

BEROWRA VALLEY REGIONAL PARK

PLAN OF MANAGEMENT



**NSW National Parks and Wildlife Service,
part of the Department of Environment and Conservation (NSW)**

April 2005

This plan of management was adopted by the Minister for the Environment on 27 April 2005.

ACKNOWLEDGMENTS

This Plan of Management is based on a draft plan prepared by Conacher Travers Pty Ltd for the Berowra Valley Regional Park Trust.

The draft plan was prepared following a period of community involvement with a wide cross-section of the local community including:

- Park neighbours, local residents and community members;
- Metropolitan Local Aboriginal Lands Council (advice only);
- Environmental and community groups such as: Redgum Bushland Committee, Friends of Berowra Valley Regional Park, Association for Berowra Creek, Sydney Branch of the National Parks Association NSW Inc., Berowra Waters Progress Association, United Residents Action Group, Pennant Hills District Civic Trust Inc., Hornsby Conservation Society Inc., Galston Area Residents Association and Quarry Road Action Group;
- Recreational groups such as: Pennant Hills Soccer Club Inc., Pennant Hills District Cricket Club, Hornsby Pony Club Inc., Marramarra Recreational Riders Alliance, Bike North, North Shore District Rifle Association No. 18 Inc and The Confederation of Bushwalking Clubs NSW Inc.; and
- Other agencies such as: Department of Land and Water Conservation, Hornsby Shire Council and National Parks and Wildlife Service.

The contributions of the many people who made submissions on the draft plan are also gratefully acknowledged.

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FOREWORD

Berowra Valley Regional Park (the Park) is located approximately 20km north-west of the City of Sydney and covers 3,870 hectares of natural bushland. The Park is part of the dissected Hornsby Plateau which is dominated by Hawkesbury Sandstone.

The Park contains at least 18 different vegetation communities which support over 230 fauna species. Two vegetation communities are identified as endangered ecological communities and around 10 threatened flora species have been recorded within the Park. Eleven threatened fauna species have been recorded in the Park and a number of others are identified as being highly likely to use the Park.

The Park contains a number of Aboriginal sites including paintings, engravings, artefacts and habitation sites. A range of historic sites of European origin are also present within the Park.

The main recreational use of the Park is for bushwalking. There are many well-developed walking tracks, including the Great North Walk which links Lane Cove and Newcastle. Other recreational uses of the Park include camping, picnicking, nature appreciation and canoeing.

This Plan provides both general and specific management objectives for this Park. In defining these objectives, consideration was given to the recreation and conservation values and purposes of the Park. Policies and actions are identified within the Plan which address these objectives and which recognise the regional setting of the Park.

Major objectives include the protection and enhancement of the conservation value of the Park; the rehabilitation and regeneration of bushland areas; and the provision of high quality day and overnight recreational opportunities within a natural bushland setting.

In accordance with the National Parks and Wildlife Regulation, this plan of management provides for leashed dog walking on three management trails within the Park, subject to monitoring of the environmental impact. A further three trails may be provided for leashed dog walking subject to an assessment of the potential environmental impact and need.

This plan of management establishes the scheme of operations for Berowra Valley Regional Park. In accordance with section 73B of the *National Parks and Wildlife Act 1974*, this plan of management is hereby adopted.

BOB DEBUS
MINISTER FOR THE ENVIRONMENT

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MAP OF BEROWRA VALLEY REGIONAL PARK

1. INTRODUCTION

The *National Parks and Wildlife Act 1974* requires that a plan of management be prepared for each regional park that outlines how an area will be managed.

The management of regional parks in NSW is in the context of a legislative and policy framework, primarily the *National Parks and Wildlife Act 1974*, the National Parks and Wildlife Regulation, the *Threatened Species Conservation Act 1995* and the policies of the National Parks and Wildlife Service. Section 72AA of the National Parks and Wildlife Act lists the matters to be considered in the preparation of a plan of management. The policies arise from the legislative background and internationally accepted principles of park management. They relate to nature conservation, Aboriginal and historic heritage conservation, recreation, commercial use, research and communication.

Other legislation, international agreements and charters may also apply to management of the area. In particular, the *Environmental Planning and Assessment Act 1979* requires the assessment and mitigation of the environmental impacts of any works proposed in this plan.

Management of Berowra Valley Regional Park must comply with the *National Parks and Wildlife Act 1974* and all other relevant legislation.

A draft plan of management for Berowra Valley Regional Park was placed on public exhibition for three months from 21 February 2003 until 21 May 2003. The exhibition of the plan of management attracted 143 submissions that raised 17 issues. All submissions received were carefully considered before adopting this plan of management.

A plan of management is a statutory document under the National Parks and Wildlife Act. Once the Minister has adopted a plan, no operations may be undertaken within Berowra Valley Regional Park except in accordance with the plan. The plan will also apply to any future additions to Berowra Valley Regional Park. Where management strategies or works are proposed for the park or any additions that are not consistent with the plan, an amendment to the plan will be required. Any amendment must follow the same process as for preparation of a plan, including public exhibition of the amendment.

2. MANAGEMENT CONTEXT

2.1 REGIONAL PARKS IN NSW

Regional parks are a relatively new category of park established by the New South Wales Government in 1995. They provide large areas of regional open space and bushland that are assessed as having high conservation, landscape and recreation values. Generally situated on the edge of urban population centres, regional parks serve the dual purpose of providing outdoor recreation opportunities while providing protection for flora and fauna species.

As regional parks are generally situated near large population centres, their environments have in some cases, but not in the case of Berowra Valley, been largely altered since European occupation. Facilities found or being developed in most regional parks include playgrounds, picnic areas, bike trails, walking tracks, lookouts and heritage sites.

One major feature of these parks is that some activities allowed within them are not permitted in other land categories within the national parks reserve system. Leashed dog-walking areas are found in some regional parks but are not permitted within other areas.

The proximity to large urban areas provides regional parks with strong social, cultural and historical values while providing valuable opportunities for the rehabilitation and regeneration of degraded areas and providing the community and region with access to high quality recreational experiences within a natural bushland setting.

2.2 BEROWRA VALLEY REGIONAL PARK

2.2.1 Location, Gazettal and Regional Setting

Berowra Valley Regional Park is located approximately 20km to the north-west of Sydney. The Park covers 3,870 hectares of natural bushland within the Berowra Creek Catchment. The Park also includes the bed of Berowra Creek upstream of where the park is on both sides of Berowra Creek (refer map).

The section of the Park west of Berowra Creek lies within the traditional area of the Daruk Aboriginal people, while the section east of Berowra Creek lies within the traditional area of the Kuring-gai people.

The Berowra Valley Regional Park Trust manages the Park. The Trust currently comprises three Hornsby Shire councillors, one NPWS staff member, one staff member from Hornsby Shire Council and two community representatives. The National Parks and Wildlife Service and Hornsby Shire Council under the direction of the Trust carry out the day to day management of the Park. These organisations undertake their responsibilities in accordance with each agency's operational plans/guidelines and a Funding and Management Agreement.

This Funding and Management Agreement defines the roles of the Berowra Valley Regional Trust, National Parks and Wildlife Service and Hornsby Shire Council in the management of this Park. It also documents the contribution (in terms of time and money) of each of these authorities to the management of the Park.

Part of the Park originally formed the Elouera Bushland Natural Park which was reserved in 1964 and consisted of 640 hectares. Additional lands were acquired and the Park was gazetted as Reserve No. 100092 for public recreation and the study and preservation of native flora and fauna in 1987. This gazettal was in response to increasing community concern over the development of bushland areas in the Hornsby Shire. The Park then came to be known as Berowra Valley Bushland Park. Further land additions were made to the

Park, which was gazetted as Berowra Valley Regional Park on 27th March 1998 and formally opened by the NSW Minister for the Environment on 23rd November 1998.

The predominant land use outside and adjacent to the Park boundary is low to medium density housing (eastern and southern sections of the Park) and small rural holdings (to the west of the Park). The main land use within the Park involves public recreation (including bushwalking, camping and picnicking) and conservation.

Various urban/rural centres and local conservation reserves bound the Park. To the north, the Park is bounded by Berowra Waters and Crown land, which separates the Park from both Muogamarra Nature Reserve and Marramarra National Park. There are also large areas of Crown land in close proximity to the Park. To the east, the Park is bounded by the suburbs of Berowra, Mt Kuring-gai, Mt Colah, Asquith, Hornsby, Normanhurst, Westleigh, Thornleigh and Ku-ring-gai Chase National Park. To the south, the Park is in close proximity to Pennant Hills Road and Lane Cove National Park. Along the western boundary, the suburbs of Cherrybrook, Dural, Galston and Berrilee bound the Park.

2.2.2 Values of Berowra Valley Regional Park

Geomorphology, Soils and Landscape

Berowra Valley Regional Park is located upon the Hornsby Plateau, a geological formation dominated by Hawkesbury Sandstone. Soils derived from Hawkesbury Sandstone are predominantly infertile and highly erodible, creating a set of highly variable conditions. These highly variable conditions have served to enhance biodiversity within the Park.

Vegetation

The Park is known to contain at least 18 distinct vegetation communities, two of which (Blue Gum High Forest and Shale Sandstone Transition Forest) have been identified as endangered ecological communities under the *Threatened Species Conservation Act 1995*. Additionally, at least 10 threatened flora species, and many regionally and locally significant species, have been identified within the Park. Full details on the vegetation communities and threatened flora species found within the Park are provided in Section 4.2 of this Plan.

Native Animals

The diverse range of vegetation communities found within this Park provides a variety of habitats for a large number of fauna species. Over 230 vertebrate fauna species have been identified within Berowra Valley Regional Park (Smith & Smith 1990). Eleven threatened fauna species have been identified within the Park and a number of others are considered to be likely inhabitants or users of the Park. The fauna species recorded in, or expected to be using, the Park are discussed further in Section 4.3 of this Plan.

Cultural Value

Cultural values within the Berowra Valley Regional Park are high due to the presence of a number of significant sites from Aboriginal and European history. The Park contains 24 known sites of Aboriginal heritage value including artwork, rock engravings, artefacts and habitation sites. There are a number of European historic sites within the Park, including a bridge, the remains of a quarry and traces of a Zigzag Railway which joined the quarry to the main railway line. These issues are discussed further in Sections 4.4 and 4.5.

Social Value

Being surrounded by such a large number of suburbs, the Park is used by the public on both an individual and group basis. Many people use the Park on a daily basis for pursuits such as exercise, nature appreciation, dog walking or simply to relax in a bushland setting. Use of the Park often increases on weekends, with picnics and bushwalking being popular activities. Weekends and public holidays also attract large groups who use the camping and picnic facilities. The close proximity of the Park to railway stations allows groups such as school and scout groups to utilise the Park for short camping, bushwalking and educational activities. The Park also provides scenic amenity for the surrounding suburban areas.

The high levels of use (from both locals and visitors) and variety of activities available within the Park have fostered the involvement of a large number of community groups. Most of these groups are voluntary and carry out vital activities which contribute significantly to the recreational and conservation value of the Park. Bush regeneration, rubbish removal, data collection, and production of a guidebook are some of the activities carried out by community groups associated with the Park.

Tourism and Education

The Berowra Valley Regional Park experiences various levels of recreational use throughout the year. The most frequent use of the Park is by bushwalkers. Recreational walkers utilise a number of tracks within the Park, particularly the Great North Walk which extends from Lane Cove in the south to Newcastle in the north. Crosslands Reserve is a popular local picnic area which experiences high levels of use, particularly on weekends and public holidays. The Park also provides opportunities for camping, picnicking, nature appreciation and canoeing, thus catering for a large range of recreational users.

The scientific community also extensively uses Berowra Valley Regional Park. Research organisations use this area of natural bushland primarily for ecological research, placing emphasis on the enhanced biodiversity values of this Park.

Statement of Significance

Berowra Valley Regional Park has national, regional and local conservation significance. Extensive areas of woodland, open forest, rainforest, mangroves, heath, saltmarsh and sandstone swamps are present within the Park. Several significant threatened or endangered flora and fauna species reside or are predicted to occur in the Park.

The social and recreational importance of the Park is reflected in its variety of public usage and locality within an urbanised area. The Park contains a number of sites of Aboriginal and European cultural value.

The Park contains much of the Berowra Creek Catchment, an area bounded by the Pacific Highway, Pennant Hills Road, Castle Hill Road, Old Northern Road and the Hawkesbury River. The Park is also of high scenic quality .

The proximity of this Park to Muogamarra Nature Reserve, Ku-ring-gai Chase National Park and Marramarra National Park serves to enhance the already high conservation values of this Park. The combined value of these areas creates a vital refuge for native plants and animals which are threatened by encroaching urbanisation in the Sydney Region.

3. OBJECTIVES OF MANAGEMENT

3.1 GENERAL OBJECTIVES FOR REGIONAL PARKS

Regional parks are reserved under the NPW Act to protect and conserve areas in a natural or modified landscape that are suitable for public recreation and enjoyment.

Under the Act, regional parks are managed to:

- Provide opportunities, in an outdoor setting, for recreation and enjoyment in natural or modified landscapes;
- Identify, interpret, manage and conserve the park so as to maintain and enhance significant landscape values;
- Conserve natural and cultural values;
- Promote public appreciation and understanding of the park's natural and cultural values;
- Provide for sustainable visitor use and enjoyment that is compatible with the conservation of the regional park's natural and cultural values; and
- Provide for the sustainable use (including adaptive reuse) of any buildings or structures or modified natural areas having regard to conservation of the regional park's natural and cultural values (NPW Act, section 30H).

3.2 SPECIFIC OBJECTIVES

In addition to the above mentioned general objectives, the following specific objectives apply to the management of Berowra Valley Regional Park:

- To integrate Park management with management of Berowra Creek Catchment, including protection of habitats and water quality.
- To protect significant geological and landscape features of the Park from disturbance.
- To maintain biodiversity through the protection of sustainable and diverse populations of native flora and fauna and their habitats.
- To provide part of a green corridor between Muogamarra Nature Reserve and Marramarra National Park and bushland on adjoining lands.
- To manage bushfire risk for protection of life and property.
- To manage bushfires to avoid the extinction of species which are known to occur naturally within the Park.
- To conserve and interpret Aboriginal sites and historic features within the Park.
- To protect the Park from impacts from urban areas, and add strategically to the Park.
- To achieve a high public profile for the Park, to increase community awareness of its existence and location as a social, natural, recreational, educational and conservation resource.

- To create a high quality education and interpretative experience within the Park, including bushwalks and appropriate educational signs.
- To maintain the precautionary approach in approving recreational facilities and activities.
- To provide users of the Park with high quality day and overnight recreational opportunities within a natural bushland setting.
- To carry out and encourage research and educational opportunities.

3.3 MANAGEMENT DIRECTIONS

The aim of Park management is to preserve Berowra Valley Regional Park for public recreation and education and to protect the natural and aesthetic values of Berowra Valley Regional Park. In addition to this aim, the following key strategies have been identified for the management of Berowra Valley Regional Park:

- To gain community support for the purpose of the Park.
- To enhance sustainable recreational opportunities within the Park.
- To continue to undertake bush regeneration, environmental restoration and water pollution mitigation measures within and adjacent to the Park.
- To manage conservation to protect the Park from urban interface and other impacts.
- To pursue collaborative management with other consent authorities which are responsible for impacts associated with the Park.

4. CONSERVATION OF NATURAL AND CULTURAL HERITAGE

4.1 GEOLOGY AND LANDFORM

The Berowra Valley Regional Park is characterised by a vast array of contrasting landforms. The Park is situated on the Hornsby Plateau, which is part of the geological structure known as the Sydney Basin. The landscape consists of a dissected sandstone plateau with a predominant north-south orientation.

The long and irregular shape of the Park provides particular management challenges in relation to the large size of the Park and the high degree of urban interface on the boundaries.

The most characteristic geological feature of the Park is Galston Gorge. This gorge directs Berowra Creek and its tributaries into the Hawkesbury River at Bar Island.

Heavily eroded sandstone ridges skirt Berowra Creek and its tributaries, often featuring wind blown caves, exfoliated rock ledges and cliff faces. Mid-slopes are mostly steep and characterised by ephemeral creeks and large sandstone boulders on shallow soils. The elevations within the Park range from 1- 225 metres Australian Height Datum (AHD). The high scenic quality of the ridgelines found within this Park creates a priority for scenic protection of these areas, particularly from vantage points within the Park such as Barnetts Lookout, Galston Gorge and Crosslands Reserve.

The Park is made up of a number of different geologies, including Hawkesbury Sandstone, Holocene quartz sands, as well as Wianamatta Group Ashfield Shale formations. In the Hornsby Park area there is a volcanic diatrema.

Soil landscapes within the Park are dominated by the Hawkesbury landscape, consisting of rugged, rolling to very steep hills on Hawkesbury Sandstone (Chapman & Murphy 1989). A number of other soil landscapes have been identified within or in close proximity to the Park. These highly erodible soils create a number of management challenges within the Park, particularly in regard to soil erosion.

Information regarding the geologies and soil landscapes found within the Park is contained in Appendix 1.

Desired Outcomes:

- The significant geological and landscape features of the Park are protected from disturbance.
- The high scenic values of the Park are maintained.

Management Strategies:

- All significant geological and landscape features in the Park will be identified to ensure they are protected from any development works; and
- Collaborative management with other consent authorities will be pursued to protect identified escarpments and areas of high scenic quality.

4.2 NATIVE PLANTS

Within Berowra Valley Regional Park there are over 500 vascular flora species within 18 separate flora communities, ranging from alluvial flat formations such as mangroves and salt marsh to tall open forests in the moist gullies, to woodlands and heath at higher elevations (Smith & Smith 1990). Descriptions of each of the identified vegetation communities within the Park are provided in Appendix 2.

Endangered Ecological Communities

Two endangered ecological communities listed under the *Threatened Species Conservation Act 1995* (TSC Act) have been identified as being present in the Park. These are:

Blue Gum High Forest

A 1.7 hectare area of Blue Gum High Forest is found within the Park at its southernmost extreme point on Boundary Road at Kitchener Road, Cherrybrook.

There is a stand of blue gums (*Eucalyptus saligna*) within a community identified as Glen Forest, as distinct from Blue Gum High Forest, on the volcanic diatreme within the Park. While this community is not currently listed under the TSC Act (it is different from the listed Blue Gum High Forest which is found on Wianamatta Shale soils in northern Sydney), it is considered to be of regional significance due to its restricted distribution.

Shale Sandstone Transition Forest

A 0.15 hectare area of Shale Sandstone Transition Forest is located within the boundaries of the Park near Lynrob Place, Thornleigh. There is potential for several other small areas of this vegetation community to be found within the Park with further investigation.

Threatened Flora Species

It is believed that at least 10 threatened flora species exist within the boundaries of the Park, some of which are locally endemic such as *Persoonia mollis* ssp. *maxima* and *Ancistrachne maidenii*. Other species and communities are regionally significant. For a list of threatened flora species identified within the Park refer to Appendix 2, and for a list of key threatening processes refer to Appendix 4.

Desired Outcomes:

- The Park is managed to conserve all plant communities in the Park and to maintain a diverse range of age classes, floristic and structural types.
- Threatened or significant plant species and endangered or regionally significant ecological communities are protected within the Park.

Management Strategies:

- Recovery plans for threatened plants will be implemented;
- Management programs such as fire and recreational management activities will consider long term impacts on vegetation communities and plant populations;
- Contract and volunteer bush regeneration programs will be undertaken;
- Local biodiversity will be preserved and enhanced through planting of locally indigenous species. Only these species will be used in revegetation and landscape works; and

- The native vegetation values of the Park's bushland to the community will be promoted.

4.3 NATIVE ANIMALS

The rich diversity of habitats in the Park, including plant communities, rock features and water, provides high quality habitat for many native animals, including a number of threatened species. Over 230 vertebrate fauna species have been recorded within Berowra Valley Regional Park (Smith & Smith 1990), including 12 threatened species listed under the *Threatened Species Conservation Act 1995* and one listed under the *Fisheries Management Act 1994*. Of these species, a large number are residents, with others being seasonal or occasional visitors to the Park. For a list of threatened fauna species within and adjacent to the Park refer to Appendix 3, and for a list of key threatening processes refer to Appendix 4.

Desired Outcomes:

- The full range of native animal species and their habitats found in the Park is conserved.
- The habitat and populations of all threatened fauna species and biogeographically significant species are protected and maintained.

Management Strategies:

- Habitats of all native fauna, including threatened or biogeographically significant species, will be protected from visitor impacts, effects of introduced species, inappropriate fire regimes, bush rock removal and other adverse impacts;
- Recovery plans for threatened animals will be implemented;
- The distribution and abundance of threatened and significant fauna species will continue to be monitored; and
- Management programs will consider long term impacts on animal populations and their habitats.

4.4 ABORIGINAL HERITAGE

Berowra Valley Regional Park and its surrounding areas have contributed significantly to the understanding of Aboriginal history in the Sydney area. Berowra Creek (which runs through the Park) is thought to have been the natural boundary between the lands of the Kuring-gai people in the east and the Daruk people in the west. As such, it is believed that the area formed a point of contact between Aboriginal people. It is believed that this contact was generally friendly and is thought to have been for the purposes of marriage, trade and ceremony (Friends of Berowra Valley Regional Park 2001).

While the oral history of Aboriginal use of the area is sparse, the Park contains 24 known sites of Aboriginal heritage. The majority of these sites are located to the southern and northern boundaries of the Park in valleys, caves and open rock platforms (Koettig 1996). The presence and types of these sites suggest that the area may have been used for infrequent purposes such as hunting, trading and ceremonies.

Protection of these assets is attainable by utilising careful management procedures. Sensitive areas will be identified and managed in accordance with the heritage values of the site. Examples of some of the Aboriginal sites found within the Park include:

- grinding grooves;
- shelters with art and potential archaeological deposits;
- engravings in flat stone;
- shelters with artefacts;
- shelters with art;
- middens;
- hand stencils;
- axe grooves; and
- drawings.

Failure to recognise historical sites in the past has led to destruction through development, while some preserved sites have been wilfully or ignorantly damaged.

Desired Outcomes:

- Aboriginal sites and places are protected from damage by human activities.
- Aboriginal people are involved in management of the Aboriginal cultural values of the Park.

Management Strategies:

- The management (including promotion, education and protection) of the Park's Aboriginal heritage will be conducted in consultation with the Metropolitan Aboriginal Lands Council and other relevant Aboriginal community organisations;
- Archaeological survey and cultural assessment will be undertaken prior to all works with the potential to impact on Aboriginal sites and places; and
- The recommendations of Hornsby Council's Aboriginal Heritage Study (1996) will be considered when directing management of sites within the Park.

4.5 HISTORIC HERITAGE

The single lane bridge (Gorge Bridge) spanning Tunks Creek in Galston Gorge is of historical value, as it was the original link between orchard growers to the west of the Gorge to the main northern railway line in the late 1800s. This bridge allowed for the growth of this region to the west of the Gorge as a holiday retreat from the 'city life' (Hornsby Shire Council 1990). This is a wooden trestle bridge and is currently being repaired and maintained as a result of its heritage status. This bridge originally had a partner over the Berowra Creek, however this was replaced by a concrete bridge.

The Steele Bridge is another bridge which crosses Berowra Creek along the Quarry Road Track. This bridge appears to be an Australian adaptation of the Bailey Design Bridge.

Another historical feature of the Park is the quarry situated off Bellamy Street, Thornleigh. This quarry was used in the 1880s, to provide ballast for the construction of the northern railway in 1886. Remains of the quarry and traces of the Zigzag Railway which joined the quarry to the main railway line can still be found today (Hornsby Shire Council 1990).

Other items of historic heritage in the Park include the tea house at Berowra Waters, an old bullock track, depression settlements and the remains of former land uses (e.g. abattoirs, grazing, shale extraction, and quarrying).

Desired Outcomes:

- Historic features are appropriately conserved and managed.
- Historical features are interpreted in a way which encourages an understanding of the Park's cultural heritage.

Management Strategies:

- Cultural heritage sites, when identified, will be managed according to their significance and potential impacts on the site;
- The historic values of the Thornleigh Quarry and the Zig-Zag railway route will be reviewed with consideration of an interpretation and restoration initiative on the site; and
- The articles of the Burra Charter for the conservation of places of historical or cultural significance will be used as guidelines for the management of historical features within the Park.

5. PARK PROTECTION

5.1 SOIL EROSION

The highly erodible nature of the soils within the Park indicates a need for management planning and practices to minimise soil erosion. A number of identified sources of soil erosion are present within the Park and include trails (vehicles), tracks (walking), rainfall and fire.

Desired Outcome:

- Human induced soil erosion in the Park is minimised.

Management Strategies:

- All works will be designed and undertaken in a manner which minimises soil erosion;
- Monitoring and appropriate treatment of areas of erosion will occur; and
- Collaboration with other authorities will be undertaken to minimise erosion on adjoining lands.

5.2 WATER QUALITY AND CATCHMENT MANAGEMENT

The Berowra Valley Regional Park is located entirely within the Berowra Creek Catchment. Berowra Creek is a major sub-catchment of the Hawkesbury River. Total catchment management requires integration by all statutory authorities and the broader community working together to reduce pollution carried by stormwater in order to protect and enhance the biodiversity and ecology of the catchment.

As such the Berowra Creek Estuary Management Study and Management Plan was prepared in order to reduce the urban impacts on the catchment and to maintain and improve catchment health and water quality.

Desired Outcomes:

- The integration of Park management with the management of the Berowra Creek Catchment is achieved.
- Catchment values and the water quality and health of Park streams are improved.
- The Park's bushland and waterways are protected from degradation and pollution from urban runoff and erosion.

Management Strategies:

- Activities which may have an effect on catchment management goals will be carried out in accordance with the recommendations of the Berowra Creek Water Quality Management Strategy and Berowra Creek Estuary Management Study and Management Plan (2000);
- Liaison with Hornsby Council, Sydney Water, and other authorities as needed to protect and improve the water quality of the Park's catchments will be maintained;
- Water quality controls will be instituted on land within and adjoining the Park to reduce deterioration of bushland and waterways through erosion, sedimentation and nutrient transport; and

- Programs will be developed to minimise dumping of green waste in the Park, including the identification of areas prone to dumping. This program will be supported by community education and law enforcement.

5.3 INTRODUCED SPECIES

5.3.1 Introduced Plants

As is the case with many urban bushland parks, weed invasion within Berowra Valley Regional Park is a major problem. Weed invasion within the Park varies between vegetation communities, however, populations of troublesome species are primarily restricted to drainage lines and the Park boundary adjoining urban areas.

Stormwater runoff has been identified as one of the major influences on weed dispersal throughout the Park. There is likely to be a higher distribution of weeds both downstream and downslope. Additionally, the high levels of phosphorus within stormwater runoff from surrounding properties have had a major influence on the density of weeds within the Park.

Dumping rubbish into the Park is a major source of weed invasion. The dumping of lawn clippings and garden rubbish is a particularly rich source of weed seeds and cuttings.

The very nature of many weed species means that they are able to quickly establish from such sources and invade native bushland where they can quickly out-compete native species. Not only do weeds affect the native plants of the area; they also have an indirect effect on native animals by reducing their natural habitat.

At present, Hornsby Shire Council and Berowra Valley Regional Park carry out bush regeneration programs within and adjacent to the Park. Regeneration means the recovery of natural integrity following disturbance or degradation (Australian Committee for IUCN 1997). At least 43 bushcare groups work in or adjacent to the Park to remove or control weeds and rehabilitate native vegetation. The reference list includes a number of references on bush regeneration techniques.

The extent of the weed problem in the Park is such that with available resources, weed control will need to be an ongoing management priority.

Desired Outcome:

- Programs to control introduced plant species are implemented which help to protect bushland, indigenous plant communities and habitat values.

Management Strategies:

- Priority will be given to encouraging and supporting weed control, bush regeneration and education programs within and adjacent to the Park;
- All weed control and bush regeneration programs will be strategic and on a catchment basis using best practice bush regeneration principles and techniques;
- Programs will be undertaken in cooperation with Hornsby Shire Council, other relevant authorities and Park neighbours and will target weed infestations, where they pose a threat to endangered ecological communities, threatened species habitats, and new infestations before they become established; and
- Locally indigenous plants will be encouraged in developments around the Park's boundary.

5.3.2 Introduced Animals

Due to the close proximity to urban areas of Sydney, a number of introduced and feral animal species are present and have become established within the Park. These species include predators such as the cat (*Felis catus*), the fox (*Vulpes vulpes*) and mosquito fish (*Gambusia holbrooki*). Predators such as these have the ability to severely affect populations of native animals within the Park. Other introduced species include the rabbit (*Oryctolagus cuniculus*), carp (*Cyprinus carpio*) and the Indian Myna (*Acridotheres tristis*). These species are able to affect native species via competition for food, shelter and other resources. Most of these are listed as key threatening processes under the *Threatened Species Conservation Act 1995* (see Appendix 4).

Dogs are also an introduced animal and can affect native species. Dogs will be excluded from core bushland areas of the Park, however, leashed dog walking will be permitted in designated areas on the periphery of the Park.

Desired Outcomes:

- Introduced animals are controlled whenever possible in cooperation with relevant authorities and Park neighbours where they significantly compete with or prey on native animals, cause erosion or damage native plant species or communities.
- Users and neighbours of the Park practise responsible pet ownership.

Management Strategies:

- Introduced plants and animals will be controlled;
- Management strategies for introduced plants and animals will be developed as appropriate. Currently domestic cats and garden escape plants are causing concern;
- Control plans for pest species will be implemented in cooperation with relevant authorities and Park neighbours and will be designed so as not to harm non-target species and Park values;
- The current fox control program will continue;
- Registered assistance animals are allowed within the Park on leashes (the following strategies relate to dogs not registered as assistance animals);
- Dogs will only be permitted on leashes, and in or on designated dog walking areas or trails. These designated areas will be signposted, with continued use dependent on monitoring for environmental impact. Designated areas will be:
 - Bellamy Fire Trail between Bellamy Street and De Saxe Close, Thornleigh (450m);
 - Daphne Fire Trail between Tuscan Way (end Daphne Close) and Patricia Place, Cherrybrook (430m); and
 - Clarinda Fire Trail between Clarinda Street and Simon Place, Hornsby (430m);
- Leashed dog walking may be permitted on the following peripheral trails subject to an assessment of potential environmental impact and need:
 - Waninga Fire Trail between Heather Place and Waninga Road, Hornsby Heights (1.4km);
 - Daphne Fire Trail between Daphne Close and Blackwattle Place, Cherrybrook (1km); and

- Arthurs Fire Trail between Merlin Close and Excalibur Close, Mt Colah (800m);
- Dogs will not be permitted at Crosslands Reserve or in proximity to picnic or BBQ areas;
- Dogs will not be permitted on walking tracks, including the Great North Walk, or anywhere else in the Park other than on the trails specified above;
- Development of a management and education program on leashed dog walking will be undertaken with Hornsby Council, including compliance and provision of waste disposal; and
- An education strategy will be developed including a brochure explaining the damage and threats unleashed dogs cause to wildlife, how designated dog walking areas were chosen and why leashed dog walking is restricted in the Park. The placement of bins and bags for faeces will be investigated.

5.4 FIRE MANAGEMENT

A Fire Management Plan has been prepared for the Park (Conacher Travers 2002) and should be consulted for all issues related to fire and fire management within the Park.

Berowra Valley Regional Park contains many advantages for fire management including well-formed roads, fire trails and steep valleys/creek lines which assist in containing fires. Berowra Creek also serves as a natural barrier in containing and directing fires on either side of the gorge.

The rugged and remote nature of some areas within the Park can aid the spread of fire, however it appears that past fire management practices have been effective in containing fire. The construction of many fire trails in the 1970s and 1980s has assisted this greatly.

Berowra Valley Regional Park has historically experienced a moderately high frequency of unplanned fires. The most recent fires within the boundaries of the Park were in December 2002 when 361 hectares were burnt in the northern section of the Park. Previous to this there have been a number of fires in the Park which were quickly suppressed, limiting the extent of area burnt.

The many hundreds of dwellings on the rim of the bushland are subject to the potential impact of bushfire. The NPWS on behalf of the Trust is the fire authority for the Park under the *Rural Fires Act 1997*. The NPWS, Rural Fire Service and the NSW Fire Brigades, through the Hornsby Kuring-gai Bushfire Management Committee, jointly manage fire suppression activities in the Park and the schedule of hazard reduction burns.

Desired Outcomes:

- The occurrence of unplanned bushfires and spread of bushfires on, from or into the Park is reduced.
- Fire regimes are appropriate for long-term maintenance of the Park's plant and animal communities.
- Bushfire management includes protecting persons and property on, or immediately adjacent to the Park, and Aboriginal sites, historic places and culturally significant features known to exist within the Park.

Management Strategies:

- Maintenance of fire trails and utilities to assist with fire suppression will be carried out;
- Rapid suppression of unplanned fires will be undertaken where possible;
- Strategic fuel management programs and hazard reduction along boundary areas will recognise biodiversity and asset protection values, and will include pre-burning surveys for Aboriginal / historic relics and rare or threatened species; and
- Fire safety and fire protection procedures will be promoted to Park neighbours and visitors.

5.5 BOUNDARY MANAGEMENT**5.5.1 Neighbour Relations**

The large size and linear shape of the Park creates a large boundary over which issues of neighbour relations become very important to the management of this Park. Resolution of issues such as encroachments, rubbish dumping, urban interface effects, park access, and boundary rationalisation are best achieved with a high degree of involvement and cooperation of Park neighbours.

Desired Outcomes:

- The integrity of the Park boundary is maintained.
- The boundaries of the Park are rationalised where opportunities to acquire land exist.

Management Strategies:

- A Neighbour Relations Plan for the Park will be undertaken to encourage involvement and cooperation and address major impacts associated with the residential/park interface including encroachments, disturbance and dumping;
- Work with relevant consent authorities for neighbouring lands to:
 - maintain the integrity of the Park boundary;
 - ensure neighbour activities are consistent with the management objectives of the Park; and
 - rationalise the Park boundaries when opportunities arise.
- Vehicular access to fire trails will be restricted to use by authorities for management purposes.

5.5.2 Land Acquisition

Berowra Valley Regional Park is bounded by urban development on all sides with a variety of land uses being undertaken on its boundaries. Areas of medium to high density housing, small rural holdings, vacant Crown land and Council owned land bordering the Park present a number of challenges to management of the Park.

The highly convoluted boundaries of this Park present a major challenge to its management. The effects of the large number of residential properties bordering the Park, urban edge effects such as weeds and feral animals and high boundary-to-area ratios contribute to ongoing management problems. The acquisition of appropriate lands adjoining the Park

would serve to add lands for conservation or recreation purposes within the Park and rationalise its boundaries.

Desired Outcomes:

- Additional suitable land is obtained to improve convoluted boundaries, decrease boundary-to-area ratio, increase range and diversity of vegetation communities, give protection to rare fauna, plants or plant communities outside present boundaries, give control over creek catchments, increase recreation opportunities, protect visual boundaries and to give coordinated management to a greater area of bushland.
- Areas on the boundary of the park are managed to minimise threats to the Park.

Management Strategies:

- Community land classified as bushland under the Hornsby LEP and which adjoins Berowra Valley Regional Park should be managed in a manner compatible with the Park so that objectives for protecting land adjoining the Park can be further advanced; and
- Vacant bushland adjoining the Park will be examined to assess suitability for inclusion in the Park.

5.5.3 Rifle Range

A rifle range (and associated safety template) is located on non-Park lands in the central section of the Park near Hornsby. The range consists of an 800m classification range, a small bore range and a zero range/pistol range. Stop butts are situated on the western end of the classification range and the safety template extends for 1900 m west into the Park. This safety template is 800 m in width at the widest point and almost bisects the Park. While the land associated with this range is not contained within the Park, it has a significant effect on activities within areas of the Park.

The rifle range is licensed to the North Shore District Rifle Association No 18 by the Department of Lands.

Insearch Limited carried out a safety audit on the range in 1995. This audit recommended the relocation of the section of the Great North Walk which crosses the safety template. As a response to this, this section of the walk was closed. An alternative route was identified which diverts the walk around the eastern borders of the rifle range.

While the safety audit found no fault with the safety procedures of the rifle range, there is little doubt that the rifle range affects residents and other users of the Park. The safety template runs through an area which features sections of the Great North Walk as well as a number of other tracks such as the Quarry Road Track. The presence of this safety template places considerable restrictions on the uses of these areas.

Desired Outcome:

- Management of the rifle range is compatible with the objectives of the Park.

Management Strategy:

- The Trust will work with the Department of Lands to ensure the management of the rifle range is compatible with objectives for Berowra Valley Regional Park.

6. VISITOR OPPORTUNITIES AND EDUCATION

6.1 INFORMATION PROVISION

6.1.1 Promotion and Interpretation

Promoting public awareness of the Park's conservation values and recreational opportunities compatible with these values is a major aspect of management within the Park. It assists in the protection of natural and cultural heritage and increases the understanding, enjoyment and satisfaction of visitors.

Desired Outcomes:

- A high public profile for the Park is achieved to increase community awareness of its existence and location as a social, natural, recreational, educational and conservation resource.
- A high quality education and interpretative experience is created within the Park.

Management Strategies:

- A system of signs proclaiming the name, correct boundaries and facilities of the Park will be developed and located prominently at major entrances to the Park. This will include a map which identifies sites for disabled and aged access;
- A program of information, education and interpretation for the Park will be developed which will include guided walks, interpretative signs and education pamphlets; and
- The establishment of interpretative areas/places in the Park, and contribution to existing or proposed centres in the region, will be considered.

6.1.2 Community Involvement

The high levels of use (from both locals and visitors) and variety of activities available within the Park have fostered the involvement of a large number of community groups. Most of these groups are voluntary and carry out vital activities which contribute significantly to the recreational and conservation value of the Park. Bush regeneration, rubbish removal, data collection and the production of a guidebook are some of the activities which are currently being carried out by community groups associated with the Park.

Desired Outcome:

- The role of community groups in management of the Park is promoted, and support for the operations of such groups is provided.

Management Strategies:

- The involvement of community groups, such as Friends of Berowra Valley Regional Park, environmental, historical, service clubs, schools and education institutions, Scouts, Guides and other youth clubs will be encouraged;
- Official recognition to community projects through provision of awards, signs at project sites, and nomination for achievement awards in broader community recognition schemes, such as the 'Keep Australia Beautiful' awards, will be given; and
- Clear, concise literature, outlining suitable projects for community groups will be developed.

6.2 RECREATION OPPORTUNITIES

Berowra Valley Regional Park experiences various levels of recreational usage throughout the year. Visitor numbers can be particularly high on weekends and public holidays. The location of the Park and the facilities it provides makes it a popular recreation area for locals and visitors alike. The Park caters for day use recreation (including picnics, bushwalking, canoeing and nature appreciation) through to organised group events (subject to activity consents) such as large group camping. The Park contains a number of areas which cater for the recreational needs of Park visitors, including disabled/aged users. Additional recreational uses in the Park include photography, drawing, painting and leashed dog walking (refer section 5.3.2 for permitted dog walking areas and conditions).

Crosslands Reserve has facilities such as parking, picnic tables, toilets, short walks, a mangrove boardwalk and a flat sealed path which allows for disabled/aged use of the area. Crosslands Reserve currently consists of two land tenures: a freehold title classified as Community Land owned and managed by Hornsby Shire Council, and land gazetted as Berowra Valley Regional Park under the *National Parks and Wildlife Act 1974*. Currently the management of Crosslands Reserve is subject to a Funding and Management Agreement between the Trust, Hornsby Shire Council and the National Parks and Wildlife Service. Therefore, desired outcomes and management strategies for Crosslands Reserve within this Plan require coordinated management from these authorities.

Barnetts Lookout (off Barnetts Road) has recently been upgraded with the provision of a playground, safety fences, seating and a well-developed track to the lookout. Parking is readily available and there are a number of picnic tables and seats. The Trust has identified this site for the possible provision of further disabled/aged facilities in the future.

Two areas within Galston Gorge (on Galston Road) have also been recently upgraded and landscaped to provide for picnics and car parking in this highly scenic section of the Park. The Lower Galston Gorge Rest Area provides a pick up and drop off point for the Great North Walk as well as an area with seats, parking and a landscaped garden area. Galston Gorge Picnic Area and Lookout provides a picnic table, seating and parking in a landscaped garden area. While both only cater for small numbers at one time, they provide valuable additions to the recreational opportunities within this Park.

The newly upgraded facilities at Galston Gorge provide for disabled parking, flat sealed access suitable for wheelchairs and suitable seating and tables overlooking areas of high scenic quality.

There are currently no formalised recreational facilities in the southern and western sections of the Park. A site (Stringybark Ridge, off Schofields Parade, Pennant Hills) has been identified in the southern section of the Park that could be developed as a passive recreation area. The site is well serviced with electricity and water, and has an existing large cleared area.

6.2.1 Bushwalking

Bushwalking is one of the most popular recreational activities within the Park. The highly scenic nature, bushland and well-developed tracks of this Park attract local, regional and international bushwalkers. Extensive works to provide bushwalking tracks and facilities at track heads such as toilets, signage, water and picnic tables have made Berowra Valley Regional Park a major focus for bushwalking activities within the Sydney Region.

Recreational walkers utilise a number of trails within the Park, particularly the Great North Walk extending from Lane Cove in the south to Newcastle in the north. This track is managed and maintained by the Department of Lands. Other formalised tracks within this Park include:

- Jungo Walk – 5km (2hrs);
- Callicoma Walk – 5km (3hrs) – Easy;
- Refuge Rock Walk – 2km return (2hrs) – Easy;
- Elouera Walk – 9km (5hrs) – Moderate;
- Blue Gum Bushwalk (3 hrs);
- Joes Mountain Circuit - 4.5km (2.5hrs); and
- Quarry Road Track - Steele Bridge circuit – 10km (4hrs).

Additionally, the fire trails within the Park provide approximately 77km of tracks for recreational walking. Some trails are not available for public use due to being located on private property or being within the rifle range safety zone.

Desired Outcome:

- A high quality bushwalking experience for recreational walkers is provided within the Park.

Management Strategies:

- The Trust will endeavour to develop and adopt a grading system for bushwalking tracks within the Park including using appropriate signage to identify tracks, difficulty levels and length;
- Possible routes for short, circular, easy grade walks will be examined, without causing undesirable duplication or proliferation of tracks;
- The Trust will continue to upgrade bushwalking tracks and facilities as resources allow, using methods which are compatible with the soils and topography of the Park; and
- The Trust will review all park maps and signs to ensure that only those trails wholly within the park are promoted for public use.

6.2.2 Day Use

In a previous recreational needs study for the area, it was identified that a major public use of the Park was for picnics and barbecues followed by a short bushwalk. The main focus of such activities is at Crosslands Reserve, which provides ample opportunity for picnics and facilities such as barbecues. Toilets, parking, playgrounds, water craft and a number of short circular walking tracks are also available. There is no shop or kiosk in this Reserve. While the site is not currently serviced by public transport, the site is accessible by a well-maintained road and large areas are available for parking.

There is an identified need to address the water and sewage disposal and prepare a redevelopment plan for the Reserve. It is envisaged that Crosslands Reserve will increase its day use visitation over the next 5 -10 years as it assumes a greater proportion of day use overflow from more established areas nearby such as Ku-ring-gai Chase National Park and Lane Cove National Park.

Crosslands Reserve contains land gazetted within the Park to the north (downstream) of the car park and freehold land held by Hornsby Shire Council to the south (upstream) of the car park. In addition Hornsby Shire Council manages the land that contains the road access to Crosslands. The Funding and Management Agreement for this Park specifies the contribution in terms of time and money for maintenance of the Park's facilities.

Stringybark Ridge has been identified as a site for future passive recreation. It will be progressively developed as an area for passive recreation with limited day-use facilities. Rehabilitation of the site and bush regeneration will also be undertaken.

Desired Outcomes:

- Users of the Park are provided with high quality day use recreational opportunities within a natural bushland setting.
- Increased usage of the Park by disabled/aged people.

Management Strategies:

- The upgrading of water supply and sewerage at Crosslands Reserve will be addressed;
- The Trust will negotiate with Hornsby Shire Council in order to seek consistent management at Crosslands Reserve. Matters for discussion will include:
 - consistency in policies for the two tenures at Crosslands Reserve;
 - funding of upgrade works at Crosslands Reserve including investigation of cost recovery options for public use of Crosslands Reserve; and
 - reserve planning to ensure appropriate utilisation of space at Crosslands Reserve for the range of recreational uses including: day use picnicking, large group use, car based camping and backpack camping.
- A redevelopment plan for Crosslands Reserve will be prepared and will cover a range of aspects including:
 - access and infrastructure requirements;
 - visitation and capacity;
 - water supply;
 - waste management; and
 - current use and visitor needs and perceptions.

Further development of the section of Crosslands Reserve within Berowra Valley Regional Park, beyond renovation or replacement of the existing facilities, will be subject to an amendment to this plan;

- Fires may only be lit in authorised fireplaces;
- Current wood burning barbecues within the Park will be progressively replaced with gas or electric alternatives. Users will be encouraged to supply their own gas barbecues where possible;
- Toilet facilities will be provided at Barnetts Lookout should the need be identified;
- Further development and redevelopment of recreational sites will consider aged/disabled access;
- Any additional development in the Berowra Waters precinct will be managed in consultation with Hornsby Shire Council and Berowra Waters residents in order to minimise any additional effect of parking;
- The site at Stringybark Ridge will be progressively developed as a passive recreation area with limited day-use facilities. This will include:
 - The provision of picnic facilities such as picnic tables, electric barbecues, picnic shelters, toilets and parking (the carpark will not exceed the size of the current carpark);
 - The provision of a camping area for users of the Great North Walk will be investigated in consultation with the Department of Lands;

- The controlled use of the site for community group activities on the basis of an approved activity consent; and
 - The relocation of the current gate to the entrance of the site and its closure between sunset and sunrise.
- A precinct plan for Stringybark Ridge will be prepared to guide the location of passive recreational facilities and protect vegetation communities, and will include rehabilitation and bush regeneration.

6.2.3 Camping

Camping is a popular activity within the Park. Use ranges from overnight stops for users of the Great North Walk, to occasional car-based camping and group camping at Crosslands Reserve. The proximity to railway stations makes it an ideal destination for light weight camping for visitors.

Desired Outcome:

- Camping occurs only at designated locations

Management Strategies:

- Camping will be permitted in designated areas along the Great North Walk (refer map) and at Crosslands Reserve, and will be investigated at Stringybark Ridge in conjunction with the Department of Lands;
- Fires may only be lit in authorised fireplaces;
- Car-based camping will be restricted to Crosslands Reserve to avoid potential conflict with day visitation;
- Large group camping will continue to be permitted within Crosslands Reserve and will be managed according to a booking system. This system will be used to manage numbers of campers in the area at any one time in order to establish a carrying capacity for the Reserve and to avoid overcrowding; and
- The fire pit area at Crosslands Reserve will be accessible for group use via this same booking system. Unauthorised use of the fire pit area will be policed.

6.2.4 Cycling

Cycling or bike riding (as opposed to motor bike riding) has been one of the more popular recreation pursuits in recent years. Cycling is currently permitted on all management trails in the Park with the exception of those sections of trail within the rifle range safety zone. Cycling is not permitted on walking tracks.

A key finding of the Hornsby Shire's Recreation Survey was that a lack of cycleways was a barrier to recreational pursuits in the area. Following this finding, Hornsby Shire Council commissioned a Bicycle Study (adopted in 1998), which identified a number of existing tracks which could be upgraded for use as formal cycleways. This study recommended the upgrading of three (3) tracks within the Park for bicycle use:

- Westleigh (Timbarra Rd) to Pennant Hills (Bellamy Street);
- Cherrybrook (Stringybark Ridge area); and
- Quarry Road Track.

Desired Outcome:

- The provision of appropriate cycleways for users of the Berowra Valley Regional Park.

Management Strategies:

- Cycling will be permitted on all management trails in the Park with the exception of those sections of trail on private property or within the rifle range safety zone;
- Cycling is not permitted on walking tracks;
- The three proposed tracks will be assessed to determine impacts on natural or historic values and, subject to minimal impacts, upgraded to cycleway standard; and
- The provision of facilities and management of bicycle use of the Park will be undertaken in consultation with Hornsby Shire Council and in accordance with the Bicycle Plan (1998).

6.2.5 Horse Riding

Horse riding is not permitted within Berowra Valley Regional Park. Trails that might be designated suitable for horse riding were reviewed prior to the preparation of the draft plan of management. However, on considering the need to restrict the presence of non-native animals within the Park, the Trust has adopted a precautionary approach and determined that horses be excluded from the Park.

Desired Outcome:

- The precautionary approach in maintaining the current policy of excluding horses and horse riding from the Park is adopted.

Management Strategy:

- Appropriate signage will be installed and the current system of policing horse riding activities will be maintained.

7. RESEARCH AND MONITORING

The purpose of scientific study and monitoring in Berowra Valley Regional Park is to improve understanding of its natural and cultural heritage and the processes which affect them. Research also establishes the requirements of management for particular species.

Desired Outcome:

- Improved management of the Berowra Valley Regional Park through research.

Management Strategies:

- Research will be undertaken to provide information about the Park's natural and cultural heritage and human use in order to facilitate management;
- Research will be subject to the policies of the NPWS concerning the granting of permits, conduct of research and the communication of results;
- Priorities for research will include:
 - Threatened plants, ecological communities and animals;
 - Aboriginal heritage of the Park;
 - Historic features of the Park; and
 - Recreational uses of the Park.
- Bird watchers and similar groups will be encouraged to pass on information gathered within the Park;
- Monitoring of vegetation regeneration will be undertaken following prescribed burns;
- Monitoring of high impact recreation activities such as dog walking and cycling will be undertaken;
- Access by researchers to areas or trails not normally accessible by the public will only be permitted if the value of the research justifies such access; and
- A prospectus will be prepared as a guide to preferred research projects in biodiversity management, fire ecology and management, visitor use of the area and cultural heritage management. Preferred topics will be those of direct relevance to management and will include:
 - The distribution, status and/or management requirements of threatened plant and animal communities;
 - Methods to control and/or eradicate weeds and feral animals;
 - The effect of different fire regimes on native animals;
 - Water catchment protection;
 - Recreational use patterns and the impact of different activities on natural and cultural resources; and
 - The distribution, significance and conservation requirements of Aboriginal sites and historic places.

8. LEASES AND LICENCES

Tours and organised activities have many benefits. They increase the opportunity for public participation in nature based activities and provide opportunities for professional instruction in the safety and minimal impact aspect of various recreational pursuits. Guided activities also have potential to interpret and promote the natural and cultural values of the Park.

The positive role of guided tours and other commercial operations needs to be balanced against the protection of the Park's natural and cultural resources and the overall demand for recreational use of the Park. Commercial and organised activities can contribute to an unacceptable level of impact at certain sites and have in the past been a direct cause of conflicts between visitors. Large groups can make it difficult for other visitors to use the Park's facilities, generate loud noise levels and spoil the recreational experience for those wanting to experience the quiet and restful atmosphere. Organised activities need to be managed as a component of all recreation in the Park to ensure that all impacts are within acceptable limits.

Commercial activities in the Park are required by legislation to have a lease or licence, while organised groups are to have consent. Leases, licences and consents provide the mechanism for ensuring activities, levels of use and behaviour are appropriate for the Park and specific locations and compatible with recreational use. Leases and licences also mean that industries and operators who utilise the Park's public resources for commercial purposes make a financial contribution to Park management and display the highest standards of behaviour towards the Park and its protection. All commercial leases and licences need to be regularly reviewed to ensure:

- that the operators are complying with their lease or licence;
- the operations are appropriate in terms of the objectives of the Park;
- the operations are providing a valuable service to Park visitors and information which improves public understanding and appreciation of the Park; and
- the operations are not having an unacceptable impact on the Park or other visitors.

The tea house at Berowra Waters forms part of the Berowra Valley Regional Park. The tea house is leased by the Berowra Valley Regional Park Trust to a private corporation. The leased area includes the kiosk and driveway to Berowra Waters Road. The tea house is historic and major works are subject to the provisions of the *Environment Planning and Assessment Act 1979*, *Heritage Act 1977* and *National Parks and Wildlife Act 1974*. A conservation plan is therefore required prior to major works.

Desired Outcome:

- Commercial and other non-Park uses have minimal environmental impact.

Management Strategies:

- Existing commercial operations within the Park will continue to be permitted in accordance with NPWS policy and licence conditions;
- Leases, licences and consents may prescribe the approved activities, location and frequency of activities, maximum group sizes and minimum guide ratios for each activity, guide standards, fees, appropriate behaviour and other special provisions to ensure the long term protection of the Park, Park visitors and recreational opportunities;
- Prior approval will be required for organised activities by schools, community and other groups of over 20 people. Limits may be placed on group sizes, locations and frequency of use to minimise environmental impacts and conflicts with other Park users;

- Licences may be issued for recreational use of the modified natural areas at Crosslands and Stringybark Ridge for a term not exceeding 3 consecutive days.
- The Trust may consider operating leases for compatible recreational uses of the Park;
- Commercial operation of the tea house at Berowra Waters will be permitted under a term lease or by a contractor;
- Limited operators accommodation at the tea house at Berowra Waters will be permitted;
- The tea house at Berowra Waters will be permitted to cater for booked public functions;
- A Heritage Assessment and/or Conservation Plan will be prepared for the tea house at Berowra Waters and its surrounds; and
- Lease and licence applications will be assessed in accordance with the provisions of the NPW Act and Regulation and NPWS Policy and Licence conditions.

9. MANAGEMENT FACILITIES AND OPERATIONS

9.1 MANAGEMENT OPERATIONS

The Berowra Valley Regional Park Trust manages the Park. The Trust currently comprises three Hornsby Shire Councillors, one NPWS staff member, one staff member from Hornsby Shire Council and two community representatives. The Plan of Management for the Park provides strategic direction to the Trust.

The NPWS and Hornsby Shire Council under the direction of the Trust carry out the day to day management of the Park. These organisations undertake their responsibilities in accordance with each agency's operational plans/guidelines and a Funding and Management Agreement which defines the roles of the Berowra Valley Regional Park Trust, NPWS and Hornsby Shire Council in implementing management strategies detailed in the Park's Plan of Management. It also documents the contribution (in terms of time and money) of each of these authorities to the management of the Park.

9.2 MANAGEMENT FACILITIES / ARRANGEMENTS

The Park's management trail system is primarily maintained for fire management purposes. Locked gates prevent unauthorised access onto the Park's trail system.

A number of state and regional authorities currently occupy or use land reserved as Berowra Valley Regional Park for public utilities or access to public utilities. Public utilities include overhead transmission lines, sewage pumping stations and associated sewer pipes and associated service trails. There are a number of acts or agreements which cover the facilities managed by other authorities within the Park.

A number of permissive occupancies for private, public or corporate entities may result from the transferral of Crown land administered by the Department of Lands to land administered under the *National Parks and Wildlife Act 1979*. It is the long term aim of the Trust to reduce, and if possible, eliminate, the number of non-park uses within the Park. To this end such occupancies will be kept under regular review and where warranted removed or relocated off the reserve and the site rehabilitated.

The Department of Lands funds and undertakes maintenance of the Great North Walk within the Park.

Desired Outcome:

- Management infrastructure adequately serves the needs of Park management and has acceptable environmental impact.

Management Strategies:

- The principles of ecologically sustainable development will be used to guide management operations. Cooperation with other authorities and stakeholders will be pursued in implementing these principles across the Park;
- Vehicle trails will be maintained to a good standard of stability and access;
- The current system of locked gates limiting access to vehicle trails will be maintained to reduce degradation of trails from general traffic;

- All management trails and facilities will be kept under review in terms of their function, maintenance requirements and impact. Trails and facilities which are no longer essential or whose impact exceed their management value will be closed and/or removed and the site rehabilitated;
- Only vehicles on authorised management operations or those covered by a lease, licence, easement or agreement will be permitted to use management trails within the Park;
- Environmental assessments will be required for the maintenance and upgrading of facilities which will potentially impact on the Park; and
- A Memorandum of Understanding will be developed for the maintenance of the Great North Walk traversing Berowra Valley Regional Park with the Department of Lands.

10. PLAN IMPLEMENTATION

This Plan of Management is part of a system of management developed by the National Parks and Wildlife Service and used by the Trust. The system includes the *National Parks and Wildlife Act 1974*, management policies, and strategic planning at corporate, directorate and regional levels.

Implementation of this Plan will be undertaken within the annual programs of the Berowra Valley Regional Park Trust. Priorities, determined in the context of regional strategic planning, will be subject to the availability of staff and funds, and to any special requirements of the Trust, National Parks and Wildlife Service and the Minister.

Regional programs are subject to ongoing review, within which, works and other activities carried out in Berowra Valley Regional Park will be evaluated in relation to the policies laid out in this Plan.

The environmental impacts of all development proposals will continue to be assessed at all stages of the development and any necessary investigations undertaken in accordance with established environmental assessment procedures.

Section 81 of the NPW Act requires that this Plan should be carried out and given effect to, and that no operations shall be carried out in relation to regional parks unless they are in accordance with this Plan. However, if after adequate investigation, operations not included within this Plan are found to be justified and acceptable, this Plan may be amended in accordance with Section 73B of the Act.

As a guide to the orderly implementation of this Plan, relative priorities for identified activities are identified below:

Key to Priorities:

High: Urgent or very important management strategies already underway or planned for immediate implementation

Medium: Management strategies which are important but not urgent

Low: Management strategies which may be deferred in preference to other priorities

Ongoing: Recurrent management strategies, generally already underway

Management strategies have been abbreviated for the purposes of this table. Full details on these management strategies are found within each relevant section of the Plan.

Priorities for Plan Implementation

Priority	Plan Reference	Activity
4. CONSERVATION OF NATURAL AND CULTURAL HERITAGE		
M	4.1	All significant geological and landscape features in the Park will be identified to ensure they are protected from any development works.
M	4.1	Collaborative management with other consent authorities will be pursued to protect identified escarpments and areas of high scenic quality.
H	4.2	Recovery plans for threatened plants will be implemented.
O	4.2	Management programs such as fire and recreational management activities will consider long term impacts on vegetation communities and plant populations.
H	4.2	Contract and volunteer bush regeneration programs will be undertaken.
H	4.2	Local biodiversity will be preserved and enhanced through planting of locally indigenous species. Only locally indigenous species will be used in bushland restoration and landscape works.
H	4.2	The native vegetation values of the Park's bushland to the community will be promoted.
O	4.3	Habitats of all native fauna, including threatened or biogeographically significant species, will be protected from visitor impacts, effects of introduced species, inappropriate fire regimes, bush rock removal and other adverse impacts.
H	4.3	Recovery plans for threatened animals will be implemented.
M	4.3	The distribution and abundance of threatened and significant fauna species will be continued to be monitored.
O	4.3	Management programs will consider long term impacts on animal populations and their habitats.
O	4.4	The management (including promotion, education and protection) of the Park's Aboriginal heritage will be conducted in consultation with the Metropolitan Aboriginal Lands Council and other relevant Aboriginal community organisations.
H	4.4	Archaeological survey and cultural assessment will be undertaken prior to all works with the potential to impact on Aboriginal sites and places.
O	4.4	The recommendations of Hornsby Council's Aboriginal Heritage Study (1996) will be considered when directing management of sites within the Park.
O	4.5	Cultural heritage sites, when identified, will be managed according to their significance and potential impacts on the site.
L	4.5	The historic values of the Thornleigh Quarry and the Zig-Zag railway route will be reviewed with consideration of an interpretation and restoration initiative on the site.
O	4.5	The articles of the Burra Charter for the conservation of places of historical or cultural significance will be used as guidelines for the management of historical features within the Park.
O	5.1	All works will be designed and undertaken in a manner which minimises soil erosion.
M	5.1	Monitoring and appropriate treatment of areas of erosion will occur.
O	5.1	Collaboration with other authorities will be undertaken to minimise erosion on adjoining lands.
O	5.2	Activities which may have an effect on catchment management goals will be carried out in accordance with the recommendations of the Berowra Creek Water Quality Management Strategy and Berowra Creek Estuary Management Study and Management Plan (2000).
O	5.2	Liaison with Hornsby Council, Sydney Water, and other authorities as needed to improve the water quality of the Park's catchments will be maintained.
H	5.2	Water quality controls will be instituted on land within and adjoining the Park to reduce deterioration of bushland and waterways through erosion,

		sedimentation and nutrient transport.
H	5.2	Programs will be developed to minimise dumping of green waste in the Park, including the identification of areas prone to dumping. This program will be supported by community education and law enforcement.
H	5.3.1	Priority will be given to encouraging and supporting weed control, bush regeneration and education programs within and adjacent to the Park.
O	5.3.1	All weed control and bush regeneration programs will be strategic and on a catchment basis using best practice bush regeneration principles and techniques.
H	5.3.1	Programs will be undertaken in cooperation with Hornsby Shire Council, other relevant authorities and Park neighbours and will target weed infestations, where they pose a threat to endangered ecological communities, threatened species habitats, and new infestations before they become established.
O	5.3.1	Locally indigenous plants will be encouraged in developments around the Park's boundary.
H	5.3.2	Introduced plants and animals will be controlled.
H	5.3.2	Management strategies for introduced plants and animals will be developed as appropriate. Currently domestic cats and garden escape plants are causing concern.
H	5.3.2	Control plans for pest species will be implemented in cooperation with relevant authorities and Park neighbours and will be designed so as not to harm non-target species and Park values.
H	5.3.2	The current fox control plan will continue.
H	5.3.2	Dogs will only be permitted on leashes, and in or on designated dog walking areas or trails. These designated areas will be signposted with continued use dependent on monitoring for environmental impact. Designated areas will be: <ul style="list-style-type: none"> ➤ Bellamy Fire Trail between Bellamy Street and De Saxe Close, Thornleigh (450m) ➤ Daphne Fire Trail between Tuscan Way (end Daphne Close) and Patricia Close, Cherrybrook (430m) ➤ Clarinda Fire Trail between Clarinda Street and Simon Place, Hornsby (430m)
H	5.3.2	Leashed dog walking may be provided for on the following peripheral trails subject to an assessment of potential environmental impact and need: <ul style="list-style-type: none"> ➤ Waninga Fire Trail between Heather Place and Waninga Road, Hornsby Heights (1.4km) ➤ Daphne Fire Trail between Daphne Close and Blackwattle Place, Cherrybrook (1 km) ➤ Arthurs Fire Trail between Merlin Close and Excalibur Close, Mt Colah (800m).
H	5.3.2	Dogs will not be permitted at Crosslands Reserve or in proximity to picnic or BBQ areas.
H	5.3.2	Dogs will not be permitted on walking tracks, including the Great North Walk, or anywhere else in the Park other than on the trails specified above.
H	5.3.2	Development of a management and education program on leashed dog walking will be undertaken with Hornsby Council, including compliance and provision of waste disposal.
M	5.3.2	An education strategy will be developed including a brochure explaining the damage and threats unleashed dogs cause to wildlife, how designated dog walking areas were chosen and why leashed dog walking is restricted in the Park. The placement of bins and bags for faeces will be investigated.

O	5.4	Maintenance of fire trails and utilities to assist with fire suppression will be carried out.
H	5.4	Rapid suppression of unplanned fires will be undertaken where possible.
H	5.4	Strategic fuel management programs and hazard reduction along boundary areas will recognise biodiversity and asset protection values, and will include pre-burning surveys for Aboriginal/historic relics and rare or threatened species.
H	5.4	Fire safety and fire protection procedures will be promoted to Park neighbours and visitors.
M	5.5.1	A Neighbour Relations Plan for the Park will be undertaken to encourage involvement and cooperation and address major impacts associated with the residential/park interface including encroachments, disturbance and dumping.
O	5.5.1	Work with relevant consent authorities for neighbouring lands to: <ul style="list-style-type: none"> - maintain the integrity of the Park boundary; - ensure neighbour activities are consistent with the management objectives of the Park; and - rationalise the Park boundaries when opportunities arise.
M	5.5.1	Vehicular access to fire trails will be restricted to use by authorities for management purposes.
H	5.5.2	Community land classified as bushland under the LEP and which adjoins Berowra Valley Regional Park should be managed in a manner compatible with the Park so that objectives for protecting land adjoining the Park can be further advanced.
M	5.5.2	Vacant bushland adjoining the Park will be examined to assess suitability for inclusion into the Park.
H	5.5.3	The Trust will work with the Department of Lands to ensure the objectives of the rifle range are compatible with objectives for Berowra Valley Regional Park.
H	6.1.1	A system of signs proclaiming the name, correct boundaries and facilities of the Park will be developed and located prominently at major entrances to the Park, this will include a map which identifies sites for disabled and aged access.
L	6.1.1	A program of information, education and interpretation for the Park will be developed, which will include guided walks, interpretative signs and educational pamphlets.
L	6.1.1	The establishment of Interpretative areas/places in the Park, and contribution to existing or proposed centres in the region, will be considered.
H	6.1.2	The involvement of community groups, such as Friends of Berowra Valley Regional Park, environmental, historical, service clubs, schools and education institutions, Scouts, Guides and other youth clubs will be encouraged.
H	6.1.2	Official recognition to community projects through provision of awards, signs at project sites, and nomination for achievement awards in broader community recognition schemes, such as the 'Keep Australia Beautiful' awards, will be given.
M	6.1.2	Clear, concise literature, outlining suitable projects for community groups will be developed.
M	6.2.1	The Trust will endeavour to develop and adopt a grading system for bushwalking tracks within the Park including using appropriate signage to identify tracks, difficulty levels and length.
L	6.2.1	Possible routes for short, circular, easy grade walks will be examined, without causing undesirable duplication or proliferation of tracks.
O	6.2.1	The Trust will continue to upgrade bushwalking tracks and facilities as resources allow, using methods which are compatible with the soils and topography of the Park.
H	6.2.2	The upgrading of water supply and sewerage at Crosslands Reserve will be addressed.

H	6.2.2	The Trust will negotiate with Hornsby Shire Council in order to seek consistent management at Crosslands Reserve. Matters for discussion will include: <ul style="list-style-type: none"> - consistency in policies for the two tenures at Crosslands Reserve; - funding of upgrade works at Crosslands Reserve including investigation of cost recovery options for public use of Crosslands Reserve; and - reserve planning to ensure appropriate utilisation of space at Crosslands Reserve for the range of recreational uses including: day use picnicking, large group use, car base camping and backpack camping.
H	6.2.2	A redevelopment plan for Crosslands Reserve will be prepared which will cover a range of aspects including: <ul style="list-style-type: none"> - access and infrastructure requirements; - visitation and capacity; - water supply; - waste management; and - current use and visitor needs and perceptions. Further development of the section of Crosslands Reserve within Berowra Valley Regional Park, beyond renovation or replacement of the existing facilities, will be subject to an amendment to this plan.
H	6.2.2	Fires may only be lit in authorised fireplaces.
H	6.2.2	Current wood burning barbecues within the Park will be progressively replaced with gas or electric alternatives. Users will be encouraged to supply their own gas barbecues where possible.
L	6.2.2	Toilet facilities will be provided at Barnetts Lookout should the need be identified.
O	6.2.2	Further development and redevelopment of recreational sites will consider aged/disabled access.
O	6.2.2	Any additional development in the Berowra Waters precinct will be managed in consultation with Hornsby Shire Council and Berowra Waters residents in order to minimise any additional effect of parking.
M	6.2.2	The site at Stringybark Ridge will be progressively developed as a passive recreation area with limited day-use facilities. This will include: <ul style="list-style-type: none"> - The provision of picnic facilities such as picnic tables, electric barbecues, picnic shelters, toilets and parking (the carpark will not exceed the size of the current carpark); - The provision of a camping area for users of the Great North Walk will be investigated in consultation with the Department of Lands; - The controlled use of the site for community group activities on the basis of an approved activity consent; - The relocation of the current gate to the entrance of the site and its closure between sunset and sunrise.
M	6.2.2	A precinct plan for Stringybark Ridge will be prepared to guide the location of passive recreational facilities and protect vegetation communities, which will include rehabilitation and bush regeneration.
H	6.2.3	Camping will be permissible in designated areas along the Great North Walk (refer map) and at Crosslands Reserve, and will be investigated at Stringybark Ridge in conjunction with the Department of Lands.
O	6.2.3	Fires may only be lit in authorised fireplaces.
H	6.2.3	Car-based camping will be restricted to Crosslands Reserve to avoid potential conflict with day visitation.
O	6.2.3	Large group camping will continue to be permitted within Crosslands Reserve and will be managed according to a booking system. This system will be used to manage numbers of campers in the area at any one time in order to establish a carrying capacity for the Reserve and to avoid overcrowding.
H	6.2.3	The fire pit area at Crosslands Reserve will be accessible for group use via this same booking system. Unauthorised use of the fire pit area will be policed.

H	6.2.3	Cycling will be permitted on all management trails in the Park with the exception of those sections of trail within the rifle range safety zone.
H	6.2.3	Cycling is not permitted on walking tracks.
M	6.2.4	The three proposed tracks will be assessed to determine impacts on natural or historic values and, subject to minimal impacts, upgraded to cycleway standard.
O	6.2.4	The provision of facilities and management of bicycle use of the Park in will be undertaken in consultation with Hornsby Shire Council and in accordance with the Bicycle Plan (1988).
H	6.2.5	Appropriate signage will be installed and the current system of policing horse riding activities will be maintained.
O	7.0	Research will be undertaken to provide information about the Park's natural and cultural heritage and human use in order to facilitate management.
O	7.0	Research will be subject to the policies of the NPWS concerning the granting of permits, conduct of research and the communication of results.
H	7.0	Priorities for research will include: <ul style="list-style-type: none"> - Threatened plants, ecological communities and animals; - Aboriginal heritage of the Park; - Historic features of the Park; and - Recreational uses of the Park.
M	7.0	Bird watchers and similar groups will be encouraged to pass on information gathered within the Park.
M	7.0	Monitoring of vegetation regeneration will be undertaken following prescribed burns.
H	7.0	Monitoring of high impact recreation activities such as dog walking and cycling will be undertaken.
M	7.0	Access by researchers to areas or trails not normally accessible by the public will only be permitted if the value of the research justifies such access.
M	7.0	A prospectus will be prepared as a guide to preferred research projects in biodiversity management, fire ecology and management, visitor use of the area and cultural heritage management. Preferred topics will be those of direct relevance to management and will include: <ul style="list-style-type: none"> - The distribution, status and/or management requirements of threatened plant and animal communities; - Methods to control and/or eradicate weeds and feral animals; - The effect of different fire regimes on native animals; - Water catchment protection; - Recreational use patterns and the impact of different activities on natural and cultural resources; and - The distribution, significance and conservation requirements of Aboriginal sites and historic places.
O	8.1.1	Existing commercial operations within the Park will continue to be permitted in accordance with NPWS policy and licence conditions.
O	8.1.1	Leases, licences and consents may prescribe the approved activities, location and frequency of activities, maximum group sizes and minimum guide ratios for each activity, guide standards, fees, appropriate behaviour and other special provisions to ensure the long term protection of the Park, Park visitors and recreational opportunities.
O	8.1.1	Prior approval will be required for organised activities by schools, community and other groups of over 20 people. Limits may be placed on group sizes, locations and frequency of use to minimise environmental impacts and conflicts with other Park users.
O	8.1.1	Licences may be issued for use of the modified natural areas at Crosslands and Stringybark Ridge for a term not exceeding 3 consecutive days.
M	8.1.1	The Trust may consider operating leases for compatible recreational uses of the Park.

O	8.1.1	Commercial operation of the tea house at Berowra Waters will be permitted under a term lease or by a contractor.
O	8.1.1	Limited operators accommodation for the tea house at Berowra Waters will be permitted.
O	8.1.1	The tea house at Berowra Waters will cater for booked public functions.
M	8.1.1	A Heritage Assessment and/or Conservation Plan will be prepared for the tea house at Berowra Waters and surrounds.
O	8.1.1	Lease and licence applications will be assessed in accordance with the provisions of the NPW Act and Regulation and NPWS Policy and Licence conditions.
H	9.1.2	The principles of ecologically sustainable development will be used to guide management operations. Cooperation with other authorities and stakeholders will be pursued in implementing these principles across the Park.
H	9.1.2	Vehicle trails will be maintained to a good standard of stability and access.
O	9.1.2	The current system of locked gates limiting access to vehicle trails will be maintained to reduce degradation of trails from general traffic.
M	9.1.2	All management trails and facilities will be kept under review in terms of their function, maintenance requirements and impact. Trails and facilities which are no longer essential or whose impact exceed their management value will be closed and/or removed and the site rehabilitated.
O	9.1.2	Only vehicles on authorised management operations or those covered by a lease, licence, easement or agreement will be permitted to use management trails within the Park.
O	9.1.2	Environmental assessments will be required for the maintenance and upgrading of facilities which will potentially impact on the Park.
M	9.1.2	A Memorandum of Understanding will be developed for the maintenance of the Great North Walk traversing Berowra Valley Regional Park with the Department of Lands.

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APPENDIX 1
GEOLOGY AND SOIL LANDSCAPES OF BEROWRA VALLEY
REGIONAL PARK

Table 1. Geology and Soil Landscapes of Berowra Valley Regional Park

Soil Landscape	Geology	Topography	Vegetation
Deep Creek	Holocene silty to peaty quartz sand, silt and clay with ferruginous and humic cementation in places	Flooded river valleys infilled with alluvium and surrounded by steep to precipitous Hawkesbury sandstone slopes	Partially cleared tall open-woodland, weed infested tall open-forest (wet sclerophyll forest and closed-forest (rainforest))
Faulconbridge	Hawkesbury Sandstone of medium to coarse grained quartz sandstone with minor shale and laminite lenses	Level to gently undulating, broad crests and ridges on plateau surfaces	Partially cleared low eucalypt woodland with a dry sclerophyll shrub understorey
Glenorie	Underlain by Wianamatta Group Ashfield Shale and Bringelly Shale formations. Ashfield Shale comprised of laminite and dark grey shale. Bringelly Shale consists of shale, calcareous claystone, laminite, fine to medium grained lithic-quartz sandstone	Low rolling and steep hills. Narrow ridges, hillcrests and valleys.	Extensively cleared tall open-forest (wet sclerophyll forest)
Gynea	Hawkesbury Sandstone which is a medium to coarse-grained quartz sandstone with minor shale and laminite lenses	Undulating to rolling low hills. Broad, convex crests, moderately inclined side slopes with wide benches, localised rock outcrop on low broken scarps.	Original dry sclerophyll woodland and open-forest now extensively cleared. Low, dry sclerophyll open-woodland dominates ridges and upper slopes
Hawkesbury	Hawkesbury Sandstone consisting of medium to coarse-grained quartz sandstone with minor shale and laminite lenses.	Rugged, rolling to very steep hills. Narrow crests and ridges, narrow incised valleys, steep sideslopes with rocky benches, broken scarps and boulders.	Mostly uncleared open-woodland (dry sclerophyll) with pockets of tall open-forest and closed-forest (rainforest)
Lambert	Hawkesbury Sandstone consisting of medium to coarse-grained quartz sandstone with minor shale and laminite lenses.	Undulating to rolling low hills. Broad ridges, gently to moderately inclined slopes, wide rock benches with low broken scarps, small hanging valleys and areas of poor drainage.	Predominantly uncleared open-heathlands, closed-heathlands and scrublands, with patches of low eucalypt woodland. Heathlands and scrublands often exposed to strong winds. Shallow, poorly drained soils fluctuate between saturated and dry. Bushfires are frequent. Isolated lines and patches of trees are occasionally associated with joint crevices.
Lucas Heights	Mittagong Formation – interbedded shale, laminite and fine to medium grained quartz sandstone.	Gently undulating plateau, with level to gently inclined slope gradients	Extensive to completely cleared low, eucalypt open-forest and low eucalypt woodland with sclerophyll shrub understorey.

Table 1 Cont. Geology and Soil Landscapes of Berowra Valley Regional Park

Soil Landscape	Geology	Topography	Vegetation
Oxford Falls	Hawkesbury Sandstone consisting of medium to coarse-grained quartz sandstone with minor shale and laminite lenses.	Hanging valleys with gently to moderately inclined slopes. Occasional broad benches and broken scarps, valley floors are relatively wide, gently inclined and often poorly drained.	Considerable variation in vegetation landscape depends on drainage. Low, dry sclerophyll woodland on better-drained slopes. Closed scrub and heathland on poorly drained areas and swampy valley floors. Tall eucalypt open-woodland with dry sclerophyll understorey on well-drained valley floors.

APPENDIX 2

**VEGETATION COMMUNITIES AND THREATENED FLORA WITHIN
BEROWRA VALLEY REGIONAL PARK**

Table 2. Vegetation Communities Within Berowra Valley Regional Park

Vegetation Community	Area (ha)	% of total area	Dominant Species	Determining Ecological / Environmental Factors
Sandstone swamp	1.9	0.05%	<i>Banksia oblongifolia</i> , <i>Schoenus brevifolius</i> , <i>Baeckea imbricata</i> .	Upland depressions on Hawkesbury Sandstone
Rock platform heath	3.8	0.1%	<i>Banksia ericifolia</i> , <i>Angophora hispida</i> , <i>Baeckea brevifolia</i> .	Exposed Hawkesbury Sandstone scarps
Low open woodland	176.2	4.6%	<i>Eucalyptus haemastoma</i> , <i>Angophora hispida</i> , <i>Banksia ericifolia</i> .	Hawkesbury Sandstone Soils
Woodland	19.2	0.5%	<i>E. seiberi</i> , <i>Corymbia gummifera</i> , <i>E. haemastoma</i> .	Hawkesbury Sandstone Soils
Woodland	187.7	4.9%	<i>E. gummifera</i> , <i>E. haemastoma</i> , <i>E. oblonga</i> .	Hawkesbury Sandstone Soils
Woodland	53.6	1.4%	<i>E. punctata</i> , <i>Corymbia gummifera</i> , <i>E. haemastoma</i> .	Hawkesbury Sandstone Soils
Woodland	436.6	11.4%	<i>E. racemosa</i> , <i>Corymbia gummifera</i> , <i>Angophora costata</i> .	Ridge tops on Hawkesbury Sandstone Soils with lateritic influence
Open forest	2198.4	57.4%	<i>E. piperita</i> , <i>Angophora costata</i> .	Hawkesbury Sandstone Soils
Open forest	3.8	0.1%	<i>E. piperita</i> , <i>Angophora bakeri</i> .	Hawkesbury Sandstone Soils
Tall open forest	448.1	11.7%	<i>E. pilularis</i> , <i>Angophora costata</i> , <i>Syncarpia glomulifera</i> .	Fertile Soils
Tall open forest	1.9	0.05%	<i>E. pilularis</i> , <i>E. saligna</i> , <i>E. paniculata</i> .	Fertile Soils
Open forest	3.4	0.09%	<i>E. saligna</i> .	Fertile Soils
Warm temperate rainforest	76.6	2.0%	<i>Tristaniopsis laurina</i> , <i>Ceratopetalum apetalum</i> , <i>Ligustrum sinense</i> .	Fertile Soils
Tall open forest	3.8	0.01%	<i>E. pilularis</i> , <i>Angophora floribunda</i> .	Hawkesbury River Communities
Mangroves	7.7	0.2%	<i>Avicennia marina</i> .	Hawkesbury River Communities
Closed forest	7.7	0.2%	<i>Casuarina glauca</i> .	Hawkesbury River Communities
Saltmarsh	3.4	0.09%	<i>Juncus kraussi</i> .	Hawkesbury River Communities
Other	199.5	5.21%	<i>Water</i> , <i>unknown vegetation</i> .	

FLORA

	Status	Description	Habitat
<i>Ancistrachne maidenii</i>	V	A scrambling perennial grass to 50cm tall.	Usually found on mid to lower slopes, associated with the Narrabeen Group soils, found near ephemeral creeks in the vicinity of the Hawkesbury River and tributaries.
<i>Darwinia biflora</i>	V (Nat)	A small understorey shrub to 80 cm tall (mostly below 50 cm tall). Small green flowers with red bracteoles and in pairs.	Occurs in woodland, open forest or shrub-heath on the edge of weathered shale-capped ridges, where these intergrade with Hawkesbury Sandstone.
<i>Darwinia peduncularis</i>	V	Spreading shrub to 1.5 m tall, with red young stems and blue-green leaves.	Grows in woodland on or near rocky outcrops, located on or near sandstone ridge tops or creeks.
<i>Epacris purpurascens</i> var. <i>purpurascens</i>	V	Erect stiff prickly shrub 50-150 cm high. White to pink flowers along much of the branchlet.	Found on both clay-capped ridges and near creeks in sandstone terrain. Likes damp places. Strongly associated with the endangered Turpentine Ironbark Forest and Shale/Sandstone Transition Forest.
<i>Eucalyptus camfieldii</i>	V (Nat)	A mallee or small tree to 2-8 metres tall. Juvenile leaves are heart-shaped or circular and adult leaf broad and lance-shaped.	Grows in shrub heath and woodland on poorly drained sandy soils on sandstone ridge tops and plateaux.
<i>Lasiopetalum joyceae</i>	V (Nat)	An erect and open shrub up to 2 metres tall. Leaves are linear and densely covered underneath with rusty coloured star-hairs.	Found on ridge tops and upper slopes on or near the shale/sandstone transition in heath, open-shrub, woodland and open forest.
<i>Leptospermum deanei</i>	V (Nat)	A slender leaf shrub, up to 5 metres tall with bark peeling in long strips.	Occurs in open forest on footslopes above the fringe of riparian (creek line) vegetation.
<i>Melaleuca deanei</i>	V (Nat)	Medium shrub 1-3 metres tall with rough papery bark. Flowers are creamy yellow.	Grows in wet heath on sandstone, or associated with hanging swamps in open heath and woodland on ridge tops or upper slopes.
<i>Persoonia mollis</i> subsp. <i>maxima</i>	E (Nat)	A medium to tall and spreading shrub, 2-6 metres high, with hairy young leaves. Flowers are yellow and covered in copper-coloured hairs.	A rare species which occurs mainly in sandstone vegetation communities. It is restricted to the deep dissected sheltered gullies on the Hornsby Plateau.
<i>Tetradlea glandulosa</i>	V (Nat)	A low spreading shrub 10-50 cm tall with multiple sprawling stems, with stiff hairs on the leaves (toothed margins) and the flower sepals and stalk. Flowers are pink and have four petals.	Grows in heath and scrub to woodlands and open forest on ridge tops and upper slopes, in areas of shale-sandstone transition habitat.

Status

E = Endangered (Schedule 1 of the TSC Act)

V = Vulnerable (Schedule 2 of the TSC Act)

(Nat) = Nationally Listed Threatened Species under the *Environmental Protection and Biodiversity Conservation Act 1999*.

APPENDIX 3
**THREATENED FAUNA WITHIN BEROWRA VALLEY REGIONAL
PARK**

FAUNA

	Status	Description	Habitat
Red-crowned Toadlet (<i>Pseudophryne australis</i>)	V	Small ground-dwelling frog to 20-25 mm in length. Dark brown to black with prominent red markings on crown and lower back.	Mid to upper slopes in open woodland and heath communities. Prefers permanently moist soaks or areas of dense ground vegetation or litter along or near headwater streambeds.
Giant Burrowing Frog (<i>Heleioporus australiacus</i>)	V (Nat)	A large plump and warty ground frog reaching up to 100 mm in total length. These frogs are coloured steely blue grey to black. Tadpoles are large up to 5 cm in length.	Small headwater ephemeral and permanent drainage lines with water quality unaffected by urban run-off. Prefers sandstone ridge top woodland, open forests and heath, and may be associated with hanging swamps.
Heath Monitor (<i>Varanus rosenbergi</i>)	V	Dark grey above finely spotted in yellow or white with blackish cross-bands from the neck to the end of the tail and with a Pale-edge facial stripe. Average length 900 mm.	Heath and woodland vegetation in areas where rocky outcrops are present for shelter.
Koala (<i>Phascolarctos cinereus</i>)	V	An arboreal marsupial with grey to brown fur with white underparts or patches. Large furry ears and large bare nose.	Rare in the Park. Likely to occur in open forest and woodland where an abundance of Scribbly Gum (<i>Eucalyptus haemastoma / racemosa</i>) and Grey Gum (<i>punctata</i>) exists.
Spotted-tailed Quoll (<i>Dasyurus maculatus</i>)	V (Nat)	A cat-sized carnivorous marsupial with rufous brown to dark brown fur above covered by white spots of varying sizes. The fur underneath is a pale brown to cream.	Variety of habitats. Core habitat is open forest in deep gullies. Suitable den sites are hollow logs, tree hollows, rock outcrops or caves.
Large Bent wing Bat (<i>Miniopterus schreibersii</i>)	V	An insectivorous bat with blackish to red-brown fur and a high-crowned head.	Broad range of habitats such as rainforest, wet gully forest, open forest and open woodland. Roosts primarily in caves or artificial habitats such as stormwater drains.

FAUNA (Cont.)

	Status	Description	Habitat
Turquoise Parrot (<i>Neophema pulchella</i>)	V	Small grass-green parrot with turquoise, yellow and red markings.	Eucalypt woodlands and open forests. Forages on the ground in grassy areas, sheltering in trees and denser vegetation. Permanent water is also favoured. Breeds in tree hollows or stumps.
Glossy Black Cockatoo (<i>Calyptorhynchus lathami</i>)	V	Small brown-black cockatoo with two bright red markings under their tail. Female differs from male in having yellow patches on head and neck and orang-red tail markings.	Forest and woodlands containing she-oaks for feeding including Black She-oak (<i>Allocasuarina littoralis</i>), and Forest Oak (<i>Allocasuarina torulosa</i>). Requires large tree hollows for nesting.
Masked Owl (<i>Tyto novaehollandiae</i>)	V	Large white or creamy-breasted owl with brown above the prominent facial disk.	Open forest and woodlands, preferring deep gullies for nesting in large tree hollows. Preys on terrestrial mammals, especially rodents. Foraging range similar to the Powerful Owl.
Powerful Owl (<i>Ninox strenua</i>)	V	Large Boobook-like owl, grey to brown with distinctive broad V-shaped markings on a pale breast.	Open forest and woodlands with a foraging range of 600-1000 hectares. Roosts in dense foliage along creek lines. Preys on arboreal mammals, including possums.
Barking Owl (<i>Ninox connivens</i>)	V	A medium-sized owl similar to a Boobook, but more robust. Dark streaks and large white spots on the wings.	Open forest and woodlands with a territorial range greater than 100 hectares. Roosts in dense foliage along creek lines. Preys on arboreal mammals and birds.
Adams Emerald Dragonfly (<i>Archaeophya adamsi</i>)	V	Listed under schedule 5 of <i>Fisheries Management Act, 1994</i> as a vulnerable species.	Found only in small streams such as Tunks Creek

Status

E = Endangered (Schedule 1 of the TSC Act)

V = Vulnerable (Schedule 2 of the TSC Act)

(Nat) = Nationally listed threatened species under the *Environment Protection and Biodiversity Conservation Act 1999*.

APPENDIX 4

KEY THREATENING PROCESSES

KEY THREATENING PROCESSES LISTED UNDER THE THREATENED SPECIES CONSERVATION ACT 1995

Alteration of the natural flow regimes of rivers, streams, floodplains and wetlands

Bushrock removal

Clearing of native vegetation

Competition and grazing by the feral European rabbit

Competition from feral honeybees

Death or injury to marine species following capture in shark control programs on ocean beaches

Ecological consequences of high fire frequencies

Entanglement in or ingestion of anthropogenic debris in marine and estuarine environments

Human-caused climate change

Importation of red imported fire ants into NSW

Infection by *Psittacine circoviral* (beak and feather) disease affecting endangered psittacine species and populations

Infection of frogs by *amphibian chytrid* causing the disease *chytridiomycosis*

Infection of native plants by *Phytophthora cinnamomi*

Introduction of the large earth bumblebee, *Bombus terrestris*

Invasion of native plant communities by exotic perennial grasses

Loss and/or degradation of sites used for hill-topping by butterflies

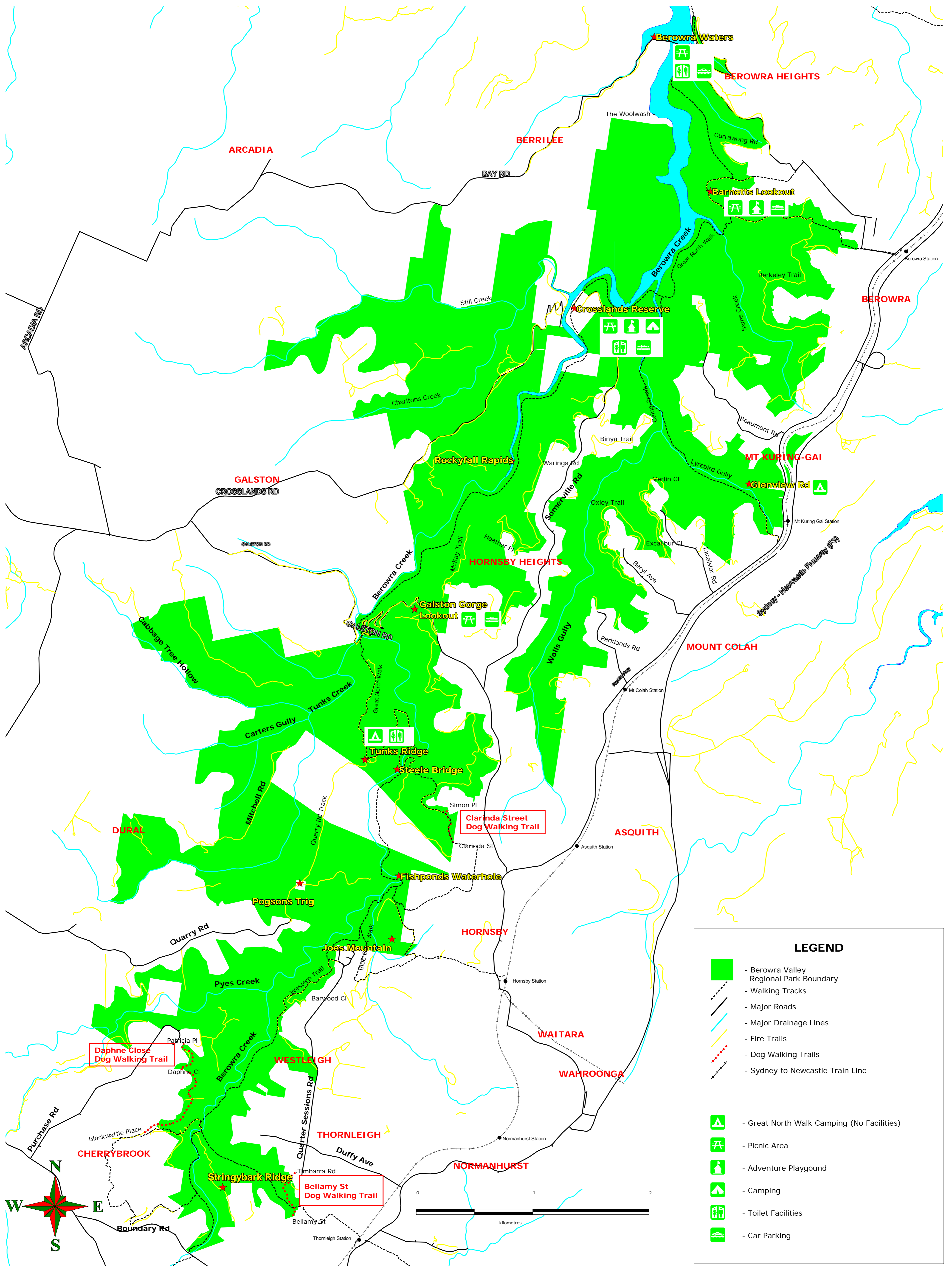
Predation by feral cats

Predation by the European red fox

Predation by the plague minnow (*Gambusia holbrooki*)

Predation by the ship rat on Lord Howe Island

Removal of dead wood and dead trees



LEGEND

- Berowra Valley Regional Park Boundary
- Walking Tracks
- Major Roads
- Major Drainage Lines
- Fire Trails
- Dog Walking Trails
- Sydney to Newcastle Train Line
- ▲ - Great North Walk Camping (No Facilities)
- ⛺ - Picnic Area
- 🎪 - Adventure Playground
- ⛶ - Camping
- 🚻 - Toilet Facilities
- 🚗 - Car Parking



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Figure 1 - Berowra Valley Regional Park