



Ku-ring-gai Chase National Park and Lion Island, Long Island and Spectacle Island Nature Reserves



**NSW
NATIONAL
PARKS AND
WILDLIFE
SERVICE**

Plan of Management

**KU-RING-GAI CHASE NATIONAL PARK
AND LION ISLAND, LONG ISLAND AND SPECTACLE ISLAND
NATURE RESERVES
PLAN OF MANAGEMENT**

This plan of management was adopted by the Minister for the Environment on 13th May 2002.

Acknowledgments:

This plan of management is based on a draft prepared by staff of the Landscape Conservation Division and the Sydney North Region of the National Parks and Wildlife Service.

Members of the former North Metropolitan District Advisory Committee and of the National Parks and Wildlife Advisory Council are thanked for their assistance and input on the plan.

The many members of the public who provided submissions on the exhibited draft plan of management are also gratefully acknowledged.

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Cover Photo: America Bay, Ku-ring-gai Chase National Park.

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FOREWORD

This plan of management applies to Ku-ring-gai Chase National Park, Lion Island Nature Reserve, Long Island Nature Reserve and Spectacle Island Nature Reserve.

Ku-ring-gai Chase National Park is situated within the Sydney Metropolitan Area, approximately 20 kilometres north of the centre of Sydney. The park generally comprises the land east of the Sydney-Newcastle Expressway, south of the Hawkesbury River, west of Pittwater and north of Mona Vale Road between St Ives and Ingleside. Most of Barrenjoey Head is also part of the national park. Lion Island, Long Island and Spectacle Island Nature Reserves are located within the lower Hawkesbury River in close proximity to Ku-ring-gai Chase and consequently have been included in this plan of management.

Ku-ring-gai Chase, which was established in 1894, is the second oldest national park in Australia. It contains outstanding scenic landforms, many important plant and animal communities and a large number of Aboriginal sites and European historic places. Ku-ring-gai Chase National Park also provides a diverse range of recreational opportunities close to Sydney. This plan gives priority to the protection of the natural and cultural values of the park while still providing for high levels of recreational use.

The island nature reserves complement the national park by protecting important natural values, including a variety of vegetation communities and habitat for coastal birds.

This plan of management establishes the scheme of operations for Ku-ring-gai Chase National Park and Lion Island, Long Island and Spectacle Island Nature Reserves. In accordance with the provisions of Sections 75 and 76 of the *National Parks and Wildlife Act 1974* this plan of management is hereby adopted.

A draft plan of management for Ku-ring-gai Chase National Park, Lion Island Nature Reserve, Long Island Nature Reserve and Spectacle Island Nature Reserve was placed on public exhibition from 23rd April until 30th July 1999, with submissions being accepted for a further two weeks. The exhibition of the plan attracted 2,235 submissions which raised 30 issues.

The National Parks and Wildlife Advisory Council considered the plan and the submissions received at its meeting on 14th February 2000 and made recommendations relating to the Plan. All submissions together with the Advisory Council's recommendations, were carefully considered in finalising this plan of management.

BOB DEBUS
Minister for the Environment

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1. INTRODUCTION

The *National Parks and Wildlife Act 1974* requires that a plan of management be prepared for each national park. A plan of management is a legal document which outlines how a national park will be managed in the years ahead.

The procedure for the adoption of a plan of management for a national park is specified in the Act and involves the following stages:

- the Director-General gives notice that a plan of management has been prepared;
- the plan is placed on public exhibition for at least one month and any person may comment on it;
- the plan and copies of all representations are referred to the National Parks and Wildlife Advisory Council for consideration;
- the Director-General submits the plan, together with any comments and suggestions of the Advisory Council, to the Minister for the Environment; and
- the Minister may adopt the plan after considering the recommendations of the Advisory Council or may refer the plan back to the Director-General and Council for further consideration;

The procedure for the adoption of a plan of management for a nature reserve follows similar steps although there is no requirement to exhibit the plan. The National Parks and Wildlife Service has however adopted a policy of exhibiting plans of management for most nature reserves in a similar manner to national parks.

Once a plan of management for a national park or nature reserve has been adopted by the Minister, no operations may be undertaken within that national park or nature reserve unless those operations are in accordance with the plan.

Ku-ring-gai Chase National Park was previously subject to a plan of management which was adopted in 1971. A new plan of management for Ku-ring-gai Chase National Park, which also covered Lion Island, Long Island and Spectacle Island Nature Reserves, was placed on public exhibition from 23rd April to 30th July 1999, with submissions being accepted for a further two weeks after the close of the exhibition period. The exhibition of the draft plan attracted 2,235 submissions which raised 30 issues. All comments received were referred to the National Parks and Wildlife Advisory Council for its consideration and advice. The draft Plan and the comments and suggestions of the Advisory Council were in turn considered by the Minister before adopting this plan of management. When this new plan of management was adopted, the Minister cancelled the 1971 plan for Ku-ring-gai Chase National Park.

Additional information on the management of national park and the nature reserves may be obtained from the National Parks and Wildlife Service, Ku-ring-gai Chase National Park, Bobbin Head (phone 02 9457 8900).

2. MANAGEMENT CONTEXT

2.1 THE PLANNING FRAMEWORK

2.1.1 National Parks in New South Wales

The national park concept was introduced into Australia through the establishment of Royal National Park in 1879. National parks in New South Wales were originally managed by trusts. The *National Parks and Wildlife Act 1967* transferred the management of national parks to the National Parks and Wildlife Service. The 1967 Act has since been replaced by the *National Parks and Wildlife Act 1974*.

The *National Parks and Wildlife Act 1974* defines national parks as “spacious areas containing unique or outstanding scenery or natural phenomena” (Section 8(2)(a)). For the purposes of preparing plans of management, the NSW National Parks and Wildlife Service has adopted the International Union for the Conservation of Nature and Natural Resources (IUCN) Guidelines for Protected Area Management Categories which defines a national park as:

"a natural area of land and/or sea, designated to (a) protect the ecological integrity of one or more ecosystems for present and future generations, (b) exclude exploitation or occupation inimical to the purposes of designation of the area, and (c) provide a foundation for spiritual, scientific, educational, recreational and visitor opportunities, all of which must be environmentally and culturally compatible" (IUCN, 1994).

National parks are part of the regional pattern of land use. The management of a national park aims at minimising disturbance to natural and cultural heritage values. Other land uses (e.g. mining, agriculture and forestry) are distinguished by an acceptance or encouragement of environmental modification. National parks, therefore, provide for only a limited part of the range of land uses in any region.

2.1.2 Nature Reserves in New South Wales

Nature reserves in New South Wales arose out of faunal reserves. Faunal reserves were first established under the *Fauna Protection Act 1948*. The *National Parks and Wildlife Act* reclassified faunal reserves as nature reserves.

Nature reserves are defined under the *National Parks and Wildlife Act 1974* as “areas of special scientific interest containing wildlife or natural environments or natural phenomena” (Section 8(2)(c)).

The purposes of nature reserves are defined in the Act as:

- (a) the care, propagation, preservation and conservation of wildlife;
- (b) the care, preservation and conservation of natural environments and natural phenomena;
- (c) the study of wildlife, natural environments and natural phenomena; and

- (d) the promotion of the appreciation and enjoyment of wildlife, natural environments and natural phenomena.

The IUCN (1994) defines a nature reserve as:

“An area of land and/or sea possessing some outstanding or representative ecosystems, geological or physiological features and/or species, available primarily for scientific research and/or environmental monitoring.”

Nature reserves are valuable refuge areas where natural processes, phenomena and wildlife can be studied. The definition of nature reserves does not include as a major objective, the provision of opportunities for outdoor recreation.

2.2 KU-RING-GAI CHASE NATIONAL PARK AND LION ISLAND, LONG ISLAND AND SPECTACLE ISLAND NATURE RESERVES

2.2.1 Location, History and Regional Setting

Ku-ring-gai Chase National Park is located within the Sydney Metropolitan Area, approximately 20 kilometres north of the centre of Sydney. It generally comprises the land east of the Sydney-Newcastle Expressway, south of the Hawkesbury River, west of Pittwater and north of Mona Vale Road. It also includes Barrenjoey Head on the eastern side of Pittwater.

Ku-ring-gai Chase was established following pressure from a local citizen, Eccleston Du Faur, to establish a “National Park for North Sydney”. Approximately 13,500 hectares, including not only land areas but also most of Cowan Water, was set aside in 1894 as Ku-ring-gai Chase and placed under the care, control and management of trustees. The park was named after its original inhabitants, an Aboriginal group called the Kuring-gai or Guringai, and called a “chase” to indicate it was an area of natural bush which was not enclosed by fences (letter from Du Faur to the Minister for Lands, 1892).

With the proclamation of the *National Parks and Wildlife Act* in 1967, Ku-ring-gai Chase became a national park under the care, control and management of the Director of National Parks and Wildlife. Various additions have been made to Ku-ring-gai Chase National Park so that today the park is 14,882 hectares in size.

Lion Island, Long Island and Spectacle Island Nature Reserves are all located in the Hawkesbury River close to Ku-ring-gai Chase National Park and are managed by staff based in the national park. Together with the national park, they are a major feature of the lower Hawkesbury River and have consequently been included in the same plan of management.

Lion Island, which was dedicated as a fauna reserve in 1956, is situated just inside the entrance to Broken Bay. The nature reserve covers all of the island, an area of approximately 8 hectares. It was reclassified as a nature reserve under the *National Parks and Wildlife Act 1967*.

Long Island Nature Reserve was dedicated in 1972, and comprised over 73 hectares of Long Island, an area which was previously a reserve for public recreation notified in 1911. Long Island is located in the Hawkesbury River near the township of Brooklyn. A small area at the eastern end of the island which includes a railway tunnel and other buildings associated with management of the railway is not part of the nature reserve but managed by the State Rail Authority.

Spectacle Island Nature Reserve was also dedicated in 1972, over a reserve for public recreation notified in 1919. The nature reserve covers all of the island, which is located in the Hawkesbury River near its junction with Mooney Mooney Creek, an area of some 36 hectares.

Ku-ring-gai Chase National Park and Lion Island, Long Island and Spectacle Island Nature Reserves are part of a system of protected areas on the lower reaches of the Hawkesbury River, which includes Marramarra, Bouddi, Brisbane Waters, Popran and Dharug National Parks, Berowra Valley Regional Park and Muogamarra Nature Reserve. These parks and reserves protect the natural scenic values of the lower Hawkesbury River as well as being important for the conservation of natural and cultural values.

Ku-ring-gai Chase National Park is located within the Sydney metropolitan area and is surrounded by residential areas (medium density with some semi-rural properties) on all but its western side, where the boundary is generally the F3 Sydney-Newcastle Freeway, and the northern side where the boundary is the Hawkesbury River and its tributaries. The large number of neighbours (around 6,500), and the increasing urbanisation in the surrounding area together with the concurrent loss of bushland, has placed increasing pressure on the park in recent years to provide for a variety of recreational opportunities including bushwalking, picnicking, sight-seeing, horse riding, boating, cycling and jogging. The waterways of the lower Hawkesbury River are a major feature of the park.

The national park and nature reserves are located within a number of local government areas:

- the Lambert Peninsula and Barrenjoey Head are within Pittwater local government area;
- the area south of Coal and Candle Creek and east of Cowan Water, is within Warringah local government area;
- the area west of Cowan Water and east of Cockle Creek is within Ku-ring-gai local government area;
- the western side of Cockle Creek and Cowan Water, north to Brooklyn and including Long Island, is within Hornsby local government area; and
- Spectacle Island and Lion Island fall within the Gosford local government area.

2.2.2 Importance of the National Park and Nature Reserves

Ku-ring-gai Chase National Park, Lion Island Nature Reserve, Long Island Nature Reserve and Spectacle Island Nature Reserve, together with Brisbane Water and Bouddi National Parks on the northern shores of the Hawkesbury River, provide a scenically attractive entrance to Broken Bay and the Hawkesbury River. The imposing sandstone headland of West Head, the distinctive landforms of Lion Island and Barrenjoey Head, and the rocky cliffs, naturally vegetated hillslopes and small secluded beaches of the national park and the nature reserves provide a magnificent backdrop to the waterways of Broken Bay, Cowan Water and Pittwater. In addition, the extensive views of the waterways, bushland and parts of Sydney from the Lambert Peninsula, along the waterways and many other places within the park are of high scenic value and attract many visitors to the park.

Ku-ring-gai Chase National Park, Lion Island, Long Island and Spectacle Island are all listed on the Register of the National Estate. Ku-ring-gai Chase is listed for its aesthetic value, for its scientific importance as a remnant of the natural environment of Sydney and for the abundance of Aboriginal sites it contains. Lion Island is listed because it provides breeding habitat for a number of shearwaters and little penguins. Long Island is listed for the variation and distinctive characteristics of its vegetation, and Spectacle Island for its particularly diverse vegetation. The area at the top of Barrenjoey Head which includes the prominent lighthouse and keepers cottages, has also been listed on the Register of the National Estate.

The national park and nature reserves form part of a group of sandstone parks surrounding Sydney. The rocks of the area have been eroded over millions of years to form deep valleys and cliffs and isolated islands. Shale beds between the sandstones have resulted in large natural terraces which support important hanging swamps with their associated plant communities. Igneous intrusions on West Head, outcrops of the Narrabeen Group of shales and sandstones and small areas of Wianamatta Shale, together with variations in aspect and topography, have given rise to a variety of plant communities and over 1,000 different species of plants.

A number of threatened plant and animal communities are protected within the national park and nature reserves, including fourteen plant species and thirteen animal species listed under the *Threatened Species Conservation Act 1995*. In addition, Ku-ring-gai Chase National Park contains many uncommon plant species and a number of endangered ecological communities are represented within the park. Lion Island provides habitat for the largest population of little penguins *Eudyptula minor* in the Sydney area.

The national park contains extensive evidence of Aboriginal occupation of the area prior to European contact, including a number of easily accessible Aboriginal rock engravings located along the Lambert Peninsula. These and other sites within the park, which include cave paintings, occupation sites, engravings, grinding grooves and stone arrangements, provide significant evidence of the way of life of the Guringai people, the original inhabitants of the area, of which little was recorded by Europeans at contact and whose communities were soon destroyed through disease and conflict with European settlers.

Ku-ring-gai Chase is the second oldest national park in Sydney and the second oldest continuous national park in Australia. It was established largely through the work of one man, Eccleston Du Faur, who was concerned about the destruction of the bush by collectors of wildflowers and timber getters. As such, it was the first national park in Australia to be established primarily for nature conservation (earlier parks such as The (Royal) National Park and Centennial Park were established primarily for recreation, and modifications to the environment including extraction of natural resources were permitted on these reserves).

A number of sites of historic value remain within Ku-ring-gai Chase National Park. Remnants of early recreational use of the area include a holiday cottage (Beechwood) built in 1882, roads constructed around the turn of the century specifically to provide access to a recreation area (Bobbin Head) and many sandstone structures constructed by unemployment scheme labour during the 1930's.

The park also contains the Bobbin Inn which was constructed as a restaurant and dance hall in the 1930s, a war memorial sculptured in the sandstone near Turramurra in the 1920s, military observation posts and defence emplacements which were constructed around West Head during the Second World War and other historic features.

The lighthouse, keepers' cottages and roadway at Barrenjoey Head were designed by colonial architect James Barnett. This is the only lighthouse in NSW to utilise and maintain unpainted face sandstone for its tower, oil store and cottages.

The natural and cultural heritage of the national park, and its location within the Sydney metropolitan area, provide significant opportunities for education and research. The Chase Alive interpretation program and Kalkari Visitor Centre both play important roles in promoting the importance of the park and improving understanding of the area, as does the Gibberagong Field Studies Centre.

The national park also provides outstanding opportunities for recreation by the people of Sydney and visitors to the city. Locals and tourists flock to the scenic lookouts on the Lambert Peninsula, the many walking tracks within the park, the secluded camping area at The Basin, the popular picnic areas at Bobbin Head, Apple Tree Bay, Illawong Bay and along the Lambert Peninsula, the waterways of Cowan Water and Coal and Candle Creek, and many other sites within the park. In addition, the extensive bushland areas and waterways of the park provide opportunities for seclusion and a sense of isolation from the city without leaving the Sydney metropolitan area.

Statement of Importance

Ku-ring-gai Chase National Park, Lion Island Nature Reserve, Long Island Nature Reserve and Spectacle Island Nature Reserve are important because:

- * They are part of a system of national parks, nature reserves and regional parks which protect the nature conservation and cultural heritage values of the lower Hawkesbury River.

- * The naturally vegetated hillslopes and imposing sandstone cliffs of the national park and nature reserves provide a magnificent scenic backdrop to the waterways of Broken Bay, Pittwater and Cowan Water as well as being scenic attractions when viewed from both within and outside the park.
- * The park and reserves protect a large number of plant and animal species which, because of development of the city, are now uncommon within the Sydney metropolitan area.
- * The park and reserves contain species and communities which are listed under the *Threatened Species Conservation Act 1995*, including fourteen threatened plant species, three endangered ecological communities, two endangered populations and thirteen threatened animal species.

Ku-ring-gai Chase National Park is also important because:

- * It is the second oldest national park in Australia and the oldest national park established primarily for nature conservation.
- * The park is richly endowed with evidence of past Aboriginal habitation, with a number of sites being easily accessible to visitors.
- * The park contains important historic sites associated with early recreational use of the park, transport, navigation and defence.
- * It protects not only a substantial area of land but also a major part of the waterways of northern Sydney.
- * The natural and cultural heritage of the national park provide significant opportunities for education and research.
- * It is a large natural area within the Sydney metropolitan area and provides a sense of isolation and escape from the city.
- * Outstanding views of the waterways, bushland and parts of Sydney can be obtained from the national park.
- * The bush, waterways and recreation facilities of Ku-ring-gai Chase National Park provide a range of recreational opportunities for the people of Sydney and an increasingly large number of international visitors. Developments include picnic areas, walking tracks, boat launching ramps, marinas, kiosks, lookouts, interpretation facilities and a camping area.

3. OBJECTIVES OF MANAGEMENT

3.1 GENERAL OBJECTIVES FOR MANAGEMENT

The following general objectives relate to the management of national parks in New South Wales:

- * the protection and preservation of scenic and natural features;
- * the conservation of wildlife, including the maintenance of biodiversity and populations of threatened species;
- * the maintenance of natural processes as far as is possible;
- * the preservation of Aboriginal sites;
- * the conservation of historic features;
- * the encouragement of scientific and educational enquiry into environmental features and process, Aboriginal and historic features; and
- * the provision of appropriate recreation opportunities.

The general objectives relating to the management of nature reserves in New South Wales include all but the last of the objectives listed above.

3.2 SPECIFIC OBJECTIVES FOR KU-RING-GAI CHASE NATIONAL PARK AND LION ISLAND, LONG ISLAND AND SPECTACLE ISLAND NATURE RESERVES

In addition to the general objectives stated above, the following specific objectives also apply to the management of Ku-ring-gai Chase National Park, Lion Island Nature Reserve, Long Island Nature Reserve and Spectacle Island Nature Reserve:

- * Protection of the national park and nature reserves as part of a system of parks and reserves which together protect the natural and cultural heritage, water catchments and scenic values of the lower Hawkesbury River and its tributaries;
- * Maintenance of ecological integrity within the park and reserves, and between the park and reserves and adjoining areas, consistent with their purpose of reservation;
- * Promotion of Ku-ring-gai Chase National Park as a show place for the parks of the lower Hawkesbury River, with a variety of visitor facilities and experiences which are appropriate to the national park and lead towards ecologically sustainable use of the park; and

- * Promotion of increased public awareness and understanding of the importance and value of protecting the natural and cultural heritage of the national park and nature reserves in their own right, and as part of a system of conservation reserves within the Sydney metropolitan area.

3.3 OVERALL STRATEGY

The overall strategy for the management of Ku-ring-gai Chase National Park, Lion Island Nature Reserve, Long Island Nature Reserve and Spectacle Island Nature Reserve is to:

- * protect the national park and nature reserves from detrimental impacts of fire, weeds, feral animals, pollution, erosion and visitor use impacts through direct control and remediation works and through education of park visitors, stakeholders and neighbours;
- * protect the outstanding scenic values of the national park when viewed from both within and outside the park;
- * maintain and promote selected sites and facilities within the national park which can cope with the high levels of visitor use;
- * limit facilities to existing developed areas of the national park or park boundaries where possible, rather than further dissecting the park with new developments; and
- * continue to limit access to the nature reserves to protect the nature conservation values for which they were dedicated.

4. POLICIES AND FRAMEWORK FOR MANAGEMENT

This section outlines the policies that, within the general policies of the National Parks and Wildlife Service, provide the framework for management of Ku-ring-gai Chase National Park, Lion Island Nature Reserve, Long Island Nature Reserve and Spectacle Island Nature Reserve.

The policies and actions established in this plan of management provide the framework for future management and are consistent with anticipated resources available to the Service and with anticipated community trends over the next five to ten years. Other management actions may be developed over the life of this plan consistent with the objectives and policies set out in the plan.

Where not specifically provided for in this plan of management, the management of Ku-ring-gai Chase National Park, Lion Island Nature Reserve, Long Island Nature Reserve and Spectacle Island Nature Reserve will be in accordance with the *National Parks and Wildlife Act* and the Service's Field Management Policies which are not repeated in this plan.

4.1 THE NATURAL AND CULTURAL LANDSCAPE

4.1.1 Geology, Soils and Landforms

Ku-ring-gai Chase National Park and the island nature reserves are situated near the centre of the Sydney Basin, a major structural unit of Permian and Triassic age (around 200-250 million years ago) consisting almost entirely of horizontally bedded sedimentary rocks. During this time the Sydney region was a large freshwater lake which was slowly filled by deposits of sand, silt and pebbles. At the end of the Triassic period, the area was uplifted to become dry land and began to weather and erode. A final vigorous period of erosion during the ice ages when sea levels were much lower, formed deep V-shaped valleys in the plateau surface. Following the last glacial period, rising sea levels flooded the lower valleys and cut off some of the peaks to form Lion Island, Long Island, Spectacle Island and Barrenjoey Head. Subsequent deposition has resulted in Barrenjoey Head being again connected to the mainland by an isthmus.

Hawkesbury Sandstone is the most extensive rock type in the national park and nature reserves and forms the plateaus and hill slopes of the national park, the capping on the eastern end of Lion Island, and most of Long Island and Spectacle Island. In places, particularly along the broad ridge of the Lambert Peninsula, are found wide rock benches with shale lenses which result in small, permanently wet, hanging swamps with peat soils. The soils derived from Hawkesbury Sandstone are coarse grained and form shallow sandy soils on the broad ridges and deeper yellow earths in the valleys. On steep slopes, the potential for disturbance causing soil loss and associated impacts increases significantly and imposes significant constraints on recreation and management use of the park.

The oldest rocks in the park are the Narrabeen Group of sandstones and shales. These outcrop at the lower elevations (below 20-40 metres in vertical height) along

the western shores of Pittwater, the shores of Cowan Water north of Cottage Point, and around the edges of Barrenjoey Head, Lion Island, Long Island and Spectacle Island. The Narrabeen Shales produce relatively rich red clay soils.

A few small residual areas of Wianamatta shale remain in the Duffys Forest area of the national park. Most of this rock type in the area is outside the park and has been cleared and developed. There are also small areas of laterite or ironstone soils overlying the Wianamatta shales along the ridge tops within the park at Terrey Hills and Ingleside.

Igneous dykes and diatremes intruded into the surrounding rocks around 65-40 million years ago. These weather to form a deep red soil with a higher nutrient content than the surrounding areas. One dyke cuts through West Head near the Resolute picnic area, while deeply weathered breccia-filled diatremes have formed the amphitheatre-shaped valleys of Campbells Crater near Cowan and Smiths Crater near Smiths Creek in Cowan Water.

The geomorphology of the national park and nature reserves has resulted in a distinctive landscape which is a major factor in the attractiveness of the Broken Bay area. It is important that the scenic values of the foreshores, hillslopes and skylines of the park and adjoining areas be maintained free of built elements which will intrude on the natural landforms and detract from its scenic qualities. The Sydney Regional Environmental Plan No. 20, which covers the Hawkesbury and Nepean Rivers, also emphasises the importance of protecting the scenic quality of the river foreshores and significant areas of vegetation and habitat values.

Ku-ring-gai Chase National Park ranges in altitude from the bed of Cowan Water to Willunga Trig on the Lambert Peninsula, which is the highest point in the park at 228 metres above sea level.

Some major changes to the landscape have been undertaken in the past. The picnic areas at Bobbin Head, Apple Tree Bay and Illawong Bay were created by dumping fill on the mud flats, which occurred in stages from 1911 until 1955. Over time this fill has sunk creating cracks in carparks and buildings and cracking pipes. Sea wall repairs and foreshore restoration is ongoing in a number of areas to prevent further foreshore erosion.

From 1901 on, a number of quarries were created in the park to provide material for construction of roads and buildings. These include a quarry part-way down Bobbin Head Road from which stone was extracted to construct the first road to Bobbin Head and a number of the early sandstone buildings within the park. This quarry has historic value and will be left as is. A more recent gravel pit near the top of the Bobbin Head Trail needs restoration, as do a number of roadside borrow areas. Two other quarries in the park are currently used as sites for stockpiling sandstone and soil when necessary. It is essential for the park to have sites for stockpiling material for repair of management trails and walking tracks, and these two quarries will be retained for this purpose although they will be reduced in size and sediment control measures instituted where necessary.

Erosion is a naturally occurring process, however recreational and other use of roads, walking tracks and management trails within and adjoining the park have resulted in accelerated erosion and siltation, particularly on steeply or moderately sloping sections of the park and on the edges of the waterways. This imposes significant constraints on the locations suitable for recreation and management use. In addition the creation of new tracks by walkers, trail bike riders and horse riders has compounded the problem and meant that maintenance of tracks and trails to an acceptable standard, fencing of trails to prevent unauthorised access and the rehabilitation of tracks and trails is a major on-going commitment.

Policies and Actions

- * The landscape and scenic values of the park and nature reserves when viewed from both within and outside the park and reserves will be maintained. The natural foreshores, hillslopes and ridgelines will be retained free of built elements and any new facilities within the park will be designed, sited and maintained so as to harmonise with their surroundings and not be visually intrusive.
- * The Service will advise other consent and determining authorities of the impacts of development on the parks and reserves and seek to mitigate these impacts.
- * Negotiations will be undertaken with the State Rail Authority with a view to establishing a conservation agreement over the SRA land on Long Island.
- * Ongoing erosion control and stabilisation work will be undertaken on eroded sections of tracks and trails and the sea walls at Bobbin Head. Priority will be given to upgrading tracks along the edge of Cowan Water, the Berowra Track, the Jerusalem Bay to Brooklyn section of the Great North Walk, and to the Resolute Track.
- * Fencing and stabilisation of unauthorised tracks and braided sections of existing tracks and trails within the park will continue to be undertaken, with priority given to tracks in the McCarrs Creek catchment, in the Duffys Forest area, and on Barrenjoey Head.
- * Maintenance of tracks and trails and rehabilitation of disturbed areas within the park not required for public or management use will be undertaken using materials which are geologically compatible and be consistent with Department of Land and Water Conservation guidelines.
- * Controls on recreation and other uses of the park will be implemented where an activity is degrading soil and catchment values.
- * The extraction of sand, clay, rock and gravel from the park, other than dredging to maintain access to wharves and a swimming area (see sections 4.2.2.7 and 4.2.2.8), will be prohibited.

- * Two old quarries, one near the Mount Colah entrance station and one near the Terrey Hills entrance, will continue to be used as sites for stockpiling sandstone and soil when necessary.
- * Sediment control measures, weed control and revegetation work will be instituted where necessary around the quarries used for stockpiling of material.
- * The quarry near the Terrey Hills entrance will be reduced in size, the edges rehabilitated and planting undertaken to screen the stockpile from the road.
- * The old gravel pit near the top of the Bobbin Head Trail and roadside borrow areas will be restored and revegetated.
- * Discussions will be held with the Roads and Traffic Authority in regard to maintenance of silt traps and restoring the area used for a batching plant for the F3 expressway construction near Mount Colah and the sites of houses demolished for the expressway.

4.1.2 Water Quality and Catchment Protection

The waterways of the Hawkesbury River, Pittwater and Cowan Water, together with the smaller creeks and waterways within Ku-ring-gai Chase National Park (the bed of most of Cowan Water, Coal and Candle Creek, Smiths Creek and the Inner Basin are gazetted as part of Ku-ring-gai Chase National Park), are significant features of the area and their protection is an important objective of management.

The catchments of Coal and Candle Creek, Yeomans Bay, Refuge Bay, Flint and Steel Bay, Salvation Creek and The Basin are totally within Ku-ring-gai Chase National Park but many of the other catchments are suffering from the development of neighbouring urban, industrial and recreational areas. Development within these catchments has given rise to accelerated siltation and pollution of the watercourses within the park and increased nutrients within streams resulting in increased weed growth along watercourses. Areas of particular concern are those sections of the park downstream of industrial estates in the Cockle Creek catchment; golf courses at Terrey Hills, Asquith and North Turramurra; horse stables in the McCarrs Creek, Kierans Creek and Smiths Creek catchments; and the F3 Sydney-Newcastle Freeway. Seepage of sewage and waste water from houses near waterways is also a problem. Deterioration of the quality of the park's waterways has a significant impact on native plants and animals. Pollutants also have a major impact on recreational experiences because the creeks and waterways are focal points of visitor interest and activities.

Recreational use of the waterways and foreshores in and adjoining the park has also resulted in deteriorating water quality. Oil and fuel spills, dumping of rubbish in the water and discharges of sewage and waste water from boats, marinas and public facilities, particularly in small bays which are not regularly flushed by tidal waters, are a major problem.

The *Catchment Management Act 1989* introduced the concept of total catchment management which provides an umbrella framework in which to manage land to achieve cleaner water, less soil erosion, improved vegetation cover, the maintenance of ecological processes and a balanced and healthier environment. It also provides a focus to balance conservation needs and development pressures and encourages a more aware and involved community. An important means of achieving these aims is the formation and support of catchment management boards and trusts at a local level. Catchment management plays an important role in protecting the catchment values of the streams within Ku-ring-gai Chase National Park and of the Hawkesbury River and its tributaries which surround the park and most of the island nature reserves. In addition, Sydney Regional Environmental Plan No. 20 emphasises the importance of protecting water quality in the Hawkesbury River. Ku-ring-gai and Hornsby Councils, the Coastal Environment Centre at Narrabeen, and the Gibberagong Field Studies Centre through its Streamwatch program, monitor water quality in and adjoining the park.

Policies and Actions

- * The creeks and waterways within the park and reserves will be maintained in as natural and unpolluted a state as possible.
- * The Service will continue to support water quality monitoring undertaken by local councils and the Gibberagong Field Studies Centre and the work of the catchment management groups in maintaining and improving the water quality of the catchments within and adjoining the national park and nature reserves.
- * Alternative means of sewage disposal, such as composting toilets and connection to rising mains, will be investigated for facilities located on land fill areas or near waterways in the park. Controls will be placed on the use of some facilities if suitable methods of sewage disposal can not be found.
- * The Service will liaise with local councils, the Roads and Traffic Authority, local golf courses, catchment management committees and other relevant authorities to minimise the impacts of developments within the catchments of the waterways of the park and to ensure that all sediment control devices are regularly maintained.
- * A 'No Discharge from Boats' policy will be implemented progressively within the park boundaries in conjunction with the Waterways Authority, boat owners and the boating industry, particularly in areas of poor tidal flushing and/or high use.
- * Warringah Council, Pittwater Council and the Environment Protection Authority will be requested to ensure that all houses at Cottage Point and along the western edge of Pittwater have appropriate means of sewage disposal which does not result in sewage entering the park.

- * The Service will liaise with the local councils and the Roads and Traffic Authority to ensure that appropriate controls and procedures are implemented for minimising the impacts of stormwater and chemical spills on the park.

4.1.3 Native Plants

Ku-ring-gai Chase National Park is particularly important in conserving a large area of relatively undisturbed vegetation of the type which gives the Sydney bushland its distinctive character. It is also important for conserving vegetation types which are significant in a local and regional context. These tend to be of limited size and are associated with unusual or remnant geological and topographical features.

A number of surveys of plant communities within the national park have been undertaken, including a major survey by the Royal Botanic Gardens Sydney (Benson & Thomas 1985). A total of 24 plant communities were identified in this survey, comprising over 1,000 plant species. Vegetation surveys have also been undertaken of Lion Island (Benson 1981), Spectacle Island (Webb 1981) and Long Island (Benson & Howell 1994). Lion Island, Long Island and Spectacle Island Nature Reserves support a similar range of vegetation to the national park but the diversity is more remarkable because of their small size. The following is a brief overview of the vegetation communities of the national park and nature reserves.

The vegetation of the park varies according to the soil type, topography, aspect and drainage. A dry heath vegetation is found on the shallow sandy soils which have formed on the exposed rock outcrops of the Hawkesbury sandstone ridges, such as along the Lambert Peninsula. Typical species include banksia *Banksia ericifolia*, dagger heath *Hakea teretifolia*, scrub oak *Allocasuarina distyla* and dwarf apple *Angophora hispida*. Wet heathland occurs on the rock platforms where drainage is poor and the thin clay soil retains water. Species found in these hanging swamps include the swamp banksia *Banksia robur*, pink swamp heath *Sprengelia incarnata*, prickly tea tree *Leptospermum juniperinum*, sedges such as *Gahnia sieberana* and the insectivorous sundews *Drosera* species.

A low eucalypt woodland is found on the gentle upper slopes and protected ridge-tops. This community is dominated by the scribbly gums *Eucalyptus haemastoma* and *Eucalyptus racemosa*, red bloodwood *Corymbia gummifera* and yellow bloodwood *Corymbia eximia*. Black she-oak *Allocasuarina littoralis* and old man banksia *Banksia serrata* are also present. On the steeper, lower sandstone hillslopes is an open forest dominated by smooth-barked apple *Angophora costata* and Sydney peppermint *Eucalyptus piperita*. Also occurring within this community are red bloodwoods and Christmas bush *Ceratopetalum gummiferum*.

On the Narrabeen shales along the lower slopes of western Pittwater and parts of Cowan Water are taller open forests which include stands of grey ironbark *Eucalyptus paniculata* and forest oak *Allocasuarina torulosa*. Cycads *Macrozamia communis*, turpentines *Syncarpia glomulifera*, the rough-barked apple *Angophora floribunda*, bangalay *E. botryoides* and grey gum *E. punctata* are also found here. In the deeper protected gullies, such as near Jerusalem Bay, are small areas of warm temperate rainforest which include water gums *Tristaniopsis laurina*, coachwoods

Cerapetalum apetalum, lilly pillys *Acmena smithii*, Port Jackson figs *Ficus rubiginosa* and cabbage tree palms *Livistona australis*.

The mudflats at or near the tidal limit of Cowan Creek, Smiths Creek, Cockle Creek, Porto Bay and at the western end of Spectacle Island support mangroves *Aegiceras corniculatum* and *Avicennia marina*, with swamp oak *Casuarina glauca* on the margins. Saltmarsh communities are also found at the head of Smiths Creek and Cockle Creek.

Threatened and Uncommon Species

A number of plant species found within the park are listed as either endangered or vulnerable under the *Threatened Species Conservation Act 1995*. Recorded species currently known to occur in the park are listed in the table below.

<i>Acacia bynoeana</i>	Vulnerable species found on sandy soils in gullies.
<i>Ancistrachne maidenii</i>	Vulnerable species.
<i>Cryptostylis hunteriana</i>	Vulnerable species, last seen in the park in 1974.
<i>Darwinia biflora</i>	Vulnerable species found on the clay/sandstone interface.
<i>Eucalyptus camfieldii</i>	Vulnerable species found on ridge tops.
<i>Grevillea caleyi</i>	Endangered species which is found in four small locations in the park.
<i>Haloragodendron lucasii</i>	Endangered species, found in wet mid-slope areas.
<i>Kunzea rupestris</i>	Endangered species which is found on one sandstone ridge in the park.
<i>Lasiopetalum joyaceae</i>	Vulnerable species found only in heath on ridges in the Sydney area.
<i>Melaleuca deanei</i>	Vulnerable species found in marshy heath areas.
<i>Micromyrtus blakelyi</i>	Vulnerable species found on rocky outcrops.
<i>Microtis angusii</i>	Vulnerable species.
<i>Persoonia mollis</i> ssp. <i>maxima</i>	Endangered species found in three locations in the park. It is normally within 10-15m of creeks in steep gullies.
<i>Tetratheca glandulosa</i>	Vulnerable species found near its southern most limit in the park, mainly along ridges.

Under the *Threatened Species Conservation Act* a recovery plan and/or threat abatement plan must be prepared for endangered and vulnerable plants. The purpose of a recovery plan is to promote the recovery of a threatened species, population or ecological community to a position of viability in nature. A threat

abatement plan outlines the management of key threatening processes with a view to their abatement, amelioration or elimination.

A recovery plan has been approved for *Persoonia mollis* ssp. *maxima*. Draft recovery plans have been prepared for *Grevillea caleyi*, *Haloragodendron lucasii* and *Kunzea rupestris*, and recovery plans are currently in preparation for *Darwinia biflora* and *Tetraloche glandulosa*. These plans will be implemented during the term of this Plan. Some fencing, closure of tracks and trails and other works to protect the populations of *Grevillea caleyi* have already been undertaken in the park and will be continued. This recovery plan also recommends that the areas where *Grevillea caleyi* is located, which last burnt in 1994, be protected from fire until at least 2002. The recovery plans for *Haloragodendron lucasii* and *Kunzea rupestris* recommend protection of these plants from damage by people, removal of weeds impacting on the plants and protection from high fire frequencies until research has established an appropriate fire regime. No other plant species found in the park currently have a recovery plan or threat abatement plan.

Regionally rare or uncommon species found in the park include *Allocasuarina verticillata*, *Amperea xiphoclada*, *Angophora crassifolia*, *Blechnum ambiguum*, *Boronia fraseri*, *Boronia serrulata*, *Boronia mollis*, *Callistemon linearifolius*, *Darwinia procera*, *Eucalyptus capitellata*, *Eucalyptus leuhmanniana*, *Eucalyptus squamosa*, *Genoplesium baueri*, *Hibbertia nitida*, *Leucopogon amplexicaulis*, *Lomandra brevis*, *Persoonia isophylla*, *Persoonia mollis* ssp. *maxima*, *Pimelea curviflora* ssp. *curviflora*, *Pimelea latifolia* ssp. *hirsuta*, *Platysace stephensonii*, *Rulingia hermanniifolia*, *Tetraloche neglecta* and *Xanthorrhoea macronema*. It is important that these plants are also protected.

In addition to individual species of importance, there are several community types of importance within the park, including:

- * The Duffys Forest vegetation community being an open forest dominated by *Eucalyptus capitellata*/*Eucalyptus sieberi*/*Eucalyptus haemastoma*/*Eucalyptus oblonga*/*Corymbia gummifera*/*Angophora costata* associations found on lateritic and shale derived soils on ridge tops in the Duffys Forest/Terrey Hills/St Ives area (this community has been listed as an endangered ecological community under the *Threatened Species Conservation Act*);
- * The Pittwater Spotted Gum Forest being an open forest of spotted gum *Eucalyptus maculata* and grey ironbark *Eucalyptus paniculata* found on Narrabeen shales on western edge of Pittwater from Towlers Bay to Elvina Bay (the spotted gum community on the shores of Pittwater has been listed as an endangered ecological community under the *Threatened Species Conservation Act*);
- * Sydney Coastal Riverflat Forest dominated by *Eucalyptus saligna*, a small patch of which has been located on Cowan Creek upstream of Bobbin Head (this community has been listed as an endangered ecological community under the *Threatened Species Conservation Act*);

- * Low woodland (*Eucalyptus camfieldii*/*Eucalyptus haemastoma* association) found near the start of the Elvina Trail on the Lambert Peninsula;
- * Diatreme vegetation communities at Campbells Crater and Smiths Crater, which includes rough barked apple *Angophora floribunda*, cabbage tree palms *Livistona australis*, blue stringybark *Eucalyptus agglomerata* and a few remnant red cedars *Toona ciliata*;
- * Dyke vegetation communities, particularly at West Head, comprising species such as bastard mahogany *Eucalyptus umbra*, broad-fruited red mahogany *Eucalyptus scias*, cabbage tree palms *Livistona australis*, cycads *Macrozamia communis* and grass trees *Xanthorrhoea arborea*;
- * Open forest on Wianamatta shale along Cockle Creek upstream of Gibberagong Waterholes on Cockle Creek (contains a number of uncommon species or species which do not occur elsewhere in the park);
- * Vegetation communities containing rainforest species along creek lines and the western edge of Pittwater; and
- * Hanging swamp communities, particularly on the Lambert Peninsula, and associated seepage zones which include the yellow-top mallee ash *Eucalyptus leuhmanniana*.

Most of the above threatened or uncommon plants and communities are found on the ridge tops where shale or lateritic soils occur. They are particularly vulnerable because these soils are highly erodible.

The long term protection of the park's vegetation in general, and some species in particular, may be at risk due to the effects of human disturbance arising within and outside the park. Disturbances include introduced plants and animals, fire and fire suppression or hazard reduction works, water pollution from urban and industrial areas, recreational activities and management operations associated with transmission lines and other services (see relevant sections for more details). Bush regeneration programs are being implemented in a number of places within the park, mainly in association with weed control (see section 4.1.7) but also to restore existing degraded areas.

When the vegetation of the park was mapped in 1985, six permanent scientific reference sites were established and described in detail. The sites are located near Towlers Bay, at Smiths Crater, at the start of the Ryland Trail near Mona Vale Road, near the start of the Elvina Trail, above Flint and Steel, and at Campbells Crater. The intention was that the vegetation structure and floristics at these sites should continue to be monitored on a regular basis so as to determine if any changes are occurring in the park.

Policies and Actions

- * As far as possible the natural abundance, structure and diversity of all native plant species and communities will be conserved through the maintenance of

natural processes, the mitigation of human impacts and through specific conservation programs and bush regeneration programs where necessary.

- * Priority will be given to the protection of threatened plants and communities listed under the *Threatened Species Conservation Act* and of all shale and lateritic ridge tops, hanging swamps, volcanic landscapes, spotted gum/grey ironbark forests, forests along the upper reaches of Cockle Creek, forests containing rainforest species, and intact alluvial flats.
- * Tracks and trails through or adjoining sensitive vegetation communities will be fenced if necessary, monitored, and will be closed if negative impacts are indicated.
- * All developers, operators or organisers of activities undertaken on the park and reserves will be required to minimise disturbance to native vegetation and rehabilitate any damage resulting from the activity.
- * Only species indigenous to the park and reserves will be used in any planting or bush regeneration programs, except for replacement heritage plantings (see section 4.1.6) and grasses in high visitor use areas. Where possible locally collected seed stock will be used.
- * Recovery plans and/or threat abatement plans will be implemented as prepared.
- * The six permanent scientific reference sites within the park will be monitored on an annual basis.
- * Records of the occurrence and location of species, including lower plant groups, plant communities, endangered ecological communities and critical habitats within the parks and reserves will be maintained by the Service in collaboration with the Royal Botanic Gardens, local councils and community and volunteer groups.

4.1.4 Native Animals

There have been a number of small scale animal surveys carried out within Ku-ring-gai Chase National Park. The results of these surveys, in addition to the records obtained from site observations by individuals over the last 20 or so years, comprise the fauna list for the park.

Over 28 native mammals, 160 birds and approximately 20 reptiles have been recorded in the park. There are likely to be more native species within the park however this will only be verified by a systematic survey and recording of species.

Thirteen animals found in the national park and nature reserves are listed under the *Threatened Species Conservation Act*. The southern brown bandicoot *Isodon obesulus*, which is listed as endangered under the Act, has been recorded on the Lambert Peninsula and in the North Turrumurra area. In addition, the koala

Phascolarctus cinerus, tiger quoll *Dasyurus maculatus*, bent-wing bat *Miniopterus schreibersii*, large-footed mouse-eared bat *Myotis adversus*, glossy black cockatoo *Calyptorhynchus lathami*, powerful owl *Ninox strenua*, masked owl *Tyto novaehollandiae*, swift parrot *Lathamus discolor*, leathery turtle *Dermochelys coriacea*, heath monitor *Varanus rosenbergi*, giant burrowing frog *Heleioporus australiacus* and red-crowned toadlet *Pseudophryne australis* have all been recorded in the park. These latter species are listed as vulnerable under the Act.

The Gang-gang Cockatoo population in the Hornsby and Ku-ring-gai local government areas and the Koala population in the Pittwater local government area have been listed as endangered under the *Threatened Species Conservation Act 1995*. These populations may extend into the park.

Other mammal species found in the park include the eastern pygmy possum *Cercartetus nanus*, feather-tailed glider *Acrobates pygmaeus*, the New Holland mouse *Pseudomys novaehollandiae*, swamp wallaby *Wallabia bicolor*, brush-tailed possum *Trichosurus vulpecula*, ring-tailed possum *Pseudocheirus peregrinus*, sugar glider *Petaurus breviceps*, echidna *Tachyglossus aculeatus*, long-nosed bandicoot *Perameles nasuta*, platypus *Ornithorhynchus anatinus*, grey-headed flying fox *Pteropus poliocephalus*, chocolate wattled bat *Chalinolobus morio* and Goulds wattled bat *Chalinolobus gouldii*. It is notable that swamp wallabies are found on Long Island and Spectacle Island as well as within Ku-ring-gai Chase National Park.

Birds found in the park and nature reserves range from the small New Holland honeyeater *Phylidonyris novaehollandiae* and eastern spinebill *Acanthorhynchus tenuirostris* of the heathlands; to the large wedge-tailed eagle *Aquila audax*, brown falcon *Falco berigora*, nankeen kestrel *Falco cenchroides*, whistling kite *Milvus sphenurus*, osprey *Pandion haliaetus* and white-breasted sea-eagle *Haliaeetus leucogaster*. The eastern rosella *Platycercus eximius*, crimson rosella *Platycercus elegans*, galah *Cacatua roseicapilla*, sulphur-crested cockatoo *Cacatua galerita*, laughing kookaburra *Dacelo novaeguineae* and brush turkey *Alectura lathami* are found in the woodlands while rainbow lorikeet *Trichoglossus haematodus*, Lewins honeyeater *Meliphaga lewinii*, superb blue wren *Malarus cyaneus* and rock warbler *Origma solitaria* inhabit the forest areas. The superb lyre bird *Menura novaehollandiae* is a common sight in the national park, and little penguins *Eudyptula minor* are found on Lion Island and in the surrounding waters. The area supports the largest colony of little penguins close to Sydney.

Reptiles present in the park include the death adder *Acanthopis antarcticus*, red-bellied black snake *Pseudechis porphyriacus*, diamond python *Morelia spilota*, eastern brown snake *Pseudonaja textilis*, eastern tiger snake *Notechis scutatus*, eastern water dragon *Physignathus lesueurii*, eastern blue-tongued lizard *Tiliqua scincoides* and lace monitor *Varanus varius*. In addition, around 100 butterflies and moths have been recorded in the park as well as rare freshwater crayfish *Euastacus australasiensis* and spiders.

Research and surveys are currently underway into southern brown bandicoots and effects of fire and diet changes on small mammals on the Lambert Peninsula, and into invertebrate species in mangroves at Bobbin Head and Apple Tree Bay.

Recovery and/or threat abatement plans must also be prepared for all animals listed under the *Threatened Species Conservation Act*. Recovery plans will be implemented as prepared. In addition some native animals, for example quolls and bandicoots, are under threat from poisons and other controls on neighbouring properties.

Policies and Actions

- * The park and reserves will be managed to conserve their value as habitat for native animals. Particular attention will be given to protecting the habitats of animals listed under the *Threatened Species Conservation Act*, and animals of special concern such as the southern brown bandicoot, eastern pygmy possum, feather-tailed glider, New Holland mouse, platypus and little penguin.
- * Research into the requirements, status and distribution of native animals, particularly threatened animals and animals of special concern such as the platypus and little penguin, will be encouraged.
- * The habitats and other requirements of native animals will be taken into account in management operations such as weed control, bush regeneration, feral animal control and fire protection works. Special care will be undertaken that species such as the koala, tiger quoll and bandicoot are not impacted by these programs.
- * The Service will promote the retention of wildlife corridors linking the park to other bushland areas, and in particular to Garigal National Park, Muogamarra Nature Reserve and Berowra Valley Regional Park.
- * A survey will be undertaken to determine the number of koalas remaining in the park and guidelines for the management of koalas within the park and the surrounding district will be prepared. Consideration will be given to the release of additional koalas into the park so as to ensure a viable colony.
- * Information will be prepared to advise neighbours on living in harmony with native animals.
- * Records of the occurrence and location of species, including invertebrates, and endangered populations within the parks and reserves will be maintained by the Service in collaboration with the Australian Museum, local councils and community and volunteer groups.

4.1.5 Aboriginal Heritage

Ku-ring-gai Chase National Park contains extensive evidence of Aboriginal occupation. Until the early nineteenth century the area was part of the territory of the Guringai group, who occupied the area from Broken Bay in the north to Port Jackson (Sydney Harbour) in the south and west to the Lane Cove River. Two groups of the Guringai occupied the area which is now park: the Garrigal people

occupied the area around the Lambert Peninsula and the Terramerragal lived in the Turramurra area.

Within six weeks of the arrival of the First Fleet in Port Jackson, Governor Phillip was exploring Broken Bay and on 5th March 1788 he camped at Resolute Beach near West Head. Phillip commented on the friendliness of the Aboriginal people on this trip, but one year later when he again visited Broken Bay all except those too sick with smallpox fled from him. By 1790 over half the Guringai population had been wiped out by smallpox and by the 1840s most of the Aboriginal people had disappeared from Pittwater as their traditional land was taken over by white settlers.

Much of the evidence of the traditional way of life of the Guringai was destroyed by the development of the city of Sydney. Aboriginal sites which have survived provide the only indications of traditional Aboriginal life within the area. The Aboriginal sites and places in the park and reserves are significant to local Aboriginal people, both as evidence of the traditional way of life of the original occupants and for the education of their children. They are also of interest to the wider public and important to improved understanding of Aboriginal culture.

There are more than 350 Aboriginal sites recorded for the park and reserves, with the majority concentrated on the Lambert Peninsula. The most widespread evidence of past Aboriginal use of the park and reserves consists of shell middens, which are found along most of the foreshores. There are also over 170 rock engraving sites recorded in the park and reserves. They include figures which resemble emus, echidna, fish, kangaroos, boomerangs, shields, footprints, people and mythical figures. Other Aboriginal sites include hand stencils, grinding grooves, stone arrangements, burials and occupation sites. No systematic archaeological survey has however been carried out of the whole park and it is likely that there are many more sites in the park and reserves that have not yet been located or recorded.

Only a small number of Aboriginal sites in the park and reserves are promoted for public viewing and understanding, although many other sites receive regular visitation because they are located close to roads or walking tracks. Sites currently signposted and interpreted to the public through signs, brochures or guided tours are mainly on the Lambert Peninsula. They include the engravings near the start of the Elvina Trail and Basin Trail, engravings on the Echidna Track and Resolute Track, and hand stencils in Red Hand Cave near the Resolute Picnic Area. There are also two frequently visited sites in the Bobbin Head section of the park, that is on the Gibbergong and Bobbin Head walking tracks.

On occasions vandalism and graffiti has damaged a number of Aboriginal sites within the park and reserves. Protective structures and interpretive signs have been erected at Red Hand Cave and at a number of other sites within the park. On-going monitoring of sites is being undertaken by the Service and the Metropolitan Local Aboriginal Land Council. Except for the Red Hand Cave protection works have been directional structures rather than fencing, however if vandalism continues stronger protection measures will be necessary.

The National Parks and Wildlife Service currently has the legislative responsibility for the management of Aboriginal sites but its policies recognise that Aboriginal people have the right to make decisions about the management of Aboriginal heritage and the presentation of information about Aboriginal culture and history.

Ku-ring-gai Chase National Park falls within the Metropolitan Local Aboriginal Land Council area. The Land Council has a special interest in the management of Aboriginal sites within the park and reserves and plays an important role in providing advice to the Service about the management and conservation of Aboriginal sites.

Policies and Actions

- * Aboriginal sites within the park and reserves will be conserved and managed in partnership with Aboriginal people.
- * The Service will continue to liaise with the Metropolitan Local Aboriginal Land Council and other relevant Aboriginal community organisations about management of Aboriginal sites and interpretation of the Aboriginal history of the park and reserves.
- * As far as practical Aboriginal sites will be protected from disturbance or damage by human activities. Regular inspections of the most visited Aboriginal sites will be undertaken in association with the Land Council and appropriate protection works implemented. These may include interpretive signs, notification of penalties for damaging sites, barriers, fencing or, if necessary, closure of the sites to public access.
- * Any work with the potential to impact on Aboriginal sites will be preceded by an archaeological survey, and work will only be undertaken with the approval of the Metropolitan Local Aboriginal Land Council.
- * Non-destructive research into past Aboriginal use of the area, including systematic surveys for Aboriginal sites and assessments of the real and potential impacts of people and other threats on sites, will be encouraged.
- * General understanding and appreciation of Aboriginal culture and occupation of the park and reserves will be promoted in park brochures and interpretation programs.
- * The Aboriginal engraving sites on the Elvina, Basin, Resolute and Echidna Tracks and the Red Hands Cave at West Head, and engravings on the Gibberagong and Bobbin Head Tracks near Bobbin Head will be identified in park brochures or on park signs. Other Aboriginal sites will not be promoted unless approved by the Metropolitan Local Aboriginal Land Council.
- * Directional barriers and interpretation signs will be erected around the sites on the Elvina Bay, Gibberagong and Bobbin Head Tracks.
- * The interpretive sign at the Red Hand Cave will be replaced with signage which emphasises use of rock shelters for occupation as well as art.

- * Information disseminated during commercial tours of Aboriginal sites will require approval of the Metropolitan Local Aboriginal Land Council and the National Parks and Wildlife Service.

4.1.6 Historic Heritage

Ku-ring-gai Chase National Park also contains a number of European sites of historic value. These sites include examples of early recreation settings, buildings, ruins, a colonial lighthouse, monuments, plantings, early transport routes and military installations.

In the early days of the colony, the Ku-ring-gai area was mainly used for boat building and timber getting. Soda ash, salt and shell lime were also collected from the area. Transport between Sydney and the area was primarily by boat, an often treacherous journey that was made easier by the erection of a navigation light on Barrenjoey Head in 1855, which was replaced the Stewart Towers in 1868 and then by the present lighthouse in 1881. The lighthouse was automated in 1932. Trading vessels sought shelter from storms in Coasters Retreat (The Basin), hence its name.

Smuggling was also a problem and a customs house was erected at the base of Barrenjoey Head in 1843 and operated until 1904. The large house at the base of Barrenjoey Head was constructed in the 1920's. The other cottages near the water were built much later as fishing shacks, as was the red boatshed. Barrenjoey Head has only recently been included in the national park. A draft conservation and cultural tourism plan has been prepared for the site and is likely to be implemented during the term of this plan.

In the late 1800's work began on a railway to the Hawkesbury River. The concrete wall of Brooklyn dam was built in 1884 to provide water for the steam trains using this line. The dam was enlarged six times between that date and 1924. Brooklyn Dam was added to Ku-ring-gai Chase National Park in 1989. The dam wall needs ongoing monitoring as it may be being weakened by trees growing out of the wall and by blocked drainage.

William Lawson, the Blue Mountains explorer, was granted 260 hectares on the Lambert Peninsula in 1834 and over the following years land grants were made to others at The Basin, Little Mackerel and Great Mackerel Beaches, Soldiers Point and Cottage Point. In 1882 Beechwood Cottage was built as a holiday cottage at The Basin by the then owner of the property, Frederick Jackson, who also permitted the public to camp and picnic at The Basin. By the 1880s there were also a number of boat sheds along Cowan Creek, including a boatshed at Bobbin Head and Windybanks' boatshed at Waratah Bay. None of these original boatsheds remain today.

By the early 1890's a number of people were becoming concerned at the degradation of the area. Eccleston Du Faur, a resident of Turramurra, managed to convince the government that a park was necessary "to prevent the reckless destruction of native flowers" and because of the "rapidly increasing neighbourhood"

(letter from Du Faur to Henry Copeland, 1892). As a result of Du Faur's efforts, 13,500 hectares (which covered most of the current national park except for West Head and Barrenjoey Head) was dedicated as Ku-ring-gai Chase in 1894 and placed under the care of trustees.

The Trust placed a priority on nature conservation and did not permit logging and other extractive industries in the park, unlike the trustees of The (Royal) National Park south of Sydney. They also actively promoted the park to visitors as a means of raising revenue for park management. In 1895 a wharf was constructed at Lovett Bay and a walking track built up the hill to Flagstaff (or Perrys) Lookout which became one of the most popular early picnic spots on Pittwater. In 1901 Eccleston Du Faur contributed some of his own money to the construction of a road from North Turramurra to Bobbin Head and in 1903 another road was built from Mount Colah railway station to join the Bobbin Head road via a causeway, creating a circular drive through this section of the park. Sea walls were also constructed at this time as part of a major reclamation project. The Bobbin Head Trail is along much of this first road constructed by Du Faur while the Birrawanna Track in part follows the old carriage track from Mount Colah to Apple Tree Flat.

In 1915 the Trust purchased The Basin on Pittwater, which was then the most popular recreation area adjoining the park. They repaired Beechwood Cottage and built a jetty, boatshed, swimming enclosure and dressing sheds for visitors.

Between 1924 and 1926 a small (1.5 metre high) replica of the Great Sphinx in Egypt was carved out of the sandstone near Turramurra by Private William T. Shirley, a tuberculosis patient at the nearby Lady Davidson Home for Ex-Servicemen. The monument is flanked by two small pyramids and inscribed "Lest We Forget" in memory of his A.I.F. comrades during the First World War. The area around the sphinx was restored in 1995.

Most of the facilities at Bobbin Head were constructed during the 1930s, mainly from government unemployment relief grants, including additional sea walls, most of the shelter sheds, the sandstone toilets and bus shelter, parts of the current boatshed and the road to Apple Tree Bay. The Bobbin Inn and a road to Illawong Bay were also constructed at this time, as was the landscaping of Orchard Park (named after the Trust president), planting of Norfolk Island pines at The Basin, and the construction of the brick monuments near the bridge at Bobbin Head. In 1940 a stone ambulance room/rangers office was constructed near the bus shelter on the eastern side of the Bobbin Head bridge (it was modified in 1976 to provide a temporary kiosk while the Bobbin Inn was closed for renovations).

During the 1950s further building work was undertaken at Bobbin Head. Garages, a workshop, additional picnic shelters and kiosks were constructed, a concrete bridge was provided across the creek and extensions and modifications were made to the Bobbin Inn. A koala sanctuary (now Kalkari) was developed on the ridge above Bobbin Head. A number of facilities were also constructed at places such as Illawong Bay and Akuna Bay, but little except the sea walls and the rangers house above Illawong remain at these bays.

Land at West Head was resumed for military purposes in 1941. Gun emplacements, an observation post, searchlight stations, a trolley way, huts and other structures were constructed on the headland as part of the protection of Sydney during World War II. Following the war the military buildings near the point became a National Fitness Camp, while most of the remainder of the Lambert Peninsula was gazetted in 1951 as part of Ku-ring-gai Chase National Park. As part of the agreement to transfer the lands, military exercises were allowed to continue on the peninsula during the 1950s and 1960s. In 1964 the camp closed down, the buildings were removed, the land added to the park and the lookout at West Head developed.

In 1967, following 73 years of trust management, the Chase was gazetted as a national park under the management of the newly-formed National Parks and Wildlife Service. The Service took over the recently completed park office and visitors centre on the hill above Bobbin Head, converted the koala sanctuary built in the 1950s to a visitor information centre, and removed the prefabricated holiday cottages built at The Basin in the 1950s and early 1960s.

Over the years there have been many changes to the developed areas of the park, with new facilities being constructed while others were modified or removed. Similarly, the landscaped areas at Bobbin Head have changed from a bush setting in the early 1900s, to a formal landscape in the 1930s, then back to a more informal and native landscape in the 1950s through to the 1990s. One of the few consistent landscape features throughout the park has been the planting of Norfolk Island pines along the waters edge in the main visitor areas. For the centenary of Ku-ring-gai Chase National Park in 1994 major works were undertaken at Bobbin Head including restoration of the remaining picnic shelters, conversion of the old sandstone garages to a picnic shelter, removal of the old boat ramp and some trees that were overshadowing the picnic pavilion, and other landscaping works.

In addition to the historic places and structures mentioned above, there are many other historic places within Ku-ring-gai Chase National Park including a number of graves at The Basin and the remains of stone walls and building foundations in many places throughout the park. There are the sites/foundations of up to 18 fishing shacks on Spectacle Island and a dam of about 5m in diameter constructed out of sandstone blocks. There are no known historic sites on Lion Island or Long Island Nature Reserves although historic sites associated with the railway exist on the section of Long island not dedicated as nature reserve.

Policies and Actions

- * Historic places within the park and reserves will be conserved to maintain significant cultural values.
- * Historic features which are situated within the precinct of major visitor areas will be interpreted.
- * Conservation assessments, including where necessary the preparation of conservation plans, will precede any works on a historic feature other than regular maintenance and urgent stabilisation work.

- * Work which may disturb, damage or destroy relics as defined under the *Heritage Act 1977* will be preceded by an archaeological assessment. Any such proposed excavation will require a permit issued under the *Heritage Act*.
- * Non-destructive research into the history and historic features of the national park and nature reserves will be encouraged.
- * The general 1930's character of the Bobbin Head picnic areas will be retained. A walking path from opposite the Bobbin Inn to the pavilion will be re-established and replacement plantings of selected introduced trees will be undertaken in Orchard Park. However no attempt will be made to replicate all the 1930's plantings or to reconstruct all picnic shelters, pathways or other landscape features of the 1930s.
- * The Norfolk Island pines defining the edge of the Bobbin Head picnic areas and The Basin will be retained and replacement planting undertaken as necessary.
- * The 1976 renovations to the old rangers office/ambulance room at Bobbin Head will be removed. The Service will investigate adaptive uses for the building including use as either a picnic shelter, interpretive shelter or education centre.
- * The spalling of the concrete/rusting of steel on the West Head fortifications will be monitored and repaired if necessary. A steel door will be attached to the piquet to prevent access into the building. A track will be constructed to the gun emplacement just off the Resolute Track, which will be interpreted.
- * Minor changes will be undertaken of the interior of Beechwood Cottage at The Basin, including new internal openings, to permit the cottage to be used by the public (see section 4.2.2.4). Interpretive signs will be placed outside Beechwood if it is not to be generally open to the public. The fig and magnolia near Beechwood will be replaced with plants of the same species when they become senescent or die.
- * The shacks and boat shed at the base of Barrenjoey Head will be recorded and may be removed subject to the provisions of the Conservation and Cultural Tourism Plan.
- * The Service will implement the Conservation and Cultural Tourism Plan following public exhibition and adoption.
- * The 1881 configuration and pre-1932 fabric of the lighthouse and lighthouse keepers cottages will be managed in accordance with the Conservation and Cultural Tourism Plan.
- * As far as possible the fabric of the lighthouse and the lighthouse keepers cottages will be preserved and interpreted; the roofs of the cottages may be coloured to make them less obvious; the verandahs may be reconstructed or

retained in their closed-in state; no new openings will be created in the buildings and no partitions erected in the tower; and the cottages may be used for staff accommodation, holiday accommodation for the public and/or to house an interpretive display.

- * The introduced plants outside the house gardens on Barrenjoey Head will be removed.
- * The trees growing out of the wall of Brooklyn Dam will be poisoned and the overflow pipes cleaned. If water leaks from the dam, the water in the dam will be allowed to find its natural level.

4.1.7 Introduced Plants

Introduced plants are those species which do not occur naturally within an area. This section does not cover plants of historic significance which are dealt with under section 4.1.6.

Introduced plants are mainly a problem in Ku-ring-gai Chase National Park along watercourses, in areas adjacent to urban development, in areas of past habitation within the park, and in some areas of high public usage. Two hundred and thirty six (236) exotic species have been recorded in Ku-ring-gai Chase National Park (Thomas and Benson, 1985). The major cause is soil disturbance and the input of polluted, nutrient-rich waters from urban and semi-rural development in some catchments. Run-off from neighbouring properties and roads, weeds in neighbouring bushland and gardens, and dumping of garden refuse in the park are also sources of weeds.

In addition to the watercourses within the park, other major weed sites include Hungry Beach, Flint and Steel, adjoining settlements on the western foreshores of Pittwater, the old boatshed site north of Apple Tree Bay, Barrenjoey Head, the area used by the army below West Head, and the McCarrs Creek area. Lion Island and Spectacle Island Nature Reserves also contain major weed sites.

The weeds of most concern in the park are bitou bush *Chrysanthemoides monilifera*, ludwigia *Ludwigia peruviana*, pampas grass *Cortaderia selloana*, privet *Ligustrum sinense* and *L. lucidum*, mist flower *Ageratina riparia*, crofton weed *Ageratina adenophora*, lantana *Lantana camara* and whisky grass *Andropogon virginicus*.

Bitou bush is being controlled on a continuous basis at Barrenjoey Head, Lion Island and the Lambert Peninsula, with the aim being to eradicate this plant from the park. Ludwigia will also continue to be controlled at all sites annually while pampas grass is being attacked on a catchment basis. The Service is working with neighbouring landholders and the Ingleside Landcare Group to eradicate ludwigia in the local area while pampas grass has been almost eradicated from the Cowan catchment by groups working in association with the Cowan Catchment Support Committee. Privet (both small and large leaved) is moving into the park via creek lines, particularly in the south of the park. The area around Gibberagong Waterholes on Cockle Creek is heavily infested. Priority on privet control is being given to Kierans

Creek, Ku-ring-gai Creek and the upper Cowan Creek in accordance with the Cowan Catchment Weeds Strategy (2000) which emphasises the need to work from more healthy bushland to less healthy bushland.

Mistflower and crofton weed are also spreading into the park via watercourses. Crofton weed is spreading from the sediment detention ponds along the freeway into the western section of the park. It is also present on most beaches on the Lambert Peninsula and in the Ingleside area. Mistflower is spreading into the creeks in the south-western corner. Control of crofton weed has been successfully undertaken in the park. Crofton weed (and lantana) has been successfully controlled in Campbells Crater by a volunteer Bushcare Group and the area has regenerated with native species. The success of this program has been the result of the long-term follow-up work and provides a model for the control of isolated weed infestations.

Lantana is present at many of the beaches in the park (large infestations occur at Flint and Steel, near West Head lookout and on Lion and Spectacle Islands). Lantana is also present along the urban boundary of the park, in areas of past habitation and scattered clumps are present in the McCarrs Creek catchment. Local volunteers and Community Service workers have been involved in a successful lantana control program for this weed at Towlers Bay and a volunteer program is underway on Lion Island.

Whisky grass is a prolifically seeding perennial grass which has the potential to spread rapidly across bare cleared soil. Infestations are present along West Head Road and to a lesser degree along Bobbin Head Road. Grading and regular slashing of road edges can increase the spread if undertaken while the plant is seeding.

Other weeds occurring in more isolated areas of the national park and nature reserves include asparagus fern *Asparagus densiflorus* on Barrenjoey Head; coral trees *Erythrina syksii*, camphor laurels *Cinnamomum camphora* and mother-of-millions *Bryophyllum delagoense* on the Lambert Peninsula beaches, elephant grass *Arundo donax* and cats claw creeper *Macfadyena unguis-cati* at Gibberagong Waterholes, and honeysuckle *Lonicera japonica* at Bobbin Head.

Introduced plants also includes native species which are not indigenous to the area. Within Ku-ring-gai Chase National Park these include the Gynea lily *Doryanthes excelsia* which were deliberately planted on the western side of Cowan Water earlier this century and the golden wreath wattle *Acacia saligna* which has colonised the road edges of Mona Vale Road at Ingleside and a number of other road sides. The Gynea lily is not of major concern because it is not spreading. The golden wreath wattle, a native of Western Australia, is spreading and control is being undertaken in association with local councils and an educational leaflet is being developed.

In addition to the Service's obligation to conserve the natural environment, the *Noxious Weeds Act 1993* places an obligation upon public authorities to control noxious weeds on land that it occupies to the extent necessary to prevent such weeds spreading to adjoining lands. Of the above plants ludwigia, pampas grass, lantana, privet and elephant grass have been identified as noxious within all the local government areas covering the national park, bitou bush is listed as noxious within

the Pittwater, Hornsby and Ku-ring-gai areas, cats claw is listed for Ku-ring-gai and Hornsby, and honeysuckle for Pittwater and Warringah council areas.

Weed management involves two approaches: controlling existing weed infestations, and preventing new weed infestations. Within each of these strategies, control is based on a system of priorities which recognise the nature and extent of weed invasion. Priority for the control of introduced plants within the park and reserves will be given to species which:

- are listed as noxious weeds under the *Noxious Weeds Act*;
- pose a threat to threatened or uncommon native species;
- threaten the conservation or recreation values of an area;
- have a high potential for invading native vegetation communities;
- are in riparian zones;
- are part of an on-going control program; and
- are small, isolated occurrences.

Volunteers provide invaluable assistance to the Service in controlling weeds and undertaking bush regeneration. There are currently 15 volunteer Bushcare sites in Ku-ring-gai Chase National Park and on the nature reserves. They are working: along the western foreshores of Pittwater at Coasters Retreat, Towlers Bay, Elvina Bay and Lovett Bay; at West Head lookout; on Lion Island; on Spectacle Island; on Barrenjoey Head; at Cottage Point; at Terrey Hills; at Duffys Forest; at Campbells Crater; at Ingleside; at Mt Kuring-gai; and along the Sphinx Track at North Turramurra. The Cowan and Northern Beaches Catchment committees co-ordinate a number of weed control programs on the park and Ku-ring-gai, Warringah and Pittwater Councils have a number of Bushcare groups that work in areas adjoining the park.

Policies and Actions

- * Weeds in the park will be controlled, and where possible eradicated.
- * A weed management strategy, identifying priorities and programs for weed control in the park and reserves, will be prepared and implemented.
- * Priority will be placed on the control of bitou bush, ludwigia and pampas grass, with the aim being to eradicate these weeds from the park.
- * Other weeds will be controlled in accordance with the weed management strategy.
- * An education brochure on the golden wreath wattle will be developed in association with local councils.
- * The Volunteer Bushcare Program will continue to be supported, including by the provision of trained co-ordinators, and the program will be progressively expanded to other areas within the national park and nature reserves.
- * The Service will continue to support integrated weed management projects in association with catchment management committees, local councils and other agencies.

4.1.8 Introduced animals

A number of introduced animals have been recorded within the park. These include cats *Felis catus*, dogs *Canis familiaris*, foxes *Vulpes vulpes*, black rats *Rattus rattus*, mice *Mus musculus*, European honey-bees *Apis mellifera*, and rabbits *Oryctolagus cuniculus*.

Introduced animals have a detrimental impact upon the natural condition of the park by disturbing the native vegetation, increasing soil erosion and affecting natural pollination processes. They also compete with native animals for available food and/or predate on native animals.

Foxes are considered to be having the greatest impact on the park. Recent research by the University of NSW and Macquarie University has found that 64% of fox diets was mammals, with 14% vegetative matter, 13% birds and 3% refuse from garbage wastes. The most common mammalian prey species were swamp wallabies, followed closely by rabbits, then brush-tailed possums, long-nose bandicoots and ringtail possums (Kennedy, 1995). Plant species eaten by foxes include bitou bush, blackberry and privet which is then spread in droppings. Observations of foxes in Ku-ring-gai Chase National Park indicate that foxes mainly travel along roads, fire trails and walking tracks.

A fox control program is currently underway on Lambert Peninsula. The Lambert Peninsula was selected because of its isolation, its one narrow re-entry point, the presence of threatened fauna, limited park neighbours and its restricted public access at night. Manufactured 1080 baits are buried in sand bait stations along fire trails, above beaches and in areas of known fox presence, and monitoring of the baits taken and for non-target species is undertaken.

Domestic cats and dogs are also a major problem in the park. Roaming of these animals in the park is not only a direct threat to small native animals (dogs, for example, are a threat to swamp wallabies, long-nose bandicoots, brush-tail possums and quolls) but also their smell can disturb animals and inhibit feeding and breeding. Neighbours leaving dog and cat food in gardens can also artificially support young feral cats and foxes until they have developed their hunting abilities.

Rabbits are more a problem on adjoining grassed lands such as golf courses than in the park. Successful rabbit control in these neighbouring off-park areas may have an impact on fox diets and fox control on the park may change rabbit numbers on neighbouring lands.

Although no honey bee hives are located on the park or nature reserves, foraging from off-park hives may have an impact on native biota, including on the endangered *Grevillea caleyi*. The close proximity of the park to metropolitan areas and the high number of visitors also make the park an unsuitable location for bee hives.

Policies and Actions

- * Dogs and other introduced animals, including European honey-bee hives, will not be permitted in the park or reserves with the exception of horses on authorised horse trails (see section 4.2.2), authorised companion animals and assistance animals.
- * Introduced animal populations will be controlled and where practicable eliminated.
- * A pest species management strategy will be prepared and implemented. Priority will be given to the control of foxes, cats and dogs.
- * Control methods will be those which are most direct for the target species and which have minimum impact on non-target species. Care will be taken to avoid baiting for feral animals in places and by means which could result in baits being inadvertently taken by native species such as quolls or bandicoots.
- * The fox control program will be continued on the Lambert Peninsula, and the program expanded to other sites in the park.
- * Neighbouring landowners in the Terrey Hills and Ingleside areas will be approached in regard to undertaking a co-operative fox and rabbit control program.
- * Any introduced bee hives found on the national park or nature reserves will be removed in conjunction with NSW Agriculture and the NSW Apiarists' Association.
- * Research into the impact of the fox control program on native animals will be undertaken. Research will also be encouraged into the status and distribution of feral animals in the park, the impact of introduced animals on native plants and animals, and the changing densities of other feral animals such as cats and rabbits following control of foxes.
- * Information will be prepared for neighbours outlining the impact of domestic animals, particularly cats and dogs, on the park and means they can undertake to limit impacts of their pets on the park.

4.1.9 Fire Management

The management of fires within natural areas is a complex and often controversial issue. The achievement of many of the objectives of management for the park depends to a large degree on careful and well considered fire management planning.

Fire has been an important factor influencing the environment of the national park and nature reserves for thousands of years. Fire is regarded by the National Parks and Wildlife Service as a natural process, one of the established physical factors of

the Australian environment to which native plants and animals have become adapted. The correct management of fire is essential to avoid extinction of native plants and animals.

The natural fire regime of the national park and nature reserves is unknown. It is believed that Aboriginal people burnt sections of the ridges within the Sydney area frequently (about every 1-5 years) while the hillslopes and valleys would have burnt less frequently (Conroy, 1996).

Recent ecological research in similar ecosystems (Bradstock et al, 1995) indicates that a fire frequency of between 12 to 25 years is appropriate for the maintenance of most vegetation communities in the national park and nature reserves. Heath communities generally require no more than one fire every 12-15 years while forest communities require no more than one fire every 15-25 years in order to maintain structure and species composition. Rainforest and estuarine communities should not be burnt. Research is currently underway into the fire ecology of threatened species within the national park.

The National Parks and Wildlife Service has as its primary aims in fire management:

- to reduce the risk of bushfire damage to life and property both within and immediately adjacent to areas where the Service has a statutory responsibility;
- to effectively manage bushfire for the protection and conservation of the natural, cultural, scenic and recreational features of the Service areas; and
- to cooperate and work with other organisations in fire management planning and implementation within the area.

Ku-ring-gai Chase National Park falls within both the Hornsby/Ku-ring-gai and Warringah/Pittwater Rural Fire Districts. Lion and Spectacle Islands are within the Gosford Rural Fire District. Long Island is within the Hornsby/Ku-ring-gai Rural Fire District. The National Parks and Wildlife Service submits fuel management proposals, including trail maintenance and hazard reduction proposals, to the district bush fire management committee to assist in the co-ordination of annual district works programs. The Service also assists in the preparation of risk management plans and operations plans for the district. Both risk management and operational plans are made available for public comment.

Under the *Rural Fires Act 1997*, the Service is recognised along with the Rural Fire Service, State Forests of NSW and the NSW Fire Brigades, as a fire authority. The Service therefore has shared responsibilities for the co-ordination of bushfire suppression, mitigation and prevention activities in accordance with the principles of ecologically sustainable development within rural fire districts. The Service, as a land manager, also has a statutory obligation to prevent the occurrence of wildfire and to minimise the spread of wildfires within the park and reserves. The Service works closely with the Rural Fire Service and the NSW Fire Brigades in this regard.

Ku-ring-gai Chase National Park

Available records show that over the last 50 years most of Ku-ring-gai Chase National Park has been subject to a fire frequency of 10-15 years, particularly the ridges and upper slopes. There has been an average of 10 small (usually less than 5 hectare) wildfires a year, with extensive wildfires (over 500 hectares) occurring in 1943, 1946, 1958, 1965, 1968, 1971, 1979, 1980, 1983, 1990 and 1994. The January 1994 fire burnt 7,110 hectares or almost half the park. After the 1994 fires it was estimated that only about 1% of the park contained vegetation which was older than 21 years (Conroy, 1996).

Over the last 10 years most wildfires within the park (90%) have been a result of arson or the dumping and burning of cars, with 72% of fires having started from beach and foreshore areas of the park. Also over recent years, sections of the park have been burnt deliberately by the Service to reduce fire hazards near park boundaries and to provide a mosaic of age classes in the vegetation communities of the park. However recent fire events have shown that it is possible for a wildfire to run through the same area within a year, although the wildfire may be reduced in intensity.

The properties at greatest risk from a fire in Ku-ring-gai Chase National Park are those to the south of the park. Mt Kuring-gai township, which protrudes into the park, is also at risk from fire. Environmental weeds have been able to increase on the boundary of the park due to high fire frequencies in past. Other methods of fire protection, including manual removal of fuel loads and bush regeneration works, are being trialed with positive results. Strategic fire trails will continue to be maintained and upgraded as necessary, as fire breaks and access points.

In June 2000 a tragic accident occurred in the Mt Ku-ring-gai area of the park which took the lives of four Service officers and critically injured three others. This incident stands as a stark reminder of the dangers associated with all bushfires.

Lion Island, Long Island and Spectacle Island Nature Reserves

The nature reserves have had very few fires with the majority of Lion Island, Long Island and Spectacle Island being fire free for over 30 years. Records for the islands show that only two fires have occurred in the past twenty years, both on Long Island. Fires on the islands would be contained on the island and have no impact on private property. There are no fire trails on the islands, and no prescribed burning will be undertaken for hazard reduction purposes.

Policies and Actions

Fire Prevention

- * Fire in Ku-ring-gai Chase National Park and Lion Island, Long Island and Spectacle Island will be managed in accordance with this plan of management and the fire management plans for the park and reserves, which will contain more detailed fire management prescriptions.

- * A fire management plan for Ku-ring-gai Chase National Park and a fire management plan for the island nature reserves will be prepared by December 2003.
- * Fuel reduction will be undertaken to mitigate the impacts of wildfires. Alternative strategies to burning will be investigated for identified fuel reduction zones.
- * The Service will participate in the preparation of risk management plans and operations plans for the Hornsby/Ku-ring-gai, Gosford and Warringah/Pittwater Rural Fire Districts.
- * Existing trails considered essential for fire management will be retained and upgraded to a standard consistent with their classification under the relevant fire management plan. These trails will be maintained for both strategic fuel management and wildfire control purposes.
- * Trails not required for fire or other management operations will be maintained as walking tracks or closed and revegetated (refer section 4.2.4).
- * No new permanent management trails or fire breaks will be constructed unless in accordance with an approved fire management plan, although minor re-routing of existing trails may be undertaken.
- * Barriers and locked gates will be maintained on all management trails to reduce the incidence of arson and the burning of cars, the two main causes of fires.
- * Regular boat patrols will be undertaken over summer to enforce the prohibition on fires on park beaches.
- * Park fire bans and closures may be imposed when weather conditions and fuel loads are such as to present fire control problems.
- * The Service will seek to improve the level of community understanding of the role and management of fire within the park and the importance of fire prevention measures outside of Service areas.
- * The Service will only provide fuel free areas within the national park when prescribed within a fire management plan and impacts on the park are determined to be acceptable.

Prescribed Burning and Fire Frequency

- * Prescribed burning will be based primarily on the ecological needs of native species and communities. The appropriate range of fire frequencies for each community will be detailed in the reserve fire management plan and will be applied wherever possible.
- * As far as possible fire frequency will be minimised in:

- areas containing rainforest species;
 - estuarine communities;
 - Smiths Crater, Campbells Crater and the West Head dyke areas;
 - The Basin catchment area; and
 - communities of threatened or uncommon plants and animals which may be threatened by fire (e.g. *Kunzea rupestris*).
- * Prescribed burning may be undertaken to reduce the risk of high intensity fire close to any property or major visitor area, consistent with the criteria for determining fire hazard and associated fuel reduction zones.
 - * Monitoring plots will be established and species and community indicators will be developed so as to monitor fire effects within burning zones and to assist in the development of more specific burning regimes.
 - * Records of all wildfires and prescribed burns will be kept and used for fire management purposes.
 - * Pre and post weeding needs will be considered as part of all prescribed burning programs.
 - * The six scientific reference sites within the park will be prescribed burnt only for approved experimental or ecological purposes.
 - * Research will be encouraged into the effects of fire on different plant and animal communities, the most desirable fire frequencies for specific vegetation communities and threatened species within the park, and into traditional Aboriginal burning practices.
 - * As far as possible, the risk of high intensity fire will be minimised in areas known to support significant arboreal animal populations e.g. koalas.

Fire Suppression

- * All wildfires will be managed and controlled as quickly as possible and contained as far as possible within the park or nature reserve.
- * Preference will be given to fire suppression methods which have least adverse environmental impact.
- * Chemical fire retardants will only be used where essential to control fires under extreme conditions. The use of foam will be minimised, particularly during mop up operations.
- * Temporary trails and fire breaks will be avoided, but if required they will be rehabilitated as soon as possible after use.

4.2 USE OF THE NATIONAL PARK AND NATURE RESERVES

Ku-ring-gai Chase National Park and Lion Island, Long Island and Spectacle Island Nature Reserves will be managed to ensure that their use, whether by the general public, special interest groups, Service managers or other authorities, is appropriate and conforms with the management objectives and strategy of this plan.

The major categories of use that may be appropriate within Service areas are:

- * promotion of natural and cultural heritage conservation;
- * environmental education;
- * recreation in a natural setting;
- * scientific research; and
- * management operations by the Service and other authorities.

The extent to which these categories of use are appropriate to Ku-ring-gai Chase National Park and Lion Island, Long Island and Spectacle Island Nature Reserves are indicated in the following sections of the plan.

4.2.1 Promotion, Education and Interpretation

Promoting public awareness of the Service's conservation responsibilities, the values of the area and the recreational opportunities available is a major aspect of management of parks and reserves. It assists in the protection of natural and cultural heritage and increases the understanding, enjoyment and satisfaction of visitors.

Ku-ring-gai Chase National Park is located within the Sydney metropolitan area and has significant and varied natural and cultural values. It is also the second oldest national park in Sydney, the second oldest continuous national park in Australia and the park has a long history of public use. A number of visitor surveys have been undertaken in Ku-ring-gai Chase over the last 15 years. These have found that the main qualities which attract visitors to the national park are the scenery and the quiet and restful atmosphere. Consistent with its original declaration as an area for conservation and passive recreation, and with the results of visitor surveys, Ku-ring-gai Chase National Park will be promoted as a place where people can enjoy passive recreation and peace and quiet amidst spectacular scenery.

All of Lion Island and Spectacle Island and most of Long Island are dedicated as nature reserves. The primary purposes of nature reserves are the conservation of wildlife and natural environments and environmental education (including scientific research) into these resources. Public access to Lion Island Nature Reserve, Long Island Nature Reserve and Spectacle Island Nature Reserve is restricted to approved conservation, education and research purposes. No recreational facilities will be provided on the islands.

An information centre and shop has been established in the Bobbin Inn at Bobbin Head. Information and interpretive signs are also located at the Mount Colah and Terrey Hills park entrances, near the start of the West Head Road, at the West Head

lookout, in the Bobbin Head and Resolute picnic areas, at the Sphinx and at other major visitor destinations within the park.

The Kalkari Visitor Centre is located on Ku-ring-gai Chase Road approximately 1km from Bobbin Head. This area was originally developed as a koala sanctuary and small zoo in the 1950s. It was named Kalkari, an Aboriginal word meaning “to wait”, around 1970 and was redesigned as an area to display animals of the Hawkesbury Sandstone region. The zoo cages were removed, the enclosures made as inconspicuous and large as possible, birds attracted to the area by means of ponds and feed trays, and a visitor centre and interpretive display were constructed.

Today Kalkari is the base for the Chase Alive volunteer program and the visitor centre is staffed by volunteers. In order to open the visitor centre to the park, most of the 1970s display has been removed and new displays are being developed. The intention is not to have a static display but to provide an adaptable space which will be used for displays which change on a regular basis. A new 3-D slide show has recently been developed and installed in the visitor centre.

The grounds of Kalkari are also progressively being upgraded. Areas are being replanted with native species and the tracks and information signs are being upgraded. The fence around the grounds will be retained as it protects animals from predation by feral animals and from the risk of being killed on the road. The animals within the fence currently consist of kangaroos, swamp wallabies and emus, while native birds are attracted by feed trays. Wallabies are still present in the area but kangaroos and emus have not been present for over 100 years. It is proposed that the non-indigenous species will be progressively removed from Kalkari and it will contain only species which historically occur locally and do not require intensive management.

The “Chase Alive” program was established in 1989. Volunteers provide information and lead guided walks, children’s programs and other activities within the park. Approximately 15,000 people attend these activities each year. These activities provide a means by which visitors can learn more about Ku-ring-gai Chase National Park, and promote understanding, enjoyment and appreciation of the national park and of conservation generally.

The Gibberagong Field Studies Centre is a co-operative program run by the Department of Education and Training in association with the National Parks and Wildlife Service. In 1984 the field studies centre moved from Muogamarra Nature Reserve back to Ku-ring-gai Chase National Park where it began in 1971. It now occupies the old staff training centre at Bobbin Head. The centre is a teaching facility with a science laboratory, library and overnight accommodation for 30 students. The centre is staffed by teachers employed by the Department of Education and Training and is used by over 3,000 school students a year, mainly on a day basis. Teaching usually incorporates a bushwalk and activities and lessons associated with the natural and cultural heritage of the park. Camping trips are sometimes undertaken by the Field Studies Centre at The Basin and at Muogamarra Nature Reserve.

Policies and Actions

- * Understanding and appreciation of the natural and cultural features of Ku-ring-gai Chase National Park and Lion Island, Long Island and Spectacle Island Nature Reserves will be promoted.
- * Information will be provided through on-site interpretive and information signs, guided walks and talks, visitor information centres, brochures, newsletters and workshops.
- * The following themes will be emphasised in promoting Ku-ring-gai Chase National Park:
 - its importance as the first park in Australia established primarily for nature conservation;
 - the continuing role of the park in protecting the bushland and waterways of northern Sydney for over 100 years;
 - the significant plant and animal species and communities which are found within the park;
 - the important Aboriginal sites which are contained within the park;
 - the European history of the area and interesting historic places such as Bobbin Head, The Sphinx, The Basin and Barrenjoey Head;
 - the outstanding scenic values, including views of the Sydney bushland and the waterways of the lower Hawkesbury River;
 - the attractive natural landscape which provides opportunities to undertake a range of recreational activities in the bush;
 - the high quality visitor facilities; and
 - the value of the park as a place to see and understand more about national parks and nature conservation within the Sydney metropolitan area.
- * Public access to Lion Island, Long Island and Spectacle Island Nature Reserves will require a permit from the Regional Manager and will be restricted to conservation, education and research purposes.
- * Kalkari will be promoted as a centre for environmental education, interpretation and activities which encourage a greater understanding and appreciation of the park.
- * The grounds of the Kalkari Visitor Centre will be improved with additional signs, plantings and fencing. Only those species known to naturally occur within the Park will be introduced or translocated into the Kalkari grounds.
- * The continued operation of information and education programs and guided tours within the park, such as those undertaken by Chase Alive, the Gibberagong Field Studies Centre and other educational organisations, will be encouraged.

4.2.2 Recreation Opportunities in Ku-ring-gai Chase National Park

(This section of the plan only deals with Ku-ring-gai Chase National Park as no recreational access will be permitted to the nature reserves.)

Ku-ring-gai Chase National Park has always been an extremely popular area for recreation. From 1894 until 1967 the park was managed by trustees who carried out most of the major developments in the park. Apple Tree Bay, Bobbin Head, Illawong Bay and Akuna Bay were developed for recreation by infilling mudflats, mangroves and sand bars between about 1910 and 1940. The facilities at West Head were developed in the early 1960s.

The 1971 plan of management proposed that most of the park be zoned as a "natural area" and that visitor use be concentrated in the few areas capable of accommodating large numbers of people (NPWS 1971, p. 18). Most of these areas were already developed however one major new development area was proposed in the park, near the Terrey Hills entrance. This development, which included a visitor centre, tea rooms and camping area, never eventuated due to problems with the proposed site and changes in visitor use patterns. It is no longer proposed to develop this area.

Today Ku-ring-gai Chase National Park contains a range of recreational facilities, including picnic areas, boat launching ramps, boat moorings, marinas, restaurants, kiosks, scenic roads, camp sites, visitor/information centres, lookouts and walking tracks. Although there is no systematic recording of visitor numbers for the park as a whole, records from vehicle entry stations and from individual sites within the park indicate that approximately 2 million visits are made to the park each year.

A number of visitor surveys have been undertaken in the park over recent years. The most recent survey, of 1181 visitors in 307 cars that entered the park over Easter 1997 (Ramsay, 1997) found that the two most popular locations in the park were Bobbin Head and the West Head lookout, which attracted 34% and 35% respectively of car visitors. The main reasons for visiting the Bobbin Head area were for a picnic (27%) or a barbecue (19%). Sightseeing (31%) and bushwalking (31%) were the main reasons given for visiting the West Head/Lambert Peninsula area. The main qualities which attracted visitors to the park were the scenery and the quiet and restful atmosphere. Almost half of all visitors (48%) went walking in the park.

There was a high percentage of regular visitors, with 43% having visited the park within the 3 months prior to the survey. Most visitors to Bobbin Head (86%) lived within 20 kilometres of the area, with 50% of groups including children under 15 years of age and 30% of groups having people 60 years of age and older. Most visitors to West Head lived more than 20 kilometres from the park, with 8% of visitors being from interstate and 15% from overseas. Twenty-seven percent (27%) of groups visiting the West Head area included children under 15 while 33% of groups included people 60 years of age and older.

A survey was undertaken of 125 boats in the park over the period. This found that the majority of boats came from Pittwater and that they spent most time at Smiths

Creek, America/Refuge Bay and Castle/Yeomans Bay. Most were regular visitors, with 78% having visited the park in the last 3 months. The factors which boaters said attracted them to the national park were firstly the quiet and restful atmosphere, and secondly the scenery.

Due to the important natural values of Ku-ring-gai Chase National Park, the increasing importance of maintaining the remaining bushland within the Sydney metropolitan area and the large number of existing recreational developments within and outside the park, only a small number of additional walking tracks are proposed to be developed for recreation within Ku-ring-gai Chase National Park. Instead visitors will be encouraged to use the existing visitor use areas. Visitors will also be encouraged to minimise their impacts on the environment.

Policies and Actions

- * Recreational use of Ku-ring-gai Chase National Park will be focussed on sites which can sustain such use. Existing visitor use areas will be promoted in preference to constructing new areas for recreation.
- * Preference will be given to recreation activities which do not degrade the natural or cultural values of the park and which maintain the quiet and restful atmosphere desired by most visitors to the park.
- * All visitors will be encouraged to minimise their impact on the park and on other visitors to the park.
- * The impacts of recreational activities on the park and other users will be monitored and activities controlled where necessary so as to minimise conflicts between users, protect visitor safety and welfare, minimise nuisance to neighbours and other visitors, and protect the natural and cultural heritage values of the park.
- * Controls may be placed on people entering sections of the park when overcrowded, during periods of high fire danger, or for fire or other emergency operations.
- * Regular surveys of park visitors will be undertaken to provide an on-going understanding of the activities and perceptions of visitors.
- * No recreational facilities will be provided on the nature reserves.

4.2.2.1 Access and Sightseeing

Access to Ku-ring-gai Chase is by road to Bobbin Head and Apple Tree Bay from either North Turrumurra or Mount Colah, and to Cottage Point, Akuna Bay, Illawong Bay and West Head from Terrey Hills or Church Point. There are walking tracks leading into the park from Mount Kuring-gai, Berowra, Cowan, Mount Colah and Hawkesbury River (Brooklyn) railway stations as well as from neighbouring suburbs. Ferries provide access to a number of beaches along the western side of Pittwater

and to Bobbin Head. The public vehicle and pedestrian access systems to and within Ku-ring-gai Chase National Park are shown on the map (centre pages).

There are currently four entrance stations to Ku-ring-gai Chase at which entry fees are collected. These provide a service to visitors in terms of information and brochures, but also require a fee to be paid before it is seen whether parking and picnic facilities are available. Consideration is currently being given to the installation of pay and display parking meters in some areas.

Ku-ring-gai Chase National Park is officially closed between sunset and sunrise however there has been a relatively high level of after-hours use of some sections of the park. As foreshadowed in the 1971 plan of management, the West Head road was gated in early 1997 so that it could be closed to vehicular traffic at night. The closure of this road has significantly reduced the amount of wildlife killed on the road and the vandalism that occurred in the area. It has also reduced the risk of fires in the area and meant that the road is safer for pedestrians and cyclists in the early mornings and evenings. A number of picnic areas in other sections of the park are also gated at night to provide better protection of these areas.

The narrow and winding nature of many of the roads within the park means that the speed of traffic is a concern. Negotiations will be undertaken with the Roads and Traffic Authority (RTA) to implement traffic calming measures such as lower speed limits and/or speed humps, particularly near Bobbin Head and Kalkari. The section of Coal and Candle Drive from the Cottage Point turnoff to Akuna Bay is particularly winding. Gating of this road at night may reduce vandalism.

All roads within the park are used for sightseeing. There are a large number of places along the roads which provide spectacular views of the park, the waterways, the islands and of the suburbs along the northern beaches. Wide verges where vehicles can pull off the roads are provided in a number of locations however many of the roads are too narrow or winding for pull-overs to be provided. Spectacular views can also be obtained from most walking tracks within the park.

The West Head/Lambert Peninsula area has a large number of walking tracks and viewing areas. An information board has been provided in a small pull-over bay near the start of the West Head Road to orientate visitors and assist them to locate lookouts and walking tracks.

The most popular viewing point in the park is the West Head lookout at the end of West Head Road which can become congested at peak times. To limit the length of stay of visitors, and thus allow the maximum possible use of the lookout, no picnic facilities will be provided at the lookout and signs will be erected directing people to the Resolute picnic area approximately 500m back from the lookout. Also to limit congestion, a bus set-down and pick-up area will be provided near the lookout, but on busy days buses will have to park at the Resolute picnic area rather than at the lookout. A parking space for the disabled will also be provided. The sandstone paths and walls at the West Head lookout have recently been repaired and improved car parking provided. Improved information for visitors will also be provided at West Head. The character of sandstone paths and low sandstone walls in a bush setting will be retained.

In addition to the West Head Lookout, a pull-over area has been provided on West Head Road between the Challenger Trail and Flint and Steel Track at a location which provides views in a westerly direction of the park and the Hawkesbury River. It will be kept low key with no developments other than signage and low fencing if required. Only limited parking will be provided along the road edge.

Policies and Actions

- * The existing road access system (see map, centre pages) will be retained.
- * Access to the park by public transport will be promoted.
- * The Service will liaise with the Roads and Traffic Authority and local councils regarding the possible installation of traffic calming devices on both Bobbin Head Road and/or Ku-ring-gai Chase Road.
- * The Service will liaise with relevant authorities with a view to where possible having the roads within the park gated at night and in the long term having a one-way road from Akuna Bay to the Cottage Point turn-off.
- * A bus set-down area and disabled parking bay will be provided near the West Head lookout.
- * Directional and interpretive signs at the West Head lookout will be improved.
- * The existing sandstone character of the West Head lookout will be retained.
- * An information bay will be provided approximately 1km along the West Head road from its intersection with Coal and Candle Drive, and information signs erected at other strategic locations.
- * Other means of collecting park use fees will be investigated and implemented if feasible.

4.2.2.2 Picnicking

The largest and most popular picnic area in Ku-ring-gai Chase National Park is at Bobbin Head. Parts of this picnic area were redeveloped in 1994 consistent with a conservation plan so as to maintain the historic character of the area (see section 4.1.4). The picnic facilities located in the old sandstone shelter at Bobbin Head (The Station) and the pavilion in Orchard Park can be booked by groups. Minor improvements, including a pedestrian crossing and gas barbecues, are proposed for this area however the historic character of the area will be maintained.

Other major picnic areas in Ku-ring-gai Chase National Park are the Resolute picnic area, The Basin, Illawong Bay and Apple Tree Bay. Barbecues, picnic shelters and toilets are provided at these areas. Gas barbecues have recently been provided at these picnic areas and an additional picnic shelter has been provided at The Basin.

Smaller picnic areas are located at West Head Lookout, The Duckholes, Salvation Creek and on the roadside opposite the Regional Office on Ku-ring-gai Chase Road. These areas have minimal facilities. A picnic area was previously developed across the road from Kalkari but the dangers of accessing this area meant it was little used and it is now overgrown. A small picnic area will be provided adjoining Kalkari and the facilities removed from the picnic area across the road. Picnicking may be undertaken throughout the park.

Restaurants are located within the park at Bobbin Head and Akuna Bay and kiosks are located at Bobbin Head, Apple Tree Bay and Akuna Bay. Food outlets are also provided at a number of locations just outside the park boundaries, including at Cottage Point. There have been a number of proposals to develop kiosks or restaurants at other locations within the park, including at the Resolute picnic area and Barrenjoey Head, however such developments are neither necessary nor appropriate and no additional locations will be developed as food outlets.

Garbage was a major problem throughout the park and emptying of garbage bins a major cost on the park. Recycling stations have been established at Bobbin Head, Apple Tree Bay and The Basin.

Another major problem within the park is the collection of firewood which destroys the surrounding bush and reduces habitat for native animals. Provision of wood for the barbecues has not stopped the collection of wood from the bush. There is also the risk of fire escaping from wood barbecues, and wood fires cannot be used when fire bans are in place. These impacts are most noticeable in the more popular picnic areas of the park.

Policies and Actions

- * The Bobbin Head, Apple Tree Bay, Resolute, Illawong Bay and The Basin picnic areas will be maintained as developed picnic areas. Gas barbecues, toilets, picnic tables and shelter sheds will be provided at these picnic areas.
- * The West Head Lookout, Duckhole picnic area, Salvation Creek picnic area and the picnic area opposite the Regional Office will be maintained as low key picnic areas. A small number of car parking spaces, picnic tables, interpretive signage, wood or gas fired barbeques and toilets may be provided at these locations, and at Barrenjoey Head, if environmentally acceptable.
- * The facilities will be removed from the old picnic area opposite Kalkari and a low key picnic area with a small number of picnic tables provided adjoining the Kalkari carpark.
- * Sections of the dead-end roads along the foreshores of Bobbin Head will be replaced with grass to increase safety and improve views from the picnic area. The provision of an equivalent number of car spaces in other areas of the picnic grounds will be investigated and implemented if feasible.

- * The play equipment at Bobbin Head will be progressively replaced with play equipment that is educational and more compatible with its national park setting.
- * The provision of additional picnic shelters at Appletree Bay will be investigated and implemented if feasible.
- * The road system at Apple Tree Bay will be redesigned to provide more picnic areas close to the water and to remove dead-end roads.
- * The Station and Pavilion at Bobbin Head and other large shelters within the park may be made available for group bookings.
- * The use of portable gas and spirit stoves will be permitted in picnic and camping areas only. The use of heatbead and charcoal fueled stoves and barbeques will not be permitted in the park or reserves. All other cooking fires must be in authorised and signposted fireplaces unless otherwise approved by the Regional Manager.
- * Rubbish bins and recycling stations will be provided at Bobbin Head, Apple Tree Bay and The Basin. Visitors will be encouraged to remove or recycle their rubbish from other sections of the park.

4.2.2.3 Walking

There are currently over 50 kilometres of walking tracks within Ku-ring-gai Chase National Park as well as the park management trail system which is available for walking. Walking tracks provide access to many outstanding features within the park and encourage a close appreciation of the park's plants and animals.

Walking is a popular recreational activity in Ku-ring-gai Chase National Park. The 1997 visitor survey found that 40% of visitors to Bobbin Head and 54% of visitors to West Head undertook a walk during their visit. The most popular walks in the West Head/Lambert Peninsula area were the Red Hand Walk and the Resolute, Basin, Flint and Steel and America Bay Tracks. The most popular walks in the Bobbin Head area were the boardwalk section of the Gibberagong Track, the track from Apple Tree Bay to Waratah Bay, the Bobbin Head Track and the Sphinx Track.

In the past there has been a policy of maintaining all walking tracks within the park to the same standard, however the time and cost of implementing such a policy meant that many tracks were not maintained. In addition not all walks do or should provide the same type of experience. To provide a range of bush walking experiences, some tracks will be maintained and promoted as high standard walks suitable for all levels of walkers, while others will be maintained as lower standard constructed tracks, and still others as rough bush tracks for those wanting to experience a sense of adventure. Generally the higher standard tracks will be those close to picnic areas or major parking areas. For management purposes some tracks will be maintained at a standard suitable for emergency vehicular access (see section 4.2.4), while some tracks will be closed.

A section of the Great North Walk between Sydney and Newcastle passes through the park. This track needs considerable work, including re-routing in some places. Other tracks may be re-routed in places where necessary to minimise environmental damage and improve the walking experience, and the linking of tracks to provide a loop walk in a number of places or access to public transport will be investigated.

Policies and Actions

- * A network of walking tracks will continue to be maintained in the park to cater for a range of abilities and desired experiences, including tracks suitable for wheelchairs where appropriate.
- * Tracks or parts of tracks will be classified and maintained as either a walk, constructed track or route in accordance with the Service's walking track policy (NPWS, 1988a).
- * The following tracks in the Bobbin Head area will be upgraded where necessary and maintained to a high standard:
 - Mangrove Board Walk;
 - Gibberagong Track;
 - Bobbin Head Track;
 - Kalkari Walk;
 - Apple Tree Bay to Waratah Bay Track;
 - Mt Ku-ring-gai Track;
 - Birrawanna Track;
 - Sphinx Track; and
 - Warrimoo Track.
- * The following tracks on the Lambert Peninsula, will be upgraded where necessary and maintained to a high standard for bushwalking:
 - Resolute Track;
 - Flint and Steel Track;
 - America Bay Track;
 - Red Hand Walk; and
 - Echidna Track.
- * Other tracks which are part of the walking tracks system will be maintained as less developed bush tracks.
- * Tracks not part of the walking track or management trail system will be closed and revegetated.
- * Tracks will be re-routed where necessary to provide a better walk and minimise environmental damage.
- * The section of the Great North Walk from Cowan to Brooklyn will be upgraded and re-routed where necessary in association with the Department of Land and Water Conservation.

- * The walking track to the top of Barrenjoey Head will be re-routed where necessary, upgraded and signposted. It will be promoted as part of a loop walk incorporating the old sandstone road to the lighthouse.
- * Tracks to the top and bottom of the climbing cliffs on Barrenjoey Head will be formalised.
- * Minimum impact bushwalking practices will be promoted, including removal of own rubbish and keeping to designated tracks.
- * The possibility of providing a walking track from the Bairne Trail to Towlers Bay Trail along the foreshores of Pittwater will be investigated. The linking of the Mackerel Trail to the road behind Great Mackerel Beach will also be investigated. No walkway will be provided across The Basin.
- * The feasibility of constructing a walking track from Kalkari to Mt Colah, utilising existing tracks and a pipeline route will be investigated.
- * A small loop walking track at the end of the mangrove boardwalk at Bobbin Head will be investigated and constructed if feasible.
- * Information and directional signs will be installed on the most heavily used tracks. Small directional markers may be provided on other tracks where necessary. Signs will be placed at the end of tracks where necessary to provide information and make it obvious that it is the end of the track.

4.2.2.4 Camping

Camping in the park is presently permitted only at The Basin. The management of camping at The Basin was reviewed during 1986 to overcome deficiencies in the booking system and problems resulting from people occupying sites for periods of more than two weeks during summer holiday periods thus denying others the opportunity to camp. Recently parts of The Basin have been levelled to prevent water accumulating in low lying areas. Garbage facilities have been centralised in a limited number of locations, recycling bins provided and gas barbecues installed to reduce the need for trucks to deliver firewood to The Basin. A fire pit will be retained for special organised events. In addition to the shelter shed proposed in section 4.2.2.2, increased planting of trees will be undertaken to provide shade for campers and picnickers.

Beechwood Cottage at The Basin was originally built as a holiday cottage. A number of future uses consistent with the conservation plan for the cottage are being investigated. It is proposed that if it is not required for management purposes, all or part of the building be available for booking by groups for meetings or other activities, or possibly for booking by the public for accommodation on either a nightly or weekly basis.

Brooklyn Dam has been used for camping for a number of years. Although not officially a camping area, it is shown on the maps for the Great North Walk as a

camping site. The area around the dam is degraded and the dam contains unseen hazards.

Policies and Actions

- * Camping will be permitted only at The Basin and at Brooklyn Dam.
- * Camping at The Basin will continue to be limited to a maximum of 2 weeks at any one time. Subject to demand for sites, the maximum length of stay may be reduced.
- * Additional shade trees will be planted at The Basin and recycling stations established.
- * The use of Beechwood Cottage for holiday accommodation and group activities will be investigated.
- * Camping at Brooklyn Dam will be limited to bush camping for one night at a time, and may be prohibited if impacts are found to be too great. No garbage bins will be provided. People will be required to remove their own rubbish and practice minimum impact camping. A toilet may be provided.
- * Signs will be erected at The Basin and Brooklyn Dam providing information about the camping area, the dam and conditions of use.
- * Camping will continue to be permitted at Brooklyn Dam and a precinct plan will be prepared for the Brooklyn Dam area which will include a safety audit, and interpretive and recreational management strategies.

4.2.2.5 Horse Riding

Horse riding has been legitimately undertaken in parts of Ku-ring-gai Chase National Park for many years. Since the 1960's horse riding has only been permitted on specified trails within the park.

In the 1960's and 1980's, studies were undertaken of the impacts of horse riding on the park and controls introduced to manage horse riding activities. The last review, which was undertaken in 1986, resulted in the introduction of a horse riding management system for Ku-ring-gai Chase and Garigal National Parks under which horse riders in these parks were required to have an annual riding permit or a day-use riding ticket. The revised system also resulted in the closure of some trails to horse riding and the rehabilitation of unauthorised bridle paths in certain sensitive areas such as the McCarrs Creek catchment and the Ryland Trail area at Terrey Hills, but still allowed horse riding on 21 kilometres of trails in Ku-ring-gai Chase and Garigal National Parks.

Horse riders have continued to lobby for additional trails so that they can ride in the bush, undertake loop rides, ride to scenic locations and ride from home to major horse riding centres such as the St Ives Showground, without riding on or near major

roads. Not all of these requests can be met within the national park due to the steepness of much of the park and the need for the Service to meet its statutory obligations, such as protection of Aboriginal sites and threatened plants and animals, protection of catchments and the need to cater for a variety of activities.

Horse riding may have unacceptable impacts on some areas of the park. These include areas with deep sandy soils, on steep slopes, in hanging swamps and within endangered ecological communities.

Most horses which are ridden within the park are located in the Ingleside, Duffys Forest and Terrey Hills areas. There are a number of authorised horse trails in this area, both on and off park. Some riders continue to use trails not authorised for horse riding. A number of additional tracks have been formed by horse riders including near Booralie Road; and off the end of the Long and Wilkins Trails within the park. Some riders do not comply with the permit requirement and the fees raised from the horse riding permit system have not been sufficient to repair damage to trails or maintain fences across unauthorised trails. The major structural damage to the trails generally occurs when the soil is wet and this occurs either during or immediately after rain periods.

In the early 1990's the North Shore Horse and Pony Association proposed that a new horse trail be constructed linking Wirreanda Road at Ingleside and the Duckhole Trail. This trail was not approved for construction at the time due to the high environmental impacts of the proposal. However the proposed widening of Mona Vale Road by the Roads and Traffic Authority may present an alternative to link the Ingleside Valley with the authorised trails at Terrey Hills.

Part of the Perimeter Trail, the Long Trail and parts of the Wilkins Loop Track (also known as the South Wilkins and Quarry Tracks) pass through areas of the Duffys Forest endangered ecological community. The Perimeter and the Long Trails have been hardened to cope with vehicles and providing horses keep to the trails, the impact of horse riding on the surrounding vegetation is minimal. However the impacts of horse riding and other uses on the tracks that pass through the Duffy's Forest endangered ecological community such as the southern section of the Wilkins Loop Track (ie the Quarry Trail) are of more concern due to fragmentation of the community, trampling, erosion of soils and sedimentation in creeks.

Policies and Actions

- * Horse riding will continue to be permitted within Ku-ring-gai Chase National Park, on the following trails only:
 - Perimeter Trail;
 - Terrey Hills Trail;
 - Neverfail Gully Trail;
 - Long Trail;
 - Wilkins Trail;
 - the northern loop (ie the South Wilkins Track) only of the Wilkins Loop Track;
 - the trail from Terrey Hills to St Ives along Mona Vale Road; and
 - a trail through a small section of park adjoining Booralie Road.

- * The Regional Manager may also authorise limited horse riding use of the Chiltern North Trail for special purposes only (eg disadvantaged groups);
- * Signs will be erected at the start of all authorised horse trails indicating that they are authorised for horse riding and informing other users of the trail.
- * Minimum impact horse riding practices, including no riding during or immediately after wet weather, will be promoted in collaboration with horse riding groups.
- * Group rides involving more than 10 horses will require prior approval of the Regional Manager. Competition rides and endurance events will not be permitted within the park.
- * Trails may be temporarily or permanently closed to horse riding if use is found to be creating excessive damage to the trail or the surrounding area; or during and immediately after extended periods of wet weather. Closures will be implemented in close consultation with horse riding groups.
- * The impacts of horse riding on park values will be monitored. Meetings will continue to be held with local riding groups to determine methods of reducing the impacts of horse riding in the park and of educating riders about the importance of park heritage values.
- * The southern section of the Wilkins Loop Track (otherwise known as the Quarry Track) will be closed and rehabilitated in consultation with horse riding groups and Department of Land and Water Conservation. The installation of interpretive signs and hitching rails will be considered in this area to encourage rider appreciation and understanding of the importance of the Duffy's Forest endangered ecological community and to minimise soil erosion.
- * The Perimeter Trail, particularly the creek crossing near the Terrey Hills Golf Club, will be improved in order to permit safer horse riding access and to improve the park environment. This will be done in consultation with the Golf Club, horse riding groups and the Rural Fire Service and subject if necessary to the approval of the Department of Land and Water Conservation.
- * The Service will continue to work with horse riding groups to identify an appropriate option for linking authorised horse trails in the Ingleside Valley with authorised horse trails at Terrey Hills.

4.2.2.6 Cycling

Cycling is an increasingly popular activity within Ku-ring-gai Chase National Park, especially with the expanding use of mountain bikes. Public roads and management trails provide opportunities for a variety of rides by road cyclists and mountain bikers.

Many of the sealed roads within the park are narrow, winding and slippery in wet conditions. Consequently care needs to be taken by both cyclists and motorists using the roads. Conflicts have occurred between large groups of cyclists, motorists and other park users. To minimise these conflicts, large organised events including cycling events are generally not permitted on roads within the park on Sundays or public holidays.

Care needs to be taken by cyclists using the management trails within the park to avoid conflict with other park visitors such as walkers and horses. Cyclists also need to be aware that cycling can erode trails, especially those on steep slopes, and change drainage patterns. Consistent with Service policy, cycling is not permitted on walking tracks or off tracks due to the steepness of the terrain, potential to damage vegetation and the potential conflict with walkers.

Policies and Actions

- * Cycling will only be permitted on the public road system and on management trails within the park (see map, centre pages). Cycling will not be permitted on walking tracks.
- * Some management trails may be temporarily or permanently closed to cycling if use is found to be creating excessive damage to the trail or the surrounding area, or if the trail is dangerous to cyclists or other users.
- * Signs will be erected to indicate where tracks abruptly change from management trail to walking track, and trails where special care needs to be taken in regard to horses.
- * Group rides by more than 10 people and organised events within the park will require the prior approval of the Regional Manager.

4.2.2.7 Boating

The waterways of Ku-ring-gai Chase National Park comprise most of Cowan Water, including Coal and Candle Creek, Smiths Creek and The Basin Lagoon. The waterways in and adjoining Ku-ring-gai Chase National Park are to many people, the park's greatest asset, although many boat users are unaware when they are in the national park. The waterways are extremely popular and used on a regular basis by boats kept at the marinas and moorings within the park; moored in Pittwater, Brisbane Water or near Brooklyn; or launched from the boat ramps at Apple Tree Bay, Akuna Bay, in Pittwater or from Parsley Bay near Brooklyn.

Ferries also provide access to a number of wharves in and adjoining the park. Access to the wharf at The Basin is however becoming difficult due to accretion of sand and dredging may need to be undertaken to maintain a suitable depth for continued ferry access to the wharf.

There are two marinas within the park. The marina at Akuna Bay has wet berths, hire boats and a dry stack area for small boats. Shops and a restaurant are also

located in the complex. The marina at Bobbin Head has hire boats, wet berths, moorings, a slipway and a kiosk. The Ku-ring-gai Motor Yacht Club at Cottage Point is partly outside the park but has a jetty, slipway and moorings within the park. The public has access to the water through the Ku-ring-gai Motor Yacht Club's property (refer section 4.2.2.9 for further information on commercial operations in the park).

In addition to the moorings managed by the marina at Bobbin Head, there are also a number of other mooring licences within the park which are issued by the Service to individuals (ie Class A) or to corporations (ie Class B) such as the Appletree Bay Boat Owners Association Inc.

There are also 48 public moorings within the park which are maintained by the Service. These public moorings are provided to enhance public safety and the enjoyment of boat users, and to reduce the environmental impact of tying of boats to trees in the park. Under the *National Parks and Wildlife (Land Management) Regulation 1995* use of the public moorings is restricted to one boat per mooring with a maximum stay of 24 hours. This is to allow equitable use of the moorings and to stop the moorings being moved by boats, however the regulations are frequently ignored and result in great deal of time and effort by staff enforcing the regulations and antagonism by boat users. Boat owners using the public moorings and those hiring houseboats, cruisers and sailboats contribute little towards the provision or maintenance of these public moorings. If the public moorings are to continue to be provided by the Service, greater co-operation is needed from users and some return should be provided to the Service to assist in maintenance of the moorings, either by commercial hire companies or from private users through a levy on their registration fees.

The increased popularity of boating on Cowan Creek and Pittwater has led to a decrease in the long-term quality of these waterways. Proposals to institute a policy of no discharge into the waters of the park (see section 4.1.2) and controls on marinas, slipways and associated facilities are intended to improve water quality. Limits on the number of boats moored in the park will also assist in improving water quality. High boat speeds in the bays and creeks of the park are also of concern to both boat users and park management as the wash rocks boats and damages the banks, and excessive noise disturbs boaters and visitors who have walked to the shore.

There are approximately 90 kilometres of shoreline in the park but only about 1.5 kilometres is physically capable of being used for picnicking and other activities and these areas are consequently placed under considerable pressure. Many of the beaches and sand flats along the foreshore are accessible only by boat. The major impacts which occur on these areas include the loss of stabilising vegetation caused by picnickers and illegal campers, littering and impacts from pets illegally let ashore from boats. In addition, the escape of fires from the beaches and other foreshore areas has been the cause of over 70% of bushfires in the park. The foreshores of the park will remain available for picnicking however no facilities will be provided and no camping or wood fires will be permitted.

Policies and Actions

- * The shoreline of the park will be maintained in as natural a state as possible. Visitor facilities within the park and reserves will only be provided along the foreshores at Apple Tree Bay, Akuna Bay, Illawong Bay, Bobbin Head, Cottage Point and The Basin.
- * Signs containing information about the waterways of the park and other facilities for boat users will be provided at Apple Tree Bay, Akuna Bay, Bobbin Head, Cottage Point, The Basin and at the park entrance on Cowan Water.
- * The Service will continue to work with the Waterways Authority on all issues affecting boating in the park and will liaise with the Authority with a view to improving the education and information services to the boating community using waters in and around the park, including information on proper disposal of waste.
- * Speed limits and no wash zones within the waterways of the park will be reviewed in consultation with the Waterways Authority. In particular a 4 knot limit in Smiths Creek, Jerusalem Bay, and an extension to the current 4 knot speed limit at Apple Tree Bay will be investigated with the Authority.
- * The prohibition of power boats on Cowan Creek upstream of the Bobbin Head marina, on Apple Tree Creek upstream of the footbridge and on Cockle Creek upstream of the road bridge at Bobbin Head, so as to provide quiet natural waterways within the park, will be investigated in consultation with the Waterways Authority.
- * The existing 48 public moorings in the park will be retained, and a small number of additional public moorings may be provided at Apple Tree Bay, Cottage Point and Bobbin Head.
- * The Service's goal over the life of this plan, will be to reduce the total number of moorings within the park. While the total combined number of moorings and marina berths will not be increased beyond current levels, the ratio between the two may change.
- * Mooring licenses will continue to be issued within the park at Apple Tree Bay, Bobbin Head and Cottage Point in accordance with the Regulation and this plan and will be subject to the following:
 - Mooring licences will be non-transferable, but if surrendered or terminated may be reallocated by the Service;
 - All mooring licensees and approved hirers or consentees, must be the registered owner of any vessel at the licenced mooring. No other boats are permitted to be on these moorings without the approval in writing of the NPWS Regional Manager;
 - All licensed moorings will be located within approved areas at Cottage Point (east and west), Apple Tree Bay and Bobbin Head only. These areas have been previously defined in conjunction with the Waterways

- Authority and the total area will not be extended during the term of this plan; and
- All licensees are to comply with any conditions which may be issued by the Service from time to time in relation to inspections and reports, licence fees, boat type and length, waste water and sewage treatment systems, insurance, indemnities and mooring condition, markings, placement and maintenance, multiple ownership etc.
- * The Service will remove all non-complying moorings from the park and may terminate the appropriate licence if appropriate;
 - * Signs will be provided behind the beaches within the park indicating that no camping, pets or wood fires are permitted in that area. No barbeque facilities will be provided at beaches however portable gas or spirit stoves may be used.

4.2.2.8 Other Recreational Activities

The waters adjoining Ku-ring-gai Chase National Park and Lion Island, Long Island and Spectacle Island Nature Reserves can contain sharks. A number of swimming enclosures were provided in the past but, due to damage caused by flooding and boats, only the enclosure at The Basin remains. The Basin swimming area is very popular but may need dredging from time to time to remove sand that fills up the swimming area.

Orienteering used to occur regularly in the park but increasing visitor use pressures and problems with orienteers creating new tracks which were then followed by other people, led to controls on the number of orienteering competitors and restrictions on off-track running being introduced in 1991. These controls have meant that the park is no longer suitable for orienteering or rogaining however practise runs or other events using existing tracks may be permitted.

Fishing from both the foreshores and from boats is a popular activity within the park. The management of fish and fishing within the State is the responsibility of NSW Fisheries. Recreational fishing is permitted in the park in accordance with the regulations of NSW Fisheries. Net fishing from either the banks or the shore has been prohibited since the park's reservation in 1894. People fishing in some parts of the park, particularly at Illawong Bay and around Barrenjoey Head and Lion Island, have caused a number of problems including lighting of fires, littering, leaving of fishing line which entangles wildlife, and damage to park facilities. The foreshores around the base of Barrenjoey Head are declared an Intertidal Protected Area under the *Fisheries Management Act 1994*. Collecting of crustaceans and marine animals off the rocks in this area is prohibited.

Climbing and abseiling activities are becoming increasingly popular in and around the Sydney metropolitan area. The most used sites in Ku-ring-gai Chase National Park at present are on Barrenjoey Head and near Kalkari. Impacts from these activities include damage to rare plants, damage to rock faces by bolts and frequent

use of the one site, the creation of a myriad of tracks to the top and bottom of cliffs, and disturbance of birds nesting on the cliffs.

The *National Parks and Wildlife (Land Management) Regulation 1995* prohibits persons from undertaking adventure activities in the park without the consent of the Service. The Regulation can be applied to exclude activities which are inappropriate in the park or at particular locations.

Policies and Actions

- * Persons who wish to undertake any activities in the national park which may involve risking the safety of the person or the safety of other persons will require prior written approval from the Regional Manager under the *National Parks and Wildlife (Land Management) Regulation*.
- * Rock climbing and abseiling will be permitted on Barrenjoey Head provided that:
 - participants minimise environmental impacts to the cliffs and surrounding vegetation;
 - prior approval has been given by the Regional Manager for groups of 10 or more, or for commercial rock climbing and abseiling activities;
 - the safety of participants continues to be the responsibility of participants and their companions; and
 - no new or replacement bolts are established without written approval from the Regional Manager (approval will be on the basis that the Service accepts no responsibility for the safety of the bolt).
- * Rock climbing and abseiling activities involving ropes and mountaineering equipment will not be permitted elsewhere in the park without the prior written approval of the Regional Manager;
- * Bolts which are placed in contravention of this plan, are no longer required or which may lead to unacceptable environmental or safety impacts will be removed.
- * Subject to environmental assessment, sand may be dredged if necessary from the swimming area at The Basin.
- * Fishing, but not netting, will be permitted in accordance with the regulations of NSW Fisheries. The Service will continue to liaise with NSW Fisheries to ensure that fishing has no unacceptable impacts on the park or marine mammals.
- * Orienteering and rogaining events involving 10 or more persons will not be permitted in the park without the prior written approval of the Regional Manager. Off-trail events may be approved subject to favourable environmental impact assessment.

- * Activities which are causing unacceptable impacts to the park, specific locations or to other visitors may be regulated under *the National Parks and Wildlife Service (Land Management) Regulation*.
- * In managing adventure activities, consideration will be given to:
 - the minimisation of environmental impacts;
 - the minimisation of visitor conflicts;
 - promotion of safety; and
 - the protection of other park visitors.

4.2.2.9 Commercial and Organised Activities

Commercial recreation and guided tours form a small but growing component of public use of Ku-ring-gai Chase National Park. Commercial and organised activities currently undertaken in the park include tours by bus, car and boat, guided walks, wildlife and wildflower viewing, boat hire, horse riding, fishing trips, educational tours, commercial filming, photographic instruction and viewing of Aboriginal sites. There are a number of commercial operations in the park which occupy a building or buildings. These are the marina complexes at Bobbin Head, Akuna Bay and Cottage Point, the Bobbin Inn at Bobbin Head, the kiosk at Apple Tree Bay, and a cottage at Towlers Bay which is rented by the Service for holiday accommodation.

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 aspects 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 high demand for recreational use of the park. Commercial and organised activities can contribute to an unacceptable level of impact at certain sites and has 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 to have a lease, licence or consent. Leases, licenses and consents provide the mechanism for ensuring that activities, levels of use and behaviour are appropriate for the park and specific locations and compatible with general recreational use. Leases and licenses 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, are providing a valuable service to park visitors and information which improves public understanding and appreciation of the park, and are not having an unacceptable impact on the park or other visitors.

The Bobbin Inn is proposed to be run under lease or contract arrangement and the kiosk at Apple Tree Bay is currently operating under a licence. The marina at Bobbin Head has recently been re-leased until 2019. The lease requires the lessee to upgrade the marina to provide a better facility for visitors and to reduce pollution. The marina at Akuna Bay is subject to a start-up lease until the year 2011. The lease for the marina at Cottage Point is also being negotiated at present.

Policies and Actions

- * All commercial activities conducted within the park, including on the park's waterways, but excluding those commercial fishing activities licensed under the *Fisheries Management Act 1994* which do not use land or facilities within the park, will be required to have a lease or licence from the Service.
- * Leases, licences and consents for commercial activities 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 recreation opportunities.
- * Prior approval from the Regional Manager will be required for organised activities by schools, community and active recreational groups of over 20 people unless otherwise prescribed within this plan. Limits may be placed on group sizes, locations and frequency of use to minimise environmental impacts and conflicts with other park users.
- * Preference will be given to activities which increase knowledge and appreciation of the natural and/or cultural values of the park.
- * Recreation and other activities which pose a danger to other users, create a significant noise or other nuisance, or have a major impact on the natural or cultural heritage of the park will not be permitted.
- * Organised and commercial activities will not be granted any rights of access which are exclusive of the public or which exceed normal public rights of use or access.
- * Where there are competing commercial demands or conflicts between general recreational use of the park and commercial/organised activities, commercial/organised activities will not be permitted to exceed a small proportion of the total use of any setting or location.
- * Commercial operators whose activities may encroach on or utilise any Aboriginal site or place, must consult with local Aboriginal community groups.
- * Some commercial or organised activities which might normally be regarded as appropriate in a national park setting but which have a high impact will be excluded from the park where there are alternative venues available outside the park.

- * All commercial operators and activities will be monitored with respect to impacts, safety requirements and compliance with licence conditions.
- * The Service will encourage the marinas in the park to install recycling and pump-out facilities for boats.
- * Some facilities at marinas, such as slipways, may be closed if suitable means of preventing pollutants entering the waterways cannot be provided.
- * The marina at Bobbin Head will be upgraded under the new lease to provide a better facility for park visitors.
- * The area currently used for storage of trailable boats at Akuna Bay will be returned to public car parking.
- * No additional commercial moorings beyond those permitted by the current leases will be permitted in or near Akuna Bay or Bobbin Head.
- * Opportunities for the significant reduction of the impacts of the marinas in the park following the expiration or termination of their current leases will be investigated.

4.2.3 Research

Research into the natural and cultural resources of Ku-ring-gai Chase National Park and Lion Island, Long Island and Spectacle Island Nature Reserves, their management requirements, the activities and perceptions of park users, and the impacts of park users is essential to the development of appropriate management practices. Important research topics have been included in other sections of this plan. In particular, additional information is required to improve understanding of the management requirements for threatened plant and animal communities.

The Service's staff and financial resources must be directed towards the research areas of greatest need. Research by other organisations and students may provide valuable information for understanding and managing the park's resources as well as assist management by trialing new techniques. Research studies which have previously been undertaken in the national park and nature reserves have included surveys of native animals, visitor use surveys, research into the impacts of different activities, and research into the management requirements of specific species.

Some important research topics have already been mentioned in earlier sections of this plan. However there are many other issues facing management that present further opportunities for appropriate research by outside organisations. A prospectus will be prepared to encourage involvement of other organisations in priority research areas, such as ongoing investigation of user needs, continued research into long term solutions to the parks weed and drainage problems, and research into the management of the areas threatened species and uncommon plant communities.

Policies and Actions

- * Research which assists in improving the management of Ku-ring-gai Chase National Park and Lion Island, Long Island and Spectacle Island Nature Reserves will be encouraged.
- * Research will be subject to Service policies concerning the granting of permits, conduct of research and the communication of results.
- * Research structures and markers will be placed in locations which will minimise their visual impact and be removed upon completion of the project.
- * Access by researchers to areas or tracks not normally accessible by the public will only be permitted if the value of the research justifies such access.
- * A prospectus will be prepared as a guide to preferred research projects in flora and fauna 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 effects of different fire regimes on native plants and 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.

4.2.4 Management Operations

In addition to the public roads throughout Ku-ring-gai Chase National Park there are approximately 100 km of management trails within the park (there are no management trails on Lion Island, Long Island or Spectacle Island Nature Reserves). The primary purpose of the management trails is fire control. The trails are used to provide access into fires or as boundaries for fire suppression. The trails also provide access for other essential management operations such as weed control, feral animal control, park maintenance and search and rescue activities. A number of management trails are however no longer required to be maintained as vehicle trails and will be reduced to walking track width.

There are a number of power lines, water pipelines and telephone lines within the national park which service the public (including lease operations) and management facilities within the park. Four public telephones are also maintained for the public, one at the Resolute picnic area near West Head, one at Bobbin Head and two at The Basin. A helicopter pad is located within the Mt Colah works depot and near the Resolute picnic area.

There are a number of houses within the park. Most are close to major visitor use areas, or to management facilities such as the works depot, and are used as staff residences or offices. The housing of staff within the park is particularly useful for quick response to emergencies and other after-hours problems.

A number of state and regional authorities currently occupy or use land reserved as Ku-ring-gai Chase National Park for public utilities or access to public utilities. Public utilities include three high tension power lines, a water main which generally follows the railway, and services to Cottage Point. There are also access trails to service these utilities and to service the Sydney-Newcastle Expressway, Pacific Highway and the main northern railway line. A radio tower to assist surf rescue operations is located on Barrenjoey Head.

There are also a number of public roads which lie within the external boundaries of Ku-ring-gai Chase National Park. These are the Sydney-Newcastle expressway (M3), Coal and Candle Drive (Liberator General San Martin Drive) (MR525), McCarrs Creek Road (MR174), Bobbin Head and Ku-ring-gai Chase Roads (MR366), West Head Road and Cottage Point Road. These roads are managed by the Roads and Traffic Authority.

There are a number of acts or agreements which cover the facilities managed by other authorities within the park. The 1971 plan of management noted that power lines, telephone lines, highways, pipelines and similar utilities are not compatible with the natural area zoning of most of the park and stated that no further high tension power lines will be allowed to cross the park, other than those required to serve park facilities (NPWS 1971, p19). Further it is a long term aim of the Service to reduce, and if possible eliminate, the number of non-park power lines and other utilities, including trails used for their maintenance, within the park. To this end such occupancies will be kept under regular review and where warranted the facility and associated roads will be relocated off the reserves and/or closed and the site rehabilitated.

There are also a number of structures in the park, including wharves, pontoons, boat sheds, water pipes and residences, which are occupied or used by individuals or families not directly connected with the management of the park. Most of these encroachments are located in the Cottage Point area although some do occur elsewhere. A small number of structures at Cottage Point were permitted by agreement with the Trust prior to 1967. Some encroachments are held under a permissive occupancy or short-term licence, while others have no form of legal tenure.

As identified in the 1971 plan, "this type of use of the park by private individuals can no longer be permitted" and "as soon as possible the buildings will be vacated and removed" (NPWS 1971, p.28). The 1971 plan also noted that structures below high water mark at Cottage Point could remain "while they present no management problems". Unfortunately, rather than buildings being removed, additional private buildings and structures have been built on the park. This was not only in contravention of the plan but the increased number of structures established since 1971 means that these structures present both a management problem for the park and for users of the park's waterways and foreshores.

Policies and Actions

- * The management trail system and existing park management facilities will be maintained for essential management purposes.
- * Vehicular use of management trails will be restricted to routine park management activities conducted by the Service unless otherwise approved by the Regional Manager. Private vehicular use of management trails will not be permitted.
- * The following management trails are no longer required for fire or other management operations and will be closed, stabilised and revegetated: Portuguese, Smiths Creek East, Ryland (part only near Mona Vale Road) and Nerang Trails and a number of small unnamed tracks radiating from the major trails.
- * The following management trails will be maintained as walking tracks or light fire tanker trails: Wallaroo North and South, Salvation North, Topham, Soldiers Point, Cowan and North Mackerel Trails (pending the development of an alternative walking track to provide access between the Mackerel Beach ferry wharf and West Head).
- * All management trails and facilities will be kept under review in terms of their function, maintenance requirements and impact. Trails and other facilities which are no longer essential or whose impact exceed their management value will be closed and/or removed and the site rehabilitated.
- * The Service will work with local government in providing appropriate public wharves within and adjacent to the park.
- * Where a non-park facility, such as a power line or sewerage line, is identified as not being currently covered by a formal agreement with either the Minister or the Director-General, the need for the facility will be reviewed and if the facility is considered essential, action will be taken to lease or licence the works, facilities or structures as soon as possible to ensure that they are maintained to Service specifications and in accordance with the Department of Land and Water Conservation trail maintenance and construction guidelines.
- * Environmental assessments will be required for the maintenance and upgrading of facilities which will potentially impact on the park.
- * The long term goal of the Service is to remove all encroachments and other alien tenures from the park. No new encroachments, alien tenures or utilities will be permitted in the park other than those which are determined by the Service to be either exceptional and in the public interest, or those determined by the Service to be essential for park management purposes.

- * All encroachments in the park will be assessed in the first 12 months following the adoption of this plan in order to confirm the bona fides of the current owners and users of the encroachment.
- * Encroachment licences may only be renewed or reallocated by the Service in accordance with the following guidelines:
 - written evidence exists of previous approvals issued by the Service or an ‘existing interest’ established under the Act, and where the necessary approvals of other relevant authorities, including the local government authority and the Waterways Authority exists or are obtained for the encroachment concerned; and
 - subject to an audit of compliance with the previous licence and approval conditions, particularly in relation to payment of licence fees; public liability and indemnity; size, use and form of the structure; and if appropriate, operation of waste water and sewage treatments.
- * Encroachment licences will be non-transferable except as provided herein.
- * Encroachments will be gradually reduced in size and impact on the park and will eventually be removed as opportunities occur (eg redevelopment or upgrade of the site or structure).
- * All unlicensed encroachments will be removed at the expense of the owner.
- * Any new lands added to Ku-ring-gai Chase National Park or Long Island Nature Reserve will be managed consistent with the objectives, policies and actions in this plan of management.

5. PLAN IMPLEMENTATION

This plan of management is part of a system of park management implemented by the National Parks and Wildlife Service. The system includes the *National Parks and Wildlife Act 1974*, field management policies, established conservation and recreation philosophies, and strategic planning at corporate, directorate and regional levels.

The implementation of this plan will be undertaken within the annual programs of the Service's Sydney North Region. Priorities, determined in the context of regional and directorate strategic planning, will be subject to the availability of necessary staff and funds and to any special requirements of the Director-General or Minister.

Regional programs are subject to ongoing review, within which, works and other activities carried out in Ku-ring-gai Chase National Park and Lion Island, Long Island and Spectacle Island Nature Reserves are evaluated in relation to the objectives laid out in this plan.

The environmental impact 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 *National Parks and Wildlife Act 1974* requires that this plan shall be carried out and given effect to, and that no operations shall be undertaken in relation to the national park and nature reserves unless they are in accordance with the plan. However, if after adequate investigation, operations not included in the plan are found to be justified, this plan may be amended in accordance with section 76(6) of the Act.

As a guide to the implementation of this plan, relative priorities for identified activities are summarised on the following pages. The following criteria have been used to allocate priorities:

High Priority: programs that need to be done in the immediate to near future on the basis that to not undertake these works will result in unacceptable degradation of the resource and/or greatly increased costs associated with rehabilitation at a later date. Also included as high priority are programs which are given a high priority for legal or public safety reasons.

Medium Priority: programs which are important but can be deferred without unacceptable loss of natural and/or cultural heritage values.

Low Priority: programs which will be undertaken only after high and moderate priority programs have been completed or which can be undertaken by other means such as volunteers, grant, concession operation, sponsorship or similar.

HIGH PRIORITY	Plan Reference
Undertake erosion control/stabilisation of tracks/trails	4.1.1
Fence and stabilise unauthorised tracks	4.1.1
Liaise re minimising the impacts of developments within catchments	4.1.2
Liaise re sewage disposal at Cottage Point	4.1.2
Approach local councils and RTA to implement controls on stormwater	4.1.2
Establish monitoring program for six permanent scientific reference sites	4.1.3
Develop with MLALC a program of inspections of Aboriginal sites	4.1.5
Poison trees on wall of Brooklyn Dam and clean overflow pipes	4.1.6
Finalise and implement the Barrenjoey Lighthouse Conservation Plan	4.1.6
Prepare and implement weed management strategy	4.1.7
Prepare and implement pest species management strategy	4.1.8
Research impact of fox control program on native animals	4.1.8
Prepare information for neighbours on impacts of domestic animals	4.1.8
Prepare fire management plans	4.1.9
Upgrade the Kalkari Visitor Centre	4.2.1
Liaise with RTA re traffic calming at Bobbin Head	4.2.2.1
Improve parking near the West Head lookout	4.2.2.1
Improve signs at the West Head lookout	4.2.2.1
Establish low key picnic facilities at Barrenjoey Head etc	4.2.2.2
Upgrade and signpost Barrenjoey Head walking track	4.2.2.3
Formalise tracks to climbing cliffs on Barrenjoey Head	4.2.2.3
Install signs and markers on walking tracks	4.2.2.3
Prepare Precinct Management Plan for Brooklyn Dam site	4.2.2.4
Monitor camping at Brooklyn Dam	4.2.2.4

HIGH PRIORITY (continued)	Plan Reference
Erect signs at The Basin and Brooklyn Dam	4.2.2.4
Erect signs at the start of authorised horse trails	4.2.2.5
Provide information on minimum impact horse riding practices and liaise with local riding groups re minimising impacts	4.2.2.5
Close and rehabilitate the Wilkins Loop Track (Quarry Trail section)	4.2.2.5
Improve the Perimeter Trail in conjunction with horse riding groups etc.	4.2.2.5
Erect signs on cycling trails	4.2.2.6
Erect signs on the beaches within the park	4.2.2.7
Establish licenses for all commercial operations	4.2.2.9
Establish monitoring program for all commercial operators and activities	4.2.2.9
Liaise with marinas re recycling, pump-out facilities and pollutants	4.2.2.9
Return area used for storage of trailable boats at Akuna Bay to public car parking	4.2.2.9
Close and revegetate unnecessary trails	4.2.4
 MEDIUM PRIORITY	
Negotiate re conservation of non-Service land on Long Island	4.1.1
Undertake works on Terrey Hills quarry/stockpile	4.1.1
Restore and revegetate old gravel pit on Bobbin Head Trail and roadside borrow areas	4.1.1
Discuss with RTA maintenance of silt traps and restoration of F3 expressway sites	4.1.1
Investigate alternative sewage disposal for park facilities near waterways	4.1.2
Develop and introduce education program on discharge from boats	4.1.2
Undertake survey of koalas remaining in the park	4.1.4
Prepare information for neighbours on living with native animals	4.1.4

MEDIUM PRIORITY (continued)	Plan Reference
Encourage research into native animals in the park	4.1.4
Erect barriers and signs at Aboriginal sites on the Elvina Bay, Gibberagong and Bobbin Head Tracks	4.1.5
Replace interpretative sign at the Red Hand Cave	4.1.5
Encourage research into Aboriginal heritage	4.1.5
Encourage research into historic heritage of park	4.1.6
Remove introduced plants from the house gardens on Barrenjoey Head	4.1.6
Record and evaluate shacks and shed at base of Barrenjoey Head	4.1.6
Expand volunteer bush regeneration program	4.1.7
Prepare brochure on golden wreath wattle	4.1.7
Establish fire monitoring plots	4.1.9
Survey park visitors and monitor impacts of recreation	4.2.2
Provide information signs on West Head Road	4.2.2.1
Investigate pay and display fee system	4.2.2.1
Provide picnic area adjoining the Kalkari carpark	4.2.2.2
Redesign roads and provide additional picnic areas at Apple Tree Bay	4.2.2.2
Upgrade Great North Walk from Cowan to Brooklyn	4.2.2.3
Provide information on minimum impact bushwalking practices	4.2.2.3
Investigate walking track from Bairne Trail to Towlers Bay	4.2.2.3
Plant shade trees at The Basin and establish recycling stations	4.2.2.4
Investigate alternative uses for Beechwood Cottage and its interpretation	4.2.2.4
Erect signs about the waterways of the park	4.2.2.7
Liaise with the Waterways Authority to improve education and information to the boating community using the park	4.2.2.7

MEDIUM PRIORITY (continued)	Plan Reference
Review speed limit zones and no wash zones	4.2.2.7
Investigate institution of power boat free zones	4.2.2.7
Investigate means of funding public moorings	4.2.2.7
Liaise with NSW Fisheries re management of fishing in the park	4.2.2.8
Prepare and distribute prospectus of preferred research projects	4.2.3
Review all non-park uses and licence essential facilities	4.2.4
Review, license or removal all unlicensed encroachments	4.2.4
 LOW PRIORITY	
Construct walking path from opposite the Bobbin Inn to the pavilion	4.1.6
Modify old rangers office/ambulance room	4.1.6
Monitor West Head fortifications and place a steel door on the piquet	4.1.6
Construct track to the gun emplacement just off the Resolute Track	4.1.6
Liaise re gating of roads and one-way road system	4.2.2.1
Remove facilities from old picnic area opposite Kalkari	4.2.2.2
Grass dead-end roads along the foreshore of Bobbin Head	4.2.2.2
Replace play equipment at Bobbin Head with more park-compatible play equipment	4.2.2.2
Investigate converting old garages at Apple Tree Bay to picnic shelters	4.2.2.2
Investigate feasibility of walking track to Mt Colah from Kalkari	4.2.2.3
Investigate loop walking track at end of mangrove boardwalk	4.2.2.3
Investigate reduction of impacts of marinas	4.2.2.9

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