Urban Ecology Strategic Action Plan

CITY OF SYDNEY

Sydney2030/Green/Global/Connected

The *Urban Ecology Strategic Action Plan* is a supporting document to the *Environmental Action 2016 – 2021 Strategy and Action Plan* that was endorsed by the City of Sydney in March 2017. The City's most up to date set of environmental targets and actions are contained in *Environmental Action 2016 – 2021 Strategy and Action Plan.*

city of villages

Contents

This policy was adopted by the City of Sydney Council in March 2014.

Message from the Lord Mayor

Urban biodiversity – the animals, plants and other living organisms that inhabit urban areas, and the ecosystems they form – is gaining increasing recognition worldwide. Around the world, as more and more people are choosing to live in cities, awareness has grown of the role that cities can play in biodiversity conservation, and of the contribution that biodiversity can make to improving the quality of life of urban residents.

While biodiversity has been greatly reduced from its original state in the City of Sydney area, many indigenous plants and animals remain, and there is substantial potential to conserve and enhance the habitats that support them. There is also potential to improve the awareness of City residents about biodiversity, and to promote their participation in activities that can contribute to biodiversity conservation. The Urban Ecology Strategic Action Plan outlines the City of Sydney's approach to this over a ten-year period.

Through this Plan, the City will work towards the restoration and conservation of resilient urban ecosystems that support a diverse range of locally indigenous flora and fauna species. In so doing we aim to create a liveable city for all of its inhabitants.

Clover Moore
Lord Mayor

Executive Summary

Introduction

The City of Sydney (the City) commissioned this Urban Ecology Strategic Action Plan as one of many cross-organisational initiatives aimed at achieving the *Sustainable Sydney 2030* vision of a green, global, connected City. Urban ecology is a strategic focus area of the City's Greening Sydney Plan, which documents the City's commitment and aspirations for the 'living' green component of the *Sustainable Sydney 2030* vision.

The focus of this Plan is the biodiversity of the City of Sydney local government area (LGA). Although biodiversity has been greatly reduced from its original state within the LGA, some significant vegetation and many fauna species remain, and there is substantial potential to conserve and enhance these existing biodiversity values. There is also associated potential to improve community awareness of and appreciation for biodiversity, not just locally but more broadly.

The City's vision for the Plan is to restore and conserve resilient urban ecosystems that support a diverse range of locally indigenous flora and fauna species, and in so doing to create a liveable City for all of its inhabitants.

Approach

To guide the development of the Plan, the current status of biodiversity in the LGA was first determined by an Urban Ecology Survey, which comprised:

1. A review of existing information;
2. Flora and fauna surveys, vegetation mapping and habitat assessment;
3. Community consultation;
4. Identification of priority sites, supporting sites and priority fauna species;
5. Identification of potential habitat linkages across the LGA and between adjacent LGAs; and
6. Identification of threats to biodiversity within the LGA.

An overview of the survey results is presented in the following sections.

Flora

Small areas of vegetation representative of five recognisable communities, including some possible remnants and naturally occurring species, were identified and mapped in the LGA:

- Sydney Turpentine Ironbark Forest – possible remnant trees;
- Coastal Saltmarsh – planted and naturally regenerating patches;
- Coastal Swamp/Alluvial Forest – possible remnant trees;
- Mangrove Forest – planted and naturally regenerating trees;
- Coastal Sandstone Outcrop Complex – possible remnants and other naturally occurring species; and
- Freshwater Wetlands – vegetated constructed wetlands/ponds.

Several bush restoration sites and other plantings comprising indigenous/mostly indigenous species were also mapped.

All of the above are of conservation significance. Sydney Turpentine Ironbark Forest, Coastal Saltmarsh and Coastal Swamp/Alluvial Forest are of particular significance as they are representative of endangered ecological communities.

Around 365 indigenous flora species were recorded, and individuals of around 70 of these were considered to be naturally occurring. More than 80 weed species were also recorded.

Fauna

A total of 99 fauna species was confirmed in the LGA, comprising 87 indigenous species and 12 introduced species. The total comprises:

- 70 bird species, including seven introduced species;
- 13 mammal species (with an additional two unconfirmed), including five introduced species;
- 11 reptile species; and
- Five frog species.

Many of the species recorded have adapted well to urbanisation and are abundant and widespread in the LGA and other urban areas. In contrast, many of the other species were recorded in small numbers at only a small number of sites, and appear to be scarce in the LGA. These types of species have declined and in many cases disappeared altogether in this LGA and many other highly urbanised areas.

Three of the fauna species recorded – the Green and Golden Bell Frog, Grey-headed Flying-fox, Powerful Owl and one of the unconfirmed species, the Eastern Bent-wing Bat, are listed as threatened species. Long-nosed Bandicoots in the LGA may be part of an endangered population.

Priority sites

Six priority sites with relatively high biodiversity values were identified in the LGA based on the survey results. These are listed below (two actually comprise multiple sites that are in close proximity to each other, and three are not managed by the City):

- Sydney Park;
- Glebe Foreshore Walk East to Orphan School Creek;
- Pyrmont (sandstone cliffs and outcrops and bush restoration sites);
- the Royal Botanic Gardens and Domain (Yurong Precinct);
- Garden Island (northern end); and
- Moore Park (Mt Steel, Moore Park Golf and Lake Kippax).

Many other sites in the LGA were identified as having important biodiversity values in their own right and/or as having the potential to support the priority sites. These supporting sites include small, City-managed parks as well as sites managed by others.

Priority fauna species

Eight priority fauna species/groups were identified in the LGA, including all of the threatened species, as well as the species that were recorded in small numbers and at a small number of sites, and that are generally uncommon in urban areas. The priority species are:

- the Green and Golden Bell Frog and other frogs such as the Eastern Dwarf Tree Frog and Perons Tree Frog;
- Grey-headed Flying-fox;
- Powerful Owl;
- Long-nosed Bandicoot;
- Microbats such as Gould's Wattled Bat, Eastern Freetail Bat, and Little Forest Bat;
- Small birds such as the Superb Fairy-wren, New Holland Honeyeater and Silvereye;
- Freshwater wetland birds such as the Australian Reed-warbler, Black-fronted Dotterel, Black-winged Stilt, Buff-banded Rail and Royal Spoonbill; and
- Reptiles such as the Eastern Blue-tongue, Bar-sided Skink and Gully Skink.

Threats

Numerous threats to biodiversity were identified in the LGA. These are common to most urban areas, particularly inner city locations, and include:

- Limited habitat availability;
- Lack of habitat connectivity;
- Destruction and fragmentation of remaining habitat;
- Low genetic diversity;
- Weed invasion;
- Use of chemical herbicides and pesticides;
- Introduced fauna;
- Indigenous fauna;
- Diseases and pathogens;
- Poor water quality and inappropriate hydrological regimes;
- Light, noise, traffic, and other disturbance; and
- Climate change.

Strategic Action Plan

Objectives and targets

In order to achieve the City's vision for the Plan, a series of objectives and targets have been developed, as outlined in Table A.

Table A Urban Ecology Strategic Action Plan objectives, targets, and monitoring requirements

Category	Objectives	Targets
Locally indigenous vegetation	Protect, expand and improve condition of naturally occurring locally indigenous vegetation, including possible remnants	• Area of naturally occurring vegetation maintained or increased from 2012 baseline of 2.7 hectares by 2023 • Naturally occurring vegetation in good condition by 2023
	Increase the extent of bush restoration sites across the LGA, and maintain sites in good condition	• Area of bush restoration sites increased by 100 per cent from 2012 baseline of 4.2 hectares by 2023 • Bush restoration sites characterised by well-established, structurally complex vegetation, free of weeds by 2023
	Re-establish representative patches of the likely original vegetation communities	Representative patches of at least three likely original vegetation communities established by 2024
Fauna	Protect and enhance sites that provide habitat for priority fauna species	Indigenous fauna species diversity maintained or increased by 2023 based on 2012 baseline
	Increase the distribution and abundance of priority fauna species across the LGA	Priority fauna species recorded from greater number of locations and in higher numbers compared to 2012 baseline by 2023
Habitat connectivity	Improve habitat connectivity across the LGA, particularly between priority sites, and between identified habitat areas in adjoining LGAs	Progressive increase in number of habitat features for priority fauna species established along potential habitat linkages by 2023

Actions

To meet the objectives and targets, two broad types of actions are outlined in the Plan:

1. General actions – actions that require implementation across the City of Sydney organisation and/or the LGA as a whole. These have been further grouped into five categories:

- Park and streetscape maintenance – actions focused on expanding bush restoration and other habitat enhancement works, and ensuring that best practice bush regeneration and biodiversity management practices are implemented;
- Planning controls – actions focused on ensuring an appropriate level of ecological assessment is incorporated into the development assessment process, and maximising the potential for new developments to incorporate habitat features;
- Staff and contractor engagement – actions focused on improving staff and contractor awareness of biodiversity and their requirements in relation to this Plan;
- Community engagement – actions focused on improving community awareness of biodiversity and increasing participation in bush restoration and other habitat enhancement works; and
- Partnerships – actions focused on collaborations with other land managers within the LGA, and with government departments, non-government organisations and research institutions to maximise the effectiveness of the Plan.

2. Specific actions – site-specific actions that relate to the six priority sites, and species-specific actions that relate to the priority fauna species.

Implementation, performance assessment, reporting and review

The Plan will be implemented over a ten-year period, from 2013–14 to 2022–23. Numerous actions are already in progress, and many will be ongoing. An annual implementation plan will be prepared and key projects will be incorporated into the City's annual Corporate Plan.

Plan implementation will require estimated one-off funding of $597,000 and annual recurrent funding of approximately $1,378,000. Approximately $93,000 of one-off funding and $1,263,000 of annual recurrent funding is covered within existing budgets. New budget items will be subject to the annual budget bid process.

In order to evaluate the City's performance in implementing the Plan, the overall number of actions implemented annually will be monitored and recorded and monitoring will also be undertaken in relation to the targets.

An annual report on the implementation of the Plan will be produced at the end of each financial year, with a summary incorporated into the City's annual State of Environment Report. Progress throughout the year will be reported in the City's quarterly Environmental Sustainability Progress Report.

The Plan will be subject to the principles of adaptive management, i.e. actions will be reviewed annually based on monitoring results and modified where necessary. Recommendations for modification of the plan will be incorporated into the annual report. The plan will also be subject to a full review after a ten-year period, i.e. in 2022–23.

01 Background

1.1 Introduction

The City of Sydney (the City) commissioned this Urban Ecology Strategic Action Plan (the Plan) as one of many cross-organisational initiatives aimed at achieving the Sustainable Sydney 2030 vision of a green, global, connected City, and in response to considerable community interest. Urban ecology is a strategic focus area of the City's Greening Sydney Plan, which documents the City's commitment and aspirations for the 'living' green component of the Sustainable Sydney 2030 vision.

This Plan outlines the City of Sydney's approach to biodiversity management over a ten-year timeframe. It outlines the City's legislative and non-regulatory obligations in relation to biodiversity management, provides information about the past and present biodiversity of the local government area (LGA), identifies current threats to biodiversity within the LGA, outlines objectives, targets and the actions required to conserve and enhance biodiversity, including terrestrial, aquatic and marine across the LGA, and outlines the monitoring that will be undertaken to measure progress and how this will be reported.

1.2 What is urban ecology and why is it important?

Urban ecology is the study of the relationship between living organisms and their environment in an urbanised context. Living organisms and the ecosystems they form are commonly termed 'biodiversity', a truncation of the words biological diversity.

Biodiversity provides the ecological processes including ecosystem services that are essential for the survival of humans and all other living organisms. These include maintenance of oxygen in and absorbing pollutants from the air (Pugh et al. 2012), soil enrichment, water purification, plant pollination, food production, pest control, climate regulation, decomposition of organic waste, and erosion control. These processes do not just take place in natural areas like extensive tracts of bushland – they take place in all environments, including urban areas like the LGA.

Biodiversity also has intrinsic cultural, aesthetic, and often economic values. Given most of Australia's (and the world's) human population now lives in urban areas, and urban areas are continuing to expand, urban biodiversity is and will continue to comprise the plants, animals and other organisms most people encounter in their day-to-day lives. It can contribute to the quality of life of urban residents by improving visual and recreational amenity, and providing a connection with the natural world (Miller 2005) – research shows that regular contact with nature can help to lower stress, boost immunity, heighten creativity and improve cognititve function. It is also important in helping urban residents to form an ethic of care for biodiversity, not just locally but more widely (Lunney & Burgin 2004). This has significant potential to lead to action being taken to address patterns of biodiversity decline not just at the local scale, but also at regional, national and global scales (Miller 2005; McKinney 2002).

Biodiversity can provide a connection with nature and enhance quality of life in the inner city.

a Indigenous vegetation at Embarkation Park, Potts Point.

b Habitat plantings undertaken by a Glebe resident.

c Bush restoration site on the Glebe foreshore.

d Indigenous grassland at Prince Alfred Park, Redfern.

e An inner-city resident enjoying Banksia blooms.

(Photos K. Oxenham)

This Plan is focused on the terrestrial biodiversity of the LGA, and mainly considers those groups of species for which a relatively large body of information is available, these being vertebrate fauna (amphibians, reptiles, birds and mammals) and vascular flora (including trees, shrubs, grasses, herbs and ferns). It is acknowledged, however, the vast majority of biodiversity comprises invertebrates, mosses, lichens, bacteria and other groups. The actions outlined in this Plan are intended to benefit all of these taxonomic groups.

1.3 Why an Urban Ecology Strategic Action Plan for the City?

The City is characterised by high-density residential, commercial and industrial land uses with open space largely dedicated to recreational uses. Almost all of the original vegetation and other natural features have been removed or modified. As a result, biodiversity within the LGA has been greatly reduced from its original state. Without appropriate management, increasing human population and ongoing development are likely to cause further declines. To prevent this, a Plan is required to provide a co-ordinated approach to ensuring the conservation and enhancement of biodiversity in the LGA.

Managing urban biodiversity involves many challenges, but also offers many opportunities. While the extent of vegetation clearance and removal or modification of other natural features has led to the loss of many species from the city, many species still can and do live in the LGA – in fact, numerous species, both indigenous and exotic, have flourished in urban areas including the city. However, many other species are present in the city in only small numbers and/or at a small number of sites – these are the types of species that are at risk of disappearing from the LGA without management action, and it is these species that are the focus of this Plan.

Many other cities around the world have implemented biodiversity-related initiatives as the importance of urban biodiversity has gained recognition. Examples include:

- Paris, France, where the Paris Council has adopted a biodiversity plan for the city that proposes the following three main courses of action:
  – Creation of ecological corridors to connect large natural areas;
  – Making biodiversity a key consideration in municipal actions, including urban planning and the use and sustainable management of green space, rivers and canals; and
  – Improving community awareness and engagement through the establishment of a Paris Biodiversity Observatory.
- Toronto, Canada, where the City of Toronto is preparing a Biodiversity Strategy and has produced the following with assistance from community groups, academics and other stakeholders:
  – The 'Biodiversity Series', a collection of publications on the variety of species found within the city;
  – Bird-friendly development guidelines; and
  – A green roof bylaw, requiring residential, commercial, industrial and institutional developments to incorporate green roofs.
- Nagoya, Japan, where the City of Nagoya has specified three focus areas relating to biodiversity in its Basic Environmental Plan, one of which is taking action to co-exist with nature, for example by:
  – The preservation and wise use of wetlands;
  – The regeneration of Higashiyama Zoo and Botanical Gardens; and
  – The creation of managed satoyama woodlands.
- Malmo, the third largest city in Sweden, where a 'green points' system has been applied to new residential developments to ensure the incorporation of habitat features such as ponds, bat roost boxes, butterfly flower beds and wildflower meadows.

Similarly, urban biodiversity initiatives are being implemented in other Australian cities. Brisbane City Council has prepared the Brisbane City Biodiversity Strategy, and the City of Melbourne is in the process of preparing an urban ecology and biodiversity strategy.


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a. A recently-constructed frog pond in a prominent park in central Paris (photo K. Oxenham)

b. A green roof vegetated with indigenous species on a wi-fi zone in central Paris

c. Living fence at the London Wetlands Centre (photo K. Oxenham)

d. Sculpture designed to provide habitat for native bees in the Jardin des Plantes, Paris (photo K. Oxenham)

e. The High Line in New York City – a disused, elevated railway converted into open space vegetated with diverse indigenous species

f. Green roof on Chicago City Hall

1.4 Vision

The City's vision is to restore and conserve resilient urban ecosystems that support a diverse range of locally indigenous flora and fauna, and in so doing create a liveable City for all of its inhabitants.

To achieve this vision, three categories of objectives have been identified for this Plan, as outlined in Table 1.

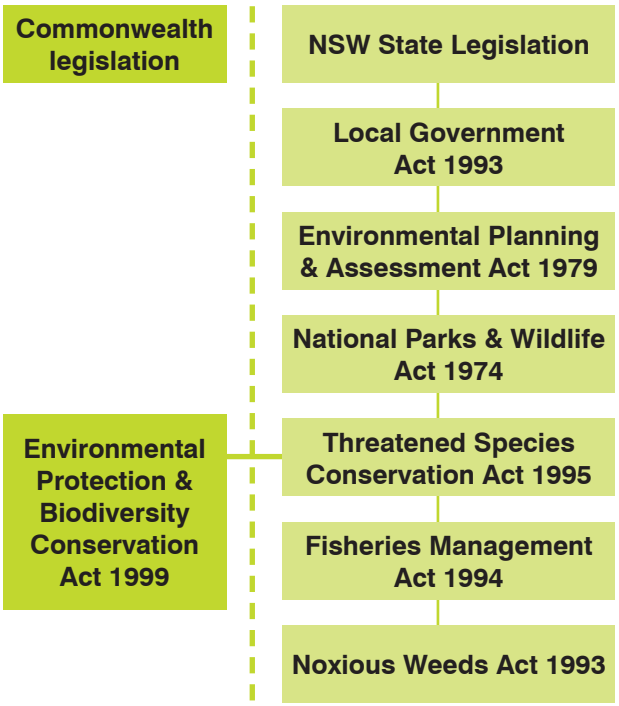
Table 1 Objectives of the Urban Ecology Strategic Action Plan

Category	Objectives
Locally indigenous vegetation	• Protect, expand and improve condition of naturally occurring locally indigenous vegetation, including possible remnants. • Increase the extent of bush restoration sites across the LGA, and maintain sites in good condition. • Re-establish representative patches of the likely original vegetation communities.
Fauna	• Protect and enhance sites that provide habitat for priority fauna species. • Increase the distribution and abundance of priority fauna species across the LGA.
Habitat connectivity	• Improve habitat connectivity across the LGA, particularly between priority sites, and between identified habitat areas in adjoining LGAs.

1.5 Context

1.5.1 Legislation and planning instruments

Biodiversity is addressed in a range of legislation relevant to the City. In particular, under the *Local Government Act 1993* (LG Act), it is part of each council's charter to properly manage, develop, protect, restore, enhance and conserve the environment of the area for which it is responsible, in a manner that is consistent with and promotes the principles of ecologically sustainable development. This charter is reinforced by the objectives of numerous other Acts. Those most relevant to this Plan are listed below.



1.5.2 Non-regulatory local government functions

Like all local government authorities, the City also has an important non-regulatory role in traditional functions that have implications for biodiversity conservation. These include maintaining parks and other public open space, undertaking capital works, and setting the framework for future patterns of development. Like other local government authorities, the City is also able to offer other supporting mechanisms to promote biodiversity conservation such as grants and community education initiatives, and is well-placed to establish partnerships with Commonwealth and State agencies, private landholders, and other stakeholders to achieve biodiversity conservation objectives. There is strong community interest in biodiversity in the LGA and increasing community expectation the City play an active role in biodiversity conservation initiatives.

1.5.3 Other plans and policies

This Plan has been prepared in accordance with and/or aims to be consistent with and support the objectives of numerous other related City plans and policies, and it is also just as important that these plans and policies are implemented or applied to complement this Plan. Plans and policies of particular relevance are listed below, and discussed further in Appendix 1.

This Plan has also been prepared to be consistent with relevant national, state and regional strategies and plans, as well as those of neighbouring LGAs, which are also listed below.

City of Sydney Plans and Policies

- Sustainable Sydney 2030;
- Environmental Management Plan;
- Greening Sydney Plan;
- Sydney Local Environmental Plan 2012, Sydney Development Control Plan 2012, and Landscape Code (in development);
- Park Plans of Management;
- City of Sydney Tree Policies & Plans;
- Urban Forest Strategy;
- Community Gardens Policy;
- Livable Green Network;
- Companion Animals Policy; and
- Decentralised Water Master Plan.
- Green Roofs and Walls Strategy

National, State and regional strategies and plans

Australia's Biodiversity Strategy 2010–2030

Draft NSW Biodiversity Strategy 2010–2015

Hawkesbury–Nepean Catchment Action Plan

Other LGA strategies and plans

Marrickville Council Biodiversity Strategy 2011–2021 and Action Plan 2011–2015

Leichhardt Municipal Council Draft Native Revegetation and Biodiversity Management Plan (in preparation)

Woollahra Municipal Council Biodiversity Strategy (in preparation)

Randwick City Council Draft Biodiversity Strategy (in preparation)

Greenway Revegetation and Bushcare Plan

Biodiversity Study of the Waverley Local Government Area

02 Approach

2.1 Study area

The study area for this Plan is the City of Sydney Local Government Area (LGA). It is bordered by the Woollahra and Randwick LGAs to the east, Botany LGA to the south and the Leichhardt and Marrickville LGAs to the west. Sydney Harbour forms the northern boundary of the LGA, with the North Sydney and Mosman LGAs adjoining the harbour to its north (Figure 1).

The City of Sydney LGA covers 2,615 hectares of the Sydney metropolitan area. It is a highly urbanised area comprising the city centre, The Rocks, Millers Point, Ultimo, Pyrmont, Surry Hills, Woolloomooloo, Kings Cross, Elizabeth Bay, Potts Point, Rushcutters Bay, Darlinghurst, Chippendale, Darlington, Camperdown, Forest Lodge, Glebe, Alexandria, Beaconsfield, St Peters, Erskineville, Newtown, Redfern, Rosebery, Paddington, Centennial Park, Moore Park, Surry Hills, Waterloo, and Zetland (Figure 2).

The LGA is largely characterised by high-density residential, commercial and industrial land uses with open space largely dedicated to recreational uses.

2.2 Urban Ecology Survey

The current status of biodiversity in the LGA was assessed by an Urban Ecology Survey, which was undertaken by Australian Museum Business Services. The survey comprised six components, described in the following sections.

2.2.1 Review of existing information

Existing information regarding the flora and fauna of the LGA and the Sydney region, as well as urban ecology in general, was collated and reviewed. Information sourced included:

- Soil landscape maps;
- Vegetation maps;
- Database records;
- Published scientific literature;
- Flora and fauna survey reports relevant to the LGA;
- Biodiversity strategies and plans prepared for other LGAs;
- Records provided by the community;
- Records provided by the City;
- City management plans, policies and studies; and
- Recent and historical aerial photographs.

2.2.2 Field surveys

Flora and fauna surveys were undertaken within parks and other public land throughout the LGA in late 2010 and early 2011. Sites were selected on the basis of size, presence and diversity of indigenous vegetation and other habitat features, connectivity and/or distribution within the LGA (such that surveys were undertaken at all large parks and a representative selection of smaller parks across the LGA).

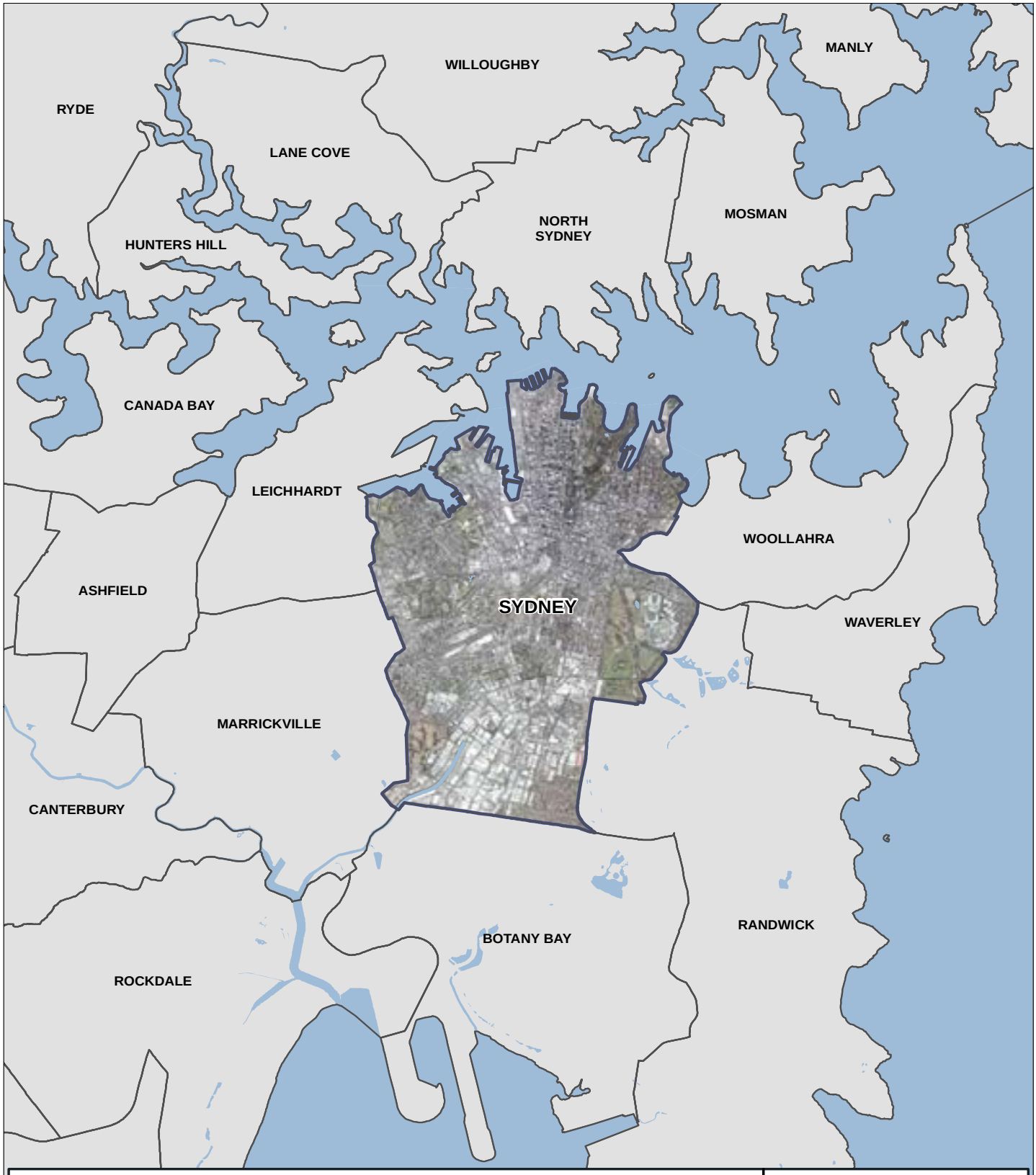


FIGURE 1
Regional Context of the City of Sydney LGA

- City of Sydney Boundary
- Surrounding LGAs
- Sydney Harbour

FIGURE 2
Suburb Locations within the LGA

- City of Sydney Boundary
- Suburb Boundaries
- Surrounding LGAs

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Flora surveys and habitat assessment

Flora surveys and habitat assessment were undertaken at 60 sites, the locations of which are indicated in Figure 3. Some sites were surveyed in detail, while others were subject to a brief inspection only.

The presence of naturally occurring vegetation, including possible remnants, was determined, and a list of indigenous and exotic plant species recorded was prepared for each site, and for the whole LGA.

Indigenous vegetation including bush restoration sites and other plantings, but generally excluding isolated trees or trees without an understorey, was mapped at each site with the assistance of aerial photographs, satellite images and vegetation mapping previously undertaken for the Sydney Metropolitan Catchment Management Authority (SMCMA) (DECCW 2009). Naturally occurring vegetation was generally classified according to the communities identified by DECCW (2009). Vegetation map unit boundaries were subsequently digitised using ArcGIS software.

Indigenous plantings identified or undertaken at additional sites subsequent to the surveys were also added to the vegetation maps.

Fauna surveys

Surveys were undertaken for frogs, reptiles, birds and mammals. The surveys comprised nocturnal searches for frogs at 14 sites, day-time searches for reptiles at 12 sites, day-time bird surveys at 22 sites, and spotlighting for possums, owls and other nocturnal fauna, plus microchiropteran bat surveys at 14 sites. Survey site locations are indicated in Figure 4.

A list of all fauna species recorded was prepared for the LGA. This was supplemented by opportunistic observations made by City staff, records provided via the online survey (refer Section 2.2.3), and other reports from the community made between October 2010 and March 2012, to provide a more comprehensive fauna list for the LGA.

Important fauna habitat features were added to the vegetation maps, including several that were identified after the surveys.

2.2.3 Community consultation

Community consultation involved in-depth discussions with targeted community groups and an online survey.

In-depth discussions were held with:

- The Glebe Society's Blue Wren Group;
- Pyrmont Ultimo Landcare volunteers; and
- Glebe Bushcare Group volunteers.

The purpose of the discussions was to identify issues affecting biodiversity in the LGA that each group would like to see addressed in this Plan.

The online survey was open for three months on the City's website in late 2010/early 2011. It aimed to:

- Obtain records of unusual/uncommon species observed in the LGA by the community;
- Identify the community's opinion of the relative importance of various activities towards improving biodiversity in the City; and
- Gauge the level of community interest in participating in bush restoration activities, planting days, biodiversity monitoring programs and similar.

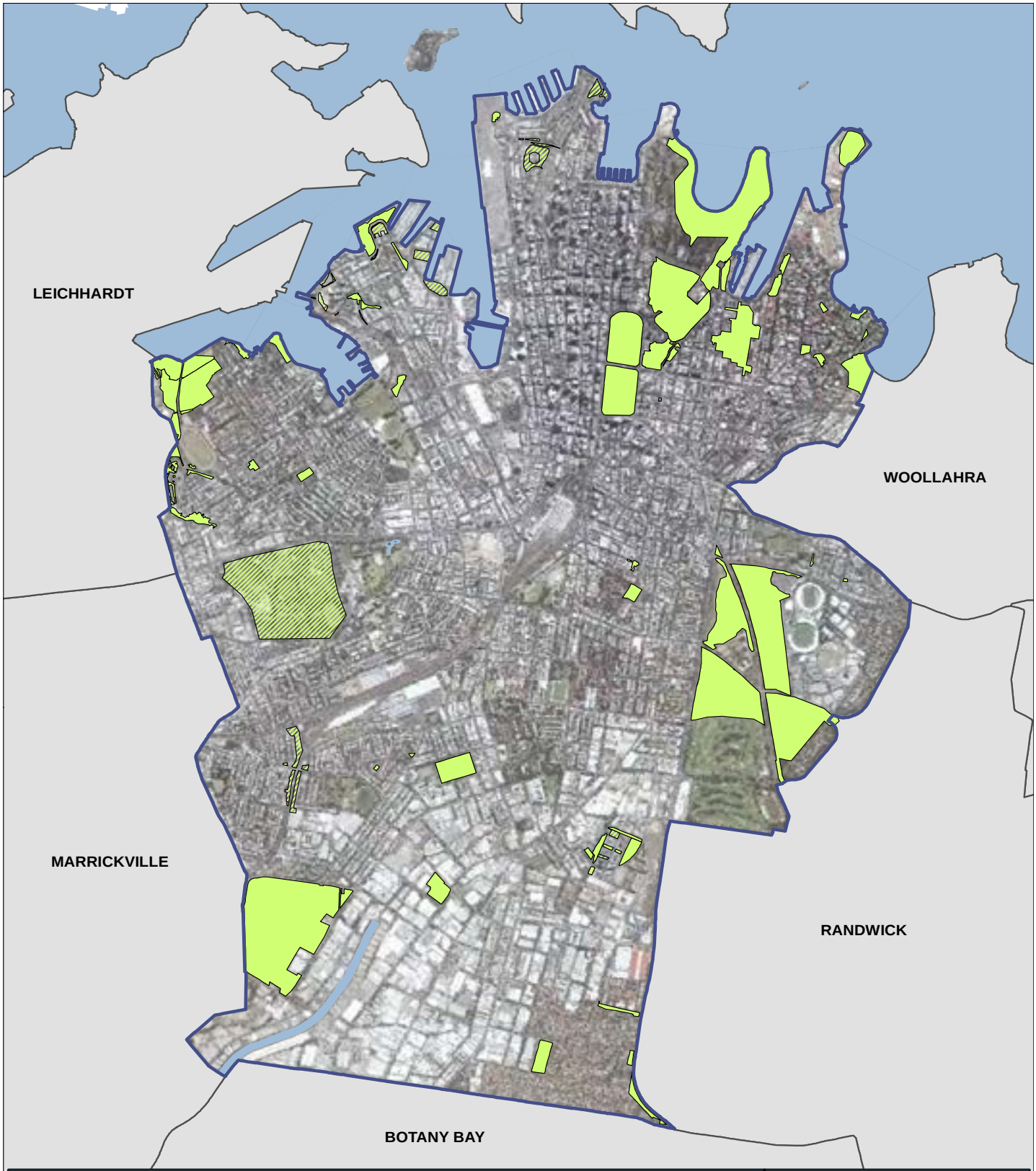

FIGURE 3
Flora Survey Sites

Survey Type

- Brief Notes
- Full Survey

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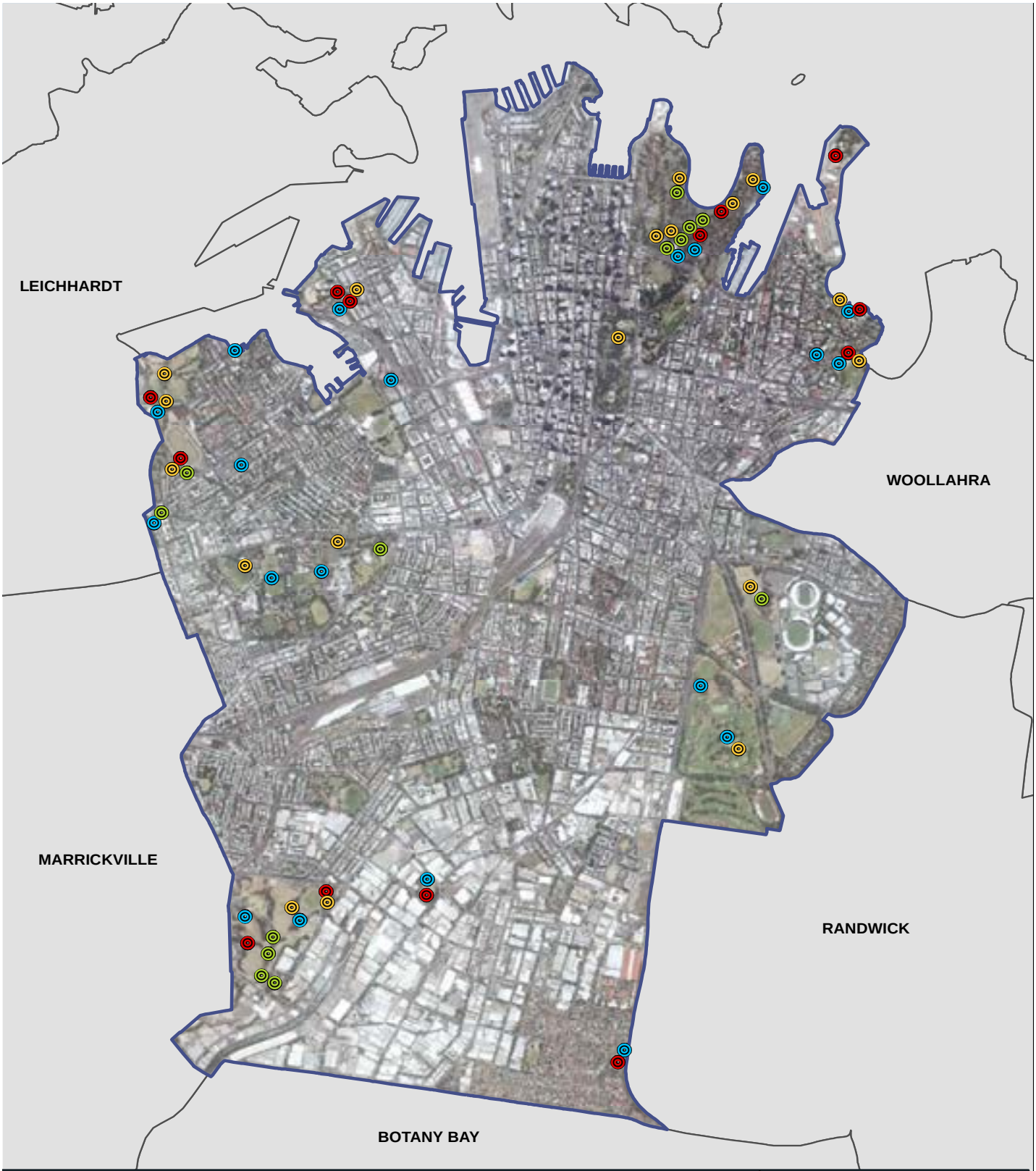

FIGURE 4
Fauna Survey Sites

- Spotlighting and Anabat
- Frogs
- Reptiles (daytime)
- Birds (daytime)

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2.2.4 Identification of conservation priorities

Priority sites and supporting sites

In order to identify priority sites for this Plan, the biodiversity value of surveyed sites was assessed within the context of the LGA. Criteria used in this assessment included size, vegetation structure, indigenous species diversity, presence of natural features including possible remnant vegetation, and potential to improve biodiversity values. Sites were classified as having high, medium or low biodiversity value and corresponding priority.

Priority fauna species

In order to identify priority fauna species, each species/group was assessed on the basis of survey results, a consideration of overall conservation status, status in the LGA and in urban areas generally, amount of potential habitat within the LGA, and potential to implement actions that may improve status in the LGA. Each species/group was classified as being of high, medium or low priority.

2.2.5 Identification of potential habitat linkages

A map indicating locations in which useful habitat linkages could potentially be created, both across the LGA and between adjacent LGAs, was produced using an aerial photograph of the city and surrounds and maps of the following:

- Vegetation and other habitat features including ponds;
- Priority sites and supporting sites;
- Existing and proposed parks;
- Community gardens;
- Green roofs;
- Priority pedestrian and cycle routes identified in the City's Liveable Green Network Strategy;
- Existing and proposed raingardens;
- Other water-sensitive urban design opportunities identified in the City's Decentralised Water Master Plan;
- Above-ground Sydney Water easements;
- Bush regeneration/restoration and other habitat enhancement sites in adjoining LGAs;
- Existing/potential habitat corridors identified in adjoining LGAs, including the proposed Greenway; and
- Other sites known or considered likely to have habitat value in adjoining LGAs, such as Sydney Harbour National Park, Centennial Parklands, Botany Wetlands, Sydney Airport and numerous golf courses.

All of the above maps were overlaid on the aerial photograph, enabling identification of the general areas in which habitat linkages could be created to connect priority sites to each other and to habitat areas in adjoining LGAs. Overland linkages were identified as well as linkages over water between foreshore headlands.

2.2.6 Identification of threats

Threats to biodiversity in the LGA were identified based on results from the Urban Ecology Survey, with reference to relevant Key Threatening Processes listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* and the NSW *Threatened Species Conservation Act 1995* where relevant.

03 Results

3.1 Flora

The City of Sydney LGA is situated on the sandstone formations of the Sydney Basin and original soils were mostly sandy, with sandstone rock outcropping and some clay (Chapman & Murphy 1989). Seven soil landscape units have been classified within the LGA (Figure 5).

The likely pattern of original vegetation within the LGA, based on Benson & Howell (1990 & 1994) is shown in Figures 6 and 7. Figure 6 provides a broad perspective of the Sydney region and identifies three vegetation types within the LGA (Turpentine-Ironbark Forest; Sandstone Heaths, Woodlands & Forests; and Eastern Suburbs Banksia Scrub). Freshwater wetlands including Billy Goat Swamp and Waterloo Swamp also occurred in the southern part of the LGA (Centennial Parklands, undated; Doran 2004) – these were part of the larger Botany wetlands system.

Figure 7 indicates the likely distribution of vegetation for the city centre in greater detail, identifying five plant communities (Turpentine-Ironbark Forest, Sandstone Woodland, Swamp Forest, Swamp Woodland, and Eastern Suburbs Banksia Scrub), along with two geological environments (mudflats and sand dunes). The Sandstone Woodland and Swamp Woodland are part of the larger sandstone complex mapped in Figure 6; Swamp Forest was not identified in mapping at the broader scale. Two additional communities, Coastal Saltmarsh and Mangrove Forest, are likely to have occurred on the mudflats. The likely original vegetation of remaining areas of the LGA has not been determined at the same level of detail as the city centre.

With such a range of environments and vegetation communities, the LGA is likely to have supported high diversity of flora species. The sandstone-dominated vegetation of Pyrmont, for example, is likely to have provided habitat for over 600 plant species (Broadbent 2010).

Since European colonisation in 1788, the original vegetation of the LGA has been almost completely removed as a result of urban development and associated activites including shoreline reclamation, filling of swamps, and channelisation of watercourses including the Tank Stream in the city centre, Shea's Creek (now Alexandra Canal), Johnstons Creek and Rushcutters Bay Creek. The LGA is now largely characterised by high-density residential, commercial and industrial land uses, with open space largely dedicated to recreational use. Four of the likely original vegetation communities, Sydney Turpentine Ironbark Forest, Eastern Suburbs Banksia Scrub, Coastal Saltmarsh, and Sydney Freshwater Wetlands, are all now listed as endangered under NSW and/or Commonwealth legislation.

The photographs on page 22 indicate the extent of vegetation clearance and development that had occurred in the LGA by the middle of last century, but also the increase in vegetation cover that has occurred since that time, largely through planting undertaken in modified environments in public open space, some of which has been transformed in recent years from former industrial uses. This vegetation comprises a mix of planted indigenous (both local and from other parts of Australia) and exotic species.

Nevertheless, some naturally occurring vegetation, including possible remnants, was identified in the LGA during the surveys. This vegetation has survived in small refuges, persisted in lawns or garden beds, or recolonised modified environments. Ferns, grasses and groundcovers are the most widespread of the naturally occurring species, with a range of tree and shrub species at a smaller number of locations. Examples of naturally occurring species recorded are listed in Table 2.

Vegetation representative of five recognisable, naturally occurring vegetation communities was identified and mapped in the LGA. Coastal Saltmarsh and Mangrove Forest were included as naturally occurring because although current stands were planted, they are now spreading and regenerating naturally. Constructed freshwater wetlands, bush restoration sites, and other indigenous/mostly indigenous plantings were also mapped, as were identified major weed infestations. Table 3 lists all vegetation map units, states their conservation status, and describes their occurrence; Figures 8a-d indicates their location and extent.

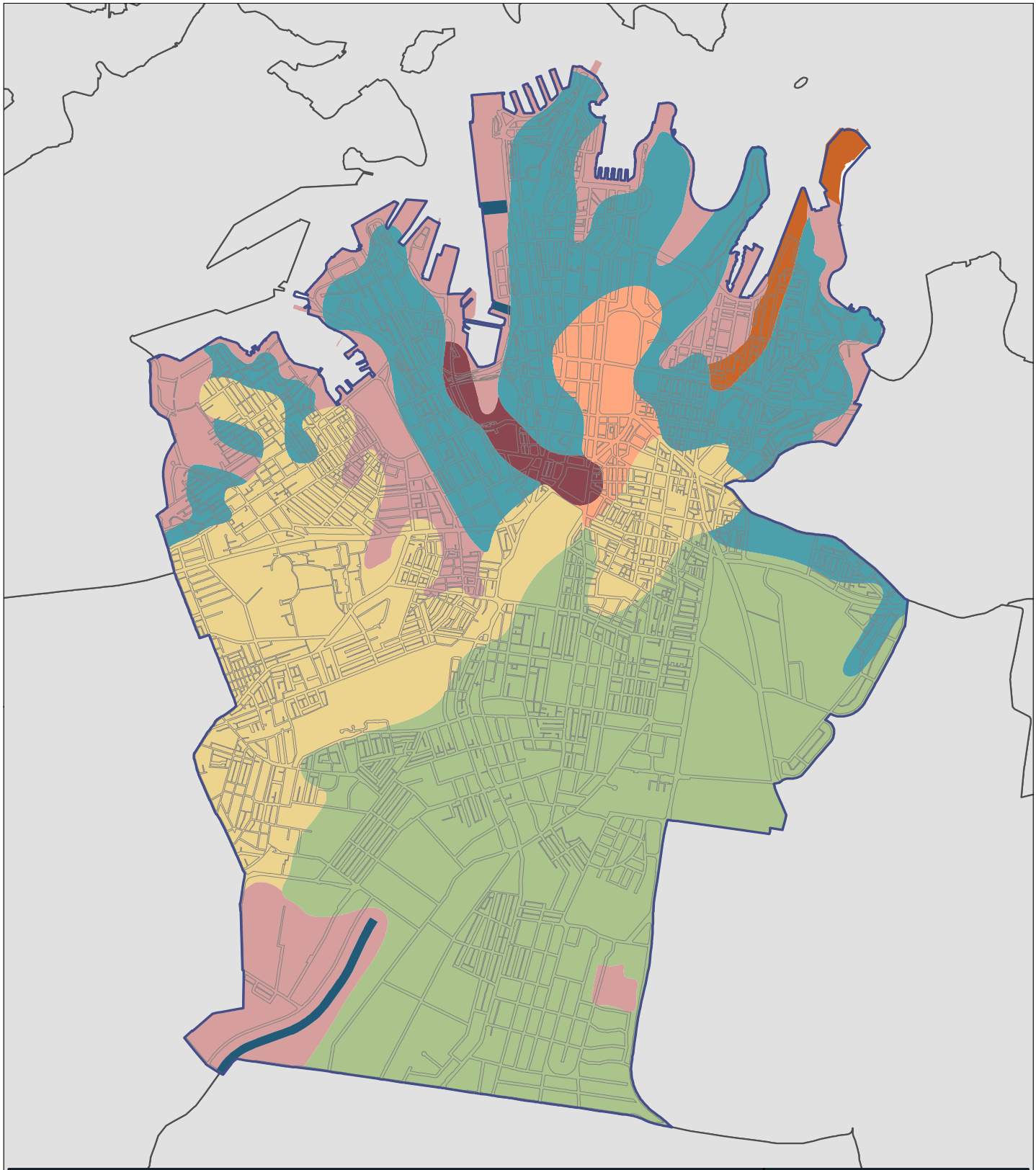

FIGURE 5
Soil Landscapes of the LGA

- Blacktown
- Deep creek
- Disturbed terrain
- Gymea
- Hawkesbury
- Lucas Heights
- Tuggerah
- Water

Source: Chapman & Murphy (1989)

N

500 250 0 500 m

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FIGURE 6
Original Vegetation of the Sydney Region

- City of Sydney LGA
- Blue Gum High Forest
- Turpentine-Ironbark Forest
- River-flat Forests
- Cumberland Plain Woodlands
- Eastern Suburbs Banksia Scrub
- Estuarine and Freshwater Wetlands
- Castlereagh Woodlands
- Sandstone Heaths, Woodlands and Forests

Source: Benson & Howell (1990)

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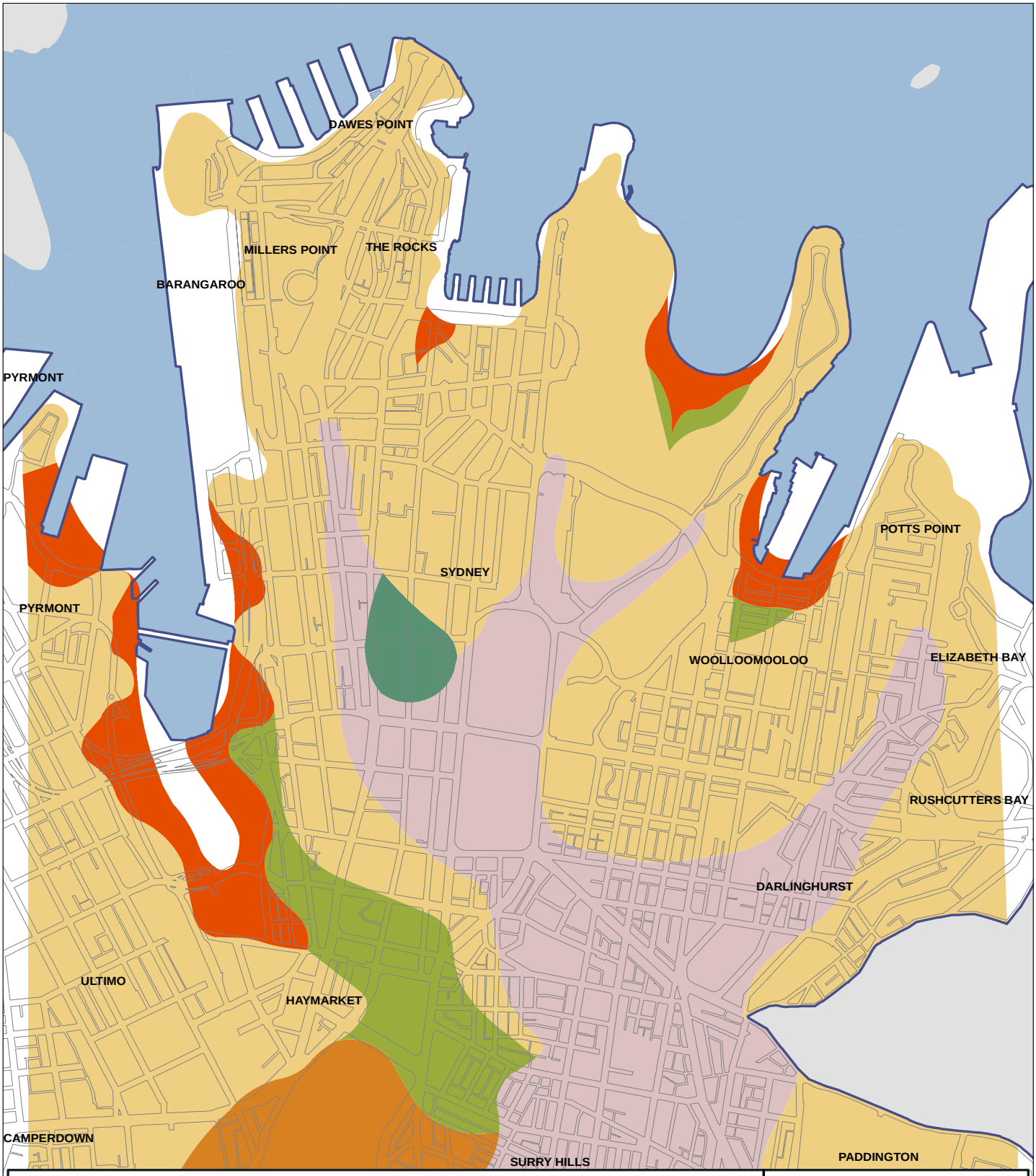

FIGURE 7
Likely Original Vegetation Communities in the Sydney CBD

- Hawkesbury sandstone slopes with woodland of Eucalyptus pilularis, Eucalyptus gummifera, Eucalyptus piperita and Angophora costata
- Mudflats, exposed at low tide
- Swamp forest of Casuarina glauca and Eucalyptus robusta
- Swamp woodland with Eucalyptus racemosa
- Forest of Angophora costata and Eucalyptus pilularis, the eastern limit of Turpentine-Ironbark Forest
- The edge of the sand dunes with Eastern Suburbs Banksia Scrub

Source: Benson & Howell (1990)

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200 100 0 200 m

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Improved vegetation cover in Glebe from 1943 (left) to 2011 (right), with areas such as Bicentennial Park, Blackwattle Bay Park and other parts of the Glebe foreshore transformed from industrial uses to public open space.

Sydney Park, St Peters – an industrial site in 1943 (left), transformed into a public open space featuring stands of indigenous vegetation and freshwater wetlands (right, in 2011).

Table 2 Examples of naturally occurring species identified in the LGA

Trees	Shrubs/small trees	Grasses	Groundcovers	Ferns
Angophora costata *Angophora floribunda* *Casuarina glauca* *Eucalyptus botryoides* *Eucalyptus paniculata* *Eucalyptus pilularis* *Eucalyptus resinifera* *Eucalyptus tereticornis* *Ficus rubiginosa*	*Acacia implexa* *Angophora hispida* *Banksia integrifolia* *Breynia oblongifolia* *Glochidion ferdinandi* *Myrsine variabilis*	*Microlaena stipoides* *Dichelachne crinita* *Oplismenus aemulus*	*Carex inversa* *Cyperus gracilis* *Crassula sieberiana* *Dichondra repens* *Lobelia anceps* *Sarcocornia quinquenervia* *Suaeda australis* *Wahlenbergia gracilis*	*Adiantum aethiopicum* *Asplenium flabellifolium* *Davallia solida var. pyxidata* *Gleichenia dicarpa* *Psilotum nudum*

Table 3 Indigenous vegetation map units identified in the LGA

Vegetation map unit	Conservation Status	Location within the LGA	Habitat	Description	Area (ha)
Sydney Turpentine Ironbark Forest*	Sydney Turpentine Ironbark Forest CEEC (EPBC Act); EEC (TSC Act)	Orphan School Creek, Forest Lodge and St John's Anglican Church, Glebe	Shale soils	Possible remnant *Angophora floribunda* tree near Orphan School Creek; possible remnant *Eucalyptus paniculata* tree and groundcover species at St John's Anglican Church	0.006
Coastal Saltmarsh*	Coastal Saltmarsh EEC (TSC Act)	Bicentennial, Federal and Jubilee Parks, Glebe	Intertidal zone	Planted and naturally regenerating stands in constructed wetland, along Johnstons Creek Canal and on the Rozelle Bay foreshore	0.30
Coastal Swamp/ Alluvial Forest*	Component of Swamp Oak Floodplain Forest/River-flat Eucalypt Forest EECs (TSC Act)	Royal Botanic Gardens and Lewis Hoad Reserve, Glebe	Sandstone cliff/Outcrop; reclaimed foreshore	Remnant *Eucalyptus tereticornis* and *Casuarina glauca* trees in Royal Botanic Gardens; possible remnant *Eucalyptus botryoides* tree in Lewis Hoad Reserve	0.02
Mangrove Forest*	PMV (FM Act)	Bicentennial Park and The Anchorage, Glebe	Intertidal zone	Planted and naturally regenerating stands of *Avicennia marina*	0.13

Table 3 Indigenous vegetation map units identified in the LGA continued

Vegetation map unit	Conservation Status	Location within the LGA	Habitat	Description	Area (ha)
Coastal Sandstone Outcrop Complex* (comprises elelments of Coastal Sandstone Foreshores Forest, Sandstone Cliff Soak and Coastal Littoral Rainforest)	Local	Domain (Yurong Precinct); Garden Island, Woolloomooloo; Quarry Master Drive, Wentworth Park Light Rail Station and Light Rail Corridor, Pyrmont; Pirrama Road, Pyrmont; The Anchorage, Glebe; Arthur (Paddy) Grey Reserve, Glebe; Arthur McElhone Reserve, Elizabeth Bay; Embarkation Park and McElhone Stairs, Potts Point	Sandstone outcrop	Naturally occurring vegetation associated with sandstone cliffs and outcrops including possible remnants in the Royal Botanic Gardens, Domain and Garden Island, and possible remnant *Angophora hispida* tree at Arthur McElhone Reserve	2.30
Constructed Freshwater Wetlands	Local (not currently considered representative of Sydney Freshwater Wetlands EEC)	Sydney Park, St Peters; Woolwash Park, Zetland; University of Sydney, Darlington	Low-lying areas	Constructed wetlands and ponds with associated aquatic and fringing vegetation	2.45
Bush restoration sites	Local	Federal, Bicentennial and Jubilee Parks, The Anchorage and Arthur (Paddy) Grey Reserve, Glebe; Orphan School Creek, Forest Lodge; various sites in Pyrmont			4.18
Other indigenous/ mostly indigenous plantings	Local	Sydney Park, St Peters; Embarkation Park, Potts Point; Southern Cross Drive Reserve, Rosebery; Blackwattle Bay Park, Glebe			19.74
Indigenous plantings/ naturally occurring vegetation	Local	Domain (Yurong Precinct)			7.71

*Includes naturally occurring elements

CEEC – Critically Endangered Ecological Community
EEC – Endangered Ecological Community
PMV – Protected Marine Vegetation
EPBC Act – *Environment Protection and Biodiversity Conservation Act 1999*
TSC Act – *Threatened Species Conservation Act 1995*
FM Act – *Fisheries Management Act 1994*

As indicated in Table 3, most map units are of conservation significance in at least a local context. Sydney Turpentine Ironbark Forest (STIF), Coastal Saltmarsh and Coastal Swamp/Alluvial Forest (CSAF) are particularly significant as they are all representative of endangered ecological communities.

The area of all map units is very limited (Figures 8a-d). STIF and CSAF are represented only by a small number of remnant/possible remnant trees, with associated groundcover species in some cases, while Coastal Sandstone Outctrop Complex (CSOC), which comprises elements of the Coastal Sandstone Foreshores Forest, Coastal Littoral Rainforest and Sandstone Cliff Soak communities described by DECCW (2009), has a more substantial occurrence, with possible remnant trees, shrubs and groundcovers in the Yurong Precinct of the Domain and the Royal Botanic Gardens (Benson & Howell 2002; Lesryk 2005) and Garden Island, where it was mapped by DECCW (2009). Stands of Coastal Saltmarsh, although limited, include the typical range of species that occur in this community in the Sydney region.

Examples of naturally occurring species in the LGA that have survived in small refuges or recolonised modified environments.

a Lobelia

b Necklace Fern

c Port Jackson Fig at Pyrmont

d Arthur McElhone Reserve

The endangered Coastal Saltmarsh community in a constructed wetland in Federal Park (left) and growing along Johnstons Creek Canal (right).

Planted and naturally regenerating Grey Mangroves *Avicennia marina* at Rozelle Bay.

Patches of Coastal Sandstone Foreshores Forest in the Yurong Precinct of the Domain.

Elements of possible remnant Coastal Sandstone Foreshores Forest at Garden Island (left), including senescent and regenerating Hickory Wattle (right).

Sandstone outcrops vegetated with elements of Coastal Sandstone Outcrop Complex at Lewis Hoad Reserve, Glebe (left) and at Embarkation Park, Potts Point (right).

FIGURE 8a
Mapped Vegetation and Freshwater Ponds in the Northwest of the City of Sydney LGA

- Coastal Sandstone Outcrop Complex
- Coastal Saltmarsh
- Mangrove Forest
- Bush Restoration Sites
- Indigenous/Mostly Indigenous Plantings
- Major Weed Infestation
- Ponds

Possible Remnant Trees

- Rough barked Apple (Angophora floribunda) - Sydney Turpentine Ironbark Forest
- Bangalay (Eucalyptus botryoides) - Coastal Swamp/Alluvial Forest
- Grey Ironbark (Eucalyptus paniculata) - Sydney Turpentine Ironbark Forest

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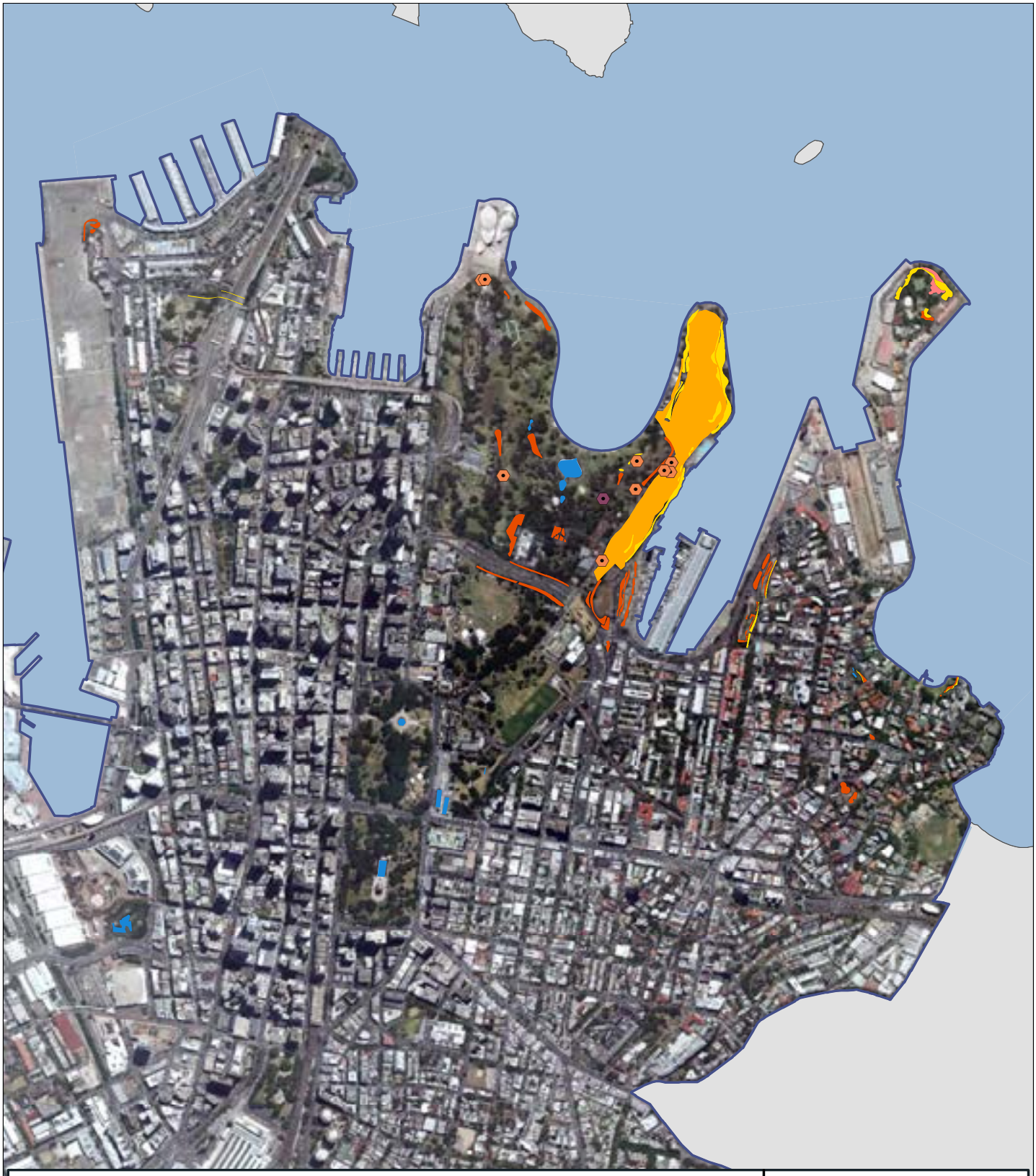

FIGURE 8b
Mapped Vegetation and Freshwater Ponds in the Northeast of the City of Sydney LGA

- Coastal Sandstone Outcrop Complex
- Indigenous Plantings/Naturally occurring Vegetation
- Bush Restoration Sites
- Indigenous/Mostly Indigenous Plantings
- Ponds

Possible Remnant Trees

- Swamp Oak (Casuarina glauca) - Coastal Swamp/Alluvial Forest
- Forest Red Gum (Eucalyptus tereticornis) - Coastal Swamp/Alluvial Forest

N

200 100 0 200m

1:15,000 at A4

FIGURE 8c
Mapped Vegetation and Freshwater Ponds in the Southeast of the City of Sydney LGA

- Indigenous/Mostly Indigenous Plantings
- Major Weed Infestation
- Freshwater Wetlands
- Ponds

N

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1:20,000 at A4

FIGURE 8d
Mapped Vegetation and Freshwater Ponds in the Southwest of the City of Sydney LGA

- Indigenous/Mostly Indigenous Plantings
- Freshwater Wetlands
- Major Weed Infestation

N

200 100 0 200m

1:15,000 at A4

The mapped bush restoration sites are distinguished from other indigenous/mostly indigenous plantings because they are maintained by volunteer groups or specialist bush regeneration contractors. Most have been established and are maintained by two volunteer groups – the Glebe Bushcare Group, who have also propagated many of the species planted at these sites at the Rozelle Bay Community Native Nursery, and Pyrmont Ultimo Landcare. Bush restoration works have also been undertaken by the City at several sites, and the Department of Defence has likewise begun bush restoration at Garden Island and at Victoria Barracks (subsequent to the flora surveys). The largest bush restoration site is Orphan School Creek in Forest Lodge, which was established by the developers of an adjacent apartment complex in response to community demand, with species selection based on specialist advice (Ondinea 1999 & 2006). A new volunteer bush restoration group, Friends of Orphan School Creek, will commence work at this site in 2013.

Community members including volunteers from the PEACE group and National Tree Day volunteers have made a significant contribution to the mapped other indigenous/mostly indigenous plantings, particularly at Sydney Park.

Bush restoration site planted by Glebe Bushcare Group volunteers at Federal Park, Glebe, in January 2011 (left) and the same site one year later (right). (photos K. Oxenham)

Bush restoration works undertaken by the City at Blackwattle Bay Park (left) in October 2011 and (right) the same site one year later. (photos K. Oxenham)

Some of the possible remnant trees identified in the LGA.

a Grey Ironbark *Eucalyptus paniculata* representative of the endangered Sydney Turpentine Ironbark Forest at St John's Anglican Church, Glebe.

b Bangalay *Eucalyptus botryoides* at Lew Hoade Reserve, Glebe.

c Forest Red Gum *Eucalyptus tereticornis* in the Royal Botanic Gardens.

d Swamp Oak *Casuarina glauca* in the Royal Botanic Gardens.

Around 365 indigenous species were recorded in the LGA, and individuals of around 20 per cent were considered likely to be naturally occurring. No threatened species were recorded, although some planted specimens may occur in the Royal Botanic Gardens or the Yurong Precinct of the Domain. 81 (82 depending on Koelreuteria id) weed species were recorded, including four weeds of national significance (Lantana, Salvinia, Bitou Bush and Asparagus Fern), 13 weeds declared noxious in the LGA, and 20 environmental weeds, several of which are declared noxious in other LGAs and one of which, *Koelreuteria elegans ssp. formosana* is a National Environmental Alert weed. An environmental weed of particular concern is the Chinese Hackberry, a tree that was widely planted in the past in City parks, some streets and many private properties.

A list of all flora species recorded during the surveys is provided in Appendix 2. Many more species, both exotic and indigenous, are likely to be present across the LGA.

Some of the locally indigenous species planted in the LGA. (photos K. Oxenham)

a *Leptospermum polygalifolium*
b *Dilwynnia* species
c *Indigofera australis*
d Flannel Flower
e Whiteroot
f Golden Guinea Flower
g Kangaroo Grass
h Blue Flax Lily
i Pink Spider Flower
j Native Violet

Major weed infestations in the LGA are largely limited to cliffs and outcrops, rail corridors and water easements, although some private properties, particularly disused sites, are also weed-infested. Weeds are spreading from these locations in many instances.

Examples of major weed infestations in the LGA: the light rail corridor at Pyrmont (above) and a Sydney Water easement in Alexandria (below). (photos K. Oxenham)

3.2 Fauna

Like the original vegetation, the diversity of terrestrial vertebrate fauna species within the LGA has also been greatly reduced from its original state. The original fauna would have included a wide range of frogs, reptiles, birds and ground-dwelling and arboreal mammals including microchiropteran bats. Many of these species have disappeared from the area.

Nevertheless, data from the fauna surveys combined with opportunistic observations made by City staff and reliable reports from the community from October 2010 to June 2012 indicate that a reasonably diverse fauna assemblage is present within the LGA. As well as natural habitat features, modified and constructed habitats such as ponds, cliff lines, retaining walls and fences, weed infestations, roof cavities, and even tall buildings in the city centre are used by some of the species recorded.


a


b


c


d

Examples of species using constructed features in the LGA.

a A Peregrine Falcon on a CBD window ledge. (photo P. Munro).

b Elegant Snake-eyed Skinks (also known as Wall Skinks) inhabiting a sandstone retaining wall at Glebe. (photo K. Oxenham)

c Welcome Swallows, which often nest on built structures, roosting on a gabion wall at Sydney Park.

d A White-faced Heron and Little Black Cormorants roosting on posts in Sydney Park.

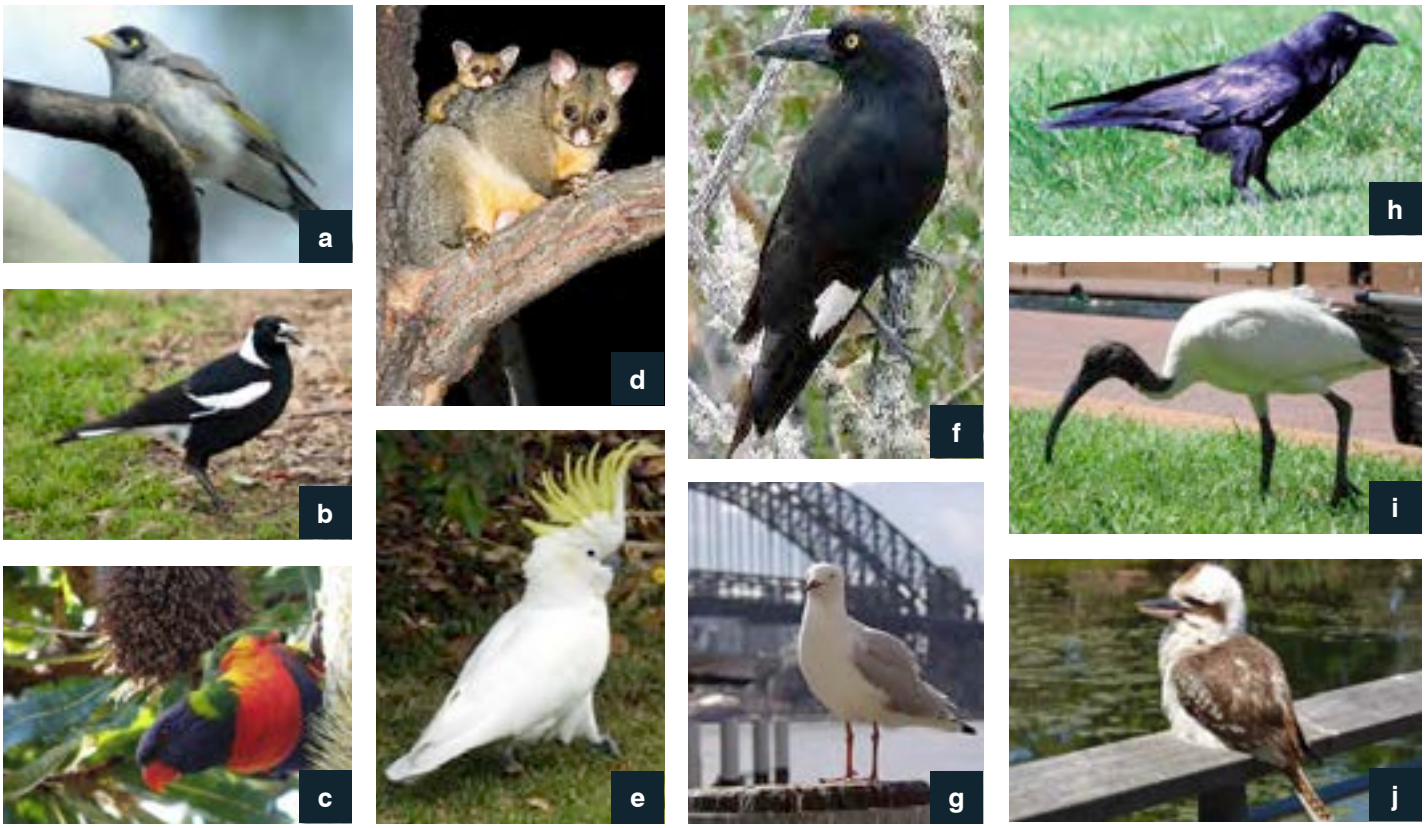
Constructed ponds and weed infestations identified within the LGA are indicated in Figures 8a-d.

A total of 99 fauna species was confirmed in the LGA, comprising 87 indigenous species (with an additional two unconfirmed), as well as 12 introduced fauna species. This total comprises:

- 70 bird species, including seven introduced species;
- 13 mammal species (with an additional two unconfirmed microchiropteran bats), including five introduced species;
- 11 reptile species; and
- Five frog species.

A complete list of the species recorded is provided in Appendix 3.

Many of the species recorded have adapted well to urbanisation and are abundant and widespread in the LGA and other urban areas (Russell *et al*. 2011; Major 2004; Major & Parsons 2010; Parsons 2009). These include the Common Brushtail Possum and large-bodied birds such as the Rainbow Lorikeet, Noisy Miner, Pied Currawong, Grey Butcherbird, Laughing Kookaburra, Australian Raven, Sulphur-crested Cockatoo, Australian White Ibis, Silver Gull, and the introduced Rock Dove (commonly known as the feral pigeon) and Common Myna (also known as the Indian Myna). Most of these larger indigenous birds were not originally resident in central Sydney, or at least not in large numbers (Major 2004; Major & Parsons 2010).



Common indigenous species in the LGA that have adapted well to urbanisation.

a Noisy Miner
b Australian Magpie at Sydney Park
c Rainbow Lorikeet (photo A. Davis)
d Common Brushtail Possom
e Sulphur-crested Cockatoo
f Pied Currawong
g Silver Gull
h Australian Raven
i Australian White Ibis
j Laughing Kookaburra

In contrast, many of the other species were recorded in small numbers at only a small number of sites, and appear to be scarce in the LGA. These included:

- Frogs such as the Green and Golden Bell Frog, Dwarf Eastern Tree Frog, and Perons Tree Frog;
- Reptiles such as the Eastern Blue-tongue, Eastern Water Dragon, Eastern Water Skink, Bar-sided Skink and Gully Skink;
- Small birds such as the Superb Fairy-wren and Silvereye;
- Wetland birds such as the Australian Reed-warbler, Black-fronted Dotterel, Black-winged Stilt, Buff-banded Rail and Royal Spoonbill;
- The Long-nosed Bandicoot, which was the only ground-dwelling indigenous mammal recorded; and
- Microchiropteran bats (microbats) such as Gould's Wattled Bat, Eastern Freetail Bat and Little Forest Bat.

These types of species were once common and widespread in the Sydney area (Major & Parsons 2010; Shea 2010; Recher 2010), but have declined and in many cases disappeared altogether in this LGA and many other highly urbanised areas, as discussed further in Section 3.5.

Three of the fauna species recorded, and one of the unconfirmed species, are currently listed as threatened (Table 4). The Long-nosed Bandicoot has also been included in Table 4 as an endangered population listing currently applies to the Marrickville, Leichhardt, Ashfield, Canada Bay, and Canterbury LGAs; the listing may be extended to the City of Sydney LGA given that the individuals present in the area are likely to be part of the wider inner west population.

Introduced birds that are common and widespread across the LGA: Common Myna (left), Rock Dove or feral pigeon (centre) and Common Starling (right).


a


b


c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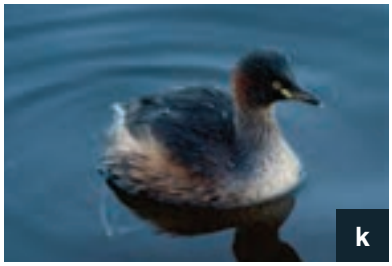
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Uncommon fauna species recorded in the LGA.

a Eastern Dwarf Tree Frog (photo K. Oxenham)
b Eastern Water Skink at Chinese Gardens, Darling Harbour (photo K. Oxenham)
c Eastern Water Dragon at Chinese Gardens, Darling Harbour (photo K. Oxenham)
d Eastern Blue-tongue at Sydney Park
e Gully Skink (photo K. Oxenham)
f Juvenile Eastern Long-necked Turtle at Wetland 1, Sydney Park (photo K. Oxenham)
g Superb Fairy-wren (photo N. Lazarus)
h Silvereye (photo N. Lazarus)
i New Holland Honeyeater (photo N. Lazarus)
j Buff-banded Rail in Royal Botanic Gardens
k Australasian Grebe at Sydney Park
l Royal Spoonbill at Sydney Park
m Black-winged Stilt (photo J. Irvine)
n Australian Reed-warbler at Sydney Park
o Gould's Wattled Bat (photo M. Turton)

Table 4 Threatened species recorded within the LGA

Species	Conservation Status	Location	Details
Green and Golden Bell Frog	V (EPBC Act); E (TSC Act)	Rosebery	Small, declining population, with breeding habitat limited to small ponds in one residential backyard.
Grey-headed Flying-fox	V (EPBC Act); V (TSC Act)	Forages over wide area at night (former camp in Royal Botanic Gardens)	Variable numbers throughout the year.
Powerful Owl	V (TSC Act)	Royal Botanic Gardens	Two individuals regularly present.
Eastern Bent-wing Bat	V (TSC Act)	University of Sydney	Unconfirmed record (call could not be positively identified).
Long-nosed Bandicoot	EP (TSC Act)	Alexandria, University of Sydney	Records of three individuals to date, including one reported juvenile, in a community garden, park and university campus respectively.

V – vulnerable

E – endangered

EP – endangered population (currently not applicable to the City)

Threatened fauna species recorded in the LGA (although not a threatened species, the Long-nosed Bandicoot is included since individuals within the city may be part of an endangered population).

a Green and Golden Bell Frog (photo K. Oxenham)

b Grey-headed Flying-fox

c Powerful Owl in the Royal Botanic Gardens

d Eastern Bent-wing Bat (photo M. Turton)

e Long-nosed Bandicoot at Alexandria (photo NPWS)

3.3 Community consultation

This section provides an overview of results from the community consultation process. The full community consultation report is provided as Appendix 4, and issues raised and other findings have been incorporated into the Plan where appropriate.

3.3.1 Community group consultation

Responses from the targeted community group consultation sessions were grouped into four categories; responses in each category are summarised below.

- Policy – the need for an over-arching City policy relating to biodiversity was identified to coordinate a consistent approach towards biodiversity management across the organisation;
- Procedures – it was considered that the City should put into place numerous procedures and processes, particularly to ensure City parks maintenance staff and contractors have appropriate qualifications and experience in biodiversity-friendly maintenance practices, but also to maximise the area of indigenous plantings and ensure appropriate management of companion and feral animals;
- Education and training – the establishment of biodiversity-related training programs for City staff and contractors was recommended, as was establishing educational programs for school and university students; and
- Community resources – it was recommended that the City review actions implemented by other councils, educational programs being implemented by others in the LGA, and consult with experts on local biodiversity issues in relation to development of this Plan.

3.3.2 Online survey findings

A total of 231 responses were received to the online survey. Respondents were predominantly local; 50 per cent identified themselves as residents and 27 per cent as workers in the LGA.

Ninety-eight respondents reported interesting/unusual fauna species they had observed in the city, and these were incorporated into the fauna species list for the LGA. They included the Red-bellied Black Snake, Superb Fairy-wren, Peregrine Falcon, Powerful Owl, White-headed Pigeon, Silvereye, Eastern Long-necked Turtle, Eastern Blue-tongue, Tawny Frogmouth, and Common Ringtail Possum. Most of these were confirmed in the fauna surveys and/or by City staff.

Tawny Frogmouths (photographed above in a Glebe backyard) were reported by a number of residents, as were Common Ringtail Possums (below).

With regard to the importance of various activities that have potential to improve biodiversity in the LGA, the majority of respondents rated all activities listed in the survey as important, with protection and enhancement of existing habitats rated particularly important (Figure 9).

The survey also revealed substantial community interest in participating in bush restoration activities, community planting days, educational workshops and biodiversity monitoring programs (Figure 10). Among other things this indicates considerable potential for the formation of additional bush restoration groups in the LGA. Suitable sites at which such groups could work include Sydney Park, Moore Park, and small parks in Paddington, Green Square and Potts Point.

Figure 9 Rating of importance of activities in terms of improving biodiversity in the City

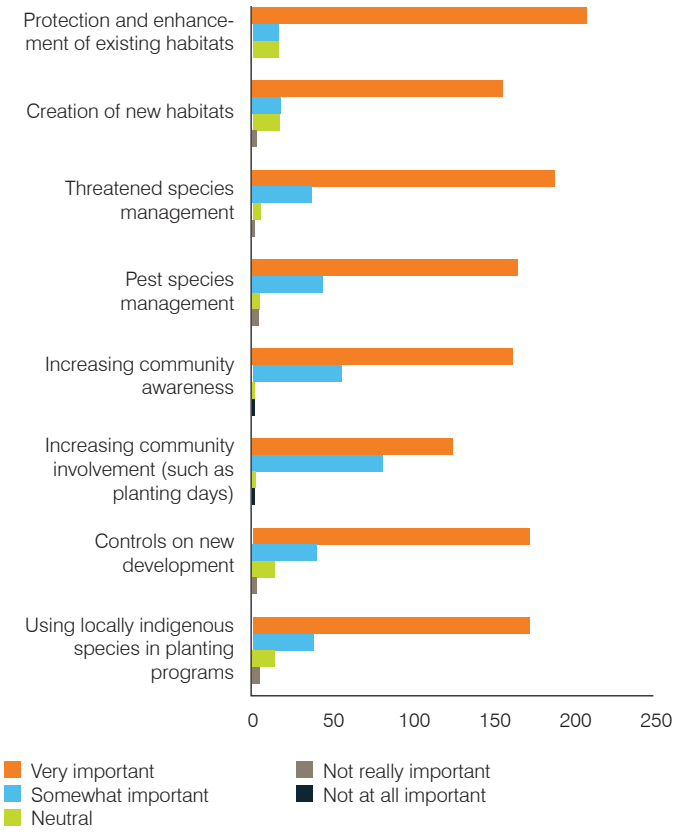
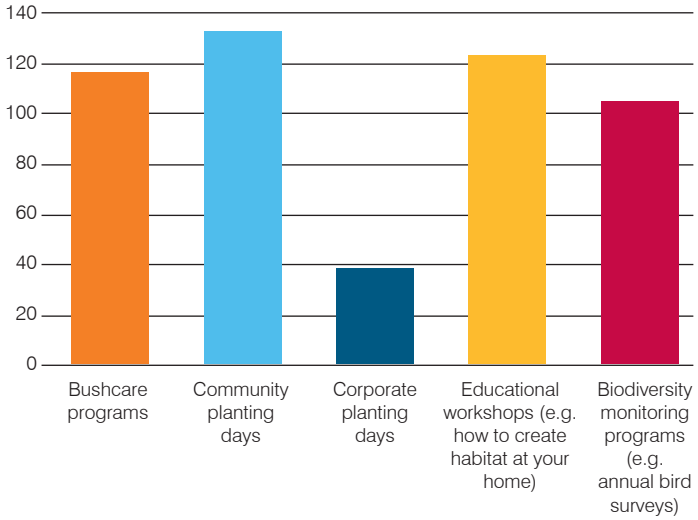


Figure 10 Interest in participating in biodiversity-related activities



3.4 Priority sites

Six high-priority sites were identified in the LGA based on the assessment of biodiversity values. These are listed below (note two comprise multiple sites in close proximity to each other):

- Sydney Park, St Peters;
- Glebe Foreshore Walk East – Orphan School Creek, Glebe-Forest Lodge;
- Pyrmont (sandstone cliffs and outcrops and bush restoration sites);
- the Royal Botanic Gardens and Domain (Yurong Precinct);
- Garden Island (northern end), Woolloomooloo; and
- Moore Park (Mt Steel, Moore Park Golf and Lake Kippax).

It should be noted the latter three sites are not managed by the City of Sydney, but are under the management of other agencies who have been consulted in the development of this Plan.

The biodiversity values of each site are briefly discussed in the following sections, as are the constraints that are likely to be affecting these values. Numerous smaller sites that provide an important role in supporting the priority sites are also briefly discussed.

3.4.1 Sydney Park

Biodiversity values

The high biodiversity values of this site (Figure 11) are attributable to the following:

- Large size (44 hectares);
- The presence of large, constructed freshwater wetlands and associated rocky drainage lines as well as planted woodland and forest patches;
- High flora species diversity (over 100 indigenous species recorded during the surveys, although many are not local);
- Relatively diverse fauna habitat features, including the wetlands, drainage lines and woodland and forest patches;
- The highest indigenous bird species diversity in the LGA (49 indigenous species recorded, 22 of which are wetland species and several of which were not recorded elsewhere in the LGA);
- The presence of one of few known populations of both the Superb Fairy-wren and Eastern Blue-tongue in the LGA;
- The presence of a breeding population of the Eastern Long-necked Turtle;
- High potential to re-establish elements of the likely original vegetation communities, including the endangered Eastern Suburbs Banksia Scrub, and expand on existing plantings that comprise elements of Coastal Sand Swamp Forest (representative of the endangered Swamp Sclerophyll Forest on Coastal Floodplains community) and Coastal Freshwater Reedland (representative of the endangered Freshwater Wetlands on Coastal Floodplains community); to increase the diversity of locally indigenous flora species; and to undertake fauna habitat enhancements without compromising the existing range of uses; and
- Potential to establish habitat connectivity with the Glebe Foreshore Walk East-Orphan School Creek corridor via the rail corridor and the University of Sydney; with sites in the Randwick LGA via landscaping associated with the future redevelopment of Green Square and other precincts in the southern part of the LGA and Moore Park; and with sites in the Marrickville and Botany Bay LGAs via landscaping associated with future redevelopments along Alexandra Canal.

Site constraints

Site constraints affecting the above biodiversity values include:

- Ongoing methane and leachate management issues resulting from the site's past use as a landfill have potential to effect vegetation growth;
- The structurally simple nature of most existing terrestrial plantings (comprising densely planted trees with no understorey), provide habitat for only the most common indigenous species, particularly aggressive and predatory birds;
- The very high density of trees in most terrestrial plantings limits both their potential to grow to full size and the space, light and nutrients required to enable an understorey to establish;
- The potential for dense stands of *Casuarina glauca*, which are already limiting plant diversity in some parts of the park due to the ability of this species to suppress the germination and growth of other species, to rapidly spread by vigorous suckers and outcompete other vegetation, particularly around wetlands and drainage lines, and to affect wetland health through shading;
- Limited staff knowledge or experience in bush regeneration and biodiversity management techniques further limits the potential for understorey establishment and other habitat enhancements;
- Reduced wetland health as a result of nutrient-rich mulch washing downslope from terrestrial garden beds due to the lack of stabilising understorey vegetation;
- The potential for increased volumes of water from stormwater harvesting to limit the implemention of best practice hydrological regimes, incorporating periods of at least partial drying, to ensure wetland health;
- Infestation of all wetlands with Mosquito Fishis likely to be limiting frog populations;
- Infestations of environmental weeds, particularly Ludwigia (Wetland 2), *Juncus acutus* (Wetland 4) and Golden Wreath Wattle (*Acacia saligna*);
- Heavy use for recreational activities including dog walking, cycling, organised sports and picnicking, which result in noise and physical disturbance to wetlands and other habitat areas.

Where present, dense understorey provides habitat for small birds at Sydney Park (left), and a densely vegetated bioretention swale and bird roosting posts installed as part of a stormwater harvesting project provide good habitat at Wetland 4, Sydney Park (right).

Fauna at Sydney Park includes a range of wetland birds, including the Black Swan (left, at Wetland 2), which is one of several species that breed at the park, and the Black-fronted Dotterel (right, at Wetland 4).

FIGURE 11
Sydney Park

- Indigenous/Mostly Indigenous Plantings
- Freshwater Wetlands
- Major Weed Infestation
- Drainage line
- Open drainage channels

N

50 25 0 50m

1:5,000 at A4

3.4.2 Glebe Foreshore Walk East to Orphan School Creek

Biodiversity values

The high biodiversity values of this 'site' (Figure 12a-c), which comprises several large parks – the Glebe Foreshore Walk, Blackwattle Bay Park, Bicentennial Park, Federal Park, Jubilee Park and Orphan School Creek – and a number of pocket parks adjoining Johnstons Creek Canal – including AV Henry Reserve, Minogue Crescent Reserve, Lewis Hoad Reserve, Canal Reserve, JV McMahon Reserve, Wigram Road Reserve and Spindler Reserve in the Leichhardt LGA – are attributable to the following:

- Relatively large size, incorporating several bush restoration sites;
- Relatively continuous area of open space from the Glebe Foreshore to Forest Lodge, a distance of 2.5 kilometres;
- Presence of a possible remnant tree representative of the criticially endangered Sydney Turpentine Ironbark Forest community, near Orphan School Creek;
- Presence of the endangered Coastal Saltmarsh community, in Federal, Bicentennial and Jubilee Parks;
- Presence of a possible remnant tree representative of the endangered River-flat Forest on Coastal Floodplains community (Swamp Forest/Alluvial Forest map unit) in Lewis Hoad Reserve;
- Presence of the only patches of Mangrove Forest that occur within the LGA, on the Rozelle Bay foreshore;
- Presence of naturally occurring flora species that occur in association with sandstone outcrops;
- Very high flora species diversity (over 100 locally indigenous species recorded) as a result of bushland restoration works at numerous sites, mostly by volunteers from the Glebe Bushcare Group;
- Diverse fauna habitat features, including sandstone outcrops and retaining walls, a rocky modified creekline and other ground-level habitat features such as fallen timber, a small freshwater pond and freshwater seepages, structurally complex patches of locally indigenous vegetation, and intertidal habitats;
- The presence of one of only two known populations of both the Bar-sided Skink and Eastern Water Skink in the LGA;
- High potential to expand bush restoration works and increase the diversity of locally indigenous flora species, and to undertake fauna habitat enhancements;
- High potential to expand on planted elements of the endangered Swamp Oak Floodplain Forest community that are already present in the park, using shrubs and groundcovers of this community;
- The greatest potential to provide an almost continuous (albeit narrow) habitat corridor in the LGA, with connectivity to habitat areas in the Leichhardt LGA, and potential for connectivity to be established with sites at Pyrmont along the future Glebe Foreshore Walk extension, and new parks that will be created in this area in the future at Harold Park, the Hill and Crescent Land sites; and
- Potential for naturalisation of Johnstons Creek Canal, to not only improve habitat for Coastal Saltmarsh but also to benefit a range of estuarine fauna species, including wetland birds, fish and aquatic invertebrates.

Site constraints

Site constraints affecting the above biodiversity values include:

- The limited extent and poor condition of Coastal Saltmarsh along Johnstons Creek Canal due to the presence of self-sown Phoenix Palms (which have reduced the area of tidal inundation by raising the soil surface elevation, and cause shading), and trampling and soil compaction by park users and dogs;
- Limited overall contract staff knowledge and experience in bush regeneration and biodiversity management techniques (although the fenced Coastal Saltmarsh in Federal Park and most of Orphan School Creek are well-maintained by specialist bush regeneration contractors);
- The narrow, linear nature of the potential corridor, since corridors of this type are of limited value to some priority fauna species (refer Section 3.3.2);
- The occurrence of environmental weeds, particularly annuals and Chinese Hackberry *Celtis sinensis;* and
- Heavy use of the Glebe Foreshore Walk, Blackwattle Bay Park, Bicentennial Park, Jubilee Park, and Federal Park for recreational activities including dog walking, cycling, organised sports and picnicking, which result in noise and physical disturbance to habitat areas.

Bush restoration sites at Blackwattle Bay Park (left) and Orphan School Creek (right) (photos K. Oxenham)

Bar-sided Skinks inhabit sandstone outcrops and retaining walls along the Glebe Foreshore Walk (left, photo K. Oxenham) and the intertidal zone provides habitat for estuarine species like the Striated Heron (right, photo J. Irvine).

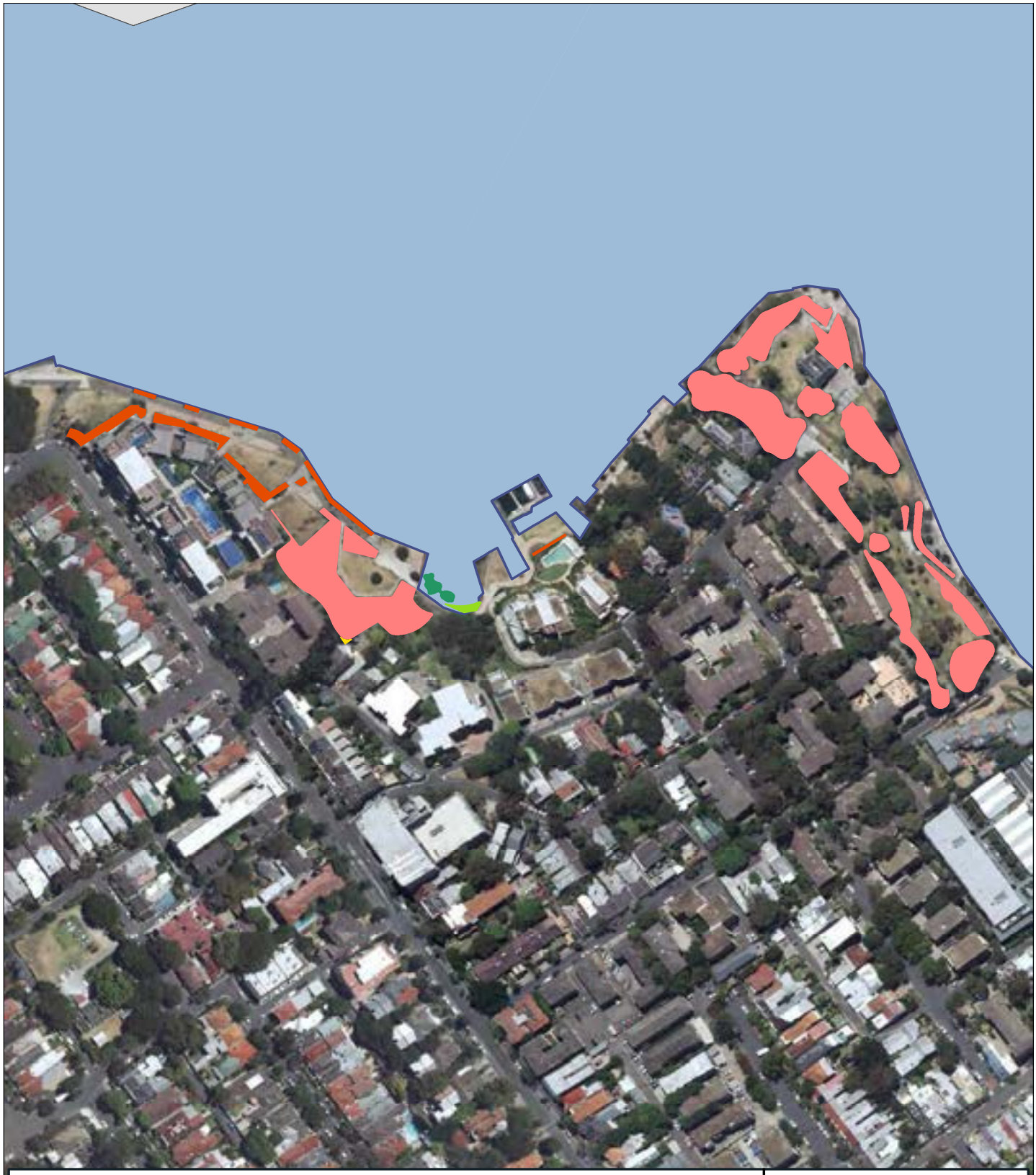


FIGURE 12a
Blackwattle Bay Park to Bicentennial Park

- Coastal Sandstone Outcrop Complex
- Coastal Saltmarsh
- Mangrove Forest
- Bush Restoration Sites
- Indigenous/Mostly Indigenous Plantings

N

30 15 0 30 m

1:2,500 at A4

FIGURE 12b
Bicentennial Park to Harold Park

- Coastal Sandstone Outcrop Complex
- Coastal Saltmarsh
- Mangrove Forest
- Bush Restoration Sites
- Indigenous/Mostly Indigenous Plantings
- Major Weed Infestation

N

40 20 0 40 m

1:2,500 at A4

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FIGURE 12c
Harold Park to Orphan School Creek

- Coastal Sandstone Outcrop Complex
- Bush Restoration Sites
- Indigenous/Mostly Indigenous Plantings
- Major Weed Infestation

Possible Remnant Trees

- Rough barked Apple (Angophora floribunda) - Sydney Turpentine Ironbark Forest
- Bangalay (Eucalyptus botryoides) - Coastal Swamp/Alluvial Forest

N

50 25 0 50 m

1:3,500 at A4

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3.4.3 Pyrmont

Biodiversity values

The high biodiversity values of this 'site' (Figure 13), which comprises several sandstone cliffs and outcrops and bush restoration sites, is attributable to the following:

- Sandstone cliffs and outcrops that, although modified, provide similar habitat to natural sandstone features that are likely to have once been more widespread in the LGA and that provide a refuge for ferns and other naturally occurring flora species;
- Very high flora species diversity as a result of bushland restoration works undertaken by Pyrmont Ultimo Landcare volunteers, with approximately 120 indigenous species recorded during the surveys;
- High potential to expand bush restoration sites and increase the diversity of locally indigenous flora species, and potential to undertake fauna habitat enhancements;
- Clear demonstration of the potential for bushland restoration in even the most highly urbanised areas;
- Reasonable connectivity between most cliffs and outcrops and bush restoration sites along the light rail corridor, which although currently weed-infested provides suitable habitat for small birds and reptiles; and
- Potential for future connectivity with the Glebe Foreshore Walk to Orphan School Creek corridor as a result of the future Glebe Foreshore Walk extension.

Site constraints

Site constraints affecting the above biodiversity values include:

- The relatively small size of this 'site';
- The high concentration of tall buildings and other features such as road overpasses affect vegetation growth by limiting sunlight and/or rainfall at parts of the 'site';
- Infestations of environmental and noxious weeds including Fountain Grass, Asthma Weed, Lantana, Chinese Hackberry, and Crofton Weed, especially on cliff faces and along the light rail corridor, but also on some parts of the foreshore (although as mentioned above these weeds provide suitable habitat for some fauna); and
- Steep terrain poses access, safety and cost issues for bush restoration works.

Bush restoration site adjoining sandstone cliff (left) and naturally occurring ferns and figs on modified sandstone cliff (right).

FIGURE 13
Pyrmont

- Coastal Sandstone Outcrop Complex
- Bush Restoration Sites
- Indigenous/Mostly Indigenous Plantings
- Major Weed Infestation

N

100 50 0 100 m

1:7,500 at A4

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3.4.4 Royal Botanic Gardens and Domain (Yurong Precinct)

Biodiversity values

This site (Figure 14) has the highest biodiversity values in the LGA, attributable to the following:

- Large size (53 hectares);
- The most intact and extensive sandstone outcrops within the LGA, within the Yurong Precinct of the Domain (Mrs Macquaries Point);
- Possible remnant trees representative of the endangered River-flat Eucalypt Forest community;
- Possible remnants of the Coastal Sandstone Foreshores Forest, Coastal Littoral Rainforest and Coastal Cliff Soak communities;
- Very high diversity of flora species, both exotic and indigenous;
- The largest assemblage of locally indigenous species considered likely to be naturally occurring in the LGA – a total of 27 tree, shrub and groundcover species that mainly occur in association with sandstone outcrops;
- The presence of the Growing Friends nursery, at which indigenous and exotic species are propagated and sold to the public, with the assistance of volunteers from the Foundation and Friends of the Botanic Gardens;
- Diverse fauna habitat features, including sandstone cliffs, outcrops and retaining walls, freshwater ponds and associated drainage lines, a sculpture designed to provide microbat roosting habitat, structurally complex plantings from a range of exotic and indigenous vegetation types within the Royal Botanic Gardens (including themed areas such as the Tropical Centre and Rainforest Walk), and structurally complex patches of locally indigenous vegetation created through past bush restoration works in the Yurong Precinct;
- High fauna species diversity – 34 indigenous species recorded, including 25 birds, and two threatened species (the Powerful Owl, a pair of which appears to be resident in the Royal Botanic Gardens, and the Grey-headed Flying-fox, which is likely to continue to forage at the site despite the recent camp relocation);
- The only site at which the Eastern Dwarf Tree Frog and Buff-banded Rail were recorded in the LGA, and one of only two sites at which the Eastern Water Dragon was recorded;
- The only site at which Little Pied Cormorants and Little Black Cormorants nest in the LGA;
- Vegetation and habitats are relatively well-protected from disturbance as pets are prohibited and the site is closed to public access at night;
- High potential to expand bush restoration works and increase the diversity of locally indigenous flora species; such works were identified by the Royal Botanic Gardens and Domain Trust as one of several 'Future Domain' proposals that may be implemented in the lead-up to the bicentenary of the Royal Botanic Gardens in 2016 (Royal Botanic Gardens and Domain Trust website); and
- Existing volunteer base through the Foundation and Friends of the Botanic Gardens.

Site constraints

Site constraints affecting the above biodiversity values include:

- The primary function of the site as a Royal Botanic Garden, i.e. to maintain a living plant collection, including rare specimens, for education and botanical research, which is not always compatible with the provision of fauna habitat;
- Disturbance from high levels of public use; and
- High levels of bird feeding by the public, and the likelihood for this to encourage species that are common and widespread, including nuisance species, potentially to the detriment of uncommon/declining species, as well as to private property and/or resident amenity.

Little Black and Little Pied Cormorant nesting colony (left) and juvenile Eastern Water Dragon in the Royal Botanic Gardens (right) (photos K. Oxenham).

Plantings of mostly indigenous on the eastern side of the Yuroung Precinct (left), and indigenous palntings in the Royal Botanic Gardens (right).

FIGURE 14
Royal Botanic Gardens and Domain

- Coastal Sandstone Outcrop Complex
- Indigenous Plantings/Naturally occurring Vegetation
- Indigenous/Mostly Indigenous Plantings
- Ponds
- Drainage line

Possible Remnant Trees

- Swamp Oak (Casuarina glauca) - Coastal Swamp/Alluvial Forest
- Forest Red Gum (Eucalyptus tereticornis) - Coastal Swamp/Alluvial Forest

N

100 50 0 100 m

1:7,500 at A4

3.4.5 Garden Island (northern end)

Biodiversity values

The high biodiversity values of this site (Figure 15) are attributable to the following:

- Remnant trees of the Coastal Sandstone Foreshores Forest community, along with potentially naturally occurring shrubs, grasses and groundcovers;
- High diversity of indigenous flora species (more than 40 species);
- The presence of one of only two known populations of the Bar-sided Skink in the LGA;
- The onsite tunnel network may provide roosting habitat for microbats;
- High potential to continue bush regeneration works commenced in 2011, to increase the diversity of locally indigenous flora species and to undertake fauna habitat enhancements; and
- Relatively well protected from disturbance as public access is limited – only part of the site can be accessed during the day, and only by ferry or tour bus.

Site constraints

Site constraints affecting the above biodiversity values include:

- Its small size (approximately 2.7 hectares);
- The primary function of the site as the main base for the Royal Australian Navy fleet on the east coast of Australia, which is not necessarily compatible with biodiversity conservation;
- Heritage values of existing gardens, landscape and buildings, which are likely to pose restrictions on the expansion of bush regeneration and other habitat enhancement works;
- Remaining infestations of environmental and noxious weeds including Asparagus Fern, Madeira Vine, Potato Vine, English Ivy and Morning Glory; and
- Steep terrain poses access, safety and cost issues for bush restoration works.

Possible remnant trees of Coastal Sandstone Forest at Garden Island.

FIGURE 15
Garden Island

- Coastal Sandstone Outcrop Complex
- Bush Restoration Sites
- Indigenous/Mostly Indigenous Plantings

N

20 10 0 20m

1:1,500 at A4

3.4.6 Moore Park (Mt Steel, Moore Park Golf and Lake Kippax)

Biodiversity values

The high biodiversity values of this site (Figure 16) are attributable to the following:

- Its large size (approximately 64 hectares);
- Good range of planted indigenous trees and shrubs with some indigenous grass and groundcover species in the vicinity of Mt Steel and Moore Park Golf;
- The only site at which two epiphytic fern species, Elk Horn (*Platycerium bifurcatum*) and Rock Felt Fern (*Pyrrosia rupestris*), were recorded in the LGA (growing in mature planted fig trees);
- The presence of a large freshwater pond (Lake Kippax), located at the site of the former Billy Goat Swamp swamp (Centennial Parklands, undated);
- The only site at which Gould's Wattled Bat and the Eastern Freetail Bat were recorded;
- High potential to undertake bush restoration works and increase the diversity of locally indigenous flora species, and to undertake fauna habitat enhancements without compromising the existing range of land uses; and
- Its existing connectivity to habitat within Centennial Parklands and other sites in the Randwick LGA, and potential to contribute to a habitat linkage to Sydney Park via landscaping associated with future redevelopments at Green Square and other precincts in the southern part of the LGA.

Site constraints

- Disturbance created by high levels of public use, including regular large events, in the vicinity of Lake Kippax in particular; and
- The primary function of most of the site as a golf course and driving range.

Existing indigenous plantings at Moore Park (left), with potential for infill planting and other habitat enhancements, and possibility for establishing understorey beneath existing indigenous trees on parts of Mt Steel (right) without compromising existing range of uses (photos K. Oxenham)

Australasian Grebe nesting at Lake Kippax, Moore Park (left) and Nankeen Kestrel foraging over Moore Park Golf (right) (photos K. Oxenham)

FIGURE 16
Moore Park

Indigenous/Mostly Indigenous Plantings

Ponds

N

150 75 0 150m

1:10,000 at A4

3.4.7 Supporting sites

There are many sites in the LGA that have important biodiversity values in their own right and/or have the potential to support the priority sites. These include small, City-managed parks as well as sites managed by others. A selection of these sites is briefly described below; details for other surveyed sites are provided in the identification of biodiversity values (Appendix 5):

- Embarkation Park and McElhone Stairs, Potts Point – sandstone cliffs, high diversity of locally indigenous species (>40 species), including four that are likely to be naturally occurring.
- Arthur McElhone Reserve, Elizabeth Bay – moderate-high indigenous species diversity (30–40 species), a sandstone outcrop with potentially naturally occurring species including the only known potentially natural Dwarf Apple (*Angophora hispida*) within the LGA, and freshwater habitat (constructed ponds and wet depressions/seepage along rock outcrop).
- Arthur (Paddy) Grey Reserve, Glebe – sandstone outcrop with some potentially naturally occurring species plus high diversity of locally indigenous shrubs and groundcovers planted by volunteers from the Glebe Society's Blue Wren Group and the broader community.
- Bannerman Crescent Reserve, Southern Cross Drive Reserve, and Kimberley Grove Reserve, Rosebery – diverse indigenous plantings with some connectivity to indigenous vegetation along Southern Cross Drive and the Australian and Eastlakes Golf Courses, and high potential for existing biodiversity values to be enhanced.
- Woolwash Park, Zetland – small, constructed freshwater wetland associated with a natural aquifer and vegetated with a good variety of macrophytes; good example of a habitat type that is very limited in the LGA.
- Rail corridors – sections of both the light and heavy rail corridors feature long grasses, thick weed infestations and ground-level debris that provide suitable habitat for a range of fauna species. Fencing along these corridors and restricted public access add to their habitat value.
- University of Sydney, Camperdown and Darlington – the university campus features a mix of long-established exotic and indigenous plantings that support one of few known Superb Fairy-wren populations in the LGA. Recent capital works onsite have incorporated a high proportion of indigenous plantings as well as a small freshwater wetland vegetated with a good variety of macrophytes and fringing vegetation.
- Chinese Gardens, Darling Habour – the freshwater ponds and substantial rocky areas in this landscaped garden support populations of the Eastern Water Dragon and Eastern Water Skink. While these species may originally have been introduced to the garden, which is isolated from other habitat areas, they appear to be flourishing.
- Victoria Barracks, Paddington – bush restoration works are in progress in the south eastern part of this site managed by the Department of Defence, with significant weed control undertaken and hundreds of local provenance seedlings planted to date.

Recent landscaping works at the University of Sydney have incorporated indigenous plantings (left) and a vegetated pond (right). (photos K. Oxenham)

Woolwash Park wetland in Zetland (left) and Embarkation Park in Potts Point (right) are among a number of other supporting sites. (photos K. Oxenham)

3.5 Priority fauna species

The following fauna species were identified as priorities in the LGA for this Strategic Action Plan:

- Green and Golden Bell Frog and other frogs;
- Grey-headed Flying-fox;
- Powerful Owl;
- Long-nosed Bandicoot;
- Microbats;
- Small birds;
- Wetland birds; and
- Reptiles.

Most of these species occur at one or more of the sites discussed in Section 3.4, although some occur at other sites, including residential backyards. Most are dependent on particular habitat features that are limited within the LGA, such as dense shrubby vegetation, rock crevices, ground-level features such as rocks and fallen timber, tree hollows, and freshwater wetlands/ponds.

The following sections provide a profile of each priority species/group.

3.5.1 Green and Golden Bell Frog and other frogs

The Green and Golden Bell Frog (GGBF) was once abundant in Sydney and elsewhere across its range – it was described in 1863 as being "the most common of all Australian frogs" (Lemckert 2010), and remained very common until about 30 years ago, when it underwent a dramatic decline. This decline is thought to have been largely due to a combination of habitat loss, fragmentation and degradation; disease caused by the chytrid fungus (which has led to worldwide frog declines); and predation by the introduced Mosquito Fish (DEWHA 2009; DECCW 2008b; DECC 2005; White & Pyke 2008). GGBFs are now limited to a small number of isolated populations, and the species is listed as threatened under both the EPBC and TSC Acts.

In the City, GGBFs are limited to a very small population (estimated at less than 20 individuals) in Rosebery. This population is centred on a residential backyard in which the frogs colonised a disused, above-ground swimming pool in the mid-1990s, from a larger area of nearby habitat that has since been destroyed by a residential apartment development (DECCW 2008b).

When the pool became dilapidated, the Rosebery residents enlisted the help of the NSW Frog and Tadpole Study Group (FATS) who replaced the pool in 2005 with two small, purpose-built habitat ponds. The City provided funding to FATS for these works.

Peron's Tree Frog (photo K. Oxenham)

Green and Golden Bell Frog (photo K. Oxenham)

Although GGBFs bred in the ponds in large numbers every year until the 2009–10 season, the residents have reported an ongoing decline in the population. They have not observed any tadpoles in the past two years, and have also observed predation by Laughing Kookaburras on adult frogs. Without action, this population faces extinction in the very near future.

Translocation of GGBFs from Rosebery to Sydney Park was identified as a priority action by DECCW (2008b) in the management plan for the Lower Cooks River 'key' GGBF population. However, past translocations of this species have been largely unsuccessful (White & Pyke 2008) and translocation would in any case be difficult given that this is usually undertaken with tadpoles, which do not appear to have been produced in the last two years. Better outcomes may be achieved by establishing more breeding habitat, i.e. freshwater ponds, in the Rosebery area where GGBFs could colonise them naturally.

There are several City parks in Rosebery in which ponds could be constructed, and most backyards in Rosebery are large enough to readily accommodate ponds. There is also a relatively large number of of backyard swimming pools in Rosebery, which could easily be converted to ponds – conversion of just a small number could save the local GGBF population from extinction. A successful 'Pool to Pond' conversion program run by Ku-ring-gai Council has demonstrated the conversion is simple and effective, and Woollahra Council has also recently commenced a 'Pool to Pond' program.

The other frog species recorded in the LGA were the Striped Marsh Frog, Common Eastern Froglet, Perons Tree Frog and Eastern Dwarf Tree Frog. The Striped Marsh Frog and Common Eastern Froglet are more flexible in their habitat requirements and are consequently more widespread in the LGA than the latter two species: Perons Tree Frog was recorded at a small number of sites in the LGA and the Eastern Dwarf Tree Frog at only one site. While tree frogs in general have declined throughout the more densely populated and developed parts of Sydney (White & Burgin 2004), these two species are still common elsewhere throughout their range (Tyler & Knight 2011), including parts of adjoining LGAs, so it should be possible to achieve an increase in their distribution and abundance in the city.

Like the GGBF, all of these species would benefit from the construction of more freshwater ponds and pool conversions, as well as improvements to the habitat value of existing ponds and water features – particularly through increasing the complexity of adjacent terrestrial habitat features (Hamer & McDonnell 2010). This can be achieved by providing a diverse range of fringing vegetation along with ground-level features like rocks around ponds. Improving habitat connectivity between ponds, improving water quality, minimising pond shading, controlling predatory fish – particularly the Mosquito Fish – and providing aquatic vegetation are also important in encouraging a range of frogs (Hamer & Parris 2011). Restrictions on the use of chemical herbicides in and around frog habitats is also critical.

Attempts are currently being made to re-establish populations of similar frog species to those that occur in the city at unoccupied ponds in Melbourne (A. Hamer, *pers. comm*.); if successful, this could potentially be replicated in Sydney.

Frog and Tadpole Study Group working bee (left) to replace dilapidated swimming pool with purpose-built GGBF ponds in a Rosebery backyard; and the main pond today (right) (photo K. Oxenham)

3.5.1 Grey-headed Flying-fox

The Grey-headed Flying-fox has experienced substantial declines across its range as a result of the destruction and development of its natural habitat, particularly along and near the coast. Its range also appears to be contracting in the north and expanding southwards (DSEWPaC 2012). It is listed as threatened under both the EPBC and TSC Acts.

Grey-headed Flying-foxes forage at night over extensive areas, feeding primarily on the nectar, flowers and fruit of a wide variety of trees – mainly *Eucalyptus, Corymbia, Angophora, Melaleuca* and *Banksia* species – and supplement this diet with leaves (DECCW 2009b). They also feed on *Ficus* species and on introduced trees. Their diet varies throughout the year depending on which trees are flowering or fruiting (DECCW 2009b). They play an important ecosystem function in terms of seed dispersal and pollination of many indigenous tree species (NSW Scientific Committee 2001).

During the day, Grey-headed Flying-foxes roost communally in trees, usually in large numbers. Until mid-2012, a large camp comprising thousands of individuals was present at the Royal Botanic Gardens. Despite the relocation of the camp by the Royal Botanic Gardens and Domain Trust, the Grey-headed Flying-fox is likely to remain relatively abundant in the LGA, since individuals from other nearby camps (for example at Centennial Park) are likely to continue to forage throughout the area at night.

Existing tree maintenance practices in the LGA will contribute to their conservation. In Melbourne, at least 87 street tree species and more than 315,000 individual street trees provide a food source for Grey-headed Flying-foxes (Williams *et al*., 2006), and it is likely that there would be a similar number in Sydney.

Increasing winter-flowering tree species such as Swamp Mahogany and Forest Red Gum in City parks would assist to ensure a year-round food supply (other winter-flowering species such as Spotted Gum and Broad-leaved Paperbark are already common in streets and parks across the LGA). Reducing the potential for Grey-headed Flying-fox electrocutions on overhead power lines, a common occurrence in urban areas, is also likely to benefit the species.

3.5.2 Powerful Owl

The Powerful Owl is Australia's largest owl species and like most large predators, it has a large home range, with a single pair usually occupying a given territory (DECC 2006). It is a forest-dwelling and hollow-nesting species, and has been listed as threatened under the TSC Act mainly due to loss of habitat, including hollow-bearing trees, through logging and clearing for urban development and agriculture.

Powerful Owls have historically occurred in the outer suburbs of Sydney, particularly where there are substantial adjoining bushland areas (Kavanagh 2004), but in recent years there have been numerous records much closer to the city, presumably due to the abundance of prey such as possums and flying-foxes (Birds in Backyards website). A pair now appears to be resident in the Royal Botanic Gardens, where they can often be seen roosting in a leafy tree during the day, usually holding the remains of the previous night's prey in their talons. They have also been recorded in other parts of the LGA on occasion.

Although prey is abundant in the gardens, it is unlikely that there are any tree hollows that are large enough for nesting. As Powerful Owls have successfully nested in a purpose-built nest box in Melbourne (McNabb & Greenwood 2011), Royal Botanic Gardens staff installed a similar nest box in early 2012 ahead of the breeding season, which extends from mid-May to mid-July. It has not been used to date, but will continue to be monitored. Installation of additional nest boxes may increase the likelihood of the owls nesting.

BirdLife Australia's Birds in Backyards program is currently running a Powerful Owl Project, which aims to identify the critical roosting and breeding requirements of the species in the Sydney region, identify important areas requiring protection, and improve awareness of the public and land managers about Powerful Owls and issues affecting their conservation (Birds in Backyards website).

Powerful Owl in the Royal Botanic Gardens. (photo C. Tomkinson)

3.5.3 Long-nosed Bandicoot

The Long-nosed Bandicoot is very common in bushland around Sydney and elsewhere throughout its range, but like most other indigenous ground-dwelling mammals, it has disappeared from most highly urbanised areas and is considered extinct from most parts of inner city Sydney (Leary *et al*. 2004). In 2002, however, numerous reports from residents led to the discovery of a small population around the inner-western suburbs of Dulwich Hill, Marrickville, Lewisham and Petersham. This was surprising given that it was considered extinct from the area by the 1970s; there is no known source population nearby; and it is very vulnerable to predation from foxes, cats and dogs, as well as threats posed by traffic and limited habitat availability and connectivity. This inner-western population has subsequently been listed as endangered under the TSC Act.

A radio-tracking study found the bandicoots forage almost exclusively in urban backyards and shelter by day under old buildings (Leary *et al*. 2004). It is considered possible they may have persisted at industrial sites in the inner west (such as old flour mills and warehouses), and redevelopment of such sites may have forced them to relocate to urban backyards (Leary *et al*. 2004).

Three Long-nosed Bandicoots have since been recorded in the LGA, at Alexandria and Camperdown. The first of these was photographed by a motion-sensitive camera in a community garden in April 2011, while the second (reportedly a juvenile) was found injured in January 2012 in the adjacent Alexandria Park and had to be euthanased. While no further sightings of bandicoots or their diggings have been reported since that time, it is possible that other individuals are present in the area, particularly in and around the many industrial sites in the southern part of the LGA. The third bandicoot record was from the University of Sydney's Camperdown campus, where a dead individual was discovered in November 2012.

Hughes & Banks (2010) found Long-nosed Bandicoot foraging activity was greater in areas with moist, soft soils close to dense vegetation cover, and suggest artificial watering and the provision of additional cover may assist in the conservation of urban bandicoot populations through increasing foraging opportunities.

3.5.4 Microbats

Microchiropteran bats (microbats) are small-bodied, generally insectivorous species which locate their insect prey by echolocation, usually above dense vegetation or waterbodies. In urban areas, they can also sometimes be seen foraging around street lights. By day, they normally roost within the hollows of live or dead trees, under bark, or within caves. Within urban areas where tree hollows and other natural habitat is less available, some microbats have adapted to roosting in man-made structures such as roof and wall cavities of buildings, stormwater drains, and tunnels, but most still depend on tree hollows for refuge and breeding.

There are about 17 microbat species in the Sydney metropolitan area (Threlfall *et al*. 2012a). Only three species – Gould's Wattled Bat, the Eastern Freetail Bat, and Little Forest Bat were confirmed in the City during the surveys, although there were possible records of two additional species, the Southern Forest Bat and threatened Eastern Bent-wing Bat. Several other species may also be present, but were not detected.

Most of the microbat species in Sydney are urban-sensitive (Threlfall *et al*. 2012a). The species detected in the LGA were only recorded from a small number of sites. A recent study (Threlfall *et al*. 2012b) found that only one microbat species – Gould's Wattled Bat, which is the most widespread species in NSW and the ACT (Pennay *et al*. 2011) – can routinely tolerate life in the highly urbanised inner city. A related study also found habitat enhancement efforts for microbats in urban areas should focus on maintaining and restoring bushland and riparian habitat, particularly in areas with fertile, shale-influenced soils (Threlfall *et al.* 2012b). Shale-influenced soils in the LGA are largely limited to the inner west and Surry Hills (the Blacktown soil landscape indicated in Figure 5).

Provision of roost boxes may be another means of encouraging microbats in urban areas, although their use of roost boxes is poorly understood and is likely to be influenced by numerous factors including box design and placement. Rhodes & Jones (2011), however, found five microbat species used roost boxes installed in tall *Eucalyptus* trees in Brisbane parks and backyards, and the boxes were more likely to be used if clustered in groups of at least six within 50 metres of each other, in areas with high grass cover within one kilometre and in areas with high forest cover within five kilometres. Evans & Lumsden (2011) found that Gould's Wattled Bat used roost boxes as well as natural tree hollows in the suburbs of Melbourne, and there was no apparent preference for either roost type. This species has also readily colonised roost boxes recently installed at Sydney Olympic Park.

As well as microbats, roost boxes may also be used by other species, including several that are likely to exclude or prey upon microbats, such as ants, introduced honeybees, and introduced rats (Rhodes & Jones 2011), so it is important that boxes are designed to prevent or minimise potential for this.

3.5.5 Small birds

Given birds are currently the most diverse and prominent vertebrate group within the LGA, the general absence of small woodland bird species was particularly notable in the survey results. The current bird assemblage is dominated by large indigenous honeyeaters, parrots, carnivores and introduced species.

Most of these larger species were not originally resident in the Sydney area (Major 2010; Major & Parsons 2010), or at least not in large numbers – populations of all increased dramatically in the 20th century as Sydney's human population and associated development increased markedly (Recher 2010). Many of the small bird species that did once occur here, such as the Red-browed Finch, Grey Fantail, Eastern Spinebill, and Spotted Pardalote (Major & Parsons 2010), were not recorded in the survey and no longer appear to be present in the LGA. Some of these smaller species still occur in other parts of Sydney, however, including adjoining LGAs, but many have declined in general across their range (Major 2010; Major & Parsons 2010; Recher 2010; Parsons 2009).

Apart from the Willie Wagtail, which is reasonably well-adapted to urban environments and is found across the LGA, the only small woodland birds that appear to be resident in the LGA today are the Superb Fairy-wren, Silvereye and New Holland Honeyeater. Other small birds recorded in the LGA were the White-plumed Honeyeater and Rufous Whistler – each at one site on only one occasion. Several other species, including rainforest species such as the Rufous Fantail and Black-faced Monarch which migrate through Sydney, may also occur in small numbers from time to time.

The Superb Fairy-wren appears to be limited to small populations at Sydney Park, St Peters; Erskineville; the University of Sydney, Camperdown; and possibly Glebe. Lesryk Environmental Consultants also reported it from the Royal Botanic Gardens in 2005, but it no longer occurs there. It lives in small, territorial groups and is a weak flier, unlike the Silvereye and New Holland Honeyeater which are more mobile and capable of moving around the landscape in response to availability of food. Small numbers of New Holland Honeyeaters have been recorded recently at Erskineville and Rosebery. Silvereyes have been recorded at a greater number of locations and appear to be more abundant and widespread across the LGA, though still not particularly common.

Small birds that once occurred in the LGA but no longer appear to be present: Red-browed Finch (left) and Spotted Pardalote (right). (photos N. Lazarus)

The decline of small birds is mainly attributable to the loss of habitat that has occurred with increased urbanisation, along with an associated increase in larger, aggressive birds, especially the Noisy Miner, as discussed in Section 3.7.8. Nest predation by introduced rats may also be a factor.

Most small woodland birds are dependent on dense understorey vegetation comprising a mix of different indigenous shrubs, grasses and groundcover species, which provide the food and shelter they require (Parsons 2009; Debus 2008). Ground level features like fallen logs are also beneficial habitat features. These characteristics are missing from most urban parks and gardens, which tend to be characterised instead by trees over mown lawn, mulch or paved surfaces. This type of environment favours many of the larger bird species that have consequently become abundant in Sydney and other urban areas, and several of which are aggressive towards or prey on small birds (Section 3.7.8).

Concern over the decline of small birds led to the formation of The Glebe Society's Blue Wren Group, a group of residents who for several years have led community education and habitat enhancement initiatives, with a particular focus on the Superb Fairy-wren. With grant funding from the City, the Blue Wren Group commissioned a study to investigate the status of Superb Fairy-wrens in Glebe and Forest Lodge, and to provide recommendations to promote the conservation of wrens and other small birds. The resultant report (Stevens 2008) identifies potential habitat corridors in the Glebe and Forest Lodge area, and particularly stresses the importance of small parks, backyards and the light rail corridor in providing habitat for small birds, given they are generally more protected from disturbance than most City parks.

While some small birds will use a range of indigenous and exotic species as habitat, and weeds like Lantana can be particularly important (Parsons *et al*., 2008), Parsons & Major (2004) found that several small birds, including the Superb Fairy-wren, were more likely to be encountered in backyard gardens dominated by indigenous vegetation, whereas Noisy Miners dominated gardens with a mix of exotic and indigenous plants.

Several studies (for example Ashley *et al*. 2009 and Catterall 2004) have also shown that plantings of small eucalypt-dominated urban strips and patches are unlikely to provide useful habitat for many small birds, due to their tendency to be colonised by Noisy Miners. Hastings & Beattie (2006), however, found that incorporating acacias, preferably bipinnate species such as the locally indigenous Sydney Green Wattle *Acacia decurrens* and Parramatta Green Wattle *Acacia parramattensis*, along with a dense shrubby understorey was effective in promoting the abundance and diversity of small birds, as Noisy Miners were not resident in plantings with these characteristics.

3.5.6 Reptiles

Based on records from the Australian Museum, there were originally 45 reptile species within the Sydney metropolitan area – most have declined and some, particularly larger species, have disappeared altogether from suburban environments and adjacent small bushland areas (Shea 2010; White & Burgin 2004).

Four of the 11 species recorded in the LGA – the Eastern Water Skink, Bar-sided Skink, Eastern Water Dragon and Gully Skink – are considered 'suburban battlers' in Sydney (Shea 2010), because although they are still present, they are generally uncommon. This certainly seems to be the case in the LGA, although the Bar-sided Skink seems relatively abundant in foreshore locations where suitable rocky habitat is present, and has also been recorded from nearby trees. The occurrence of the Gully Skink in the LGA is of interest in that it is only known in Sydney from a small number of sites in the eastern suburbs and on the north shore (Shea 2010).

Five of the other reptile species recorded in the LGA are considered to be long-term 'suburban survivors' (Shea 2010) as they appear to have adapted well to urbanisation. However, two of these – the Weasel Skink and Eastern Blue-tongue – were recorded from one and two sites respectively and do not appear common in the LGA.

The only known reasonable Eastern Blue-tongue population in the LGA appears to be at Sydney Park, where it is vulnerable to dog attacks and other disturbance.

More than 2,000 Eastern Blue-tongue rescues were recorded by WIRES over a three-year period in Sydney (Koenig *et al*., 2002); vehicles and dogs killed many adults in spring (the breeding season) when adult males move about more frequently, while domestic cats killed mainly juveniles. However, in highly urbanised areas such as the inner city, habitat loss rather than domestic pets was found to be the most important cause for lizard rescue (Koenig *et al*., 2002).

This illustrates the importance of maximising habitat for Eastern Blue-tongues and other reptiles, and improving connectivity between habitat patches to enable them to move safely across the landscape. Koenig *et al*. (2001) found for example that Eastern Blue-tongues actively avoided crossing roads and instead used corridors of dense vegetation to move between shelter sites. Hamer & McDonnell (2010) also stressed the need to maintain structural complexity in habitat patches – for example through providing ground-level habitat features such as rocks and logs – and to protect habitat patches and corridors.

As well as parks, residential backyards can also provide valuable reptile habitat, and reptiles in return play a useful role in controlling garden pests – Eastern Blue-tongues for example prey on garden snails. They and other species readily inhabit backyards in Sydney provided suitable shelter sites are present (Koenig *et al*., 2001) – these can comprise rock retaining walls and other rock features, logs and other ground-level features including artificial structures. However, domestic pets and the use of chemical pesticides such as snail baits, which are likely to be fatal to Eastern Blue-tongues that eat poisoned snails, pose threats to reptiles in backyards, and it is important to improve community awareness about this.

Ideal habitat for the Eastern Water Dragon at the Chinese Gardens, Darling Harbour: rocks, water, long vegetation; and a Weasel Skink. (photos K. Oxenham)

3.5.7 Freshwater wetland birds

Given the freshwater swamps and creeklines that were once present in what is now the LGA, it is likely that a range of freshwater wetland birds was once common. Large numbers and a great variety of bird species, including 'red-bills' (probably Purple Swamphens), 'water hens' (probably Dusky Moorhens), bitterns, many kinds of duck, snipe, and rails, were reported from Lachlan Swamp in the early-mid 1800s (Doran 2004), to the east of the LGA in what is now Centennial Park. It is likely that swamps and other freshwater bodies in the LGA supported a similar assemblage.

Filling of these swamps and channelisation of creeks that took place with the development of Sydney would have led to the disappearance of many of these species. Hunting was also likely to have contributed; large species like the Black Swan were reportedly hunted to local extinction by the mid-19th century (Doran 2004). Many wetland birds have similarly declined overall across Australia (Birds Australia 2008), although there have been recent increases after three years of inland wetland flooding (Porter & Kingsford 2011).

Although no natural freshwater wetlands remain in the LGA, several duck species, the Purple Swamphen and Dusky Moorhen are still reasonably abundant where wetlands and ponds have been constructed. Most other freshwater wetland birds, however, now only occur in very small numbers. These include the Black Swan, Buff-banded Rail, Australian Reed-warbler, Black-fronted Dotterel, Royal Spoonbill, Eastern Great Egret, and Black-winged Stilt.

The four latter species do not appear to be resident in the LGA but appear from time to time, mostly at Sydney Park. They are all waders that forage in shallow water and/or on muddy banks created by fluctuating water levels. Some are also very sensitive to disturbance, for example from recreational activities including dog walking.

Other species such as the Australian Reed-warbler inhabit dense reed beds and are reliant on the maintenance of this habitat type, while species like the Buff-banded Rail generally require thick long grasses and sedges. Increasing the availability of these habitat types is likely to benefit these species, and could encourage other similar birds, including the Golden-headed Cisticola, Little Grassbird, Baillon's Crake and the migratory Latham's Snipe to inhabitat the LGA.

Black Swan adults and cygnets at Sydney Park (left) and Eastern Great Egret (right, photo J. Irvine)– wetland birds that are uncommon in the LGA.

3.6 Potential habitat linkages

The locations of potential habitat linkages identified within the LGA and between known or potential habitat areas in adjoining LGAs are indicated in Figure 17. While it is unlikely that continuous habitat 'corridors' can be created along their full length, there is considerable potential to at least create 'stepping stones' of habitat along or in the vicinity of these potential habitat linkages to facilitate the movement of more mobile species across the landscape.

Figure 17
Potential Habitat Linkages

3.7 Threats

Current threats to biodiversity in the LGA are outlined below.

3.7.1 Limited habitat availability

Arguably the main threat to biodiversity in the LGA today is the limited availability of habitat. The LGA has been almost completely modified from its natural state and is now dominated by the built environment. The habitat features upon which many species rely are consequently very limited.

Many of the species that have disappeared from or are scarce in the LGA require structurally complex habitat comprising a mix of trees with a dense understorey of shrubs, grasses, groundcovers, and/or other features like rock crevices, fallen logs, tree hollows and wetlands. Many species moreover require large areas of habitat that have a minimal perimeter to area ratio, i.e. large, round or square rather than narrow linear areas, as the former have a 'core' that is protected from disturbance at the edges. Studies have shown for example that a minimum area of more than 10 hectares is required to conserve many small birds (Piper & Catterall 2003), although habitat complexity can be more important than area for frogs and reptiles in urban areas (Jellinek *et al*. 2004; Hodkison *et al*. 2007).

Given that vegetation in most parks and gardens in the LGA comprises trees over mown lawn or mulch, with understorey vegetation sparse or absent; areas of structurally complex habitat are scarce and small; no large areas are available for bush restoration; fallen logs have generally been removed as part of site maintenance; most natural creeks have been modified and swamps filled; and trees with hollows are generally removed for safety reasons, many species that once occurred in the LGA are unlikely to return, particularly given the other challenges of surviving in a highly urbanised environment.

There is consequently a clear need to maximise, to the extent possible, the availability of suitable habitat to prevent the loss of species that currently remain in small numbers, and to encourage the species that can (for example, those that still occur in surrounding LGAs) to recolonise the area.

Aerial photos of part of Surry Hills (left) and Pyrmont (right) illustrate the limited availability of habitat within the LGA due to its highly urbanised nature

3.7.2 Lack of habitat connectivity

While canopy connectivity is relatively good across much of the LGA, habitat connectivity at the understorey level is very poor. As discussed above, many species are reliant on this type of habitat, which as well as providing food and shelter enables them to move and disperse across the landscape.

The lack of connectivity means that the existing small patches of structurally complex habitat are generally isolated from each other by intensively developed urban areas and roads, as well as paths, lawns, sportsgrounds and other recreational features associated with most areas of public open space.

The isolated nature of habitats within the LGA, in combination with their limited extent, further limits the potential for many species to survive in the LGA, particularly ground-dwelling species and other less mobile species, since it limits recruitment and gene flow (discussed further in Section 3.7.4). Species particularly at risk include the endangered Green and Golden Bell Frog, which is restricted to one site at Rosebery where it is isolated from the nearest population at Arncliffe in the Botany Bay LGA, and the Superb Fairy-wren, which is a poor flier, and remaining populations of which are isolated from each other and from populations in adjoining LGAs.

While narrow strips of habitat and small 'stepping stone' habitats can improve connectivity between larger areas, recommended widths for functional habitat corridors vary from 25–500 metres, since narrow corridors lack the protected 'core' area required by many species. Corridors of such widths are obviously not achieveable in the city context given the extent of development and competing demands for open space. Neverthless, numerous species are likely to benefit from maximising connectivity of understorey vegetation and ground-level habitat features across the LGA.

3.7.3 Destruction and fragmentation of remaining habitat

Destruction and fragmentation of habitat within the LGA can result from maintenance practices that are incompatible with biodiversity conservation, for example inappropriate use of herbicide, lawnmowers and brushcutters; excess application of mulch leading to smothering of habitat and/or excessive nutrification of waterbodies; misidentification of indigenous plants as weeds (and vice versa); and removal of other important habitat features such as fallen timber and hollow-bearing trees (the latter of which is often required for safety reasons).

Habitat destruction and fragmentation can also result from construction works associated with new developments, redevelopment, and infrastructure maintenance, for example through the unstaged removal of habitat features such as thick long grass and dense shrubs (including weeds, which can provide important habitat for some species as discussed in Section 3.7.5), rock retaining walls, rock piles and debris including rubbish piles, scrap metal and similar.

Clearing of indigenous vegetation is listed as a Key Threatening Process under both the EPBC Act and TSC Act. The loss of hollow-bearing trees, removal of dead wood and dead trees, and bushrock removal are also all listed as Key Threatening Processes under the TSC Act.

3.7.4 Low genetic diversity

The limited habitat availability and poor habitat connectivity characteristic of the LGA has resulted in small isolated populations of numerous species. This is likely to lead to decreased genetic diversity, resulting in reduced resilience of many flora and fauna species to factors such as environmental change, disease, and predation, further limiting their availability to persist in the LGA.

There are similar risks associated with low genetic diversity if vegetation used in bush restoration and other habitat creation/enhancement works is not sourced from a variety of locations.

3.7.5 Weed invasion

Noxious and environmental weeds can suppress and out-compete indigenous flora species. Some weeds also provide a food source for aggressive/predatory bird species that have been implicated in the decline of small birds (as discussed in Section 3.7.8).

Examples of weeds in the City include:

- Fountain Grass and exotic vines such as Asparagus Fern, Madeira Vine, Potato Vine, English Ivy and Morning Glory that are invading sandstone cliffs and outcrops and possible forest remnants;
- Exotic grasses including Kikuyu and other turf species that are outcompeting indigenous groundcover and wetland species;
- Chinese Hackberry (*Celtis sinensis*), which is invading bush restoration sites, parks and railway corridors;
- Dense thickets of African Olive in the Yurong Precinct of the Domain and of Lantana and other weeds in the light rail corridor at Pyrmont that are likely to be inhibiting the germination and growth of indigenous flora;
- Noxious aquatic weeds Ludwigia at Wetland 2 in Sydney Park and Salvinia at Woolwash Park wetland, that can proliferate to adversely affect wetland health; and
- Soft-fruiting species such as Privet and Chinese Hackberry that are increasing the food supply of the Pied Currawong, which also preys on the eggs and chicks of small birds.

The loss and degradation of indigenous plant and animal habitat by invasion of escaped garden plants, including aquatic plants, is listed as a Key Threatening Process under the EPBC Act, while the invasion of numerous species including exotic vines and scramblers, Lantana, exotic perennial grasses, African Olive and Bitou Bush are listed as Key Threatening Processes under the TSC Act.

Despite the threats posed by weed invasion in general, it should be noted that dense thickets of some weeds can be an important habitat resource for small birds, the Long-nosed Bandicoot and other species that occur within the LGA in small numbers/at a small number of sites, particularly given that indigenous vegetation and other habitat is limited in the area.

Infrastructure maintenance works damaging habitat at Orphan School Creek, Forest Lodge (left) and off-site removal of fallen logs and branches at Sydney Park (right). (photos K. Oxenham)

The noxious weed Fountain Grass and other weeds on the foreshore at Pyrmont (above left), annual weeds can outcompete native species if not controlled (below left) and the noxious weed Salvinia infesting Woolwash Park wetland (right).

3.7.6 Use of chemical herbicides and pesticides

The use of chemical herbicides and pesticides, while effective in controlling weeds or pest fauna, can also be detrimental to indigenous species. For example, overspray of herbicide can lead to the death of non-target indigenous plants, and can also impede their germination. Herbicides can also be fatal to aquatic species, and species like frogs and some reptiles that can absorb chemicals through their permeable skin.

Chemical snail baits, which are effective in controlling garden snails, can unfortunately also kill indigenous species like the Eastern Blue-tongue, which preys on snails, and is ironically an excellent natural control for them. Similarly, chemical pesticides can lead to the death of frogs, which prey on numerous insect pests, and use of rat baits can be fatal to raptors, owls or other birds that may prey on poisoned rats.

3.7.7 Introduced fauna

A number of introduced species, including domestic pets, pose a threat to indigenous fauna in the LGA, mainly through predation but also in some cases through competition or disturbance.

Predation by introduced species including the European Red Fox and feral cats are listed as Key Threatening Processes under both the EPBC Act and TSC Acts, and predation by Mosquito Fish and competition from feral honeybees are also listed as Key Threatening Process under the TSC Act.

Examples of the impact of introduced fauna in the City include:

- Predation of frogs, reptiles, birds and potentially Long-nosed Bandicoots by foxes, feral cats, rats and domestic pets; and
- Predation of frog eggs and tadpoles by the Mosquito Fish at freshwater wetlands in Sydney Park and Woolwash Park.

While the impact of cats and dogs may be minimised by increased owner awareness as well as strategic fencing of habitat areas, control of the European Red Fox and feral cat are very difficult in publicly accessible urban areas. Both are also resource-intensive and unlikely to be particularly effective, since removal of one animal generally results in arrival of another to take its place. Within the LGA, both are more likely to be scavenging on garbage or preying on introduced rodents, given these are more abundant than the indigenous species upon which they could potentially feed.

The introduced Black Rat and Brown Rat are both common across Sydney, and while both can impact adversely on indigenous fauna through competition and predation (Banks & Hughes 2012), and may have contributed to the decline of small birds, the majority in the LGA are likely to currently be scavenging on garbage or other waste. Introduced rats do however affect humans through their potential to carry disease (Banks & Hughes 2012). The City therefore undertakes a regular program of monitoring, baiting and control of rat populations on public land and ensures any severe rat infestations creating unhealthy conditions on private property are controlled by education, regulation and/or enforcement.

The Mosquito Fish has been implicated in the decline of the endangered Green and Golden Bell Frog and other frog species. It produces up to 300 young several times a year, and can therefore quickly proliferate to infest a wetland. It is a difficult species to eradicate from large waterbodies, but periodic wetland draining can be effective in reducing numbers.

Despite widespread public perception about the Common Myna (also known as the Indian Myna), which has become common and widespread in the City and other urban areas, numerous studies (eg Haythorpe *et al*. 2012; Taylor 2011; Lowe *et al*. 2010; Parsons *et al*. 2006) have shown it does not appear to have any adverse impact on indigenous bird species in Sydney, and efforts to control it would be better directed to habitat enhancement works for the small bird species which have declined in many urban areas. Even in the ACT, where a recent study has shown a negative impact on some bird species, habitat enhancement for indigenous birds has still been recommended over myna control (Grarock *et al*. 2012). The only potentially effective control method for Common Mynas – cage trapping – is extremely resource intensive, and its effectiveness in terms of reducing overall myna numbers is uncertain (Tidemann 2010).

3.7.8 Indigenous fauna

A number of aggressive and predatory indigenous birds that have proliferated in the LGA and other urban areas have been implicated in the decline of small birds. In particular, aggressive exclusion by the Noisy Miner – rather than the introduced Common Myna – as well as predation by species such as the Pied Currawong, Australian Raven, Grey Butcherbird and Laughing Kookaburra are likely to have contributed to reduced diversity and abundance of small birds (Parsons *et al*. 2006; Bayly & Blumstein 2001), as well as resultant decrease in the ecosystem services such as pollination and predation of insect pests that small bird species provide.

Numerous studies have found a significant negative impact on small birds resulting from the Noisy Miner (Parsons 2009; Debus 2008; Parsons *et al*. 2006; Hastings & Beattie 2006; Parsons & Major 2004; Piper & Catterall 2003; Grey *et al*. 1997), and a nomination has been made to have 'aggressive exclusion of birds from potential woodland and forest habitat by over-abundant Noisy Miners' listed as a Key Threatening Process under the EPBC Act. Noisy Miners and other aggressive/predatory birds are well-adapted to the structurally simple habitat comprising trees and mown lawn, mulch or paved surfaces that characterises many parks, streets and backyards in urban areas.

The predatory Pied Currawong also benefits from the presence of soft fruit-bearing trees that are common in urban areas, such as the introduced Camphor Laurel, the environmental weed Chinese Hackberry, the noxious weed Privet, and the locally indigenous Lilly Pilly and Sweet Pittosporum, as their fruit provides it with an additional food source. Our Urban environment is an important refuge for indigenous fauna and while some species are doing well it is proposed to support and focus on those indigenous species that require assistance.

3.7.9 Nuisance fauna

A number of indigenous and introduced species are often considered 'nuisance' species because of their impact on public amenity, rather than any particular impact on biodiversity. Such species include the Australian White Ibis, Sulphur-crested Cockatoo, Common Brushtail Possum, Rock Dove (or feral pigeon), and Common Myna (or Indian Myna). Most indigenous species are protected in NSW under the *National Parks and Wildlife Act 1974*, which is administered by the NSW National Parks and Wildlife Service (NPWS). Any applications to cull indigenous species are processed by the NPWS. Introduced species are not protected under this legislation.

The Australian White Ibis is an indigenous species that was originally an inhabitant of inland wetlands. Large populations have however established in Sydney and other urban areas outside of its original distribution, presumably as a result of inland drought in combination with the abundance of food – large numbers forage at landfills and ibis also scavenge for food scraps in garbage bins, cafés, and parks (Martin *et al*. 2010 & 2007). Ibis populations have increased dramatically in Sydney in recent years (Martin *et al*. 2010). They are considered a nuisance for their scavenging habits, as well as due to noise and odour associated with their nesting colonies.

On City-managed land, nesting colonies have establishd in Phoenix Palms (their preferred nesting habitat in urban areas), in Cook + Phillip Park and Redfern Park, with a smaller colony in a single Phoenix Palm in Fitzroy Gardens in Kings Cross. The NPWS has issued conditional licences to cull eggs and chicks around Sydney in the past, but due to concerns about the overall conservation status of the species, culling is no longer permitted. The NPWS is preparing an Ibis Management Strategy for the Sydney region, and currently recommend the more effective, non-lethal approaches of either removing Phoenix Palms or heavily pruning them each year to prevent nesting.

Common Mynas tend to occur in and around built-up areas rather than bushland (left); the indigenous Noisy Miner (right) has been implicated in the decline of small birds. (photos K. Oxenham)

The Sulphur-crested Cockatoo is another species that has adapted well to urban areas and is now common in the city. It tends to be more fondly regarded than the Australian White Ibis, presumably due to its charismatic appearance and behaviour. Many Sydney residents feed cockatoos, as can be seen for example from a facebook page established for a cockatoo research project (see facebook.com/cockatoo.wingtag). However, this species is capable of causing substantial property damage by chewing through features such as timber window frames, timber decking, wiring, building facades, and roof tiles. Feeding may encourage this nuisance behaviour, and also lead to the spread of beak and feather disease (OEH 2011). The NPWS has issued licences to cull Sulphur-crested Cockatoos around Sydney in some cases, and is currently preparing a Cockatoo Management Strategy to guide the management of human-cockatoo conflicts in urban areas.

The Common Brushtail Possum is indigenous to Sydney, but has adapted well to urbanisation (Russell *et al*. 2011) and is a common species in the city. Like the Sulphur-crested Cockatoo, this species is charismatic and often fed by residents and park users, leading in some areas to unnaturally high populations of this normally fairly solitary species. Large concentrations of possums, for example at Hyde Park, have led to substantial tree defoliation, and this species also impacts on public amenity through feeding on backyard fruit, vegetables and other plants. Given that it is a hollow-dwelling species, and that tree hollows are scarce in most urban areas, its main impact on public amenity is its tendency to invade roof cavities where it can be noisy and cause property damage (Russell *et al*. 2011). It is considered a pest by many residents (Matthews *et al*. 2004). The NPWS has a policy on managing possums that cause this type of disturbance – it requires property owners to take all reasonable efforts to prevent access to roof cavities by possums. In some circumstances, NPWS issues conditional licences to authorise the relocation of possoms from roof cavities (OEH 2012).

The Rock Dove (or feral pigeon) is an introduced species that occurs in large numbers in many city parks. It impacts on public amenity through scavenging for food, although people often actively feed it. It often roosts in/on buildings where it can foul surfaces, cause property damage and potentially pose a health risk. It does not tend to occur in more 'natural' habitats or appear to have any adverse impact on other species.

Although the Common Myna, discussed in Section 3.7.7, does not appear to be adversely impacting on biodiversity in Sydney, it is very abundant in the city where it does impact on public amenity through noise, particularly at its communal roost sites.

Bird feeding (left) can encourage unnatural behaviour and encourage nuisance fauna such as cockatoos, ibis and pigeons. It can also lead to the spread of beak and feather disease, which is affecting this Sulphur-crested Cockatoo in Woolloomooloo (right). (photos K. Oxenham)

3.7.10 Diseases and pathogens

A number of diseases and pathogens pose a threat to indigenous flora and fauna in the LGA, including naturally occurring and planted locally indigenous vegetation and priority fauna species. Some are listed as Key Threatening Processes under the EPBC Act and TSC Act; those of relevance to the City are:

- Infection of plants such as Eucalyptus, Angophora, Paperbark, Bottlebrush, and Turpentine species by Myrtle Rust;
- Dieback caused by the root-rot fungus *Phytophthora cinnamomi*;
- Infection of frogs by amphibian chytrid fungus; and
- Beak and feather disease affecting endangered parrots (while this disease is affecting Sulphur-crested Cockatoos in the city, it should be noted this is not an endangered but a common and widespread parrot species).

3.7.11 Poor water quality and inappropriate hydrological regimes

Poor water quality can lead to the degradation of wetland ecosystems, as can inappropriate hydrological regimes, with consequent adverse impacts to wetland flora and fauna. Examples in the LGA context include nutrient enrichment and subsequent algal blooms and depletion of oxygen levels in the Sydney Park wetlands, at least partly as a result of mulch washing into the wetlands from adjoining slopes (Sainty & Associates 2009) and from excessive feeding of water birds; and the potential for degradation of wetland vegetation from the maintenance of constant water levels (to maintain wetland health, periodic water level fluctuations are required, i.e. periods in which they are allowed to partially dry out).

Natural germination of *Juncus* species at Wetland 1, Sydney Park (left) is assisted by water level fluctuations, which can also assist in minimising blooms of the floating fern Azolla, here covering the whole of Wetland 5, Sydney Park (right) and algae that can be detrimental to wetland health. (photos K. Oxenham)

3.7.12 Light, noise, traffic, and other disturbance

The normal behaviour of fauna can be altered by the presence and movement of people and dogs, and by other disturbance including artificial light, noise and traffic (e.g. Potvin & Parris 2012; Parris *et al*. 2009; Herrera-Montes & Aide 2011). Disturbance impacts vary between species and individuals, and can be more significant at particular times of the year – for example during breeding seasons it can lead to abandonment of young. Levels of disturbance in the LGA are obviously high given its highly urbanised nature.

Traffic is a particular threat to many fauna species, including priority species that are ground-dwelling such as frogs, reptiles, and bandicoots.

The establishment of habitat plantings is sometimes hindered by trampling by park users and dogs, and plantings are also sometimes vandalised.

3.7.13 Climate change

Climate change has the potential to alter the distribution, abundance and availability of habitat for both indigenous and exotic species, and this potential could exacerbate many of the other threats discussed above.

Potential impacts of climate change in the LGA also include loss of habitat for the endangered Coastal Saltmarsh community as a result of rising sea levels, and depletion of food resources for priority fauna species such as the vulnerable Grey-headed Flying-fox.

Loss of terrestrial habitat caused by human-generated emissions of greenhouse gases is listed as a Key Threatening Process under the EPBC Act, and climate change is also listed as a Key Threatening Process under the TSC Act.

04 Urban Ecology Strategic Action Plan

4.1 Overview

This section provides an overview of the Plan. It first outlines the objectives and targets, then provides an introduction to the actions that are the basis of the Plan and to how they will be implemented. It also outlines how the City will assess and report on its performance in implementing the plan, and how and when the Plan will be reviewed.

4.1.1 Objectives, targets and monitoring requirements

The objectives and targets required to achieve the City's vision for the Plan have been grouped into the following three categories:

- Locally indigenous vegetation;
- Fauna; and
- Habitat connectivity.

Objectives and targets for each category are outlined in Table 5, along with the monitoring that will be undertaken in relation to each to assess the City's performance in implementing the Plan (performance is discussed further in Section 4.1.4).

While the objectives relate to both public and private land across the LGA, the targets relate mainly to City-managed land since it is not possible for the City to control or accurately monitor all activities that take place on land managed by others. Despite this, both public land managed by others and private property will play important roles in meeting the objectives of the Plan, and therefore many of the actions outlined in Sections 4.2–4.4 relate to such land.

Table 5 Urban Ecology Strategic Action Plan objectives, targets, and monitoring requirements

Category	Objectives	Targets	Monitoring	Monitoring frequency
Locally indigenous vegetation	Protect, expand and improve condition of naturally occurring locally indigenous vegetation, including possible remnants	Area of naturally occurring vegetation maintained or increased from 2012 baseline of 2.7 hectares by 2023	Systematic flora surveys and vegetation mapping	Five-yearly
	Increase the extent of bush restoration sites across the LGA, and maintain sites in good condition	• Area of bush restoration sites increased by 100 per cent from 2012 baseline of 4.2 hectares by 2023 • Bush restoration sites characterised by well-established, structurally complex vegetation, free of weeds by 2023	• Mapping of bush restoration sites • Condition assessment	• As sites are established, with annual review • Monthly reporting, with annual review
	Re-establish representative patches of the likely original vegetation communities	Representative patches of at least three of the likely original vegetation communities established by 2023	Systematic flora surveys and vegetation mapping	Five-yearly
Fauna	Protect and enhance sites that provide habitat for priority fauna species	Indigenous fauna species diversity maintained or increased by 2023 based on 2012 baseline of 87 confirmed species, comprising: – 5 frogs – 11 reptiles – 63 birds – 8 mammals	Systematic spring bird surveys, with opportunistic reporting of all fauna groups at other times	Annual
	Increase the distribution and abundance of priority fauna species across the LGA	Priority fauna species recorded from greater number of locations and in higher numbers compared to 2012 baseline by 2023	LGA-wide systematic fauna surveys	Five-yearly
Habitat connectivity	Improve habitat connectivity across the LGA, particularly between priority sites, and between identified habitat areas in adjoining LGAs	Progressive increase in number of habitat features for priority fauna species established along potential habitat linkages by 2023	Mapping of habitat features	Annual

4.1.2 Actions

The actions identified for the Plan are based on the survey results and aim to address issues raised in the community consultation process and identified threats to biodiversity in the LGA. Two broad types of actions have been identified:

- General actions – actions that require implementation across the City of Sydney organisation and/or the LGA as a whole. These have been further grouped into the following five categories:
  – Park and streetscape maintenance
  – Planning controls
  – Staff and contractor engagement
  – Community engagement
  – Partnerships
- Specific actions – site-specific actions that relate to the six priority sites, and species-specific actions that relate to the priority fauna species, with some additional actions for other species.

General actions are outlined in detail in Section 4.2; site-specific actions are outlined in Section 4.3, and species-specific actions are outlined in Section 4.4.

4.1.3 Implementation

The Plan will be implemented over a ten-year period, from 2013–14 to 2022–23. The timeframe for implementation and status of each of the actions is indicated in Section 5. As indicated, numerous actions are already in progress, and many will be ongoing.

An annual implementation plan will be prepared and key projects incorporated into the City's annual Corporate Plan.

4.1.4 Performance assessment

In order to evaluate the City's performance in implementing the Plan, the overall number of actions implemented annually (in accordance with the annual implementation plan) will be monitored and recorded.

Monitoring will also be undertaken in relation to the targets as indicated in Table 5 – some monitoring will be undertaken annually, and some at longer intervals.

4.1.5 Reporting

An annual report on the implementation of the Plan, including an overview of actions implemented and monitoring results, will be produced at the end of each financial year, with a summary incorporated into the City's annual State of Environment Report. The City's quarterly Environmental Sustainability Progress Report will also include a summary of progress throughout the year.

4.1.6 Review

The Plan will be subject to the principles of adaptive management, i.e. Sections 4.2–4.4 and Section 5 will be reviewed annually and modified:

- Where monitoring results indicate this is necessary;
- To incorporate new advances or knowledge in the field of urban ecology;
- In response to any identified changes in priorities; and/or
- To take advantage of new opportunities that may arise in the City.

Recommendations for modification of the Plan will be incorporated into the annual report.

The Plan will also be subject to a full review after a ten-year period, i.e. in 2022–23.

4.2 General actions

4.2.1 Park and streetscape management

The following actions will be undertaken to ensure that best practice bush regeneration and biodiversity management techniques are incorporated into the management of parks and streetscapes:

1. An annual bush restoration and habitat enhancement program will be implemented in City-managed parks. The program will incorporate the principles outlined in Appendix 6.
2. A Bush Restoration Management Plan will be prepared to outline the best practice bush regeneration and biodiversity management techniques that will be implemented in the maintenance of bush restoration and habitat enhancement sites. The requirements of the plan are outlined in Appendix 7.
3. The principles and requirements of both the above will be incorporated into:
   - Landscaping associated with park and streetscape upgrades, in-road plantings and other capital works within the LGA, wherever possible and compatible with existing site conditions and relevant City codes; and
   - All future park and streetscape maintenance contracts.
4. A qualified and experienced bush regeneration specialist will be appointed to fill an existing vacancy within the City's park and streetscape maintenance team.
5. Training in best practice bush regeneration and biodiversity management techniques will be given to existing park and streetscape maintenance staff.
6. Habitat protection fencing will be installed at strategic locations to reduce disturbance to habitats from dogs and park users.
7. Indigenous trees removed due to tree failure or other reasons will be strategically placed within parks to provide ground-level habitat features wherever possible.
8. Where new lighting is required in/near indigenous vegetation patches or other habitat features such as wetlands, lightspill will be minimised wherever possible by installing narrow spectrum bulbs, down lights, shields, embedded lights and/or motion-activated lighting.
9. The diversity of street plantings will be maximised to the extent possible.
10. Understorey species will be included in in-road tree plantings wherever possible.
11. Trials of additional indigenous tree species, particularly any that have recognised habitat value for priority fauna species, will be undertaken with a view to future inclusion in the next review of the City's *Street Tree Master Plan* and *Park Tree Management Plans*.

Examples of pocket parks and edges of larger parks at which habitat planting and other habitat enhancements could be undertaken without compromising existing uses.

a Clyne Reserve, The Rocks
b Pocket park in Erskineville
c Ernest Pedersen Reserve, Glebe
d Cooper Street Closure, Surry Hills
e Edges of Erskineville Oval, Erskineville
f Oatley Reserve, Paddington
g Pocket park in Woolloomooloo
h Pocket Park in Rosebery
i South Sydney Rotary Park, Alexandria

Habitat enhancement works incorporated into the first stage of a stormwater harvesting project at Wetland 4, Sydney Park:
a works in progress
b 18 months later

c & d Plantings and rock features incorporated into landscaping associated with the recent Johnstons Creek Canal shared path.

4.2.2 Planning controls

Landscaping can significantly contribute to the biodiversity of a development site that may be negatively impacted upon as a result of construction. The following actions will be implemented to ensure that these considerations are incorporated into planning instruments and appropriately addressed during the development assessment process:

1. A reference to Figure 17, which identifies priority sites, supporting sites and potential habitat linkages will be mentioned in the relevant section of the Sydney Development Control Plan and Landscape Code. A copy of the map and this Plan will be available on the City's website.
2. Consideration will be given to this Plan, and particularly relevant principles of the Habitat Creation Guide (refer Section 4.2.4) in preparation of the City's Landscape Code.
3. A map layer based on Figure 17, Potential Habitat Linkages, will be added to the City's mapping tool, and updated from time to time as required.
4. Development assessment guidelines will be prepared in accordance with Appendix 9 to ensure appropriate ecological assessment is undertaken for proposed developments, particularly development in or near priority sites, supporting sites and potential habitat linkages and on degraded and disused sites.

Removal of habitat features such as thick weeds, long grass and ground debris at this proposed development site at Green Square has the potential to adversely impact biodiversity (left), while a new apartment complex in Pyrmont (right) that has incorporated locally indigenous species into site landscaping is a good example of the potential for new developments to contribute to biodiversity (photos K. Oxenham & S. Golding).

4.2.3 Staff and contractor engagement

Increased awareness and engagement of all relevant City staff and contractors regarding the actions outlined in this document is essential to ensure the effective implementation of this Plan. The following actions will be implemented:

1. City staff in all relevant units will be briefed on the contents of this Plan, and made aware of their requirements under it.
2. An ecological induction process will be prepared and implemented for all new staff and contractors undertaking on-ground works that have potential to impact on indigenous vegetation and/or other habitat features.
3. Regular biodiversity-related stories will be included in the City's weekly internal email newsletter.

4.2.4 Community engagement

A great level of community engagement is required to assist in the implementation of this Plan, particularly given volunteer bush restoration groups and private properties will play an important role in achieving its objectives. Increased awareness of biodiversity in the LGA is likely to also lead to increased care and concern, not just on private property but on public land as well. The City will actively promote the policies of this Plan through various community engagement activities. The following actions will be implemented to promote community engagement:

1. A user-friendly Habitat Creation Guide will be prepared for the LGA. The guide will be made available on the City's website, with hard copies distributed to volunteer bush restoration groups and community gardeners, and at workshops and other events. The guide will:
   - Provide lists of species from the likely original vegetation communities (Appendix 8), as well as other species, both indigenous and introduced, that have recognised value as habitat for priority fauna species and invertebrates like butterflies;
   - Incorporate information from the *City of Sydney Native Plant List – Sydney Inner West Species* (RBCNN, undated), the suggested plant species list for Superb Fairy-wren habitat (Stevens 2008), and Birds in Backyards guidelines (Parsons 2009);
   - Provide information on the appearance of each species;
   - Provide information on the habitat value of particular species;
   - Distinguish species that are readily available and robust from those that are more difficult to obtain and/or grow;
   - Provide information on planting and maintenance requirements; and
   - Provide guidelines about incorporating other habitat features including frog ponds, rock features, and roost boxes.
2. A demonstration habitat garden will be created on City-managed, publicly-accessible land.
3. Ongoing support will be provided for existing volunteer bush restoration groups and other local community groups such as The Glebe Society's Blue Wren Group.
4. Targeted community consultation will be undertaken to encourage establishment of new volunteer bush restoration groups, particularly around Sydney Park, Moore Park, Green Square, Paddington and Potts Point (refer Section 3.7.2).
5. The potential for locally indigenous plant production at Sydney Park will be investigated as part of the proposed City Farm.
6. Community gardens will continue to be be encouraged to incorporate locally indigenous plants and other habitat features.
7. Permanent interpretive signage will investigated at City-managed priority sites as part of the existing parks signage program.
8. Interpretive strategies will be investigated for both City and non-City managed areas including restoration areas, to provide information about responsible dog management.

9. Information about the potential impacts of companion animals on wildlife and responsible pet management in and around habitat areas will be incorporated into:
   - Dog obedience training courses provided by the City;
   - The City's companion animal fact sheets; and
   - Sustainable pet care pages on the City's website.
10. Biodiversity will continue to be promoted through the Green Villages program by:
   - Ongoing workshops to increase community awareness of biodiversity and of how to incorporate locally indigenous vegetation and other habitat features into backyards, onto balconies, on common property including rooftops, in community gardens, at schools, and onto footpaths (in accordance with the City's Footpath Gardening Policy);
   - Including biodiversity-related stories when possible in the City's Green Village News monthly e-newsletter;
   - Providing information about existing biodiversity monitoring programs, such as the Australian Museum's BugWise, Web2Spider and Plant2Pollinator programs, on the Green Villages website;
   - Encouraging and supporting community-led social media initiatives relating to local biodiversity, such as the Sydney Park Swans facebook page; and
   - Other Green Villages initiatives whenever possible.
11. An online fauna database will be established to enable the community to report fauna observations and obtain information about the species that occur in the LGA.
12. Community participation will be encouraged in annual bird surveys (refer Table 5).
13. Grants for biodiversity-related projects will continue to be provided through the City's existing grant programs.
14. The potential to establish a program to encourage schools within the LGA to undertake habitat creation, enhancement and monitoring activities, and to involve students in these activities, will be investigated and implemented if practicable.
15. The potential to hold an annual competition for City residents around the theme of incorporating locally indigenous vegetation and other habitat features into small spaces will be investigated, and implemented if practicable.
16. Community planting events will continue to be held in conjunction with National Tree Day, with the Glebe Society's Blue Wren Group, volunteer bush restoration groups, and other organisations such as Conservation Volunteers Australia and Landcare.
17. Biodiversity-themed display materials will be developed for use at planting days and other events.
18. The potential to hold an annual volunteer planting weekend for City residents in rural NSW in association with Landcare or a rural Council (similar to the program run by North Sydney Council with Landcare at Boorowa in south-western NSW), to increase awareness of biodiversity issues on a broader scale, will be investigated.
19. Biodiversity-themed public art installations such as Forgotten Songs in the CBD and What Bird Is That in Surry Hills will continue to be encouraged through existing City art programs for their potential to increase community awareness of biodiversity issues.
20. Information about pest and nuisance fauna management will continue to be provided to local residents.
21. The tree management provisions of the Sydney Development Control Plan 2012 and the City's Urban Forest Strategy will be used to encourage environmental weed trees such as Chinese Hackberry (Celtis sinensis) to be removed from private property and replaced with suitable alternatives where appropriate.


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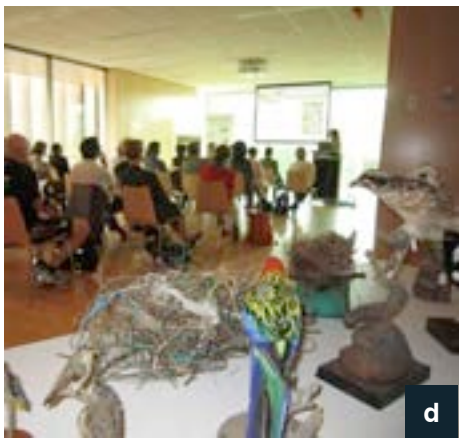
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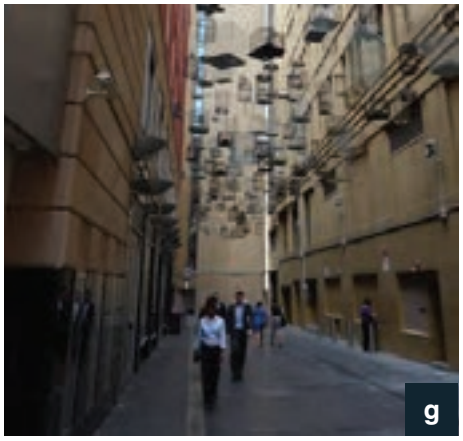
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Community engagement actions that will be ongoing and expanded throughout the LGA.

a Glebe Bushcare Group volunteers at a bush restoration site in Federal Park. (photo K. Oxenham)

b&c City residents participating in community planting days.

d Backyard biodiversity workshop at Surry Hills.

e biodiversity tour on the Glebe foreshore.

f A facebook page set up in mid-2012 by residents interested in Black Swans nesting at Sydney Park – a good example of social media being used to improve community engagement in local biodiversity issues.

g Biodiversity-inspired public art commissioned by the City: *Forgotten Songs* at Angel Place in the city centre.

h The *What Bird is That?* mural at Surry Hills. (photos K. Oxenham)

4.2.5 Partnerships

Several priority sites are not managed by the City but by other agencies. Other public land, including sites along or near potential habitat linkages, is likewise managed by others. For example, other land managers are the main authorities responsible for managing the foreshore and subsequently aquatic biodiversity. The City of Sydney recognises the importance of working together with these authorities to enhance aquatic biodiversity. Collaboration with these other land managers, which include the Royal Botanic Gardens and Domain Trust, the Department of Defence, the Centennial and Moore Park Trust, the University of Sydney, Sydney Water, Railcorp, the Sydney Harbour Foreshore Authority, Housing NSW and adjoining local government authorities (Leichhardt, Marrickville, Botany Bay, Randwick and Woollahra), is required to maximise the effectiveness of this Plan. Similarly, collaboration with other government departments, non-government organisations and research institutions will contribute to the successful implementation of the Plan. The following actions will be implemented:

1. Other land managers within and adjoining the LGA, particularly the managers of priority sites, supporting sites and sites along and near potential habitat linkages, will be briefed on the contents of this Plan to:
   - Create awareness of the existing or potential biodiversity value of land under their management;
   - Encourage the implementation of locally indigenous planting and other habitat enhancement works, adoption of the principles of the Bush Restoration Management Plan (Section 4.2.1), including staged weed control and habitat replacement programs, and implementation of site-specific actions where possible; and
   - Encourage provision of access to their land for volunteer restoration groups to expand bush restoration sites, for example:
     – By RailCorp to potential bush restoration sites identified near Erskineville and Newtown Stations (RailCorp 2006); and
     – By Sydney Water to weed-infested above-ground pipeline easements, such as adjacent to Perry Park in Alexandria.
2. Partnerships will be established with other land managers within and adjoining the LGA where possible, to facilitate implementation of actions outlined in this Plan.
3. Cooperation with the NSW Office of Environment and Heritage will be ongoing in relation to biodiversity management issues such as the management of threatened species, endangered ecological communities, and nuisance fauna species.
4. The City will continue to advocate with the NSW Department of Primary Industries for the declaration of Chinese Hackberry *(Celtis sinensis)* as a noxious weed under the *Noxious Weeds Act 1995*.
5. Collaboration with research institutions such as the University of Sydney, the Australian Museum and non-government organisations such as BirdLife Australia and Birding NSW will be ongoing in relation to research, monitoring and community education projects that are likely to assist in the ongoing implementation of this Plan.

Plantings undertaken by University of Sydney grounds maintenance staff in July 2011 (left) to provide habitat for the Superb Fairy-wren population at the Camperdown campus and the same plantings establishing habitat value in August 2012 (right).

Sulphur-crested Cockatoo on an inner-city balcony (left) fitted with wing tags as part of University of Sydney and Royal Botanic Gardens and Domain Trust research project, and Australian White Ibis in the Royal Botanic Gardens (right) fitted with leg bands as part of a University of Wollongong, Australian Museum and Royal Botanic Gardens and Domain Trust project. The City will continue to support such studies, which have potential to improve community awareness of biodiversity issues and provide useful information for fauna management.

4.3 Specific actions

4.3.1 City-managed priority sites

In addition to the general actions outlined in Section 4.2, the biodiversity values of City-managed priority sites will be improved through implementation of the actions listed in Table 6.

Table 6 Actions to be implemented at City-managed priority sites

Site	Actions
Sydney Park	Representative patches of the likely original vegetation communities will be established. The communities considered suitable are: • Eastern Suburbs Banksia Scrub, on elevated parts of the site away from the wetlands • Coastal Sand Swamp Forest (excluding *Casuarina glauca*), adjacent to wetlands • Coastal Freshwater Reedland, within and around wetlands, swales and drainage lines
	The diversity and structural complexity of existing indigenous vegetation patches will be increased, and patches will be expanded and consolidated where possible.
	Failed trees in existing densely planted stands will be replaced with understorey species.
	The coverage and diversity of macrophytes, sedges and long grasses will be improved around the wetlands.
	Continuous vegetated areas will be established, linking drainage lines with terrestrial garden beds and wetlands, to facilitate safe movement across the site by ground-dwelling fauna.
	A Planting Plan will be prepared to guide all future plantings.
	Swamp Oak (*Casuarina glauca*) will be contained to existing stands and suckers will be removed, particularly around wetlands, swales and drainage lines.
	Fencing will be increased around wetlands and rocky drainage lines to reduce disturbance to these habitats.
	Installation of one of more new ponds near the existing wetlands, with ability to be drained, and with fine mesh screens at inlets and outlets to prevent Mosquito Fish access, will be investigated at Sydney Park and implemented if practicable.
	A Wetland Maintenance Manual will be prepared for the park, and will include requirements for implementing an appropriate hydrological regime involving periods of at least partial draining for several weeks in late winter/early spring.
	Regular ranger patrols will continue, to improve education about the impacts of dogs on fauna and habitat plantings and to ensure compliance with park regulations. Patrols will continue to be increased when required, for example when wetland birds are nesting and/or having young.
	Installation of permanent interpretive signage or other interpretive strategies will be investigated to discourage bird feeding, to provide information about responsible dog management and to provide information about wetland birds.
	The establishment of a new volunteer bush restoration group at the park will be strongly encouraged.
	A program of biodiversity-related tours for school and community groups will be established. Where possible, these will be integrated into existing programs such as cycling courses that are held at the park.
	Water quality and leachate and methane from landfill will continue to be monitored, and remedial action taken where necessary.
	All of the above will be incorporated into the next revision of the Sydney Park Master Plan/Plan of Management.

Table 6 Actions to be implemented at City-managed priority sites continued

Site	Actions
Glebe Foreshore Walk East to Orphan School Creek	Representative patches of the likely original vegetation communities will be established. The communities considered suitable are: • Coastal Sandstone Foreshores Forest, along the Glebe Foreshore Walk and in Blackwattle Bay Park • Estuarine Swamp Forest, adjoining Johnstons Creek Canal from its mouth to the light rail corridor; • Coastal Alluvial Bangalay Forest, further upstream beyond the extent of tidal influence • Sydney Turpentine Ironbark Forest, at and around Orphan School Creek
	A continuous habitat corridor of the maximum width possible will be established from the Glebe Foreshore Walk East to Orphan School Creek, without compromising existing use or obscuring residents' views along the foreshore.
	The habitat corridor will be extended through landscaping associated with Stage 5 of the Glebe Foreshore Walk extension, in consultation with the Department of Education and Sydney Secondary College, and the potential for extension to the Sydney Fish Markets at Pyrmont through future foreshore walk extensions will be investigated with the relevant stakeholders.
	Bush restoration and habitat enhancement principles will be incorporated into landscaping associated with areas of public open space that are to be created in future at the Crescent Lands, Harold Park and the Hill, such that they contribute to the habitat corridor.
	The involvement of the Glebe Bushcare Group, The Glebe Society's Blue Wren Group, Friends of Orphan School Creek and other community members will be encouraged in the above works and subsequent maintenance.
	Habitat enhancement works will be undertaken for the endangered Coastal Saltmarsh community on either side of Johnstons Creek Canal and the Rozelle Bay foreshores, in accordance with best practice guidelines (DECC 2008), and in collaboration with Sydney Water (the owners of part of this land).
	The potential to naturalise Johnstons Creek Canal will continue to be investigated in collaboration with Sydney Water.
	In consultation with Sydney Water, construction of one or more new ponds at Orphan School Creek will be investigated in accordance with the site's original design, and implemented if practicable.
Pyrmont (sandstone cliffs and outcrops)	Representative patches of the likely original vegetation communities will be established. The communities considered suitable are: 1. Sandstone Cliff Soak species from Coastal Sandstone Gully Forest, on sandstone cliffs and outcrops 2. Coastal Sandstone Gully Forest, adjoining sandstone cliffs and outcrops (shaded sites) 3. Coastal Sandstone Ridgetop Woodland, adjoining sandstone cliffs and outcrops (sunny sites)
	A central program for infestations of noxious and environmental weeds on sandstone cliffs and outcrops and adjoining areas will be scoped, and implementation commenced.
	At identified sites (for example Jones Street Pocket Park), exotic ornamental plants will be removed in stages to maximise the space available for bush restoration and other habitat enhancement works.
	The involvement of Pyrmont Ultimo Landcare and other community members will be encouraged in the above works, wherever practicable.

Potential for infill planting at Sydney Park beneath trees where an understorey is currently lacking (left) and in sparsely planted garden beds (right). Photos K. Oxenham

Infill planting in existing garden beds on the Glebe foreshore will contribute to the Glebe Foreshore Walk East to Orphan School Creek corridor (left), as will habitat enhancement works for the endangered Coastal Saltmarsh community (right). Photos K. Oxenham.

Weed-infested cliff at Pyrmont (left), and part of Jones St Pocket Park (right), at which failed landscape plantings have already been replaced with locally indigenous species by Pyrmont Ultimo Landcare. Photos K. Oxenham

4.3.2 Priority sites managed by others

The three other priority sites – the Royal Botanic Gardens and Domain (Yurong Precinct), Garden Island and Moore Park – are not managed by the City. Each of the respective land managers have been consulted in the development of this Plan, and are supportive in principle of the actions suggested in Table 7. However, implementation of these actions will be at the discretion of each land manager, and may be constrained by the primary function of each site, its heritage value, available funding and/or other issues.

Table 7 Actions suggested for priority sites managed by others

Site	Actions
Royal Botanic Gardens and Domain (Yurong Precinct)	Undertake infill planting and expand the existing bush restoration areas on the rocky slopes and outcrops on the eastern side of the Yurong Precinct, using a mix of understorey species from the Coastal Sandstone Foreshore Forest (CSFF) community (Appendix 8).
	Extend existing bush restoration areas using species from the CSFF community into parts of the central ridge of the Yurong Precinct, particularly in the vicinity of the possible remnant trees, around rock outcrops, and in little-used parts of the site.
	Establish walking paths through and between bush restoration sites to create the potential for a 'bushwalk' experience in the middle of the city, and maximise this potential by linking with existing paths through established plantings.
	Encourage involvement of the Foundation and Friends of the Botanic Gardens volunteers and city residents in the above works.
	Undertake infill planting with shrubs, grasses and groundcovers in sparsely-planted garden beds wherever possible in the Royal Botanic Gardens, but particularly in garden beds that are already characterised by indigenous vegetation.
	Establish a partnership with the City to improve the range of local provenance stock from the likely indigenous vegetation communities available for sale at the Growing Friends nursery.
	Make local provenance seed collected/stored through the Royal Botanic Gardens and Domain Trust's PlantBank project available to other indigenous plant nurseries to improve the availability of stock for planting programs.
	Expand existing reed beds in the freshwater ponds in the Royal Botanic Gardens, and establish fringing sedges and grasses if possible.
	Install new interpretive signage at strategic locations within the Royal Botanic Gardens to discourage visitors from feeding birds.
	Incorporate the above actions where possible into future master plans, landscape management plans and similar for the Royal Botanic Gardens and Domain, to maximise potential for meeting biodiversity objectives whilst ensuring alignment with the site's primary functions, its heritage values and other constraints.
Garden Island	Continue the existing bush regeneration program of planting species from the Coastal Sandstone Foreshores Forest (CSFF) community (Appendix 8) and other locally indigenous species identified in the *Habitat Creation Guide* (when developed, refer Section 4.2.4) as having recognised habitat value for priority fauna species and that are suited to the site conditions.
	Consider expanding existing CSFF patches where possible, for example understorey species characteristic of CSFF beneath existing trees.
	Should they require removal due to poor health/tree damage/safety concerns, replace non-local indigenous tree species such as Brush Box and Tallowwood, that have potential to regenerate readily and out-compete locally indigenous species, with species from the CSFF community.
	Undertake microbat surveys in the onsite tunnel network to determine the presence of roost sites and identify the need for any special protection measures to prevent their disturbance.

Site	Actions
	Incorporate the above actions where possible into the next revision of the *Garden Island Landscape Management Plan 2004*, to maximise potential for meeting biodiversity objectives whilst ensuring alignment with the site's primary function, its heritage values and other constraints.
Moore Park (Mt Steel, Moore Park Golf and Lake Kippax)	Undertake infill planting in existing garden beds on Mt Steel and along South Dowling Street with understorey species from the Eastern Suburbs Banksia Scrub (ESBS) community (Appendix 8) and other locally indigenous species identified in the *Habitat Creation Guide* (when developed, refer Section 4.2.4) as having recognised habitat value for priority fauna species and that are suited to the site conditions.
	Continue to establish locally indigenous vegetation patches on the Moore Park Golf course where possible, incorporating the same planting principles as above.
	Strengthen planted edges and consider habitat value at Lake Kippax, in accordance with Centennial Parklands Plan of Management 2006–16 by: • Planting macrophytes at strategic locations (where there are no overhanging trees) around the lake margin; • Planting fringing sedges and grasses at strategic locations; • Investigating potential to remove fringing peppercorns, for replacement with Melaleuca species from the Coastal Freshwater Reedland community, with reference to the Centennial Park and Moore Park Trust's Tree Master Plan; and • Investigate potential to improve water quality, for example through installation of a gross pollutant trap as recommended by the Centennial Park and Moore Park Trust *Ponds Management Plan.*
	Incorporate the above actions where possible into future master plans, landscape management plans and similar for Moore Park, to maximise potential for meeting biodiversity objectives whilst ensuring alignment with the site's primary functions and other values/constraints.


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b


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a Potential to expand on previous bush restoration works undertaken on the eastern side of the Yurong precinct.

b Potential to undertake bush restoration works in parts of the central ridge of the Yurong precinct.

c Potential for infill planting in existing garden beds in the Royal Botanic Gardens.

d Potential for infill planting for establishing reed beds in existing ponds in the Royal Botanic Gardens.

Potential for expansion of existing Coastal Sandstone Foreshores Forest at Garden Island by understory planting beneath existing trees (left), and seedlings planted as part of recent bush regeneration works (right).

Potential for expansion of existing indigenous plantings at Moore Park Golf (left) and for establishment of reed beds in Kippax Lake (right), where submerged planter boxes could be used around the concrete edges.

4.3.3 Priority fauna species

Green and Golden Bell Frog and other frogs

1. A program will be implemented to increase community awareness of Green and Golden Bell Frogs in the LGA, particularly the Rosebery area, and to encourage sightings to be reported. The program will include:
   - Preparation of an educational flyer about the Green and Golden Bell Frog, for distribution at workshops and other events, and made available on the City's Green Villages website; and
   - Continued mention during presentations at workshops and other events, and in media releases.
2. Installation of new ponds with ability to be drained and with fine mesh screens at inlets and outlets to prevent Mosquito Fish access will be investigated at Sydney Park and City-managed parks in Rosebery, and implemented if practicable.
3. A 'Pool to Pond' program will be established, similar to the successful program that has been implemented by Ku-ring-gai Council, encouraging and assisting City residents to convert disused backyard swimming pools to ponds, particularly in the Rosebery area where many backyard pools have potential to provide Green and Golden Bell Frog habitat. In doing this, it will be important to ensure that residents are aware of the legislative implications of potentially providing habitat for a threatened species on their land.
4. Installation of ponds will be encouraged in residential backyards, common property areas, and schools, particularly in the Rosebery area. In doing this, it will be important to ensure that residents are aware of the legislative implications of potentially providing habitat for a threatened species on their land. Support by Council will be provided to residents to understand these requirements through advice, as required, to assist with this process.
5. Habitat will be enhanced at existing freshwater wetlands and ponds in City-managed parks by improving the coverage and diversity of emergent and fringing vegetation, and adding other habitat features such as rocks and shelter boards (which can be concealed amongst fringing vegetation) where possible.
6. Annual drainage of Woolwash Park wetland will be investigated and implemented if feasible to control/eradicate Mosquito Fish.
7. Freshwater wetlands, ponds, raingardens and other frog-friendly water-sensitive urban design features vegetated with appropriate species (Appendix 8) will be constructed wherever possible in City-managed parks and streetscapes, and similar features will be encouraged in new developments and on land managed by others.
8. A small pond and other frog-friendly habitat features will be incorporated into the demonstration habitat garden.
9. In accordance with the *Management Plan for the Lower Cooks River Green and Golden Bell Frog Key Population* (DECCW 2008b), investigate the translocation of Green and Golden Bell Frogs to Sydney Park, pending a sufficient supply of tadpoles/frogs from the source population at Rosebery, the establishment of Mosquito Fish-free breeding habitat at the park, and completion of a risk assessment.
10. The potential to re-establish frog populations at unoccupied ponds will be investigated, pending results from trials in Melbourne.

Backyard pools in Rosebery (left): conversion of even a small number to ponds would provide valuable habitat for the small population of endangered Green and Golden Bell Frogs and other frog species that occur in this suburb, and (right) one of more than 40 ponds that have been converted to date in the Ku-ring-gai LGA. (photo P. Clarke)

Frog species such as the Striped Marsh Frog (left) will also benefit from the construction of ponds and other water-sensitive design features such as raingardens (right). (photos K. Oxenham)

Grey-headed Flying-fox

1. Existing Grey-headed Flying-fox feed trees will continue to be maintained in parks and streets, in accordance with the City's *Street Management Plan* and *Park Tree Management Plans*.
2. The existing program of aerial bundling of overhead cables will be continued in conjunction with Ausgrid.
3. The City will work closely with the Royal Botanic Gardens and Domain Trust where required in relation to Grey-headed Flying-fox monitoring and/or other issues associated with the camp relocation.
4. Information about fauna-friendly fruit-tree netting will be provided at workshops, seminars and other events.

Powerful Owl

1. The City will work closely with the Royal Botanic Gardens and Domain Trust to maintain the existing Powerful Owl nest box if required, and/or to install additional nest boxes.
2. If Powerful Owls use a nest box, the potential to install a web-based camera will be investigated in collaboration with the Royal Botanic Gardens and Domain Trust to enable nesting activity to be observed by the public.

Powerful Owl on the hunt by night in the Royal Botanic Gardens (left) and purpose-built nest box installed high in a tree in the gardens (right). (photos S. Golding)

Long-nosed Bandicoot

1. A program will be implemented to increase community awareness of the Long-nosed Bandicoot in the LGA, and to encourage sightings to be reported. The program will include:
   - Continued distribution of the existing educational flyer about the Long-nosed Bandicoot at workshops, talks and other events;
   - Making the flyer available on the City's Green Villages website;
   - Continued mention at workshops, talks and other events, and in media releases; and
   - Installation of interpretive signage about the Long-nosed Bandicoot and the need to keep dogs under control at Alexandria Park.
2. Should more Long-nosed Bandicoots be recorded in the City, surveys will be undertaken to determine the status of this species in the LGA, patterns of habitat use, and the need to undertake habitat enhancements and/or establish bandicoot protection zones, in conjunction with OEH and the University of Sydney or other research institution.

Long-nosed Bandicoot digging (photo T. Leary) and the City's bandicoot flyer (right).

Small birds

1. The area of structurally complex and diverse understorey habitat will be maximised, particularly at priority sites, supporting sites and along and near potential habitat linkages, using species from the likely original vegetation communities (Appendix 8) as well as other species identified in the *Habitat Creation Guide* (when developed, refer Section 4.2.4) as having recognised habitat value for small birds (note this will include species identified by Stevens 2008).
2. Wherever possible, round or squarish rather than long, thin habitat patches will be created to provide a more protected, 'core' area of habitat (noting that habitat patches should be at least 2–4 hectares if sufficient space is available).
3. Small bird-friendly habitat features will be incorporated into the demonstration habitat garden (Section 4.2.4).
4. Small bird-friendly habitat planting will be encouraged in residential backyards, common property areas, and schools throughout the LGA, and particularly at sites along and near potential habitat linkages, and this will be reinforced by the Landscape Code.
5. Awareness of the potential impact of aggressive and predatory birds and rats on small birds will be increased through the Green Villages program.
6. Where removal of dense vegetation (including weeds) is required, including at proposed development sites, adoption of a staged approach will be required, whereby:
   - Each stage is followed by replacement planting of locally indigenous or other species of similar habitat value to compensate for the vegetation removed; and
   - The next stage of vegetation removal does not take place until the replacement planting has established.
7. Understorey planting, including bipinnate Acacia species, will be encouraged under isolated trees or lines of trees, particularly Eucalyptus, Corymbia, and Angophora species, to assist small birds avoid the Noisy Miner and other aggressive and/or predatory birds (acknowledging that this is difficult to achieve in many situations e.g. most streets, and in parks where isolated trees are often required to provide shade and/or landscape features).
8. Planting of large-flowering plants, including Grevillea hybrids, and of soft-fruiting plants will be avoided at habitat planting sites, and consideration will be given to their staged removal (particularly those that are noxious or environmental weeds, such as Chinese Hackberry) at priority and supporting sites, followed by replacement with small bird-friendly, locally indigenous alternatives.
9. Initiatives of The Glebe Society's Blue Wren Group will continue to be supported.

Large-flowering plants, such as these Grevillea hybrids at Embarkation Park (left) encourage aggressive nectarivorous birds like the Noisy Miner that are a threat to small birds, including the Grey Fantail (right, photo N. Lazarus) – a species that no longer occurs in the LGA, but could be encouraged to return.

Microbats

1. Microbat roost boxes will be installed at a selection of sites, with a focus on riparian areas, the largest areas of indigenous vegetation, and parts of the LGA in which original soils were shale-derived (indicated by Blacktown soil landscape in Figure 5), and with design and placement to be based on advice from a bat specialist.
2. A bat box will also be incorporated into the demonstration habitat garden (Section 4.2.4).
3. Hollow and dead trees will be retained wherever possible. The potential for fencing/other barriers will be investigated as an alternative to removal where there are risks to public safety.
4. Fencing or other protective measures will be investigated for any microbat roost sites identified in the LGA.
5. Feral honeybees will continue to be controlled when hives establish on City-managed land.
6. Increased understorey planting as specified for small birds will also be undertaken to improve the extent and diversity of foraging habitat for microbats.
7. Dark corridors will be investigated in sites that are feasible e.g. Sydney Park and Federal Park, that are also connected with the potential habitat linkages (Figure 17).

Microbat roost box. (photo N. Williams)

Reptiles

1. Rock features, including sandstone retaining walls, gabion walls and rock piles, will be incorporated into landscaping wherever possible.
2. Dead or hollow trees and branches removed for safety or aesthetic reasons will be cut up and distributed at bush restoration and habitat enhancement sites to provide ground-level habitat features.
3. Provision of additional ground-level habitat features such as shelter boards will be investigated and implemented where practicable at bush restoration and habitat enhancement sites.
4. The use of herbicide will be avoided on sandstone cliffs and outcrops, on retaining walls, and other rocky features wherever possible.
5. Reptile-friendly habitat features will be incorporated into the demonstration habitat garden (Section 4.2.4).
6. Reptile-friendly habitat features will be encouraged in residential backyards, common property areas, and schools throught the LGA, particularly at sites along and near potential habitat linkages, and this will be reinforced by the Landscape Code.
7. Information about the effect of snail baits, and alternative methods of snail control will be included in the *Habitat Creation Guide* and Green Village program initiatives.


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a Increased rock features like this dry-pack sandstone wall in the Royal Botanic Gardens will encourage reptile species.

b Bar-sided Skink (photographed on the Glebe foreshore). (photo K. Oxenham)

c The Eastern Blue-tongue (photographed at Sydney Park).

d Southern Leaf-tailed Geckos once occurred in the LGA and are still present in surrounding areas. (photo K. Oxenham)

Freshwater wetland birds

1. Permanent fencing will be increased around the Sydney Park wetlands.
2. Provision of additional roost sites will be investigated in and around the Sydney Park wetlands and installed if practicable.
3. At least two unvegetated, muddy or sandy banks will be maintained around the Sydney Park wetlands to provide foraging and roosting habitat for waders and other birds.
4. New freshwater wetlands and ponds vegetated with appropriate species (Appendix 8) will be constructed wherever possible in City-managed parks.
5. Dense reed beds will be re-established at Victoria Park.
6. Interpretive signage and other interpretive strategies to provide information about freshwater wetland birds will be investigated and implemented where practicable at Sydney Park.
7. Signage to discourage bird feeding will be investigated at Sydney Park and Victoria Park, and encouraged at the Royal Botanic Gardens.
8. Ranger patrols will be maintained at Sydney Park, and rangers will continue take an active role in educating park users about the importance of the wetlands, and in ensuring compliance with park regulations, particularly relating to dogs. Patrols will continue to be increased when required, for example when waterbirds are nesting and/or have young.

Extra roosts over the Sydney Park wetlands would increase habitat for wetland birds such as the Australasian Darter (above left) (photo J. Irvine), and other habitat enhancements of the wetlands (below) including fencing will encourage a wide range of species including the Black-winged Stilt (above right). (photo K. Oxenham)

4.3.4 Other species

1. A baseline invertebrate survey will be undertaken for the LGA.
2. The existing indigenous bee hive installation program will be continued at interested community gardens, and installation of indigenous bee hives at other sites will be encouraged.
3. The potential to install a web-based camera will be investigated to enable Peregrine Falcon nesting activity to be observed by the community, should an active nest site be identified in the city centre where individuals are periodically reported.
4. Australian White Ibis nesting colonies will be managed in accordance with the Regional Ibis Management Strategy prepared by NPWS, once released.

The Blue Triangle Butterfly (top left), a highly-visible invertebrate that occurs in the LGA; a Peregrine Falcon watches over a window-washer from a CBD window ledge (top right), and a hive of the indigenous stingless bee, *Trigona carbonaria*, being installed at The Luncheon Club Eden Garden, Waterloo (below).

05 Implementation

The timeframe for implementation of the actions outlined in Section 5 is indicated in Tables 8–10, along with their status. The estimated budget required for implementation is indicated in Tables 11 and 12. Many actions are covered by existing budgets. New budget items will be subject to the annual budget bid process.

Table 8 Timeframe, status and estimated cost of general actions

		Timeframe	Status
Park and streetscape maintenance			
A.1	Implement an annual bush restoration and habitat enhancement program in City-managed parks and streetscapes	Ongoing	In progress
A.2	Prepare and implement a Bush Restoration Management Plan (BRMP)	2013–2014	To be initiated
A.3	Incorporate habitat planting principles and fauna habitat enhancements into landscaping associated with park and streetscape upgrades	Ongoing	In progress
A.4	Incorporate requirements of BRMP into all future park and streetscape maintenance contracts	2013–2014 and ongoing	In progress
A.5	Appoint a qualified and experienced bush regeneration specialist to the City's park and streetscape maintenance team	2013–2014	To be initiated
A.6	Provide training in best practice bush regeneration and biodiversity management techniques to existing park and streetscape maintenance staff	2013–2014 and ongoing	To be initiated
A.7	Install fencing at strategic locations to reduce disturbance to habitats from dogs and park users	2013–2014 and ongoing	To be initiated
A.8	Strategically place indigenous trees removed due to failure or other reasons within parks to provide ground-level habitat features	2013–2014 and ongoing	To be initiated
A.9	Minimise lightspill where new lighting is required in/near habitat areas	Ongoing	In progress
A.10	Maximise diversity of street plantings	2013–2014 and ongoing	To be initiated
A.11	Include understorey planting where possible in in-road tree plantings	2013–2014 and ongoing	To be initiated
A.12	Undertake trials of indigenous tree species that have recognised habitat value for priority fauna species for suitability as street trees	2013–2023	To be initiated

Table 8 Timeframe, status and estimated cost of general actions continued

		Timeframe	Status
Planning controls			
B.1	Refer to the Potential Habitat Linkages map (Figure 17) in the relevant section of the DCP and Landscape Code, and provide a copy on the City's website	2013–2014	In progress
B.2	Consider relevant principles of this Plan, and the Habitat Creation Guide in particular, in the preparation of the Landscape Code	2013–2014	In progress
B.3	Add a layer based on the Potential Habitat Linkages map (Figure 17) to the City's mapping tool, and update as required	2013–2014	To be initiated
B.4	Prepare ecological assessment guidelines for proposed developments	2013–2014	To be initiated
Staff and contractor engagement			
C.1	Brief all relevant City units on the contents of this Plan	2013–2014	To be initiated
C.2	Prepare and implement an ecological induction process for new staff and contractors	2013–2014 and ongoing	To be initiated
C.3	Include regular biodiversity-related stories in the City's weekly internal email newsletter	2013–2014 and ongoing	To be initiated
Community engagement			
D.1	Produce a user-friendly Habitat Creation Guide for the LGA	2013–2014	To be initiated
D.2	Establish a demonstration habitat garden	2014–2016	To be initiated
D.3	Support existing volunteer bush restoration groups	Ongoing	In progress
D.4	Encourage new volunteer bush restoration groups	2013–2014 and ongoing	To be initiated
D.5	Investigate potential for locally-indigenous plant production as part of the proposed City Farm	2014–2016	To be initiated
D.6	Encourage community gardens to incorporate habitat features	Ongoing	In progress
D.7	Investigate permanent interpretive signage at City-managed priority sites	2013–2015	To be initiated
D.8	Incorporate information about responsible pet management in and around habitat areas into existing dog obedience training courses, companion animal fact sheets and the City's website	2013–2014 and ongoing	In progress
D.9	Promote biodiversity through the Green Villages program	Ongoing	In progress
D.10	Establish an online fauna sighting database	2013–2014	To be initiated
D.11	Encourage community participation in annual bird surveys	2013–2014 and ongoing	To be initiated
D.12	Continue to provide grants for biodiversity-related projects	Ongoing	In progress
D.13	Establish school program	2015–2016	To be initiated
D.14	Establish annual habitat creation competition	2015–2016	To be initiated
D.15	Continue to hold annual community planting events	Ongoing	In progress
D.16	Develop biodiversity-themed display materials for events	2013–2014	To be initiated
D.17	Investigate potential for annual volunteer planting weekend in rural NSW	2015–2016	To be initiated
D.18	Encourage biodiversity-themed public art installations	Ongoing	In progress
D.19	Provide information about nuisance fauna to City residents	Ongoing	In progress
D.20	Encourage environmental weed trees to be removed from private property and replaced with suitable alternatives through the DCP and Urban Forest Strategy	2013–2014 and ongoing	To be initiated
Partnerships			

Table 8 Timeframe, status and estimated cost of general actions continued

		Timeframe	Status
E.1	Brief other land managers on this Plan	2013–2014	To be initiated
E.2	Establish partnerships/collaborate with other land managers	Ongoing	In progress
E.3	Collaborate with the NSW Office of Environment and Heritage	Ongoing	In progress
E.4	Advocate for declaration of Chinese Hackberry as a noxious weed	Ongoing	In progress
E.5	Collaborate with research institutions and non-government organisations	Ongoing	In progress

Table 9 Timeframe, status and estimated cost of actions for City-managed priority sites

		Timeframe	Status
Sydney Park			
F.1	Establish representative patches of likely original vegetation communities	2013–2014 and ongoing	In progress
F.2	Increase diversity and structural complexity, and expand and consolidate existing indigenous vegetation patches	Ongoing	In progress
F.3	Replace failed trees in existing densely-planted stands with understorey species	2013–2014 and ongoing	To be initiated
F.4	Improve coverage and diversity of macrophytes, sedges and long grasses around the wetlands	2013–2016	In progress
F.5	Establish continuous vegetated areas, linking drainage lines with terrestrial plantings and wetlands	2013–2016	To be initiated
F.6	Prepare a Planting Plan	2013–2014	To be initiated
F.7	Contain Swamp Oak	Ongoing	In progress
F.8	Maximise fencing around wetlands and rocky drainage lines	2013–2015	In progress
F.9	Investigate new frog ponds and install if practicable	2013–2016	In progress
F.10	Prepare Wetland Maintenance Manual, to include appropriate hydrological regime	2013–2014	In progress
F.11	Continue regular ranger patrols	Ongoing	In progress
F.12	Investigate interpretive signage and other interpretive strategies regarding dogs, bird feeding and wetland bird species	2013–2015	In progress
F.13	Encourage establishment of new volunteer bush restoration group	2013–2014	To be initiated
F.14	Establish biodiversity-related tour program	2014–2015	To be initiated
F.15	Continue to monitor and manage water quality and methane from landfill and take remedial action where necessary	Ongoing	In progress
F.16	Incorporate the above into next Master Plan/Plan of Management revision	2013–2015	To be initiated
Glebe Foreshore Walk East-Orphan School Creek			
G.1	Establish representative patches of likely original vegetation communities	Ongoing	In progress

Table 9 Timeframe, status and estimated cost of actions for City-managed priority sites continued

		Timeframe	Status
G.2	Establish continuous habitat corridor	2013–2023	In progress
G.3	Extend the habitat corridor through Stage 5 of the Glebe Foreshore Walk extension, and to Pyrmont in the future	2013–2015 (Stage 5); tbd for Pyrmont extension	To be initiated
G.4	Incorporate bush restoration and habitat enhancement principles into landscaping of new open space	Ongoing	In progress
G.5	Encourage involvement of the Glebe Bushcare Group and other volunteers in corridor creation and enhancement	2013–2014 and ongoing	In progress
G.6	Undertake Coastal Saltmarsh habitat enhancement	2013–2016	To be initiated
G.7	Continue to investigate potential to naturalise Johnstons Creek Canal	2013–2023	To be initiated
G.8	Investigate construction of a pond at Orphan School Creek, and install if practicable	2013–2015	To be initiated
Pyrmont			
H.1	Establish representative patches of likely original vegetation communities	Ongoing	In progress (Pyrmont Ultimo Landcare)
H.2	Scope and implement control program for weeds on sandstone cliffs and outcrops	2013–2014 and ongoing	To be initiated
H.3	Remove ornamental plants at identified sites for replacement with locally-indigenous species	2013–2014 and ongoing	In progress (Pyrmont Ultimo Landcare)
H.4	Encourage involvement of Pyrmont Ultimo Landcare in the above works	Ongoing	In progress

Table 10 Timeframe and status of actions for priority fauna species and other fauna

		Timeframe	Status
Green and Golden Bell Frog and other frogs			
I.1	Implement GGBF awareness program	Ongoing	In progress
I.2	Investigate new ponds at Rosebery park and Sydney Park and install if practicable	2013–2015	To be initiated
I.3	Establish 'Pool to Pond' conversion program	2013–2015	To be initiated
I.4	Encourage residents to install ponds and other frog-friendly features	Ongoing	In progress
I.5	Enhance habitat at existing freshwater wetlands and ponds in City-managed parks	2013–2016	In progress
I.6	Investigate annual drainage program at Woolwash Park wetland	2013–2014 and ongoing	To be initiated
I.7	Construct additional freshwater wetlands, ponds and other frog-friendly WSUD features	Ongoing	In progress
I.8	Incorporate frog pond into demonstration habitat garden	2014–2016	To be initiated
I.9	Investigate translocation of GGBFs to Sydney Park	2014–2015	To be initiated, dependent on existing population status
Grey-headed Flying-fox			
J.1	Maintain existing GHFF feed trees	Ongoing	In progress
J.2	Continue existing aerial bundling program	Ongoing	In progress
J.3	Cooperate with the RBGDT in GHFF monitoring associated with camp relocation	When/if required	To be initiated
J.4	Provide information about fauna-friendly fruit-tree netting through the Green Villages program	Ongoing	In progress
Powerful Owl			
K.1	Work with RBGDT to install and maintain nest boxes	When/if required	To be initiated
K.2	Collaborate with the RBGDT to investigate a web-based camera to film nesting activity, if nest boxes are used	Dependent on nesting	To be initiated
Long-nosed Bandicoot			
L.1	Implement LNB awareness program	Ongoing	In progress
L.2	Investigate need to undertake LNB surveys and habitat enhancement	Ongoing	In progress
Small birds			

Table 10 Timeframe and status of actions for priority fauna species and other fauna continued

		Timeframe	Status
M.1	Maximise the availability of structurally-complex and diverse understorey habitat	Ongoing	In progress
M.2	Create more protected, 'core' habitat areas by establishing round or square habitat patches in preference to long, thin patches	Ongoing	In progress
M.3	Incorporate small bird-friendly features into demonstration habitat garden	2014–2016	To be initiated
M.4	Encourage small bird-friendly habitat planting on private property and at schools	Ongoing	In progress
M.5	Ensure a staged approach to removal of dense vegetation	Ongoing	In progress
M.6	Undertake understorey planting wherever possible under isolated trees, particularly eucalypts	Ongoing	In progress
M.7	Avoid planting large-flowering and large-fruiting plants, and consider staged removal and replacement	Ongoing	In progress
M.8	Continue to support the initiatives of The Glebe Society's Blue Wren Group	Ongoing	In progress
Microbats			
N.1	Install roost boxes	2013–2014	To be initiated
N.2	Maintain hollow and dead trees wherever possible	2013–2014 and ongoing	To be initiated
N.3	Fence or otherwise protect identified microbat roosts	Dependent on roost site identification	To be initiated
N.4	Control feral honeybees on City-managed land	Ongoing	In progress
Reptiles			
O.1	Incorporate rock features into landscaping on City-managed land	Ongoing	In progress
O.2	Ensure that dead or hollow trees and branches removed for safety or aesthetic reasons are cut up and distributed at bush restoration and habitat enhancement sites	2013–2014 and ongoing	To be initiated
O.3	Investigate potential for ground-level habitat features at bush restoration and habitat enhancement sites, and install where practicable	2013–2014 and ongoing	To be initiated
O.4	Avoid herbicide use on cliffs and rock outcrops, retaining walls, rocky drainage lines and other rocky features wherever possible	Ongoing	In progress
O.5	Incorporate reptile-friendly features into the demonstration habitat garden	2014–2016	To be initiated
Freshwater wetland birds			

Table 10 Timeframe and status of actions for priority fauna species and other fauna continued

		Timeframe	Status
P.1	Maximise fencing around the Sydney Park wetlands	2013–2016	In progress
P.2	Install additional roost sites in and around the Sydney Park wetlands	2013–2014	In progress
P.3	Maintain unvegetated, muddy or sandy banks around the Sydney Park wetlands	2013–2023	In progress
P.4	Construct new freshwater wetlands wherever possible	2013–2023	To be initiated
P.5	Re-establish dense reed beds at Victoria Park	2013–2014	To be initiated
P.6	Investigate potential to incorporate interpretive information about wetland birds at Sydney Park, and implement where practicable	2013–2015	To be initiated
P.7	Investigate signage to discourage bird feeding at Sydney Park and Victoria Park and implement where practicable, and encourage similar signage at the Royal Botanic Gardens	2013–2014	In progress
P.8	Continue ranger patrols at Sydney Park	Ongoing	In progress
Other species			
Q.1	Undertake a baseline invertebrate survey	2015–2016	To be initiated
Q.2	Continue indigenous bee hive installation program	2013–2023	In progress
Q.3	Investigate potential to install a web-based camera to film Peregrine Falcon nesting activity	Dependent on identification of nest site	To be initiated
Q.4	Manage Australian White Ibis nesting colonies in accordance with the regional Ibis Management Strategy prepared by NPWS, once released	2013–2023	To be initiated
Q.5	Support partnerships and innovative designs that seek to improve aquatic habitat features along seawalls	2014 – 2023	In progress

Table 11 Estimated implementation costs over 10-year life of the Strategic Action Plan

				Estimated cost ($K)	Total estimated cost ($K)
General actions	Park & streetscape maintenance*	Actions from existing budgets	One-off	2	327
			Recurrent	275	
		Actions requiring new budget	One-off	40	
			Recurrent	10	
	Planning controls	Actions from existing budgets	One-off	5	15
			Recurrent	10	
		Actions requiring new budget	One-off	–	
			Recurrent	–	
	Staff & contractor engagement	Actions from existing budgets	One-off	2	16
			Recurrent	14	
		Actions requiring new budget	One-off	–	
			Recurrent	–	
	Community engagement	Actions from existing budgets	One-off	10	452
			Recurrent	192	
		Actions requiring new budget	One-off	200	
			Recurrent	50	
	Partnerships	Actions from existing budgets	One-off	4	26
			Recurrent	12	
		Actions requiring new budget	One-off	–	
			Recurrent	10	
Site-specific actions ^		Actions from existing budgets	One-off	60	280
			Recurrent	65	
		Actions requiring new budget	One-off	155	
			Recurrent	–	
Species-specific actions ^		Actions from existing budgets	One-off	10	859
			Recurrent	695	
		Actions requiring new budget	One-off	109	
			Recurrent	45	

*Costs exclude actions that are dependent on scope of future projects as they arise
^ Additional costs for many site-specific and species-specific actions are included in the costs for general actions

Table 12 Summary of implementation costs over 10–year life of the Strategic Action Plan

		Estimated cost ($K)
Actions from existing budgets	One-off	93
	Recurrent	1,263
Actions requiring new budget	One-off	504
	Recurrent	115

06
Case studies

This section presents several case studies to illustrate the types of outcomes this Plan is aiming to achieve in different scenarios. The case study sites are all located in the City LGA, thus providing a clear demonstration of the types of initiatives that can be implemented to conserve and enhance biodiversity in this highly urbanised environment, and the potential for community engagement in these initiatives. Large parks have been excluded as case studies, since they have all been discussed as priority sites earlier in this document.

6.1 Small park

Arthur (Paddy) Grey Reserve is a small (0.36 hectare) park in Glebe. It is approximately 500 metres from the Blackwattle Bay Park–Orphan School Creek corridor, for which it is a supporting site. The park provides for passive recreation, and features open lawn with scattered trees (both exotic and indigenous), interspersed with planted garden beds. An exposed sandstone outcrop that runs through the middle of the park is also a notable feature – it is sparsely vegetated with some naturally occurring species including ferns and a Port Jackson Fig *Ficus rubignosa*.

While once characterised by more extensive lawns and formal landscaped garden beds, Arthur (Paddy) Grey Reserve has been gradually transformed over the past three years to provide habitat for the Superb Fairy-wren and contribute to the establishment of habitat corridors for this priority species in Glebe and Forest Lodge, where residents report it still occurs in small numbers.

Some lawn has been converted to new garden beds, other garden beds have been extended, weeds and other exotic species have been removed, and a mix of locally indigenous shrubs, grasses and groundcovers have been planted.

As well as improving the habitat value of the site for Superb Fairy-wrens and other small birds, the plantings have contributed to the restoration of the likely original vegetation of the site, Sydney Turpentine Ironbark Forest (now listed as critically endangered), with a sandstone influence. Most of the plantings are consistent with this vegetation type.

The transformation of the park was driven by The Glebe Society's Blue Wren Group, who have also undertaken most of the plantings in conjunction with volunteers from the Glebe Bushcare Group and others from the Rozelle Bay Community Native Nursery, and with the wider community during a past National Tree Day event held in conjunction with the City. The City has also installed temporary signage to inform park users about the plantings and the habitat requirements of Superb Fairy-wrens and other small birds.

The plantings are developing habitat value, as well as the typical look and feel of bushland around Sydney, which park users are able to experience on a regular basis. Although initially maintained by general horticultural contractors, the plantings have been maintained by specialist bush regeneration contractors since 2011, with assistance at periodic working bees from Blue Wren Group and Glebe Bushcare Group volunteers.

The transformation of Arthur (Paddy) Grey Reserve clearly demonstrates:

- That bush restoration and other habitat enhancement works, including the restoration of likely original vegetation communities, can successfully be undertaken even in a small, highly modified park, without compromising its use by the public;
- The valuable contribution that can be made by local community groups and other volunteers in advocating for and undertaking such works;
- The potential for bush restoration and other habitat enhancement works to improve community awareness of biodiversity; and
- How such works can contribute to the quality of life of urban residents through providing opportunities to connect with nature.

Plantings developing habitat value at Arthur (Paddy) Grey Reserve (left), and Blue Wren Group and Glebe Bushcare Group volunteers with bush regeneration contractors after a working bee (right).

6.2 Volunteer bush restoration site

0.17 hectares of RailCorp land adjoining the southern side of the Wentworth Park Light Rail Station in Pyrmont is one of a number of sites at which Pyrmont Ultimo Landcare (PUL) volunteers have undertaken bush restoration works for several years, with the aims of establishing wildlife habitat whilst improving community awareness of biodiversity and building community spirit among local residents.

The site surrounds a pathway that provides pedestrian access to the light rail station. Although it had once been landscaped by RailCorp with mostly indigenous species, the site was neglected and became degraded and weed-infested. Recognising its potential, PUL obtained permission to work at the site in 2004. They then commenced a weekly program of bush restoration works, focusing on weed removal followed by planting of locally indigenous species.

Despite access restrictions to part of the site, as well as ongoing invasion of Chinese Hackberry, Lantana, Privet, African Olive and other weeds from infestations on adjoining land, the site is now dominated by a diverse assemblage of locally indigenous trees, shrubs, groundcovers and climbers from a range of vegetation communities. More than 60 species were recorded during the surveys. This vegetation has established well and provides a small area of habitat suitable for small birds and other species. A modified sandstone outcrop adjacent to the site supports three naturally occurring species and adds to the site's habitat value, although it is currently dominated by weeds including Fountain Grass, Fishbone Fern and Asthma Weed.

As well as improving its habitat value, PUL's work has also greatly improved the appearance of the previously neglected site. PUL continues to work at the site every Sunday morning, undertaking maintenance weeding, infill planting and other works, and in the last two years they have commenced additional bush restoration works on the northern side of the light rail station. They have installed temporary signage to inform passers by of their work and encourage others to join their group, which currently comprises about 20 dedicated and enthusiastic local residents.

The City supports PUL's work by providing grant funding, topsoil, mulch, and plants, and removing green waste and other rubbish. PUL has also successfully sourced funding and other support from a number of companies based in Pyrmont, including Channel Ten, LendLease and The Star, and volunteers from Google, American Express, Suncorp and other companies have assisted PUL in maintenance weeding and planting works from time to time.

PUL's Wentworth Park Light Rail Stop site clearly demonstrates:

- That bush restoration and other habitat enhancement works can successfully be undertaken even at a small, neglected site in a highly built-up area;
- The potential for such works to dramatically improve site appearance;
- The valuable contribution that can be made by volunteer groups in undertaking bush restoration and other habitat enhancement works;
- The potential for such works to improve community awareness of biodiversity, whilst also building community spirit;
- How such works can contribute to the quality of life of urban residents through providing opportunities to connect with nature; and
- The potential for partnerships to be established between corporate and community groups to undertake these types of works.

Diverse plantings at the Wentworth Park Light Rail bush restoration site, established and maintained by Pyrmont Ultimo Landcare volunteers (right).

6.3 Private property

6.3.1 Backyard

Residents of a terrace house in Forest Lodge have created habitat in their small backyard, illustrated in the photos below. At about 30 square metres, it is a size typical of many terrace houses, and like most backyards, it is fenced.

A diverse mix of indigenous shrubs and groundcovers has been planted to create habitat for small birds, along with a few canopy trees. As one side of the backyard receives substantial sunlight, it has been planted with species typical of the likely original sandstone/shale woodland communities of the area. The other half of the backyard receives limited sunlight, and has therefore been planted with rainforest species (mostly non-local) that are tolerant of shaded conditions.

A frog pond has been installed in a relatively sunny position, and rocks, terracotta roof tiles, and small logs are concealed amongst the undergrowth to provide ground-level habitat features for frogs, reptiles and invertebrates.

Numerous small birds have been recorded from this backyard in recent years, including the Rufous Fantatil, Golden Whistler and Leaden Flycatcher – small rainforest birds that migrate through Sydney. Striped Marsh Frogs have been recorded in and around the frog pond, as well as sheltering beneath ground-level features. Indigenous Blue-banded Bees, Teddy Bear Bees and other invertebrates are also commonly observed.

As well as providing habitat for a range of species, the backyard is very attractive and has the feel of a peaceful bushland haven distant from the hustle and bustle of the City Centre, which in reality is virtually a stone's throw away.

This site is a good demonstration of:

- The potential for even small areas to provide habitat used by a range of species;
- The value of habitat in backyards and on other private property given it is generally more protected from disturbance than most larger habitat areas on public land; and
- How habitat in backyards can contribute to the quality of life of urban residents through providing opportunities to connect with nature as well as a peaceful, private space for relaxation.

Diverse habitat provided by the small backyard of a Forest Lodge terrace. Woodland species have been used in sunnier positions (left), while rainforest species, both local and from other parts of Australia (right) planted in shady positions have attracted small, migratory rainforest birds.

6.3.2 Apartment complex

Green roofs and walls are a growing occurence in the city. The Draft Green Roofs Policy 2013 has recorded 79 green roofs and walls across the LGA. A 'green roof' comprising substantial garden beds was installed in Woolloomooloo as part of the development of a low-rise residential apartment block at 10 Lincoln Crescent, Woolloomooloo. The roof was planted with a mix of indigenous and exotic species, most of which are shrubs, long grasses and groundcovers.

The roof has substantial potential to provide habitat for small birds and other species given the overall type and density of existing plantings, combined with its location immediately adjacent to the Yurong Precinct of the Domain, a priority site with which there is some existing habitat connectivity.

Apartment residents are involved in the maintenance of the green roof.

Although the habitat value of the garden could be improved by increasing the diversity of indigenous plantings, removing species such as large-flowering Grevillea hybrids that encourage large, aggressive birds, and introducing one or more freshwater sources such as bird baths, the roof is nevertheless a good demonstration of the potential for:

- Green roofs to provide habitat;
- Habitat to be created on common property areas;
- Habitat to be incorporated into landscaping associated with new developments; and
- Habitat plantings to contribute to the quality of life of urban residents through providing opportunities to connect with nature.

Green roof at 10 Lincoln Crescent, Woolloomooloo.

6.4 Community garden

Alexandria Community Garden is one of a growing number of community gardens in the LGA. It has been established in two sections, one within the grounds of Alexandria Community School, which also houses Alexandria Community Centre, and the other on the school's sportsfield. Being located in the grounds of the school and community centre, the garden is visited by a wide range of people of all ages.

It features a large number of mulched, ground-level and raised garden beds in which a wide range of fruit, vegetables and herbs have been planted and are tended by the community gardeners, with an additional school garden tended by students. The garden beds are surrounded by mulched areas, and the garden also features compost heaps, a rocky pond incorporating an aquaponic demonstration system, a hive of the stingless indigenous bee *Trigona carbonaria*, and, at the sportsfield section, a range of indigenous shrubs and trees that provide a wind-break and physical barrier to the food gardens.

As well as producing food for humans, the range of different plants within the garden provides habitat for a wide range of insects and other invertebrates – some of which in turn benefit the gardens through providing services such as pollination and soil fertilisation.

The presence of the pond, indigenous beehive and indigenous plantings further add to the habitat value of the garden and create the potential to attract a wider range of species, including priority species such as frogs, reptiles, and small birds. Of particular note, the garden was recently home to at least one Long-nosed Bandicoot, which foraged regularly among the mulch and sheltered within compost heaps and garden equipment and debris. This was the first bandicoot recorded in the LGA for many years.

Alexandria Community Garden is an excellent demonstration of the potential for community gardens to:

- Produce food while also providing habitat for a range of species, particularly indigenous plants and invertebrates but also vertebrate fauna including priority species;
- Incorporate additional habitat features such as ponds and indigenous plantings without compromising the main function of food production but instead contributing to it, for example through providing a wind-break; and
- Provide educational opportunities to improve community awareness, not just about food production but biodiversity as well.

Alexandria Community Garden: mulched vegetable garden (left) that provided bandicoot foraging habitat, and (right) the gardeners at work; indigenous plantings in the foreground provide a physical barrier and wind-break to food gardens.

6.5 School

Erksineville Public School is located in the inner-western suburb of Erskineville. More than 300 students from Kindergarten to Year 6 currently attend the school.

The grounds of the school were once comprised almost entirely of bitumen. However, a group of parents and friends led a transformation of the grounds some years ago. Substantial green spaces were established with a focus on food gardens, sculptural elements and an outdoor classroom/amphitheatre, but also including indigenous plantings and ground-level habitat features such as sandstone boulders and logs.

Although many of the indigenous plantings have failed due to site constraints, the wide range of plants that remains along with the ground-level features contribute to habitat, particularly given the location of the school adjacent to Erskineville Station. The rail corridor in this area is characterised by a mix of dense weeds and indigenous vegetation that is likely to provide habitat for a range of species including small birds and reptiles – the school gardens potentially attract these types of species from time to time.

There is also substantial potential to improve the habitat value of the school gardens by incorporating more indigenous plantings – particularly shrubs and long grasses – in and around the now well-established food gardens and rocks and logs.

Erskineville Public School demonstrates the potential for school grounds to:

- Provide habitat for a range of species, potentially as part of or in addition to a food garden;
- Incorporate additional habitat features such as ponds and indigenous plantings without compromising the main function of food production but instead contributing to it, for example through providing a physical barrier; and
- Provide educational opportunities to improve community awareness, not just about food production but biodiversity as well.

Erskineville Public School.

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Appendix 1

Relevant plans and policies

Sustainable Sydney 2030

Sustainable Sydney 2030 is the City's guiding strategic plan for sustainable development of the City to 2030 and beyond. It sets a vision for a Green, Global and Connected city:

- Green, with minimal environmental impact from its operations, and green with trees, parks, gardens and linked open spaces, green by example and green by reputation.
- Global in economic development, global in links and knowledge exchange, global and open-minded in outlook and attitude.
- Connected physically by walking, cycling and high quality public transport, connected 'viturally ' by world-class telecommunications, connected through a sense of community and social well-being, connected to other spheres of government and to those with an interest in the City.

Environmental Management Plan 2007

The City's Environmental Management Plan 2007 (EMP) establishes the City's environmental vision, goals, targets and actions for a 10 year period. Many of the targets and actions contained within the EMP were subsequently incorporated within Sustainable Sydney 2030. It addresses the themes of energy and emissions, water, waste, plants and animals, and includes commitments relating to the following that have been expanded upon in this Plan:

- Community planting days;
- Native plants; and
- Native wildlife.

Greening Sydney Plan

The *Greening Sydney Plan* contributes to the "Green" component of the Sustainable Sydney 2030 vision and delivery of EMP objectives. It documents the City's commitment and aspirations for the "living" green elements of our urban landscape. Its strategic action areas are:

- Urban canopy;
- Urban ecology, namely the development and implementation of this Plan; and
- Community empowerment.

Sydney Local Environmental Plan 2012 and Sydney Development Control Plan 2012

The *Sydney Local Environmental Plan 2012* (LEP) is the key planning instrument for controlling development and guiding planning decisions made by Council. The LEP provides development controls for new buildings and other developments, including provisions relating to biodiversity conservation.

The LEP is supported by the Sydney Development Control Plan 2012 (DCP), which includes more detailed planning and design guidelines, including specific provisions aimed at protecting habitat features within and adjacent to proposed development sites, and improving the diversity and abundance of locally indigenous flora and fauna species across the LGA.

Landscape Code

The City is currently developing a Landscape Code to accompany the DCP in guiding the design, installation and maintenance of landscape treatments associated with new developments across the LGA. The principles of this Plan are being considered in development of the Landscape Code.

Park Plans of Management

A Plan of Management is a document that outlines how community land will be used, managed and improved in the future. The City has both generic Plans of Management that apply to many parks, and specific Plans of Management for selected parks at which management requirements are relatively complex, along with a range of supporting policies and strategies. Plans of Management can include provisions relating to the conservation and enhancement of biodiversity. Biodiversity was considered in the recent generic Plan of Management revision, and where relevant, actions from this Plan will be incorporated into future specific Plan of Management revisions.

Tree Management Policy and Plans

The City has developed a Tree Management Policy and a suite of other plans to ensure the protection and enhancement of the City's urban forest. These include:

- *Tree Management Policy;*
- *Urban Forest Strategy;*
- *Tree Management Controls;*
- Street Tree Master Plan; and
- Register of Significant Trees.

The City's urban forest comprises a mix of both exotic and indigenous species, both local and from other parts of Australia. As well as providing myriad other environmental benefits, these trees collectively play a role in providing habitat for fauna species, both local and introduced, although many of the priority fauna species identified in this Plan are more dependent on understory vegetation or other habitat features. This Plan includes numerous actions relating to trees that will be implemented in parallel with the Tree Management Policy and suite of other plans.

Community Gardens Policy

The City recognises community gardening as a valuable recreational activity that contributes to the health and well-being of the wider community and provides a wide range of environmental, social and educational benefits. The purpose of the Community Gardens Policy is to establish a framework for the City's commitment to the appropriate management of both new and existing community gardens. Implementation of the Policy promotes the objectives of this Plan since, in addition to other recognised benefits of community gardens, they can also play a role in providing habitat to promote biodiversity.

Liveable Green Network

The Liveable Green Network aims to provide a pedestrian and cycling network across the LGA. Characteristics that will be incorporated along routes prioritised for the network will include:

- Landscape treatments such as street trees and verge planting to make streets more attractive, add interest, provide shade and improve habitat to promote biodiversity; and
- Water-sensitive urban design treatments such as raingardens to improve management of stormwater runoff, maximise infiltration of water, help irrigate the landscape and provide habitat.

Companion Animals Policy

The City's Companion Animals Policy encourages and reinforces responsible pet management, to provide a balanced approach to managing domestic pets, and to maximise the social benefits of pet ownership. The policy is consistent with the aims of the NSW *Companion Animals Act 1998*, which contains regulations relating to pets that must be enforced by local government authorities.

Decentralised Water Master Plan

The City has developed a Decentralised Water Master Plan for the LGA, which identifies that local water sources such as stormwater, seawater and wastewater can produce up to 12 billion litres of local recycled water each year. Benefits to biodiversity of implementing the Decentralised Water Master Plan include improved quality of stormwater discharging into our wetlands and waterways, and opportunities for habitat enhancement through stormwater harvesting, raingardens and other bioretention systems.

Green Roofs and Walls Strategy

The City is aiming to increase the uptake of green roofs and walls. The Strategy provides a framework for the development of a comprehensive Green Roofs and Walls Policy and Implementation Plan. Both green roofs and walls have the potential to make positive contributions to the environment, with other social and enconomic benefits also. It is recognised that green roofs and walls can also play a role in providing habitat for urban flora and fauna.

National and State biodiversity strategies

The Australian Government has recently prepared *Australia's Biodiversity Strategy 2010–2030*, and the NSW Government has prepared the *Draft NSW Biodiversity Strategy 2010–2015*.

Australia's Biodiversity Strategy 2010-2030 identifies the following three priorities, which are addressed at the local level in this Plan:

1. Engaging all Australians – through mainstreaming biodiversity, increasing indigenous engagement, and enhancing strategic investments and partnerships – since all Australians benefit from biodiversity, all Australians can and should contribute to its well-being;
2. Building ecosystem resilience in a changing climate – through protecting biodiversity, maintaining and re-establishing ecosystem function, and reducing threats to biodiversity; and
3. Getting measurable results – through improving and sharing knowledge, delivering conservation initiatives effectively, and implementing robust national monitoring, reporting and evaluation.

The *Draft NSW Biodiversity Strategy 2010–2015* identifies local government authorities as playing a key role in natural resource management, and also emphasises that it is vital for landholders, industry, government and the wider community to adopt complementary approaches towards biodiversity investment. These principles have been incorporated into this Plan. The draft strategy also identifies State-scale priority ecosystems and threatened species for conservation. Of relevance to the City, these include Coastal Saltmarsh and the Green and Golden Bell Frog.

Other relevant plans

The Hawkesbury–Nepean Catchment Action Plan (CAP) was prepared by the Sydney Metropolitan Catchment Management Authority (SMCMA) *and approved by the Minister in 2013. It* is central to the delivery of natural resource management in accordance with the NSW State Plan throughout the Sydney metropolitan region. The vision of the CAP is for "Community Growth Reconciled with Nature – an urban community that thrives within a valued natural landscape". The CAP depicts a region where there are strong and positive links between healthy, functioning natural resource systems, vibrant communities and a robust and sustainable economy. In relation to biodiversity, the CAP specifies the following targets to achieve by 2016:

- the extent and condition of terrestrial native vegetation in all landscapes is maintained or improved;
- there is an increase in the connectivity of terrestrial native vegetation;
- aquatic and terrestrial threatened species and endangered ecological communities and endangered populations are better conserved by implementing actions identified in Priority Action Statements; and
- the impact of terrestrial and aquatic invasive species on biodiversity is reduced by decreasing the number, distribution and impact of invasive weeds, pest animals and pathogens.

Appendix 2

Flora species recorded in the LGA

Type	Scientific Name	Common Name	Likely indigenous to City of Sydney	Naturally occurring at some sites	Example Locations
TREES	*Acacia baileyana*	Cootamundra Wattle			Kimberley Grove Reserve, Sydney Park
	Acacia binervia	Coast Myall	Y		Moore Park, Domain, Bannerman Crescent Reserve, Orphan School Creek
	Acacia dealbata	Silver Wattle			Sydney Park
	Acacia decurrens	Black Wattle	Y		Sydney Park, AV Henry Reserve
	Acacia elata	Mountain Cedar Wattle	Y		Sydney Park, AV Henry Reserve, Perry Park, Erskineville, Elizabeth Bay
	Acacia implexa	Hickory Wattle	Y	Y	Sydney Park, Garden Island, AV Henry Reserve, Domain, Blackwattle Bay Park
	Acacia irrorata	Green Wattle	Y		Sydney Park
	Acacia parramattensis	Parramatta Wattle	Y	Y	Bicentennial Park, Federal Park, Wentworth Park Light Rail station, Blackwattle Bay Park, Erskineville rail corridor (corner of Swanson Street and Burren Street), Lewis Hoad Reserve, Arthur (Paddy) Grey Reserve
	Acacia podalyriifolia	Queensland Wattle			Blackwattle Bay Park
	Acmena smithii	Lilly Pilly	Y		Bicentennial Park, Federal Park, Sydney Park
	Agathis robusta	Qld Kauri			Sydney Park, Ward Park, Hyde Park
	Agonis flexuosa	Willow Myrtle			Rushcutters Bay Park, Kimberley Grove Reserve
	Allocasuarina littoralis	Black She Oak	Y		Arthur McElhone Reserve, Domain, Blackwattle Bay Park, Sydney Park
	Allocasuarina torulosa	Forest Oak	Y		Orphan School Creek
	Allocasuarina spp.	She Oak	Some		Widespread
	Angophora costata	Smooth-barked Apple	Y	Y	Rozelle Bay; Glebe Foreshore Walk, Moore Park, Garden Island, Pirrama Park, Orphan School Creek, Royal Botanic Gardens, Domain, Wentworth Park Light Rail station, Blackwattle Bay Park, Lewis Hoad Reserve, Arthur (Paddy) Grey Reserve
	Angophora floribunda	Hard-barked Apple	Y	Y	Sydney Park, Garden Island, Orphan School Creek
	Angophora hispida	Dwarf Apple	Y	Possible	Arthur McElhone Reserve, AV Henry Reserve, Orphan School Creek, Bannerman Crescent Reserve, Sydney Park

Type	Scientific Name	Common Name	Likely indigenous to City of Sydney	Naturally occurring at some sites	Example Locations
TREES continued	*Araucaria bidwillii*	Bunya Pine			Rushcutters Bay Park, University of Sydney
	Araucaria cunninghamii	Hoop Pine			Garden Island, Moore Park
	Araucaria heterophylla	Norfolk Island Pine			Widespread
	Archontophoenix alexandrae	Alexandra Palm			Oatley Reserve (Paddington), Sydney Park
	Archontophoenix cunninghamii	Bangalow Palm	Y		Fitzroy Gardens, Dibbs Road Reserve
	Avicennia marina	Grey Mangrove	Y		Bicentennial Park
	Banksia integrifolia	Coast Banksia	Y	Y	Widespread - Moore Park, Garden Island, Zetland, Blackwattle Bay
	Banksia robur	Swamp Banksia	Y		Arthur McElhone Reserve, Sydney Park
	Banksia serrata	Old Man Banksia	Y		Sydney Park, Orphan School Creek
	Brachychiton acerifolius	Illawarra Flame Tree	Y		Hyde Park, Sydney University, Domain, Forest Lodge
	Brachychiton discolor	Lacebark Kurrajong			Forest Lodge
	Brachychiton rupestris	Bottle Tree			Darling Harbour, Southern Cross Drive Reserve
	Callistemon salignus	Willow Bottlebrush	Y		Sydney Park
	Callistemon viminalis	Crimson Bottlebrush			Widespread
	Castanospermum australe	Black Bean			Rushcutters Bay, Erskineville
	Casuarina cunninghamiana	River Oak	Y		Lawrence Hargreave, Royal Botanic Gardens, Domain, Wentworth Park Light Rail station, Perry Park, Southern Cross Drive Reserve, Blackwattle Bay, Erskineville
	Casuarina glauca	Swamp Oak	Y	Y	Widespread – Bicentennial and Federal Parks Garden Island, Rushcutters Bay, Sydney Park, Royal Botanic Gardens, Domain, Southern Cross Drive Reserve, Blackwattle Bay, Erskineville parks
	Ceratopetalum gummiferum	Christmas Bush	Y		Dibbs Street Res, Arthur (Paddy) Grey Reserve
	Clerodendrum tomentosum	Hairy Clerodendrum	Y	Y	Royal Botanic Gardens, Sydney Park, Pyrmont
	Commersonia fraseri	Brush Kurrajong	Y		Sydney Park
	Corymbia citriodora	Lemon Scented Gum			Zetland, Blackwattle Bay, Erskineville, Forest Lodge
	Corymbia eximia	Yellow Bloodwood			Sydney Park
	Corymbia ficifolia	W.A. Flowering Gum			Erskineville, Woolloomooloo

Type	Scientific Name	Common Name	Likely indigenous to City of Sydney	Naturally occurring at some sites	Example Locations
TREES continued	*Corymbia gummifera*	Red Bloodwood	Y	Y	Moore Park, Domain (possibly remnant tree), Southern Cross Drive Reserve, Sydney Park, Orphan School Creek, Embarkation Park
	Corymbia maculata	Spotted Gum	Y		Moore Park, Sydney park, AV Henry, Orphan School Creek, Zetland, Blackwattle Bay, Arthur (Paddy) Grey Reserve
	Cupaniopsis anacardioides	Tuckeroo	Y	Possible	Widespread- Sydney Park, Embarkation Park, Arthur McElhone Reserve, Pyrmont, Bicentennial Park, Wentworth Park Light Rail station; Elizabeth Bay (one old tree in private garden)
	Davidsonia jerseyana	Davidsons Plum			Southern Cross Drive Reserve
	Dysoxylum rufum	Hairy Rosewood			Sydney Park
	Elaeocarpus eumundi	Smooth-leaved Quandong			Dibbs Street Reserve, Erskineville
	Elaeocarpus reticulatus	Blueberry Ash	Y	Possible	Widespread
	Eucalyptus botryoides	Bangalay	Y	Y	Widespread - Moore Park, Garden Island, Forbes St, Pyrmont, Sydney Park, Zetland, Perry Park, Southern Cross Drive Reserve, Blackwattle Bay, Erskineville, Lewis Hoad Reserve
	Eucalyptus caesia	Silver Princess			Erskineville
	Eucalyptus camaldulensis	River Red Gum			Alexandria Park
	Eucalyptus crebra	Narrow-leaved Ironbark	Y		Rushcutters Bay, Saunders Street (Pyrmont), RBG, Domain
	Eucalyptus elata	River Peppermint			Erskineville
	Eucalyptus globoidea	White Stringybark	Y		Orphan School Creek
	Eucalyptus grandis	Flooded Gum			Orphan School Creek, Royal Botanic Gardens, Domain, Zetland, Wentworth Park Light Rail station, Southern Cross Drive Reserve, Turruwal Park
	Eucalyptus haemastoma	Scribbly Gum	Y		Sydney Park, Orphan School Creek
	Eucalyptus maidenii	Maiden's Gum			Domain
	Eucalyptus microcorys	Tallowwood			Hyde Park, Sydney Park, Widespread
	Eucalyptus moluccana	Grey Box	Y		Sydney Park
	Eucalyptus nicholii	Narrow-leaved Black Peppermint			Perry Park, Glebe
	Eucalyptus paniculata ssp. paniculata	Grey Ironbark	Y	Y	St. John Anglican Church Glebe, Orphan School Creek

Type	Scientific Name	Common Name	Likely indigenous to City of Sydney	Naturally occurring at some sites	Example Locations
TREES continued	*Eucalyptus pilularis*	Blackbutt	Y	Y	Domain
	Eucalyptus piperita	Sydney Peppermint	Y		Orphan School Creek, Pyrmont, Sydney Park
	Eucalyptus punctata	Grey Gum	Y	Y	Moore Park, Domain, Bannerman Crescent Reserve, Jack Shuttleworth Reserve
	Eucalyptus racemosa	Scribbly Gum	Y		Glebe
	Eucalyptus resinifera	Red Mahogany	Y	Y	Domain, Orphan School Creek
	Eucalyptus robusta	Swamp Mahogany	Y		Rushcutters Bay, Ward Park, Sydney Park, Royal Botanic Gardens, Domain, Zetland, Perry Park, Erskineville, Orphan School Creek
	Eucalyptus saligna	Sydney Blue Gum	Y		Moore Park, Ward Park, Saunders St (Pyrmont), Blackwattle Bay
	Eucalyptus saligna x botryoides				Turruwal Park
	Eucalyptus scoparia	Wallengarra Gum			Forest Lodge
	Eucalyptus sideroxylon	Mugga Ironbark	Y		Elizabeth Bay Road, Erskineville
	Eucalyptus tereticornis	Forest Red Gum	Y	Y	Royal Botanic Gardens, Orphan School Creek
	Eucalyptus torelliana	Cadaghi			Johnstons Canal, Glebe
	Eucalyptus species		Some		Widespread, Sydney University
	Ficus benjamina	Weeping Fig			Rushcutters Bay
	Ficus microcarpa var. hillii	Hill's Weeping Fig			Moore Park, Hyde Park, Domain, Zetland
	Ficus macrophylla	Moreton Bay Fig			Rozelle Bay, Rushcutters Bay, Alexandria Park
	Ficus obliqua	Small-leaved Fig			Moore Park, Cook + Phillip Park
	Ficus rubiginosa forma rubiginosa and forma glabrescens	Port Jackson Fig	Y	Y	Widespread
	Ficus superba var. henneana	Deciduous Fig			Moore Park, Jubilee Park
	Ficus virens var sublanceolata				Moore Park
	Ficus watkinsoniana (tentative identification)				Zetland
	Flindersia australis	Crow's Ash			Beare Park, Macleay Reserve, Hyde Park

Type	Scientific Name	Common Name	Likely indigenous to City of Sydney	Naturally occurring at some sites	Example Locations
TREES continued	*Glochidion ferdinandi*	Cheese Tree	Y	Y	Sydney Park, Royal Botanic Gardens, Domain, Wentworth Park Light Rail station, Garden Island
	Grevillea robusta	Silky Oak			Lawrence Hargreave Reserve, Wentworth Park Light Rail station, Southern Cross Drive Reserve
	Hakea salicifolia	Willow-leaved Hakea	Y		Arthur McElhone Reserve
	Helicia diversifolius	White Oak			Forest Lodge
	Hibiscus heterophyllus	Native Rosella	Y		Sydney Park
	Hibiscus tiliaceus	Beach Hibiscus			Sydney Park
	Hymenosporum flavum	Native Frangipani	Y		Glebe, Sydney Park, Bicentennial Park, Southern Cross Drive Reserve, Erskineville
	Lagunaria patersonia	Norfolk Island Hisbiscus			Rushcutters Bay, Turruwal Park, Kimberley Grove Reserve
	Leptospermum petersonii	Lemon Scented Tea Tree			Erskineville
	Leptospermum trinervium	Flaky-barked Tea-tree	Y		Glebe foreshore
	Livistona australis	Cabbage Palm	Y		Hyde Park, Beare Park, Forbes Street, Erskineville, Glebe, Sydney Park; widespread
	Lophostemon confertus	Brush Box			Widespread
	Melaleuca armillaris	Bracelet Honey-myrtle	Y		Garden Island, Embarkation Park, Wentworth Park Light Rail station, Widespread
	Melaleuca bracteata	Black Tea-tree			Ward Park, Embarkation Park, Arthur McElhone Reserve, Bicentennial/Federal Park, Domain, Southern Cross Drive Reserve, Erskineville
	Melaleuca linariifolia	Snow-in-summer	Y		Sydney Park, Embarkation Park, Wentworth Park Light Rail station, Perry Park, Southern Cross Drive Reserve, Orphan School Creek
	Melaleuca styphelioides	Prickly-leaved Paperbark	Y		Glebe foreshore, Sydney Park, Rushcutters Bay, Orphan School Creek, Wentworth Park Light Rail station
	Melaleuca quinquenervia	Broad-leaved Paperbark	Y		Hyde Park, Sydney Park, Garden Island, Zetland, widespread
	Melia azedarach	White Cedar	Y		Garden Island, Lawrence Hargreave, Macleay Reserve, Sydney Park, Southern Cross Drive Reserve, Erskineville
	Pittosporum undulatum	Pittosporum	Y	Y	Widespread – Sydney Park, Garden island, Domain, Zetland, Perry Park, Erskineville rail corridor, Lewis Hoad Reserve, Arthur (Paddy) Grey Reserve
	Podocarpus elatus	Plum Pine	Y		Ward Park, Garden Island, Lawrence Hargreave Reserve
	Schefflera actinophylla	Umbrella Tree			Alexandria Park, Perry Park

Type	Scientific Name	Common Name	Likely indigenous to City of Sydney	Naturally occurring at some sites	Example Locations
TREES continued	*Stenocarpus sinuatus*	Firewheel Tree			Sydney Park, Garden Island, Lawrence Hargreave Reserve, Blackwattle Bay
	Syncarpia glomulifera	Turpentine	Y		Sydney Park, Orphan School Creek, Erskineville, Johnstons Canal, Glebe
	Syzygium australe	Brush Cherry	Possible		Embarkation Park, Sydney Park, Blackwattle Bay, widespread
	Syzygium luehmannii	Small-leaved Lilly Pilly			Bannerman Crescent Reserve, Erskineville
	Syzygium oleosum	Blue Lilly Pilly	Y		Zetland, Wentworth Park Light Rail station, Perry Park, Southern Cross Drive Reserve, Dibbs Street Reserve
	Syzygium paniculatum	Brush Cherry	Y		Pyrmont
	Syzygium species				Beare Park, Sydney Park
	Trema aspera	Native Peach	Y		Pyrmont (Bank Street)
	Toona ciliate	Red Cedar	Y		Pyrmont (Saunders Street)
	Tristaniopsis laurina	Water Gum	Y		Widespread
	Waterhousea floribunda	Weeping Lilly Pilly			Arthur McElhone Reserve, Saunders St (Pyrmont)
	Wollemia nobilis	Wollemi Pine			Sydney Park
SHRUBS	*Acacia cognata*	Bower Wattle			Beare Park, Sydney Park
	Acacia falcata	Sickle Wattle	Y		AV Henry Reserve, Bicentennial/Federal Park, Orphan School Creek, Arthur (Paddy) Grey Reserve
	Acacia fimbriata	Fringed Wattle			Sydney Park, Mary O'Brien Reserve, Wentworth Park Light Rail station, Arthur (Paddy) Grey Reserve
	Acacia floribunda	White Sally Wattle	Y		Bicentennial/Federal Park, Sydney Park
	Acacia linifolia	Flax Wattle	Y		Arthur (Paddy) Grey Reserve, Glebe Foreshore
	Acacia longifolia var. longifolia	Sydney Golden Wattle	Y		Sydney Park, Garden Island, Saunders Street (Pyrmont), AV Henry Reserve, Moore Park, Domain, Perry Park, Southern Cross Drive Reserve, Bannerman Crescent Reserve
	Acacia longifolia var. sophorae	Coastal Wattle	Y		Perry Park, Glebe, Sydney Park
	Acacia myrtifolia	Red-stemmed Wattle	Y		Pyrmont, Sydney Park
	Acacia saligna	Golden Wreath Wattle			Sydney Park, Southern Cross Drive Reserve, Bannerman Crescent Reserve, Kimberley Grove Reserve, Lewis Hoad Reserve
	Acacia stricta	Straight Wattle	Y		Pyrmont
	Acacia suaveolens	Sweet Wattle	Y		Wentworth Park Light Rail station, Orphan School Creek
	Acacia terminalis subsp. terminalis	Sunshine Wattle	Y		Wentworth Park Light Rail station, Royal Botanic Gardens, Domain, Bicentennial Park/Federal Park, Orphan School Creek

Type	Scientific Name	Common Name	Likely indigenous to City of Sydney	Naturally occurring at some sites	Example Locations
SHRUBS continued	*Acacia ulicifolia*	Prickly Moses	Y		Bicentennial/Federal Park, AV Henry Reserve, Arthur (Paddy) Grey Reserve
	Allocasuarina distyla	Scrub She-oak	Y		Bannerman Crescent Reserve
	Austromyrtus tenuifolia				Bear Park
	Sannantha similis (Baeckea virgata)		Y		Glebe, Pyrmont
	Baeckea species	Baeckea	Some		Embarkation Park, Beare Park, Sydney Park, Arthur (Paddy) Grey Reserve
	Banksia aemula	Wallum Banksia	Y		Moore Park, Embarkation Park, Pirrama Park, Blackwattle Bay
	Banksia ericifolia	Heath Banksia	Y		Embarkation Park, Sydney Park, Bicentennial/ Federal Park, Domain, Southern Cross Drive Reserve, Bannerman Crescent Reserve
	Banksia marginata	Silver Banksia	Y		Blackwattle Bay
	Banksia spinulosa	Hair-pin Banksia	Y		Sydney Park, Wentworth Park Light Rail station, Blackwattle Bay, Lewis Hoad Reserve
	Banksia species	Banksia	Some		Embarkation Park, Southern Cross Drive Reserve
	Bauera rubioides	Dog Rose	Y		Pyrmont
	Breynia oblongifolia	Coffee Bush	Y		Glebe foreshore; Bicentennial/Federal Park; widespread
	Bursaria spinosa	Native Blackthorn	Y		Saunders Street (Pyrmont), Sydney Park, AV Henry Reserve, Wentworth Park Light Rail station, Orphan School Creek
	Ozothamnus diosmifolius	Dogwood	Y		Bicentennial/Federal Park
	Callicoma serratifolia	Black Wattle	Y		Saunders Street (Pyrmont), Orphan School Creek, Wentworth Park Light Rail station
	Callistemon citrinus	Crimson Bottlebrush	Y		Widespread
	Callistemon linearis	Narrow-leaved Bottlebrush	Y		Bicentennial/Federal Park, Domain, Wentworth Park Light Rail station, Southern Cross Drive Reserve, Erskineville rail corridor
	Callistemon species				Widespread
	Callitris species				Sydney Park
	Calytrix tetragona	Common Fringe-myrtle	Y		Pyrmont
	Clerodendrum tomentosum	Hairy Clerodendrum	Y	Y	Royal Botanic Gardens
	Cordyline species				Sydney Park
	Correa alba	White Correa	Y		Glebe foreshore, Saunders Street (Pyrmont), Bicentennial/Federal Park, Blackwattle Bay

Type	Scientific Name	Common Name	Likely indigenous to City of Sydney	Naturally occurring at some sites	Example Locations
SHRUBS continued	*Correa reflexa*	Common Correa	Y		Wentworth Park Light Rail station, Bicentennial/ Federal Park,
	Desmodium rhytidophyllum	Tick-trefoil	Y		Arthur (Paddy) Grey Reserve
	Dillwynia retorta	Eggs and Bacon	Y		Orphan School Creek
	Dodonaea triquetra	Large-leaved Hop Bush	Y		Glebe foreshore, Bicentennial and Federal Reserves, Saunders Street (Pyrmont), Orphan School Creek, Domain, Wentworth Park Light Rail station, Southern Cross Drive Reserve, Blackwattle Bay
	Dodonaea viscosa subsp. cuneata	Sticky Hop Bush	Y		Bicentennial/Federal Park
	Doryanthes excelsa	Gymea Lily	Y		Widespread
	Einadia hastata	Berry Saltbush	Y		Bicentennial/Federal Park
	Epacris longiflora	Fuchsia Heath	Y		Pyrmont
	Grevillea linearifolia	Linear-leaf Grevillea	Y		Saunders Street (Pyrmont), AV Henry Reserve
	Grevillea rosmarinifolia	Rosemary Grevillea			Glebe foreshore
	Grevillea sericea	Pink Spider Flower	Y		Bicentennial/Federal Park, Domain, Bannerman Crescent Reserve, Orphan School Creek
	Grevillea hybrids				Sydney Park, Embarkation Park, Domain, Southern Cross Drive Reserve
	Hakea dactyloides	Finger Hakea	Y		Orphan School Creek, Pyrmont
	Hakea sericea	Needlebush	Y		Saunders Street (Pyrmont), Bicentennial/Federal Park, Domain, Wentworth Park Light Rail station
	Hakea salicifolia	Willow-leaved Hakea	Y		Southern Cross Drive Reserve, Erskineville rail corridor (close to station)
	Hakea teretifolia	Needlebush	Y		Bicentennial/Federal Park
	Homalanthus populifolius	Bleeding Heart	Y		Lewis Hoad Reserve, Arthur (Paddy) Grey Reserve
	Indigofera australis	Native Indigo	Y		Sydney Park, Wentworth Park Light Rail station
	Isopogon anemonifolius	Broad-leaf Drumsticks	Y		Pyrmont
	Kunzea ambigua	Tick Bush	Y		Sydney Park, Beare Park, Saunders Street (Pyrmont), Bicentennial/Federal Park, Domain, Wentworth Park Light Rail station, Southern Cross Drive Reserve, Bannerman Crescent Reserve, Arthur (Paddy) Grey Reserve, Blackwattle Bay, Orphan School Creek
	Kunzea capitata	Pink Kunzea	Y		Embarkation Park, Sydney Park, Bicentennial/ Federal Park, Domain
	Lambertia formosa	Mountain Devil	Y		Domain

Type	Scientific Name	Common Name	Likely indigenous to City of Sydney	Naturally occurring at some sites	Example Locations
SHRUBS continued	*Leptospermum juniperinum*	Prickly Teatree	Y		Bannerman Crescent Reserve
	Leptospermum laevigatum	Coast Teatree	Y		Moore Park, Glebe, Domain, Perry Park, Southern Cross Drive Reserve, Bannerman Crescent Reserve
	Leptospermum polygalifolium	Tantoon	Y		Bicentennial/Federal Park, Orphan School Creek, Wentworth Park Light Rail station
	Leucopogon lanceolatus	Lance-leaf Beard-Heath	Y		Domain
	Leucopogon microphyllus	Small-leaved Beard-Heath	Y		Domain
	Leucopogon parviflorus	Coastal Beard-heath	Y		Blackwattle Bay
	Lomatia silaifolia	Crinkle Bush,	Y		Lewis Hoad Reserve
	Lomatia myricoides	River Lomatia	Y		Lewis Hoad Reserve
	Macrozamia communis	Burrawang	Y		Arthur McElhone Reserve, Sydney Park, Royal Botanic Gardens, Alexandria Park, Pyrmont
	Melaleuca armillaris	Bracelet Honey-myrtle	Y		Moore Park, Sydney Park, Federal Park
	Melaleuca ericifolia	Swamp Paperbark	Y		Federal Park
	Melaleuca erubescens				Sydney Park
	Melaleuca hypericifolia	Hillock Bush	Y		Sydney Park, Southern Cross Drive Reserve
	Melaleuca nodosa	Prickly-leaved Paperbark	Y		Glebe foreshore, Bicentennial and Federal Reserves , Sydney Park, Domain, Wentworth Park Light Rail station, Orphan School Creek
	Melaleuca thymifolia	Thyme Honey-myrtle	Y		Domain, Sydney Park
	Micromyrtus ciliata	Fringed Heath-myrtle	Y		Pyrmont
	Myoporum probably insulare	*Boobialla*	Y		Blackwattle Bay
	Myrsine variabilis	Muttonwood	Y	Y	Garden Island, Royal Botanic Gardens, Domain
	Notelaea longifolia	Mock Olive	Y		Johnstons Canal, Glebe
	Ozothamnus diosmifolius	Dogwood	Y		Saunders St (Pyrmont), Bicentennial/Federal Park, Orphan School Ck, Wentworth Park Light Rail station, Turruwal Park, Arthur (Paddy) Grey Reserve
	Persoonia lanceolata	Lance Leaf Geebung	Y		Domain
	Persoonia laurina	Laurel Geebung	Y		Arthur (Paddy) Grey Reserve

Type	Scientific Name	Common Name	Likely indigenous to City of Sydney	Naturally occurring at some sites	Example Locations
SHRUBS continued	*Persoonia linearis*	Narrow-leaved Geebung	Y		Domain
	Persoonia pinifolia	Pine-leaved Geebung,	Y		Domain, Orphan School Creek
	Philotheca myoporoides	Long-leaved Wax Flower	Y		Bicentennial/Federal Park, Sydney Park
	Pimelea linifolia	Slender Rice Flower	Y		Pyrmont, Glebe
	Pittosporum revolutum	Wild Yellow Jasmine	Y		Saunders Street (Pyrmont)
	Platysace lanceolata	Shrubby Platysace	Y		Pyrmont
	Polyscias sambucifolia	Ferny Panax	Y		Saunders Street (Pyrmont), Wentworth Park Light Rail station
	Pomaderris ferruginea	Woolly Pomaderris	Y		Arthur (Paddy) Grey Reserve
	Pomaderris lanigera	Rusty Pomaderris	Y		Orphan School Creek
	Pomaderris species	Pomaderris			Wentworth Park Light Rail station
	Prostanthera linearis	Mint Bush	Y		Beare Park
	Pultenaea daphnoides	Large-leaf Bush-pea	Y		Orphan School Creek, Wentworth Park Light Rail station
	Pultenaea flexilis	Graceful Bush-pea	Y		Saunders Street (Pyrmont)
	Pultenaea retusa	Notched Bush-pea	Y		Pyrmont
	Pultenaea villosa	Hairy Bush-pea	Y		Orphan School Creek
	Rhagodia candolleana	Seaberry Saltbush	Y	Y	Beare Park, Garden Island, Bicentennial/ Federal Park
	Sannantha similis (Baeckea virgata)		Y		Wentworth Park Light Rail station
	Solanum aviculare	Kangaroo Apple,	Y		Saunders Street (Pyrmont)
	Viminaria juncea	Native Broom	Y		Rosebery
	Westringia fruticosa	Native Rosemary	Y		Widespread
	Xanthorrhoea media	Native Rosemary	Y		Pyrmont
	Xanthosia pilosa	Woolly Xanthosia	Y		Pyrmont
	Xylomelum pyriforme	Woody Pear	Y		Sydney Park
	Zieria smithii	Sandfly Zieria	Y		Pyrmont

Type	Scientific Name	Common Name	Likely indigenous to City of Sydney	Naturally occurring at some sites	Example Locations
FERNS	*Adiantum aethiopicum*	Maiden Hair Fern	Y	Y	Elizabeth Bay, , Pyrmont, Rushcutters Bay, Oatley Reserve, Arthur McElhone Reserve, the Rocks, Royal Botanic Gardens/Domain
	Adiantum atroviride	Maiden Hair Fern	Y	Y	Pyrmont, Forbes St. Precinct, Royal Botanic Gardens
	Asplenium australasicum	Birds Nest Fern	Y		Ward Park, Beare Park, Sydney Park, Lewis Hoad Reserve
	Asplenium possibly difforme	Spleenwort	Y		Royal Botanic Gardens
	Asplenium flabellifolium	Necklace Fern	Y	Y	Domain, Royal Botanic Gardens
	Asplenium flaccidum ssp. flaccidum	Weeping Spleenwort			Royal Botanic Gardens
	Blechnum cartilagineum	Gristle Fern	Y	Y	Glebe foreshore, Beare Park, Saunders Street (Pyrmont)
	Blechnum ambiguum	Blechnum	Y	Y	Domain – old 1998 record and possibly Arthur McElhone Reserve
	Calochlaena dubia	Rainbow Fern	Y	Possible	Orphan School Creek, Royal Botanic Gardens
	Cheilanthes distans	Bristly Cloak Fern	Y	Y	Royal Botanic Gardens
	Christella dentata	Binung	Y	Possible	Royal Botanic Gardens (modified creek line) – potentially self-sown from cultivated plant; Lewis Hoad Reserve
	Cyathea australis	Tree Fern	Y	Y	Pyrmont, Royal Botanic Gardens, Domain
	Cyathea cooperi	Straw Tree Fern			Arthur McElhone Reserve, Beare Park, Royal Botanic Gardens, Dibbs Street Reserve, Lewis Hoad Reserve, Pyrmont, Widespread
	Cyrtomium falcatum	Holly Fern			Pyrmont, Royal Botanic Gardens
	Davallia solida var. pyxidata	Hares Foot Fern	Y	Y	Royal Botanic Gardens, Domain
	Dicksonia species	Tree Fern			Widespread
	Doodia aspera	Prickly Rasp Fern	Y	Y	Glebe foreshore, Saunders Street (Pyrmont)
	Doodia caudata	Small Rasp Fern	Y	Y	Domain
	Gleichenia dicarpa	Pouched Coral Fern	Y	Y	Pyrmont, the Rocks
	Histiopteris incisa	Bat's Wing Fern	Y	Y	Pyrmont, Arthur McElhone Reserve, the Rocks, Royal Botanic Gardens, Domain
	Hypolepis muelleri	Harsh Ground Fern	Y	Possible	Glebe foreshore, Bicentennial/Federal Park, Royal Botanic Gardens
	Microsorum scandens	Fragrant Fern	Y	Y	Royal Botanic Gardens
	Pellaea falcata	Sickle Fern	Y	Y	Saunders Street (Pyrmont)

Type	Scientific Name	Common Name	Likely indigenous to City of Sydney	Naturally occurring at some sites	Example Locations
FERNS continued	*Platycerium bifurcatum*	Elkhorn	Y	Possible	Moore Park/Centennial Park
	Psilotum nudum	Skeleton Fork Fern	Y	Y	Arthur McElhone Reserve, Pyrmont (Pirrama Park), Royal Botanic Gardens, Lewis Hoad Reserve
	Pteridium esculentum	Common Bracken	Y	Y	Domain, Pyrmont
	Pteris tremula	Tender Brake	Y	Y	Embarkation Park, Oatley Reserve
	Pteris vittata	Ladder Brake	Possible	Y	Pyrmont (Saunders Street), Royal Botanic Gardens, Erskineville (rail tunnel), Lewis Hoad Reserve
	Pyrrosia rupestris	Rock Felt Fern	Y	Possible	Moore Park/Centennial Park
	Todea barbara	King Fern	Y	Y	Lewis Hoad Reserve, Royal Botanic Gardens
HERBS *+Wetland species*	*Actinotus helianthi*	Flannel Flower	Y		Pyrmont
	+Alisma plantago-aquatica	Water Plantain	Y		Sydney Park
	Alternanthera denticulata	Native Joyweed	Y		Sydney Park
	Alternanthera species A sensu Harden 1990	Native Joyweed	Y	Possible	Moore Park
	Anigozanthos species	Kangaroo Paw			Dibbs Street Reserve
	+Azolla filiculoides	Azolla	Y	Y	Sydney Park
	Brachyscome cultivar	Native Daisy			Lawrence Hargreave Reserv
	Carpobrotus glaucescens	Coastal Pigface	Y	Y	Beare Park, Pirrama Park, Bicentennial Park
	Centaurium spicatum		Y	Y	Domain
	Centella asiatica	Pennywort	Y	Y	Rozelle Bay, Glebe foreshore, Orphan School Creek, Domain, Wentworth Park Light Rail station
	Chenopodium glaucum	Glaucous Goosefoot	Y	Y	Bicentennial Park
	Commelina cyanea	Native Wandering Jew	Y	Y	Embarkation Park, Sydney Park, Bicentennial/ Federal Park, Orphan School Creek, Royal Botanic Gardens, Domain, Dibbs Street Reserve, Lewis Hoad Reserve
	Cordyline species	Cordyline			Sydney Park
	Cotula australis	Common Cotula	Y	Y	Hyde P, Moore Park, Garden Island, Lawrence Hargreave, Clyne Reserve, Lewis Hoad Reserve
	Crassula sieberiana	Australian Stonecrop	Y	Y	Domain

Type	Scientific Name	Common Name	Likely indigenous to City of Sydney	Naturally occurring at some sites	Example Locations
HERBS continued *+Wetland species*	*+Crinum pedunculatum*	Swamp Lily	Possible		Widespread
	Dianella caerulea	Blue Flax Lily	Y	Y	Widespread, appears naturally occurring at one location in Royal Botanic Gardens
	Dianella caerulea subsp. assera	Blue Flax Lily	Y		Widespread
	Dianella revoluta	Blue Flax Lily	Y	Y	Glebe foreshore, Domain (Hind 1988)
	Dianella species (unidentified)	Flax Lily	Y		Sydney Park, Wentworth Park Light Rail station
	Dichondra repens	Kidney Weed	Y	Y	Hyde Park, Garden Island, Glebe, Orphan School Creek, Royal Botanic Gardens, Domain, Dibbs Street Reserve, Arthur (Paddy) Grey Reserve
	Epilobium billardiereanum ssp. ciliatum	Willow Herb	Y		Orphan School Creek
	Geranium homeanum	Native Geranium	Y		Orphan School Creek, Bicentennial/ Federal Park
	Goodenia ovata	Hop Goodenia	Y		Saunders Street (Pyrmont), Wentworth Park Light Rail station, Arthur (Paddy) Grey Reserve
	Hydrocotyle peduncularis	Hydrocotyle	Y	Y	Royal Botanic Gardens, Orphan School Creek
	Lobelia anceps	Lobelia	Y	Y	Pirrama Park, Saunders Street (Pyrmont), Domain, Orphan School Creek
	Lythrum hyssopifolium	Hyssop Loosestrife	Y		Sydney Park
	+Nymphaea sp.	Waterlily			Woolwash Park (Zetland)
	Opercularia aspera	Stink Weed	Y	Y	Domain,
	Oxalis species (probably native)	Oxalis	Y	Y	Hyde Park
	Oxalis rubens	Native Oxalis	Y	Y	Domain
	Pelargonium australe	Native Pelargonium	Y		Glebe Foreshore, Ward Park, Saunders St (Pyrmont), Arthur (Paddy) Grey Reserve
	Persicaria decipiens	Slender Knotweed	Y		Sydney Park, Orphan School Creek
	Persicaria hydropiper	Water Pepper	Y		Orphan School Creek
	+Philydrum lanuginosum	Woolly Frogmouth	Y		Woolwash Park (Zetland)
	Pimelea linifolia	Rice Flower	Y		Domain
	+Pistia stratiotes	Water Lettuce			Woolwash Park (Zetland)
	Plectranthus parviflorus	Cockspur Flower	Y	Possible	Bicentennial/Federal Park, Glebe Foreshore, Orphan School Creek, Wentworth Park Light Rail station
	Pollia ?crispata	Pollia	Y	Possible	Royal Botanic Gardens

Type	Scientific Name	Common Name	Likely indigenous to City of Sydney	Naturally occurring at some sites	Example Locations
HERBS continued *+Wetland species*	*Pomax umbellata*	Pomax	Y		Orphan School Creek
	+Pontederia cordata	Pickerel Weed			Arthur McElhone Reserve
	Poranthera microphylla		Y	Y	Royal Botanic Gardens
	Portulaca oleracea	Pigweed	Y	Y	Garden Island, Sydney Park, Blackwattle Bay, Lewis Hoad Reserve
	Pratia purpurascens	Whiteroot	Y	Possible	Glebe Foreshore, Bicentennial Park, Federal Park, Beare Park
	Rumex brownii	Swamp Dock	Y	Y	Moore Park, Domain
	Sarcocornia quinqueflora	Beaded Glasswort	Y	Y	Bicentennial Park, Federal Park
	Scaevola albida	Pale Fan-flower	Y		Saunders St (Pyrmont)
	Suaeda australis	Austral Seablite	Y	Y	Bicentennial Park, Federal Park
	Tetragonia tetragonioides	New Zealand Spinach	Y	Y	Bicentennial Park
	+Triglochin striata	Streaked Arrow Grass	Y	Y	Bicentennial Park, Orphan School Creek
	+Vallisneria probably australis	Ribbonweed	Y		Sydney Park
	Veronica plebeia	Trailing Speedwell	Y	Y	Domain, Royal Botanic Gardens
	Viola hederacea	Native Violet	Y		Widespread
	Wahlenbergia gracilis	Native Blue Bell	Y	Y	Glebe Foreshore, Forest Lodge, Moore Park, Saunders Street (Pyrmont), Orphan School Creek, Domain, Royal Botanic Gardens, Blackwattle Bay

Type	Scientific Name	Common Name	Likely indigenous to City of Sydney	Naturally occurring at some sites	Example Locations
GRASSES, SEDGES, RUSHES *+Wetland species*					
	Austrodanthonia fulva	Wallaby Grass	Y		Southern Cross Drive Reserve
	Austrodanthonia species	Wallaby Grass	Y		Orphan School Creek, Wentworth Park Light Rail station, Glebe, Domain
	Austrostipa ramosissima	Speargrass	Y	Possible	Johnstons Canal, Glebe, Saunders Street (Pyrmont)
	+Baumea articulata	Jointed Twig-rush	Y		Woolwash Park (Zetland), Sydney Park
	+Baumea rubiginosa	Twig-rush	Y		Woolwash Park (Zetland)
	+Bolboschoenus fluviatilis	Marsh Club-rush	Y		Sydney Park
	Bothriochloa macra	Red-leg Grass	Y		Wentworth Park Light Rail station
	+Carex appressa	Tall Sedge	Y		Sydney Park, Orphan School Creek, Zetland
	Carex inversa	Knob Sedge	Y	Y	Glebe (St. John Anglican church)
	+Cladium procerum	Sedge	Y		Sydney Park
	Cymbopogon refractus	Barb Wire Grass	Y		Orphan School Creek, Bicentennial/Federal Park, Arthur (Paddy) Grey Reserve
	Cynodon dactylon	Common Couch	Y	Y	Widespread
	+Cyperus exaltatus	Cyperus	Y		Sydney Park
	Cyperus gracilis	Slender Flat-sedge	Y	Y	Garden Island, Johnstons Canal, Glebe Oatley Reserve, Arthur (Paddy) Grey Reserve
	Cyperus mirus	Cyperus	Y	Y	Jubilee Park (rock outcrop east of oval) , Lewis Hoad Reserve, Royal Botanic Gardens
	+Cyperus polystachyos	Cyperus	Y	Y	Beare Park, Woolwash Park (Zetland), Domain (Hind 1988), Lewis Hoad Reserve
	Dichelachne crinita	Longhair Plumegrass	Y	Possible	Glebe foreshore, Pirrama Park, Saunders Street (Pyrmont), Bicentennial/Federal Park, Orphan School Creek, Domain
	Dichelachne micrantha	Shorthair Plumegrass	Y	Y	Bicentennial/Federal Park, Domain, Wentworth Park Light Rail station, Erskineville rail corridor in vicinity of station
	Dichelachne rara	Plumegrass	Y		Orphan School Creek
	Echinopogon caespitosus	Hedgehog Grass	Y		Bicentennial/Federal Park, Orphan School Creek, Arthur (Paddy) Grey Reserve
	Echinopogon ovatus	Hedgehog Grass	Y		Bicentennial/Federal Park, Orphan School Creek, Wentworth Park Light Rail station
	+Eleocharis acutus	Common Spike-rush	Y		Sydney Park
	+Eleocharis sphacelata	Tall Spike-rush	Y		Sydney Park, Woolwash Park (Zetland)

Type	Scientific Name	Common Name	Likely indigenous to City of Sydney	Naturally occurring at some sites	Example Locations
GRASSES, SEDGES, RUSHES continued *+Wetland species*	*Entolasia marginata*	Border Panic	Y	Y	Pyrmont, Garden Island
	Entolasia stricta	Wire Panic	Y		Pyrmont, Orphan School Creek
	+Ficinia nodosa	Knotted Club-rush	Y		Sydney Park, Glebe foreshore, Arthur McElhone Reserve, Pirrama Park, Orphan School Creek, Domain, Zetland, Wentworth Park Light Rail station, Blackwattle Bay, Dibbs Street Reserve
	Gahnia aspera	Rough Saw-sedge	Y		Orphan School Creek, Bicentennial/Federal Park
	Gahnia sieberiana	Red-fruit Saw-sedge	Y		Sydney Park
	Imperata cylindrica	Blady Grass	Y		Sydney Park, Orphan School Creek, Domain
	+Isolepis inundata		Y		Sydney Park
	+Juncus kraussii ssp. australiensis	Sea Rush	Y		Arthur McElhone Reserve, Sydney Park, Bicentennial/Federal Park
	+Juncus prismatocarpus		Y		Sydney Park
	+Juncus usitatus	Common Rush	Y		Sydney Park, Arthur McElhone Reserve, Pirrama Park, Orphan School Creek, Domain, Zetland, Wentworth Park Light Rail station, Blackwattle Bay
	Lachnagrostis avenacea	Blowngrass	Y		Glebe Foreshore, Sydney Park, Bicentennial/ Federal Park, Orphan School Creek, Dibbs Street Reserve
	Lomandra hystrix	Mat-rush			Widepsread
	Lomandra longifolia	Spiny-headed Mat Rush	Y		Widepsread
	Microlaena stipoides	Weeping Grass	Y	Y	Glebe Foreshore, Bicentennial/Federal Parks, Garden Island, Sydney Park, Domain, Royal Botanic Gardens, Wentworth Park Light Rail station, Lewis Hoad Reserve
	Oplismenus aemulus	Basket Grass	Y	Y	Embarkation Park, Bicentennial/Federal Park, Orphan School Creek, Royal Botanic Gardens, Lewis Hoad Reserve
	+Paspalum distichum	Water Couch	Y		Sydney Park
	Poa affinis	Tussock Grass	Y		Sydney Park, Orphan School Creek, Arthur (Paddy) Grey Reserve
	Poa labillardieri	Tussock Grass	Y		Zetland
	Poa sieberiana	Poa	Y		Ward Park, Oatley Reserve, Zetland
	+Schoenoplectus mucronatus		Y		Woolwash Park (Zetland)
	+Schoenoplectus validus		Y		Sydney Park, Woolwash Park (Zetland)
	Sporobolus virginicus	Saltwater Couch	Y	Possible	Bicentennial and Federal Parks

Type	Scientific Name	Common Name	Likely indigenous to City of Sydney	Naturally occurring at some sites	Example Locations
GRASSES, SEDGES, RUSHES continued *+Wetland species*	*Themeda australis*	Kangaroo Grass	Y		Glebe Foreshore, Oatley Reserve, Saunders Street (Pyrmont), Domain, Wentworth Park Light Rail station
	+Typha possibly domingensis	Cumbungi	Y		Sydney Park, Woolwash Park (Zetland)
	+Typha orientalis	Cumbungi	Y		Sydney Park, Woolwash Park (Zetland)
CLIMBERS/ TWINERS	*Cayratia clematidea*	Native Grape	Y	Possible	Wentworth Park Light Rail station, Lawrence Hargreave
	Cissus antarctica	Kangaroo Vine	Y		Garden Island, Lawrence Hargreave, Orphan School Creek, Blackwattle Bay, Embarkation Park
	Clematis aristata	Old Man's Beard	Y		Orphan School Creek, Wentworth Park Light Rail station
	Commelina cyanea	Native Wandering Jew	Y	Y	Rozelle Bay, Glebe Foreshore, Garden Island, Beare Park (on sandstone), Rushcutters Bay, Saunders Street (Pyrmont), Royal Botanic Gardens, Domain, Wentworth Park Light Rail station, Kimberley Grove Reserve
	Eustrephus latifolius	Wombat Berry	Y		Bicentennial/Federal Park
	Geitonoplesium cymosum	Scrambling Lily	Y		Federal Park
	Glycine microphylla		Y	Possible	Glebe Foreshore, Wentworth Park Light Rail station, Johnstons Canal (Rozelle)
	Glycine tabacina		Y		Bicentennial/Federal Park
	Hardenbergia violacea	Flase Sarsparilla	Y		Widespread
	Hibbertia scandens	Climbing Guinea Flower	Y		Garden Island, Beare Park, Forbes Street., Pirrama Park, AV Henry, Orphan School Creek, Wentworth Park Light Rail station, Blackwattle Bay
	Kennedia rubicunda	Dusky Coral Pea	Y		Orphan School Creek, Domain, Wentworth Park Light Rail station
	Pandorea jasminoides	Bower Vine	Y		Zetland
	Pandorea pandorana	Wonga Wonga Vine	Y		Forbes St, Bicentennial/Federal Park, Orphan School Creek, Domain, Wentworth Park Light Rail station
	Smilax glyciphylla	Sweet Sarsaparilla	Y		Royal Botanic Gardens

Appendix 3

Fauna species recorded in the LGA+

Frogs
Striped Marsh Frog
Common Eastern Froglet
Green and Golden Bell Frog#
Eastern Dwarf Tree Frog
Peron's Tree Frog

Mammals
Common Brushtail Possum
Common Ringtail Possum
Long-nosed Bandicoot ^
Grey-headed Flying-fox#
Black Flying-fox
Gould's Wattled Bat
(Eastern Bent-wing Bat#)
Eastern Freetail Bat
(Southern Forest Bat)
Little Forest Bat
Black Rat*
Brown Rat*
House Mouse*
Red Fox*
Feral Cat*

Reptiles
Eastern Long-necked Turtle
Eastern Water Dragon
Elegant Snake-eyed Skink
Dark-flecked Garden Sunskink
Pale-flecked Garden Sunskink
Weasel Skink
Gully Skink
Eastern Water Skink
Bar-sided Skink
Eastern Blue-tongue
Red-bellied Black Snake

Birds
Australian Wood Duck
Black Swan
Plumed Whistling Duck
Hardhead
Pacific Black Duck
Mallard*
Grey Teal
Chestnut Teal
Australasian Grebe
Australasian Darter
Little Black Cormorant
Pied Cormorant
Little Pied Cormorant
Australian Pelican
White-faced Heron
Cattle Egret
Eastern Great Egret
Striated Heron
Australian White Ibis
Royal Spoonbill
White-bellied Sea-eagle
Nankeen Kestrel
Peregrine Falcon
Black-shouldered Kite
Buff-banded Rail
Dusky Moorhen
Purple Swamphen
Eurasian Coot
Black-winged Stilt
Black-fronted Dotterel
Masked Lapwing
Silver Gull
Spotted Turtle-dove*
Rock Dove*
Crested Pigeon
Yellow-tailed Black Cockatoo
Sulphur-crested Cockatoo
Little Corella
Galah
Rainbow Lorikeet
Eastern Koel
Channel-billed Cuckoo
Powerful Owl#
Barn Owl
Tawny Frogmouth
Laughing Kookaburra
Superb Fairy-wren
Little Wattlebird
Red Wattlebird
Noisy Miner
New Holland Honeyeater
White-plumed Honeyeater
Red-whiskered Bulbul*
Rufous Whistler
Willie Wagtail
Black-faced Cuckoo-shrike
Australasian Figbird
Grey Butcherbird
Australian Magpie
Pied Currawong
Magpie-lark
Australian Raven
Nutmeg Mannikin*
Welcome Swallow
Tree Martin
Australian Reed-warbler
Silvereye
Common Myna*
Common Starling*
White-headed Pigeon

+ records from Dec 2010–June 2012 only

#threatened species under the TSC and/or EPBC Act

^endangered population in Inner West under the TSC Act (does not currently apply to the City LGA)

*introduced species

( ) unconfirmed record

Appendix 4

Community consultation results

Introduction

The community consultation aspect of the Urban Ecology Survey and Strategic Action Plan project was managed by Dr Lynda Kelly of Australian Museum Business Services (AMBS) in conjunction with Glenn Muir (AMBS) and Katie Oxenham (City of Sydney). Community input was received in two ways:

1. Three in-depth consultations with community groups: Blue Wren Group (29 November 2010); Pyrmont Ultimo Landcare (8 December 2010) and Rozelle Bay Nursery Group (15 December 2010). Meetings were held onsite with total participation of approximately 28 people.
2. An online survey (via Survey Monkey) open from 15 October 2010 to 17 January 2011 with total response rate of 231.

COMMUNITY GROUP CONSULTATION FINDINGS

Three community meetings were held over November/ December 2010 with Blue Wren Group; Pyrmont Ultimo Landcare and the Rozelle Bay Nursery Group. Meetings were held at each organisation with total participation of approximately 28 people. These groups were chosen as they were considered interested, informed and engaged in the issues and seen as community leaders (and therefore increase buy-in to the strategy).

The discussion was kept open-ended in order to solicit key issues for the Strategy from each organisation's perspective. Responses were grouped around four key theme areas: policy, procedures, education and training, and community resources.

Policy

There was a strong sense across the groups the Council needed an over-arching policy for biodiversity, and a feeling that the approach to date has been fairly ad hoc.:

> *"[An] overarching policy will help different departments work together and make consistent decisions"*
>
> *"Need to know what [Council] stand for, engage with other land managers and take the opportunities"*
>
> *"Open the conversations"*
>
> *"Encourage biodiversity as a basic principle"*
>
> *"Focus on more than just threatened species … philosophy of sustainable populations of common and engaging species"*

There was also a recognition that the policy (and resulting processes) need to be owned across Council – by staff as well as contractors. It was felt that a policy would help in breaking down (perceived) silos in Council as well as providing one consistent and findable point of contact, given the complexity and diversity of areas Council is involved with. This contact point should be sufficiently senior in role in order to have some influence over Council policy, to be able to coordinate across Council and provide information and guidance to other areas of Council and remove blockages (both regulatory and financial):

> *"Ownership is key. [You] only need the one staff to oversee, need people on the ground also"*

It was suggested that the policy have a high level goal of increasing biodiversity through *"Encouraging the establishment and maintenance of a diverse flora and fauna".* This goal can be used to persuade others to get on board and underpin Council's work in this area as well as increase the influence of Council across other Trusts and Government agencies that operate within Sydney LGA.

It was noted that biodiversity is a major global issue that needs action at the highest levels of Government:

> *"[Biodiversity] needs to be factored in urban landscape as we all live there now [and strive for] aesthetic values in our contact with the natural world"*

Procedures

Closely linked with, and stemming from, the policy issue were many suggestions of both concrete and high-level procedural decisions that could be considered and implemented. These were specifically around contractors, plantings and companion animals.

The use of **contractors** in site maintenance was a noticeable talking point across all groups (and was recognised that this is an area Council is also grappling with). Key concerns were around who the contractors have in their employ; what qualifications were held by personnel and whether there is sufficient regard to considering and understanding the importance of maintaining biodiversity. It was felt that the lines of communication between Council, contractors and volunteers needed to be improved (with suggestions under Policy also relevant here). This area needed to have a more consistent approach with better checking of qualifications and skills of those employed via contract and the desire expressed for less contractors and more staff:

"[Need] more informed and in-house Council staff rather than contractors"

There were a range of suggestions and questions regarding the issue of **plantings**:

- Create incentives such as garden competitions, free collars for cats, community nursery
- Could there be assistance provided to remove exotic/noxious plants rather than residents having to pay?
- Noxious weeds – need clearer idea of who enforces Council's requirements, given that DPI administers the Noxious Weeds Act
- Could Council establish a native nursery focusing on local area plants? Would generate savings for Council and a resource for the local community. Needs to be well-publicised and a place for residents to get advice on plantings. This would:

  "Promote the growing of appropriate plants for the City plus encourage volunteers (such as the homeless, those with disabilities) to work there"

- Identify areas for indigenous plantings and habitats:

  "[In the strategy] look for corridors and opportunities for creative plantings; think about the types of plants; include offsets as a requirement in large developments"

  "[Look at] opportunities for more wetlands – do more walkways"

  "Increasing the canopy not always a good solution, eucalypts good for light and filtered shade and habitat"

The problem of **companion animals** generally, and cats specifically, were raised across each group:

"What is Council's policy on cats and what to do about them? Could there be a 'one animal' policy introduced?"

It was recognised that this is an emotive issue and felt that education was probably the best way to manage it. Coupled with this was the recognition that Council needs to address the broad issue of feral animals, specifically foxes, cats and rabbits.

Other procedural issues/questions raised were:

- Urban ecology is a dynamic thing – when do you survey? Past, present or future?
- Look at the biggest changes to the area and track the effects (examples cited here were the development of the Children's Hospital into high-rise; increase in introduced species such as Indian mynahs; 70s gum tree planting encouraging currawongs and loss of small birds; increased urbanisation; concrete replacing greenery)
- Can a mangrove swamp be established?
- How do we encourage water rats? Are they a suitable species for the LGA?
- *"Council needs to assert its authority in the Harold Park area"*

Education and Training

The third area to emerge from the community group consultations were ideas around education, which mainly focused on involving school and university students; and training of contractors and staff:

"Education is not done. Build education into the strategy

"Involve local schools in the survey. [Encourage] school projects"

Training ideas centered around Council staff and contractors:

"Council policy needs to be supported by internal [staff] and contractors training. [this will] lead to community education and how to engage in conversation with residents"

"Educate contractors about relocation [of plants rather than just removing them] for example"

"[Training enables] staff [to] make informed judgment and have the language to talk to residents"

Community Resources

The final area from the consultations was community resources, which included suggestions of individual and groups to contact, including other councils/LGAs:

"Look at what others do and learn from that"

"Leichardt Council a good model to look at"

"Do a tour of Leichardt Council – learn from them"

- Share contacts within authorities such as RTA, DPI, Maritime, etc – central database suggested
- Look at programs offered by the Observatory Hill Environmental Education Centre (http://www.observhill-e.schools.nsw.edu.au/Site/Home.html)
- Dr Tony Larkum, marine biologist living in Glebe (alarkum@bigpond.net.au) re-established Rozelle Bay/Blackwattle bay mangroves
- The Hindmarsh's have a comprehensive bird list (via Pyrmont Ultimo Landcare)
- Develop relationship with Leichardt Nursery?
- Talk to Sydney University about their reptile surveys
- The submission by Pyrmont Ultimo Landcare to Sustainable Sydney 2030 (http://www.cityofsydney.nsw.gov.au/2030/)

ONLINE SURVEY FINDINGS

A relatively simple survey was developed to seek broader feedback about the proposed Action Plan. Questions were developed in conjunction with Katie Oxenham and input from Council's Communications Department. The survey was placed on the City of Sydney website (http://www.cityofsydney.nsw.gov.au/Environment/Biodiversity/UrbanEcologySurvey.asp - note it has been removed as now closed) and was broadly advertised via the City of Sydney website, community groups, chambers of commerce, libraries and media releases/stories. An online tool, Survey Monkey, was used to collect and analyse responses. This report details the key findings, with a copy of the full results provided to Council (via Katie Oxenham).

Sample[1] details

A total of 231 responses[2] were received as follows:

- 36% male and 64% female
- Good age range:
  - 34% aged 35-49 years
  - 27% aged 25-34 years
  - 26% aged 50-64 years
  - 7% aged over 65
  - 5% under 25 years
- 50% identified as residents; 27% as workers; 14% interested in biodiversity (but not living/working in Sydney), and 9% ticked 'Other'. Of residents:
  - 46% lived in area more than ten years
  - 23% more than five, less than ten years
  - 21% more than one, less than five years
  - 9% less than one year

Seventy-nine percent of respondents were interested in being kept up-to-date on the Strategy – these names and email addresses have been supplied to Council separately.

Listing any interesting/unusual animals

The first question asked people to list any animal sightings. 98 responses were received which have been passed to AMBS Ecology to incorporate in their field survey findings.

Interest in participating in biodiversity-related activities

The aim of this question was to see overall what kinds of biodiversity activities were of broad interest to respondents. This was a multiple response question, with a total of 515 responses as follows:

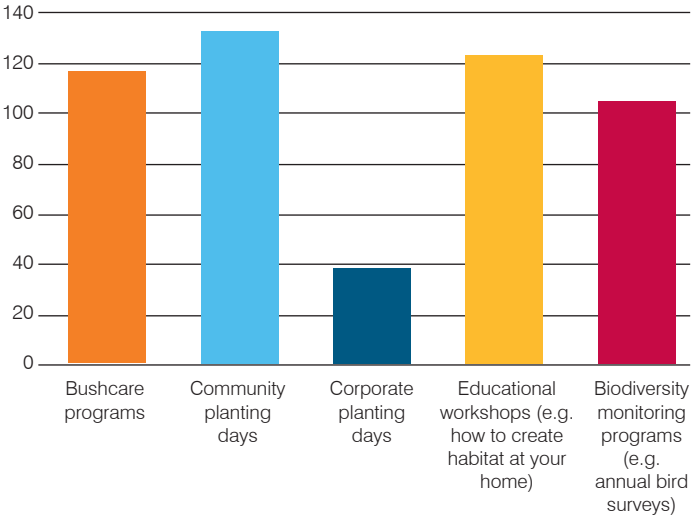
- 26% Community planting days
- 24% Educational workshops
- 22% Bushcare programs
- 20% Biodiversity monitoring
- 7% Corporate planning days

1 A note on sampling: This is a self-selected sample which means the findings can be biased. However, this method has resulted in more high quality and detailed responses as participants are interested and engaged in the topic. However, it is recommended that results be viewed with this in mind.

2 Note that responses don't always add to 100 due to rounding errors and some non-responses

Chart 1: Interest in biodiversity activities

Are you interested in participating in any of the following biodiversity-related activities within the City of Sydney council area?



There was also an option to add comments. 22 comments were received with specific feedback as follows:

- *I'd be interested in 'bat box' distribution days*
- *Already involved with Pyrmont/Ultimo Landcare*
- *Programs aimed at people keeping their cats in their own backyards*
- *Bush tucker community gardens as part of community gardens*
- *Giving talks at the primary and secondary schools to educate people on these important issues*
- *Already involved. Would like to learn about foreshore wildlife*
- *Education about microclimates in local parklands and what the Council is trying to regain or emulate from the wild*
- *Education to reduce the use of pesticides that can damage ecosystem and on keeping cats indoors*
- *Wildlife rescue and care groups*
- *Wildlife caring*
- *Providing information or conducting workshops for school children*
- *Ecological studies before development on remnant bush-Pyrmont last stage of Jacksons Landing did not do this and the last refuge was destroyed without any survey*

Rating importance of activities to improve biodiversity

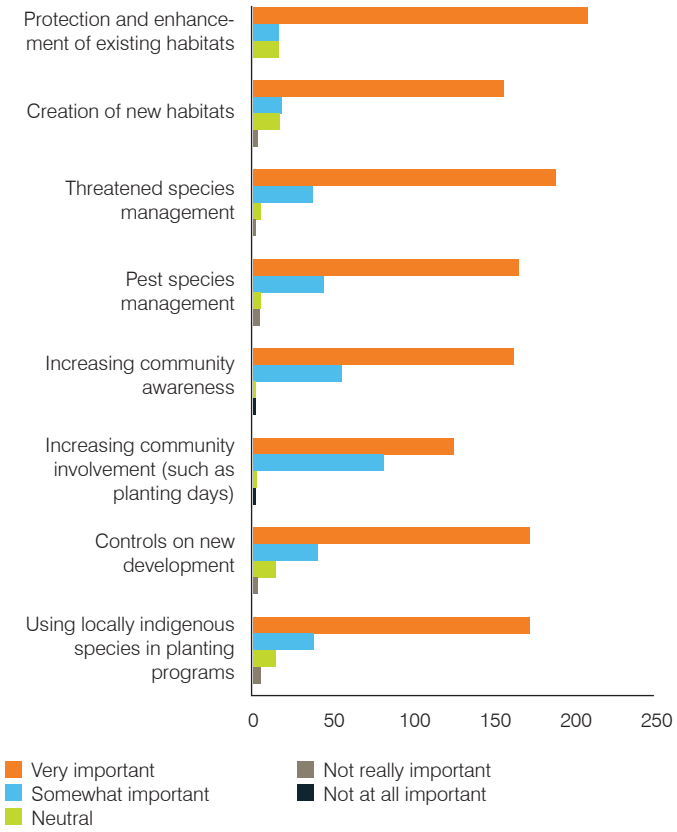
A set of activities were provided for respondents to select the level of importance to them, shown in Table 1. Overall, respondents thought all activities were important, with *Protection and enhancement of existing habitats* being seen as the most important (91% rating as very important) followed by *Threatened species management* (82% rated very important).

Table 1: Rating of importance of activities (in order of highest to lowest)

	Very Important %	Somewhat Important %	Neutral %	Not really important %	Not at all important %
Protection and enhancement of existing habitats	91	7	2	0	0
Threatened species management	82	16	2	0	0
Using locally indigenous species in planting programs	75	17	6	2	0
Controls on new development	75	17	6	1	0
Pest species management	71	24	4	0	0
Creation of new habitats	68	24	7	1	0
Increasing community involvement	55	35	9	1	0

Chart 2: Rating importance of activities (in order of how asked in survey)

How important are the following activities to you in terms of improving biodiversity in the City of Sydney council area?



Other issues they'd like Council to address

This was an open-ended question with 93 responses received – many were extremely detailed (the full list of responses to this question is attached as a pdf file). Responses were categorised under three of the areas identified from the community consultation meetings – policy; procedure and education. Each separate response was counted (with a total of 515 responses overall).

85% made a comment about **procedure**, which included a broader range of issues than from the community group consultations, including:

- Roof gardens;
- Waste management/composting;
- Water recycling and management (including rainwater);
- Air and water quality; transport issues;
- Provision of nesting boxes; and
- Wildlife corridors.

Sample comments:

"I think a food strategy would be good that places the emphasis on creating an alternative food source in the urban environment" (#30)

"Bringing in by laws to prevent people from allowing dogs and cats to wander and therefore kill or harm local wildlife …" (#35)

"I am always shocked by how much rainwater is lost in the Sydney area to the point where you have floods created by the back up. If every structure was fitted with tanks that could capture this water that could be used for laundry/ toilet or the garden it would [mean] less water would need to be taken from the country areas…" (#74)

"I would like to see construction [of] functional wetlands in Inner City parks that include frog habitat … The ponds could include small areas of mud which are essential for swallows and some native wasps to build their nests." (#96)

10% of responses related to **education and training**:

"Perhaps a leaflet or other education/awareness strategy included in rates notices or with the Lord Mayor's newsletter that provides some information about flora and fauna that is indigenous to the area" (#36)

"Schools can be a vital part of developing community awareness. Council should make an effort to make a contact in each school (other than the busy principal) and develop programs to involve students" (#5)

"I commend the City for finally adding a Biodiversity Officer to the team and think that community education is the key" (#38)

5% of responses related to **policy** areas Council should address for example:

"The installation of a biodiversity committee made up of community representatives (with an interest and skills) to act as a support decision making body…" (#65)

"Placing weight on priorities and fixing strategies to a detailed implementation plan which includes funding" (#88)

Report prepared by Dr Lynda Kelly, AMBS, 9 February 2011

Appendix 5

Identification of biodiversity values

Site	Size	Landscape	Vegetation Structure	Canopy cover	No. indigenous flora species	Naturally occurring flora species	Fauna values	Potential to increase biodiversity	Other values or notes	Overall biodiversity values in LGA context (high, medium, low)
Sydney Park, St Peters	Large	Undulating land on site of former landfill	Mostly canopy and lawn, with understorey in some sections	Variable; very high in woodland plantings	>100	<5 (wetland species)	High	High	Large area; large freshwater wetlands contribute to high fauna values; very high diversity of indigenous flora species, but local vegetation focus lacking, and woodland plantings generally lacking understorey. High public use; dog-off leash area.	High
Royal Botanic Gardens (RBG) and Domain (Yurong Precinct)	Large	Foreshore land with some natural sandstone outcrops	All layers	>30%	>90	c.25	High	High	Sandstone outcrops with forest remnants; remnant trees of Coastal Swamp/Alluvial Forest EEC and other naturally occurring species; extensive indigenous plantings of local provenance; actual native species richness in RBG much higher. Ponds, themed plantings and sandstone outcrops contribute to high fauna values. High public use, but access to RBG generally restricted to day time. Dogs prohibited.	High
Bicentennial, Federal and Jubilee Parks, AV Henry Reserve, Glebe	Large	Reclaimed land on waterfront with concrete-lined stormwater canal; bush restoration sites and estuarine habitat	Mostly canopy and lawn, with understorey in some sections	Variable	>100	c. 15	Medium	High	Coastal Saltmarsh EEC and mangrove forest; diverse indigenous plantings in several bush restoration sites established and maintained by volunteers; connectivity with several adjoining parks values. Sandstone outcrops and other rocky habitat contribute to fauna values. High public use; partially dog off-leash area.	High
Moore Park (Mt Steel, Moore Park Golf, Lake Kippax)	Large	Undulating hills, sandy soils, some sandstone at surface around Mt Steel; low-lying, flat, completely modified terrain around Lake Kippax	Mostly canopy and lawn, with understorey in some sections	>30%	20–40 recorded but likely >40	2	Low	High	Extensive turf areas; historic fig plantings and more recent indigenous native plantings. Connectivity to adjacent Centennial Park. Dogs prohibited in Moore Park Golf and Lake Kippax; Mt Steel is dog off-leash.	High
Garden Island (northern end), Woolloomooloo	Large	Modified foreshore ridge-top with sandstone cliff	All layers	>30%	>40	13	Medium	Medium	Coastal Sandstone Outcrop with high number of naturally occurring species. Restricted access. Dogs prohibited.	High
Saunders Street Open Space, Jones St Pocket Park and light rail corridor, Pyrmont	Small	Bush restoration sites adjoining sandstone cliffs and steep slopes	All layers	>30%	>40	c.10	Medium	Medium	Significant sandstone cliff habitat with naturally occurring species; mostly indigenous plantings at several adjoining bush restoration sites established and maintained by volunteers; heavy weed infestation along light rail corridor.	High

Site	Size	Landscape	Vegetation Structure	Canopy cover	No. indig-enous flora species	Naturally occurring flora species	Fauna values	Potential to increase biodiversity	Other values or notes	Overall biodiversity values in LGA context (high, medium, low)
Orphan School Creek, Forest Lodge	Medium	Modified creekline gully	All layers	<30%	>80	3	Medium	Medium	Modified, dry creek line and adjoining bush restoration site; good diversity of indigenous plantings, particularly shrubs and groundcovers, and possible remnant tree of Sydney Turpentine Ironbark Forest EEC. Potential connectivity to Federal and Bicentennial Parks. Fencing and steep slopes restrict public access to some sections.	High
Wentworth Park Light Rail Station	Small	Bush restoration site adjacent to light rail line; modified sandstone outcrop on southern side	All layers	<10%	>46	0	Medium	Medium	Bush restoration site established and maintained by volunteers, with diverse plantings and adjoining sandstone outcrops; some connectivity with other bush restoration sites in Pyrmont via the light rail corridor.	High
Embarkation Park and McElhone Stairs, Potts Point	Medium	Tiered park on carpark roof adjoining modified sandstone cliffs	All layers	<10%	>40	4	Low	High	Diverse native plantings in park, but many encourage common, aggressive indigenous fauna; adjoining sandstone cliff habitat subject to weed invasion but also supports naturally occurring species.	Medium
Clyne Reserve, The Rocks	Small	Hilltop site, sandstone outcropping at surface	Mostly canopy and lawn	>30%	<20	1	Low	High	Mostly native plantings; understorey currently sparse. Dog on-leash area.	Medium
Alexandria Park, Alexandria	Small	Completely modified, inner city park	Mostly canopy and lawn	>30%	<20	0	Medium (due to Long-nosed Bandicoot)	Low	Good fig canopy, similar to many other City parks. Limited potential for understorey plantings or other habitat enhancements given formal design and existing range of uses. Dog off-leash park.	Medium
Beare Park, Elizabeth Bay	Small	Reclaimed land on waterfront; limited sandstone outcrops	All layers	c. 30%	20–40	1	Low	Low	Potential to enhance sandstone plantings; diverse indigenous plantings close to playground. Dog off-leash from late afternoon until early morning.	Medium
Rushcutters Bay Park, Rushcutters Bay	Medium	Reclaimed land on waterfront; sandstone cliff at western edge.	Mostly canopy and lawn	<30%	<20	2	Medium, along western boundary	Low	Sandstone cliff with naturally occurring indigenous ferns; some potential to plant species representative of original swamp forest; historic plantings; high public use. Dog off-leash from late afternoon to early morning.	Medium
Pirrama Road, Pyrmont	Small	Modified sandstone cliff	Mostly ferns and herbs	<10%	<20	9	Low	Low	Significant sandstone cliff habitat with naturally occurring vegetation.	Medium
Woolwash Park, Zetland	Small	Constructed freshwater wetland connected to natural aquifer	Canopy and understorey (wetland species only)	>10%	<20	?	Medium	Low	Good representation of freshwater wetland habitat, currently scarce in the LGA; habitat value reduced by Mosquito Fish infestation.	Medium

Site	Size	Landscape	Vegetation Structure	Canopy cover	No. indigenous flora species	Naturally occurring flora species	Fauna values	Potential to increase biodiversity	Other values or notes	Overall biodiversity values in LGA context (high, medium, low)
Kirsova One Playground, park on corner of Swanson Street and Railway Pde and Burren St, Erskineville	Small	Completely modified pocket parks and road reserves	All layers	>30%	20–40	2	Medium	Low	Sites provide support for dense weedy habitat within the rail corridor.	Medium
Pirrama Park and Pyrmont Point Park	Medium	Reclaimed land on waterfront; minor sandstone cliff at southern end of park	Mostly canopy and lawn	<10%	c. 20	3	Low	Low	New park; mostly indigenous plantings; swales incorporate good range of indigenous sedges/grasses. High public use.	Medium
Argyle Street, The Rocks	Small	Steep sandstone cliff along road	Mostly canopy along street and ferns, herbs on cliff	>30%	<10	4	Low	Low	Significant sandstone habitat with large fern specimens; mixed plantings along bottom of cliff.	Medium
University of Sydney	Large	Completely modified university campus	Mostly canopy and lawn, with understorey in some areas	<30%	20–40 (estimate in limited area surveyed)	Possible	Medium	Medium	Mix of indigenous and exotic plantings including mature trees; increasing use of indigenous species in recent landscaping; well-vegetated small pond is representative of freshwater wetland habitat, currently scarce in the LGA; dogs prohibited.	Medium
Arthur McElhone Reserve, Elizabeth Bay	Small	Elevated park with large ponds above sandstone rock outcrop	All layers	<30%	30–40	5	Medium	Medium	Sandstone outcrop with naturally occurring species and possible remnant Dwarf Apple; rock habitat with ephemeral pools; mix of indigenous and exotic plantings in main park; well-vegetated ponds.	Medium
DH Foley Park and St Johns Anglican Church grounds, Glebe	Small	Completely modified park, and adjoining church grounds	Mostly canopy and lawn	>30%	<20	1	Low	Medium	Significant Grey Ironbark tree with Dichondra and Carex, possibly remnant of Sydney Turpentine Ironbark Forest EEC, in church grounds.	Medium
Blackwattle Bay Park, Glebe	Medium	Foreshore park with small sandstone outcrops and bush restoration sites	All layers	>10%	30–40	0	Medium	Medium	Diverse indigenous plantings reflecting likely original sandstone foreshore vegetation; connectivity to Bicentennial, Federal, Jubilee Parks etc. High public use; dog off-leash area.	Medium
Southern Cross Drive Reserve, Rosebery	Medium	Completely modified park	All layers	>30%	>40	Some may have colonised	Low	Medium	Corridor values, close proximity to Moore Park; diverse native plantings; low public usage.	Medium

Site	Size	Landscape	Vegetation Structure	Canopy cover	No. indigenous flora species	Naturally occurring flora species	Fauna values	Potential to increase biodiversity	Other values or notes	Overall biodiversity values in LGA context (high, medium, low)
Lewis Hoade Reserve, Forest Lodge	Small	Narrow pocket park along sandstone outcrop	All layers	>30%	c. 40	c.12	Medium	Medium	Significant sandstone outcrop habitat with naturally occurring species; old Bangalay at eastern end possibly remnant of Alluvial Forest EEC; connectivity with AV Henry, Federal, Jubilee, Bicentennial Parks; small natural pool in rock shelf.	Medium
The Anchorage, Glebe	Small	Bush restoration site along Glebe foreshore; small rock outcrop in south east corner	All layers	>10%	c. 40	c. 5–10	Medium	Medium	Connectivity with Blackwattle Bay Park and Bicentennial Park etc. Bush restoration site maintained by volunteers.	Medium
John Street Reserve, Glebe	Small	Completely modified pocket park. Proposed site of demonstration habitat garden	Most canopy and lawn	c. 30%	<10	0	Low	Medium	Has the potential linkage value with the demonstration habitat garden. Low public use and quiet.	Low
Arundel Street Reserve, Forest Lodge	Small	Completely modified park	Mostly canopy and lawn with some understorey plantings	<30%	c.10	?	Medium	Low	Includes Melaleuca's and a mix of grasses and herbs. Low public use and small size. Potential support to linkage area.	Low
Larkin Street Park, Forest Lodge	Small	Completely modified park	Mostly canopy and lawn, with understorey in some sections	<30%	<20	0	Medium	Medium	Potential for increasing understorey plantings in perimeter of park to have some habitat value.	Low
Arthur (Paddy) Grey Reserve, Forest Lodge	Small	Park surrounding sandstone outcrop with some seepage; bush restoration site	All layers	>30%	c. 40	4	Medium	Medium	Sandstone outcrop habitat with some (sparse) naturally occurring species; good range of indigenous plantings, mostly undertaken by volunteers.	Medium
Bannerman Crescent Reserve, Rosebery	Small	Suburban pocket park	All layers	>10%	c. 30	0	Medium	Medium	Recently planted; good range of indigenous shrubs and small trees; low usage. Connectivity with other indigenous plantings along Southern Cross Drive and golf courses etc to the east.	Medium
Perry Park, Alexandria	Medium	Completely modified park	Mostly canopy and lawn	c.30%	20–40	0	Medium	Medium	Potential for increasing understorey plantings; connectivity to weedy Sydney Water easement that has some habitat values.	Medium
Eddie Ward Park, Surry Hills	Small	Completely modified park	Mostly canopy and lawn	<30%	20–40	0	Low	Low	Mix of indigenous and exotic plantings; groundcover mostly exotic; high public use.	Low

Site	Size	Landscape	Vegetation Structure	Canopy cover	No. indig-enous flora species	Naturally occurring flora species	Fauna values	Potential to increase biodiversity	Other values or notes	Overall biodiversity values in LGA context (high, medium, low)
Joynton Road and side streets to Joynton Park e.g. Morris Grove, Zetland	Small	Completely modified streetscape	Mostly canopy	>30%	<20	0	Low	Low	Swales planted with limited range of indigenous sedges/ grasses beneath tree canopy in middle of side streets.	Low
Argyle Place Park	Small	Completely modified pocket park	Mostly canopy and lawn	>30%	<10	0	Low	Low	Mostly indigenous canopy.	Low
Hyde Park	Medium	Completely modified, formally landscaped park	Most canopy and lawn	>30%	<20	Few ground-covers	Low	Low	Extensive fig canopy; formal design, high public use.	Low
Observatory Hill	Medium	Elevated, completely modified park	Mostly canopy and lawn	>30%	<10	0	Low	Low	Historic fig plantings.	Low
Fitzroy Gardens, Kings Cross	Small	Completely modified pocket park	Mostly canopy only	>30%	<10	0	Low	Low	Formal plantings; high public use.	Low
Macleay Reserve, Elizabeth Bay	Small	Completely modified	Mostly canopy and lawn	<30%	<10	0	Low	Low	Mostly indigenous plantings; uncommon Ironbark planted locally.	Low
Dawes Point, The Rocks	Small	Completely modified, waterfront site	Mostly canopy and lawn	<30%	<10	0	Low	Low	Both indigenous and exotic canopy.	Low
Ballarat and Darling Island Park, Pyrmont	Small	Completely modified, waterfront sites	Mostly canopy and lawn	<30%	<10	0	Low	Low	Mostly indigenous species.	Low
Turruwul Park, Rosebery	Small	Completely modified	Mostly canopy and lawn	>10%	<20		Low	Low	Sport and other recreational facilities; high public use.	Low
Cook+Phillip Park	Small	Highly modified	Canopy, lawn and understorey	>30%	<20	0	Low	Low-Medium	Formal landscaping; high public use; dog off-leash area.	Low
Kimberley Grove Reserve, Rosebery	Medium	Pocket park on ridge-line	Mostly canopy and lawn	>10%	<20	0	Low	Medium	One of several parks in Rosebery with potential to improve the habitat value of the local area.	Low
Oatley Reserve, Paddington	Small	Slope with sandstone exposed at surface	Mostly canopy and lawn	<30%	<20	3 or 4	Low	Medium	Potential for increased indigenous plantings; low public use apart from playground at southern end.	Low
Stewart St Closure, Paddington	Small	Completely modified pocket park	Canopy and lawn	>30%	<10	1	Low	Medium	Mostly indigenous plantings; some potential for infill understorey planting.	Low

Site	Size	Landscape	Vegetation Structure	Canopy cover	No. indigenous flora species	Naturally occurring flora species	Fauna values	Potential to increase biodiversity	Other values or notes	Overall biodiversity values in LGA context (high, medium, low)
Lawrence Hargreave Reserve, Kings Cross	Small	Park on top of car park	Mostly canopy and lawn	<30%	c.20	2	Low	Medium	Mostly indigenous plantings, but understorey very sparse.	Low
Joynton and Tote Parks, Zetland	Small	Completely modified park	Mostly canopy and lawn	>10%	<20	0	Low	Medium	Swales with good range of indigenous sedges/grasses and large sandstone boulders, but dry conditions reduce habitat value.	Low
Forbes Street Precinct – closed areas between Nicholson Street and Cathedral Street and Wallamulla Park	Small	Completely modified sites including pocket parks	Mostly canopy and lawn	>30%	<20	0	Low	Medium	Potential for indigenous plantings in several pocket parks/ open space adjoining rail viaduct.	Low
Cooper Street Closure and some adjoining areas, Surry Hills	Small	Completely modified site	Mostly canopy and lawn	>30%	<10	0	Low	Medium	Mostly exotic plantings but potential to establish indigenous understorey.	Low
Pyrmont Bay Park	Small	Completely modified foreshore park	Mostly canopy and lawn	>30%	<10	0	Low	Medium	Existing garden beds sparsely planted.	Low
Dibbs Street and Jack Shuttleworth Reserves, Erskineville	Small	Small pocket parks	Mostly canopy and lawn	>30%	20–40	0	Low	Low	Reasonable local canopy connectivity between parks, gardens, streets and rail corridor. Potential to increase diversity and density of plantings.	Low
Erskineville rail corridor (as viewed from edges, Swanson St to Bridge St)	Small	Weed-infested rail corridor	Few trees, dense understorey	<10%	<10	Potentially 2–3	Medium	Medium	No access to corridor for survey. Very weedy, little potential for naturally occurring flora but dense vegetation has fauna habitat value; substantial potential for bush restoration; connectivity between Sydney Park and University of Sydney.	Low

Appendix 6

Annual bush restoration and habitat enhancement program principles

The annual bush restoration and habitat enhancement program will:

- Focus on priority sites and supporting sites, but also include under-utilised or publicly inaccessible sections of other parks, particularly where these are along or near the potential linkages indicated in Figure 17;
- Initially focus on infill planting and other habitat enhancement within existing garden beds that are characterised by indigenous vegetation, with subsequent expansion and consolidation wherever possible without compromising existing site use; and
- Incorporate the following planting principles:
  - Species from the likely original vegetation communities, and/or other indigenous species that have identified value as habitat for priority fauna species (refer Appendix 8) are to be used wherever possible and compatible with the existing site conditions;
  - Species from other indigenous vegetation communities may also be incorporated if considered better suited to site conditions;
  - Other indigenous species that have identified value as habitat for priority fauna species may also be incorporated;
  - Where new trees are required, they are to be planted at a minimum 50 metre spacing to maximise the potential for understorey development;
  - A mix of understorey species (shrubs, grasses, sedges, vines/scramblers and groundcovers) is to be used to improve plant diversity and habitat complexity;
  - The density of new plantings, particularly groundcover species, is to be maximised in order to stabilise and increase ecological function of the soil, and minimise potential for weed invasion;
  - Local provenance stock, preferably propagated from seed, is to be used wherever possible;
  - The use of hybridised plants, large-flowering plants and soft-fruiting plants is to be avoided;
  - The use of bipinnate Acacias is to be maximised;
  - The exact mix of species to be planted is to be based on site-specific advice obtained from a qualified and experienced bush regeneration specialist, with reference to this document and the user-friendly *Habitat Creation Guide*, once developed (refer Section 4.2.4);
  - Plants are to be sourced from local nurseries that specialise in indigenous species of local provenance, in order to increase the range and genetic diversity of species available for planting; and
  - The potential for seed to be collected from new sources, such as the Yurong Precinct of the Domain, Sydney Harbour National Park, Centennial Parklands and similar, is to be investigated to increase the diversity of locally indigenous species propagated at local nurseries and available for planting.
- Incorporate habitat enhancements for priority fauna species and other fauna as outlined in Section 4.3.3, wherever possible and appropriate based on specialist ecological advice; and
- Include the installation of temporary fencing around habitat plantings to prevent access by dogs and park users during the plant establishment phase, and identify the need for permanent fencing.

Appendix 7

Bush restoration management plan requirements

The Bush Restoration Management Plan will:

- Include a map indicating the the locations of:
  - Identified naturally occurring vegetation, including possible remnants; and
  - Existing and proposed future bush restoration sites.
- Identify the areas where the City's volunteers work and provide support for difficult tasks such as the removal of noxious weeds in difficult access areas.
- Specify the requirement for maintenance to be undertaken by or under the supervision of qualified and experienced bush regeneration specialists;
- Require that all City staff and contractors involved in park and streetscape maintenance undergo an induction to ensure they are familiar with the contents and requirements of the plan;
- Specify a regular program of monitoring, maintenance and reporting on the condition of bush restoration and habitat enhancement sites, to enable any issues to be addressed as early as possible;
- Specify the particular maintenance practices that require implementation in accordance with best practice bush regeneration and biodiversity management techniques, including:
  - Installation of at least temporary fencing around all bush restoration sites during the plant establishment phase, to minimise the potential for trampling and vandalism;
  - Watering as required during the plant establishment phase;
  - Exclusion of mowing and brush-cutting;
  - Restrictions on herbicide use, particularly around wetlands, drainage lines and sandstone cliffs and outcrops;
  - Manual removal of weeds and other inappropriate species;
  - Installation of timber edging, paving or similar to create a defined maintenance edge;
  - Encouraging natural regeneration where possible;
  - Undertaking supplementary planting with locally indigenous species from the relevant likely original vegetation communities and other species listed in Appendix 8 and the *Habitat Creation Guide*, when developed (refer Section 4.2.4);
  - Retaining fauna habitat features such as dense understorey vegetation, rocks, fallen timber and other woody debris, leaf litter, mistletoe and tree hollows wherever possible;
  - Ensuring that dead/hollow indigenous trees/branches that have to be removed for safety or aesthetic reasons from, are distributed at bush restoration and habitat enhancement sites (cut into pieces if required);
  - Ensuring that removal of dense vegetation (including weeds), where required, is undertaken in stages, with each stage followed by replacement planting of locally indigenous species or other species of similar habitat value to compensate for the vegetation removed, and that the next stage of vegetation removal does not take place until the replacement planting has established; and
  - Ensuring that shrubs are pruned lightly, when necessary, outside of bird nesting season.
- Outline a specific program of staged weed removal to protect naturally occurring vegetation on sandstone cliffs and outcrops throughout the LGA, along with replacement planting where possible using species from the Sandstone Cliff Soaks community (Appendix 8); and
- Outline a specific program for collection and propagation of seed from possible remnants and other naturally occurring vegetation within the LGA for subsequent use in the annual bush restoration and habitat enhancement program.
- Include a list of common weed species which should be removed, including methods for their removal.

Appendix 8

Species to be considered in bush restoration and other habitat enhancement programs

The following species lists, which should be used in conjunction with Figure 5 Soil Landscapes of the LGA, include:

- The likely original vegetation communities of the LGA, based on Tozer *et al*. (2010), DECCW (2009) and various NSW Scientific Committee final determinations for endangered ecological communities; and
- Coastal Escarpment Littoral Rainforest and a range of species suitable for water-sensitive urban design (WSUD), based on EPA (1997), that may not have originally occurred in the LGA, but occur elsewhere in Sydney, provide good habitat and/or may be better suited to current conditions at some sites than the likely original communities.

It should be noted that not all species are readily available, and many are difficult to propagate and grow. The *Habitat Creation Guide* (Section 4.2.4) will provide more information in this regard.

Vegetation Community	Description and Soil Landscape	Tree Layer	Small Tree/ Shrub Layer	Ground Layer	Vines/Climbers
Sydney Turpentine Ironbark Forest	A diverse eucalypt forest with an open shrub layer and grassy groundcover. occupies undulating terrain and broad ridgetops on shale up to 500m ASL. Blacktown Soil Landscape Unit	*Angophora costata* *Angophora floribunda* *Allocasuarina torulosa* *Eucalyptus punctata* *Eucalyptus pilularis* *Eucalyptus paniculata* *Eucalyptus eugenioides* *Eucalyptus globoidea* *Eucalyptus resinifera* *Syncarpia glomulifera* *Exocarpos cupressiformis*	*Acacia decurrens* *Acacia falcata* *Acacia floribunda* *Acacia implexa* *Acacia longifolia* *Acacia parramattensis* *Breynia oblongifolia* *Bursaria spinosa* *Clerodendrum tomentosum* *Desmodium rhytidophyllum* *Dodonaea triquetra* *Einadia hastata* *Glochidion ferdinandi* *Goodenia hederacea* *Kunzea ambigua* *Leucopogon juniperinus* *Maytenus silvestris* *Myrsine variabilis* *Notelaea longifolia* *Omalanthus populifolius* *Ozothamnus diosmifolius* *Persoonia linearis* *Pittosporum revolutum* *Polyscias sambucifolia* *Zieria smithii*	**Herbs:** *Centella asiatica* *Dianella caerulea* *Dichondra repens* *Hibbertia aspera* *Hydrocotyle peduncularis* *Pratia purpurascens* *Pseuderanthemum variabile* *Veronica plebeia* *Wahlenbergia gracilis* **Grasses:** *Aristida vagans* *Austrodanthonia tenuior* *Cymbopogon refractus* *Echinopogon species* *Entolasia marginata* *Entolasia stricta* *Microlaena stipoides* *Oplismenus aemulus* *Oplismenus imbecillis* *Setaria (Paspalidium) distans* *Poa affinis* *Themeda australis* *Poa affinis* **Sedges/Rushes:** *Carex inversa* *Cyperus gracilis* *Gahnia aspera* *Lomandra filiformis* *Lomandra longifolia* **Ferns:** *Adiantum aethiopicum, Cheilanthes sieberi* *Doodia aspera*	*Billardiera scandens* *Clematis glycinoides* *Commelina cyanea* *Eustrephus latifolius* *Glycine clandestina* *Glycine microphylla* *Hardenbergia violacea* *Kennedia rubicunda* *Pandorea pandorana*

Vegetation Community	Description and Soil Landscape	Tree Layer	Small Tree/ Shrub Layer	Ground Layer	Vines/Climbers
Coastal Sandstone Foreshores Forest and Coastal Shale Sandstone Forest	Open eucalypt forest on sheltered sandstone slopes along foreshores (maritime influence), often with some clay influence. Also shale-sandstone transitional areas away from foreshore. Moist shrub layer and groundcover of ferns, and grasses. Gymea, Hawkesbury or Lucas Heights Soil Landscape Units	*Angophora costata* *Banksia integrifolia* *Corymbia gummifera* *Eucalyptus botryoides* *Eucalyptus pilularis* *Eucalyptus piperita* *Eucalyptus resinifera* *Eucalyptus punctata* *Ficus rubiginosa*	*Acacia implexa* *Acacia longifolia* *Acacia linifolia* *Acacia suaveolens* *Acacia terminalis* *Allocasuarina littoralis* *Banksia spinulosa* *Breynia oblongifolia* *Ceratopetalum gummiferum* *Clerodendrum tomentosum* *Dodonaea triquetra,* *Elaeocarpus reticulatus* *Epacris longiflora* *Glochidion ferdinandi* *Hakea sericea* *Homalanthus populifolius* *Kunzea ambigua* *Leptospermum polygalifolium* *Leucopogon juniperinus* *Leucopogon lanceolatus* *Lomatia silaifolia* *Myrsine variabilis* *Notelaea longifolia* *Ozothamnus diosmifolius* *Persoonia levis* *Persoonia linearis* *Pittosporum revolutum* *Platysace linearifolia* *Podocarpus spinulosus* *Polyscias sambucifolia* *Pomaderris ferruginea* *Synoum glandulosum* *Zieria smithii* *Xanthorrhoea arborea*	**Herbs:** *Commelina cyanea* *Crassula sieberiana* *Dianella caerulea* *Dichondra repens* *Hydrocotyle peduncularis* *Pratia purpurascens* *Plectranthus parvifolius* *Pseuderanthemum variabilis* *Veronica plebeia* *Wahlenbergia gracilis* **Grasses:** *Dichelachne micrantha* *Dichelachne crinita* *Echinopogon caespitosus* *Entolasia stricta* *Microlaena stipoides* *Oplismenus aemulus* *Oplismenus imbecillis* *Poa affinis* *Themeda australis* **Sedges/Rushes:** *Cyperus gracilis* *Cyperus mirus* *Lepidosperma laterale* *Lomandra longifolia* **Ferns:** *Adiantum aethiopicum* *Calochlaena dubia* *Davallia solida var. pyxidata* *Pteridium esculentum*	*Cayratia clematidea* *Clematis glycinoides* *Eustrephus latifolius* *Glycine clandestina* *Glycine tabacina* *Hibbertia dentata* *Pandorea pandorana* *Smilax glyciphylla*

Vegetation Community	Description and Soil Landscape	Tree Layer	Small Tree/ Shrub Layer	Ground Layer	Vines/Climbers
Coastal Sandstone Ridgetop Woodland	A low eucalypt forest with a diverse sclerophyll shrub layer and open groundcover of sedges. Widespread on ridgetops and upper valley slopes. Lucas Heights, Gymea or Hawkesbury Soil Landscape Units	*Angophora costata* *Angophora hispida* *Corymbia eximia* *Corymbia gummifera* *Eucalyptus haemastoma* *Eucalyptus racemosa* *Eucalyptus sieberi* *Eucalyptus oblonga* *Eucalyptus sparsifolia* *Eucalyptus squamosa*	*Acacia linifolia* *Acacia suaveolens* *Acacia terminalis* *Acacia ulicifolia* *Allocasuarina distyla* *Aotus ericoides* *Baeckea diosmifolia* *Baeckea linifolia* *Banksia ericifolia* *Banksia marginata* *Banksia serrata* *Banksia spinulosa* *Bossiaea heterophylla* *Bossiaea obcordata* *Calytrix tetragona* *Darwinia fascicularis* *Dillwynia floribunda* *Dillwynia retorta* *Epacris longiflora* *Epacris microphylla* *Gompholobium grandifolium* *Grevillea mucronulata* *Grevillea sericea* *Grevillea speciosa* *Hakea dactyloides* *Hakea sericea* *Hovea linearis* *Isopogon anemonifolius* *Lambertia formosa* *Leptospermum trinervium* *Monotoca scoparia* *Persoonia levis* *Petrophile pulchella* *Persoonia pinifolia* *Platysace lanceolata* *Phebalium squamulosum* *Pultenaea tuberculata* *Pultenaea stipularis* *Ricinocarpos pinifolius* *Telopea speciosissima* *Xylomelum pyriforme* *Xanthorrhoea arborea* *Xanthorrhoea resinifera*	**Herbs:** *Actinotus helianthi* *Actinotus minor* *Dampiera stricta* *Mirbelia rubiifolia* *Patersonia sericea* *Scaevola ramosissima* *Xanthosia pilosa* **Grasses:** *Anisopogon avenacea* *Austrostipa pubescens* *Entolasia stricta* *Sedges/Rushes:* *Caustis flexuosa* *Cyathochaeta diandra* *Guringalia dimorpha* *Lepidosperma concavum* *Lepyrodia scariosa* *Lomandra glauca* *Lomandra gracilis* *Lomandra obliqua* *Schoenus imberbis* **Ferns:** *Lindsaea linearis*	*Cassytha pubescens*

Vegetation Community	Description and Soil Landscape	Tree Layer	Small Tree/ Shrub Layer	Ground Layer	Vines/Climbers
Coastal Sandstone Gully Forest (includes Sandstone Cliff Soaks[1] and and Coastal Enriched Sandstone Sheltered Forest)	Open eucalypt forest with a diverse sclerophyll shrub stratum and an open groundcover dominated by sedges found in gullies. Includes moist sandstone cliff/ outcrop flora. Gymea and Hawkesbury Soil Landscape Units	*Angophora costata* *Banksia serrata* *Callicoma serratifolia*[1] *Corymbia gummifera* *Eucalyptus pilularis* *Eucalyptus piperita* *Ficus rubiginosa*[1] *Tristania neriifolia*[1]	*Acacia linifolia* *Acacia suaveolens* *Acacia terminalis* *Aotus ericoides* *Astroloma pinifolium* *Austromyrtus tenuifolius*[1] *Banksia ericifolia* *Banksia marginata* *Banksia spinulosa* *Bauera rubioides*[1] *Bossiaea heterophylla* *Ceratopetalum gummiferum* *Dodonaea triquetra,* *Doryanthes excelsa* *Dracophyllum secundum*[1] *Epacris microphylla*[1] *Eriostemon australasicus* *Gompholobium grandiflorum* *Grevillea diffusa* *Hakea propinqua* *Hakea teretifolia* *Hibbertia bracteata* *Hibbertia linearis* *Lasiopetalum ferrugineum* *Leptospermum polygalifolium* *Leptospermum squarrosum* *Leptospermum trinervium* *Leucopogon amplexicaulis*[1] *Leucopogon ericoides* *Lomatia silaifolia* *Persoonia levis* *Persoonia pinifolia* *Platysace linearifolia* *Podocarpus spinulosus* *Prostanthera linearis* *Pultenaea daphnoides* *Sprengelia incarnata*[1] *Styphelia tubiflora* *Viminaria juncea* *Zieria laevigata*	**Herbs:** *Gonocarpus teucrioides*[1] *Dianella caerulea* *Dampiera stricta* *Lobelia anceps*[1] *Patersonia glabrata* *Selaginella uliginosa*[1] **Grasses:** *Entolasia stricta* **Sedges/Rushes:** *Juncus continuus*[1] *Lepidosperma filiforme*[1] *Lepidosperma laterale* *Lomandra longifolia* *Caustis flexuosa* *Baloskion tetraphyllus* *Empodisma minus* *Gahnia sieberiana,* **Ferns:** *Adiantum aethiopicum*[1] *Adiantum hispidulum*[1] *Blechnum ambiguum*[1] *Blechnum wattsii*[1] *Gleichenia dicarpa*[1] *Histiopteris incisa*[1] *Pteridium esculentum* *Lindsaea microphylla* *Sticherus flabellatus*[1] *Todea barbata*[1]	*Clematis glycinoides* *Eustrephus latifolius* *Hibbertia dentata* *Kennedia rubicunda* *Morinda jasminoides* *Stephania japonica var. discolor Marsdenia suaveolens Smilax glyciphylla*

Vegetation Community	Description and Soil Landscape	Tree Layer	Small Tree/ Shrub Layer	Ground Layer	Vines/Climbers
Littoral Thicket	Open to dense scrub or low closed forest with an open groundcover, restricted to beach dunes and clay soil. Grows on headlands within 200m of the sea, subject to moderate wind shear and salt spray. Gymea and Hawkesbury Soil Landscape Units	*Banksia integrifolia, Acmena smithii, Eucalyptus botryoides, Ficus rubiginosa Livistona australis Leptospermum laevigatum*	*Acacia longifolia Breynia oblongifolia Glochidion ferdinandi Monotoca elliptica Myrsine variabilis Notelaea longifolia Synoum glandulosum Westringia fruticosa*	**Herbs:** *Commelina cyanea Dianella caerulea Dichondra repens Hibbertia scandens Rhagodia candolleana Pseuderanthemum variabile Pelargonium australe Viola hederacea* **Grasses:** *Entolasia marginata Oplismenus imbecillis Sedges/Rushes: Lomandra longifolia Isolepis nodosa* **Ferns:** *Adiantum aethiopicum Adiantum hispidulum Blechnum cartilagineum Calochlaena dubia Doodia aspera Pteridium esculentum*	*Cayratia clematidea Eustrephus latifolius Hibbertia scandens Kennedia rubicunda Morinda jasminoides Stephania japonica var. discolor*
Coastal Escarpment Littoral Rainforest	Potentially suitable for shaded sites.	*Angophora costata Syncarpia glomulifera subsp. glomulifera Eucalyptus botryoides Acmena smithii Livistona australis Elaeocarpus reticulatus Callicoma serratifolia*	*Eupomatia laurina Pittosporum undulatum Synoum glandulosum Breynia oblongifolia Glochidion ferdinandi Homalanthus populifolius Notelaea longifolia Cyathea australis Endiandra sieberi Myrsine variabilis Backhousia myrtifolia*	**Herbs and grasses:** *Dianella caerulea Oplismenus imbecillis Pseuderanthemum variable Entolasia marginata Microlaena stipoides Oplismenus imbecillis Viola hederacea Plectranthus parviflorus Macrozamia communis Poa affinis* **Ferns:** *Calochlaena dubia Doodia aspera Blechnum cartilagineum Adiantum aethiopicum Adiantum hispidulum*	*Morinda jasminoides Smilax australis Geitonoplesium cymosum Glycine clandestine Marsdenia rostrata Morinda jasminoides Pandorea pandorana Passiflora herbertiana Smilax glyciphylla Cissus hypoglauca Eustrephus latifolius*

Vegetation Community	Description and Soil Landscape	Tree Layer	Small Tree/ Shrub Layer	Ground Layer	Vines/Climbers
Eastern Suburbs Banksia Scrub	Characterised by a dense to open tall shrub canopy and open groundcover of forbs and sedges, and may include small areas of shrub swamp (s), woodland or low forest. Podsolised sand dunes, sometimes perched on coastal sandstone plateaux. Tuggerah Soil Landscape Unit	*Corymbia gummifera* *Angophora costata* *Eucalyptus botryoides* *Eucalyptus haemastoma* *Eucalyptus piperita* *Banksia integrifolia*	*Acacia longifolia* *Acacia suaveolens* *Acacia terminalis* *Acacia ulicifolia* *Actinotus helianthi* *Allocasuarina distyla* *Aotus ericoides* *Astroloma pinifolium* *Baeckea imbricata (s)* *Banksia aemula* *Banksia ericifolia (s)* *Banksia marginata* *Banksia serrata* *Bauera rubioides (s)* *Boronia ledifolia* *Bossiaea heterophylla* *Bossiaea scolopendria* *Callistemon citrinus (s)* *Conospermum taxifolium* *Correa reflexa* *Darwinia fascicularis* *Darwinia leptantha* *Dillwynia retorta* *Epacris longiflora* *Epacris microphylla* *Epacris obtusifolia* *Eriostemon australasius* *Gompholobium grandiflorum* *Grevillea sphacelata* *Grevillea speciosa* *Hakea teretifolia (s)* *Hibbertia fasciculata* *Isopogon anemonifolius* *Kunzea ambigua* *Lambertia formosa* *Lasiopetalum ferrugineum* *Leucopogon ericoides* *Leptospermum juniperinum (s)* *Leptospermum laevigatum* *Melaleuca armillaris* *Melaleuca ericifolia (s)* *Melaleuca nodosa* *Melaleuca squamea (s)* *Micrantheum ericoides* *Monotoca elliptica* *Monotoca scoparia* *Persoonia lanceolata* *Persoonia levis* *Philotheca salsolifolia* *Pimelea linifolia* *Platysace lanceolata* *Platysace linearifolia* *Ricinocarpos pinifolius* *Styphelia viridis* *Viminaria juncea (s)* *Woollsia pungens* *Xanthorrhoea media*	**Herbs:** *Actinotus minor* *Actinotus helianthi* *Boronia parviflora (s)* *Dampiera stricta* *Gonocarpus teucrioides* *Dianella revoluta* *Isotoma fluviatilis (s)* *Patersonia glabrata* *Philydrum lanuginosum (s)* *Pomax umbellata* *Viola hederacea (s)* *Villarsia exalata (s)* *Xanthorrhoea resinifera* *Xanthosia pilosa* **Grasses:** *Austrostipa pubescens* *Dichelachne crinita* *Entolasia stricta* *Eragrostis brownii* *Hemarthria uncinata (s)* *Isachne globosa (s)* **Sedges/Rushes:** *Caustis pentandra* *Cyathochaeta diandra* *Eleocharis sphacelata (s)* *Gahnia sieberiana (s)* *Haemodorum planifolium* *Hypolaena fastigata* *Lepidosperma laterale* *Leptocarpus tenax (s)* *Lepyrodia scariosa* *Lomandra glauca* *Lomandra longifolia* *Chordifex (Restio) fastigiatus* *Schoenus ericetorum* **Ferns:** *Pteridium esculentum*	*Billardiera scandens* *Hardenbergia violacea* *Hibbertia scandens*

Vegetation Community	Description and Soil Landscape	Tree Layer	Small Tree/ Shrub Layer	Ground Layer	Vines/Climbers
Coastal Sand Swamp Forest	A low eucalypt forest with an open shrub layer and a dense groundcover of sedges and forbs, and occurs as scattered patches along the coastline at elevations below 15m ASL in drainage lines and depressions on sandy alluvium and coastal sand flats. Tuggerah Soil Landscape Unit	*Banksia integrifolia* *Casuarina glauca* *Eucalyptus botryoides* *Eucalyptus robusta* *Livistona australis* *Melaleuca linariifolia* *Melaleuca styphelioides*	*Acacia longifolia* *Banksia ericifolia* *Banksia robur* *Elaeocarpus reticulatus* *Glochidion ferdinandi* *Leptospermum continentale* *Leptospermum polygalifolium* *Melaleuca ericifolia* *Melaleuca thymifolia* *Monotoca elliptica* *Polyscias sambucifolia*	**Herbs:** *Centella asiatica* *Gahnia clarkei* *Gonocarpus micranthus* *Hydrocotyle peduncularis* *Lobelia anceps* *Selaginella uliginosa* *Villarsia exalata* **Grasses:** *Entolasia marginata* *Entolasia stricta* *Hemarthria uncinata (s)* *Isachne globosa* **Sedges/Rushes:** *Baumea articulata* *Baumea juncea* *Empodisma minus* *Gahnia clarkei* *Leptocarpus tenax* *Schoenus brevifolius* **Ferns:** *Blechnum indicum* *Gleichenia dicarpa* *Hypolepis muelleri* *Pteridium esculentum*	*Parsonsia straminea* *Hibbertia scandens* *Stephania japonica var. discolor*
Floodplain Swamp Forest	This is a low, rather dense forest, with an open shrub layer and a semi-continuous groundcover dominated by taxa tolerant of brackish groundwater. Deep Creek Soil Landscape Unit	*Casuarina glauca* *Eucalyptus botryoides* *Eucalyptus robusta* *Livistona australis* *Melaleuca linariifolia* *Melaleuca quinquenervia* *Melaleuca styphelioides* *Syzygium paniculatum*	*Melaleuca ericifolia* *Glochidion ferdinandi*	**Herbs:** *Alternanthera denticulata* *Commelina cyanea* *Centella asiatica* *Lobelia anceps* *Persicaria decipiens* *Rumex brownii* **Grasses:** *Cynodon dactylon* *Entolasia marginata* *Hemarthria uncinata* *Isachne globosa* *Paspalum distichum* *Phragmites australis* **Rushes/Sedges:** *Carex appressa* *Gahnia clarkei* *Gahnia sieberiana* *Juncus kraussii subsp. australiensis* *Juncus usitatus* *Microlaena stipoides* *Oplismenus imbecillis* *Phragmites australis* **Ferns:** *Blechnum indicum* *Gleichenia dicarpa* *Histiopteris incisa* *Hypolepis muelleri*	*Cayratia clematidea* *Parsonsia straminea* *Stephania japonica var. discolor*

Vegetation Community	Description and Soil Landscape	Tree Layer	Small Tree/ Shrub Layer	Ground Layer	Vines/Climbers
Coastal Freshwater Reedland	Reeds to 3m high dominated by few species e.g. Phragmites and Typha. Low lying land <5 metres above sea level on coastal plains and flats. Poorly drained alluvial flats and sand depressions.	*Casuarina glauca* *Melaleuca decora* *Melaleuca ericifolia* *Melaleuca linariifolia*		**Reeds and Rushes 1–3m** *Typha orientalis* *Phragmites australis* *Bolboschoenus fluviatilis* *Eleocharis sphacelata* **Sedges, grasses and herbs < 1.5 m high** *Baumea juncea* *Carex appressa* *Philydrum lanuginosum* *Isachne globosa* *Juncus krausii* *Juncus continuus* **Groundcovers** *Blechnum indicum* *Gleichenia dicarpa* *Hypolepis muelleri* *Hemarthria uncinata* *Hydrocotyle verticillata* *Juncus planifolius* *Parsonsia straminea*	
Species suitable for WSUD (incorporates species from numerous communities; list not comprehensive)		*Banksia integrifolia* *Banksia aemula* *Melaleuca ericifolia* *Melaleuca styphelioides* *Melaleuca linarifolia* *Melaleuca quinquenervia*	*Callistemon citrinus* *Callistemon linearis* *Callistemon salignus* *Banksia paludosa* *Banksia robur* *Leptospermum continentale* *Leptospermum polygalifolium* *Leptospermum trinervium* *Melaleuca erubuscens* *Melaleuca thymifolia*	**Reeds:** *Alisma plantago aquatica* *Baumea articulata* *Baumea rubignosa* *Bolboschoenus caldwelii* *Bolboschoenus fluviatilis* *Eleocharis acuta* *Eleocharis sphacelata* *Restio tetraphyllus* *Schoenoplectus validus* *Schoenoplectus mucronatus* *Triglochin procerum* **Sedges:** *Carex appresa* *Carex fascicularis* *Ficinia (Isolepis) nodosa* *Gahnia sieberiana* *Juncus continuus* *Juncus usitatus* *Lepironia articulata* **Grasses:** *Dianella caerulea var. caerulea* *Dianella revoluta* *Dichelachne micrantha* *Echinopogon ovatus* *Imperata cylindrica* *Lomandra longifolia* *Microlaena stipoides* *Themeda australis* **Herbs:** *Cotula coronoipifolia* *Crinum pedunculatum* *Philydrum lanuginosum* *Potomogeton crisps*	

Vegetation Community	Description and Soil Landscape	Tree Layer	Small Tree/ Shrub Layer	Ground Layer	Vines/Climbers
Coastal Saltmarsh	A complex, fine-scale mosaic of succulent herbs and sedges restricted to estuarine mudflats and saline lagoons, and is found on the upper limit of the intertidal zone. Supratidal Hydrosols soils.		*Atriplex australasica* *Rhagodia candolleana*	**Herbs:** *Samolus repens* *Sarcocornia quinqueflora subsp. quinqueflora* *Selliera radicans* *Suaeda australis* *Triglochin striata* **Grasses:** *Sporobolus virginicus* *Zoysia macrantha* **Sedges/Reeds:** *Baumea juncea* *Gahnia filum* *Ficinis (Isolepis) nodosa* *Juncus kraussii*	
Estuarine Mangroves	A low forest characterised by a dense tree/scrub canopy over bare mud or a patchy herbaceous groundcover restricted to mudflats exposed to daily tidal inundation. Marine mud soils.	*Avicennia marina ssp. australasica*		**Herbs:** *Samolus repens* *Sarcocornia quinqueflora subsp. quinqueflora*	

Appendix 9

Development assessment guidelines

Development assessment guidelines will be prepared to ensure that:

- An ecological assessment is undertaken where required;
- Developments avoid or minimise the removal of, and disturbance to, indigenous vegetation and other habitat features (including exotic vegetation and artificial structures), particularly those that have potential to support priority fauna species;
- Existing habitat features within and adjacent to development sites are protected where possible;
- Where habitat removal is required, an ecologist or wildlife rescue officer is engaged to check habitat features for the presence of fauna, and relocate any fauna to a suitable area of nearby habitat;
- Wherever possible, a suitable offset is provided to compensate for any indigenous vegetation or other habitat features removed or disturbed; and
- Diverse and structurally complex locally indigenous vegetation and other fauna habitat features are incorporated into site landscaping wherever possible, consistent with Appendix 8 and the City's Landscape Code, particularly at or near priority sites, supporting sites and potential habitat linkages (Figure 17).