

CULLENDULLA CREEK NATURE RESERVE
PLAN OF MANAGEMENT

NSW National Parks and Wildlife Service
February, 2004

This plan of management was adopted by the Minister for the Environment on 3 February 2004.

Acknowledgments

This plan is based on a draft plan prepared by staff of the NPWS South Coast Region.

A Reference Group composed of representatives of local community and government organisations was formed to provide information and comment during preparation of the plan and the valuable assistance of this group is gratefully acknowledged.

Thanks also go to Mr Evan Holt who provided historical information.

Cover photograph by J. Miller.

NSW National Parks and Wildlife Service

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FOREWORD

Cullendulla Creek Nature Reserve is located on the south coast of NSW, on the northern embayment of Batemans Bay.

The reserve is comprised primarily of areas of sand dunes, estuarine wetland and forested headland. It protects a rare dune feature known as a chenier complex; the only known example south of North Queensland. It also contains one of the largest stands of mangroves south of Sydney, and areas of salt marsh, forest red gum and littoral rainforest.

The reserve has a diverse fauna and provides habitat for at least five threatened native animal species, and migratory waders protected by international treaties.

A large number of Aboriginal places and sites have been recorded in the reserve including rare mounded midden sites.

Because of its small size and conservation significance, management emphasis in the reserve will be on protection of its ecological integrity, habitat values and special features such as the chenier complex. Fauna and flora surveys, weed control, rehabilitation of disturbed areas, and control of access and use to ensure that they are sustainable, will be the main management programs in the foreseeable future. Aboriginal sites subject to erosion will be protected and there will be continued provision for scientific research.

This plan of management establishes the scheme of operations for Cullendulla Creek Nature Reserve. In accordance with section 76 of the *National Parks and Wildlife Act 1974*, this plan of management is hereby adopted.

BOB DEBUS
Minister for the Environment

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1. INTRODUCTION

The management of nature reserves in NSW is in the context of a legislative and policy framework, primarily the *National Parks and Wildlife Act 1974* (NPW Act), the NPW Land Management Regulation, the *Threatened Species Conservation Act 1995* (TSC Act) and the policies of the National Parks and Wildlife Service (NPWS). Section 72AA of the NPW Act lists the matters to be considered in the preparation of a plan of management. The policies arise from the legislative background and internationally accepted principles of park management. They relate to nature conservation, Aboriginal and historic heritage conservation, recreation, commercial use, research and communication. Other legislation, international agreements and charters may also apply to management of the area. In particular, the *Environmental Planning and Assessment Act 1979* (EPA Act) requires the assessment and mitigation of the environmental impacts of any works proposed in this plan.

The National Parks and Wildlife Act requires that a plan of management be prepared for each nature reserve. A plan of management is a legal document that outlines how the area will be managed in the years ahead.

Once the Minister has adopted a plan, no operations may be undertaken within the nature reserve except in accordance with the plan.

Although not a requirement at the time under the Act, a draft plan of management for Cullendulla Creek Nature Reserve was placed on public exhibition for four months from 12th April until 5th August 2002. The exhibition of the plan of management attracted 3 submissions which raised 9 issues. All submissions received were carefully considered before adopting this plan of management.

The planning process leading to the development of this plan has involved the collection and use of a large amount of information, which for reasons of document size, has not been included in the plan. For additional information or enquires on any aspect of the plan, contact the Service's Ulladulla Office at PO Box 72, ULLADULLA or by phone on (02) 4455 9500.

2. MANAGEMENT CONTEXT

2.1 NATURE RESERVES IN NEW SOUTH WALES

Nature reserves are reserved under the National Parks and Wildlife Act to protect and conserve areas containing outstanding, unique or representative ecosystems, species, communities or natural phenomena.

Under the Act, nature reserves are managed to:

- conserve biodiversity, maintain ecosystem functions, and protect geological and geomorphological features and natural phenomena;
- conserve places, objects, features and landscapes of cultural value;
- promote public appreciation, enjoyment and understanding of the reserve's natural and cultural values; and
- provide for appropriate research and monitoring.

Nature reserves differ from national parks in that they do not have as a management principle to provide for visitor use.

The National Parks and Wildlife Service also has obligations relating to the management of Cullendulla Creek Nature Reserve under international agreements ratified by the Australian Government. These agreements are:

- the Agreement between the Government of Australia and the Government of Japan for the Protection of Migratory Birds and Birds in Danger of Extinction and their Environment (JAMBA); and
- the Agreement between the Peoples Republic of China and the Government of Australia for the Protection of Migratory Birds and their Environment (CAMBA).

The agreements with Japan and China list a number of species found in the nature reserve. A similar agreement is currently being negotiated with the Russian Government.

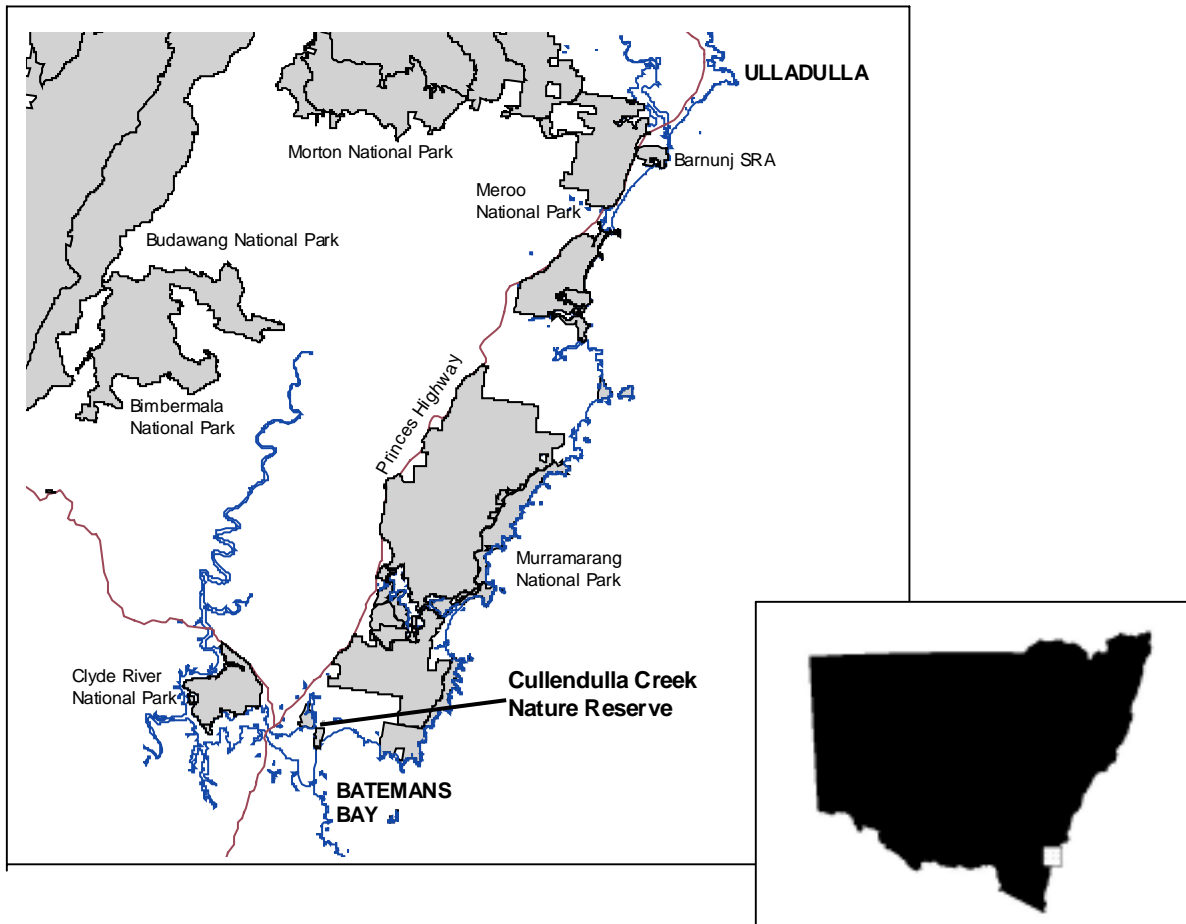
2.2 CULLENDULLA CREEK NATURE RESERVE

2.2.1 Location, Gazettal and Regional Setting

Cullendulla Creek Nature Reserve was dedicated in 1999 over dunes and wetlands associated with the lower reaches of Cullendulla Creek. On 1 January 2001 the gazettal of 46ha of forest at Square Head increased the reserve size to a total of 126ha.

The reserve is situated on a northern embayment of Batemans Bay. It is bounded by the township of Long Beach to the east and Surfside to the west. The area is popular with tourists, being in close proximity to the large holiday centres of Batemans Bay and Milton-Ulladulla.

Murramarang National Park is nearby to the east and north east of the reserve while Clyde River National Park lies a few kilometres to the west.



2.2.2 Importance of Cullendulla Creek Nature Reserve

Cullendulla Creek Nature Reserve is significant for its protection of an important dune complex, estuarine wetlands and diverse plant and animal communities, including habitat for several rare or threatened species.

A succession of sand dunes (or beach ridges) covers the western section of the reserve. The dunes include a rare geomorphologic feature known as a chenier complex, which is the only known example south of North Queensland. It consists of ridges of sand and shell overlying shelly sands and provides significant scientific information relating to past shoreline patterns and Aboriginal use.

The geomorphological features of the area are important for scientific research and the reserve has been visited by students of geography, geology, botany and related subjects.

Between the dunes are areas of estuarine wetland. The reserve contains one of the largest stands of Grey Mangroves (*Avicennia marina*) south of Sydney and 28% of all Clyde River catchment mangroves. Another species, the River Mangrove (*Aegiceras corniculatum*), also occurs in the reserve in unusually close proximity to the sea.

Both sections of the reserve support areas of Forest Red Gum (*Eucalyptus tereticornis*). This species has been extensively cleared and is poorly represented in reserves.

Two small areas of littoral rainforest are located in the eastern section.

A number of biogeographically significant plant species including Saw-sedge (*Gahnia filum*), Native Sea-lavender (*Limonium australe*) and Spear Grass (*Stipa stipoides*) occur in the reserve.

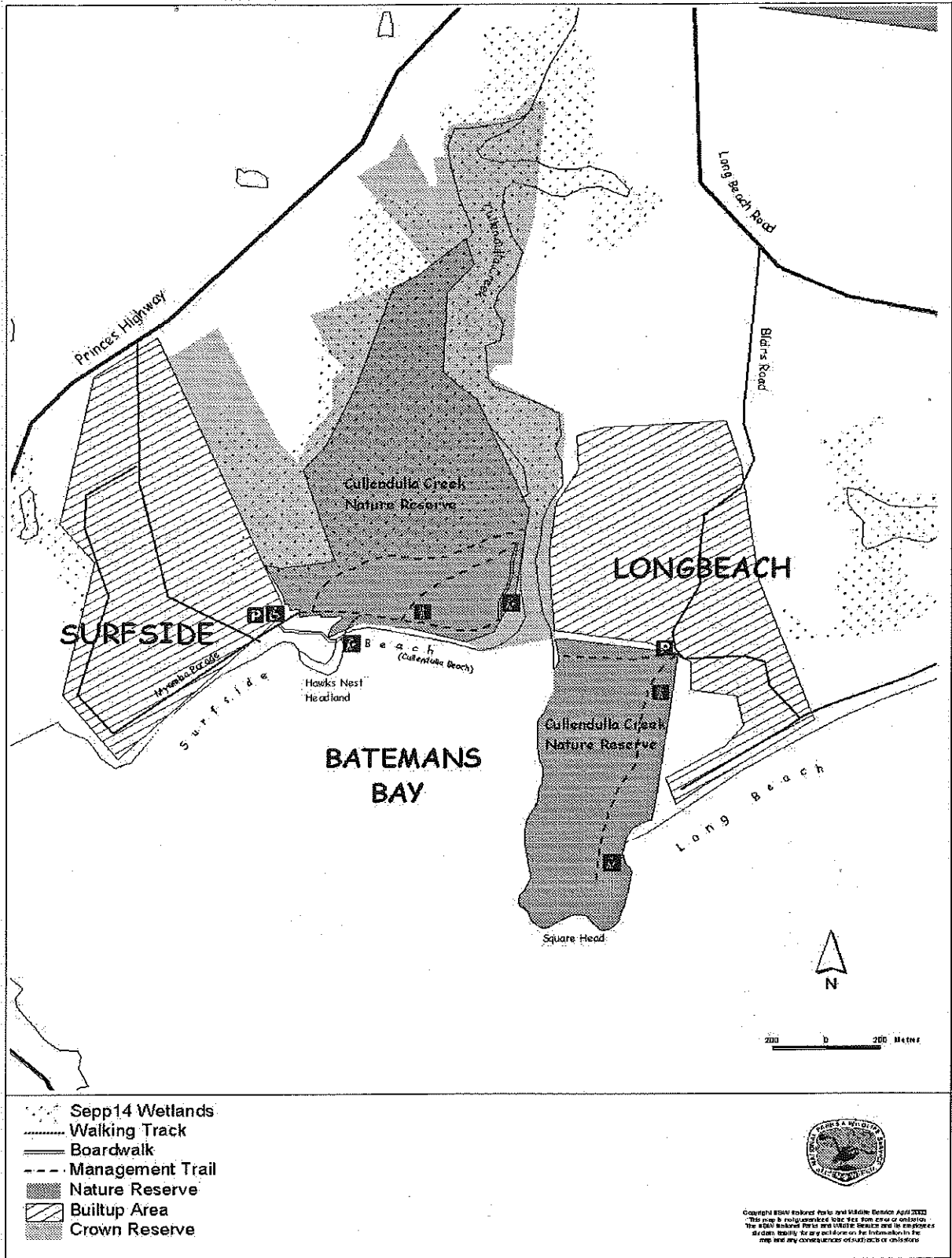
The reserve's varied environments provide habitat for a high diversity and abundance of fauna for such a small area. Several threatened species listed on Schedule 2 (vulnerable species) of the *Threatened Species Conservation Act 1995* have been recorded: the Sooty Owl (*Tyto tenebricosa*), Yellow-bellied Glider (*Petaurus australis*), Large-footed Mouse-eared Bat (*Myotis rueppellii*), Common Bentwing-bat (*Miniopterus schreibersii*) and the Great Pipistrelle (*Falsistrellus tasmaniensis*). The reserve provides potential habitat for several other threatened species (see section 4.1.3).

The Cullendulla Creek estuary is an important fish nursery for the Clyde River area and the creek outlet provides habitat for the Sydney Cockle *Anadara trapezia* which occurs in unusual abundance.

Cullendulla Creek Nature Reserve, along with other areas along the coast, contains rock platforms and beach environments that were utilised by Aboriginal people. The reserve contains a large number of Aboriginal midden sites, including rarely recorded mounded midden sites, and surface scatters. It is also suspected to contain Aboriginal burials, as others have been recorded nearby.

The Cullendulla embayment was formally included on the Register of the National Estate by the Australian Heritage Commission on 24 June 1997.

Cullendulla Creek Nature Reserve



3. OBJECTIVES OF MANAGEMENT

3.1 GENERAL OBJECTIVES FOR NATURE RESERVES

The following general objectives relate to the management of nature reserves in New South Wales:

- * protection and preservation of scenic and natural features, including significant geological and geomorphological features;
- * conservation of wildlife, including maintenance of biodiversity and populations of threatened species;
- * maintenance of natural processes;
- * preservation of catchment values;
- * preservation of Aboriginal sites in consultation with the Aboriginal community;
- * conservation of non-Aboriginal historic features;
- * provision of opportunities for appropriate use; and
- * encouragement of scientific and educational enquiry into environmental features and processes.

3.2 SPECIFIC OBJECTIVES FOR CULLENDULLA CREEK NATURE RESERVE

In addition to the above general objectives the management of Cullendulla Creek Nature Reserve will be subject to the following more specific objectives:

- * protection of the dune system and in particular of the chenier complex;
- * protection and where necessary restoration of the estuarine wetland communities; and
- * promotion of visitor and community appreciation of the geomorphological, habitat and cultural values of the reserve.

3.3 OVERALL STRATEGY

Cullendulla Creek Nature Reserve is a small area with very high scientific and habitat values. Management priority will be given to maintenance and enhancement of the diverse natural and cultural resources of the reserve through survey and management of threatened and other species, weed and feral animal control, rehabilitation of disturbed areas and conservation of significant Aboriginal sites and places in consultation with local Aboriginal people. The chenier complex will be managed as a scientific reference area and protected from disturbance.

Visitor use will be restricted to low impact walking and beach activities at Cullendulla Beach and Square Head. The environmental impact of visitor use will be reduced by provision of well defined access tracks and promotion of public awareness of the special values of the reserve.

4. POLICIES AND FRAMEWORK FOR MANAGEMENT

This chapter contains the policies and framework for the management of Cullendulla Creek Nature Reserve together with relevant background information. Policies are summarised under the following section headings:

- 4.1 NATURE CONSERVATION
- 4.2 CULTURAL HERITAGE
- 4.3 USE OF THE AREA

Natural and cultural heritage and on-going use are presented individually for convenience and clarity. In practice, however, they are strongly inter-related and together form the landscape of an area. Much of the Australian environment has been influenced by past Aboriginal and non-Aboriginal land use practices and the activities of modern day Australians continue to influence natural environments through recreational use, cultural practices, the presence of introduced plants and animals and in some cases air and water pollution.

The policies outlined in this plan of management provide the long term framework for management of Cullendulla Creek Nature Reserve. The actions identified in the plan are those to which priority will be given in the foreseeable future.

Where not specifically provided for in this plan, management of Cullendulla Creek Nature Reserve will also be in accordance with the National Parks and Wildlife Act and with general Service policies.

4.1 NATURE CONSERVATION

Nature conservation covers all aspects of the natural environment including geology and soils, water quality, native plants and animals and the relationship between these. For convenience, management of landscape values, introduced species and fire are also considered in this section.

4.1.1 Geology, Landform, Erosion and Water Quality

The reserve consists of a beach ridge/estuarine wetland system in the lower catchment of Cullendulla Creek and a rocky ridgeline forming a headland into Batemans Bay (Square Head).

Two geological units occur in the reserve. These are Ordovician sediments consisting of siltstone, claystone, sandstone, quartzite and chert found on the western side of Cullendulla Creek within the beach ridge and wetland system, and the metamorphic Wagonga beds consisting of siliceous and carbonaceous cherts with abundant quartz veins, on Square Head.

Cullendulla Creek was once in a small gully that drained into the Clyde River. When the sea level rose about 7000 years ago, this gully was drowned and formed a small bay. Estuarine muds were then deposited in the area and this local shallowing meant that sand flowing down the Clyde began to mix with tidal delta sands, forming shoals in the Cullendulla area. For the last 2000 to 3000 years, grey sand and shell material has been deposited over the estuarine muds and sands, forming a shallow tidal sand surface. Refracted swell and wave winds reworked the sands into ridges and more sand was deposited. These ridges make up the beachridge /chenier complex.

Cheniers are long, low (3m to 6m high) narrow beach ridges formed roughly parallel to the shoreline. They can be differentiated from other beach ridges by the material

they have been deposited on. Cheniers overly estuarine muds whereas beach ridges overlay estuarine sands. There is a succession of nine separate beach ridges in the reserve northwards from Cullendulla Beach. The two most northerly ridges are cheniers and are located west of Cullendulla Creek at the northern tip of the reserve.

At present the most seaward ridge is showing evidence of progressive erosion and overtopping by waves (WBM 1999). The supply of sand to Cullendulla Beach (eastern part of Surfside Beach) is probably dependent on a combination of intense flood events and wave-induced current circulation. Sand washed down from the Clyde after a flood supplies sand to nearshore areas off Surfside Beach. Current circulation can then redistribute this sand along the nearshore areas of Surfside and Cullendulla Beaches and onto the Cullendulla shoals. When the nearshore zone is depleted of sand, increased wave attack and erosion by overtopping and/or movement of the beach sand offshore to the depleted zone may occur (WBM 1999). Reports have suggested that only infrequent intense floods have the capacity for substantial re-working of shoals located in the mouth of the Clyde River. It is possible that the current erosion of Cullendulla Beach will be reversed if a large flood occurs. In the meantime, the erosion threatens a Telstra optic fibre easement and foreshore recreation access.

Much of the Cullendulla Creek catchment is forested, although there are some stormwater and other pollution sources from development surrounding the wetlands. There is considerable community concern about the potential environmental effects on the Creek of new residential development occurring on the eastern watershed, adjacent to Square Head. Urban runoff, stormwater and other nutrient loadings will be directed into Cullendulla Creek, potentially resulting in significant impacts on water quality and habitat values. Maintenance of proposed stormwater retention basins will be important if impacts are to be minimised.

The reserve is an important component of views obtained from the south side of Batemans Bay and from adjacent residential areas. Appropriate location and design of facilities in the reserve and of development outside are needed for protection of the high landscape values. Sensitive areas for visual impact are Cullendulla Beach, Square Head, and the Cullendulla Creek foreshore.

Policies

- Protect the beach ridge system by maintaining vegetation cover and ensuring any works are carried out with minimal disturbance.
- Design and locate visitor and other facilities to ensure that they have minimal visual and environmental impact.
- Minimise soil erosion by appropriate control measures in areas of proposed works.
- Liaise with the Eurobodalla Shire Council, the Lower South Coast Catchment Management Board, the Clyde River Estuary Management Committee and other authorities to maintain water quality in catchments flowing into the reserve.

Actions

- Investigate current water quality monitoring programs and if needed prepare a water quality monitoring strategy for the reserve.

- In conjunction with other authorities, investigate options for a multi agency and community approach to managing urban runoff and stormwater into Cullendulla Creek.

4.1.2 Native Vegetation

Several environments occur within the reserve. Those in the western section are Zostera seagrass beds, exposed shorelines, tidally exposed sandbars, stands of Swamp Oak (*Casuarina glauca*) woodland, Bangalay (*Eucalyptus botryoides*) – Swamp Oak open forest, salt marsh, mudflats, mangrove (mainly Grey Mangrove *Avicennia marina*) and Forest Red Gum (*Eucalyptus tereticornis*) forest. A zone also exists between the mangrove and forest communities that consists of a mud pavement covered in a mat of blue/green algae, with isolated seedlings of Grey Mangrove and Beaded Glasswort (*Sarcocornia quinqueflora*).

Square Head is dominated by tall moist open forest including Spotted Gum (*Corymbia maculata*), Grey Ironbark (*Eucalyptus paniculata*) and Blackbutt (*Eucalyptus pilularis*) with Forest Red Gum (*Eucalyptus tereticornis*) occurring on its southern tip. A dense understory of Burrawang (*Macrozamia communis*) dominates the forest floor. Small pockets of littoral rainforest are sheltered on the eastern face behind Long Beach and in a gully along the northern boundary. Dominant species include Red Fruited Olive Plum (*Cassine australis*), Large Mock Olive (*Notelaea longifolia*), Brush Muttonwood (*Rapanea howittiana*) and Black Plum (*Diospyros australis*). The northern area may be threatened by adjacent residential development.

Further survey is required to prepare a comprehensive vegetation map for the reserve and to search for occurrences of threatened and significant species.

A large proportion of the Cullendulla Beach hind dune was formerly grazed and contains very little natural vegetation. It is dominated by Bracken (*Pteridium esculentum*). Several smaller cleared or disturbed areas occur.

As the reserve is relatively small in size, the maintenance of adjacent naturally vegetated areas is important, including retention if possible of connecting corridors of natural vegetation with surrounding areas of State Forest, Murramarang National Park and Crown Land.

Policies

- Manage native vegetation to:
 - maintain the existing floristic and structural diversity;
 - conserve threatened and biogeographically significant species; and
 - maximise habitat values for native animals.
- Liaise with neighbours and land use authorities to encourage retention and protective management of areas of native vegetation close to the reserve.

Actions

- Carry out a flora survey targeting threatened and significant species.
- Monitor regeneration of cleared and disturbed areas, and take appropriate action such as planting if adequate regeneration does not occur.

4.1.3 Native Animals

While fauna survey has been limited the reserve is known to contain a diversity of fauna. Water birds recorded include the Purple Swamphen (*Porphyrio porphyrio*), Eurasian Coot (*Fulica atra*), Dusky Moorhen (*Gallinula tenebrosa*), Black Swan (*Cygnus atratus*), several species of duck, Australian White Ibis (*Threskiornis aethiopica*), two species of spoonbill and three species of heron. Other birds occurring in the reserve include the White-bellied Sea-Eagle (*Haliaeetus leucogaster*), Marsh Harrier (*Circus assimilis*), Sacred Kingfisher (*Todiramphus sanctus*) and the Yellow-faced Honeyeater (*Lichenostomus chrysops*).

A large number of waders, some listed on International treaties, have been recorded in the Clyde River estuary and may occur within the reserve. These include the Eastern Curlew (*Numenius madagascariensis*), Bar-tailed Godwit (*Limnosa lapponica*) and Sharp-tailed Sandpiper (*Calidrus acuminata*).

A number of mammals occur including seven species of bat, of which three are listed as vulnerable (see section 2.2.2). Other mammals include the Common Wombat (*Vombatus ursinus*), Sugar Glider (*Petaurus breviceps*) and the Short-beaked Echidna (*Tachyglossus aculeatus*).

Several reptile species occur in the reserve including the Eastern Blue Tongue Lizard (*Tiliqua scincoides*), Red-bellied Black Snake (*Pseudechis prophyriacus*) and the Eastern Long-necked Tortoise (*Chelodina longicollis*) (Travers Morgan Pty. Ltd 1986).

A great diversity of frogs has been recorded including the Spotted Marsh Frog (*Limnodynastes tasmaniensis*), Dwarf Green Frog (*Litoria fallax*) and Peron's Tree Frog (*Litoria peronii*).

As well as the threatened species listed in section 2.2.2, the reserve provides potential habitat for the endangered Hooded Plover (*Thinornis rubricollis*) and Green and Golden Bell Frog (*Litoria aurea*) and the vulnerable Pied Oystercatcher (*Haematopus longirostris*), Sooty Oystercatcher (*Haematopus fuliginosus*), Powerful Owl (*Ninox strenua*), Masked Owl (*Tyto novaehollandiae*), Glossy Black Cockatoo (*Calyptorhynchus lathami*) and Black Bittern (*Ixobrychus flavicollis*). Each of these species has been recorded nearby. Under the Threatened Species Conservation Act recovery plans are being prepared for threatened species and will be implemented in the reserve.

Policies

- Conserve the diversity and high quality of habitats for all native animals occurring in the reserve. Give priority to management strategies or programs that favour conservation of threatened species and their habitats.
- Implement recovery plans for threatened species occurring in the reserve where appropriate.

Actions

- Carry out fauna surveys within the reserve, particularly for threatened species.
- Carry out an intertidal zone animal survey in consultation with NSW Fisheries.

4.1.4 Introduced Species

An introduced species is defined in this plan as any plant or animal species not native to the reserve. Introduced species within the reserve and on adjoining land are of concern because they have the potential to have detrimental effects on ecological values and can spread to and from neighbouring land. The *Noxious Weeds Act 1993* places an obligation upon public authorities to control weeds declared as noxious on land that they occupy to the extent necessary to prevent such weeds spreading to adjoining lands.

Scattered occurrences of noxious weeds occur throughout the reserve, particularly on the raised, well drained sand ridges. These include Bitou Bush (*Chrysanthemoides monilifera*), Pampas Grass (*Cortaderia selloana*), Blackberry (*Rubus fruticosus*), Moth Vine (*Araujia hortorum*), Coast Morning Glory (*Ipomea cairica*), Cape Ivy (*Delairea odorata*) and Asparagus Fern (*Protasparagus aethiopicus*). Square Head has the most significant occurrence of Bitou Bush between Batemans Bay and Lake Conjola. Other weed species present in the reserve include Honeysuckle (*Lonicera japonica*) and Passionfruit Vine (*Passiflora edulis*). These infestations can be attributed to past disturbance including human occupation, cattle grazing, clearing and rubbish dumping.

Weed eradication programs have been carried out within the reserve, guided by a Weed Management Strategy. Weed control will be an on-going management commitment.

Introduced animal species within the reserve are the European Red Fox (*Vulpes vulpes*), Feral Cat (*Felix catus*) and European Wild Rabbit (*Oryctolagus cuniculus*). These prey on native animals, inhibit plant regeneration or create soil disturbance. The occurrence of introduced species is likely to increase with the on-going development of surrounding areas.

Policies

- Control and if possible eradicate introduced plant species. Give priority for treatment to those species that:
 - have been declared noxious;
 - threaten the integrity of native communities;
 - may affect neighbouring lands;
 - have a high capacity for dispersal; and/or
 - are new isolated occurrences.
- Undertake weed control in conjunction with Eurobodalla Shire Council and community volunteers/groups where appropriate.
- Control pest animal species as far as practicable, in cooperation with neighbouring land owners.
- Design and implement control programs for pest species in such a manner as to minimise the impact on non-target animals and other reserve values.

Actions

- Carry out on-going weed control programs in accordance with the Weed Management Strategy. Give priority treatment to:
 - Bitou Bush;
 - Pampas Grass;
 - Blackberry;
 - Moth Vine;

- Coast Morning Glory;
 - Cape Ivy;
 - Honeysuckle;
 - Passionfruit Vine;
 - Asparagus Fern; and
 - Bridal Veil Creeper.
- Work with Eurobodalla Shire Council to increase awareness of the impacts of dumping garden refuse and cultivation of environmental weeds in gardens.
 - Install signs where necessary and carry out education programs with local residents to reduce the impact of introduced plant and animal species, including domestic animals, on the reserve.
 - Assess the level of fox activity and the potential impacts in the reserve and develop a coordinated control plan.
 - Control rabbits and feral cats as far as practicable.

4.1.5 Fire Management

Fire is a natural feature of many environments and is essential to the survival of some plant communities. Inappropriate fire regimes however can lead to loss of particular plant and animal species and communities. Fire can also damage cultural heritage sites, recreation and management facilities and can threaten visitors and neighbouring land.

The fire history of the reserve is not well known but it does not appear to have been subject to frequent fire, owing to its coastal location. The estuarine wetlands of the western section and Cullendulla Creek itself both form natural fire breaks.

The forest communities require fire, particularly the Spotted Gum/Macrozamia community of Square Head. Small fires have occurred on the southern tip of the headland and on the creek foreshore, mainly originating from campfires. The area of littoral rainforest on the northern boundary is highly sensitive to fire.

The following table outlines vegetation types occurring in the reserve and fire regime guidelines.

Vegetation Type	Fire Regime
Mangrove /Saltmarsh	A decline in biodiversity is predicted if there is any fire in this community
Casuarina forest	A decline in biodiversity is predicted if there is no fire for more than 30 years
Forest Red Gum	A decline in biodiversity is predicted if there is no fire for more than 30 years
Spotted Gum / Macrozamia	Needs fire between 5 to 30 years
Littoral rainforest	A decline in biodiversity is predicted if there is any fire in this community

A diversity of fire regimes is needed to maintain natural diversity. Management of fire should ideally aim to provide a pattern of fires of high, moderate and low intensity, frequency and extent. Extinctions are most likely when fire regimes of relatively fixed intensity, frequency and extent prevail without variation. Further, areas burnt too frequently are reduced to pyrogenic species such as Bladley Grass

(*Imperata cylindrica*) and Bracken, an understorey that accumulates fuel quickly and is capable of further frequent burning.

Fire management strategies such as fuel reduction, fire trail maintenance and detection and cooperative arrangements will be applied where appropriate to best protect life, property and natural and cultural assets within and adjacent to the reserve. Close to boundary areas, fuel management zones will be implemented in cooperation with neighbours.

Because of the small size and significance of the reserve, protection and maintenance of conservation values must have high priority. It is important for adjacent private property and new subdivisions to be designed and managed to reduce fire risk, rather than expecting all risk management activities and associated costs to be borne by the adjacent bushland.

An important part of the Service's fire management is participation in local cooperative fire management arrangements. The Service is a member of the Eurobodalla District Bush Fire Management Committee which aims to coordinate fire management and fire control on a district basis. Flammable parts of the reserve will be included in appropriate risk management zones in the Eurobodalla District Bush Fire Risk Management Plan. Bushfire management issues in the reserve may also be covered in a landscape-based fire management plan to be developed for nearby Murramarang National Park.

Policies

- Manage fire to:
 - protect human life and property within and adjacent to the reserve;
 - maintain plant and animal species and communities through the provision of fire regimes compatible with their conservation; and
 - protect Aboriginal sites, visitor facilities and management structures.
- Control all wild-fires occurring within the reserve and as far as possible exclude fire from the littoral rainforest community on Square Head.
- Avoid use of heavy machinery for fire suppression in the reserve, particularly in the vicinity of rare plants, Aboriginal sites, sand dunes and wetlands.
- Rehabilitate areas disturbed by fire suppression operations as soon as practical after a fire.

Actions

- Maintain existing management trails within the reserve.
- Define and maintain asset protection zones adjacent to private properties along the eastern boundary of Square Head and the eastern side of Surfside. This may include slashing and fuel management burning.
- Research fire regimes and fire requirements for vegetation communities within the reserve, including the effects of fire intensity, frequency and seasonality.
- Continue participation on the Eurobodalla District Bush Fire Management Committee.
- Maintain close contact and cooperation with land use planning authorities and neighbours, and promote awareness of fire and conservation management

issues, including responsible urban and property design, maintenance of planning constraints and property protection practice.

4.2 CULTURAL HERITAGE

4.2.1 Aboriginal Heritage

The area incorporating Cullendulla Creek Nature Reserve fell within the territory of the large Walbanja language group. At the time of white settlement Aboriginal people affiliated with the Walbanja were recorded between Cape Dromadery and near Ulladulla on the coast and inland to Braidwood and the Shoalhaven River (Organ 1990).

Cullendulla is an Aboriginal word and there are several suggestions as to its meaning. One suggestion is that Cullendulla was an elder of the Walbanga tribe who lived on Cullendulla Creek. A second suggestion is that Cullendulla means 'battle ground', however it is not known what battle it refers to.

The Aboriginal people of the area had a diverse economy, with trade and cultural links with neighbouring groups. Although predominantly fisher people, they would have also utilised the surrounding forests and woodlands for meat and plants. Anecdotal evidence suggests that there were many Aboriginal people in the district during the 1850's however these had dwindled to small groups both living within and passing through the area by the 1920s.

It is reported (Reg Freebody, pers. comm.) Aboriginal people formerly gathered each year for a feast of mud oysters, mussels and shellfish at the mouth of the Cullendulla Creek. This tradition is continued today with locals from the Aboriginal community visiting Cullendulla Creek to collect the Sydney Cockle.

It is recognised that the landscape, and the plants, animals and physical features within the landscape are all an integral part of Aboriginal cultural heritage. Within the reserve there may be individual places that are significant to Aboriginal people. These include mythological sites, ceremonial sites and resource sites. Some sites may not contain any physical evidence of past use or occupation.

Several surveys for Aboriginal places and sites have been carried out in the process of research and previous development proposals, but a systematic survey together with an oral history would enable fuller appreciation of the history of Aboriginal use and its significance to contemporary Aboriginal people.

A relatively large number of Aboriginal midden sites have been recorded, including rarely recorded mounded midden sites, and surface scatters of stone artefacts. There is a high potential for Aboriginal skeletal remains to occur within the beach ridges as burials have been discovered in the Batemans Bay area. Some exposed midden sites are currently subject to erosion due to uncontrolled pedestrian access and natural shoreline action. A more detailed site survey is required to obtain better site data for the reserve.

While the Service has legal responsibility for the protection of Aboriginal sites it acknowledges the right of Aboriginal people to make decisions about their own heritage. Therefore Aboriginal communities will be consulted about the management of Aboriginal places and sites and related issues and how the Aboriginal culture and history of the reserve should be promoted and presented. Planning to protect a number of midden sites in the reserve is occurring in consultation with the Batemans Bay Aboriginal Land Council.

Policies

- Protect Aboriginal sites within the reserve from human disturbance. Protect sites threatened by natural causes if possible or identify them as priority sites for detailed recording and research.
- Continue consultation with the Batemans Bay Aboriginal Land Council and other relevant Aboriginal community members including native title claimants, knowledge holders and elders and involve them in all aspects of management of Aboriginal places, values and interpretation in the reserve.
- Prepare an archaeological assessment where works have the potential to impact on Aboriginal sites.
- Do not publish the location of Aboriginal sites except where:
 - the agreement of relevant Aboriginal community organisations and individuals has been obtained;
 - a conservation study has been prepared and any management works necessary to protect the site from damage have been implemented; and
 - the site will be interpreted to promote public knowledge and appreciation of Aboriginal culture.
- Allow Aboriginal use related to maintenance of traditional links to the land to continue, in accordance with the objectives and policies of this plan.

Action

- Undertake a protection and recording program for Aboriginal sites subject to erosion and pedestrian access.

4.2.2 Non-Aboriginal History

European explorers and settlers reached the Cullendulla area in the early 19th Century. By around 1840, land grants had taken possession from the Walbanja people. Edward Lord held a land grant of 410ha covering land to the west of Cullendulla Creek, including the reserve area.

During the 1860s, the main source of income around Cullendulla was timber. Mick Ryan owned a mill, wharf and 46ha of land at the headwaters of Cullendulla Creek on its east bank. On the opposite bank stood the Benandarah mill and wharf. These mills ran timber to Cullendulla Creek on a horse or bullock drawn tramway and loaded it onto punts. At high tide, the punts were poled down the creek to waiting ships. The ships would anchor in the sheltered waters to the west of Square Head and unload their ballast of sandstone and brick before taking on the timber.

Ships travelled from Sydney to pick up their timber cargo, which was used for house building and specialty products such as wheel spokes and tool handles. On some occasions the ships would continue up the Clyde River to Nelligen. There they would load more timber and return to Cullendulla Creek to meet the reloaded punts and pick up a deck cargo. The remains of the Benandarah wharf and part of the wooden tramway rails still exist to the north of the reserve.

Later known activities occurring within the reserve area were residential occupation and cattle grazing in the 1960s, telephone cable and water pipeline installation, professional fishing and recreational use. These resulted in formation of easements, clearings and rubbish deposition.

Policy

- Conserve any significant historic places occurring in the reserve.

Actions

- Conduct further research into past uses and assess the significance of any features located.
- Assess the significance of the rubbish mounds within previously cleared areas and remove where assessed as not significant.

4.3 USE OF THE AREA

Certain public uses may be appropriate in Service areas provided that they do not conflict with the primary purpose of conservation of natural and cultural heritage and are consistent with the objectives and strategy of the plan of management. The major categories of use that can be appropriate in Service areas are:

- education and promotion of the area, the Service and the conservation of natural and cultural resources;
- involvement of the public in aspects of management;
- certain types of recreation;
- Aboriginal cultural activities;
- research; and
- management operations by the Service and other authorities with statutory responsibilities in the area.

The extent to which these categories of use will be provided for in Cullendulla Creek Nature Reserve is indicated below.

4.3.1 Recreation and Education Opportunities

The primary purposes of nature reserves are conservation of wildlife and natural environments, and provision of opportunities for research and learning about these resources. Visitor use is appropriate where it does not conflict with conservation objectives and promotes understanding and appreciation of the reserve's significance. Cullendulla Creek Nature Reserve contains features that would be vulnerable to damage through inappropriate or over-use. For this reason public use of the reserve will be limited.

The scenic coastline and opportunities for water based recreation are the main attractions for visitors to the reserve, especially during the summer period.

Appropriate existing uses include:

- beach activities, primarily swimming and picnicking;
- walking and bird watching;
- cycling and canoeing; and
- estuary, beach and rock fishing.

Provision for visitor use has been considered in a regional context. Public land managed by the Service and other authorities in the region provides diverse

opportunities for water based recreation, camping and other activities such as horse riding. Accordingly, visitor facilities provided in the reserve will be low key and no unauthorised vehicle access will be allowed.

Access to the beaches will continue to be provided but information and facilities will be designed to promote appreciation of the reserve's natural and cultural heritage. The creek, mangrove environments, beach ridges and Spotted Gum/Macrozamia forest are attractive and interesting features and will be interpreted to visitors.

In the past, visitors drove across freehold land to access Cullendulla Beach and the Creek foreshore from a track at the end of Myamba Parade. Due to conditions placed on the sale of the land and for environmental protection, all access along this track has been limited to authorised users. The Service has provided an alternative pedestrian access track/boardwalk to the beach from the Council's public car park located off Myamba Parade. The boardwalk is designed to accommodate persons in wheelchairs. An interpretive display has been provided at the beach end of the boardwalk focusing on the natural and cultural values of the dunes and wetlands.

A raised timber boardwalk and associated interpretation have been provided through an area of mangroves along Cullendulla Creek in order to promote visitor appreciation of this ecosystem and address impacts from previous unorganised access. The boardwalk combines with a short management track to create a loop walk.

Management tracks located in the Square Head section provide pleasant walking opportunities with views of the Bay. The feasibility of providing a loop walking track linking the two management tracks will be investigated. Its construction will depend upon environmental impacts, safety issues and cost.

Several portions of crown land surround the reserve and may be nominated for addition. At present numerous informal vehicle and pedestrian tracks exist along the eastern foreshore of Cullendulla Creek, within crown land adjacent to residential development occurring at Long Beach. In the event of addition of this area to the nature reserve, liaison with Eurobodalla Shire Council will be initiated to manage pedestrian access to the foreshore.

Policies

- Continue to provide the following low key day use facilities within the reserve: the boardwalk to Cullendulla Beach, interpretive shelter, interpreted mangrove walking trail, car park on the boundary of the Square Head section and basic seating behind Cullendulla Beach and at various points along the ridgeline track at Square Head.
- Allow use of vehicle tracks in the reserve for pedestrian access, management purposes and authorised users only.
- Prohibit camping and horse riding.
- Permit bicycling on the management trails on Square Head and on Cullendulla Beach. Bicycles may be walked on the Cullendulla Beach boardwalk. Bicycles will not be permitted on the Mangrove Loop Walk or on management trails in the western part of the reserve.
- Promote understanding and appreciation of the natural and cultural values of the reserve, in particular the chenier dunes; mangroves and Aboriginal occupation.

- Work with Eurobodalla Shire Council to manage access to the creek foreshore from the Long Beach development in the event that Crown lands adjacent to the development are nominated for addition to the reserve.

Actions

- Investigate the feasibility of providing a loop walk on Square Head.
- Liaise with NSW Waterways to seek the imposition of a 4 knot speed limit on all water craft within the Cullendulla Creek estuary.

4.3.2 Community Liaison

Many organisations and individuals have an on-going interest in management of the reserve. A range of stakeholder issues was identified through a public consultation process that preceded preparation of this plan. These issues covered all aspects of management and use of the reserve. The Service aims to provide ongoing opportunities for stakeholders to be consulted and involved in a meaningful way in the management of the reserve.

Communication with a range of individuals, neighbours, community groups, peak industry bodies, corporate and agency representatives will be needed. Involvement of stakeholders may relate to specific issues or sites, such as pest control or significant cultural heritage places, or apply to conservation management principles across the whole reserve or the wider landscape.

Policies

- Cooperate and, where appropriate, enter into partnerships with neighbours and other key stakeholders to best manage pest species, fire, recreation, threatened species and more generally, in the protection of natural and cultural resources in the reserve. In particular, neighbours will be encouraged to report sightings of significant flora and fauna and to assist in the implementation of recovery plan actions where appropriate.
- Encourage neighbours and other stakeholders to contact area management staff to discuss issues of concern or support in the management of the reserve.
- Keep Eurobodalla Shire Council informed of management strategies and priorities for the reserve, to ensure better outcomes for conservation and recreation across the broader landscape, and to provide the best protection for the reserve's natural, cultural and visitor values.
- Seek opportunities in local print and electronic media to provide updates on management issues and actions.

4.3.3 Research and Monitoring

The purpose of scientific study in the reserve is to improve understanding of its natural and cultural heritage and the processes that affect them. Research also establishes the requirements for management of particular species.

Several scientific studies have taken place within the reserve and the area is an important one for scientific research, student field studies, education and environmental monitoring. The chenier complex is of major scientific interest.

Service research efforts must be directed towards the areas of greatest need and will concentrate on Aboriginal sites and fauna/flora surveys. Monitoring will be undertaken to provide feedback on management programs and directions for future adaptive management, as part of wider programs under Ecologically Sustainable Management monitoring.

Policies

- Undertake research to provide information on the reserve's natural and cultural heritage and on human use in order to facilitate management.
- Promote appropriate research by other organisations. Maintain liaison with researchers to obtain as much mutual information and assistance as possible.
- Require research structures and long term markers to be placed in locations that will minimise their visual impact and require their removal upon completion of the research.

Action

- Prepare a prospectus to promote and guide research by other organisations into programs useful for management purposes, in particular Aboriginal sites and flora and fauna surveys.

4.3.4 Management Operations

A number of vehicle tracks exist within the reserve (see Map). The tracks on the western side of Cullendulla Creek were existing tracks used to service a Telstra optic fibre cable and Eurobodalla Shire Council sewerage rising main and water main. The Telstra line continues within the Square Head section of the reserve. On occasion, use of the trails will be required for NPWS management purposes including fire and weed management and asset maintenance.

The tracks are used by professional fishers and oysterfarmers to access the beaches and Cullendulla Creek and this use will continue to be permitted. Use is occasional and will only be permitted under strict conditions to minimise environmental impact.

Policies

- Keep management tracks gated and allow vehicle access only for management purposes and by authorised users such as Council, Telstra, professional fishers and scientific researchers.
- Keep utilities under review. Encourage their closure and rehabilitation as opportunities allow, in conjunction with relevant government agencies.
- Allow use of management tracks by persons holding a professional fishing or oyster lease licence and who are currently registered with the Service, subject to conditions that minimise environmental impact.

Actions

- Formalise easement agreements over existing utilities with Telstra and Eurobodalla Shire Council.

Develop conditions for use of tracks by professional fishers and oyster farmers.

5. PLAN IMPLEMENTATION

This plan of management is part of a system of management developed by the National Parks and Wildlife Service. The system includes the National Parks and Wildlife Act, 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 South Coast 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 Cullendulla Creek Nature Reserve 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 Act requires that this plan shall be carried out and given effect to, and that no operations shall be undertaken in relation to the nature reserve unless they are in accordance with the plan.

No term is proposed for this plan of management. If after adequate investigation, operations not included in the plan are found to be justified, this plan may be amended in accordance with 73B of the Act.

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

ACTIVITY	PLAN REF
High Priority	
* Investigate water quality monitoring and prepare strategy if needed	4.1.1
* Investigate options for multi agency and community urban stormwater runoff management	4.1.1
* Undertake flora and fauna surveys	4.1.2 & 4.1.3
* Control priority weeds	4.1.4
* Assess level of fox activity and develop control plan	4.1.4
* Control rabbits and feral cats as far as practicable	4.1.4
* Maintain fire management trails	4.1.5
* Continue participation on Eurobodalla District Bush Fire Management Committee	4.1.5
* Define and maintain asset protection zones	4.1.5

- * Promote awareness of fire protection issues 4.1.5
- * Undertake Aboriginal site protection and recording program 4.2.1
- * Formalise easement agreements for existing utilities 4.3.4

Medium Priority

- * Conduct information program for weeds and domestic animals 4.1.4
- * Research fire regimes and requirements 4.1.5
- * Investigate feasibility of loop walking track on Square Head 4.3.1
- * Liaise with NSW Waterways to seek speed limit on water craft 4.3.1

Low Priority

- * Carry out an intertidal zone animal survey 4.1.3
- * Monitor regeneration of cleared areas 4.1.2
- * Conduct further research into non-Aboriginal use and features 4.2.2
- * Remove rubbish mounds in cleared areas 4.2.2
- * Prepare research prospectus to promote research by other organisations 4.3.3
- * Develop conditions for use of tracks by professional fishers and oyster farmers 4.3.4

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