

Conservation and engagement in Sydney

- 5.1 On 27 March 2012, the Committee visited sites in Sydney that highlighted issues relating to ecological restoration, research, ex situ conservation and community engagement. In Australia's most populous city, the Committee welcomed the opportunity to investigate climate change impacts on biodiversity in an urban setting.
- 5.2 The Committee visited Sydney Olympic Park and the Australian Botanic Garden at Mount Annan. Both sites contained a range of elements of interest to the Committee and provided an opportunity to consider some of the wider themes of the inquiry, such as ecological restoration programs, ex situ conservation, community engagement, and threats to biodiversity such as pests and disease.

Committee activities

Sydney Olympic Park

- 5.3 Sydney Olympic Park is located 14 kilometres west of the Sydney central business district. With a history of intensive land use, the Sydney Olympic Park site is now used for sporting and cultural events, and contains commercial developments and extensive parklands, including 430 hectares of open space, recreation areas, wetlands and waterways. The site is managed by the Sydney Olympic Park Authority (SOPA).
- 5.4 The Committee was interested to visit the site in light of Sydney Olympic Park's significant biodiversity values, extensive ecological restoration and remediation program, and public engagement work.

- 5.5 At Sydney Olympic Park, the Committee met with and received briefings from the following officers from SOPA:
- Mr Mike Bartlett, Manager of Education;
 - Ms Kerry Darcovich, Senior Manager of Environment and Ecology; and
 - Dr Marianne Sheumack, Project Manager, Education and Sustainability.
- 5.6 The Committee received the following documents:
- SOPA (2009) *Greenguide: Environmental awareness and due diligence information*.
 - SOPA, *Annual Report 2010–11*.
 - SOPA (2011) *Fact Sheet – Restoring ecosystems*.
 - SOPA (2011) *Fact Sheet – Biodiversity*.
 - SOPA (2011) *Fact Sheet – Education*.
 - SOPA (2011) *Fact Sheet – Parklands*.
 - SOPA (2006) *Urban Water Reuse and Integrated Water Management*.
 - Department of Environment and Climate Change (NSW) (2008) *Protecting and Restoring Coastal Saltmarsh*.
 - Map of Sydney Olympic Park.
- 5.7 Key sites visited by the Committee included the Education Centre in Bicentennial Park; the protected Badu Mangroves; the Brickpit Ring Walk; and Haslam’s Creek and Narawang Wetland.
- 5.8 The Committee was briefed on a range of other matters, including the Sydney Olympic Park Water Reclamation and Management System, and Newington Nature Reserve. The Committee was interested to hear that the latter site was formerly managed by the Commonwealth Department of Defence, and includes 13 hectares of remnant Sydney Turpentine-Ironbark Forest. These natural values have been preserved largely because public access to the reserve was restricted by the Royal Australian Navy for over 100 years.

Figure 5.1 Committee members and SOPA officers inspecting the protected Badu Mangroves



Photograph courtesy of Sydney Olympic Park Authority

Australian Botanic Garden, Mount Annan

- 5.9 An estate under the Royal Botanic Gardens and Domain Trust, the Australian Botanic Garden, Mount Annan, displays over 4000 plants, set in 416 hectares of hills and lakes. The Garden contains remnant Cumberland Plain Woodland and houses horticultural research facilities, including the NSW Seedbank. A new world-class scientific facility called PlantBank is also being constructed at the site.
- 5.10 The Committee met with and received briefings from the following representatives of the Australian Botanic Garden:
- Dr Catherine Offord, Manager, Horticultural Research, Science and Conservation; and
 - Mr Peter Cuneo, Manager, Natural Heritage.
- 5.11 Prior to the visit, the Committee received the following documents:
- *Briefing notes – Visit to the Australian Botanic Garden, Mount Annan and NSW Seedbank 27th March 2012*, Royal Botanic Gardens and Domain Trust.
 - ‘Pushed to the limit: consequences of climate change for the Araucariaceae: a relictual rain forest family’, C. A. Offord, *Annals of Botany*, 2011, 108, pp. 347–57.

- *Plant Germplasm Conservation in Australia: Strategies and Guidelines for developing, managing and utilising ex situ collections*, C. A. Offord and P. F. Meagher (eds), 2009, 'Chapter 1: Introduction' and 'Chapter 2: Options and major considerations for plant germplasm conservation', C. A. Offord and R. O. Makinson.
- 5.12 The focus of the Committee's visit was the Australian Botanic Garden's research work; ex situ Wollemi pine collection; expertise in germplasm conservation; and its role in engaging the community on biodiversity issues.

Issues explored in Sydney

Ecological restoration and remediation programs

- 5.13 Originally part of Homebush Bay, the land now comprising Sydney Olympic Park was formerly used for industrial and military purposes, including a brickworks, abattoir, armaments depot, and several rubbish dumps. In the late 1990s the degraded wetland and terrestrial ecosystems underwent what was, at that time, the largest land remediation exercise ever undertaken in Australia.
- 5.14 The Committee understands that the ecological aspect of the remediation works aimed to rebuild functional, naturalistic ecosystems within an urban parkland environment, and included remediation of 160 hectares of contaminated land; recovery and containment of nine million cubic metres of waste; restoration of 100 hectares of remnant wetlands and 20 hectares of remnant eucalypt forest; conversion of concrete stormwater channels into a naturalistic tidal waterway; restoration of tidal flushing to a 35 hectare land-locked wetland; construction of new wetland, grassland, woodland and saltmarsh on remediated land; and construction of new habitats for target plant and animal communities.
- 5.15 Today, Sydney Olympic Park has significant biodiversity values, particularly given that it is situated in the geographic centre of a large city. Habitat restoration and management works are an ongoing part of the Park's management. Approximately 300 hectares of the park provide habitat for threatened species, protected marine vegetation and endangered ecological communities, in addition to hundreds of native plant and vertebrate species.

- 5.16 The Committee is aware that, although the Park's estuarine habitats are part of a larger network of similar habitats along the Parramatta River, terrestrially and in ecological terms, Olympic Park is effectively an island. Surrounding urban development has meant that the ecological communities in the park are physically disconnected from most natural habitats in the region. The park is therefore subject to the same ecological threats that most island ecosystems tend to face: edge effects; low or zero rates of external recruitment by many species; and low rates of recovery from localised ecosystem disturbances.¹
- 5.17 The Committee's visit to the disused quarry at the Brickpit Ring Walk site, which is protected because of its role as the primary habitat of the endangered Green and Golden Bell Frog, allowed Members to see firsthand a good example of a severely degraded ecosystem being actively managed to retain biodiversity values. The Committee heard that the brickpit now supports 40–50 bird species and microbats.
- 5.18 While the brickpit's natural and constructed wetland habitats are used for biodiversity conservation, part of the site has also been repurposed as a reservoir that supplies non-potable water to Sydney Olympic Park and Newington. The brickpit therefore demonstrates sustainable use of natural resources.
- 5.19 The Committee inspected the Eastern Water Quality Control Pond. The naturalistic pond moderates the flow of stormwater run-off and absorbs nutrients, before the water is filtered and pumped into the brickpit reservoir for distribution. The pond also provides habitat for five frog species and 40 bird species. It therefore contributes to water filtration, while achieving biodiversity outcomes.
- 5.20 The Committee also visited the Narawang Wetland and Haslams Creek. The latter previously consisted of concrete stormwater channels, but has been reconstructed into a naturalistic tidal waterway edged by extensive areas of replacement saltmarsh habitat. The Committee heard that saltmarsh habitats are very vulnerable to the effects of climate change because their range is limited to the area between the mean and maximum high tide marks. As sea levels rise, saltmarsh will also need to migrate accordingly, but this is not always possible, especially as many waterside developments include sea walls.
- 5.21 The Committee also inspected the protected Badu Mangroves which, covering 65 hectares, represents the largest stand of mangroves in the Parramatta River catchment.

1 Sydney Olympic Park Authority (2011), *Fact Sheet – Biodiversity*, p. 2.

Committee comment

- 5.22 The Committee was impressed with the transformation of the Sydney Olympic Park site as a result of the extensive ecological restoration and remediation works carried out in the late 1990s and more recently. It was clear to the Committee that a great deal of thought and ingenuity had gone into the restoration and creation of functional ecosystems in what was once a much degraded landscape.
- 5.23 As the effects of climate changes continue to be felt across Australia over the coming years, restoration and conservation programs like the ones undertaken at Sydney Olympic Park – albeit at a smaller scale – may become necessary in various locations. The Park’s success story is heartening. The Committee notes that progress of the significant restoration program was assisted by the imposed deadline of the 2000 Sydney Olympics. However, this case study underlines the good ecological outcomes that can be achieved with government commitment and adequate resources.
- 5.24 The Committee notes that there are currently about 11 000 office workers based at Olympic Park, and that number is planned to increase. It also notes that 16 000 residents are expected to live within the Sydney Olympic Park precinct by 2030. Clearly, the confluence of so many people and land uses in an area of such high biodiversity values will present particular challenges to SOPA in years to come, and the Committee will continue to observe with interest how these challenges will be addressed.

Figure 5.2 A biodiverse urban setting: Office tower in Sydney Olympic Park as viewed from the protected Badu Mangroves



Photograph courtesy of committee secretariat

Community engagement

- 5.25 Sydney Olympic Park and the Australian Botanic Garden both engage the community on environmental matters by managing their parks and open spaces for members of the public to visit and enjoy. Specific initiatives are also used to promote engagement: SOPA engages young people and opens up conservation sites to the public without jeopardising its conservation work; and PlantBank facility will enhance the Australian Botanic Garden's capacity for effective public engagement on biodiversity issues.
- 5.26 The Committee heard that, each year, half a million school students attend school events, excursions and activities at Sydney Olympic Park. About 28 000 of those are students – from government and non-government primary and secondary schools – who visit Sydney Olympic Park as part of SOPA's program of school excursions.²

² SOPA, *Annual Report 2010–11*, p. 80; Sydney Olympic Park Authority (2011) *Fact Sheet – Education*, p. 1.

- 5.27 At the Education Centre in Bicentennial Park, where SOPA teaches school children using hands-on learning and curriculum based environmental education programs, the Committee had the opportunity to see high school science and geography students engaged in excursion programs. The Committee heard that SOPA offers around 35 separate curriculum based school excursion programs for Kindergarten to Year 12 school students. The vast majority of these programs are wetlands-based excursions focusing on geography and science. The Committee understands that SOPA also runs professional development courses for school teachers.
- 5.28 As discussed above, the brickpit at Sydney Olympic Park is a site for the conservation of the endangered green and golden bell frog's primary habitat. Following pressure to allow public access to the brickpit site, an elevated ring walk was constructed in 2005. This has allowed members of the public – including members of the Committee during this site inspection – to visit the site and to learn about the threatened species and related conservation work, without disturbing the habitat. This has enabled the brickpit to achieve biodiversity conservation goals, as well as community engagement outcomes.
- 5.29 At the Australian Botanic Garden, the Committee heard that the removal of entry fees for the Garden in 2011 had resulted in a significant increase in visitor numbers. The Committee also heard about plans for the PlantBank facility, currently under construction. The Committee heard that the facility has been designed with community engagement principles in mind, and that the PlantBank would make seedbanking and ex situ biodiversity conservation much more open to the public. The facility is discussed in more detail below.

Committee comment

- 5.30 SOPA's excursion programs and the Brickpit Ring Walk are good examples of initiatives that can foster the community's engagement with the issue of biodiversity and the environment more generally, particularly in an urban context.
- 5.31 The Committee was impressed with the use of Sydney Olympic Park as a resource for educating young people on biodiversity issues. School children visiting the Park as part of SOPA excursion programs, represent an excellent opportunity to improve the next generation's understanding and appreciation of environmental matters, including biodiversity and climate change. The Committee considers it especially important that the school excursion programs are able to engage young people from an

urban environment in particular, who may not have routine exposure to or high awareness of ecological issues.

- 5.32 The Committee notes that, in some senses, SOPA has become a victim of its own success. As community engagement with the site has improved and the number of visitors to the Park has increased, so too have the pressures on Sydney Olympic Park's maintenance and ecological management programs. The Committee noted above that increases in the number of residents and workers in the precinct was likely to put pressure on SOPA's resources. This is true also of the number of visitors to the Park. While the increasing visitor numbers are commendable, the Committee foresees potential stresses on SOPA's resources and programs.
- 5.33 The Committee is pleased that visitor numbers to the Australian Botanic Gardens have increased, due partly to the removal of entry fees. The Committee is supportive of initiatives that encourage more people to make use of botanic gardens. The Committee is also pleased that the Australian Botanic Garden's PlantBank has been designed to improve public engagement. Such facilities have the potential to engage novices as well as researchers and students.

The role of botanic gardens

- 5.34 Botanic gardens have a range of roles relating to the conservation of biodiversity, as exemplified by the Australian Botanic Garden, Mount Annan.
- 5.35 The most obvious role of botanic gardens relates to their horticultural displays. These displays can be used as a form of ex situ conservation of plant genetic diversity. The displays can contribute to ensuring the survival of high value and threatened plant species in particular.
- 5.36 Botanic gardens also manage and preserve areas of natural vegetation. The Committee heard about the Australian Botanic Garden's program to eradicate the African olive noxious weed (*Olea europaea* subsp. *cuspidate*). The African olive existed on the site when the Australian Botanic Garden was opened in 1988, and has been actively managed since.
- 5.37 Botanic gardens have a role in community engagement, botanical research and plant taxonomy, and this is certainly true of the Australian Botanic Garden. These issues are discussed below in the context of the PlantBank facility.

Committee comment

- 5.38 The Committee's inspection of sites at the Australian Botanic Garden highlighted the potentially increasing role for botanic gardens in conserving biodiversity in a changing climate. Botanic gardens' horticultural, research and community engagement activities in particular will be important for informing biodiversity conservation initiatives, educating the public, and promoting biodiversity conservation as a worthwhile goal.
- 5.39 In light of these important roles, there is a need to ensure that botanic gardens are appropriately resourced. Visitor levels will also need to be monitored, as increased numbers of visitors are likely to result in additional pressures on the gardens' land management resources.

Figure 5.3 African olive grove in the distance, Australian Botanic Garden, Mount Annan



Photograph courtesy of committee secretariat

NSW Seedbank and PlantBank

- 5.40 At the Australian Botanic Garden, the Committee visited the NSW Seedbank facility and received briefings on the state's seedbanking activities. Seedbanking is a form of ex situ biodiversity conservation, where plant germplasm is stored for future use.
- 5.41 The Committee heard that most Australian plants have dry seeds that tend to store very well, making them good candidates for seedbanking. It was also informed that stored seeds from NSW Seedbank have been used to revegetate sites where local extinctions had occurred. For example, a species of *Allocasuarina* (she-oak) was reduced to one female individual at Nielsen Park in Sydney Harbour, due to stressors such as weeds, Phytophthora infection, and fire regime changes. Stored seeds were able to be used in situ to bolster the number of she-oaks.
- 5.42 The Seedbank is a significant repository for threatened species' seed in Australia. The Committee was informed that seed has been collected for 36 per cent of threatened species. The collection does not involve merely storing the seed, but also results in better understanding the biology of those seeds. This is particularly important in Australia, where seed biology is especially complicated because many plants have evolved in the presence of fire.
- 5.43 The NSW Seedbank was originally very small and was intended to service only the needs of the Australian Botanic Garden and its horticultural displays. Its role has evolved to include a conservation focus, partly due to its involvement in the Millennium Seedbank Project.
- 5.44 NSW Seedbank is part of the Australian Seedbank Partnership, which is a legacy of the Millennium Seedbank Partnership Project initiated by the United Kingdom's Kew Gardens. The project received funding from the Millennium Foundation. The botanic gardens at Mount Annan and in the Blue Mountains joined the project and have banked the seeds of approximately 250 native plant species annually. These seeds have also been sent to the Millennium Seedbank in Kew to form a duplicate collection.
- 5.45 The Committee heard that Project partners are required to duplicate their seed collections at the Millennium Seedbank. However, because funding for the Partnership has been cut, many partners are unable to meet this obligation. The scarcity of funding has also made it more difficult to attract new partners. Notwithstanding these challenges, the Committee heard that there are also a number of cases where the financial

relationship with the Project has ceased but the seedbanking work has continued.

- 5.46 The Committee also visited the site of the NSW PlantBank facility currently under construction. The facility will house a large seedbank and integrated plant conservation centre. The Committee heard that some species of plant, for example, rainforest species, are not good candidates for seedbanking. It was explained that part of the PlantBank concept was to provide ex situ conservation options for seeds from such species, such as by cryogenic freezing.
- 5.47 Construction of PlantBank is expected to be complete by early 2013. Most of the funding for the \$19.8 million facility will be provided by the NSW Government, although \$4.3 million is expected to be funded from external sources.

Committee comment

- 5.48 The Committee notes the significant capital investment the NSW PlantBank represents. It also heard that much of the facility's ongoing funding will need to be generated from external sources. The Committee considers that ex situ conservation facilities such as PlantBank will be an important part of Australia's biodiversity conservation response to climate change. It is therefore important that such facilities are funded adequately.
- 5.49 There may be scope for seedbanks to better focus their activities to prioritise habitats under the greatest threat from climate change, such as alpine ecosystems. During the course of its inquiry the Committee anticipates hearing more from other Australian seedbanks and the Australian Seedbank Partnership in relation to issues such as coordination.
- 5.50 The Committee also notes the emerging interest in connectivity corridor programs as a biodiversity conservation measure, particularly in the context of climate change. It expects that seedbanking and the research associated with it will prove valuable in ensuring sufficient and appropriate seed for revegetation projects.

Wollemi pine as a 'living fossil'

- 5.51 The Wollemi pine (*Wollemia nobilis*) is an endemic Australian evergreen conifer reaching 25 to 40 metres tall. It is a member of the *Wollemia* genus of trees, which was known only through the fossil record until David Noble discovered living *Wollemia nobilis* in Wollemi National Park in 1994. The discovery was made in a remote series of deep, narrow gorges, in a

temperate rainforest wilderness area of the national park, which is part of the Greater Blue Mountains World Heritage Area in NSW. The Wollemi pine species was thought to be extinct, the last fossil record of the species being dated at about 200 million years ago.³

- 5.52 Fewer than 100 individual trees exist in the wild, in three localities that remain undisclosed to the public. The main threat to the Wollemi pine's survival in the wild is visitation by humans. In November 2005, Wollemi pine trees growing in the wild were found to have been infected by the *Phytophthora cinnamomi* water mould, and it is believed that the pathogen was introduced to the site by unauthorised visitors.
- 5.53 Following the species' discovery in 1994, the Australian Botanic Garden was involved in a propagation program to make the Wollemi pine available to botanic gardens in Australia and overseas. Subsequently, the propagation and distribution of the species was commercialised, and members of the public are now able to purchase seedlings for their own gardens.
- 5.54 The Committee inspected the ex situ Wollemi pine collection at the Australian Botanic Garden. The collection contains representatives of every known Wollemi pine plant growing in the wild. The collection is also the ultimate source of all Wollemi pines propagated worldwide.

Committee comment

- 5.55 The Wollemi pine provides an interesting case study that demonstrates the importance of refugia and protected areas in helping species survive changes in climate. This may be particularly important as climate changes take place and ecosystems are transformed in coming decades.
- 5.56 The Wollemi pine cultivation program is also an example of an innovative conservation strategy that also engages the community. The plants are distributed within Australia and internationally under commercial licence, with the aim of conserving the species by having the pine grown in parks, gardens and homes. Moreover, royalties from sales are returned to programs for the conservation of the Wollemi pine and other rare and threatened species. This dual conservation approach is also combined with the community engagement outcomes that are achieved by exposing more people to the species and its story.

3 Royal Botanic Gardens and Domain Trust, *Wollemi Pine – Age and ancestry*, <http://www.rbgsyd.nsw.gov.au/plant_info/wollemi_pine/age_and_ancestry> viewed 17 April 2012.

Pests and disease

- 5.57 As noted above, at the Australian Botanic Garden the Committee heard that many of the wild-growing Wollemi pines had been infected by phytophthora, highlighting the importance of containment, research, and public education, as discussed in Chapter 2.
- 5.58 The Committee heard that phytophthora was also present at the Australian Botanic Garden site when it was acquired by the Royal Botanic Gardens and Domain Trust. The Committee heard that the Australian Botanic Garden has managed the threat of phytophthora mainly by planting species that are tolerant to the mould.
- 5.59 The Committee was interested to hear that myrtle rust (*Uredo rangelii*) is an emerging and significant issue for biodiversity, particularly in NSW. The Committee understands that myrtle rust came from South America, through a nursery in NSW. It is a newly described fungus that has spread relatively rapidly along the east coast of Australia. As a windborne pathogen, it has been very difficult to contain. It has been in Australia for only about 18 months and is said to have already caused a great deal of devastation to more than 100 naturally susceptible plant species. Several types of endemic Australian plants are susceptible to myrtle rust, including bottle brush, tea tree, and eucalypts.
- 5.60 The Committee also heard about the presence of phytophthora and myrtle rust in Sydney Olympic Park. SOPA officers advised that stringent hygiene procedures have been put in place for contractors. The Committee was also informed that the chytrid amphibian fungus is present at Sydney Olympic Park, but that the local frog communities appear to have some resistance to it. It is thought that this resistance could be due to the presence of heavy metals in the water.

Committee comment

- 5.61 The Committee notes the considerable threat to Australia's biodiversity posed by the spread of myrtle rust. Appropriate governance and adequate funding are necessary to ensure the damage from myrtle rust is minimised. Governance arrangements could also benefit from further consideration to ensure that authorities have the flexibility to act quickly when a pathogen outbreak is detected in future.
- 5.62 The Committee was advised that the CSIRO is conducting research into the vulnerability of different plant species to myrtle rust. However, the Committee understands there may be a need for more research on the epidemiology of myrtle rust, so that the fungus can be better understood.

This would be of benefit in the context of climate change, as a better understanding of the disease and the likely impact of temperature changes may assist policy-makers and land managers in formulating appropriate and targeted responses. Given that myrtle rust arrived from South America, the Committee notes the importance of sound and rigorous biosecurity measures, particularly in the context of uncertainties about system interactions in a changing climate.

- 5.63 The Committee notes that considerable effort goes into controlling weed species in Sydney Olympic Park and at the Australian Botanic Garden, especially in threatened habitats (such as the coastal saltmarsh at Olympic Park) and in scarce remnant vegetation (such as the Cumberland Plain Woodland at the Australian Botanic Garden). The Committee considers there is a need for vigilance and appropriate funding for weed eradication programs.

Concluding remarks

- 5.64 The Committee's inspection program in Sydney made a valuable contribution to the inquiry, particularly through the coverage of issues such as ecological restoration and remediation; community engagement; ex situ conservation and innovative conservation strategies; and the impact on biodiversity of threats such as pests and disease.
- 5.65 At Sydney Olympic Park, the Committee appreciated the opportunity to inspect a diverse range of sites that demonstrated:
- ecological management practices to maintain and improve remnant ecosystems in the Badu Mangroves;
 - severely degraded landscapes that are actively managed for biodiversity as well and community engagement outcomes;
 - remnant native forest in the Newington Nature Reserve, demonstrating the biodiversity benefits of regulated protection of areas, albeit incidental in this case; and
 - the benefits of community engagement and education programs, particularly in urban environments.
- 5.66 The scale and success of the ecological restoration undertaken at Sydney Olympic Park could provide lessons for application to other sites across Australia. The Park's urban location provides a point of comparison with other restoration works the Committee has inspected to date, and

information about its school excursion program has made an important contribution to the community engagement aspect of the Committee's inquiry.

- 5.67 At the Australian Botanic Garden, the Committee was interested to learn about the role of seedbanks in ex situ conservation efforts. The Committee is pleased that the new PlantBank facility will bring together conservation, research, teaching and community engagement activities. The visit to the Australian Botanic Garden made an excellent contribution to the Committee's understanding of the types of disease-related threats facing Australia's terrestrial ecosystems.
- 5.68 The Committee wishes to record its thanks to the Sydney Olympic Park Authority and the Royal Botanic Gardens and Domain Trust for making their officers available to provide extensive briefings to the Committee and to facilitate the visits.