WOOYUNG NATURE RESERVE

PLAN OF MANAGEMENT

NSW National Parks and Wildlife Service

Part of the Department of Environment and Climate Change NSW

September 2007

This plan of management was adopted by the Minister for Climate Change, Environment and Water on 5th September 2007.

ACKNOWLEDGMENTS

This plan of management is based on a draft plan prepared by staff of the Northern Rivers Region of NPWS and Southern Cross University student Victor Hanardi, with the assistance of the Northern Directorate planning group.

Valuable information and comments were provided by NPWS specialists and members of the local community, including:

- The Northern Rivers Region Advisory Committee
- Local Aboriginal community members and the Tweed Local Aboriginal Land Council;
- Park neighbours and stakeholders; and
- Other government agencies, including NSW Fisheries and Tweed Shire Council.

Inquiries about Wooyung Nature Reserve should be directed to the NPWS Tweed Area Office, PO Box 5081, South Murwillumbah, NSW, 2484 or by telephone on (02) 6672 6360.

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FOREWORD

Wooyung Nature Reserve is located on the far north coast of New South Wales between Pottsville and Wooyung. The reserve consists of 87 hectares of coastal land bisected by the Tweed Coast Road. It includes approximately 2.5 kilometres of Mooball Beach and Wooyung Beach.

Wooyung Nature Reserve contains littoral rainforest, lowland rainforest on floodplain, coastal wetland and coastal dune vegetation communities. The reserve lies in an area characterised by high species diversity. The coastal lowlands of the region also provide important wintering grounds for altitudinal and latitudinal migratory fauna.

Most recreational use of the reserve is concentrated on Mooball Beach. Popular activities include fishing, walking and bird watching.

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

A draft plan of management for Wooyung Nature Reserve was placed on public exhibition from 18th June until 20th September 2004. The submissions received were carefully considered before adopting this plan.

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

Phil Koperberg
Minister for Climate Change, Environment and Water

1. MANAGEMENT CONTEXT

1.1 LEGISLATIVE AND POLICY FRAMEWORK

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 *Threatened Species Conservation Act 1995* (TSC Act) and 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 are compiled from the legislative background, the corporate goals of the Service 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 environmental impacts of any works proposed in this plan.

The plan of management is a statutory document under the NPW Act. Once the Minister has adopted a plan, no operations may be undertaken within the planning area except in accordance with the plan. The plan will also apply to any future additions to the planning area. If after adequate investigation, operations not included in the plan are found to be justified, the plan may be amended in accordance with section 73(B) of the NPW Act.

1.2 MANAGEMENT PURPOSES AND PRINCIPLES

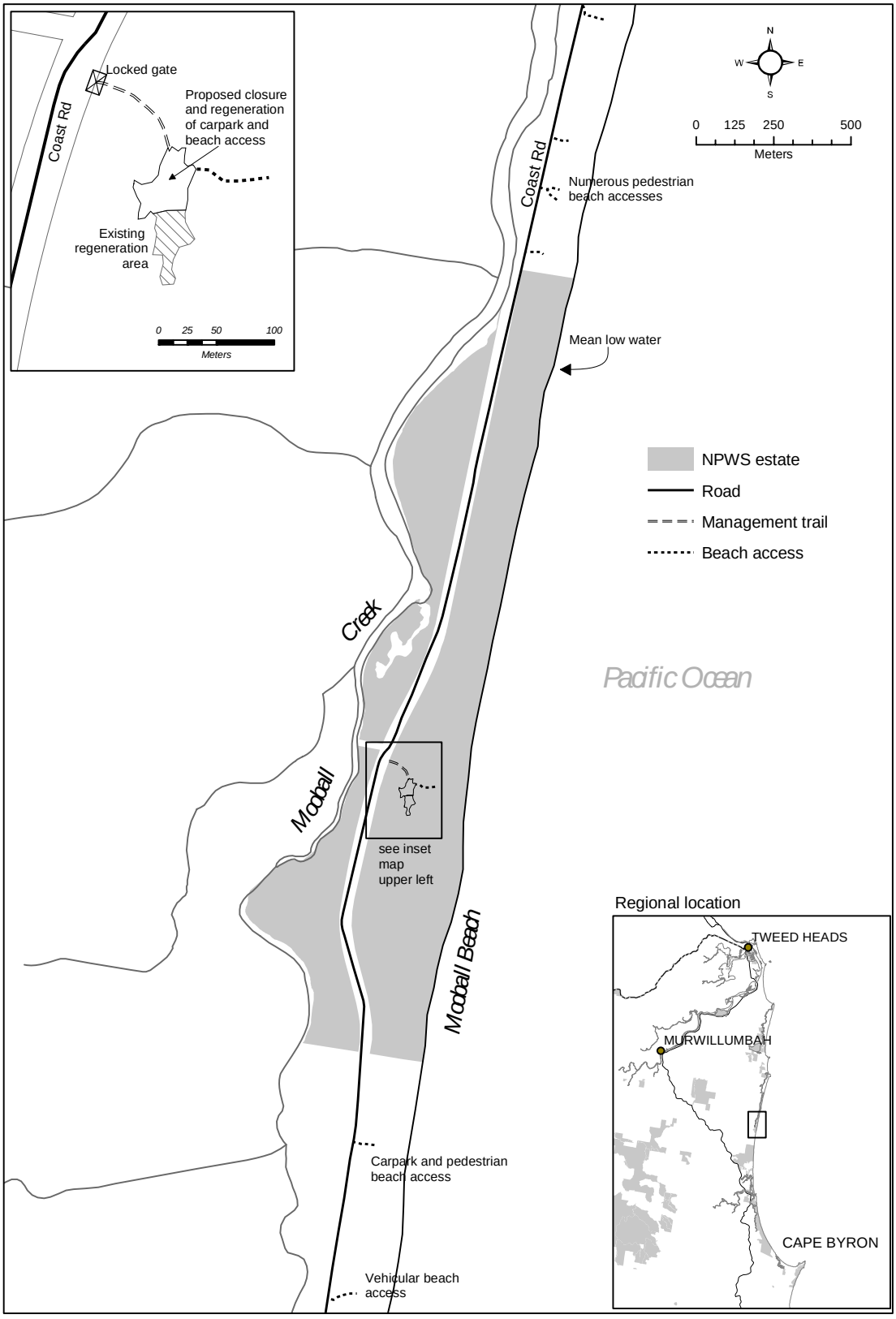
Nature reserves are reserved under the NPW Act to protect and conserve areas containing outstanding, unique or representative ecosystems, species, communities or natural phenomena.

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.

Figure 1. Site map and location of Wooyung Nature Reserve



2. WOOYUNG NATURE RESERVE

2.1 LOCATION, GAZETTAL AND REGIONAL SETTING

Wooyung Nature Reserve (referred to hereafter as 'the reserve') is located on the far north coast of NSW between Pottsville to the north and the locality of Wooyung to the south (Figure 1). The reserve consists of 87 hectares of coastal land bisected by the Tweed Coast Road. Mooball Creek constitutes the reserve's western boundary, while the eastern boundary is the mean low water mark of the South Pacific Ocean along approximately 2.5km of Mooball Beach and Wooyung Beach.

The reserve was gazetted as a nature reserve on 1st January 1999. The reserve was named as Wooyung Nature Reserve due to its proximity to the township of Wooyung as well as the part inclusion of Wooyung Beach within the boundaries of the reserve. In the Bundjalung language the word 'wooyung' means 'slow'. Prior to its gazettal, the reserve was known as Mooball Beach Reserve and was Crown land managed in trust by Tweed Shire Council.

The reserve lies within the McPherson-McLeay Overlap Zone, an area characterised by high species diversity and containing an overlap of both Bassian (northern) and Torresian (south-eastern) species close to the extent of their range (Burbidge 1960). The coastal lowlands of the region also provide important over-wintering grounds for altitudinal and latitudinal migratory fauna (Milledge 1986).

The reserve lies close to the southern boundary of Tweed Shire, an area subject to increasing population and development pressure. Land uses surrounding the reserve include grazing lands, sugar cane fields and Crown reserves for public recreation and environmental protection. A corridor of vegetation stretches southwards to Billinudgel Nature Reserve and northwards to Pottsville.

Wooyung Nature Reserve, as well as other coastal reserves like Billinudgel and Cudgen Nature Reserves, conserves important coastal landscapes, remnant vegetation, and wildlife habitat in a region subject to considerable pressures from agricultural, residential, infrastructure and tourism development.

2.2 LANDSCAPE CONTEXT

Natural and cultural heritage and on-going use 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 the environment through recreational use, cultural practices, the presence of introduced plants and animals and in some cases air and water pollution.

The geology, landform, climate and plant and animal communities of the reserve, plus its location, have determined how it has been used by both the indigenous and non-indigenous community. In recent times the land was a popular coastal recreation area for the local community until the 1960s and 1970s when the area was mined for mineral sands. The reserve is now an important part of the landscape

value of the Tweed coast and is of particular scenic and passive recreational value to nearby rural and urban areas.

Both Aboriginal and non-Aboriginal people place cultural values on natural areas, including aesthetic, social, spiritual, recreational and other values. Cultural values may be attached to the landscape as a whole or to individual components, for example to plant and animal species used by Aboriginal people. This plan of management aims to conserve both natural and cultural values. For reasons of clarity and document usefulness natural and cultural heritage, non-human threats and on-going use are dealt with individually, but their inter-relationships are recognised.

2.3 NATURAL AND CULTURAL HERITAGE

Landform, Geology and Soils

The coastline on which the reserve lies is subject to long-term coastal erosion (Roy 1975). The shape of the shoreline reflects the dominant south-easterly swell conditions which bend around Cape Byron and Julian Rocks to form the hooked shape of the Byron coast, and the open zeta-form beach stretching to the north (Graham 2001).

The geology of the reserve mainly consists of marine sediments deposited during the last sea level rise which ended some 6000 years ago (Gordon *et al.*1978). The western portion of the reserve lies upon fluvial and tidal sediments deposited by Mooball Creek, an interbarrier creek lying between the outer barrier sands and the inner barrier coastal plain lying to the west of the reserve. The geology of the area is currently being revised as part of a Comprehensive Coastal Assessment.

Three soil landscape groupings are found within the reserve:

- barrier beach and associated foredunes (rapidly drained siliceous and calcareous sands);
- disturbed outer barrier dunes (podzols and siliceous sands, highly permeable); and
- narrow interbarrier creek floodplain consisting of mixed estuarine and aeolian materials (poorly drained clays, silt, sand and gravel with surface organic matter).

These soils are highly erodible and any excavation works would be prone to gross soil loss (Morand 1996).

The Holocene (or outer barrier) dune system was substantially disturbed by sandmining activities in the 1960s and 1970s, resulting in the modification of the dune profile and dune vegetation communities.

The reserve contains approximately 2.5 km of beach frontage, which comprises one of the most secluded stretches of beach on the Tweed Coast. Despite its disturbance history, the beach has significant scenic values due to its isolation and natural setting. The vegetation communities of the reserve also have scenic values

that are particularly apparent when approaching the Tweed Coast from the south along the Tweed Coast Road.

Native Plants

The reserve contains littoral rainforest, lowland rainforest on floodplain, coastal wetland and coastal dune vegetation communities.

Littoral rainforest, listed under the TSC Act as an endangered ecological community, is found within the reserve and belongs to the *Cupaniopsis – Acmena* spp. Alliance (tuckeroo and lilly pilly) and sub-alliance No. 16 *Syzygium leuhmannii – Acmena hemilampra* (riberry – broad-leaved lilly pilly) (Floyd 1990). The conservation status of this sub-alliance has been assessed as inadequate ([Benson 1989; Floyd 1990] cited in Griffiths 1993). Two areas in the reserve were classified as State Environmental Planning Policy (SEPP) 26 Littoral Rainforests totalling 26.4 ha (Joseph 2000).

The reserve contains approximately 0.5 ha of lowland rainforest on floodplain, an endangered ecological community listed under the TSC Act. Bangalow palms (*Archontophoenix cunninghamiana)* dominate the upper and mid stratums and a number of species characteristic of this vegetation community can be found, including the hard quandong (*Elaeocarpus obovatus),* Moreton Bay fig (*Ficus macrophylla)* and cudgerie (*Flindersia schottiana)*. A larger remnant of lowland rainforest on floodplain (approx. 4.7 ha) occurs on private land to the south of the reserve.

Approximately 15.5 ha of the western portion of the reserve were classified as SEPP 14 Coastal Wetlands and contain:

- areas of grey mangroves (*Avicennia marina* var. *australis*) and river mangroves (*Aegiceras corniculatum*);
- swamp sclerophyll species such as broad-leaved paperbark (*Melaleuca quinquenervia*) and swamp oak (*Casuarina glauca);*
- wetland species such as sea rush (*Juncus kraussii*)*,* sand couch (*Sporobolus virginicus), Baumea Juncea* and the common reed (*Phragmites australis).*

The remainder of the reserve consists of disturbed coastal dune vegetation on areas subjected to sand mining during the1960s and 1970s. Much of the original dunal structure and vegetation was destroyed, and plantings of bitou bush (*Chrysanthemoides monilifera* subsp. *rotunda*), horsetail casuarina (*Casuarina equisetifolia)*, coastal wattle (*Acacia sophorae*), golden wreath wattle (*Acacia saligna*), coastal tea tree (*Leptospermum laevigatum)* and coastal banksia (*Banksia integrifolia)* were subsequently undertaken to rehabilitate and stabilise the dunes (Joseph 2000). Bitou bush now dominates the dune system within the reserve, as it does much of the Tweed Coast (refer to *2.7 Introduced Species*).

The reserve contains three species listed under the TSC Act: scented acronychia *(Acronychia littoralis)*, stinking cryptocarya *(Cryptocarya foetida)* and *Archidendron hendersonii.*

Native Animals

There is currently little information relating to the fauna of the reserve. NPWS records are limited to ten bird species including two species listed under the TSC Act: the beach stone-curlew (*Esacus neglectus)* and the pied oyster catcher (*Haematopus longirostris).* Also recorded within the reserve are the brahminy kite (*Haliastur indus*), the whistling kite (*Haliastur sphenurus*), white-bellied sea-eagle (*Haliaeetus leucogastor*), crested tern *(Sterna borgii),* and migratory species such as the common tern *(Sterna hirundo*), little tern *(sterna albifrons*)*,* bar-tailed godwit (*Limosa lapponica*) and the common greenshank (*Tringa nebularia*).

There are presently no recordings of mammal, amphibian or reptile species in the reserve. However, the reserve's location in a region of high biodiversity, its status as an over-wintering ground for bats and birds and the habitat values inherent in the reserve's vegetation communities indicate a diversity of fauna.

Principal habitats within the reserve include rainforests, mangroves, paperbark and swamp oak woodlands/forest, banksia woodlands, coastal dune communities and the beach. These provide suitable habitat and/or foraging grounds for a suite of fauna, including many threatened species. These include fruit bats like the eastern blossom bat (*Syconycteris australis)* and black flying-fox (*Pteropus alecto*), insectivorous bats like the eastern long-eared bat (*Nyctophilus bifax*) and the little bentwing bat (*Miniopterus australis*), and ground dwelling mammals such as the common planigale (*Planigale maculata*) and the long-nosed potoroo (*Potorous tridactylus*).

Threatened birds that may utilise the reserve include ospreys (*Pandion haliaetus*), rainforest pigeons like the rose crowned fruit-dove (*Ptilinopus regina*) and the wompoo fruit-dove (*Ptilinopus magnificus*), the white-eared monarch (*Monarcha leucotis*), the collared kingfisher (*Todiramphus chloris*) and the mangrove honey eater (*Lichenostomus fasciogularis*).

The reserve provides potential habitat for loggerhead (*Caretta caretta)* and green turtle (*Chelonia mydas*) nesting sites, which have been recorded on beaches adjacent to the reserve.

Aboriginal Heritage

Aboriginal communities have an association and connection to the land. The land and water biodiversity values within a landscape are central to Aboriginal spirituality and contribute to Aboriginal identity. Aboriginal communities associate natural resources with the use and enjoyment of foods and medicines, caring for the land, passing on cultural knowledge and strengthening social bonds. Aboriginal heritage and nature are inseparable from each other and need to be managed in an integrated manner across the landscape.

The north-east corner of NSW was traditionally occupied by the Bundjalung people, whose lands stretched between the Evans and Brisbane Rivers (Calley 1964 cited in NPWS 2000). The reserve lies within the Minjungbal tribal area, which stretched from Cape Byron in the south to Southport in the north, and inland to Murwillumbah and Nerang Creek (Tindale 1974). Within this tribal grouping, the Coodjingburra clan occupied the coast between the Brunswick and Tweed Rivers (Piper 1994 cited in NPWS 1998).

A number of important Aboriginal sites lie within a few kilometres of the reserve, including a bora ring and middens in Billinudgel Nature Reserve (NPWS 2000). However, there has been no research completed on the Aboriginal heritage values or archaeological research undertaken or Aboriginal sites recorded within the reserve. It is likely that any Aboriginal sites in the eastern portion of the reserve would have been disturbed by sandmining. Ongoing consultation with local Aboriginal communities is being undertaken on a range of issues.

Non-Aboriginal Heritage

The reserve, which was originally Crown lands known as Mooball Beach Reserve, was a popular recreational area for residents of Mooball and Crabbes Creek. A community hall was constructed in the mid 1920s in a clearing within the reserve and was the venue for dances, carnivals, parties, picnics, camping and other community events (McDowell, pers. comm. 2002; Foyster, pers. comm. 2002). Locals also held regular sports days featuring foot races, field events and horse races (Foyster, pers comm. 2000). The community hall was demolished by the early seventies, and nothing remains of the facilities (Foyster, pers. comm. 2002).

The Tweed Coast Road was constructed in the 1960s and the area was mined for mineral sands during the 1960s and 1970s. Sand mining activities were undertaken to extract the minerals rutile and zircon and resulted in a highly modified coastal dune system. The original dune vegetation communities were replaced with planted non-native species and the dune profile was reshaped, resulting in a more uniform profile.

From 1997 until its gazettal in 1999, the reserve was managed in trust by Tweed Shire Council as part of the Tweed Coastal Reserves.

2.4 RESEARCH & EDUCATION

Research in the reserve improves understanding of natural and cultural heritage, the processes affecting them and management requirements. Research by other organisations and students may also provide valuable information for management and should be encouraged.

2.5 VISITOR USE

The majority of use of the reserve is concentrated on Mooball Beach. Popular activities in the reserve include fishing, walking and bird watching. It is likely that

increasing population and tourism growth will lead to an increase in use of the Tweed Shire's beaches, including Mooball Beach, and an increase in visitor use of other parts of the reserve.

A day use area provides picnic tables and walking access to the beach, although the area has been subject to inappropriate use and vandalism (refer to *Visitor Impacts*). The reserve does not provide for vehicle entry/exit points onto the beach. Visitor use to Mooball Beach occurs mainly around the vehicle access points which are approx 5km north of the reserve and approx 1km south of the reserve (see figure 1). Picnic areas are also located approximately 5km to the north of the reserve at the river mouth of Mooball Creek.

Visitor use must not compromise reserve values and should be consistent with the purpose of nature reserves. Appropriate uses are those orientated towards education, appreciation, enjoyment and understanding of the reserve's natural heritage, and that are ecologically sustainable. Inappropriate uses such as four wheel drive (4WD) access, dog walking, horse riding, dance parties, open fires and camping are prohibited.

In the past local recreational fishing competitions have been given consent for 4WD access to the intertidal zone of the reserve. The consents were only applicable to annually held weekend fishing events held along the Tweed Coast. In order to be consistent with the management principles of a nature reserve future competitive fishing events will not be permitted in the reserve.

2.6 OTHER USE

Mooball Beach supports a number of commercial fishing operations, which existed prior to the gazettal of the reserve. Access points off the reserve provide commercial fishers with vehicle access to the beaches within the reserve. Vehicles associated with pre-existing commercial fishing activities may be permitted on the beach within the reserve but only if licensed by the NPWS consistent with the NPWS policy 'Access for Professional Fishing'.

2.7 MANAGEMENT OPERATIONS

There are a number of informal trails and car parking areas that are not necessary for management and may cause erosion, the dispersal of pest plants and provide vehicle access for inappropriate visitor activities.

A Crown road reserve bisects the western section of the reserve. This access is not required for management purposes and is an avenue for the introduction of potential unmanaged impacts within an area of high conservation values.

Refuse dumping is a problem around the car park area, informal trails, Tweed Coast Road and the Crown road reserve.

2.8 THREATS TO RESERVE VALUES

Erosion

Coastal erosion and ocean breakthroughs are part of the natural geomorphological processes of the Australian coastline. Over the long term, coastal erosion has the potential to erode the hind dune and impact on the Tweed Coast Road and Mooball Creek (Rabbidge & Micheli 1997; WBM 2001).

Although bank erosion is more apparent in the lower reaches of Mooball Creek, it is believed that bank erosion is also occurring adjacent to the reserve. The riparian vegetation adjoining Mooball Creek is largely undisturbed except for a small area disturbed by sandmining close to where the Tweed Coast Road comes closest to the creek.

Introduced Species

A total of 47 introduced flora species have been recorded in the reserve including the noxious weeds bitou bush (*Chrysanthemoides monilifera subsp. rotundata*), lantana (*Lantana camara)*, groundsel bush (*Baccharis halimifolia*), prickly pear (*Opuntia spp.)* and parramatta grass (*Sporobolus indicus var. capensis*) (Murray & James 1995; Joseph 2000). Bitou bush, which covers much of the coastal dunes is listed as a Key Threatening Process on Schedule 3 of the TSC Act. A *Restoration and Rehabilitation Project incorporating Weed Control Strategies* (Joseph 2000) has been completed for the reserve and an ongoing bush regeneration program is being undertaken.

There has been no research undertaken into the introduced fauna species within the reserve, although foxes (Vulpes vulpes) and cane toads (Bufo marinus) have been observed in the area (Hing, pers. comm. 2002). Predation by foxes is a threat to shore birds as they can disturb feeding, roosting and nesting birds and they can spread weed species throughout the reserve.

Fire Management

Fire is a natural feature of the environment and is essential to the survival of some Australian plant communities. Fire, however, is not essential to the plant communities found within Wooyung Nature Reserve and frequent or regular fire can cause loss of particular plant and animal species and communities. Fire could also damage cultural features and infrastructure and threaten neighbouring land.

In September 2004 a fire which burnt approximately 0.4ha of the reserve was believed to be the result of arson. The vegetation affected was primarily bitou bush.

A recent review of fire management planning throughout the Northern Directorate by NPWS has resulted in a modified approach to fire planning based on the level of complexity involved. In regard to Wooyung Nature Reserve, the NPWS considers that it is appropriate to include the specific fire management strategies for the reserve in this plan of management. This is because there have been no recorded fires in the reserve in the last 20 years and the reserve is a low potential bush fire

hazard, although it is an environmental asset at major risk from bush fire due to fire sensitivity of the rainforest and coastal wetland communities (TBFMC 2001).

NPWS uses a system of bushfire management zones for bushfire management in NPWS reserves. These zones are compatible with the system adopted by the Bushfire Coordinating Committee for use in District Bushfire Management Committee (DBFMC) bushfire risk management plans.

NPWS has assessed the reserve for fire management planning purposes and has zoned the reserve as a Land (Heritage Area) Management Zone (HAMZ). The primary fire management objectives within this zone are to prevent the extinction of any species that are known to occur naturally within the reserve, and to protect culturally significant sites. The reserve has been designated as a HAMZ because of the sensitivity of rainforest and coastal wetland communities.

Tactics for managing this HAMZ will be to exclude prescribed burning and to suppress wildfires. No other zone types have been identified in the reserve.

Visitor Impacts

In the past the day use area has been a popular spot for inappropriate activities including antisocial behaviour, rave parties and camping. These activities have caused damage to the surrounding vegetation and become strong deterrents to the general community for passive recreation use of the area.

Although, sections of the day use area have been revegetated and one beach access track has been formalised in an attempt to manage the impacts of use, inappropriate activities still are the dominant use of this area.

There are several informal walking tracks through the littoral rainforest to the beach. Constant trampling is preventing regeneration of native rainforest species and resultant sand erosion.

Isolation and Fragmentation

Clearing of vegetation within the bioregion has resulted in a high loss of biodiversity and fragmentation of habitat. Long term conservation of biodiversity both within the bioregion and the reserve depends upon the protection, enhancement and connection of remaining habitat across the landscape, involving vegetation remnants on both public and private lands.

The reserve is small in size. It is important therefore to consider the reserve in the context of surrounding remnant vegetation. Although connectivity is limited, nearby vegetated areas consolidate the habitat values of the reserve and provide ecological corridors to other surrounding forested areas.

3. MANAGEMENT ISSUES AND STRATEGIES

Current Situation	Desired Outcomes	Strategies	Priority
1. Soil and water conservation The coastline is subject to long term coastal erosion. Mooball Creek is suffering from bank erosion in lower reaches but banks are generally undisturbed in reserve. Mooball Creek's water quality is affected by agricultural activities in the upper catchment and urban runoff and recreational activities in the lower catchment.	• Unnatural erosion is minimised. • Water quality of Mooball Creek and catchment values of reserve streams are maintained.	1.1 Undertake all works in a manner that minimises erosion and water pollution. 1.2 Liaise with local authorities to maintain and improve water quality in Mooball Creek. 1.3 Prohibit or restrict any activity in the reserve that has the potential to erode the creek bank or degrade the dune system.	High Medium High
2. Native plant and animal conservation There is little information on the reserve's fauna, in particular threatened species. The Tweed Coast Road bisects much of the reserve's habitat placing ground-dwelling fauna at risk of vehicle strikes. There are extensive records of flora within the reserve (Murray & James 1995). Significant vegetation communities exist on neighbouring land on the western bank of Mooball Creek (SEPP 14 Coastal Wetlands) and to the south of the reserve (SEPP 26 Littoral rainforest, lowland rainforest on floodplain and SEPP 14). The existing car park area separates rainforest vegetation. The long-term viability of the remnant forest will be enhanced if the size of the rainforest is increased and consolidated and remaining native vegetation is protected.	• All native plant and animal species and communities are conserved. • Structural diversity and habitat values are protected and maintained. Where practicable, rehabilitation works are undertaken in disturbed areas.	2.1 Undertake fauna surveys, in particular to determine the location and distribution of threatened species, as required for management and conservation. 2.2 Implement measures included in threatened species recovery plans and threat abatement plans which are relevant to the reserve. 2.3 Liaise with Tweed Shire Council to investigate fauna road kill mitigation measures including lowering of the speed limit, installing warning signs and traffic calming devices. 2.4 Liaise with neighbours, Landcare, vegetation management committees and other land use authorities to encourage conservation and expansion of native vegetation close to the reserve. 2.5 Close the car park area within the littoral rainforest and restore and rehabilitate with locally indigenous rainforest species (refer to *Visitor Use*).	High High Low Medium High

Current Situation	Desired Outcomes	Strategies	Priority
3. Introduced species A total of 47 pest plant species have been recorded in the reserve. Bitou bush dominates the coastal dunes. No research has been undertaken into pest fauna species although red foxes and cane toads have been observed. A restoration and rehabilitation plan for the reserve has been prepared and is being implemented. The restoration plan identifies that the clearing within, and disturbance of, the littoral rainforest area needs to be decreased.	• The impact of introduced species on native species and neighbouring lands is minimised.	3.1 Implement the *Restoration and Rehabilitation Plan* and amend to reflect expansion of the revegetation area in Zone 3 to incorporate Zone 4 (see upper left inset in figure 1). 3.2 Seek the cooperation of Far North Coast County Council, the Tweed-Lismore Rural Protection Board, community groups and neighbours in implementing weed and pest animal control programs. Investigate means of integrating bitou bush control within the reserve with off-reserve control programs. 3.3 Undertake or encourage research into pest fauna species in the reserve, in particular foxes and cane toads.	High Medium Medium
4. Fire management There have been no recorded fires in the reserve in the last 20 years. The reserve is a low potential bush fire hazard, but is an environmental asset at major risk from bush fire, due to the fire sensitivity of the rainforest and coastal wetland communities.	• Persons and property are protected from bush fire. • Fire regimes are appropriate for conservation of plant and animal communities.	4.1 Implement the following fire management strategies for the reserve : a) Manage the reserve as a Heritage Area Management Zone (HAMZ). b) Suppress wild fire. c) Exclude prescribed burning (unless research indicates that fire is necessary to protect biodiversity values). 4.2 Promote coordinated and cooperative fire suppression and fuel management through participation in the Tweed Bush Fire Management Committee and direct liaison with Rural Fire Service and neighbours.	High Medium

Current Situation	Desired Outcomes	Strategies	Priority
5. Cultural heritage There has been no research into the cultural values of the reserve. Although evidence of Aboriginal occupation has been found in close proximity to the reserve, no sites are known in the reserve and little is known about traditional Aboriginal use and values. It is likely that any Aboriginal sites in the eastern portion of the reserve would have been disturbed by sandmining. The reserve was an important recreational area for the local community in the early 20th Century. The eastern section of the reserve was sand mined in the 1960s-70s.	• Aboriginal heritage values are protected in partnership with local Aboriginal community. • Cultural features are conserved and managed in accordance with their significance. • Aboriginal people are involved in management of Aboriginal cultural values in the park.	5.1 Protect and manage Aboriginal heritage in consultation with the Tweed Local Aboriginal Land Council, Bundjalung Council of Elders and local Aboriginal communities in all aspects of management of Aboriginal sites, places and values. 5.2 Precede all new ground disturbance work on undisturbed areas by a survey for the cultural features. 5.3 Encourage research into the Aboriginal heritage values of the reserve in close consultation with the Tweed LALC and Bundjalung Council of Elders. 5.4 Encourage research into the non-Aboriginal heritage values of the reserve.	High High Medium Low
6. Visitor use The reserve is dedicated down to mean low water mark, placing Mooball Beach within the reserve. The majority of use in the reserve occurs on Mooball Beach. Visitor use to the beach is likely to increase. Walking access to Mooball beach is provided immediately to the north and also to the south of the reserve (see figure 1). There are no vehicle access tracks to the beach in the Reserve. Inappropriate activities in the reserve, include 4WD access, dog walking, horse riding, dance parties and camping. Activities in the car park and areas on the western section of the reserve have had	• The local community is aware of the significance of the area and of management programs. • Low-key visitor opportunities are available that encourage appreciation of the reserve's natural heritage. • Visitor use is appropriate and ecologically sustainable.	6.1 Private vehicles will be prohibited from driving in the reserve, with the exception of vehicles given permission on a case by case basis undertaking authorised research or reserve maintenance programs including Dunecare and similar activities. Emergency vehicles may enter the reserve for emergency purposes. 6.2 Prohibit camping, dog walking and horse riding within the reserve. 6.3 Permit nature based recreational activities which are consistent with the purposes of a nature reserve, including bush and beach walking and bird watching. 6.4 Allow organised group, cultural events or educational activities (defined as more than 15 persons) consistent with the purposes of the reserve and subject to	High High High Medium

Current Situation	Desired Outcomes	Strategies	Priority
detrimental impacts on the natural values of the reserve. Impacts associated with some of these recreational activities include erosion, degradation and destruction of vegetation, increased potential for bushfires and littering.	• Use impacts are minimised.	consent and conditions necessary to minimise impacts. Competitive events will not be permitted. 6.5 Close the car park area within the littoral rainforest and restore and rehabilitate with locally indigenous rainforest species (refer to *Native Plants* above). 6.6 Develop interpretative material to promote community understanding and appreciation of the reserve's conservation values.	 High Low
7. Other use Commercial fishing activities have been undertaken on the beach within the reserve for a number of years. Vehicles associated with pre-existing commercial fishing activities may be permitted on the beach within the reserve but only if licensed by NPWS.	▪ Vehicle use on the beach has minimal ecological damage.	7.1 Issue licences for commercial fishers with pre-existing use to access the reserve for commercial fishing activities. The licences will include conditions designed to protect the natural and cultural values of the reserve.	Medium
8. Research Scientific study is needed to improve understanding of the reserve's natural and cultural heritage, the processes that affect them and the requirements for management. No fauna surveys have been completed in the reserve. The Tweed Cost Road bisects the reserve's habitats resulting in fauna road kills.	• Research is undertaken that enhances the management information base and has minimal environmental impact.	8.1 Encourage and guide research by educational organisations and others in the reserve. Priority topics for research are: fauna surveys, particularly for key indicator species and monitoring of fauna road kills, cultural heritage surveys, pest fauna species and impacts, creek bank erosion and dune integrity.	Medium

9. Management operations There are a number of informal trails and car parking areas within the reserve. A Crown road reserve bisects littoral rainforest vegetation in the western section of the reserve. Refuse dumping is a problem around informal trails, the car park area, Tweed Coast Road and the Crown road reserve. There is currently no signage within the reserve.	• Close vehicle access to the reserve. • The Crown road reserve is acquired and incorporated into the reserve and the site is rehabilitated. • Rubbish is removed from the reserve, Tweed Coast Road and the Crown road reserve and there is no further dumping of refuse in the reserve. • Reserve signage is adequate.	9.1 Close and rehabilitate tracks and informal car parking areas along Tweed Coast Road. (*refer to Visitor Use and Figure 1*) 9.2 Make a formal request to the Department of Lands to incorporate the Crown road reserve into the nature reserve to consolidate reserve boundaries and conserve and protect the littoral rainforest vegetation. In the interim negotiate with the Department of Lands to close the road reserve to vehicular and pedestrian access, remove refuse and rehabilitate. 9.3 Undertake refuse removal in cooperation with the Department of Lands, Tweed Shire council and the local community where appropriate. 9.4 Review reserve signage and update signs, including regulatory signs in relation to refuse dumping along Tweed Coast Road.	High High Medium High

Legend for priorities:

High priority activities are those imperative to achievement of the objectives and desired outcomes. They must be undertaken in the near future to avoid significant deterioration in natural, cultural or management resources.

Medium priority activities are those that are necessary to achieve the objectives and desired outcomes but are not urgent.

Low priority activities are desirable to achieve management objectives and desired outcomes but can wait until resources become available.

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