

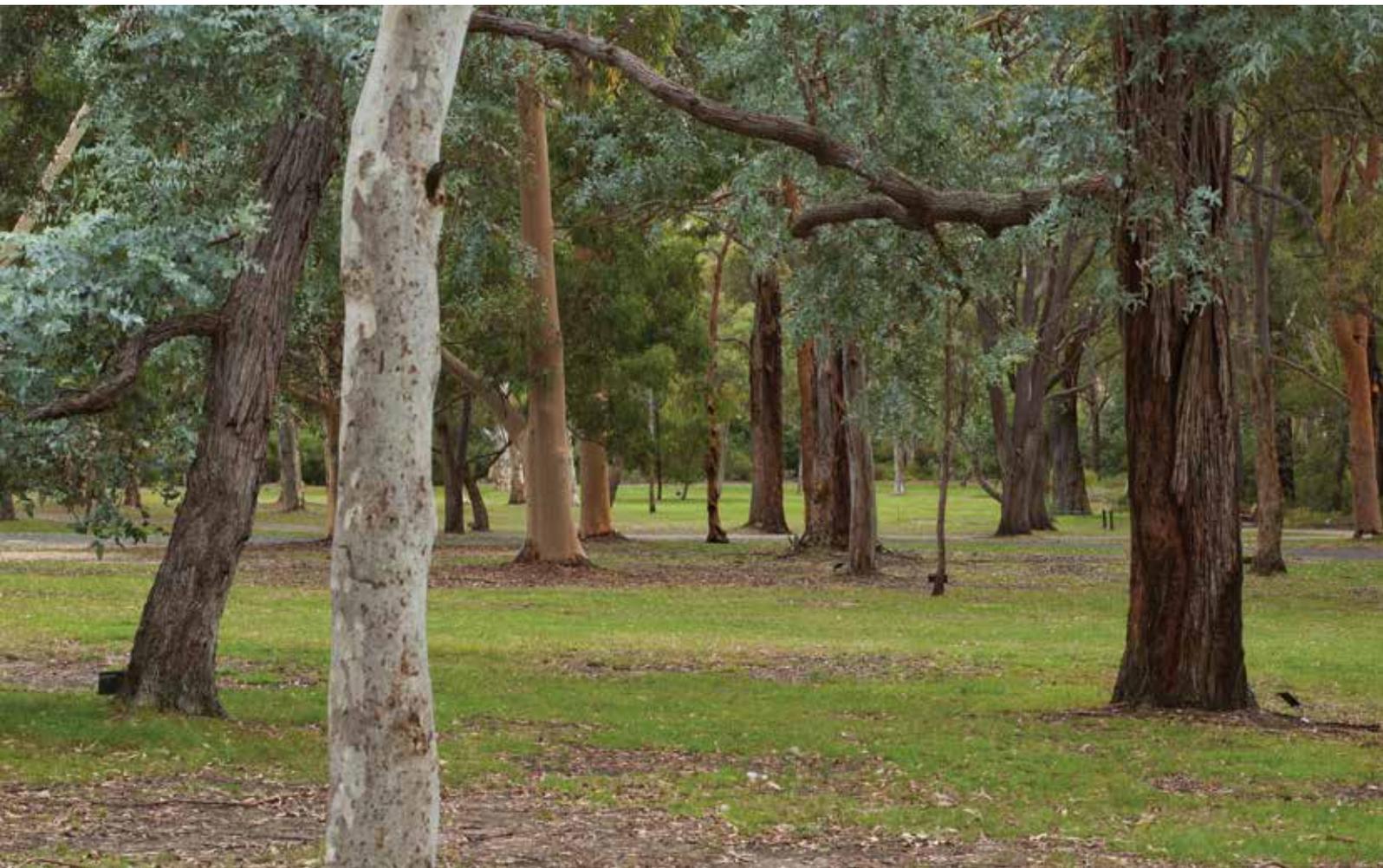


AUSTRALIAN NATIONAL
BOTANIC GARDENS

Australian National Botanic Gardens



TREE MANAGEMENT STRATEGY 2016-2026



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Front cover photographs

Araucaria cunninghamii fruit

APII a-4212 Photo: M. Fagg

Syzygium smithii fruit

APII dig-31481 Photo: M. Fagg

Grevillea robusta flowers

APII rfk-406 Photo: Rainforest Key image

Eucalyptus approximans bark

APII dig-4330 Photo: M. Fagg

The Eucalypt Lawn at the ANBG.

APII dig-43283 Photo: M. Fagg

Back cover photograph

Planted in 2017, these saplings represent a renewal of the ANBG's Eucalyptus Lawn.

APII Photo: M.Fagg

Opposite

Acacia pycnantha, (Golden Wattle) the proclamation of this species as the floral emblem for Australia took place in the Gardens in 1988.

APII a-10047 Photo: M.Fagg

Photographs from the Australian Plant Image Index (APII) held at the Australian National Botanic Gardens.

Australian National Botanic Gardens Tree Management Strategy 2016–2026

*A framework for the management, development and succession of
trees at the Australian National Botanic Gardens.*



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Livistona fulva, one of the palm trees in the ANBG's Rainforest Gully. Palms have dense root mats lacking a central tap-root which has enabled several species to be successfully relocated into the Gardens as mature trees.

APII dig-15609 Photo: M.Fagg

Introduction



The Living Collection is one of the Australian National Botanic Gardens' (ANBG) most important assets. It is the world's largest living collection of cultivated Australian plants. It consists of around 74,000 individual plants and includes over 6,000 species arranged in themed sections across 35 hectares of the 85 hectare site. The collection represents around one third of Australia's flowering native plants. A large proportion of the collection is backed and linked to database information relating to plant information, provenance and origin, as well as herbarium records.

Around 10,000 individual plants within the living collection are trees, forming an important structural and strong aesthetic component of the actively managed and cultivated landscape. The canopy structures provided by mature and developing trees provide essential shade and shelter for diverse microclimates necessary to support the living collection across the ANBG site. The remnant dry sclerophyll forest fringing the ANBG, dominated by *Eucalyptus rossii* and *E. macrorhyncha*, has been retained and managed for conservation, wildlife habitat and education.

The ANBG site has several distinctive features including its comparative steepness and elevation and its vistas towards Canberra. The site's topography is characterised by a series of five broad ridges that fan out to the east and south-east and are separated by four incised gullies. The site's eastern and northern sections are naturally protected from prevailing westerly winds.

The topography of the ANBG site and the use of strategic planting and watering create a range of favorable habitats for displaying and managing native plants sourced from across Australia, developed into a spectacular living collection that educates and raises awareness of Australia's biological diversity.

The ANBG is a declared Reserve under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Management activities need to take into account of the provisions of the EPBC Act and prescriptions within the *Australian National Botanic Gardens Management Plan 2012-2022*. As the ANBG is located on Commonwealth land, management activities are not subject to legislative requirements applicable within the Australian Capital Territory

This strategy provides the framework for the management, development and succession of trees at the Australian National Botanic Gardens.

It will guide strategic planning for the future, identifying opportunities to develop and enhance the values and features of one of Australia's most significant collections of indigenous trees.

Purpose

This strategy provides an overview of the ANBG's commitment and strategic priorities to manage trees within the ANBG living collection and delivers a high level planning framework to guide the future management and succession of trees on the site.

It has been developed with a view to enhancing the delivery of the ANBG's overarching vision; that **Australians value conserve and appreciate our rich plant heritage**, with the guidance provided by the strategy enabling a better understanding of the growth habits and maintenance needs of trees on the ANBG site, and more broadly a better understanding of Australian tree ecosystems and dependant microclimates.

The strategy defines key priority focus areas that set the standards and processes for tree management at the ANBG. It sets the framework for prioritising actions and the use of resources for tree management to deliver a safe and effective system for managing the large number and wide diversity of trees across the site.

It is underpinned by the standards, codes of practice and risk management processes considered to be best practice in the industry, backed and supported by the Parks Australia Workplace Health and Safety Advisor.

Objectives

- The risks associated with trees at the ANBG to both people and assets are minimised.
- The living collection retains a healthy and diverse mixed-age tree canopy that compliments and protects the living collection for future generations.
- Trees at the ANBG form an integral part of an inspirational place for public enjoyment and learning.
- The impacts of pests and pathogens are minimised.

Priority activities

- Continue an ongoing programme to assess and record the health, age, structural condition and significance of trees in the living collection to maintain a best practice approach to tree care, maintenance and succession.
- Undertake regular tree risk assessment and maintenance, particularly in high risk areas to ensure public safety, to protect the health of the living collection and to protect built infrastructure and assets.
- Enhance the character of the living collection for the future through the development of a mixed-age tree canopy
- Identify areas where new trees can be established, selecting species according to current and future site profile, thematic planning within the site, landscape character and species suitability.

Role and significance of trees at the ANBG

Officially opened 20 October 1970, the ANBG hosts a unique combination of trees that have significant aesthetic and scientific values underpinned by:

- The trees at the ANBG form part of the largest living collection of Australian flora, collected and documented from significantly diverse climates and soil conditions from across the continent.
- The living collection is a nationally significant public resource, providing opportunities and experiences to improve public appreciation of trees in the Australian landscape.
- The tree canopy at the ANBG is formed by a combination of remnant individual and grouped trees within the site, integrated with an extensive mix of collected and cultivated specimens.
- The mature and developing trees in the living collection provide shelter and habitat for flora and fauna, including sheltered habitats, nesting sites, and food sources for birds, mammals and invertebrates.
- The first official planting at the ANBG occurred in 1949, resulting in significant collection of mature trees of various species and structures, some of which are reaching the predicted end of their lifespan.
- The majority of trees in the collection have recorded provenance and are therefore of known origin. The database that links their provenance, field book, and herbarium and cultivation information is readily accessible to researchers, land managers and the public, serving as an internationally significant reference source.



Eucalyptus polyanthemos, one of the eucalypts native to the ANBG site, retained in the perimeter buffer zone of the Gardens.

Photo: M.Fagg

Tree Management



Tree management in botanic gardens is based on an understanding of the dynamic nature of the resource, its aesthetic, ecological requirements, public attitudes and perceptions, and management of risk to human health and assets.

The overall goal of garden management should be the establishment and development of physically and visually acceptable relationships between the landscape and the community, undertaken in a sustainable manner (Hitchmough, 1994). Individual components of the ANBG's landscape will inevitably change over time as trees are removed and replaced, but the function of the ANBG will always be sustained.

The management issues for trees at the ANBG are largely the same as they are for most large tree populations in publicly accessible settings, based on aesthetic values, management of risk, whole of life maintenance and eventual succession planning. Given diversity of species existing at the ANBG site and the varying behavior and physical requirements of each species, the overall management of trees is particularly complex.

The ANBG employs a strategic approach to tree assessment. As outlined in **Figure 1**.

FIGURE 1. Strategic approach to tree assessment



Key issues

- All trees have differing growth rates, habits, behaviors and life spans. At some point in time trees are likely to require maintenance and eventual removal as they move towards the end of their viable lifespan. All reasonable tree management options should be investigated prior to a tree removal recommendation
- As trees age they require increasingly more management intervention to maintain each specimen in a safe and healthy condition.
- Risk potential is related to the size of the tree or tree parts, the proximity to public areas, and the number and value of objects that could be impacted. As trees grow larger their potential to cause damage and safety issues increases.
- Risk potential also increases as tree structures become more complex and weathered, increasing the probability of failure in response to winds, rot and other factors.

- A significant reduction of mature trees is not generally considered as good practice or acceptable due to their potential heritage, scientific, habitat and aesthetic values.
- Trees occurring in publicly accessible sites that are demonstrated to be unsuitable to a site, are unhealthy, or are considered to pose a major risk, are a priority for consideration for removal and/or replacement.
- Potentially, each tree is an individual with relationships to the immediate surrounding site and dependent sheltered microclimates. Important decisions have to be made about how and when mature trees need to be removed or replaced and the potential consequential impacts to other individuals in the living collection.
- When planting trees at the ANBG, consideration needs to be given to
 - the suitability of soil types and the preparation of soils and ground
 - the selection of trees suitable for the location
 - the impact the tree can have on the surrounding area
- Trees provide many benefits but where they are located in situations close to people or property, safety must be a priority consideration above economics, amenity or sentiment. In addition, managers of public open space have a duty of care under Australian law to ensure that a reasonable degree of safety is maintained. The measure for action—is risk potential.

Tree risk management

Risk management is based on the systematic identification of hazards, a realistic assessment of risks and consideration of the full range of possible options before deciding on a course of action. Tree risk must be managed within the Parks Australia Risk Management Framework and in accordance with Parks Australia's WHS Visitor Safety Policy, WHS Planning and Risk Management Policy, and Fire Management Framework. Management of tree risk must assess the priority of tree risk and potential for hazards to occur against the management of other risks, competing resource priorities and the ANBG's capacity to address the identified suite of risks across the site.

The process of assessing tree risk, determining a management response and implementing the response, must be documented. A well formulated and documented risk management approach to tree management will:

- Protect human health and safety as a priority.
- provide a confident and rigorous basis for decision-making and planning
- identify potential opportunities and threats
- engage pro-active rather than re-active management
- allocate effective use of available resources

The protection of property, including the ANBG's infrastructure, is a consideration, but is not a primary driver of tree risk management. Risks from hazardous trees should be managed as part of, and integrated into, normal processes to ensure workplace and visitor safety.

The risk management strategy for tree management and maintenance at the ANBG adopts the approach to risk management outlined in the Australian Risk Management Standard AS/NZS ISO 31000:2009 (the Australian Standard) and the Parks Australia Risk Management Policy and Guidelines.

Worker exposure to hazardous trees is a reality of working in outdoor areas. Some activities in hazardous areas and conditions cannot be avoided. However managers, supervisors and workers must always consider options that minimise the risk to worker health and safety from potential tree incidents.

Effective communication of risk

Management of access within the ANBG is a significant aspect of keeping visitors safe and protecting people. Where immediate risks are identified it is important to communicate the presence of the risk, erect appropriate signage and where necessary redirect access routes away from areas where risks require treatment.

There are many challenges and threats in trying to propagate, maintain and improve a significant tree resource or asset, particularly considering the objectives of the ANBG, the strong personal investment of volunteers and the expectations of the local community. Good management practices might not always attract good public relations, particularly when action needs to be taken involving significant public trees. The hazards associated with aging and problematic trees need to be communicated to stakeholders and the community and a clear evidence needs to be established and communicated to support taking potentially controversial actions.

Tree assessment

Tree assessment is the active process that involves assessing the condition of trees within the ANBG. This is done annually across the whole of the ANBG site and is backed up by more frequent reviews in high traffic areas and specific tree assessments before major public events, responding to information and feedback on potential tree hazards and after significant weather events.

The assessment of each tree is captured as data and descriptive text using a tree assessment table which identifies the location and accession number of each tree and records the assessed condition.

Other details recorded within the assessment include recording species name, physical attributes such as tree height, crown width, structure, age and diameter at breast height, its maintenance requirements, size of any defective parts and finally a score is assigned based on its location and the likely consequences of not taking action to maintain the tree.

Target based tree risk assessments

There has been a shift away from defect driven tree assessments towards target based tree assessments, now recognised internationally as Quantified Tree Risk Assessments (QRTA). Until recent times, the arborist or urban forester has typically been obsessed with identifying every tree and its defects. This may have resulted in considerable resources being allocated to fix or remove low risk trees.

However, a tree-failure hazard assessment has two significant components:

- To be a risk, a tree must have potential to fail and cause injury or damage as a result of that failure.
- The presence of people or property as potential 'targets' increases risk potential or *likelihood*.

If people and property are not located in the vicinity of trees then the risks are more likely to be negligible. The recognition of 'targets' as a primary component of a Quantified Tree Risk Assessment has resulted in tree risk management adopting a more focused approach to assessing trees. An extension of this approach, which has gained increasing support over recent times, is to undertake risk zone mapping based on the likelihood of falling branches and trees impacting upon potential targets.

Locations within the ANBG site have been dissected into zones (see **Map 1**) to reflect higher or lower risk levels based on the risk categories described in **Table 1**. The zones shown in Map 1 may be varied from time to time as understanding of visitor use patterns improves. Areas are currently assessed according to use and the likelihood that a target will be located or will linger within the trees potential fall zone.

Based on this mapping the frequency of inspections for trees across the site can be determined. This mapping and the location of each tree is used in the tree assessment table to assign a likelihood rating.

TABLE 1. Classification tree risk likelihood

Tree risk zone	Likelihood rating	Standard minimum frequency of inspection
<ul style="list-style-type: none"> • Areas around the main path, the pedestrian concourse and other areas with high visitation • Areas with the potential for trees to impact overhead powerlines 	5 - Almost certain	6 monthly
<ul style="list-style-type: none"> • Secondary paths with moderate visitation • Areas around buildings, vehicles or other assets with low or no pedestrian traffic 	4 - Likely	Annually
<ul style="list-style-type: none"> • Tertiary paths, with low to moderate visitation 	3 - Possible	Annually
<ul style="list-style-type: none"> • Areas within the living collection with low traffic 	2 - Rare	Annually
<ul style="list-style-type: none"> • Areas rarely visited, such as bush buffer zone 	1 - Unlikely	Annually

Risk consequences

The growth cycle of a seed to mature tree can result in a number of possible hazards, each of which have a different levels of impact—or *consequence*. The majority of risks occur once the tree is mature and its condition begins to deteriorate as a result of age, stress, structural defects, dieback or external pressures such as rot and insect infestation.

The consequence of a target being impacted by a tree is generally dependent upon the size/mass of any defective part likely to fall towards a target.

Combination of the assessed condition of a tree and the positioning near or above a target results in the likelihood of a risk being realized.

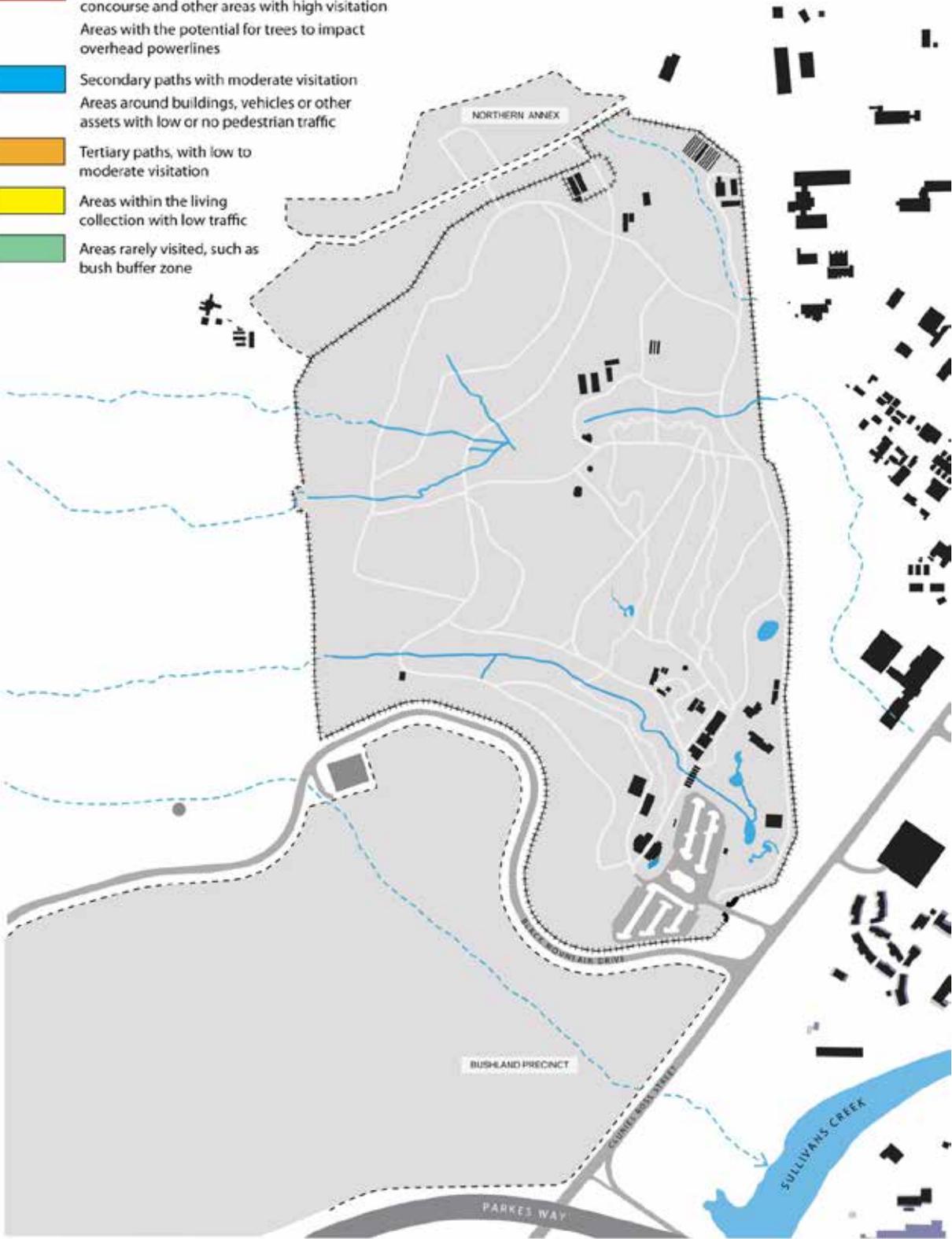
Table 2 is used to assign a consequence rating for each tree when undertaking tree assessments.

TABLE 2. Classification tree risk consequences

Tree risk	Consequence rating
Whole tree or large limbs (Greater than 150 millimetres (mm) diameter) likely to fail	4 - Critical
Part tree / medium sized limbs (75-150 mm diameter) likely to fail	3 - Major
Unstable small limbs (Up to 75 mm diameter) likely to fail	2 - Moderate
Large healthy and stable tree	1 - Minor
Healthy and stable tree of small proportions	1 - Minor

MAP 1. Tree risk zones

- Areas around the main path, the pedestrian concourse and other areas with high visitation
Areas with the potential for trees to impact overhead powerlines
- Secondary paths with moderate visitation
Areas around buildings, vehicles or other assets with low or no pedestrian traffic
- Tertiary paths, with low to moderate visitation
- Areas within the living collection with low traffic
- Areas rarely visited, such as bush buffer zone



Using the risk matrix

During the tree assessment, either undertaken during the annual cycle or more frequently where necessary, a value for the risk likelihood is assigned based on the location of the tree, and a value for the risk consequence (severity of likely impact) is determined.

Using the risk matrix shown at **Table 3**, these values can then determine the severity of likely risk and the urgency for intervention.

The calculated severity of risk is then used to schedule tree management activities, addressing the trees that are an extreme risk of causing an incident immediately, and scheduling the remaining trees for attention based on the order of risk identified within the tree assessment table.

TABLE 3. Qualitative risk analysis matrix for trees at the ANBG

Location - Likelihood of impacting upon a Target	Tree health - Consequence			
	4 Critical	3 Major	2 Moderate	1 Minor
5 Almost certain	Extreme	Extreme	Medium	Low
4 Likely	Extreme	High	Low	Low
3 Possible	High	Medium	Low	Low
2 Rare	Medium	Low	Low	Low
1 Unlikely	Low	Low	Low	Low

Extreme Risk	Immediate action required—Senior Management attention required
High Risk	High priority for action
Medium Risk	Regular action to be taken to manage moderate risk
Low Risk	Low priority for review and maintenance during routine work schedule



Staff undertaking tree maintenance of the Gardens site. Here ANBG horticulturalists Dan Marges and Anthony Buykx remove some overhanging branches in the Rainforest Gully.

APII DSCN5917 Photo: A.M. Monro

Arboriculture



Arboriculture is the cultivation, management, and study of individual trees. The ANBG is committed to utilise a well trained, specialised and competent arboriculture tree team on staff that provides capacity to:

- make considered, safe and effective decisions on tree management relevant to the specialised nature of the ANBG tree collection and overall site
- undertake tree management tasks supported by and integrated with external professionals rather than sole reliance on external specialists
- drive a culture of proactive tree risk management and high quality custodianship of the ANBG tree asset considering all its unique values and requirements.
- provide professional arboriculture skills and understanding based on contemporary tree management practices

To qualify as an arborist at the ANBG, staff must have completed at least a Certificate 3 in Arboriculture and it is desirable to have and continue with tree climbing activities at the ANBG to maintain proficiency.

Ground support staff must have a good understanding of the work undertaken by the arborists, be clear in communication, be proficient in the operation and safe use of the various equipment used, including; wood chippers and chainsaws.

Chainsaw competency training needs to be undertaken every three years by staff involved in climbing and ground support activities.

Prioritising tree management actions

As mentioned earlier, the frequency of tree assessments is dependent upon the location of tree and its proximity to a potential target. Generally, the frequency of assessment is described in **Table 1**. In addition, specific tree assessments are undertaken before major public events, responding to information and feedback on potential tree hazards and after significant weather events.

Tree management actions are informed by outcomes of the tree assessments within the Tree Assessment Table. The trees identified as highest risk (based on the tree risk matrix) are prioritised to ensure risk mitigation is strategic and responsive.

Management of the tree canopy - succession planning

The planting of a diverse range of native tree species, each of which require a significant area to grow, combined with remnant and naturally occurring trees throughout the ANBG, has resulted in site heavily covered and protected by trees.

The significant shade provided by trees and large shrubs across the site, combined with varied topography and natural drainage systems, have created a broad range of microclimates. Some providing shelter from the sun and cold weather, others providing moist microclimates where rainforest species are able to flourish.

It is important for the ANBG to develop and retain a mixed age tree canopy to replace trees that decline in health and to ensure the character of the collection for future generations. A tree canopy management programme is necessary to ensure retention of a mixed age tree canopy and to undertake appropriate succession planning.

Site selection and suitability

Not all trees within the collection are located in ideal positions for their needs. As a living collection of trees from across Australia, the soil types and climate conditions naturally occurring at the Black Mountain site are not ideal for all species. While care was taken in the past in the placement of trees, the introduction of thematic planting and a better understanding of tree habitat, soil types and tree behaviors has informed future tree management at the ANBG.

For example, not all eucalypts are suitable for the Eucalypt Lawn site at the ANBG, either due to soil, moisture and climatic conditions, or because they may be prone to dropping branches and limbs as they mature, in what has become a high traffic area for visitors.

The creation of microclimates over time has also provided moister habitats that may be more suitable for trees that would normally be found in rainforest gullies or near waterways.

Site preparation will include ripping the soil to a reasonable depth to allow root development and to break up any compaction in the surrounding soil

Appropriate placement of a tree when planted can significantly reduce the number and type of risks, such as impacts from trees placed over high traffic or long linger areas, impacts from trees growing over infrastructure and assets, or likely root incursion. Similarly, the placement of new infrastructure and public facilities need to take into account the risks associated with trees at the proposed location during the project planning stage and throughout the life of the new infrastructure/facility.

When considering succession planting, care will be given to provide a habitat similar to the conditions applicable where the species occurs naturally, and to consider the characteristics of the mature trees and its potential impact upon nearby targets into the future. As trees mature, following annual tree assessments, trees will be appropriately pruned, shaped and otherwise treated to ensure their continued health.

Pest and disease management

Management of pest and diseases should be in accordance with guidelines outlined in the ANBG pest and disease management manual.

Insect pests

The ANBG has a very healthy ecosystem that provides a natural habitat to a number of naturally occurring pest species that have the potential to affect trees. There are natural fluctuations in the number and types of pests, dependent upon climate and other mitigating factors. This is a normal part of the ecosystem and eradication of pests should not necessarily be undertaken unless the tree is suffering severely from repeated infestations and overall health of the tree is affected.

Armillaria leuteobubalina

Armillaria leuteobubalina, commonly known as the Australian honey fungus, is a species of mushroom in the family Physalacriaceae that is known to occur within the ANBG. Widely distributed in southern Australia, the fungus is responsible for a disease known as *Armillaria* root rot, a primary cause of Eucalyptus tree death and forest dieback. Any trees planted back into a known *Armillaria* affected area ideally should be inoculated with a Mycorrhizal fungi to assist the chances to resist infection.

Wood rot

There are several species of wood rotting fungi known to infect trees at the ANBG, some of these will affect the structural integrity of the tree over time. Occurrences of wood rot will be recorded during periodic tree assessments, identified and recorded on the tree risk list, recorded in the Integrated Botanical Information System (IBIS) database and monitored during subsequent tree assessments.

Habitat and Heritage

There is a need to keep trees for habitat purposes and food resources for native birds and mammals, particularly hollow bearing trees and hollows within logs from fallen trees. Fallen logs should be located in a designated area of the ANBG or used as a structural feature in garden beds, to ensure minimum disturbance to nesting habitats and to ensure the site remains safe and aesthetically pleasing for visitors.

The ANBG forms an integral component of architect Walter Burley Griffin's vision for Canberra and contributes to the aesthetic quality of the national capital. The ANBG is listed on the Commonwealth Heritage List as being nationally significant for its unique landscape, environmental character and outstanding examples of landscape design and horticulture using Australian native plants.

The ANBG actively participate in meetings and discussions with relevant neighbours and stakeholders to take an integrated approach to the management of the site and how it interacts with adjacent land in the foothills of Black Mountain. There is particular focus on operations related to fire management, feral animals and weed control.

Many of the trees in the collection now represent mature examples of their species. It is important to ensure that there are suitable succession arrangements for species in the collection, whilst retaining as many mature trees as possible in a safe and, where possible, structurally representative condition.

Information management

A critical component of the tree management strategy is the management, recording and storage of information, and ensuring that the information is useful and accessible. To facilitate this, the ANBG data on trees in the collection will include:

- A Tree Assessment Table that is accessible on the IBIS database and can be updated by all members of the ANBG tree team
- Tracking of the unique accession number for each tree, linked to the ANBG IBIS database which records a history of descriptive observations of the condition of the tree and treatment/maintenance activities.
- Mapping of trees across the ANBG site using the plant records mapping system which locates and identifies specific individual plants, including plants in the garden section (where relevant)

Sustainable practices

The ANBG will aspire to minimise its ecological footprint by pursuing environmental best practice and providing a role model for similar institutions and the Australian public. Monitoring, evaluating and reporting on environmental performance and using the results from these processes to adapt management programs will assist in achieving this goal.

In the case of tree management the integration of sustainable practices is a priority. To reduce the impact upon the environment the ANBG will:

- Reuse waste material by chipping and utilizing as mulch within the site
- Avoid the use of fire for disposing of waste plant material, with the exception of diseased material
- Retain hollow bearing logs for species habitat where aesthetically appropriate
- Retain logs in-situ in areas not accessible by the public as part of the natural woodland cycle
- Provide timber from felled trees either for reuse
- Plant trees in suitable soils/habitat to reduce individual tree watering requirements
- Provide significant canopy cover to reduce watering requirements across the living collection



The distinctive shaggy bark of *Allocasuarina inophloia*. The diversity of Australian trees offers many opportunities for landscapers.

APII a-25356 Photo: M.Fagg

Managing and developing a diverse, unique and representative tree collection



Fostering the continued development and evolution of a diverse, representative and engaging tree collection (and more broadly to the whole Living Collection) is a paramount consideration when planning for the succession and evolution of the ANBG tree collection.

Since the ANBG began, this focus has led to the establishment of a truly unique environment that has created a unique landscape narrative that immediately identifies the ANBG from other botanic gardens.

Maintaining this focus and continuing to discerningly edit the landscape through the succession and careful selection of trees will make sure the narrative will endure whilst delivering an ever-changing mix of species.

Methods and mechanisms for strategic thinking and implementation

Whilst tree succession will have a constantly changing mix of species at any one time, due to the need to remove and / or replace trees and the editing and development of the site. This ever changing scenario presents opportunities to review and introduce fresh plantings of existing species that are considered important to remain in the collection and are due for replacement, as well species new to the collection, the later reflecting the ANBG's focus for pioneering the cultivation of new and untried Australian flora.

The ANBG has several key mechanisms in the form of working groups to ensure this strategic planning is routinely considered and realised. These groups include a diverse cross section of staff from various units within the ANBG and many have external specialist partners as members. The purpose of these groups is to guide the specific actions that inform resource and collection succession planning and that sit under the framework provided by the Living Collections Policy and the ANBG management plan.

The Living Collections and Horticulture Working Group is the central working group for planning and decision making for the living collection.

Sitting under this group are various plant-based working groups (of which the Eucalypt working group is a relevant example) which are used to focus on particular plant groups. Their role covers:

- Assessments of holdings within the ANBG living and seed bank collections
- Identification of key values, narrative and significant information (of the plant group)
- Consideration and develop recommendations for which plants form the group are viable options for growing on the ANBG site

All requests and proposals are reviewed through the Living Collections and Horticulture Working Group and it acts as an inclusive forum to both assess and to foster ideas for plant succession and new introductions. For trees, this means consideration of specific species through to large or extensive tree plantings can be explored.

The makeup of this group includes representatives across the ANBG work units and is open to all staff and external stakeholders to submit ideas for consideration and is therefore well placed to assess and determine what is desirable and how to prioritise what species and plantings to add and edit, guiding both the succession of the collection and the enhancement of the landscape

Considering the opportunities and limitations of the site

We are fortunate to have a site that is furnished with a range of natural aspects and microclimates, supplemented by artificially generated ones. This provides an extensive range of conditions for growing plants and it enables the ANBG to grow a range of trees not thought possible in the macroclimate of the region. .

This is used to advantage when planning for planting in two key ways, by:

- Matching plants to the most suitable locations and conditions (where practical) for them to fulfill their role in the living collection. Typically this results in a more viable and sustainable way of growing plants with less reliance on additional inputs and resources to maintain them.
- Planting to create or enhance microclimates. This is where tree plantings come into their own, the best example being the carefully planned establishment of a dense tree canopy in the rainforest gully resulting in sheltered conditions suitable for an incredibly wide range of species. Aside from creating shelter, trees can influence microclimate markedly by their impact and influence on light. This is particularly relevant for this site in Canberra as seasonal variation in sun angles combined with weather conditions and shading by trees, can be a big factor for the amount of light reaching plants at various times throughout the year.

One limiting factor for the ANBG is the size of the site and the available space for growing trees. Although the site is extensive at over 20 hectares, not all of this area is suitable or desirable for the planting and growing of trees. In particular the amount of space for large forest trees is even more limited.

This means careful selection of species matched to location and the impact of planting over time is critical and the priority for and effort invested in planning for tree succession has and will continue to deliver a rich, diverse, ever-changing and engaging treescape.



Brachychiton rupestris, the iconic Queensland Bottle Tree is featured on one of the interpretive trails in the Gardens.

Outreach and Engagement



Outreach and engagement is a crucial component and a priority of the ANBG's strategic approach to tree management.

It is underpinned by the following key objectives:

- To engage and disseminate information on the value of trees and in particular Australian trees
- To inspire people to value trees and more broadly to support efforts to use trees to improve the environment and our well being
- To regularly provide an insight into how we manage, maintain and use tree succession.
- Ensuring that the ANBG can provide a range of experiences that connect people with plants and inspires learning and understanding of Australia's unique flora is an important secondary objective.

These objectives are delivered in many ways including a range of public and educational programs supported provided by staff of the ANBG and supported by volunteers from the Friends of the Australian National Botanic Gardens.

Developing and maintaining partnerships

The ANBG's ability to contribute to national and international policies and practices is largely due to the diverse skills and expertise of its staff. The ANBG is committed to maintaining and improving the skills of our staff through supporting participation in international and national forums and professional development and capacity building opportunities.

The ANBG is a centre of expertise with regard to the flora of Australia and for national and international collaborative efforts including the Australian Network for Plant Conservation, Botanic Gardens Australia and New Zealand Inc., the Australian Cultivar Registration Authority and work under the Convention on Biological Diversity.

The ANBG participates in many collaborative projects, conferences and committees providing opportunities for liaison and discussion between botanic gardens and herbaria.

The placement of the ANBG within the Canberra landscape and the aging urban tree population in the region provides similar challenges and opportunities to share Arboricultural knowledge and experience with relevant regional Government agencies and more broadly with national partners. The ANBG has a number of cooperative arrangements with the ACT Government with regard to cross boundary issues, vegetation and fire management. The ANBG will continue to maintain and develop these relationships towards the propagation and conservation of a healthy and representative native tree collection within the ANBG site and across the local region.

The ANBG also works with external stakeholders and regional tree management groups, participating in regional tree management forums and tree working groups, including the Canberra tree network.

Promote urban tree management through community engagement

The ANBG is an ideal reference source for the local and broader community. It hosts an extensive range of botanical information available to the public through the ANBG web site, on site demonstrations, tree management talks and through the community collaborations.

The ANBG public programs are strongly supported by the Friends of the Australian National Botanic Gardens, who draw on a vast source of community knowledge to connect visitors with the ANBG and its living collection and scientific activities. The Friends also provide a vital link between the ANBG and the community.

Through these opportunities, the ANBG seeks to increase community and institutional awareness, appreciation and understanding of tree management issues and the value of and responsibility for being tree custodians in the urban and rural landscape.



Gang Gang Cockatoos, one of several species of birds that nest in tree hollows in the remnant natural vegetation in the Gardens.

Photo: R.L. Barrett

Legislative framework



EPBC Act

The ANBG is a Commonwealth reserve under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and is managed in accordance with the Act and associated Regulations.

The EPBC Regulations control, or allow the Director to control, a range of activities in Commonwealth reserves, such as impacts on native and non-native species, recreational and commercial activities, use of vehicles, lighting of fires, access issues and research activities. The Director applies the Regulations subject to, and in accordance with, the EPBC Act and management plans.

ANBG Management plan

The EPBC Act (ss.366 and 368) requires the Director of National Parks to prepare management plans for Commonwealth reserves and sets out the content of a plan and matters to be taken into account when preparing a management plan.

Tree management in the ANBG will be guided by a range of key policies and actions outlined in the *ANBG Management Plan 2012-2022*:

Policies

- 1.1.1 The living collection will be managed to a high curatorial standard and developed to display a representation of Australia's flora and that of related regions, consistent with the ANBG Thematic Planting Guide and Living Collection Policy.
- 1.1.2 The development and implementation of best practice horticultural management will be based on scientific knowledge, on-site experimentation, excellence in horticultural practices and staff expertise.
 - 1.1.11 The living collection will be protected from damage through monitoring, preventative measures and integrated pest management and control techniques. These may include the use of pesticides or herbicides or other poisonous substances on plant, insect, mite, viral and fungal pests.
 - 1.1.12 Priority will be given to retaining naturally occurring trees on site based on their landscape and ecological values and subject to public safety considerations.
 - 1.1.13 Specialist horticultural consultants will be engaged where expertise is not available within the ANBG

Actions

- 1.1.19 Continue to develop and implement best practice horticulture suitable for native plants.
- 1.1.28 Develop and implement a tree management strategy for naturally occurring trees and those introduced from other parts of Australia, including a succession replacement plan and a maintenance program for monitoring tree health and human safety.
- 1.1.29 Regularly revise and subsequently implement integrated pest management strategies, guided by the Pest Management Manual and current standards for safe handling, effective use and storage of pesticides.
- 1.1.30 Develop and implement appropriate control methods for vertebrate animals that threaten collections.
- 1.1.31 Record and monitor occurrences of pests and diseases and implement appropriate control methods. These may include removal of tree stumps by excavation and/or burning.

- 2.3.2 Pockets of remnant vegetation which extend into the developed parts of the ANBG will be retained with only minor modifications, such as canopy reduction or ecologically appropriate understory plantings. Mature trees will be retained, subject to risk assessment, for their landscape or wildlife habitat values.
- 2.3.7 Implement weed control programs to prevent the spread of both exotic and native species from the developed part of the ANBG into the undeveloped areas and adjacent conservation areas (including the southern section of the ANBG).
- 2.3.10 Monitor populations of vertebrate pests, including rats, foxes, rabbits and cats, and implement appropriate scientifically based and humane management strategies to reduce adverse impacts.
- 3.1.3The Director may further close or restrict access to roads and walking tracks for management or safety reasons.

Policies and standards

The relevant policies and standards that relate to arboriculture in Parks Australia include the following, as amended from time to time:

Parks Australia Workplace Health and Safety (WHS) operational policies:

- WHSOP-DNP-004 - Tree Safety Management Policy
- WHSOP-DNP-008 - Hazardous Manual Tasks Policy
- WHSOP-DNP-026 - Plant Use Policy (i.e. Chainsaws and similar tools)
- WHSOP-DNP-027 - Personal Protective Equipment Policy
- WHSOP-DNP-029 - Working at Heights Policy
- WHSOP-DNP-032 - Hearing Protection Policy

Standards:

- AS 4373-2007 Pruning of amenity trees
- AS 2726 2 - 2004 Chainsaws for tree services
- AS/NZS 1891.1:2007 Harness and rigging equipment
- AS-2727 – 1997 Chainsaws guide to safe work practices
- Utility Networks (Public Safety) Regulation 2001 (ACT)



Planted in 1949, this *Eucalyptus microcorys* represents one of the earliest documented plantings in the Gardens.

APII dig-5682 Photo: M.Fagg

Implementation and Evaluation

The Tree Management Strategy will be reviewed in 2022. This timing has been selected to fall in line with the review for the *ANBG Management Plan 2012–2022* and to allow time for outcomes from the review to be implemented. In addition the risk assessment matrix will be refined prior to the review of the strategy.

The review of the strategy will be done in addition to and integrated with other key planning processes, plans and reviews including:

- the Living Collections Review
- ANBG Conservation Policy 2016–2022
- annual Living Collections Unit work plans
- the continued development of the Living Collections Operational Manual
- master planning development and outcomes
- the outcomes from the ANBG Living Collection and Horticulture Working Group and specialist plant working groups
- the Staff Performance and development Scheme

For the review of the strategy itself, a working group will be established to undertake the review and will consult widely. This will ensure a strategic, robust and transparent process.

Glossary

Integrated Botanical Information System or IBIS	the relational database that links data held in the various collections of the ANBG, the Australian National Herbarium, the Australian Plant Image Index and the Australian Plant Name Index.
Living collection	the living resources that form the basis of the work of the ANBG including the accessioned and non-accessioned open ground collections, glasshouse collections, seed bank and nursery collections.
Pest	any animal, plant or organism having, or with the potential to have, an adverse economic, environmental or social impact.
Arboriculture	the cultivation, management, and study of individual trees, shrubs, vines, and other perennial woody plants. The practice of arboriculture includes cultural techniques such as selection, planting, training, fertilization, pest and pathogen control, pruning, shaping, and removal of woody plants.

References

- Australian National Botanic Gardens Management Plan 2012–2022*
- Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)*
- The Australian National Botanic Gardens Living Collection Policy 2016–2022*
- Hitchmough, J.D. (1994). Urban landscape management. Inkata Press, Sydney*
- Tree Logic - Tree Management Review & Recommendations July 2010*



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