

ENVIRONMENTAL Performance



Did you know...

The Blue Mountains Botanic Garden Mount Tomah is the only botanic garden enclosed in a world-heritage site in the world!

Sustainable resource management

As part of the Office of Environment and Heritage we are committed to working within a sustainability framework which embraces waste reduction and increased resource recovery. Key focus areas for 2017-18 continue in water, energy and waste management across our sites.

Each of our sites has undertaken environmental improvement projects during FY17/18 to help achieve the objectives of our Environmental Policy.

Australian Botanic Garden:

- a water-saving initiative involving the installation of 35 automatic timers that have been attached to the quick coupling valve irrigation outlets that are manually run (the programming of the valves allows for shorter blocks of watering, resulting in a reduction in water consumption).

Blue Mountains Botanic Garden:

- installation of solar Bigbelly waste and recycling stations to cut down collections and reduce carbon emissions
- a site audit was undertaken in November 2017 as part of the Low Carbon Living Blue Mountains initiative.

Water management

Water management and sustainability are critical activities for the Trust. Each Garden relies on different water sources for its needs:

- the Royal Botanic Garden uses potable water for the majority of its needs and tank water in the nursery
- the Blue Mountains Botanic Garden is completely self-sufficient in terms of both water collection and usage — water for irrigation and toilet flushing is sourced from the onsite dam which collects rainwater and run-off, and all potable water is harvested from roof tops
- the Australian Botanic Garden, with approval from WaterNSW, draws water directly from the canal that supplies the Prospect Reservoir Water Filtration Plant.

Energy Management

The bulk of the Trusts' electricity usage is bought under the State Contract Control Board electricity contract (numbers 776 and 777). These contracts minimise costs and allow for the purchase of green power generated from renewable sources. Currently the Green Power component equates to 6% at each site.

Solar panels are operational at the Royal Botanic Garden Sydney Central Depot (24 kW system), Australian Botanic Garden Mount Annan (100kW system) and Blue Mountains Botanic Garden Visitor Centre (26.97 kW system). Our solar systems generated over 177 MWh of electricity in FY17/18, a saving of 147 tonnes of CO₂ emissions.

Waste management

Across our three sites, waste is managed in varying ways according to need and the waste management services available. Botanic Gardens' waste streams are clearly identified and quantities monitored. Organic and green waste is separated and either collected for recycling or re-used onsite as mulch. We continue to reduce our office waste through recycling paper and cardboard, ink cartridges and mobile phones.

Managing our living collection

State of the collection

LOCATION	Size ha	Taxa	% Wild Collected	Total Accessions	Total Trees
Royal Botanic Garden Sydney and Domain	64	9,028	20%	27,221	3,386
Australian Botanic Garden Mount Annan	416	3,032	69%	18,884	55,000 (est) 4,487 arborist managed
Blue Mountains Botanic Garden Mount Tomah	252	6,146	40%	19,668	6123

During 2017-18 we planted 254 new trees across the three botanic garden sites – 123 at the Australian Botanic Garden and over 100 at Royal Botanic Garden Sydney.

- Information requests:
 - more than 100 requests for plant information or material to support academic research from institutions in Australia and overseas.

Horticultural improvements Plant mapping and records team

*global positioning satellite

- New living collections database:
 - migration of 2 million records from KEmu to IrisBG —including clean-up of taxonomy in addition to clean-up and upload of over 25,000 images
 - development of new protocols and systems specific to user groups — nursery, horticulturists, arborists, friends, foundation, guides and science teams
 - delivery of training to the user groups across four sites and ongoing support
 - development of four new websites (GardenExplorer), allowing full public interface with the living collections at all sites
 - GIS mapping of 7,267 plant locations — RBG 2,355, ABG 3,613, BMBG 1,749.
- Completed stocktake and ground truth of living collections:
 - RBG — a stocktake of 27.85% of the collection conducted, with 7,644 GPS* points
 - ABG — a stocktake of 47% of the collection conducted, with 8,760 GPS* points
 - BMBG — a stocktake of 19.5% of the collection conducted, with 3,919 GPS* points.
- Labels/tags:
 - over 1,000 garden plant labels made for all three collections
 - 200-plus colour interpretation labels installed for new and improved plant collections
 - 2,500-plus accession tags produced.
- Accessioning:
 - Accessioned 817 plants into the collections — ABG 184; BMBG 265; RBG 638.

At the Royal Botanic Garden Sydney

We officially opened the first of our new themed gardens, the Southern African Garden, featuring our extensive collection of plants from the southernmost African countries. There was also a continued focus on providing display horticulture across the site including the following:

- the third display in the in The Calyx featuring *Pollination* of plants
- expansion of the Native Rainforest in the Palace Garden
- paving of the Oriental Garden and Lion Gate Lodge
- additional sandstone garden terraces and seating were added to Victoria Lodge landscape.

At the Domain

The revegetation of the Woolloomooloo Bay escarpment continued, with many Sydney Harbour native species re-established along Mrs Macquaries Woodland Walk. Beautification of the tree pits surrounding the Pavilion Restaurant and Café was also continued.

At the Australian Botanic Garden Mount Annan

The range of improvements were completed including:

- Site items
 - 2,331 specimens planted
 - an 'in principle' approval from Camden Council to construct two entry signs and associated landscaping at the Garden's Narellan Road entrance
 - planning for the Garden's 30th Birthday celebrations including the design of a giant '30' sign
 - completion of the Garden's Strategic Planning Framework

- design work commenced for the refurbishment of the Maze Lawn, new beds at Cunningham and Caley Drives, Lake Nadungamba and the lower Connections Garden
- detailed design development for a national *Xanthorrhoea* (grass tree) collection.

• Production Horticulture

- A refurbishment of the P3/4 propagation glasshouses in the Garden's nursery has been completed to help avoid critical system failures due to extreme summer temperatures
- the Garden's nursery is currently managing over 20 threatened species contracts including Save our Species (SOS) projects and local, state and federal government projects
- a Garden's horticulture representative presented at the International Plant Propagators Society conference in Hobart 2018 on understanding threatened species
- the Garden's Growing Friends (volunteers) plant production and sales increased to record levels, with plant lists now starting to explore other species and sizes.

• Display Horticulture

- the Elderslie Banksia Scrub Forest bed, an endangered plant community, was created within the Banksia Garden with the redevelopment of an ugly stormwater drainage culvert into a formal sandstone garden bed (funded by Transport for NSW)
- the Garden held one of its most successful annual spring displays with signature paper daisies
- a new annual and perennial bed was created at base of the Connections Garden to link the existing spring and summer displays with the main visitor/events precinct
- the 'Plants and Wildlife' section of the Connections Garden was refurbished
- a sculpture was removed and replaced with turf to create sweeping views to Sundial Hill and provide a free-flowing aspect to the Lakeside Lawn Precinct, the major event space at the Garden
- structural adjustments were made to the Display Horticulture team including the creation of a Projects Team
- planting enhancements were created at the entrances at Mount Annan Drive and Narellan Road, the Visitor Centre, BIG Garden and Banksia Garden
- annuals purchased and planted: 5,584.

• Natural Areas & Open Spaces

- a NSW Environmental Trust grant of \$99,500 was awarded for a three-year Western Sydney Rainforest Rescue Project
- a rabbit control program was implemented including Calicivirus release, Pindone treatment, strategic shooting and warren fumigation

- some 25 hectares of African Olive areas were cleared using the Ventrac mower (23 hectares) and a remote-control flail mower (two hectares)
- tree risk management work was conducted through dead-wooding and canopy reduction in the high occupation areas of the Big Ideas Garden, Banksia Garden, Stolen Generations Memorial, Macarthur Centre for Sustainable Living, Marquee and Lakeside Lawns, and the main carpark
- a five-year turf renovation plan was established, with two hectares of turf renovated in 2017-18
- a Horticultural Green Waste treatment area and strategy was introduced
- works commenced for the NSW Environmental Trust (grant funded) Western Sydney Rainforest Rescue project including more than 600 hours preparing the display area landscape and over 100 hours conducting baseline monitoring
- maintenance of the 9.5km asset protection zone along the inner perimeter of the Australian Botanic Garden boundary fence through quarterly slashing and selective tree removals
- strategic bush regeneration across six hectares of Cumberland Plain Woodland adjacent to Plantbank, incorporating over 150 Bushcare volunteer hours and 80 Natural Areas and Open Spaces team hours
- ongoing management and selective herbicide treatment of 15 hectares of grassland with significant areas of dense Chilean Needle Grass infestation.

At the Blue Mountains Botanic Garden Mount Tomah

- refurbishment of the entry experience has been a focus in preparation for upcoming treasury-funded amenities and front entrance upgrades which will improve safety and create a "sense of arrival"
- the nursery has propagated a number of rare and threatened plants in the collection for distribution to other botanic gardens as part of the living collection risk mitigation strategy
- propagated material from some rare species — including the Blue Mountains endemic Dwarf Mountain Pine (*Ptherosphaera fitzgeraldii*) and Wollemi Pine (*Wollemia nobilis*) — has been achieved in great numbers in conjunction with Foundation & Friends 'Growing Friends' for sale to the public
- the concept design for the Camellia garden was finalised, with a focus on the plant family Theaceae (some of the rarest plants in the world) and part of the national Camellia collection shared across the Blue Mountains Botanic Garden and the Royal Botanic Garden Sydney (some \$90,000 has been raised from a bequest)
- refurbishment of the Brunet Lawn and surrounding beds was completed with the addition of a Lilac (*Syringa* spp.) collection and hundreds of new bulbs to better represent those cultivated by the Brunet family
- Over 10,000 new bulbs were added to the living collection including 345 new daffodil cultivars and 300 species of African bulbs, many of which are incredibly rare.

Ecology: Animal and Plant Interactions

Our conservation and management research ranges from Gardens' run projects to collaborations with universities and government agencies across Australia.

We continue to research the ecosystem services flying-foxes provide by participating in the National Flying-fox Monitoring Program (CSIRO), Resolving Human–Flying-fox Conflict in the Face of Environmental Change (University of Melbourne, ARC funded), and the Movement Ecology of Flying-foxes (Western Sydney University, ARC funded) projects.

On a smaller scale, research commenced on the macropod population within the Australian Botanic Garden Mount Annan. Our monitoring has documented a doubling of the wallaroo population over the past five years and the colonisation of eastern grey kangaroo during this period. This research used GPS telemetry to determine the habitat used within the Garden and an individual's connectivity outside the Garden. This project is led by the Botanic Gardens in collaboration with the University of Sydney and Western Sydney University.

Nature-based education

We are currently asking school students (years 3 to 8) about their connection to nature, both at their schools through an online survey and at the Royal Botanic Garden following on-site excursions. We are also assessing the students' learning experience within the Gardens. This research will inform our education programs and potentially the school curriculum. This research is being conducted in collaboration with the University of Sydney and Swinburne University of Technology.

Citizen science

The Hollows as Homes project is a partnership with the Australian Museum and University of Sydney. This citizen science program asks members of the community to report trees bearing hollows and nest boxes (in their yard, street, park, paddock or bush), and then monitor this habitat and report observations of wildlife. In 2018 an Honours student is assessing the habitat surrounding identified hollows and the on-ground actions implemented by land managers to conserve and maintain hollow-bearing trees. The loss of tree hollows is listed as a key threatening process in NSW.

In addition, the sulphur-crested cockatoo research has entered a new phase, collaborating with the Max Planck Institute for Ornithology in Germany to supervise a PhD student researching cockatoos' ability to learn, solve problems and share their knowledge. Answering these questions will help us understand how cockatoos adapt to the urban environment and continue to thrive.

The Wingtags Project — researching the ecological role and habitat requirements of urban-adapted sulphur-crested cockatoos and Australian white ibis — was expanded to include the Australian brush-turkey. The Wingtags Project is a collaborative effort between the Royal Botanic Garden, the Australian Museum and the University of Sydney. In late 2017 a PhD candidate commenced research on Australian brush-turkeys, with a focus on how the foraging and mound construction techniques of brush turkeys affect plant diversity and seed germination.

Apprenticeship Program

Our Apprenticeship Program is one of Australia's leading and respected training programs in horticulture. As part of the program, our apprentices have the opportunity to develop skills across a diverse range of areas — from arboriculture and display horticulture, to propagation and the curation of valuable scientific collections. Our apprentices are able to hone these skills in both heritage landscapes and natural areas, in addition to developing land management conservation techniques at one of our three Gardens.

Since its launch in 1947, more than 465 apprentices have participated in the program. Our goal is to ensure our apprentices complete a nationally-recognised training course and are equipped with all the horticultural skills required to operate successfully in the industry. In 2017-18 we offered the following apprenticeship placements:

- Royal Botanic Garden Sydney: 20
- Australian Botanic Garden Mount Annan: 3
- Blue Mountains Botanic Garden Mount Tomah: 3

Strategic Programs

There are almost 500 hectares under management across our gardens and parklands, with a variety of landscapes.

The combined catalogue of more than 3,000 assets (as well as the advanced age of the Royal Botanic Garden Sydney) present considerable challenges in terms of asset maintenance and upgrades.

In 2017-18 we continued to deliver a diverse range of projects funded by NSW Government, the Trust and other external funding sources.

Summary of capital works	2017-18 Expenditure (\$,000)
Draft Australian Botanic Garden Mount Annan, Strategic Planning Framework	56
Blue Mountains Botanic Garden Mount Tomah	
Car park and visitor amenities upgrades	2,246
Total	2,302