Program and associated Saving our Species have replaced the NSW recovery plans though existing ones continue. (https://www.environment.nsw.gov.au/topics/animals-and-plants/threatened-species/programs-legislation-and-framework/recovery-plans)

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