Threatened Species Walk 2022

This walk was developed by Naarilla Hirsch as a Themed Rostered walk offered in May 2022.
Generally, this walk is about threatened species of plants. Specifically, we want to tell visitors about:

- different types of threats to ecological communities and plant species,
- ANBG conservation activities,
- why it is important to conserve plants.

By the end of this walk we want visitors to understand:

- the impact of a range of human individual and community activities on plant and ecosystem survival,
- the importance of a scientific approach in conservation.

Alternatives for Motorised Wheelchairs and Scooters

Stops 1 to 3 can be done as is
Stop 4 will need to be missed as wheelchairs will need to go around the end of the VIC along the road to the top of the grassy woodland garden

- Some of the information for this stop can be picked up as part of stop 12

Stop 5 can be done as is
Stops 6 and 7 could be done by doing stop 6 then backtracking and going straight down to stop 7 from the carpark

- This will take extra time
- An alternative is to go along the edge of the carpark to the path leading down to stop 7, follow this as it loops down through the Tassie garden, and pick up the last part of stop 6 from above
    - So you can talk about *Eucalyptus morrisbyi* and *E. risdonii*
    - Or alternatively the *E. morrisbyi* story can be told on Banks walk and you just do stop 7

The route from stop 7 to stop 8 will need to be up to the café bridge and around to the Banksia garden this way rather than across the lower Tassie rainforest bridge
Stops 7 to 10 can be done as is
To get from stop 10 to stop 11 you'll need to backtrack up to the road that goes past the treehouse entrance and along it to the Pomaderris garden
Stop 11 can be done as is
Stop 12

- There is a little bump to get onto the path that scooters should be able to manage. If not the *Triplarina imbricata* plant is visible from the road. You could leave the group on the road and point it out to them, then come back and talk about it.
- Alternatively, the pathogen story could be told at the *E. imlayensis*/*E. langleyi* stop or any of the stops with *Eucalyptus morrisbyi*, since all can be affected by both pathogens
- And you can go up the main path a short distance to see the *Homoranthus proxilis*

Stop 13 can be done as is

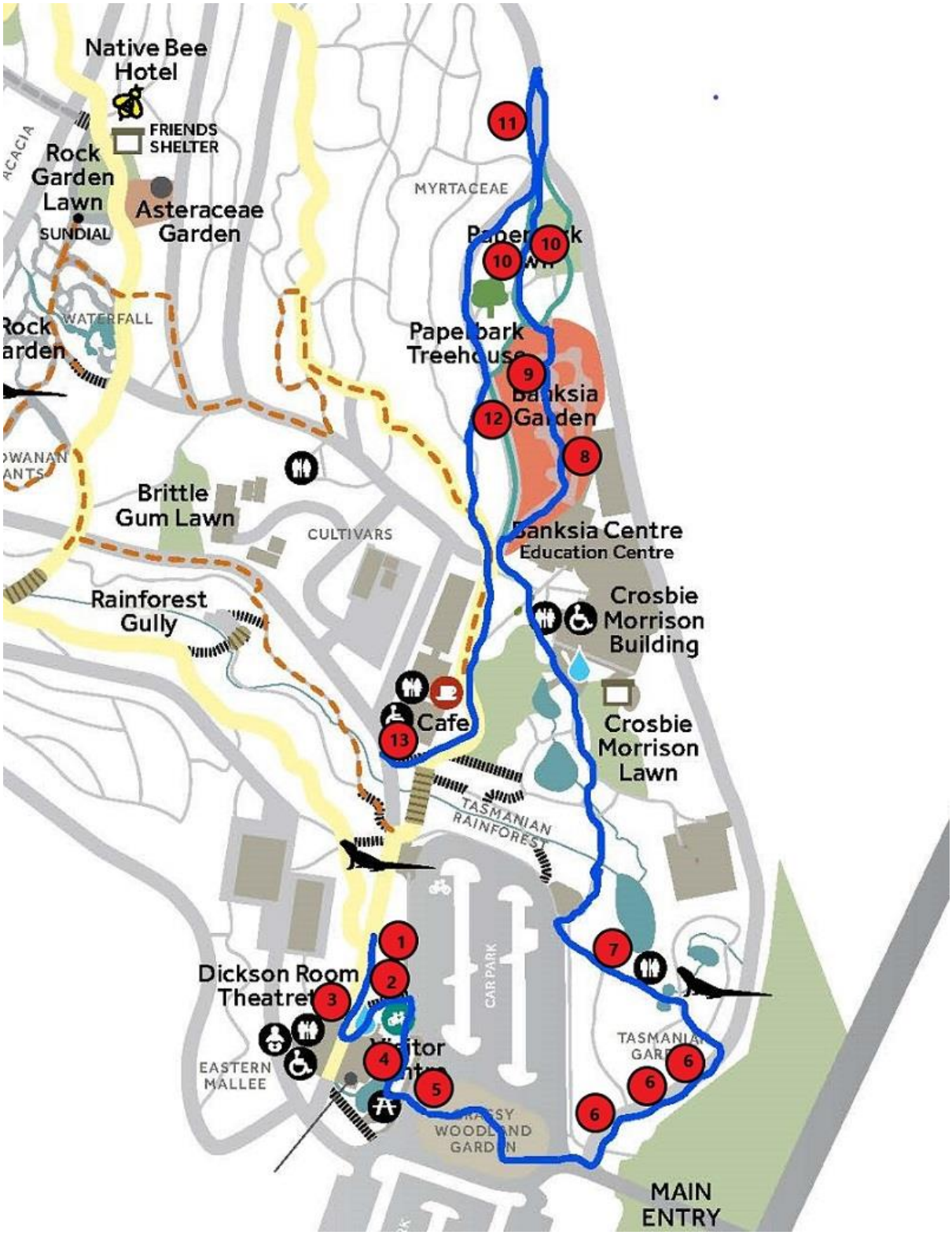
Alternative for Backup Guide

Start at the grassy woodland garden (stop 5), go around from 5 to 13, then come along Banks walk to do stops 1, 2, and 4, coming up to finish at stop 3 (VIC entrance).

Summary of Stops

Stop	Location	Theme	Plant or ecosystem
1	Concourse near Banks statue	Biodiversity Genus with many threatened species	Group of plants *Zieria citriodora*
2	Top of VIC steps	Impact of urbanisation Impact of fire regimes	*Acacia pubescens* *Eucalyptus langleyi*
3	Outside VIC	Why are alpine ecological communities important? How some threats worsen others The ANBG's contribution to alpine conservation Relict species with multiple threats Well adapted but threatened	Alpine Sphagnum Bogs and Associated Fens ecological community *Wollemia nobilis* *Acacia aphylla*
4	Ramp under VIC	Genus with many threatened species Different types of threats	*Homoranthus lunatus* *Homoranthus binghiensis* *Homoranthus papillatus*
5	Grassy woodland garden	Development as a continual threat Genetics ANBG conservation activities	Yellow box – red gum grassy woodland *Rutidosis leptorrynchoides* *Swainsona recta*
6	Road below Tassie garden	Weeds as a threat Rescuing a species Rare but not listed	*Zieria collina* *Eucalyptus morrisbyi* *Eucalyptus risdonii*
7	Tassie garden near toilet path	What to list Climate change	*Athrotaxis x laxifolia*
8	Main path into Banksia garden	Habitat Is it really threatened?	*Banksia brownii* *Banksia vincentia*
9	Far end of Banksia garden	Varieties: listed or not? Mining as a threat	*Banksia sphaerocarpa* var *dolichostyla*
10	Path into bottom of tree house	Impact of a catastrophic event Insurance populations Threatened ecological community	*Eucalyptus imlayensis* *Melaleuca ericifolia* forest
11	Pomaderris garden Further up this path	ANBG role Horticulture Examples of threatened *Pomaderris* species Conservation and Research garden	Pomaderris garden *P. pallida, P. cotoneaster, P. walshii, P. brunnea*
12	Path above Banksia garden	Fragility of regeneration Plant pathogens as a threat Other example of threatened species	*Triplarina imbricata* *Homoranthus proxilis*
13	Outside the café	Biodiversity – a different type of threatened plant	*Astelia Australiana*

Map


Native Bee Hotel
FRIENDS SHELTER
Rock Garden Lawn
SUNDIAL
Asteraceae Garden
WATERFALL
Brittle Gum Lawn
CULTIVARS
Rainforest Gully
MYRTACEAE
Banksia Centre
Education Centre
Crosbie Morrison Building
Crosbie Morrison Lawn
Cafe
TASMANIAN RAINFOREST
CAR PARK
Dickson Room
EASTERN MALLEE
MAIN ENTRY
1
2
3
4
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10
11
12
13

Walk notes

Introduction

Themes

- The diversity of threatened plant species and communities on show in the ANBG
- The range of threats faced by these plants and communities
- The critical role the ANBG plays in their conservation

Threatened species - definitions

What is a threatened species?

- A plant that meets certain criteria under threatened species legislation and has been listed under that legislation, either at Commonwealth or State/Territory level
- Commonwealth is the EPBC (Environment Protection and Biodiversity Conservation) Act
- Categories are extinct, critically endangered, endangered and vulnerable

Extent of threatened species

What can be listed?

- **Plant species**
  - Many different plant families and groups, including trees, shrubs, small plants, lilies
  - Plants from common families as well as more unusual ones
- **Ecological communities**
  - A group of native plants, animals and other organisms that naturally occur together and interact in a unique habitat.
  - Species within each ecological community interact with and depend on each other
  - Listing them is a form of landscape or systems level protection, since these communities provide vital wildlife corridors and habitat refuges for many plant and animal species
- **Threatening processes**: those affecting plants include
  - Land clearance for agriculture, urban development and infrastructure (e.g. roads, power lines)
  - Invasion by garden escapees, and by novel biota, i.e. weed invasion
  - Land degradation by feral animals –rabbits, goats, pigs – includes grazing as well as destruction such as via pig wallows
  - Dieback due to the root-rot fungus *Phytophthora cinnamomic* – also other pathogens
  - Climate change – due to more droughts and bushfires, increasing temperatures and the inability of threatened plant species to move to more suitable climates

How big is the problem?

- At the start of 2022, about 1,400 plant species and 92 plant communities were listed nationally
  - Critically endangered: about 220 plant species and 43 plant communities
  - Endangered: about 556 plant species and 47 plant communities
  - Vulnerable: about 586 plant species and 2 plant communities
- A number of others nominated but not been through the assessment process yet

Other common threats

- Small fragmented populations
- Grazing by stock or native herbivores such as kangaroos
- Inappropriate fire regimes

During the walk we will explore these in more detail, and also other threats that apply to a smaller group of plants/communities on the walk

What is being done?

Commonwealth government

- Threatened Species Commissioner
- Threatened Species Strategy 2021-2031
  - 100 priority species, 20 priority places
  - Of the 30 plant species, we will see three on this walk

NSW government – Saving our Species program

- A state-wide program aiming to secure threatened plants and animals in the wild:
  - Applies expert advice and science to projects
  - Prioritises targeted conservation projects
  - Monitors the effectiveness of projects

ACT government – strategies and action plans to guide conservation efforts

Specific government sponsored projects following the 2019 bushfires

Role of the ANBG in conserving threatened species

- Taxonomy and systemics
  - Herbarium and research data, plant material for research
- Seed collection and research
  - Seed bank, seed biology research
- Propagation techniques
  - ANBG nursery, specialist horticultural expertise
- Translocation
  - Collaborative conservation projects
- Insurance populations
  - Seed collections, seed production area, nursery collection, garden collection
- Over 300 of the threatened species listed under the EPBC Act are in the ANBG

We will discuss specific conservation activities of the ANBG as we go on our walk.

Stop 1: concourse near Banks statue

Theme: biodiversity

Why is biodiversity important? Why worry about threatened species?

- Species that were widespread but become threatened are a warning sign that the ecosystem they are part of is not doing so well. This matters because functioning ecosystems
  - Are our life support, providing oxygen, clean air and water, pollination of plants, pest control, wastewater treatment and so on
  - Provide economic benefits through their use in the primary production and tourism industries
- Scientific values include the discovery of new and helpful drugs in plants
  - So we don't want plants to go extinct before we know a lot about them
- Many Australians place high value on our native diversity through culture (Aborigines), recreational activities (camping, birdwatching etc.) and the expression of identity
- About 80% of Australia's plant species are found nowhere else in the world.

The two life-raft/threatened plants pipes and the garden bed in between

- Rather than talk about all of these threatened plants individually, let's consider the diversity we have here
- They are mostly smaller species that are more easily overlooked
  - But are all unique (e.g. check out the leaves) and many of them have lovely flowers
- A wide range of different types of plants:
- First pipe: *Boronia repanda, Hibbertia circinata*, *Prostanthera askania, Helichrysum calvertianum, Epacris exserta*
- In ground between the two pipes: *Hibbertia circinata*
- Second pipe: *Zieria citriodora, Zieria baeuerlenii, Pomaderris walshii, Prostanthera densa, Commersonia prostrata*
- Some threats are common to most or all of them and include some of the threatening processes we've just discussed: vegetation clearing, inappropriate fire regimes, weed invasion, soil pathogens, e.g. *Phytophthora* (dieback)

Theme: *Zieria* – a genus with many threatened species

- All bar one species in the genus *Zieria* are endemic to Australia
- Of the 60 species, 21 (35%) are listed as endangered
- *Zieria citriodora* (Lemon-scented Zieria) is a good example

Zieria citriodora (Lemon-scented Zieria)

- Two populations near Cooma and four in north-east Victoria
  - So listed as vulnerable nationally and endangered in NSW
  - And recent moves to upgrade it to endangered nationally
- Threats are:
  - Browsing by native herbivores and domestic stock
  - Disturbance from off-road vehicles
- ANBG conservation efforts
  - ANBG has banked a seed collection for it
  - ANBG has propagated plants that have been planted out on private land near Braidwood as part of a bush regeneration project
  - Could potentially be bred in large enough numbers to be released to nurseries, providing money for conservation

Stop 2: top of VIC steps

Theme: impact of urbanisation

Acacia pubescens (Downy wattle)

- Habitat coincides with the area of Sydney's post-World War 2 expansion
- So only found in a few small reserves in Western Sydney and one very small population in the Wollemi National Park
    - Often in roadside and railside bushland remnants
- Listed as vulnerable nationally and in NSW
- Threats from urbanisation
    - Habitat loss
    - Habitat degradation, e.g. mechanical damage (e.g. from road works), rubbish dumping, illegal track creation
- Other serious threats
    - Hybridises with *A. baileyana* (Cootamundra wattle – a weed), *A. cardiophylla* (Wyalong wattle) and other wattle species that are not native to this area

Eucalyptus langleyi (Green Mallee Ash, Albatross Mallee)

- Small area of scrubland near Nowra
- Initially 32 trees, now only 20
    - 3 clumps of trees destroyed during pipeline construction in 2000
- Listed as vulnerable nationally and endangered in NSW
- Threats similar to those of *A. pubescens*

Theme: impact of fire regimes

Acacia pubescens (Downy wattle)

- One threat is inappropriate fire regime
    - A common problem with plants near urban areas as fire regimes are determined by bushfire risk not by conservation requirements

Eucalyptus langleyi (Green Mallee Ash, Albatross Mallee)

- Highly vulnerable to fire
- Vigorous regrowth has been observed from plants that have been burnt only occasionally
    - But regrowth becomes weak on frequently burnt plants
    - Highlighting the importance of knowing the right fire regime for each threatened species

Stop 3: outside VIC

Theme: why are alpine ecological communities important?

Alpine Sphagnum Bogs and Associated Fens ecological community

- Listed as endangered nationally (EPBC)
- Highly significant from a conservation perspective
  - Significant habitat for several threatened fauna species, e.g. Southern Corroboree Frog
  - Contain pollen and charcoal deposits that provide a botanical and climatic timeline dating back millions of years, giving a picture of past climatic conditions and helping us understanding of ongoing climate change
  - Provides critical ecosystem services for major inland water resources, e.g. the Murray, Murrumbidgee and Snowy Rivers

Theme: how some threats worsen others

Alpine Sphagnum Bogs and Associated Fens ecological community

- Via global warming, climate change will reduce the area available to all alpine plants and ecological communities
- Another impact is increased frequency and intensity of bushfires
  - As seen in the 2019 fires, where much of the NSW alpine areas were burnt
- Bushfires cause disturbance, which increases the impact of other existing threats
  - Exotic weed invasion
  - Grazing and trampling by non-native hard-hooved animals, e.g. pigs, horses
    - After the 2019-20 bushfires, feral horses were a major problem as they could escape from the fires, then congregated in the few unburnt areas for the green feed

Theme: the ANBG's contribution to alpine conservation

- Pre-bushfire: alpine seed and seedling ecology research project
  - Collaborating with the ANU, Uni of Qld and Friends of the ANBG
  - Assessing alpine germination strategies, variation in seed and seedling traits and the potential impact of climate change on the ability of alpine plants to reproduce via seed
- Post-bushfire (2019-20 summer) Recovery Project, supported by the Australian Government
  - Funding to the Australian Seed Bank Partnership for seed collection, storage and germination trials of over 200 priority native species
  - Which include more than 100 plant species found in the ACT and southern NSW, particularly in alpine and grassland areas
- Post-bushfire (2019-20 summer): Survive and Thrive project
  - With WWF, the Australian Alps National Parks Cooperative Management Program, and the ACT Government
  - Goal is conservation of bushfire-affected species from Namadgi National Park and surrounding sub-alpine regions, and includes
    - New life history information – post-fire surveys
    - Seed collections and research
    - Investigate propagation techniques, and develop insurance populations

Theme: Wollemi pine – relict species with multiple threats

- A relict species confined to remote gullies in Wollemi National Park, NSW
- Discovered by bushwalker David Noble in 1994
  - At that time it was only known from the fossil record
- Critically endangered nationally

- Priority species under the Commonwealth's Threatened Species Strategy
- Threats
  - Susceptible to pathogens such as dieback (*Phytophthora connamomi*)
  - No detectable genetic variation – appears to be clonal
  - Attractive plant targeted by illegal collectors
    - NSW government make available a significant supply of commercially available clonal Wollemi Pine specimens to the public to discourage this
    - Which also raises royalties for the conservation of this and other endangered plants in NSW
- Populations specifically targeted for protection during the 2019-20 bushfires, so saved
- Attempting to establish it in nearby suitable sites

Theme: *Acacia aphylla* – well adapted but threatened

- Small populations east of Perth
- Listed as vulnerable nationally
- Thickened blue-green wiry stems, with the ability to photosynthesize like leaves are an evolutionary adaptation that greatly reduces the surface area for water loss through transpiration
- Lots of seed produced during summer
  - Seeds store well and remain viable for a long time
  - But few or no seedling often found
  - And we don't understand why it's not doing well

Stop 4: ramp under VIC

Theme: *Homoranthus* – a genus with many threatened species

- The *Homoranthus* genus is closely related to *Darwinia*
- All are endemic to Australia
- Of the 31 species, 9 (39%) are listed as threatened nationally
  - And another 5 or so are listed in one of the States or considered to be almost threatened

Theme: different types of threats

Common threats (which are common to many of the plants we'll see on the walk)

- Vegetation clearing for agriculture.
- Small population sizes
- Inappropriate fire regimes

Other threats

- *Homoranthus lunatus* (crescent-leaved Homoranthus)
  - Browsing/grazing and trampling by feral goats, domestic stock and feral pigs
  - Disturbance during road maintenance and construction
  - Weed invasion
- *Homoranthus binghiensis*
  - Grazing, particularly by goats
- *Homoranthus papillatus* (mouse bush)
  - Trampling by visitors due to its distribution on high visitation rock pavement areas

Stop 5: grassy woodland garden

Theme: development as a continual threat

Yellow box – red gum grassy woodland (BGW)

- Functioning ecosystems underpin biodiversity and the ecosystem services upon which we depend
- BGW is biodiverse and habitat for threatened birds and animals
- Less than 1% of its original range left
- Listed as critically endangered, as is Natural Temperate Grassland (NTG)
- Both are low in the landscape, i.e. prime land for urban development and agriculture
    - Much of Canberra is on what was previously BGW and NTG
    - So the ACT contains important remnants of both ecological communities
- Biggest threat is urban development. With that comes some associated threats:
    - Weeds, pest animals, inappropriate grazing and fire regimes
- In the ACT between 2019 and 2021 (i.e. in three years) there have been nine development proposals in the ACT which might in some way potentially impact on BGW and NTG areas, and a further six in nearby areas in surrounding NSW (e.g. Queanbeyan, Royalla)
    - Most development proposals are approved, although often with conditions
        - Which may include restoration work and biodiversity offsets
    - We are still finding out how to restore ecosystems like this
    - The jury is out on biodiversity offsets, which are meant to result in no net loss
        - They may show benefit in some cases, and there are some good examples in the ACT
        - But from a landscape perspective it is likely that the result will be net loss

Theme: genetics: *Rutidosis leptorrynchoides*

- Some of the plants within a threatened ecological community are threatened, others can be quite common – for example:
    - *Rutidosis leptorrynchoides (*Button wrinklewort) is a little yellow daisy and is endangered
    - *Chrysocephalum apiculatum* (Common everlasting, yellow buttons) is another little yellow daisy but occurs in all States and Territories, in a wide range of environments

Rutidosis leptorrynchoides (Button wrinklewort)

- Now restricted to 11 tiny sites in south-western Victoria and in Canberra and Queanbeyan
    - One ACT site is Stirling Ridge (Gura Bung Dhaura), across the lake near Parliament House
- Major threats for this species: the smallness of each population and the species genetics
- Extensive research done on its genetics by Andrew Young and others at CSIRO
- Self-incompatible, i.e. individuals don't breed with other close relatives
    - This system is common and is there to prevent inbreeding
    - So conservation strategies should
        - focus on maintaining population sizes above 200 plants, and
        - future re-establishment efforts should source seed broadly
- However, genetic analysis also indicates that it has two chromosomal races
    - Diploid populations are spread across the whole range, but the south-west of the Victorian population is tetraploid
    - Fertility is reduced if the two races interbreed
- So seed collection for translocation projects needs to be from a selection of plants not close together, but also not from both races
    - Highlights the importance of the detailed information the ANBG holds on everything in the living collection and the seedbank
- Need this level of genetic information for many threatened plants, but is often not available

Theme: ANBG conservation activities: *Swainsona recta*

Swainsona recta (Small Purple-pea)

- Endangered, with only a few small populations
  - Over 80% of the southern populations are on railway easements
- ANBG actions:
  - Supporting translocation projects in partnership with the ACT and NSW governments
  - Seed production area (at back of Conservation and Research garden)
    - Careful to maintain genetic diversity within this area
  - Propagation for translocation
    - Labour intensive because of the plant's staggered germination
  - Planted out at Gigerline Nature Reserve (a biodiversity offset block in the southern ACT)
    - Tried out different options, e.g. with and without water crystals
    - About 32% of the plants survived
  - Involved in the *Wandiyali Swainsona* Project (conservation Area near Jerrabomberra Creek)
    - Collaborating with the NSW Threatened Species Team, Greening Australia, and various Landcar and other groups
    - Translocations to establish new populations that will be intensively managed
  - Currently collecting more seed from the wild for banking and propagation

Stop 6: road below Tassie garden

Theme: weeds as a threat: *Zieria collina*

Zieria collina (hill Zieria)

- Grows near the edge of rainforest on and near Tamborine Mountain (Gold Coast hinterland)
- Listed as vulnerable nationally and in Qld
- Main threat to its survival are weeds such as lantana (*Lantana camara*)

Theme: rescuing a species: *Eucalyptus morrisbyi*

- South east Tasmania from 4 locations
- Listed as endangered nationally and in Tasmania
- Conservation efforts
  - Private seed orchard established in mid 1990s by a private landholder
    - Since then, hundreds of seedlings have been planted along roads, on private property near Cremorne and propagated at the Tasmanian Royal Botanic Gardens
  - So extinction in the short term is unlikely due to these ex situ and ornamental plantings

Theme: rare but not listed: *Eucalyptus risdonii*

Eucalyptus risdonii (Risdon peppermint)

- Occurs at Risdon and Grass Tree Hill near Hobart, in 6-8 populations
- Species is listed as rare but not threatened in Tasmania
  - Not thought to have suffered a significant decline in its range since European settlement
  - But currently threatened by subdivision due to its proximity to Hobart
- To get it listed nationally, need good data on
  - Low numbers and level of reduction in numbers
  - Precariousness of its geographic distribution,
  - Probability of extinction in the wild is at least 50% in immediate future for critically endangered, 20% in the near future for endangered
- What is listed as threatened by Tasmania is the ecological community *E. risdonii* forest and woodland

Stop 7: Tassie garden – near toilet path

Theme: what to list

- *Athrotaxis x laxifolia* is a hybrid of the two Athrotaxis species, *A. selaginoides* (king billy pine).and *A. cupressoides* (pencil pine)
- Possible Gondwana remnants that are very slow growing
  - A study looked at the tree ring chronology of king billy pines for their growth rate
  - Which can be used to interpret the climate and other environmental influences in Tasmania, i.e. useful in considering climate change.
- These *Athrotaxis* species are on the IUCN red list of threatened species (IUCN = International Union for Conservation of Nature)
- But none are listed in Australia. Why not?
- Possible reasons:
  - All five ecological communities dominated by *Athrotaxis* are listed as threatened in Tasmania
  - Listing an ecological community automatically protects the dominant species of those communities
  - For the most part these *Athrotaxis* species occur in Tasmania's national parks
    - It is a lot of time and effort to put together a listing proposal
    - And getting them listed may not change anything since they are already protected and being managed for their conservation

Theme: climate change

- *Athrotaxis* species are very slow growing and highly fire sensitive
  - So more frequent fires due to climate change means that the loss of a population is likely to be irreversible, with the species contracting to the most fire proof landscapes
- The Tasmanian government has established a Climate Change Monitoring Program for the Tasmanian Wilderness World Heritage Area
  - Species included are *A. cupressoides* and *A. selaginoides*
  - Aims are to determine their condition now, and see if this plus the distribution and extent of these species is changing at the stand scale to the landscape scale

Stop 8: Banksia garden – on main path in

Theme: habitat

Banksia brownii (Feather-leaved Banksia)

- Occurs in the Esperance plains and jarrah forests of south-west WA
- Very good provider of nectar for birds, mammals and insects
  - So if we have more of them we are supporting a range of native fauna
- 4 threatened bird species live in the same habitat: Western Ground Parrot, Western Bristlebird, Western Whipbird and Noisy Scrub-bird
- But listed as endangered nationally and rare in WA, with threats including *Phytophthora* and *Armillaria* infections, spread mainly by human activity
- Being grown commercially for its attractive foliage, so commercial exploitation becomes another threat

Theme: is it really threatened: *Banksia vincentia*

- The B*anksia spinulosa* species complex is a group of closely related species, sometimes difficult to tell apart, extending from north Queensland down the coast to Victoria
- On the basis of morphological (physical) examination, a species called *Banksia Vincentia* was identified
  - It was thought to be Australia's rarest Banksia, there being only 14 plants found near Vincentia in the Jervis Bay area, so listed as critically endangered nationally and in NSW
- The ANBG and others did work on its conservation included which included establishing a seed orchard and studying it's genetic diversity
- However, recent genomic analyses show that all samples of '*B. vincentia'* are actually part of *Banksia neoanglica* (New England banksia), a species in the *B. spinulosa* complex found in northern NSW (north of Tenterfield)
  - It is suspected that the current distribution is most likely a result of an historical planting
- So reassessment of its threatened status will be necessary
- It has also hybridised with some of the local Banksia species (*B. spinulosa* and *B. ericifolia*)
- This shows the importance of genetic analyses of threatened species

Stop 9: Banksia garden – on far side

Theme: Varieties: listed or not?

Banksia sphaerocarpa var *dolichostyla* (ironcap banksia)

- This variety is Listed as endangered in WA
- In the past it was listed as vulnerable nationally but will be removed because
  - the Commonwealth has decided not to list varieties any more
  - the main species (*Banksia sphaerocarpa*) is widespread

Theme: mining as a threat

Banksia sphaerocarpa var *dolichostyla* (ironcap banksia)

- Occurs on lateritic gravel and sandy soils in the Wheatbelt and Goldfields-Esperance regions of WA, mostly in areas of significant gold and nickel deposits
- Mining and exploration activities are a significant threat as they:
  - Directly destroy plants through clearing for developments
  - Have indirect effects such as changes to hydrology, increasing weed invasion and encouraging inappropriate fire regimes

Stop 10: on side path into tree house

Theme: impact of a catastrophic event: *Eucalyptus imlayensis* (Imlay mallee)

- Listed as endangered nationally and critically endangered in NSW
- Occurs at a single location in Mt Imlay National Park (inland from Eden)
- At risk from catastrophic events because of the small number of plants
  - The last 55 remaining trees were burnt in the 2019 bushfires
  - Though they are re-sprouting from lignotubers
  - Regrowth at threat from dieback (*Phytophthora cinnamomi*), which is in the area

Theme: insurance populations: *Eucalyptus imlayensis* (Imlay mallee)

- The only two trees in the world unaffected by the 2019-22 summer bushfires are here in the ANBG, including the mature one here and the juvenile one on the VIC steps
- They are an important insurance planting for this species
- Insurance populations allow for propagation of plants from seed or cuttings. For *E. imlayensis*:
  - Seeds in the seedbank are available to be used for long-term conservation
  - Plants in the living collection allow cuttings to be taken and grown on
    - The ANBG is doing work on grafting *E. imlayensis* onto root stock of closely related Eucalyptus species to improve survival rates
- Insurance plants for some species are held in the nursery rather than out in the gardens, e.g. the other two rare/threatened species from the summit of Mt Imlay

Theme: threatened ecological community: *Melaleuca ericifolia* swamp forest

- Listed as threatened in Tasmania
- Not listed nationally or in other States, but other similar coastal communities are threatened
  - Another example of a reasonably common overstorey plant which forms part of a unique and very rare ecological community

Stop 11: Pomaderris garden

Theme: ANBG role

Aims of the *Pomaderris* Garden

- To focus on what is significant about Pomaderris, as a genus, its rarity and distribution, and showcase a number of frost-tolerant species from south-eastern Australia
- To inspire visitors to grow Pomaderris by a display that is representative of home gardens
    - A good hedging and screening plant with abundant and often spectacular cream-yellow flowers in spring

Theme: horticulture

- Having threatened plants available in the horticulture industry has benefits
    - Public becomes more interested in threatened plants and their conservation
    - Heads off collectors who want them going to the last places they are growing in the wild
    - Can provide funding for conservation of the species (or other species) through royalties (e.g. Wollemi pine)
- But it doesn't provide a source for plants being returned to the wild because
    - There is no information about where a plant sold in a nursery comes from, i.e. it's genetics in relation to wild populations
    - Fashions change – no guarantee a plant will be available in nurseries in ten years time
    - The exception is the Wollemi pine, which is clonal, i.e. all surviving plants are genetically identical

Theme: examples of threatened *Pomaderris* species

Pomaderris pallida (Pale Pomaderris)

- Listed as vulnerable nationally and in NSW
- Riparian species with the main populations in the Cotter and Paddys Rivers area (ACT)
    - Such species are useful in holding stream banks together and preventing erosion, without choking of streams as exotic weeds along our waterways can
- Threats include flood damage and rural residential development

Pomaderris cotoneaster (Cotoneaster Pomaderris)

- Listed as endangered in NSW and threatened in Vic
- Called cotoneaster as it looks like *Cotoneaster glaucophyllus*, which is a bad weed both locally and elsewhere in Australia
    - So having it in this garden helps local landcare volunteers leant what it looks like

Pomaderris walshii (Carrington Falls Pomaderris)

- Listed as critically endangered in NSW
- Priority species under the Commonwealth's Threatened Species Strategy
- Threats include natural flooding and its small population
- Collaboration of several botanic gardens sharing propagated material, to minimize the risk of disaster – ANBG Canberra, Budderoo, Mt Annan, Wollongong
    - Highlights the important role of insurance plants in the ANBG collection

Pomaderris brunnea (Brown Pomaderris)

- Listed as endangered in NSW and vulnerable in Vic
- Threats are similar to those we've already discussed for other plants

Further along this path: Conservation and Research garden

- If you keep going along path to the far side of the Sydney region gully you get to the Conservation and Research garden, with the seed orchard behind it

Stop 12: path above Banksia garden

Theme: fragility of regeneration: *Triplarina imbricata*

- *Triplarina imbricata* is a good example of a plant that is regenerating
  - Suspect the original damage was from the 2020 hail storm
  - Can see how vulnerable such regeneration is to a range of threats, such as trampling, browsing by herbivores
  - Another significant threat to it is plant pathogens

Theme: plant pathogens as a threat: *Triplarina imbricata*

- Dieback – what is it?
  - We've seen several plants on the walk where *Phytophthora* is a serious threat, e.g. the Wollemi pine, *Eucalyptus imlayensis*, *Arthrotaxis* species, *Banksia brownii*
  - *Phytophthora cinnamomic* gets to plants through the soil and attacks their roots, causing them to rot
  - Any activity that moves soil, water or plant material can spread it, including:
    - recreational activities such as bushwalking, off-road vehicle use, gardening
    - industrial activities such as road building, timber harvesting, mining
    - land management activities
  - ANBG has a project to do phosphite testing with Phytophthora
- Myrtle rust
  - Another plant pathogen that is a threat to *Triplarina imbricata* (Creek Triplarina)
  - A fungal disease which attacks soft, actively growing leaves, shoot tips and young stems, and also flowers and fruit of some plants
  - Rust spores spread naturally by wind, water, insects and animals
  - Can also be carried on infected plant material, contaminated equipment, vehicles and clothing
  - The ANBG is setting up a project with the ANPC to monitor myrtle rust within the gardens

Theme: other examples of threatened species

Homoranthus proxilis (Granite Homoranthus)

- Listed as vulnerable nationally and in NSW
- Threats are similar to what we've seen for other *Homoranthus* species, e.g.
  - Clearing, damage by stock and feral animals, weeds, trampling by bushwalkers

Stop 13: road outside café

Plants: *Astelia Australiana* (Tall Astelia)

Theme: biodiversity – a different type of threatened plant

- Listed as vulnerable in Vic and nationally (EPBC)
- Plants form large colonies on humus-rich waterlogged soils in *Nothofagus* (southern beech) and *Eucalyptus regnans* (mountain ash) forests
- A Gondwana plant
  - So has separate male and female flowers
- Because it is a low species, threats include trampling from visitors and nearby timber harvesting, competition from other plants

End of walk

Appendix: extra information about each stop

Stop 1: concourse near Banks statue

The *Eucalyptus morrisbyi* (Morrisby's Gum) and all the plants in the two pipes past it and most of those in the ground between the two pipes are liferaft/threatened plants

- Note that the Morrisby's Gum will be discussed later in the walk, as will *Banksia vincentia*

Zieria citriodora (Lemon-scented Zieria)

- Towards the front in the second pipe – check the silver labels

Plants in the pipes

- Common names of plants in pipes:
  - *Boronia repanda* (Repand Boronia, Border Boronia, Granite Rose)
  - *Prostanthera askania* (Tranquillity Mintbush)
  - *pacris exserta* (South Esk Heath)
  - *Zieria citriodora* (Lemon-scented Zieria)
  - *Zieria baeuerlenii* (Bomaderry Zieria)
  - *Pomaderris walshii* (Carrington Falls Pomaderris)
  - *Prostanthera densa* (Villous Mintbush)
  - *Commersonia prostrata* (Dwarf Kerrawang)
  - *Hibbertia circinate* – occurs at top of Mt Imlay
- Other threats include trampling by recreational BMX/trail bikes and walkers, grazing by rabbits or deer, and removal of undergrowth for fire reduction purposes

Zieria citriodora (Lemon-scented Zieria)

- Like many species in the Rutaceae family its leaves are dotted with oil glands and are highly aromatic
- When crushed they have a pleasant citrus perfume
- One of the NSW sites is near Kybeyan and is on private property

Stop 2: top of VIC steps

Acacia pubescens (Downy wattle)

- At the top of the steps (on the left) – back a little

Eucalyptus langleyi (Green Mallee Ash, Albatross Mallee)

- There's an information sign about it

Note that the *Eucalyptus imlayensis* will be discussed later in the walk

Acacia pubescens (Downy wattle)

- Saving our Species plant
- Doesn't set much seed – recruitment mostly from vegetative reproduction
- Needs a minimum fire free period of 5 - 7 years to allow an adequate seedbank to develop
- Other serious threats
  - Invasive grasses including African Lovegrass, Paspalum and Briza species are preventing recruitment

Eucalyptus langleyi (Green Mallee Ash, Albatross Mallee)

- Discovered by Laurence Joseph Langley, a foundation member of the ANPS and the founder of the Australian Seed Company
- Rarely establishes from seed
- Not at risk from agriculture
- Highly vulnerable to fire and drought due to small population

- Threats
  - Possible future residential development
  - Trampling of seedlings and damage to regrowth by recreational users
  - Unauthorised vehicular access, rubbish dumping and maintenance works to those plants close to pipeline and power line easements

Stop 3: outside VIC

Alpine Sphagnum Bogs and Associated Fens ecological community

- In the pipes on the western side

Wollemia nobilis (Wollemi Pine)

- In a pipe near the VIC door – check that it is still there

Acacia aphylla *(*Leafless rock wattle, Twisted Desert Wattle, Live Wire)

- In a pipe on the wall opposite the alpine garden

Alpine areas

- Rich profusion of flora in the high country of Tas, Vic, NSW, and the ACT
- Threats include increasing tourism and developments such as Snowy 2
- Pre-bushfire: alpine seed and seedling ecology research project
  - Collaborating with the ANU, Uni of Qld and Friends of the ANBG
  - Assessing alpine germination strategies, variation in seed and seedling traits within species, and the role of maternal environment in seed traits
  - Also the potential impact of climate change on the ability of alpine plants to reproduce via seed
  - Resolving the germination strategy of species in the endangered Alpine Sphagnum Bogs and Associated Fens ecological community
- Another project is a conservation collection of the alpine form of *Epacris microphylla* (coral heath)
  - In collaboration with the NSW Department of Planning, Industry and Development
  - Collection of cuttings, propagation, and translocation back into Kosciuszko NP
- Post-bushfire: Island, Alps and Forests Multi-Regional Bushfire Recovery Project, supported by the Australian Government
  - The Australian Alps National Parks Cooperative Management Program is a partnership of the NSW, Victoria, ACT and Australian government national park authorities
  - Funding to the Australian Seed Bank Partnership for seed collection, storage and germination trials of over 200 priority native species
  - Including more than 100 plant species found in the ACT and southern NSW
    - Prioritised for collection in 2022 due to their importance to Alpine and Grassland ecosystem conservation and research at the National Seed Bank and impact of the 2019-20 summer fires on their populations.
  - Have already obtained sizeable collections of the Commonwealth EPBC listed vulnerable *Ammobium craspedioides*
  - *And* a population of *Dampiera fusca* (Endangered in NSW) is flowering well and being targeted
- Post-bushfire (2019-20 summer): Survive and Thrive project
  - Established through National Parks Conservation Trust and in partnership with WWF, the Australian Alps National Parks Cooperative Management Program, and the ACT Government
  - Goal is conservation of bushfire-affected species from Namadgi National Park and surrounding sub-alpine regions, and includes
    - New life history information – post-fire surveys
    - Seed collections and research

- Investigate propagation techniques, and develop insurance populationsVSpecies targeted
  - had all or most of their populations burnt by the 2019 fires
  - are rare and likely to meet multiple criteria for threatened species listing
  - there is either none or limited vegetative and seed stocks safely preserved in existing 'back up' collections.
- Survive and thrive species include *Leptospermum namadgiense* (Namadgi Tea Tree), *Almaleea capitata* (Slender Parrot Pea), *Viola improcera* (Dwarf Violet), *Olearia* sp. *Rhizomatica* (a daisy bush) and *Leionema lamprophyllum* subsp. *Obovatum* (Shiny Phebalium).

Wollemia nobilis (Wollemi Pine)

- Extremely long lived
- Its family (Araucariaceae) became extinct in the northern hemisphere by the end of the Cretaceous, and declined with the cooling and drying during the northward movement of Australia
- Male and female cones born on the same tree

Theme: *Acacia aphylla* – well adapted but threatened

- Small populations east of Perth
- Listed as vulnerable nationally
- Seedlings start out growing typical Acacia leaves, but these are shed after dry conditions, then the plant continues to grow stems as a totally leafless wattle, hence its name 'aphylla' which means without leaves
- Little known about its threats – they are possibly
  - Extended summer droughts (it grows in shallow soils), so climate change also
  - Inappropriate fire regimes (plants killed by fire)
  - Dieback

Stop 4: ramp under VIC

Homoranthus lunatus (crescent-leaved Homoranthus)

- About half way along the ramp

Homoranthus binghiensis

Homoranthus papillatus (mouse bush)

- Both at the end of the garden/ramp

Homoranthus lunatus (crescent-leaved Homoranthus)

- Occurs near Tenterfield (NSW), in small (<20) scattered populations
- Vulnerable nationally and in NSW
  - Does not spread vegetatively – an obligate seeder
  - Likely to be fire-sensitive and intolerant of frequent fire disturbance
- Threats include
  - Browsing by feral goats, and associated soil compaction and erosion
  - Grazing and trampling by domestic stock
  - Habitat damage and disturbance from feral pigs
  - Disturbance during road maintenance and construction
  - Weed invasion

Homoranthus binghiensis

- First formally described in 2011 by John Hunter and Lachlan Copeland
- Occurs in five known locations within the Torrington State Conservation Area (on north western slopes of NSW)

- Small numbers at each location – a few hundred individuals in total
- Endangered in NSW

Homoranthus papillatus (mouse bush)

- Dense warty protuberances on the leaves, sometimes with a strong odour
- Found on Mount Norman in Girraween National Park (Qld), among crevices of granite outcrops
- Vulnerable in Qld

Stop 5: grassy woodland garden

Yellow box – red gum grassy woodland (BGW)

- As walk through at the end of this stop, point out the diversity of grasses and other plants)

Rutidosis leptorrynchoides (Button wrinklewort)

- In first pipe (for comparison, common everlasting is in the ground just behind)
- Also in the ground to the right of the path as you go down through the garden, just before the second circle

Swainsona recta (Small Purple-pea)

- In the second pipe – check the leaves to get the right plant if you can't find a tag

Yellow box – red gum grassy woodland (BGW)

- Dominated by widely-spaced White Box, Yellow Box or Blakely's Red Gum trees
- Biodiverse – understorey is rich in native tussock grasses, herbs and scattered shrubs
- Habitat for threatened birds such as superb parrots and scarlet robins
    - Also other woodland birds that are declining in numbers
- Forms a mosaic with Natural Temperate Grassland (NTG) in the landscape
- In the ACT
    - Some is protected in nature reserves
    - But some is outside the reserve system and subject to possible development threats
- Mulligans Flat contains a good example of this ecological community
    - And the Mulligans/Goorooyarro Nature Reserve complex is one of the best exampls of the ecotone (transition area) from NTG to BGW to woodland
- Biggest threat is urban development. With that comes some associated threats:
    - Weeds and pest animals
    - Inappropriate grazing and fire regimes

Rutidosis leptorrynchoides (Button wrinklewort)

- Development, e.g. new Prime Minister's lodge, a continual threat to the Stirling Ridge site
- Self-incompatible, i.e. individuals don't breed with other close relatives
    - This system is common and is there to prevent inbreeding
    - It works effectively in large, genetically diverse populations
    - But in small, fragmented populations such as in the button wrinklewort it results in a reduction in fertilization
    - Suggesting that conservation strategies should
        - focus on maintaining population sizes above 200 plants, and
        - future re-establishment efforts should source seed broadly
        - obtain information about the genetic composition of all populations
- However, genetic analysis also indicates that it has two chromosomal races
    - Diploid populations are spread across the whole range, but the south-west of the Victorian population is tetraploid
    - Fertility is reduced if the two races interbreed

- So seed collection for translocation projects needs to be from a selection of plants not close together, but also not from both races
- Highlights the importance of the detailed information the ANBG holds on everything in the living collection and the seedbank
- Information held by the ANBG about this (and all) plants in its collection includes where the plant comes from, how it is being grown successfully, a link to the herbarium voucher, and all of the research done on the plant

Swainsona recta (Small Purple-pea)

- Southern (local area) and northern (Wellington/Orange area) populations which are genetically different
- Other conservation measures
  - Been re-introduced to at least ten sites in north east Victoria
  - ACT Government's action plan
- Higher germination rates of *Swainsona recta* seeds collected in the seed orchard compared to wild-collected seed
- ANBG involved in the *Wandiyali Swainsona* Project
  - Together with the NSW Threatened Species Team, Greening Australia, Conservation Volunteers Australia, Canberra Nature Map, Queanbeyan Landcare and Molonglo Catchment Group
  - Translocations to establish new populations that will be intensively managed
  - Within Wandiyali Conservation Area (in Box Gum Grassy Woodland near Jerrabomberra Creek)

Stop 6: road below Tassie garden

Plants are listed in the order you come across them

Plants

Zieria collina (hill Zieria)

- Just as you start going along this road, to the back of the stringy bark

Eucalyptus morrisbyi (Morrisby's Gum)

- It's the next gum tree along, just after the 20k sign – a mallee

Eucalyptus risdonii (Risdon peppermint)

- Quite a bit further along are a couple of trees – a *Callitris* and immediately in front of it the *Eucalyptus risdonii*
- And the tree further back behind both is another *Eucalyptus morrisbyi*

Once past all of these, there are two possible paths up into the Tassie garden)

- First is a steeper little stone path off to the left
- If this isn't suitable for your group, go along to the next little stone path (which is flat) and turn left at the junction to go back over the little bridge

Zieria collina (hill Zieria)

- Grows near the edge of rainforest on and near Tamborine Mountain (Gold Coast hinterland)
- Main threat to its survival is invasion by introduced species, especially lantana (*Lantana camara*)
  - Also habitat loss and fires

Eucalyptus morrisbyi

- South east Tasmania from 4 locations, the two main ones being 21 km apart – in the Government Hills near Risdon, and the fragmented Cremorne subpopulation
- Threats

    - Clearing and fragmentation for road improvement
    - Relatively susceptible to drought
    - Weeds and competition with other plant species
    - Palatable to insect and vertebrate browsing
- Threatened Species Commissioner priority plant
- Genetic analyses being undertaken

Eucalyptus risdonii (Risdon peppermint)

- Regenerates from lignotubers and epicormic buds after disturbance
- Recruitment occurs after seed is released from the canopy after fire
    - If fire is too frequent a reduction in seed can occur
- What EPBC listing criteria cover for a species
    - Level of reduction in numbers
    - Its geographic distribution is precarious for survival of the species
    - Estimated total number of mature individuals is low/very low and likely to continue to decline
    - Probability of extinction in the wild is at least
        - Critically endangered – 50% in immediate future
        - Endangered – 20% in the near future
        - Vulnerable – 10% in the medium term
    - Need data to support this

Stop 7: Tassie garden – near toilet path

Athrotaxis x laxifolia

- On the right where the path goes down to the toilet
- By comparison, ClimateWatch is a citizen science project aiming to understand how changes in temperature and rainfall are affecting the seasonal behaviour of Australia's plants and animals
- Ecological communities dominated by *Athrotaxis* are
    - *Athrotaxis cupressoides-Nothfagus gunnii* (deciduous beech) short rainforest
    - *Athrotaxis cupressoides* open woodland
    - *Athrotaxis cupressoides* rainforest
    - *Athrotaxis selaginoides - Nothofagus gunnii* short rainforest
    - *Athrotaxis selaginoides* rainforest
- *Athrotaxis* species are
        - long lived but very slow growing, i.e. regeneration is very slow
        - highly fire sensitive
        - regenerate poorly when seedlings and suckers are grazed, e.g. by rabbits, sheep, marsupials

Stop 8: Banksia garden – on main path in

Banksia brownii (Feather-leaved Banksia)

- At the end of the path in before you get to the pergola

Banksia vincentia

- By the corner of the pergola next to the *Banksia spinulosa* information sign

Banksia brownii (Feather-leaved Banksia)

- Occurs in the Esperance plains and jarrah forests of south-west WA
- But listed as endangered nationally and rare in WA, with threats including
    - *Phytophthora* and *Armillaria* infections, spread mainly by human activity
    - Land clearing

- In cultivation at the ANBG and at Kings Park and Botanic Garden in Perth
- Being grown commercially for its attractive foliage
    - Commercial exploitation another threat

Banksia vincentia

- The B*anksia spinulosa* species complex extends from Mossman in north Queensland down the east coast of Australia to Wilsons Promontory in Victoria
- NSW Saving Our Species plant
- ANBG work on its conservation included
    - Cultivating 45 plants
    - Working with other botanic gardens, Parks Australia, Booderee NP and the NSW Office of the Environment and Heritage to establish 800 plants in a new orchard in Booderee NP near Vincentia
    - Studying the genetic diversity of *B. Vincentia*, including
        - Its general genetic health and diversity
        - The level and impact of hybridisation with other *Banksias*
        - Determining ideal material to be used in translocation
- However, recent genomic analyses show that all samples of '*B. vincentia'* are nested within *Banksia neoanglica* (New England banksia), a species in the B. spinulosa complex that is found in northern NSW (north of Tenterfield)
    - It is suspected that the current distribution is most likely a result of an historical planting
- So reassessment of its threatened status will be necessary

Stop 9: Banksia garden – on far side

Banksia sphaerocarpa* var *dolichostyla (ironcap banksia)

- On the left just before the last metal post before you reach the section about fire

Variety versus cultivars: differences

- Varieties develop naturally, while cultivars are developed through human intervention.
- Seeds planted from a variety tend to grow true to type (i.e., the offspring retains the parent plant's unique characteristics), while seeds planted from a cultivar will most likely not be true to type.

Banksia sphaerocarpa* var *dolichostyla (ironcap banksia)

- Golden yellow flowers in autumn
- Has a lignotuber which can sprout new growth after damage by bush fire
- Other threats include
    - *Phytophthora cinnamomi* – may cause 95% mortality in subpopulations
    - Salinisation
- The one that is still alive was grafted onto local *Banksia* spp root stock
    - The others that were here were not grafted onto local root stock and have died
- A variety within a species may be defined when the species is very variable but the variation is insufficient to justify recognition of a separate species
    - The variety is selected with a common set of characteristics within those of the species, and seeds grow true to type
    - var. *dolichostyla* has longer flower parts (perianth and style) than the other varieties of *Banksia sphaerocarpa*

Stop 10: on side path into tree house

As you walk from the far end of the Banksia garden through to the Pomaderris garden, this is a side path (just before you get to the picnic table) leading towards the bottom of the tree house

Eucalyptus imlayensis (Imlay mallee)

- Half way along the path on the right

***Melaleuca ericifolia* swamp forest**

- To the left of this path

Eucalyptus imlayensis (Imlay mallee)

- There are two of these trees in the gardens, forming the only *ex situ* insurance population of this species in the world
  - This one is now the only mature one left, ant the tree on the VIC steps is a juvenile tree
- Establishment from seed likely to be rare
- Priority species under the Commonwealth's Threatened Species Strategy
- The ANBG took part in the Project Phoenix Strategy for the Australian Native Seed Sector
  - A short term project as part of the bushfire recovery actions
  - A strategy for collecting, storing and propagating seeds of rare plants
  - Supporting a sustainable supply of high-quality native seed to underpin landscape restoration and biodiversity conservation following the Black Summer bushfires
- *Hibbertia circinate* (Connie's Guinea flower) and *Boronia imlayensis* (Imlay Boronia) are also only found on the summit of Mt Imlay
  - *E. imlayensis* is resprouting, the other two plants were killed but hundreds of seedlings are re-establishing in the area
  - 60 seedlings of the two shrub species have been collected – half to be held by the Booderee Botanic Gardens and half by the ANBG
  - A collaborative threatened flora collection and propagation program will ensure their long-term protection
  - The seedlings have been 'potted up' and will form an ex-situ collection that can be used for both seed production and planting back into the site on Mount Imlay if required.
  - Note that there is a *Hibberia circinate* in the pipe at stop 1

Melaleuca ericifolia swamp forest

- Listed as threatened in Tasmania
- Not listed nationally or in other States, but other similar coastal communities are threatened
  - e.g. Coastal Swamp Oak (*Casuarina glauca*) Forest of NSW and SE Qld ecological community, which contains *Melaleuca ericifolia* (and other *Melaleuca* species)
- Almost pure stands of *Melaleuca ericifolia* (coast paperbark) with trees forming a dense canopy over a simple, sedgey understorey
- Threats include
  - Clearance
    - Coastal areas are popular for development of marinas, resorts
  - Logging
  - Extreme stock disturbance
  - Unplanned frequent fire

Stop 11: Pomaderris garden

Pomaderris pallida (Pale Pomaderris)

- Just before the speed bump

Pomaderris cotoneaster (Cotoneaster Pomaderris)

- Just after the speed bump (and before the grate in the ground)

Pomaderris walshii (Carrington Falls Pomaderris)

- Just after the grate in the ground (which is after the speed bump)

Pomaderris brunnea (Brown Pomaderris)

- Just before the CSIRO gate sign

Pomaderris in general

- Of the 65 species of *Pomaderris* in Australia, 11 (17%) are listed as endangered
- Many species of *Pomaderris* have three or more sets of chromosomes (polyploidy), which
  - ensures that plants remain ideally suited for present conditions, but
  - may make them vulnerable as conditions change as they lack the diversity to adapt.

Aims of the *Pomaderris* Garden

- To focus on what is significant about Pomaderris, as a genus, its rarity and distribution
- To raise public awareness and showcase a number of frost-tolerant species from south-eastern Australia including several that are rare and endangered
- To inspire visitors to grow Pomaderris by a display that is representative of home gardens
  - Abundant and often spectacular cream-yellow flowers in spring
  - A good hedging and screening plant

How was the garden established

- Collect cuttings from the wild (wild seeds are rare and not viable)
- Establish a seed orchard for these species in the ANBG
  - A trial seed orchard also established near Nerriga
- Over 500 shrubs planted near Tarago and Goulburn to improve the viability of local populations
- Bee pollination in screen-meshed tents to prevent cross-pollination and hybridisation

Pomaderris pallida (Pale Pomaderris)

- Populations of Pomaderris pallida are listed on the National Trust register for the ACT and Australian Heritage Register
- Threats include
  - rural residential development
  - Feral browsers: deer, goats and horses
  - Flood damage

Pomaderris cotoneaster (Cotoneaster Pomaderris)

- Threats include:
  - Damage along walking tracks due to public use
  - Browsing by goats
  - Weed invasion

Pomaderris walshii (Carrington Falls Pomaderris)

- Listed as critically endangered in NSW
- Priority species under the Commonwealth's Threatened Species Strategy
- Threats include:
  - Flooding (natural)
  - Small population
- Collaboration of several botanic gardens sharing propagated material, to minimize the risk of disaster – ANBG Canberra, Budderoo, Mt Annan, Wollongong
  - Highlights the important role of the ANBG in maintaining insurance plants in their collection

Pomaderris brunnea (Brown Pomaderris)

- Threats are similar to those we've already discussed for other plants:
  - Urban development, inappropriate fire regimes, trampling by people, forestry activities, weed invasion, grazing by deer, cattle and macropods

Conservation and Research garden

- Purpose of this garden
  - Have open to the public an area dedicated to threatened species that would be educational and promote interest in conservation
  - Contributes to the conservation of many species that are not easily stored as seed.
  - The plants will be used to grow new plants for reintroduction into their natural home
- Detailed information that links each plant growing here to its parent plant in the wild is kept
  - Which gives knowledge about the genetic diversity within the collection
  - And allows the ANBG to return individual clones to the wild at an appropriate spot

Stop 12: path above Banksia garden

Take the dirt path to the right as you leave the tree house area (rather than the road past the top of the Banksia garden)

Note:

- If you have a large group one option would be to quickly show everyone the *Triplarina imbricata* plant, then bring them out onto the wider path above the Banksia garden to talk about the pathogen and regeneration themes
- Alternatively, the pathogen story could be told at the *E. imlayensis*/*E. langleyi* stop or any of the stops with *Eucalyptus morrisbyi*, since all can be affected by both pathogens

Triplarina imbricata (Creek Triplarina)

- A small plant reshooting from a stump on the right about half way along the path
- It's a bit before the metal sprinkler and box with a rusty lid
- Listed as endangered nationally and in NSW
- Saving Our Species plant
- Occurs along watercourses in low open forest or in montane bogs
- Threats include
  - Habitat loss and fragmentation as a result of clearing for agriculture.
  - Invasion of habitat by weeds, particularly Small-leaved Privet and Lantana.
  - Fire
  - Trampling by domestic stock.
  - Damage to plants by visitors to riverside recreation spots.

Plant pathogens

- Dieback – what is it?
  - Plants we've seen on the walk where *Phytophthora* is a serious threat include the Wollemi pine, the overstorey *Eucalypts* in Box Gum Grassy Woodland, *Acacia aphylla* and *Eucalyptus imlayensis*, *Arthrotaxis* species, *Banksia brownie*, *Prostanthera askania*
  - *Phytophthora cinnamomic* gets to plants through the soil
  - It attacks the roots of the plant causing them to rot
  - Can range from symptomless infection of root tissue to complete invasion of the root and stem storage tissue, leading to plant death
  - Even those plants not highly susceptible will succumb during long periods of dry weather
    - the loss of root mass limits the amount of water and nutrients a plant can absorb
    - leaving it susceptible to insect attack, other plant diseases and drought stress
  - Believed to be introduced by the early settlers bringing live plants and soil to Australia
  - Any activity that moves soil, water or plant material can spread it, including:
    - recreational activities such as bushwalking, off-road vehicle use, gardening
    - industrial activities such as road building, timber harvesting, mining

        - land management activities
    - ANBG has a project to do phosphite testing with Phytophthora
- Myrtle rust
    - Rust spores spread naturally by wind, water, insects and animals, so can spread rapidly and travel very long distances

Homoranthus proxilis (Granite Homoranthus)

- On the left once you turn back onto the main path
- Saving Our Species plant
- Threats are similar to what we've seen for other *Homoranthus* species:
    - Clearing for agriculture, rural subdivision and mining activities
    - Damage, trampling and browsing and trampling by domestic stock, feral goats and pigs
    - Roadside maintenance and construction.
    - Trampling of plants by bushwalkers.
    - Weed invasion

Stop 13: road outside café

Astelia Australiana (Tall Astelia)

- In the pipes outside the café entrance (with a life raft sign)
- Occurs in upland plateaus in central Vic
- Good frog habitat
- Plants form large colonies on humus-rich waterlogged soils in *Nothofagus* (southern beech) and *Eucalyptus regnans* (mountain ash) forests
    - Association with *Nothofagus* reflects its ancient origins in the rainforests of Gondwana
- Flowers: separate and may be on different plants
    - Male flowers are maroon and have a foetid smell
    - Female flowers are green with rudimentary stamens and sometimes produce fruit without fertilization
- Largely reliant of vegetative reproduction – pollination vectors are unknown
- Because it is a low species, threats include
    - impacts of nearby timber harvesting, e.g. trampling
    - competition from other plants
    - possible future damage from visitors or collectors
    - Also threatened by loss of habitat and wildfires (fire sensitive species)