



Environment,  
Climate Change & Water  
National Parks & Wildlife Service



# Tweed Estuary Nature Reserve

## Plan of Management





# **TWEED ESTUARY NATURE RESERVE**

## **PLAN OF MANAGEMENT**

**NSW National Parks and Wildlife Service**

**Part of the Department of Environment, Climate Change and Water**

**May 2010**

**This plan of management was adopted by the Minister for Climate Change and the Environment on 18<sup>th</sup> May 2010.**

### **Acknowledgments**

The NPWS acknowledges that this reserve is in the traditional country of the Minjungbal people.

This plan of management is based on a draft plan prepared by staff of the Northern Rivers Region of the NSW National Parks and Wildlife Service (NPWS), part of the Department of Environment, Climate Change and Water, with the assistance of volunteer Ian Colvin.

NPWS specialists, the Northern Rivers Regional Advisory Committee, the Tweed River Committee and members of the public provided valuable information and comments.

For additional information or any inquiries about this reserve or this plan of management, contact the NPWS Tweed Area Office, PO Box 5081, South Murwillumbah NSW 2484 or by telephone on (02) 6670 8600.

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## FOREWORD

Tweed Estuary Nature Reserve is located on the far north coast of NSW. The reserve comprises four estuarine islands: Caddys, Daveys, Big, and Womgin Islands, which collectively cover an area of approximately 59 hectares.

Tweed Estuary Nature Reserve conserves important remnant vegetation including wetlands of state significance and the endangered ecological community of swamp oak floodplain forest. The reserve provides a significant component of the shorebird habitat of the estuaries of the lower Tweed River, which is becoming increasingly critical for bird populations as more habitat is lost to development in surrounding areas. The reserve also provides habitat for the vulnerable black flying fox and grey headed flying fox.

Tweed Estuary Nature Reserve has significant cultural value to the local Aboriginal community. It is within the traditional lands of the Minjungbal people and is part of a landscape of cultural importance to the local Nganduwal Aboriginal people.

The New South Wales *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 an area will be managed in the years ahead.

A draft plan of management for Tweed Estuary Nature Reserve was placed on public exhibition from 16<sup>th</sup> February until 28<sup>th</sup> May 2007. The submissions received were carefully considered before adopting this plan.

This plan contains a number of actions to achieve the State Plan priority to “Protect our native vegetation, biodiversity, land, rivers and coastal waterways”, including protection and rehabilitation of wetland habitat, protection of habitat for colonies of the grey headed and black flying fox, and control of weeds such as bitou bush which are impacting on habitat values.

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

A handwritten signature in black ink, appearing to read 'Frank Sartor', with a long horizontal flourish extending to the right.

**Frank Sartor MP**  
**Minister for Climate Change and the Environment**



## 1. NATURE RESERVES IN NEW SOUTH WALES

### 1.1 LEGISLATIVE AND POLICY FRAMEWORK

The management of nature reserves in NSW is in the context of the legislative and policy framework, primarily the *National Parks and Wildlife Act 1974* (NPW Act), the NPW Regulations, the *Threatened Species Conservation Act 1995* (TSC Act) and the policies of the National Parks and Wildlife Service (NPWS). The policies are based on 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 *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) also applies in relation to actions that may impact on migratory species/threatened species listed under the Act.

A plan of management is a statutory document under the NPW Act. Once the Minister has adopted the plan, no operations may be undertaken within the Tweed Estuary Nature Reserve except in accordance with the plan. This plan will also apply to any future additions to Tweed Estuary Nature Reserve. Should management strategies or works be proposed for the reserve or any additions that are not consistent with the plan, an amendment to the plan will be required.

### 1.2 MANAGEMENT PURPOSES AND PRINCIPLES

#### Nature reserves

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 (section 30J), 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 reserves 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.

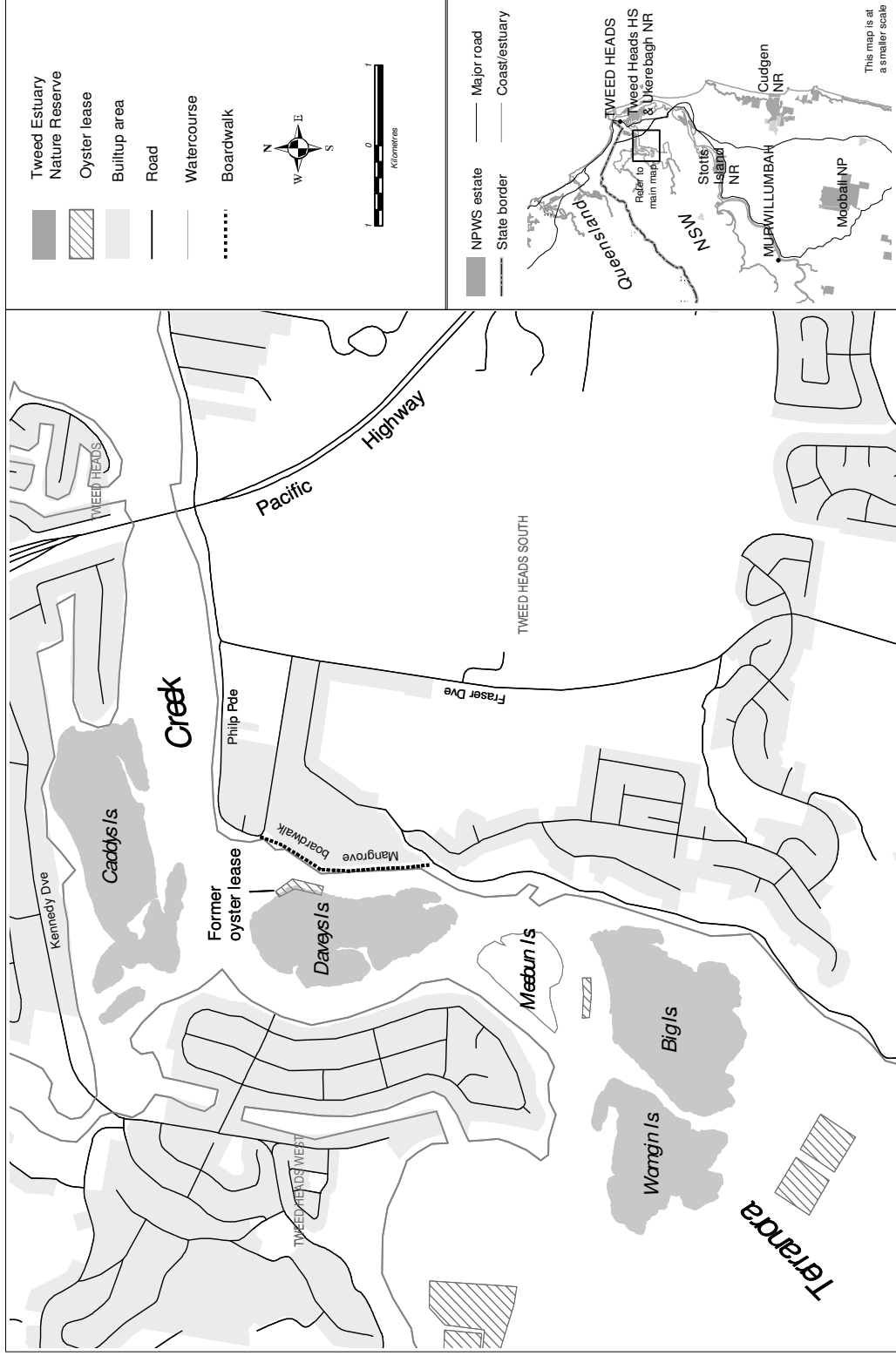
### **1.3 MANAGEMENT DIRECTIONS**

The primary emphasis of this plan is the conservation of the natural and cultural values of the reserve. Conservation of the reserve's values will be achieved through the following:

- Management of the reserve as part of a regional network of coastal and estuarine reserves;
- Conservation of the diversity of habitats within the reserve, with emphasis on the protection and rehabilitation of wetland habitat of State significance;
- Protection of habitat for colonies of the vulnerable grey headed and black flying fox; and
- Protection of habitat and reduced threats to shorebird populations of local, regional and international significance.



## Tweed Estuary Nature Reserve (59 ha)



## **2. TWEED ESTUARY NATURE RESERVE**

### **2.1 LOCATION, GAZETTAL AND REGIONAL SETTING**

Tweed Estuary Nature Reserve (hereafter referred to as “the reserve”) is located on the far north coast of NSW within the Terranora Broadwater and Terranora Creek (an estuarine tributary of the lower Tweed River). The reserve comprises four estuarine islands: Caddys; Daveys; Big; and Womgin Islands (see map). The reserve extends to mean low water mark. Collectively these islands cover an area of approximately 59 hectares. The reserve was gazetted in 1999.

The reserve is located in the midst of urban development within Tweed Heads. Tweed Heads and the adjacent Gold Coast City are areas of rapidly expanding urban development. In recent years Tweed Shire has undergone a shift from agriculture towards urban settlement and a growing tourism industry. The increasing population is affecting the health of the Tweed River and its estuaries, in particular through increasing volumes of waste-water, effluent discharge, and increased boating activity.

The reserve complements other significant wetlands and coastal reserves in the region, including Ukerebagh Nature Reserve and Tweed Heads Historic Site which lie 3 kilometres to the east on the confluence of Terranora Creek and the Tweed River.

Despite its highly developed urban context, the reserve and associated estuaries within the lower Tweed River support significant areas of natural habitat including wetlands of State significance identified under State Environmental Planning Policy No. 14 Coastal Wetlands (SEPP14).

In accordance with the NSW Government’s Estuary Management Policy, management plans have been developed for the Lower Tweed Estuary (1991a) and Upper Tweed Estuary (1996). These are combined into the Tweed Estuary Management Plan and its implementation is the responsibility of Tweed Shire Council through the Tweed River Committee (TRC). The Tweed Estuary Management Plan provides the framework for protection, rehabilitation, recreation and enhancement projects for the estuary. NPWS is represented on the TRC.

The reserve is located in the Tweed Local Government Area (LGA), Northern Rivers Catchment Management Authority (CMA) region and the Tweed Byron Local Aboriginal Lands Council (LALC) area.

### **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 bushland 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 area, plus its location, have determined how it has been used by humans. The Tweed floodplain and estuaries provided Aboriginal people with a rich source of food. The area also has a history of European use including cedar getting, sugar cane and banana plantations, oyster farming and as a transportation route for vessels along the Tweed River to Murwillumbah. More recently urban development has had a significant impact on the surrounding landscape.

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, hydrology and soils**

The reserve is located on the Tweed floodplain which is formed from Quaternary alluvial and ocean deposits of gravel, sand, silt, clay and peat (Druery and Curedale, 1979).

The reserve is an area of low relief and much of it is prone to tidal inundation and flooding. The lower Tweed River estuaries, including Terranora Creek and Terranora Broadwater, have been greatly altered over the last 100 years by the construction of ocean and river training walls, dredging and filling of channels (Druery and Curedale, 1979). The Public Works Department (1991c) suggested that a perceived shallowing of Terranora Broadwater over the last 60 years was associated with the fact that tidal levels are now significantly lower than those which occurred a century ago, rather than major siltation of the broadwater.

### **Native plants**

No plant species listed under the *Threatened Species Conservation Act 1995* have been identified in the reserve, however the vegetation communities represent an important remnant for conservation in a rapidly developing urban environment. The majority of the reserve has been identified under SEPP 14 as important coastal wetlands.

The reserve is dominated by mangrove forest, in particular grey mangrove (*Avicennia marina*). Other mangrove species in the reserve are: red mangrove (*Rhizophora stylosa*); orange mangrove (*Bruiguiera gymnorrhiza*); milky mangrove (*Exocoecaria agallocha*); and river mangrove (*Aegiceras corniculatum*). The Tweed River is the southern limit for well developed communities of these species (Public Works Department 1991c).

Small areas of saltmarsh occur in the reserve, including associations of salt couch (*Sporobolus virginicus*) and samphire (*Sarcocornia quinqueflora*) (Public Works Department 1991c).

Mangroves and seagrass are protected under the NSW *Fisheries Management Act 1994*, with coastal saltmarsh being listed as an Endangered Ecological Community under the TSC Act.

Swamp oak (*Allocasuarina glauca*) floodplain forest also occurs on Caddys, Daveys and Big Islands and is listed as an Endangered Ecological Community under the TSC Act. Small areas of paperbark forest (*Melaleuca quinquenervia*) are present on Daveys and Big Islands. On Daveys Island there are isolated occurrences of coastal sand communities featuring coastal banksia (*Banksia integrifolia*) and tuckeroo (*Cupaniopsis anacardioides*) (Pressey and Griffith 1987).

### **Native animals**

The reserve is a significant component of the shorebird habitat of the estuaries of the lower Tweed River. The reserve is becoming increasingly critical for bird populations as more habitat is lost to development in surrounding areas.

The sand flats adjacent to Womgin and Big Islands are major foraging and staging areas for both migrant and sedentary shorebirds, whose habitat has been diminished through dredging and development generally (Tweed Shire Council, 1994). The sand flats on Womgin Island provide important high tide roosting adjacent to foraging areas.

It is estimated that the Tweed River estuaries supports 885 individual shorebirds, with more than 20 species recorded (Rohweder 1998). Thirteen species known to occur within the Lower Tweed estuaries are listed under the TSC Act (refer Table 1).

Nineteen species of shorebirds recorded on the Tweed River estuaries are northern hemisphere migrants and all of these are listed under two international treaties, the Japan-Australia Migratory Birds Agreement (JAMBA) and the China-Australia Migratory Birds Agreement (CAMBA). CAMBA and JAMBA require appropriate measures be taken to preserve and enhance the environment of migratory birds. CAMBA and JAMBA listed species known to occur in the reserve are also listed in Table 1.

A colony of the black flying fox (*Pteropus alecto*) occurs on Womgin Island. Smaller colonies occasionally gather in other parts of the reserve. The grey headed flying fox (*Pteropus poliocephalus*) also occurs in the reserve. Both these species are listed as vulnerable under the TSC Act.

Mangrove habitats also provide important habitat for fish and a rich diversity of invertebrates.

**Table 1 Threatened and significant animal species recorded in the Lower Tweed estuaries**

Common name	Scientific name	Legal status*	Conservation status **
Beach stone curlew	<i>Esacus neglectus</i>	Endangered	
Terek sandpiper	<i>Xenus cinereus</i>	Vulnerable	
Black-tailed godwit	<i>Limosa limosa</i>	Vulnerable	CAMBA/JAMBA
Great knot	<i>Calidris tenuirostris</i>	Vulnerable	CAMBA/JAMBA
Sanderling	<i>Calidris alba</i>	Vulnerable	
Pied oystercatcher	<i>Haematopus longirostris</i>	Vulnerable	
Sooty oystercatcher	<i>Haematopus fuliginosus</i>	Vulnerable	
Greater sand plover	<i>Charadrius leschenaultii</i>	Vulnerable	
Mangrove honeyeater	<i>Lichenostomus fasciocularis</i>	Vulnerable	
Collared kingfisher	<i>Todiramphus chloris</i>	Vulnerable	
Osprey	<i>Pandion haliaetus</i>	Vulnerable	
Black-necked stork	<i>Ephippiorhynchus asiaticus</i>	Endangered	
Pacific golden plover	<i>Pluvialis fulva</i>		CAMBA/JAMBA
Black flying fox	<i>Pteropus alecto</i>	Vulnerable	
Grey headed flying fox	<i>Pteropus poliocephalus</i>	Vulnerable***	

\* Status under TSC Act

\*\* Migratory species listed under JAMBA and/or CAMBA International Agreements

\*\*\* Species listed as vulnerable under the EPBC Act

Under the TSC Act recovery plans may be prepared to identify actions and priorities for threatened species, populations or ecological communities. Additionally, a threatened species Priorities Action Statement (PAS) must be prepared which outlines the broad strategies and detailed priority action in NSW to promote the recovery of threatened species, populations and endangered ecological communities and to manage key threatening processes. The PAS and recovery plans will be used to guide management of threatened species in the reserve.

Recovery plans have not been prepared for any of the threatened species recorded from the reserve. Recovery actions are included in the PAS for all threatened species recorded within the reserve with the exception of the mangrove honeyeater and collared kingfisher.

### 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 reserve has significant cultural value to the local Aboriginal community. The reserve lies within the northern part of the traditional lands of the Minjungbal people.

The Minjungbal people occupied an area between Southport, Byron Bay and Murwillumbah (Piper 1976). The reserve is also located within the Tweed Byron Local Aboriginal Land Council area.

The Tweed Valley is also part of the landscape that is of cultural importance to the local Nganduwal Aboriginal people, one of the clans of the greater Bundjalung Nation (Steele 1984).

The Tweed floodplain provided a rich source of marine and freshwater food. Food was also gathered from forested areas. Evidence of shellfish harvesting may be seen in many of the middens in the region, including the shell midden recorded on Daveys Island. The midden is considered to be significant as it is one of few undisturbed sites remaining in the Tweed Estuary (Public Works Department 1991d).

The nearby Tweed Heads Historic Site contains a bora ring associated with the cultural, spiritual and ceremonial beliefs of the traditional owners. The Minjungbal Cultural Centre at Tweed Heads Historic Site includes a museum and other facilities focussing on the historical and cultural aspects of Aboriginal life and the influences of European settlement in the area.

### **Non-Aboriginal heritage**

In 1823 the Surveyor-General of NSW, John Oxley, was the first European to discover the Tweed River while exploring the coastline in search of a site for a new penal colony. Cedar getting commenced in the area in 1844, farming in 1865 and sugar cane in 1869. Banana plantations followed in the 1900s. Up until 1941, when dredging of the river was halted, the Tweed River was used primarily as a means of transport, with vessels travelling upstream to Murwillumbah. After this, only smaller craft were able to navigate the river effectively (Public Works Department 1991a).

Terranora Broadwater was used by tourist cruise launches until the late 1940s. In recent years, shallow draught tourist vessels have recommenced cruises of Terranora Broadwater.

Remnants of oyster farming occur on Big Island where there are the remains of a bitumen landing area and piers from an old wharf. There are also numerous oyster pilings on and around Daveys Island and south of Big and Womgin Islands. These remnants are not considered of significant historic value.

## **2.4 VISITOR USE**

There are no visitor facilities in the reserve. Reserve identification and regulatory signage is located on the north and south ends of Daveys Island and on the north end of Big Island.

Recreational use of the reserve is minimal despite its close proximity to surrounding urban areas. The reserve is only readily accessible by small boat. The surrounding mangrove vegetation and few landing points limit access. Most visitor use of the reserve is restricted to the shoreline at the northern and southern end of Daveys Island and to the area above the high water level on Daveys and Big Islands. Commercial fishing, recreational charter fishing and recreational fishing, including

yabbing, is subject to the *Fisheries Management Act 1994* and requires a licence under that Act.

Visitor access to the reserve is not encouraged because of the small size of the reserve and the vulnerability to disturbance of the vegetation, shorebirds and flying fox colonies. More suitable areas for nature-based recreation in an estuarine environment are available nearby, at the mangrove boardwalk off Philp Parade and at Tweed Heads Historic Site. The Tweed Heads Historic site encompasses the Minjungbal Cultural Centre with museum, picnic area, walking track, boardwalk and other facilities.

## **2.5 THREATS TO RESERVE VALUES**

### **Inappropriate visitor use**

Visitor use of the reserve is low and impacts are generally limited to small areas of Daveys and Big Islands. On Daveys Island there have recently been problems with unauthorised campfires and the construction of makeshift shelters using swamp oak poles cut from within the reserve and imported builders' waste materials. These activities can threaten the reserve's values through removal of native vegetation, introduction of rubbish and trampling, and may also facilitate invasion by weeds.

### **Acid sulphate soils and water quality**

The catchment of Terranora Broadwater that surrounds the reserve has largely been altered by urban and rural development. Water quality in the vicinity of the reserve is subject to impacts of runoff from the modified landscape, including sediment and pollutants from stormwater discharge. Run-off from residential areas has the potential to introduce pollutants such as soil, fertilisers, pesticides, pathogens, grass, plastics, litter, oil, grease and metal particles, as well as a range of other compounds and weed propagules. Potential acid sulphate soils are present in the reserve but are unlikely to be a risk unless disturbed. While there are no actions proposed as part of this plan which will disturb soils, any such activity would be subject to appropriate environmental assessment and mitigation.

The Tweed Estuary Management Plan provides the framework for protection, rehabilitation, recreation and enhancement projects for the estuary. One of the major objectives of the Estuary Management Plan is the treatment and monitoring of all discharges.

### **Introduced species**

The reserves close proximity to an urban environment means that it is subject to ongoing weed infestation through flooding and dispersal by birds and flying foxes. Weeds in the more elevated terrestrial areas of the reserve have invaded the understorey of the paperbark and swamp oak communities. Weeds species known to occur include: lantana (*Lantana camara*); asparagus fern (*Asparagus aethiopicus*); groundsel bush (*Baccharis halimifolia*); coastal morning glory (*Ipomoea cairica*); and bitou bush (*Chrysanthemoides monilifera*).

Bitou bush, exotic vines and scramblers such as asparagus species and coastal morning glory have been listed as a Key Threatening Processes under the TSC Act. A Threat Abatement Plan has been prepared for bitou bush and the reserve is listed as a priority control area for bitou bush in the 'Northern Containment Zone' between NSW and Queensland. The Bitou Bush Threat Abatement Plan addresses management of other environmental weeds to be undertaken concurrently with bitou bush control works.

Cane toads (*Bufo marinus*) have been observed on Daveys Island and are restricted to the relatively small area above the high water level. Because of their intolerance of salt water, cane toads are largely confined by the surrounding estuarine waters. Cane toads have been listed as a Key Threatening Process under the TSC Act.

## **Fire**

Fire is a natural feature of the many environments and is essential for the survival of some plant communities. However, inappropriate fire regimes can lead to loss of particular plant and animal species and communities, and high frequency fires have been listed as a key threatening process under the TSC Act.

The primary fire management objectives of the NPWS are to protect life and property and community assets from the adverse impacts of fire, whilst managing fire regimes to maintain and protect biodiversity and cultural heritage (NPWS, 2005).

The NPWS uses a zoning system for bushfire management which is compatible with the zoning used by the Far North Coast Bush Fire Management Committee (BFMC) in its bushfire risk management plan.

The NPWS approach to fire management planning is based on the level of complexity and risk to the reserve. In regard to the reserve, fire management strategies are included in this plan of management.

There has been no known fires within the reserve. As the reserve is largely intertidal there is little threat of wildfire. The few elevated areas on Caddys, Daveys and Big Islands are very small in extent and are unlikely to support wildfire except under very severe conditions. Any such fire would be small and easy to contain. There are no Aboriginal or cultural heritage values or built assets vulnerable to fire in the reserve.

NPWS has assessed the reserve for fire management planning purposes and has zoned the reserve as a Land Management Zone (LMZ). The primary fire management objectives for this zone are to prevent the extinction of all species that are known to occur naturally within the reserve, and to protect culturally significant sites. The reserve has been designated as a LMZ because of its value as a vegetation remnant and the sensitivity of its vegetation communities and flying fox colony to fire.

Requirements for most plants species can be summarised on the basis of the vegetation communities and there is a threshold in fire regime variability, which marks a critical change from a high species diversity to low species diversity. The following regime guidelines have been adopted for the reserve.



**Table 2: Fire Interval Guidelines for the Protection of Vegetation Communities**

Vegetation Community	Minimum Interval	Maximum Interval	Notes
Saline wetland	n/a	n/a	Fire should be avoided
Swamp sclerophyll forest	7*	35*	

Source: Bradstock *et al.* (2003). \* intervals given are tentative due to insufficient data.

The LMZ does not require intensive management and focuses on those actions appropriate to conserve biodiversity and cultural heritage including exclusion of fire from the reserve.

The NPWS maintains cooperative arrangements with the Rural Fire Service brigades and is actively involved in the Far North Coast BFMC.

### **Isolation and fragmentation**

Although relatively small, the reserve represents an important remnant for conservation as only 10% of the Tweed Shire coastal lowland vegetation is undeveloped (Pressey and Griffith 1987). Rapid population growth will place further demands on resources as development continues (Department Land and Water Conservation 2000).

Clearing of vegetation has not only resulted in loss of biodiversity but also fragmentation of habitat. Long term conservation of biodiversity locally within the reserve depends upon protection, enhancement and connection to remaining habitat across the landscape involving both public and freehold land.

The reserve is part of a network of wetlands in the lower Tweed River which are identified as of State significance (SEPP 14) and in the Tweed Shire Local Environmental Plan as 7(a) Environmental Protection. There may be opportunities to include some of these other wetland areas as additions to the reserve. In particular, Meebun Island (Vacant Crown Land) between Daveys and Big Island has important natural values, including wetlands, that would be a valuable addition to the reserve.

### **Climate change/sea-level rise**

Sea-level rise is one of the projected outcomes of climate change, with a sea-level rise of between 18 and 59 centimetres expected by 2100 in the absence of icesheet melt (IPCC 2007). The rate and magnitude of sea-level change is likely to vary from region to region and to date there is little agreement as to the pattern of sea-level rise. Changes in sea level will be felt through: increases and intensity and frequency of storm surges; increased erosion; loss of important wetlands and mangroves; impact on coastal ecosystems and impact on human settlements (CSIRO 2004).

On the Australian coast, impacts of sea-level rise and storm surges could be expected along the full length of the tropical coast. On the NSW coast, where narrow continental shelf limits the size of storm surges, large wind driven waves can have significant impacts (CSIRO 2004).

Climate change may significantly affect biodiversity by changing population size and distribution of species, modifying species composition, and altering the geographical extent of habitats and ecosystems. The potential impact of climate change is difficult to assess since it depends on the compounding effects of other pressures, particularly barriers to migration. Species most at risk are those unable to migrate or adapt, particularly those with small population sizes or with slow growth rates (Department of Environment and Conservation 2006:www.environment.nsw.gov.au). For the reserve the most direct impact would be on the extent of the coastal wetlands, which are already under threat from a range of pressures.

Anthropogenic Climate Change was listed as a key threatening process under the TSC Act. Loss of climatic habitat caused by anthropogenic emissions of greenhouse gases is listed as a key threatening process under the *Environmental Protection and Biodiversity Conservation (EPBC) Act 1999*.

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### 3. MANAGEMENT ISSUES AND STRATEGIES

Current Situation	Desired Outcomes	Strategies	Priority
<p><b>3.1 Soil and water conservation</b></p> <p>There is no significant erosion in the reserve. Some siltation is expected due to natural estuarine processes. Potential acid sulphate soils occur in the reserve.</p> <p>Stormwater and sewage discharge from the surrounding catchment may impact on habitat and water quality as well as carrying pollutants and sediment. This may result in elevated nutrient and bacterial levels.</p> <p>NPWS is represented on the Tweed River Committee responsible for overseeing the implementation of the Tweed River Management Plan. One of the objectives of this plan is the treatment and monitoring of all discharges.</p>	<ul style="list-style-type: none"> <li>• Soils in the reserve remain undisturbed by human activities.</li> <li>• Natural hydrological processes continue with minimal disturbance.</li> <li>• Improved water quality in Terranora Creek and Terranora Broadwater.</li> </ul>	<p>3.1.1 Liaise with Tweed Shire and other relevant agencies about ensuring that work or activities within and adjacent to Terranora Creek and the Broadwater have minimal impacts on reserve values, in particular water quality and associated habitat.</p> <p>3.1.2 Continue participation on the Tweed River Committee overseeing the implementation of the Tweed River Management Plan.</p>	<p>High</p> <p>High</p>
<p><b>3.2 Native plant and animal conservation</b></p> <p>The reserve supports important remnant vegetation including wetlands of state significance (SEPP 14) and endangered ecological community of swamp oak floodplain forest. It provides valuable habitat for a diversity of birds including TSC listed species. Some of the shorebirds are migratory and subject to JAMBA and CAMBA international agreements. A colony of black flying fox (also listed under the TSC Act) occurs on Womgin Island.</p> <p>Long term conservation of biodiversity within</p>	<ul style="list-style-type: none"> <li>• Diversity of native plant and animal species is maintained, and there is no further decline in local populations of threatened species.</li> <li>• Improved knowledge of the reserves plants</li> </ul>	<p>3.2.1 Implement relevant strategies in the Priorities Action Statement and recovery plans for threatened species as prepared (refer Introduced species).</p> <p>3.2.2 Investigate opportunities to include appropriate areas of vacant Crown land that have conservation values (such as Meebun Island) into the reserve as opportunities arise.</p> <p>3.2.3 Protect native plant and animals from visitor impacts and introduced species (refer Visitor use and Introduced species).</p>	<p>Medium</p> <p>High</p> <p>High</p>

Current Situation	Desired Outcomes	Strategies	Priority
<p>the reserve depends upon protection, enhancement and connection to remaining habitat. Meebun Island, between Daveys and Big Island, and other wetlands on the lower Tweed River and estuaries are potentially valuable additions to the reserve.</p> <p>A Priorities Action Statement has been prepared that identifies strategies and actions to promote the recovery of threatened species, populations and ecological communities and manage key threatening processes.</p>	<p>and animals and their ecological requirements.</p>	<p>3.2.4 Work with the Tweed River Committee to encourage conservation of remnant native vegetation in the vicinity of the reserve.</p>	<p>High</p>
<p><b>3.3 Introduced species</b></p> <p>The small terrestrial areas on Daveys and Big Islands are subject to disturbance typical of urban bushland. Introduced plant species include lantana, groundsel bush, asparagus fern, coastal morning glory and bitou bush.</p> <p>The Bitou Bush Threat Abatement Plan identifies the reserve as a priority area for control of bitou bush and identifies the need for concurrent management of other environmental weeds. A draft site specific management plan has been prepared for bitou bush control.</p> <p>A few cane toads have been observed on Daveys Island.</p>	<ul style="list-style-type: none"> <li>• Introduced species are controlled, and where possible eradicated.</li> <li>• Native vegetation is restored.</li> </ul>	<p>3.3.1 Implement the site specific management plan for bitou bush as per the Bitou Threat Abatement Plan and the Northern Rivers Region Bitou Bush Strategy.</p> <p>3.3.2 Control environmental weeds, including vines and scramblers, in accordance with the Bitou Threat Abatement Plan.</p> <p>3.3.3 Monitor occurrence of cane toads and institute appropriate actions to eradicate cane toads from the reserve if feasible. Monitor the reserve for recolonisation.</p>	<p>Medium</p> <p>Medium</p> <p>High</p>

Current Situation	Desired Outcomes	Strategies	Priority
<p><b>3.4 Fire management</b></p> <p>The reserve is at low fire risk due to its estuarine setting and lack of fire-prone vegetation. The reserve has been designated as a Land Management Zone (LMZ), where unplanned fire is to be excluded because of the fire sensitivity of vegetation and its importance as a vegetation remnant.</p>	<ul style="list-style-type: none"> <li>Life, property, natural and cultural values in and adjacent to the reserve are protected from fire.</li> <li>Fire is excluded from the reserve.</li> </ul>	<p>3.4.1 Manage the reserve as a LMZ, where unplanned fire is excluded from the reserve.</p> <p>3.4.2 Prescribed burning will not be undertaken on the reserve unless research indicates that fire is necessary to protect biodiversity values.</p> <p>3.4.3 Continue to participate in the Far North Coast BFMC and maintain cooperation and coordination with RFS brigades.</p> <p>3.4.4 Liaise with local residents and authorities to report unauthorised fires in the reserve.</p>	<p>High</p> <p>Medium</p> <p>High</p> <p>Medium</p>
<p><b>3.5 Cultural heritage</b></p> <p>The reserve is within the Tweed Byron Aboriginal Lands Council. It is within the traditional lands of the Minjungbal people and is part of a landscape of cultural importance to the local Nganduwal Aboriginal people.</p> <p>An Aboriginal midden is recorded within the reserve on Daveys Island. Other sites may be present.</p> <p>The Minjungbal Cultural Centre located in the Tweed Historic Site provides a focus for interpretation of historical and cultural aspects of Aboriginal life and the influences of European settlement in the area.</p> <p>There are remnants of past oyster farming including a bitumen landing area, piers from an old wharf and oyster pilings in the reserve.</p>	<ul style="list-style-type: none"> <li>The significance of the reserve to the local Aboriginal community is recognised and preserved.</li> <li>There is co-operative and integrated management of the Aboriginal heritage of the reserve with the Aboriginal community.</li> <li>Evidence of past</li> </ul>	<p>3.5.1 Protect and manage Aboriginal heritage values associated with the reserve in partnership with the local Aboriginal community including the Tweed Byron Local Aboriginal Lands Council (LALC) and other relevant individuals.</p> <p>3.5.2 Develop management strategies for the protection and management of the midden site in consultation with the Tweed Byron LALC and other relevant individuals.</p> <p>3.5.3 Remnants of past oyster farming within the reserve will be allowed to deteriorate naturally unless the remains pose a threat to public safety. The assistance of DPI Fisheries in the removal of structures will be sought where necessary.</p>	<p>Medium</p> <p>Medium</p> <p>Low</p>

Current Situation	Desired Outcomes	Strategies	Priority
<p>They are not considered to have historic significance.</p>	<p>historic use of the reserve are recorded.</p>		
<p><b>3.6 Visitor use</b></p> <p>No recreational facilities are provided in the reserve and visitor use levels are low. Access to the reserve is by boat. Visitor access is not encouraged because of the small size of the reserve and the risk of disturbance to vulnerable habitat, flying foxes and shorebirds.</p> <p>Fishing, including yabbying, recreational fishing, fishing charter boats and commercial fisheries is subject to the <i>Fisheries Management Act 1994</i> and requires a licence under that Act.</p> <p>There have recently been problems with unauthorised campfires, makeshift shelters and damage to vegetation on Daveys Island.</p>	<ul style="list-style-type: none"> <li>Visitor use is nature based and is maintained at a low level.</li> </ul>	<p>3.6.1 Allow nature-based visitor use of the reserve, such as bird watching and nature study.</p> <p>3.6.2 Prohibit commercial use (other than that licensed under the <i>Fisheries Management Act 1994</i>), group activities (defined as 10 or more people), camping and lighting of fires.</p> <p>3.6.3 Fishing in the intertidal area of the reserve is only permitted in accordance with the <i>Fisheries Management Act 1994</i>. NPWS will continue to liaise with NSW Department of Primary Industries about sustainable use of the reserve for activities licensed under the <i>Fisheries Management Act 1994</i>.</p> <p>3.6.4 Sporting and competitive activities (other than those licensed by NSW Department of Primary Industries in the intertidal zone, as identified above) will not be permitted in the reserve.</p> <p>3.6.5 Maintain reserve identification and regulatory signage on Daveys and Big Islands. Erect identification and regulatory signs on the other islands if necessary. No other facilities will be provided.</p> <p>3.6.6 Promote visitor use and education activities at alternative locations such as the boardwalk off Philip Parade, and at Tweed Heads Historic Site-Minjungbal Cultural Centre.</p>	<p>Medium</p> <p>High</p> <p>High</p> <p>High</p> <p>High</p> <p>High</p> <p>High</p>

Current Situation	Desired Outcomes	Strategies	Priority
<p><b>3.7 Research</b></p> <p>A comprehensive flora and fauna survey has not been conducted for the reserve. Baseline data would assist future management and to identify any threatened species</p>	<ul style="list-style-type: none"> <li>Research enhances management of the reserve and has minimal environmental impact.</li> </ul>	<p>3.6.7 Monitor visitor use of the reserve to determine levels of use and impact on reserve values. This will include monitoring for illegal campfires, shelters and other activities. Remove any unauthorised structures and campfires and undertake law enforcement as necessary.</p> <p>3.7.1 Encourage research to improve knowledge of the species diversity and ecology within the reserve.</p> <p>3.7.2 Liaise with educational institutions and other relevant organisation about research opportunities in the reserve.</p>	<p>High</p> <p>Medium</p> <p>Low</p>

**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.





