

WAMBERAL LAGOON NATURE RESERVE

PLAN OF MANAGEMENT

NSW National Parks and Wildlife Service

March 1993

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Photograph kindly provided by Alan Henderson.

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FOREWORD

Wamberal Lagoon Nature Reserve is located on the Central Coast of NSW approximately 10km east of Gosford between the regional centres of Terrigal and The Entrance. The nature reserve encompasses one of the best remaining examples of coastal lagoon, wetland and barrier dune on the Central Coast. Stands of undisturbed littoral rainforest, present in only a few other areas of the Central Coast, are also found in the reserve.

Since over 90% of the catchment of Wamberal Lagoon lies outside the nature reserve, protection of the lagoon depends, in particular, on the co-operation of neighbours and Gosford City Council. Accordingly the formation of a Catchment Management Committee for Wamberal Lagoon is proposed to reduce the impact of human land-use on the natural heritage of the nature reserve.

The continued implementation of a programme of weed control involving volunteers is an important aspect of the management of the nature reserve. At present, the programme is directed at the control of bitou bush, but will be progressively extended to other weed species. Maintenance of the dune protection works undertaken over recent years in the nature reserve is also an important management programme.

The area was dedicated as a nature reserve in 1981 for its environmental educational value. The Service will therefore promote the use of the nature reserve for low impact environmental education use. A priority list of research proposals including studies of the hydrological regimes of the reserve, sedimentation rates, productivity, water quality and nutrient status of the lagoon is proposed as a guide to any individual or institution undertaking scientific work on the nature reserve. This schedule will be regularly reviewed.

Limited opportunities for low impact recreational use of the lagoon and beach units of the nature reserve are also provided for in this plan of management.

This plan of management establishes the scheme of operations for Wamberal Lagoon Nature Reserve. In accordance with the provisions of Section 75 of the National Parks and Wildlife Act, 1974, this plan of management is hereby adopted.

CHRIS HARTCHER

Minister for the
Environment
30 December 1992

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1. INTRODUCTION

The National Parks and Wildlife Act, 1974, 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.

The procedures for the adoption of a plan of management for a nature reserve are specified in the Act:

When a plan of management has been prepared, the Director refers the plan to the National Parks and Wildlife Advisory Council for its consideration and advice.

The Director then submits the plan to the Minister, together with any comments or suggestions of the Advisory Council.

The Minister may adopt the plan without alteration or with such alterations as he may think fit, or may refer it back to the Director and the Council for further consideration.

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

Although not a requirement under the Act, a plan of management for Wamberal Lagoon Nature Reserve was placed on public exhibition for three months during June, July and August 1991, for comment on the proposals it contained. The plan of management attracted 23 representations covering 13 issues. All comments received were referred, along with the plan, to the National Parks and Wildlife Advisory Council for its consideration and advice. The comments and suggestions of the Advisory Council were, in turn, considered by the Minister in adopting this plan.

For simplicity, much background information has been omitted from the plan. Anyone who would like additional information on the plan or the management of the nature reserve can contact:

Central Coast District,
National Parks and Wildlife Service,
168 Mann Street,
Gosford

or by phone on (043) 24 4911.

Copies of all representations received during the public exhibition of the plan will be available for inspection at the Central Coast District Office of the Service for a period of 2 months after the adoption of the plan by the Minister.

2. MANAGEMENT CONTEXT

2.1 NATURE RESERVES IN NEW SOUTH WALES

The concept of reserving areas to include nature conservation as a general purpose was introduced into Australia with the establishment of Royal National Park in 1879, some seven years after the world's first national park was created at Yellowstone in the United States of America. Fauna reserves were first established under the Fauna Protection Act of 1948 which was replaced by the National Parks and Wildlife Act of 1967. By the latter Act Fauna Reserves were formally reclassified as nature reserves. The 1967 Act has been replaced by the National Parks and Wildlife Act, 1974.

Under the 1974 Act, nature reserves are areas of special scientific interest containing wildlife or natural environments or natural phenomena.

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'.

Nature reserves differ from national parks which include as a major objective the provision of opportunities for outdoor recreation.

2.2. WAMBERAL LAGOON NATURE RESERVE

2.2.1 Location and Regional Setting

Wamberal Lagoon Nature Reserve covers an area of 132.2 ha and contains a coastal lagoon and associated dune system. The reserve is situated on the Central Coast approximately 10km east of Gosford between the tourist centres of Terrigal and The Entrance. It is surrounded by residential land.

The nature reserve was dedicated in 1981 primarily as an educational resource for the study of coastal environments. Recent additions have extended the reserve to the north-east to include Wamberal Point and part of Forresters Beach and to the north-west along The Entrance Road. The reserve is abutted on three sides by residential and semi-urban land-use.

2.2.2 Importance of the Reserve

Coastal lagoons are an important feature of the NSW eastern seaboard where post Ice Age rises in sea level and subsequent oscillations have produced a coastline still adjusting to a semi-equilibrium. There are, however, very few coastal lagoons in NSW that have not been severely modified by settlement, mining or other forms of development. Only a handful on the north coast and even fewer south of Sydney that lie within national parks have a catchment that is totally protected.

None on the Central Coast between Sydney and Newcastle remain in a natural state, but Wamberal Lagoon has perhaps the best preserved lagoon and sand dune/beach system despite having a catchment largely modified by settlement.

Wamberal Lagoon is a small, simple (one dune crest) but dynamic coastal feature. It will be valuable for the study of any changes in sea level generated by the greenhouse effect and/or any other cause and the impact of these on a natural beach, dune and lagoon system. Fluctuations in the sea level may have the effect of permanently raising the water table of the lagoon and adjacent lands.

Wamberal Lagoon Nature Reserve lends itself to such studies because it is a relatively unmodified biophysical system and is a protected area with long term stability in land use.

Wamberal Lagoon demonstrates a relatively unmodified example of beach vegetation succession on the central coast. A cross section of the vegetation shows three zones - pioneer (characterised by spinifex and pigface); stabiliser (teatree and banksia) and climax (tuckeroo, cabbage tree palm and lillypilly) between the beach edge to about halfway through the dune.

There is similarly a succession from the lagoon up the backslope of the dune which is characterised by swamp oaks and reeds, broad leafed paperbarks with undershrubs and stiff leafed paperbarks with a clear understorey which lies to the west of the climax tuckeroo community.

The nature reserve contains a developed hydrosere community and a limited area of open forest on sandstone.

Because of its small area and the adjacent residential landuse, the nature reserve does not support a significant mammal population. It is however, regionally significant for migratory birds and one species of reptile listed as endangered on Schedule 12 of the National Parks and Wildlife Act has been recorded in the reserve.

Two areas mapped as SEPP 14 (Wetlands) plus a small area of littoral rainforest (subject to SEPP 26) are included in the nature reserve. Gosford City Council has identified a number of sites within the catchment of Wamberal Lagoon as SEPP 19 (Urban Bushland) areas.

Wamberal Lagoon Nature Reserve is totally encompassed within an urban growth area. To the north, west and south lie residential developments and the beach is to all intents and purposes urban open space. The population of the Gosford area is expanding rapidly, and such growth presents management issues for the nature reserve such as siltation, increased recreational demands, water quality deterioration and changing community attitudes towards the area.

The bed of the lagoon is included in the nature reserve whereas the waters of the lagoon are the responsibility of the Maritime Services Board with respect to boating and NSW Fisheries with respect to fishing. Land on the beach below high water mark is vested in Gosford city Council.

Gosford City Council monitors water quality in the swimming area of the lagoon for total and faecal coliforms. Council will open the lagoon if the coliform counts indicate a threat to human health or where low lying properties adjacent to the lagoon may be flooded.

Wamberal Lagoon Nature Reserve is the best remaining example of a coastal lagoon wetland and barrier dune on the Central Coast. Similar environments along the Central Coast have been substantially altered through housing developments and mining operations. The significance of Wamberal Lagoon Nature Reserve is summarised as follows:

Regional significance. The reserve:

provides opportunities for the study of a relatively unmodified coastal lagoon, its sand dune and beach system and the processes of coastal erosion;

provides opportunities for the study of a relatively unmodified succession of coastal beach and sand dune vegetation and of coastal lagoon and sandspit vegetation.

protects wetlands listed under State Environmental Planning Policy 14 and littoral rainforest communities; and

protects the habitat of a number of species identified in international treaties for the protection of migratory birds and their habitat;

Local Significance. The nature reserve:

is one of a system of refuge areas for native plant and animal communities within the highly modified rural and urban Central Coast;

protects the scenic amenity of the lagoon and its naturally vegetated foredune and sandspit;

protects the habitat of at least one species of endangered native animal identified in Schedule 12 of the National Parks and Wildlife Act;

provides opportunities for local schools and other educational institutions for outdoor environmental education programmes; and

provides limited opportunities for low impact outdoor recreation.

3. OBJECTIVES OF MANAGEMENT

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

the protection and preservation of scenic and natural features;

the maintenance of natural processes as far as is possible;

the conservation of wildlife;

the preservation of Aboriginal sites and historic features; and

the encouragement of scientific and educational enquiry into environmental features and processes.

In addition to those general objectives the following specific objectives apply to Wamberal Lagoon Nature Reserve:

to protect the natural condition of those parts of Wamberal Lagoon and sandspit within the nature reserve for the primary purpose of promoting low impact environmental education use;

to promote appropriate land use planning and management amongst neighbours of the nature reserve and other land use authorities which will afford the highest practicable protection for the natural condition of Wamberal Lagoon; and

to permit limited opportunities for low impact recreational use of the lagoon and beach units of the nature reserve.

4. POLICIES AND FRAMEWORK FOR MANAGEMENT

This section contains the policies and framework for management of Wamberal Lagoon Nature Reserve together with brief, relevant background information. Policies are summarised under the following headings:

- natural heritage;
- cultural heritage; and
- use of the area.

The policies established in this plan of management will provide the framework for management consistent with anticipated resources available to the Service for the next 5 to 10 years. The actions identified have been allocated broad priorities. Other management actions may be developed over the life span of this plan consistent with the policies set out in the plan.

4.1 NATURAL HERITAGE

4.1.1 Landforms and Coastal Processes

The natural factors which helped form the lagoon began about 15 000 years ago and lasted to approximately 3 000 years ago. During the period 15 000 to 6 000 years ago, the sea level along the south coast of Australia is estimated to have risen 120 metres. This rise in sea level brought the coastline approximately 20 kilometres west, inundating the coastal shelf that existed under Ice Age conditions.

As the oceans rose, massive quantities of marine sediment were moved shorewards by the action of wind, wave and current. These deposits were the product of erosion and deposition by ancient rivers and creeks that flowed across the now submerged continental shelf during periods of low sea levels.

With stabilisation of the ocean level, the continuing action of wave, wind and current led to a steady build up of the available marine sands at the newly established shore line. This formed the basic pattern of today's coastal sand deposits and the barrier dune; trapping water behind it and creating a lagoon between the dune and the mainland.

The deposition of sediments in the lagoon is a continuing process. Proposals that the lagoon should be dredged will not be taken up since there is no evidence that this would achieve any desirable results either in terms of flood mitigation or removal of sediment and pollutants.

Policies

The natural condition of the beach, sand dune and the lagoon system of Wamberal Lagoon will be protected for

the purposes of monitoring the impact, of changes in sea level.

The study of the landforms of Wamberal Lagoon and of the geomorphological processes which have formed them, and are continuing to modify them, will be encouraged.

4.1.2 Water Quality

Wamberal Lagoon Nature Reserve lies totally within its own small catchment but shares it with urban and intensive agricultural development. Virtually all the catchment is outside the nature reserve and this gives rise to major difficulties of management particularly with respect to flooding, siltation and nutrient enhancement. This has severe impacts on the reserve and the objective of maintaining natural processes within the nature reserve. Management of the water quality of the lagoon depends largely on the co-operation of Gosford City Council and neighbours.

Gosford City Council acknowledged their management responsibilities for the catchment in their October 1987 study "Wamberal Lagoon Catchment Study". This document is the basis for conditions now imposed on development in the lagoon catchment area with the intention of protecting the lagoon system.

The main long term pollution problem facing the lagoon is siltation caused by development in the catchment. Gosford City Council has installed silt and nutrient traps at three discharge locations to the lagoon with the aim of reducing siltation and nutrient loading. The residential areas of Forresters Beach have been provided with reticulated sewer and properties are being steadily connected, thus alleviating the problems of septic overflow and consequent nutrient enrichment of the lagoon.

Problems from urban runoff and septic overflow are most acute after heavy rain when inputs to the lagoon are highest and the buffering capacity of wetland vegetation lowest.

In 1968 following the flooding of several houses, Gosford City Council established a flood marker under Section 32A of the Local Government Act 1919. Approval was also given by the Department of Public Works and NSW Fisheries for Council to open mechanically the lagoon once the water level rises above 2.35m AHD (Australian Height Datum). Prior to the dedication of the reserve the Service agreed to the opening of the lagoon to prevent flooding of low lying residential areas.

Results of a March 1983 study when the lagoon was allowed to rise above the present flood mark, showed a lower degree of inundation of low lying areas than predicted.

Stormwater back-up in drains was also lower than expected. It may therefore be possible to raise the flood marker height between 150-300mm above the present level and still pose no threat to low lying areas. This would then endure an optimum flushing head when the lagoon is opened thus facilitating silt removal. This in turn would reduce the associated problems of eutrophication of the lagoon.

The practice of opening the lagoon for public health and flood mitigation purposes, however, is an activity under the Environmental Planning and Assessment Act. Since the land is dedicated as part of the nature reserve, the Director is the determining authority for any proposal to open the lagoon.

The Catchment Management Act came into effect in 1989. Total Catchment Management provides an umbrella framework to aim for amongst other matters, 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 Committees at a local level.

The area of the catchment for Wamberal Lagoon is outlined on Map 1.

Policies

The formation of a Catchment Management Committee for Wamberal Lagoon will be promoted so as to reduce the impacts on the nature reserve that may arise from human activities within the catchment. The Catchment Management Plan for Wamberal Lagoon will address (amongst other objectives):

the impact of sea level rises on the water table of the lagoon and nearby urban areas resulting from the warming of the planet;

the impact of diffuse pollution into the lagoon;

the establishment of a new flood marker (if warranted) which takes into account both the conservation of the natural features and processes of the lagoon and the protection of the surrounding residential areas; and

guidelines whereby recreational use of part of the lagoon may be managed, including closure of the lagoon in the event of high levels of pollution. Such a review will address under what conditions the lagoon will be opened in the interests of public health and flood mitigation.

Water quality will be maintained to enable natural biological processes to function within the lagoon.

The Service will liaise with local government and other authorities to maintain and improve water quality of the lagoon.

Land use zoning and development in the lagoon catchment which is compatible with the management objectives of the nature reserve will be encouraged.

Retention of native vegetation especially swamp communities which retain and filter water within the catchment will be encouraged wherever possible.

Preservation of the natural drainage network will be encouraged.

Community education into the benefits of catchment control measures will be promoted.

Research by government departments and educational institutions will be encouraged and directed to:

- past and present sedimentation rates;
- water quality during and after rainfall; and
- the catchment drainage system.

Action

The Service will promote the establishment of a Catchment Management Committee with the aim protecting the catchment of Wamberal Lagoon.

4.1.3 Soils and Native Plants

The soils in the nature reserve are of two types - those derived from Holocene and Pleistocene marine sands and those originating from the horizontally bedded shales and sandstones on Wamberal Point.

The long term stability of the sand dune depends on the maintenance of vegetation cover. Loss of vegetation on the seaward side of the dune through tramping and other disturbance has led to instability in places. Sand stabilisation in the large blowout at the southern end of the reserve was carried out by Gosford City Council prior to dedication of the nature reserve. Further stabilisation in this area and other locations has been carried out by the Service with advice from the Soil Conservation Service. In 1985, the Soil Conservation Service commenced trial plantings of coastal fescue seed in the reserve, to record the growth of the species and its usefulness as a sand stabiliser.

Wamberal Lagoon Nature Reserve is characterised by a wide variety of plant communities and habitats and a rich diversity of species. Vegetation types include littoral rainforest, *Banksia* scrub, heath, *Melaleuca* woodland and heath, sedgeland and saltmarsh. Because of the small size of the reserve, many of these communities cover only a limited area.

The vegetation on the Wamberal Lagoon sand dunes is an excellent example of an environmental gradient where zonations of vegetation reflect different environmental factors. The plant zones between the lagoon and the sea are basically the result of two soil complexes - that derived from marine sands and that derived from the underlying country rock.

On top of the dune face the first plant zone encountered contains mainly the hairy spinifex grass *Spinifex hirsutus*, and a perennial *Lomandra longifolia*. Both are xerophytes, plants able to survive periods of water stress by having long and stoloniferous root systems which enables them to tap the deeper moisture levels. The desiccating south-easterly winds and the low water retaining ability of the beach sands keep the upper levels of the soil dry. The plants in this zone also tolerate sand blasting and high salt from the on-shore winds. Dune soils are deep sands relatively free of any visible humus material but are also very alkaline with pH values up to 8.0.

Further inland the vegetation changes to a zone consisting mainly of *Leptospermum laevigatum* and *Banksia integrifolia*. This plant zone receives less sand blasting and sea spray and the soils contain considerably more humus. More moisture is retained in the soil and it is less alkaline. However the plants are still xerophytic and are able to tolerate periods of moisture stress.

The third major zone on the marine sand complex contains mesophytic plants that cannot survive conditions of long water stress. This community includes littoral rainforest species and is dominated by tuckeroo *Cupaniopsis anacardioides*. Here the wind effect and salt spray is almost negligible because this zone is protected from the on shore winds by the sand dunes and seaward vegetation. Soils in this zone show distinct formation of horizons, a high humus content and a neutral pH value of 6.5.

The hydrosere communities of Wamberal Lagoon comprise continually wet reedbeds (*Lepironia* sp.; *Eleocharis* sp.); partially dry reedbeds (*Juncus* sp.; *Phragmites* sp.); tea tree scrub (*Leptospermum* sp.; *Melaleuca quinquinerva*); swamp forest (*Casuarina glauca*, *Eucalyptus robusta*) and saltmarsh.

The swampland in the north of the nature reserve is dominated by *Baumea* sp. and *Lepidosperma* sp.

Vegetation on the sandstone outcrops is dominated by *Eucalyptus botryoides*, *Angophora costata* and *Banksia serrata*.

Interesting species recorded include two species of *Syzygium*, (lillypilly), one of which *S. paniculatum*, is endangered and is only known in the Central Coast Region from The Entrance North, the Budgewoi area and the upper reaches of Ourimbah Creek.

Other interesting species include *Wilsonia backhousei*, a southern Australian saltmarsh species previously known no further north than Port Jackson and *Lindsaea dimorpha*, a small fern of sporadic occurrence recorded in Brisbane Water National Park but subsequently destroyed during freeway construction.

Policies

The sand dune system will be protected from any disturbance which threatens long term stability.

Sand dune stabilisation works will be maintained in accordance with the guide-lines prepared by the Soil Conservation Service.

The condition of blowouts on the dune will be monitored and action taken as required to repair new sand erosion events.

The management of native plant communities will aim to preserve the wide distribution of floristic and structural types and age classes.

Rare and endangered species and plant communities of limited distribution, in particular the littoral rainforest, will be protected.

The botanical significance of the reserve will be assessed as part of a vegetation survey to assist management of the reserve and for use in environmental education programs.

Disturbance to known habitats of endangered species by park visitors or management works will be avoided by ensuring no works are undertaken in these areas.

Action

Dune fencing and replanting programmes will continue.

4.1.4 Native Animals

The nature reserve is of limited significance for mammals because of its small size and the pressures, such as dogs, cats, pollution and recreational use, which derive from the surrounding residential lands. The area is, however, locally important for bird life and accordingly adds considerably to the amenity of the urban landscape.

One species of endangered fauna, the diamond python (*Python spilotes*), listed in Schedule 12 of the National Parks and Wildlife Act, has been recorded in the reserve.

Seven species of birds identified in one or more international treaties for the protection of migratory birds and their habitat have been recorded in the reserve. These are:

- great egret (*Egretta alba*)
- Pacific golden plover (*Pluvialis fulva*)
- Latham's snipe (*Gallinago hardwickii*)
- bar-tailed godwit (*Limosa lapponica*)
- red-necked stint (*Calidris ruficollis*)
- curlew sandpiper (*Calidris ferruginea*)
- white-bellied sea eagle (*Haliaeetus leucogaster*)

A detailed survey of the importance of the reserve to these species has not been undertaken. A comprehensive survey covering other vertebrates and invertebrates has yet to be done.

Policies

Scientific research into native animals using the lagoon will be encouraged and the significance of the lagoon's habitat in a regional context determined.

Fauna surveys of the nature reserve will be prepared to assist management and for use in environmental education programmes.

Gosford City Council will be encouraged to maintain areas of native vegetation suitable for wildlife corridors within close proximity to the reserve.

4.1.5 Introduced Species

For the purpose of this plan of management, an introduced species is defined as any plant or animal not native to the reserve.

The introduced plants of concern in Wamberal Lagoon Nature Reserve are:

bitou bush	<i>Chrysanthemoides monilifera</i>
lantana	<i>Lantana camara</i>
asparagus fern	<i>Asparagus setaceus, Asparagus sprengeri</i>
cassia	<i>Cassia coluteoides</i>
camphor laurel	<i>Cinnamomum camphor</i>
polygala	<i>Polygala virgata</i>

A volunteer group from the Wamberal Lagoon Conservation Society removes bitou bush from the reserve on a regular basis in accordance with a program drawn up by the District.

The main introduced animal species of concern are domestic dogs (*Canis familiaris*) and the European fox (*Vulpes vulpes*). Rabbit (*Oryctolagus cuniculus*) colonies are found to the west of the nature reserve in Wamberal Cemetery, but no evidence of their presence has been found in the reserve.

Horses are not permitted in the nature reserve, including the lagoon, for health as well as nutrient enrichment and weed dispersal reasons. Previously, race horses were exercised in the lagoon, but this practice is now prohibited.

In many parts of the reserve the dominant understorey is lantana. It is recognised that in the absence of any other ground cover, this species has a stabilising effect on the sand dunes. Removal of the lantana must be a gradual process to encourage regrowth of native plants.

Policies

Measures will be taken to control and where practicable eliminate introduced species with priority to those which:

- conflict with natural resources;
- have a high capacity for dispersal; and/or
- are new isolated occurrences.

Control of introduced species will only be by techniques that cause minimal disturbance to the environment.

Only plant species endemic to Wamberal Lagoon will be used in landscaping and revegetation work. As far as possible plant material will be propagated from communities within the area to be treated.

Actions

The current bitou bush control program utilising volunteer workers will continue and be extended as part of a District wide bitou bush removal programme.

The distribution and density of species likely to cause significant environmental damage will be mapped and monitored and programmes prepared for their control.

Domestic dogs and horses will not be permitted in the reserve with the exception of guide dogs for the blind.

Signs prohibiting dogs and horses in the nature reserve will be installed at all park entry points.

4.1.6 Fire

Fire is a major factor in the Australian environment. Little is known about the long term fire history of the reserve, but it is considered to be, under natural conditions, a rare occurrence.

A small fire occurred in the southern end of the reserve, between the blowout and halfway rocks, in November 1989. A major fire occurred in 1991 which burnt much of the reserve between Halfway Rocks and Wamberal Point.

Wamberal Lagoon Nature Reserve is subject to the Central Coast District Fire Management Plan. The district fire management plan provides that in the nature reserve:

- Wildfire will be excluded from the nature reserve.
- Strategic fuel reduction will be generally carried out via mechanical and/or manual means with the following exceptions:
 - Prescribed fire may be used to protect properties in the Forresters Beach area of the reserve; and
 - Prescribed fire may be used to maintain a mosaic of age classes within *Banksia* and *Leptospermum* woodland and heath communities.
- The minimum interval between fire events for all vegetation communities will be at least ten years.
- High priority will be given to the protection of fore dunes from all fires.

The Service will co-operate with the Gosford District Fire Protection Committee and liaise with adjoining landowners to prevent and suppress fire in and adjacent to Wamberal Lagoon Nature Reserve.

Policies

Fire management in Wamberal Lagoon Nature Reserve

Will aim to:

protect human life and property;

maintain species and habitat diversity;

protect rare species and fire sensitive plant communities, particularly littoral rainforest;

protect cultural resources and recreation facilities;

control public use of fires;

attain the co-operation of Gosford City Council, other land use authorities, neighbouring landholders, and reserve users; and

encourage research into fire.

Unscheduled fires in the reserve will be extinguished as soon as possible.

Actions

Wamberal Lagoon Nature Reserve will be managed in accordance with the Central Coast District Fire Management Plan.

Fires will only be permitted in authorised fireplaces along Remembrance Drive.

Hazard reduction around the perimeter of the reserve will, with the exception immediately below, be by clearing of a break behind adjoining properties. Property owners will be encouraged to maintain these fire breaks.

Prescribed fire may be used to protect properties in the Forresters Beach area of the reserve.

4.2 CULTURAL HERITAGE

Aboriginal sites consisting of middens and two burial sites have been located at Spoon Bay and Wamberal Beach respectively. Measures to prevent damage to these sites have been carried out and regular inspections are undertaken to monitor them. Their presence suggests that other sites could be found in the area.

To date, no European sites or places of historic value have been located in the nature reserve.

Policies

Aboriginal sites will be managed in consultation with the Local Aboriginal Land Council.

Any Aboriginal sites or sites of European significance when found will be recorded and protected where appropriate.

Any development in the nature reserve which involves disturbance of the ground surface will be preceded by an assessment of the likely impact on Aboriginal sites.

Regular monitoring of known sites for signs of deterioration will be undertaken and protective works carried out as required.

4.3 USE OF THE RESERVE

It is an important aspect of the management of Wamberal Lagoon Nature Reserve to ensure that its use - whether by the general public, special interest groups, Service managers or other authorities - is appropriate, i.e., in conformity with the Act and the management objectives and policies of this plan of management.

The major categories of use that can be appropriate to varying degrees on Service areas are: certain types of recreation:

education and promotion of the area, the Service and the conservation of its natural and cultural heritage;

research; and

management operations, by the Service itself and other authorities with statutory responsibilities in the area.

The extent to which these categories of use are appropriate to Wamberal Lagoon Nature Reserve is indicated below:

4.3.1 Environmental Education and Promotion of the Area

The nature reserve is used widely by local school and other educational groups who study a range of environmental topics. Studies on coastal succession and ecological diversity are especially popular because of the clear vegetation zonation displayed in the reserve.

Policies

The use of the nature reserve for environmental education purposes will be subject to an Environmental Education

Programme prepared in conjunction with education authorities.

Use of the nature reserve by school groups will require prior notification by schools to the District Manager.

Limits on the size and number of school groups using the nature reserve may be imposed where unacceptable impact on the nature reserve occurs.

Walking tracks for the purposes of the Environmental Education Programme will not be constructed on the sand dune area. Walking tracks for such purposes may be provided through sandstone vegetation on the western side of the lagoon, through fringing wetland vegetation and the paper bark community at the rear of the sand dunes.

The use of the nature reserve for tertiary studies will be encouraged.

4.3.2 Research

Central Coast District is currently finalising a priority list of research proposals with the aim of canvassing them with relevant institutions. These include studies of the hydrological regimes of the reserve, sedimentation rates, productivity, water quality and nutrient status of the lagoon. Also of interest are lagoon bed core sampling for vegetation history, Aboriginal site surveys and surveys of native plant and animal communities.

Policy

A priority listing of research and survey projects will be prepared by the district as a guide to any individual or institution undertaking scientific work on the nature reserve. This schedule will be regularly reviewed.

4.3.3 Recreation opportunities

Wamberal Lagoon Nature Reserve was dedicated primarily for environmental education purposes. However, because of its location within an urban area, some recreational use of the nature reserve does occur although such use is water, rather than land based. The surfing beaches are not dedicated as part of the nature reserve. Swimming is permitted in the lagoon near Remembrance Drive and a walking track and boardwalk give access to the beach at Spoon Bay. Popular activities in the reserve include swimming, surfing, sunbathing, sailing, windsurfing, canoeing, walking, running, picnicking, birdwatching, photography, fishing and educational pursuits. A seasonal ranger programme takes place each year during school holidays.

There are no facilities for the launching of power boats onto the lagoon. Recreational use of the sand dune areas is not permitted.

Policies

Minimal impact, passive recreation activities will be permitted provided no damage is caused to the natural condition of the reserve.

The co-operation of other authorities will be sought in the management of recreation in a manner consistent with this plan of management.

The seasonal ranger program will continue each year.

An information sheet will continue to be produced to encourage understanding and appreciation of the reserve and the impact of humans on the natural environment.

Access for the launching of power craft into the lagoon will not be provided. The co-operation of the Waterways Authority and Gosford City Council will be sought to formalise the prohibition of power boats and ski-jets on the lagoon.

4.3.4 Management Use

There are no leases, licences or other occupancies in Wamberal Lagoon Nature Reserve issued under the National Parks and Wildlife Act.

Dune rehabilitation works involving dune fencing have recently been completed.

Recent additions (1992) to the nature reserve pose further management problems, including boundary identification, encroachments and protection of plant and animal communities within the new areas. To clearly establish the boundary of the nature reserve, it is proposed to fence the new boundary in strategic locations.

Policy

No lease, licence or other form of occupancy will be issued over any part of Wamberal Lagoon Nature Reserve unless it is in accordance with the purposes of nature reserves as outlined in the National Parks and Wildlife Act and with this plan of management.

Action

Fencing will be erected at strategic locations along the new boundary to protect the nature reserve.

5. PLAN IMPLEMENTATION

This plan of management is part of a system of management developed by the Service. The system includes the National Parks and Wildlife Act, management policies, established conservation and recreation philosophies and strategic planning at corporate, regional and district levels.

The orderly implementation of this plan of management will be undertaken within the annual programmes of the Service's Central Coast District. Priorities, determined in the context of district and regional strategic planning, will be subject to the availability of necessary staff and funds and to any special requirements of the Minister or Director.

District programmes are subject to on-going review, within which, works and other activities carried out at Wamberal Lagoon 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 from planning to implementation, and any necessary investigations undertaken in accordance with established environmental assessment procedures.

Under Section 81 of the National Parks and Wildlife Act. 1974, this plan shall be carried out and given effect to by the Director and no operations can be undertaken within Wamberal Lagoon Nature Reserve except in accordance with the plan. However, if after adequate investigation, operations not included in the plan are found to be justified, this plan will be amended in accordance with Section 76(6) of the Act.

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

ACTION	PLAN REFERENCE	PRIORITY
maintain sand dune stabilisation, dune fencing and dune replanting	4.1.1	High
produce vegetation survey and report	4.1.3	High
continue bitou bush control programme	4.1.5	High
promote community awareness of catchment management and lagoon systems	4.1.2	High
protect habitats of endangered plant species from disturbance	4.1.3	High

promote the formation of a Catchment Management Committee for Wamberal Lagoon	4.1.2	High
liaise with the Waterways Authority and Gosford City Council re the prohibition of power boats and ski-jets on the lagoon	4.3.3	High
extend introduced species control programme to cover additional species	4.1.5	Medium
develop interpretation program and install signs at appropriate locations	4.3.1	Medium
record and monitor Aboriginal sites as required by Service policy	4.2	Medium
carry out hazard reduction programmes as required by the Fire Management Plan	4.1.6	Medium
undertake strategic fencing along the boundary of the new additions	4.3.4	Low
prepare a list of preferred research projects for the nature reserve and circulate to relevant education organisations	4.3.2	Low

6. SELECTED REFERENCES

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