



## Plan of Management



## Mororo Creek Nature Reserve and Chatsworth Hill State Conservation Area



**MORORO CREEK NATURE RESERVE AND  
CHATSWORTH HILL STATE CONSERVATION AREA  
PLAN OF MANAGEMENT**

**NSW National Parks and Wildlife Service**

**September 2012**

**This plan of management was adopted by the Minister for the Environment on 13 September 2012**

### **Acknowledgments**

The NPWS acknowledges that the planning area lies in the traditional country of the Bundjalung and Yaegl people.

This plan of management is based on a draft plan prepared by the staff of the North Coast Region of the NSW National Parks and Wildlife Service (NPWS), part of the Department of Environment and Climate Change.

The North Coast Region Advisory Committee, Northern Rivers Region Advisory Committee, neighbours and members of the local community also contributed to this plan.

Cover photos: *Banksia spinulosa* and dry sclerophyll forest in Chatsworth Hill SCA by Dell Gorring, NPWS.

For additional information or any inquiries about the planning area or this plan of management, contact the NPWS Clarence North Area Office, 49 Victoria Street (PO Box 361) Grafton 2460 or by telephone on 6641 1500.

Published by:  
Office of Environment and Heritage  
59-61 Goulburn Street  
PO Box A290  
Sydney South 1232

© **Copyright State of NSW and the Office of Environment and Heritage:** Use permitted with appropriate acknowledgment.

ISBN 978 1 74293 843 1

OEH 2012/0796

Printed on recycled paper.

## FOREWORD

Mororo Creek Nature Reserve and Chatsworth Hill State Conservation Area are located north-east of Grafton and inland from Yamba in north-eastern New South Wales. Mororo Creek Nature Reserve covers an area of 80 hectares and Chatsworth Hill State Conservation Area covers 510 hectares.

These reserves conserve areas of endangered swamp sclerophyll forest, coastal saltmarsh, subtropical coastal floodplain forest and swamp oak floodplain forest. They are part of a wildlife corridor between the coastal floodplains and forested hinterland and contain the vulnerable bordered guinea flower, and four threatened animal species including the rufous bettong.

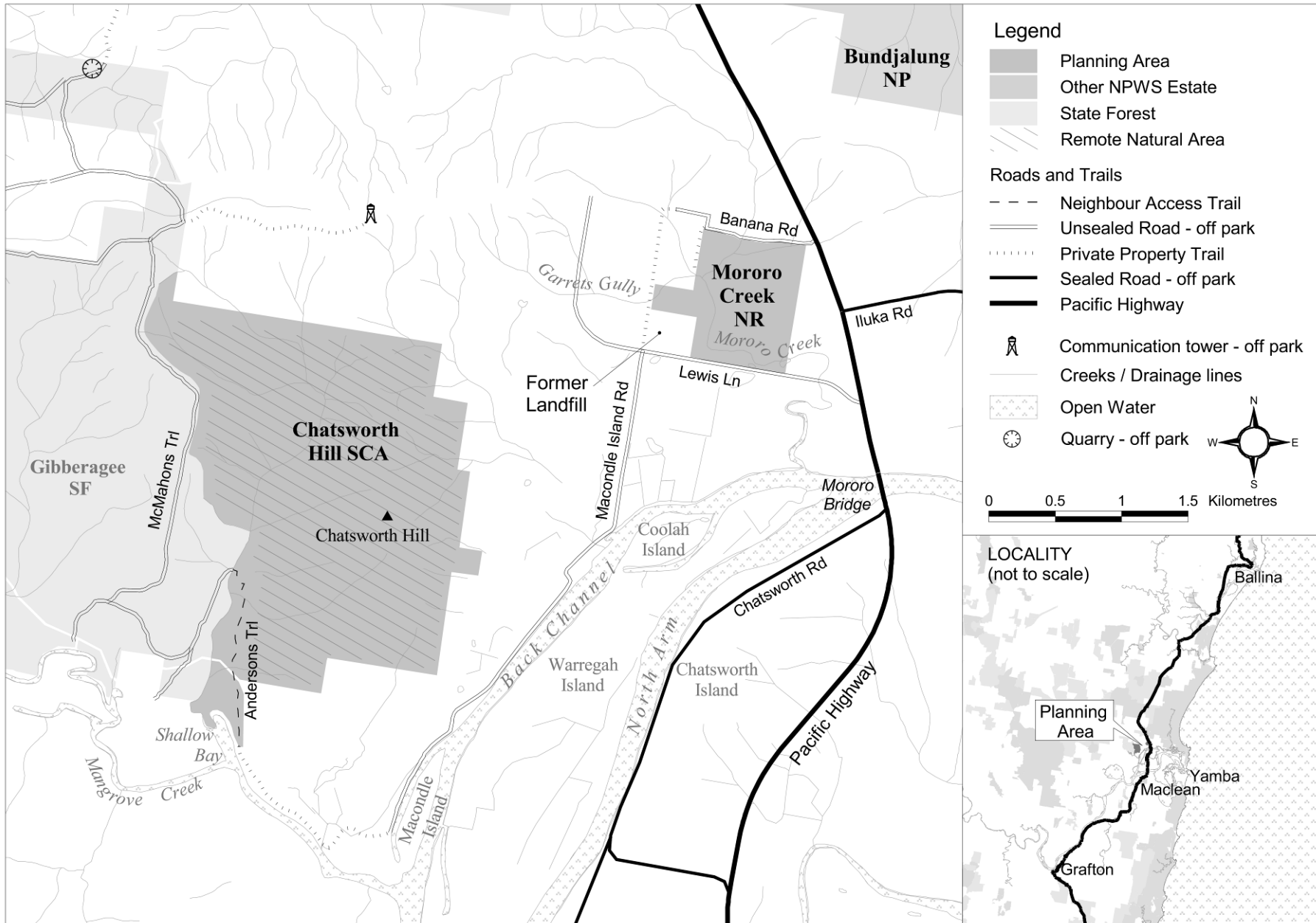
The New South Wales *National Parks and Wildlife Act 1974* requires that a plan of management be prepared for each nature reserve and state conservation area. A draft plan of management for Mororo Creek Nature Reserve and Chatsworth Hill State Conservation Area was placed on public exhibition from 1 May to 31 July 2009. The submissions received were carefully considered before adopting this plan.

The plan contains a number of actions to achieve the NSW 2021 goal to protect our natural environment. These include strategies to assist the recovery threatened species; encouraging surveys and research that increases knowledge of native plants and animals, and weeds and pest animals; and monitoring the recovery of native vegetation in areas of previous disturbance in conjunction with weed control measures.

This plan of management establishes the scheme of operations for Mororo Creek Nature Reserve and Chatsworth Hill State Conservation Area. In accordance with section 73B of the *National Parks and Wildlife Act 1974*, this plan of management is hereby adopted.

**Robyn Parker MP**  
**Minister for the Environment**

# MAP OF PLANNING AREA



## Legend

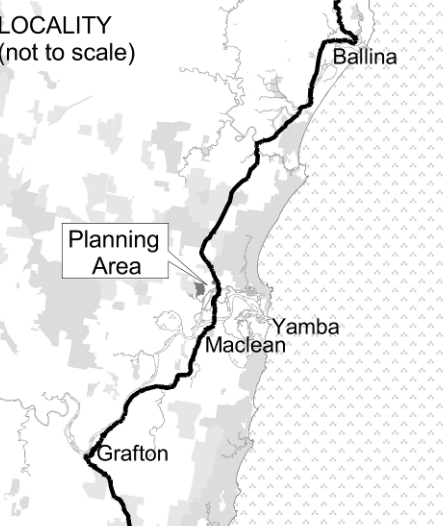
- Planning Area
- Other NPWS Estate
- State Forest
- Remote Natural Area

## Roads and Trails

- Neighbour Access Trail
- Unsealed Road - off park
- Private Property Trail
- Sealed Road - off park
- Pacific Highway
- Communication tower - off park
- Creeks / Drainage lines
- Open Water
- Quarry - off park

0 0.5 1 1.5 Kilometres

## LOCALITY (not to scale)



## 1. THE PLANNING AREA: LOCATION, GAZETTAL AND REGIONAL SETTING

Mororo Creek Nature Reserve and Chatsworth Hill State Conservation Area are both situated west of the Pacific Highway approximately 50 kilometres north-east of Grafton (29°41.4'S, 152°55.8'E), and inland from Yamba. Mororo Creek Nature Reserve was gazetted on 5 March 1999 and covers 80 hectares of former vacant crown land. Chatsworth Hill State Conservation Area is 510 hectares in size and was gazetted on 1 January 2003 over land that was formerly part of Gibberagee State Forest.

Mororo Creek Nature Reserve is situated on the Clarence River floodplain. In contrast, Chatsworth Hill State Conservation Area is located on the south-eastern extension of the Richmond Range, with only a small area located on the floodplain. They are however in close proximity to each other, and have similar social values and management issues. As a result, they have been combined for the purposes of this plan.

As well as the dedicated reserves, the area subject to this plan includes a section of Andersons Trail which has been excluded from reservation as Chatsworth Hill State Conservation Area (see map). The land on which this section of Andersons Trail lies is crown land that is vested in the Minister administering the *National Parks and Wildlife Act 1974* (NPW Act) for the purposes of Part 11 of the Act. This road was excluded from the state conservation area to ensure that access arrangements which existed immediately before its creation (in this case, for private property access) could continue.

As shown on the map, the extreme south of the state conservation area is separated from the rest of the reserve by a public road reserve. This road is currently not constructed and is not marked on the ground. It traverses a wetland listed under State Environmental Planning Policy 14 (Coastal Wetlands).

The planning area is part of a regionally important network of protected areas. Together with Gibberagee State Forest and forested private lands, the reserves form part of a forested corridor linking Bundjalung National Park to the east and the protected areas of the Richmond Range to the west. Surrounding land uses include cattle grazing, forestry, sugar cane production and some quarrying. Adjacent to the south-western corner of Mororo Creek Nature Reserve is the site of the former Mororo Landfill which has now been closed. A telecommunication tower is located on a privately owned hill to the north of Chatsworth Hill State Conservation Area. Both reserves are in a relatively undisturbed condition however some impacts arising from cattle grazing, weed incursion and previous logging operations are apparent.

Mororo Creek Nature Reserve and Chatsworth Hill State Conservation Area lie within the boundaries of the Yaegl Local Aboriginal Land Council area, the Clarence Valley Local Government Area and the Northern Rivers Catchment Management Authority.

## 2. MANAGEMENT CONTEXT

### 2.1 Legislative and policy framework

The management of nature reserves and state conservation areas in NSW is in the context of a legislative and policy framework, primarily the *National Parks and Wildlife Act 1974* (NPW Act), the NPW Regulation, 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, 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) may require the assessment and mitigation of the environmental impacts of 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 threatened or migratory species listed under that Act.

A plan of management is a statutory document under the NPW Act. Once the Minister has adopted a plan, no operations may be undertaken within Mororo Creek Nature Reserve or Chatsworth Hill State Conservation Area except in accordance with this plan. This plan will also apply to any future additions to Mororo Creek Nature Reserve or Chatsworth Hill State Conservation Area. Should management strategies or works be proposed for the nature reserve or state conservation area or any additions that are not consistent with the plan, an amendment to the plan will be required.

### 2.2 Management purposes and principles

#### 2.2.1 Nature Reserves

Nature reserves are dedicated 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 reserve's natural and cultural values; and
- provide for appropriate research and monitoring.

Nature reserves differ from national parks in that the provision for visitor use and enjoyment is not a management principle.

#### 2.2.2 State Conservation Areas

State conservation areas are reserved under the NPW Act to protect and conserve areas that contain significant or representative ecosystems, landforms or natural phenomena or places of cultural significance; that are capable of providing opportunities for sustainable visitor use and enjoyment, the sustainable use of buildings and structures, or research; and that are capable of providing opportunities for uses permitted under other provisions of the Act.

Under the Act (section 30G), state conservation areas are managed to:

- conserve biodiversity, maintain ecosystem functions, protect natural phenomena and maintain natural landscapes;



- conserve places, objects and features of cultural value;
- provide for the undertaking of uses permitted under other provisions of the NPW Act (including uses permitted under section 47J such as mineral exploration and mining), having regard to the conservation of the natural and cultural values of the state conservation area;
- provide for sustainable visitor use and enjoyment that is compatible with conservation of the area's natural and cultural values and with uses permitted in the area;
- provide for sustainable use (including adaptive reuse) of any buildings or structures or modified natural areas having regard to conservation of the area's natural and cultural values and with other uses permitted in the area; and
- provide for appropriate research and monitoring.

The NPW Act requires a review of the classification of state conservation areas every five years in consultation with the Minister administering the *Mining Act 1992*. The first review occurred in 2008 with no change in classification for Chatsworth Hill State Conservation Area. In the long term, subject to the outcomes of future five year reviews, it is intended for this state conservation area to become a nature reserve and so its management will also be guided by the management principles for nature reserves where possible.

### **2.3 Specific management objectives**

The following specific management objectives apply to the management of both Mororo Creek Nature Reserve and Chatsworth Hill State Conservation Area:

- Conservation of native vegetation communities, primarily through fire and weed control programs.
- Encouraging awareness and appreciation of the planning area's values among neighbours and the local community.
- Licensing use of Andersons Trail while it remains the only practical means of access to neighbouring private property.
- Managing the majority of Chatsworth Hill State Conservation Area (refer map) as a remote natural area.
- Allowing self-reliant nature-based activities, but without any promotion or facilities.

### 3. VALUES OF THE PLANNING AREA

The location, landforms and plant and animal communities of an area have determined how it has been used and valued. Both Aboriginal and non-Aboriginal people place values on natural areas, including aesthetic, social, spiritual and recreational values. These 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 values, their threats and use of the area are dealt with individually; their inter-relationships are however recognised.

#### 3.1 Landform, geology, hydrology and soils

Mororo Creek Nature Reserve is situated on the floodplain of the Clarence River, east of the south-eastern extension of the southern Richmond Range and is a relatively flat area with little change in elevation from five metres above sea level. Mororo Creek and several of its tributaries meander through the reserve in a southerly direction before flowing into the Back Channel of the Clarence River estuary. The soils of the reserve are comprised of undifferentiated alluvial deposits of sand, silt, clay and gravel. Large areas of the reserve are low lying, retaining surface water or saturated soils for most of the year. The reserve is highly likely to contain potential acid sulphate soils. If exposed to air, acid sulphate soils may increase the acidity of adjacent waters, and have detrimental impacts on aquatic animals and habitats.

Chatsworth Hill State Conservation Area is situated on the south-eastern extension of the southern Richmond Range, with elevations up to 228 metres above sea level at the summit of Chatsworth Hill. Soils of the state conservation area are mostly yellow podsols derived from the underlying Kangaroo Creek sandstone formation. These shallow soils are typically stony, sandy and highly acidic, of low nutrient content and highly susceptible to erosion (Morand 2001). Rocky outcrops and areas of rock and sand are common throughout the state conservation area. Several unnamed drainage lines flow south through the state conservation area into Shallow Bay, a tributary of Mangrove Creek, which also flows into the Clarence River's Back Channel. The south-western corner of the state conservation area on Mangrove Creek surrounding Shallow Bay includes a small part of a wetland formerly listed under State Environmental Planning Policy 14 (Coastal Wetlands). This wetland area is also expected to contain potential acid sulphate soils.

The geology of the state conservation area is dominated by the ridge-forming Jurassic Kangaroo Creek sandstone which, in this area is underlain at depth by the Walloon Coal Measures.

The climate is warm-humid with a summer/autumn rainfall peak during the February-May period. Rainfall in the district is approximately 1000-1100 millimetres at Grafton and 1400-1500 millimetres on the coast at Yamba.

#### 3.2 Native plants

There are three main forest types present in each of the reserves: shrubby dry sclerophyll forest, wet sclerophyll forest and swamp sclerophyll forest.

Shrubby dry sclerophyll forest covers the majority of Mororo Creek Nature Reserve. Common species include coastal blackbutt (*Eucalyptus pilularis*), red bloodwood (*Corymbia gummifera*), pink bloodwood (*C. intermedia*), broad-leaved white mahogany (*E. carnea*), smudgy apple (*Angophora woodsiana*) and small-fruited grey gum (*E. propinqua*). The mat-rush *Lomandra fluviatilis* and the palm lily *Cordyline congesta*, both considered rare by Briggs and Leigh (1996), have been recorded in the north of the

reserve. As this is outside the accepted range for this species of mat-rush, this record requires confirmation.

Similarly, the majority of Chatsworth Hill State Conservation Area supports shrubby dry sclerophyll forest, with two intermingling forest ecosystems present:

- Dry Heathy Blackbutt-Bloodwood, dominated by coastal blackbutt and, in places, large-fruited blackbutt (*E. pyrocarpa*); and
- Clarence Lowland Needlebark Stringybark, dominated by needlebark stringybark (*E. planchoniana*).

Subdominants in these ecosystems include red bloodwood, pink bloodwood, broad-leaved white mahogany, red mahogany (*E. resinifera*), black she-oak (*Allocasuarina littoralis*) and smudgy apple. A dense heathy understorey is present, dominated by banksias (*Banksia oblongifolia* and *B. spinulosa*), tea trees (*Leptospermum trinervium* and *L. polygalifolium*), geebungs (*Persoonia stradbrokeensis*), grass trees (*Xanthorrhoea* spp.) and the mountain devil (*Lambertia formosa*). Bordered guinea flower (*Hibbertia marginata*), listed as vulnerable under the TSC Act, has been recorded in the north of the state conservation area in dry sclerophyll forest. This plant is confined to the Southern Richmond Range (Harden & Everett 2000).

In both reserves, the swamp sclerophyll forest is a tall to very tall open-forest dominated by broad-leaved paperbark (*Melaleuca quinquenervia*). Swamp sclerophyll forest on coastal floodplain is recognised as an endangered ecological community under the TSC Act. Narrow-leaved tea tree (*Melaleuca alternifolia*), spiny mat-rush (*Lomandra longifolia*) and bracken fern (*Pteridium esculentum*) form a dense understorey in Mororo Creek Nature Reserve, whereas the understorey in the state conservation area is more open. Other endangered ecological communities present in the low-lying south-western parts of state conservation area include coastal saltmarsh, subtropical coastal floodplain forest, and swamp oak floodplain forest. A small area in the south eastern corner of the nature reserve may be consistent with the Commonwealth EPBC Act critically endangered ecological community listing for littoral rainforest and coastal vine thickets of Eastern Australia but this requires confirmation.

Within the wet sclerophyll forest in both reserves, common species include swamp turpentine (*Lophostemon suaveolens*), turpentine (*Syncarpia glomulifera*), salwood (*Acacia disparrima*) and forest oak (*Allocasuarina torulosa*). Pockets of rainforest occur in protected gullies within the state conservation area. The vulnerable tall knotweed (*Persicaria elatior*) and endangered narrow-leaf finger fern (*Grammitis stenophylla*) have been recorded nearby in Gibberagee State Forest and may occur in moister habitats of the state conservation area.

Past logging has modified the majority of the vegetation in the accessible parts of the state conservation area. Fire has also modified some areas and, in places, the ground cover is dominated by blady grass (*Imperata cylindrica*).

### **3.3 Native animals**

Mororo Creek Nature Reserve and Chatsworth Hill State Conservation Area are part of a vegetation corridor providing for fauna movement from forested areas in the hinterland to those on the coastal floodplain. A study of the Lower Clarence in 2009 in particular identifies the wildlife corridor values of the state conservation area (Graham 2009).

This habitat connectivity is particularly important for maintaining viable populations of threatened species. Significant animal species recorded or predicted to occur in the planning area are listed in Appendix 1.

Four threatened animal species have been recorded within Mororo Creek Nature Reserve. While there are no records of threatened fauna within Chatsworth Hill State Conservation Area, several species have been recorded in close proximity to the state conservation area and are likely to occur.

Several migratory species protected under international agreements have also been recorded in the planning area or close by.

### **3.4 Aboriginal heritage**

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

The Clarence Valley is significant to Aboriginal culture, with a rich history of land use by Aboriginal people. The planning area is located within the area represented by the Yaegl Local Aboriginal Land Council (LALC) and lies within the traditional lands of the Bundjalung and Yaegl People. A registered Native Title claim covers the northern sections of both reserves (NC98/19). The name 'Mororo' is thought to be of Aboriginal origin, meaning 'fighting place' (McSwan & Switzer 2006). Chatsworth Hill is a dominant feature in the landscape which provides views of the surrounding area. It is likely therefore that Chatsworth Hill has significance to the local community and may have been used by Aboriginal people as a lookout.

### **3.5 Historic heritage**

The land surrounding both Mororo Creek Nature Reserve and Chatsworth Hill State Conservation Area has been used for livestock grazing, quarrying, timber production and sugarcane farming since the mid-nineteenth century. These land uses, plus some residential and hobby farm development, continue adjacent to the planning area. However it appears that land use activities within what is now the reserves were restricted to selective timber harvesting and rough bush grazing. There are no historic sites recorded in the planning area.

The eastern half of the nature reserve was notified as a water reserve in the 1880s, and both reserves were held as crown leases at various times in the twentieth century. The section of Gibberagee State Forest in what is now the state conservation area was dedicated in 1974.

### **3.6 Mining and mineral exploration**

Chatsworth Hill State Conservation Area is currently covered by Petroleum Exploration Licence 457 (PEL 457). The Department of Trade and Investment, Regional Infrastructure and Services (DTIRIS) is the lead authority for mining, mineral exploration and mine site rehabilitation. DTIRIS (Minerals) is required under the EPA Act to undertake environmental assessments for mining and exploration activities in all state conservation areas. The existing Memorandum of Understanding (MOU) between NPWS and the former Department of Primary Industries (Mineral Resources) describes the management and consultative arrangements associated with exploration and mining in state conservation areas.

Approval of the Minister administering the NPW Act must be obtained before any rights under an assessment lease or exploration licence can be exercised. Likewise, the concurrence of the Minister administering the NPW Act must be obtained before any mining lease is issued. In the case of exploration licences and other prospecting titles, an access agreement under the *Mining Act 1992* between the title holder and the NPWS is required in order for the titleholder to conduct prospecting operations with the state conservation area.

## 4. THREATS TO THE PLANNING AREA'S VALUES

### 4.1 Introduced species

Lantana (*Lantana camara*) is present in areas of both the nature reserve and state conservation area subjected to previous disturbance, particularly in low-lying areas, and along drainage lines and gullies. Lantana is a vigorous invader of disturbed areas, often forming dense thickets. It competes with native plants and excretes allelopathic inhibitors into the soil, retarding native plant growth and regeneration, altering habitat values and fire regimes, and impeding access (DECC 2008). Invasion by lantana is listed as a key threatening process under the TSC Act, and all forms of lantana are declared noxious in New South Wales.

Other weeds present include groundsel bush (*Baccharis halimifolia*), castor oil plant (*Ricinus communis*), camphor laurel (*Cinnamomum camphora*), crofton weed (*Ageratina adenophora*), and some exotic grasses and herbaceous annuals. Five-leaved morning glory (*Ipomea cairica*) is present in the south-western corner of the state conservation area along Mangrove Creek. Several garden species have spread from the former landfill facility. Coral tree (*Erythrina sykesii*) and senna (*Senna pendula*) grow on the edges of the nature reserve along Lewis Lane.

Vertebrate pests include wild dogs (*Canis lupus familiaris*), which are also present on adjacent private lands and state forest, European red fox (*Vulpes vulpes*), pigs (*Sus scrofa*) and cane toads (*Bufo marinus*). These pests pose a significant threat to the fauna within and adjacent to the reserves. Predation by the European red fox and predation, habitat degradation, competition and disease transmission by feral pigs are listed as key threatening processes. Invasion and establishment of the cane toad is another key threatening process. Recent surveys have recorded large numbers of toads adjacent to the nature reserve. They are thought to have been introduced to the area in rubbish taken to the landfill facility when it was in operation.

Cattle (*Bos taurus*) occasionally stray into the state conservation area from neighbouring properties. Cattle are recognised as a potential threat through soil disturbance, compaction and erosion, weed transfer, direct grazing and trampling of threatened plants. Trampling of the wetland areas around Shallow Bay is a particular concern.

There are no licensed apiary sites within the planning area; however, the area may be within the foraging range of European honey bees (*Apis mellifera*) from hives kept on adjacent lands and feral hives may be present in the planning area.

### 4.2 Inappropriate fire regimes

Fire is a natural feature of many environments and is essential for the survival of some plant communities. Inappropriate fire regimes, in terms of season, frequency and intensity,

can lead to the loss of species and communities. High frequency fire is listed as a key threatening process under the TSC Act.

Despite limited historic records of fire for the planning area, large fires are known to have occurred in the late 1980s and also in the mid 1990s. The reserves were most recently burnt by a wildfire during 2001 when approximately one third of Mororo Creek Nature Reserve and all of what is now Chatsworth Hill State Conservation Area burned. The most likely direction for fire to enter the planning area is from the north-west under hot, dry north-westerly winds.

Requirements for most plant species can be summarised on the basis of vegetation communities and there is a threshold in fire regime variability which marks a critical change from high species diversity to low species diversity. The regime guidelines for the planning area's vegetation types are listed in Table 1. It is likely that the reserves have been burnt too frequently for maximum biodiversity.

**Table 1. Fire interval guidelines for protection of vegetation communities**

Vegetation Community	Minimum Interval	Maximum Interval	Notes
Wet sclerophyll forest	25 years	60 years	Crown fires should be avoided at the lower end of the interval range
Swamp sclerophyll forest	7 years	35 years	
Scrubby dry sclerophyll forest	7 years	30 years	

Source: Kenny *et al.* (2004)

### 4.3 Adjacent uses

Mororo Creek Nature Reserve has been and may still be affected by adjacent land uses, including the Pacific Highway to the north-east of the reserve and the closed landfill facility to the south-west. Drainage lines that run through the reserve and join Mororo Creek incorporate run-off from both.

The landfill facility (previously operated by the former Maclean Shire Council) was closed in 2000 and the site capped. A comprehensive monitoring program to assess water quality impacts from the landfill facility was conducted regularly between 1999 and 2007. While this revealed some groundwater contamination, the level of contaminate is not increasing and there has been no measured impact on the water quality of the adjacent creeks. This situation is unlikely to change in the near future (Hart 2007). Clarence Valley Council will maintain the cap on the site and monitoring will be re-introduced only prior to and following any proposed changes in land use.

The Pacific Highway is an ongoing source of litter and a potential source of chemical pollution.

### 4.4 Climate change

Anthropogenic climate change has been listed as a key threatening process under the TSC Act due to its anticipated impacts on biodiversity, through changes in the geographical extent of habitats and ecosystems, and subsequent changes in population size and distribution of species.

Projections of future changes in climate for NSW include higher temperatures, increased temperature extremes, more intense but possibly reduced annual average rainfall and higher evaporation. There are also likely to be rising sea levels, increased frequency of extreme storm events, and increased intensity and frequency of storm surges. These

changes are likely to lead to greater intensity, duration and frequency of fires, more severe droughts and increased regional flooding.

The potential impact of climate change on the planning area is difficult to predict with any accuracy since it depends on the compounding effects of other pressures, particularly barriers to migration and pressure from weeds and feral animals. Programs to reduce pressures arising from such threats will help mitigate the effects of climate change.

The most immediate impacts are likely to be felt in terms of increased duration of flood events, inundation of low-lying areas by salty water leading to die-back within the swamp sclerophyll forest and increased frequency of wildfire. Long term conservation of the planning area's biodiversity depends upon the protection and enhancement of the existing corridors of native vegetation across the landscape, which provide ecological links to other forested areas (Scotts 2003).

## 5. MANAGEMENT STRATEGIES AND ACTIONS

Current Situation	Desired Outcomes	Management Strategies / Actions	Priority
<p><b>5.1 Soil and water conservation</b></p> <p>Soils in the planning area are prone to a range of erosion hazards. The majority of the planning area has high potential hazard for topsoil and subsoil erosion, with high to extreme erodibility predicted for the steeper parts of the state conservation area. The entire area of the nature reserve and the south-western corner of the state conservation area contain potential acid sulphate soils. Management therefore seeks to undertake all works in a manner that minimises disturbance, erosion and any impact on water quality.</p> <p>Activities that may potentially exacerbate erosion include the use and maintenance of access roads and fire control lines. Soil erosion is also likely to increase following fire events. Andersons Trail in the south of the state conservation area runs through a low-lying area prone to soil movement, particularly after rainfall. This access trail requires ongoing and delicate maintenance to minimise impacts on downstream wetland areas and access restrictions will apply (refer section 5.7). In neighbouring Gibberagee State Forest, this trail and McMahons Trail traverse sections of steep grade on soils of high erosion hazard.</p> <p>Unauthorised vehicle use (predominantly by trail bikes) is causing significant damage to roads and trails in the area, and is actively contributing to soil erosion and water quality decline.</p> <p>Currently there are few other water quality issues within the planning area, although water quality in the nature reserve may be affected by run off from the Pacific Highway. Ground water in the vicinity of</p>	<ul style="list-style-type: none"> <li>• Soil erosion and disturbance of acid sulphate soils is minimised.</li> <li>• Water quality and health of streams in and downstream of the planning area are improved.</li> </ul>	<p>5.1.1 Seek the cooperation of Forests NSW in restricting access on their section of Andersons Trail and McMahons Trail.</p> <p>5.1.2 Liaise with local authorities regarding activities that may affect water quality upstream of the nature reserve, particularly changes in management of the former landfill.</p> <p>5.1.3 Liaise with Roads and Maritime Services to introduce litter traps or other mechanisms along the highway to prevent road-side litter polluting the waterways of the nature reserve.</p>	<p>Medium</p> <p>Medium</p> <p>Medium</p>



Current Situation	Desired Outcomes	Management Strategies / Actions	Priority
<p>the nature reserve has been contaminated by the former adjacent landfill facility but there appears to be no ongoing surface water contamination from this site.</p>			
<p><b>5.2 Native plants and animals</b></p> <p>The planning area conserves forest ecosystems which are considered poorly reserved, including swamp sclerophyll forest on coastal floodplain which is an endangered ecological community. The vulnerable bordered guinea flower (<i>Hibbertia marginata</i>) is recorded from the planning area and other threatened plant species have been recorded nearby in state forest. Four threatened animal species have been recorded in the nature reserve, and a number have been recorded in the vicinity of the state conservation area. Recovery actions for these species, as listed in the Priorities Action Statement and recovery plans, include targeted surveys, and the identification and mitigation of site-specific threats.</p> <p>While large parts of the planning area have been mapped as candidate old growth forest, some parts of the planning area have been subject to previous disturbances from logging and grazing. This is particularly evident in the western parts of the state conservation area and the north-western part of the nature reserve.</p> <p>The planning area forms part of a vegetated corridor, linking lowland and hinterland areas; the long-term conservation of the planning area's biodiversity relies on enhancing this landscape connectivity. Existing habitat values may be enhanced through the management of fire and introduced species (refer sections 5.4 and 5.5) and through liaison with neighbours, Clarence Valley</p>	<ul style="list-style-type: none"> <li>• Native species and communities are conserved and where possible enhanced.</li> <li>• Structural diversity and habitat values are restored in areas subject to past disturbance.</li> <li>• There is greater understanding of species diversity, distribution and ecological requirements.</li> <li>• Neighbours are aware of threatened species and actively support their conservation.</li> </ul>	<p>5.2.1 Undertake and encourage surveys and appropriate research that increases knowledge of native plants and animals within the planning area, their populations, distribution and ecological needs.</p> <p>5.2.2 Monitor population size, habitat condition and threats at known sites of the bordered guinea flower. If any are found near to roads or trails, avoid damage during road works.</p> <p>5.2.3 Monitor the recovery of native vegetation in areas of previous disturbance in conjunction with weed control measures.</p> <p>5.2.4 Liaise with neighbours to create awareness of threatened species and communities, and encourage retention and enhancement of threatened species habitat.</p> <p>5.2.5 Work with neighbours and Clarence Valley Council to encourage conservation of native vegetation adjacent to the nature reserve.</p> <p>5.2.6 Implement relevant recovery actions for endangered ecological communities and threatened species, particularly weed and fire control measures (see also sections 5.4 and 5.5).</p>	<p>Medium</p> <p>High</p> <p>Medium</p> <p>Medium</p> <p>Medium</p> <p>High</p>

Current Situation	Desired Outcomes	Management Strategies / Actions	Priority
Council and other interested organisations to encourage conservation of native vegetation adjacent to the nature reserve.			
<p><b>5.3 Cultural heritage</b></p> <p>The planning area lies within the traditional lands of the Bundjalung and Yaegl People and part is subject to a Native Title Claim.</p> <p>There has been no formal Aboriginal cultural heritage survey work carried out in the planning area and no sites are recorded. It is expected, however, that sites of Aboriginal cultural significance may be located within the two reserves. Therefore, ground disturbance work will be preceded by an appropriate level of environmental and cultural assessments.</p> <p>There has also been no historic heritage survey work within either of the reserves. No sites of historical heritage significance are known to occur in the planning area. If any relics are located they will be assessed to determine their significance and appropriate management action which may include leaving undisturbed in situ.</p>	<ul style="list-style-type: none"> <li>• Aboriginal people are involved in management of the planning area's Aboriginal cultural values.</li> <li>• Aboriginal people have opportunities to undertake cultural activities within the reserves.</li> <li>• Knowledge of the planning area's cultural values is improved.</li> <li>• Cultural features are identified and protected.</li> </ul>	<p>5.3.1 Consult and involve Native Title Claimants, the Yaegl Local Aboriginal Land Council, the Bundjalung Elders group and other relevant Aboriginal community organisations in all aspects of management and in particular the management of Aboriginal sites, places and values.</p> <p>5.3.2 Undertake and encourage surveys and research into the European and Aboriginal cultural heritage values of the planning area.</p>	<p>High</p> <p>Medium</p>
<p><b>5.4 Introduced plants and animals</b></p> <p>Pest plant and pest animal control activity within the planning area is conducted in accordance with the Regional Pest Management Strategy. This strategy identifies pest populations, priorities for control and control programs across the entire region.</p> <p>Pest plants are a minor issue within the planning area, occurring mainly in areas of previous</p>	<ul style="list-style-type: none"> <li>• The impacts of introduced plants and animals on the planning area and neighbouring lands is reduced and where possible eliminated.</li> </ul>	<p>5.4.1 Implement the Regional Pest Management Strategy, to manage introduced species, promote habitat development and regeneration of native species.</p> <p>5.4.2 Encourage and conduct weed and pest animal surveys, particularly targeted surveys for cane toads, to identify specific threats to the planning area's values.</p>	<p>High</p> <p>Medium</p>

Current Situation	Desired Outcomes	Management Strategies / Actions	Priority
<p>disturbance. Noxious weeds known to occur include lantana, castor oil plant, crofton weed, groundsel bush and camphor laurel.</p> <p>Pest animals recorded within the planning area include wild dogs, foxes, pigs and cane toads. Integrated pest animal control programs will be carried out as required with the North Coast Livestock Health and Pest Authority, Forests NSW and other neighbours. Cane toads are an emerging pest in the area and will be managed in accordance with the Regional Pest Management Strategy as well as more specific strategies that may be developed.</p> <p>In some sections of the planning area's boundaries, fences are in poor condition and/ or non-existent, allowing domestic stock to stray into the reserves from neighbouring properties. Consistent with NPWS policy, the use of horses and dogs may be authorised to assist in mustering of stock in the planning area.</p>	<ul style="list-style-type: none"> <li>Control of pest species has minimal impact on native species.</li> </ul>	<p>5.4.3 Ensure stray cattle are removed from the planning area as soon as practicable. Horses and dogs may be used to assist in mustering stock, except in wetland areas, as long as NPWS is notified on each occasion. NPWS may seek to recover costs incurred in removing cattle.</p> <p>5.4.4 Provide assistance to neighbours in accordance with the NPWS Boundary Fencing Policy to prevent domestic stock entering the planning area.</p>	<p>High</p> <p>Medium</p>
<p><b>5.5 Fire management</b></p> <p>Fire is regarded as a major issue in the planning area and, while little historical data exists, it is suspected that the fire thresholds required to maximise biodiversity have been exceeded, particularly in the state conservation area.</p> <p>The primary fire management objectives of the NPWS are to protect life, property and community assets from the adverse impacts of fire, whilst managing fire regimes to maintain and protect biodiversity and cultural heritage (NPWS 2007). NPWS is a fire authority and an active member of the Clarence Valley Zone Bushfire Management Committee (BFMC). Annual hazard reduction</p>	<ul style="list-style-type: none"> <li>Life, property and natural and cultural values are protected from fire.</li> <li>Fire frequencies are appropriate for conservation of native plant and animal communities.</li> <li>Neighbours and community well-</li> </ul>	<p>5.5.1 Implement the fire management strategies for each reserve, and update as required.</p> <p>5.5.2 Continue to participate in the Clarence Valley BFMC. Maintain cooperative arrangements with Rural Fire Service brigades and fire control officers, other fire authorities (particularly Forests NSW) and neighbouring landowners in regard to fuel management and fire suppression.</p> <p>5.5.3 Encourage further research into the ecological effects of fire in the planning area.</p>	<p>High</p> <p>High</p> <p>Medium</p>

Current Situation	Desired Outcomes	Management Strategies / Actions	Priority
<p>programs, which may include mechanical fuel reduction techniques, prescribed burning and fire trail works, are submitted to the BFMC.</p> <p>Separate fire management strategies have been prepared for each reserve. These note that, while a number of buildings occur in close proximity to the north-western corner of the nature reserve, sufficient radiation zones are currently incorporated on neighbouring private property, and no additional asset protection zones are required in the reserve. The fire management strategies therefore aim to manage fire within each reserve to protect biodiversity in accordance with the identified fire interval guidelines for vegetation communities (see Table 1). Prescribed fire may be used to achieve a variety of fire regimes to maintain habitat suitable for fauna species. The fire management strategy will also assess the risk to any cultural sites identified and include appropriate fire management practices.</p>	<p>informed and supportive of NPWS fire objectives and operations.</p>		
<p><b>5.6 Visitor use</b></p> <p>A limited number of locals and neighbours have used the planning area in the past for recreation, including bushwalking, picnicking, trail-bike riding and four-wheel driving. There are no visitor facilities in either of the reserves. Visitor facilities are provided in the nearby Bundjalung and Yuraygir national parks.</p> <p>Public roads provide access to the northern and southern boundary of the nature reserve, however there are no tracks or trails in the nature reserve. Given that parts of the reserve are intermittently inundated by water, the soils are highly erodible and the vegetation is a small remnant of an endangered ecological community, recreational</p>	<ul style="list-style-type: none"> <li>• Visitor use does not cause conflict with neighbours and has no impact on the values of the planning area.</li> <li>• Neighbours and others in the local community are aware of the significance of the planning area and of management</li> </ul>	<p>5.6.1 Allow visitors to access the nature reserve by foot only. This use will not be promoted and no recreational facilities will be developed. Visitors wishing to access the state conservation area will be required to have the relevant neighbours' permission and written consent from NPWS.</p> <p>5.6.2 Prohibit cycling, recreational horse riding and camping in the planning area.</p> <p>5.6.3 Organise regular contact with neighbours and community organisations regarding the planning area.</p> <p>5.6.4 Seek the cooperation of Forests NSW to limit public access to their section of Andersons Trail and to McMahons</p>	<p>High</p> <p>High</p> <p>Medium</p> <p>Medium</p>

Current Situation	Desired Outcomes	Management Strategies / Actions	Priority
<p>use should not be encouraged.</p> <p>Access to the state conservation area and the neighbouring section of Gibberagee State Forest from the east is across private property (see section 5.7). Visitation to the state conservation area therefore potentially puts visitors in conflict with neighbours.</p> <p>Andersons Trail traverses a fragile, low-lying swamp area. Inappropriate levels of use in wet weather, both within the state conservation area and on adjacent private property and state forest, erode trail surfaces and impact on important wetlands (see section 5.1). This trail is therefore not generally suitable for use by horses, bicycles or vehicles except as required for management access or access to neighbouring private property (see sections 5.4 and 5.7).</p> <p>Promotion of community understanding and appreciation of the conservation values of the planning area is important to minimise the occurrence of damaging activities.</p>	<p>programs.</p>	<p>Trail (refer 5.7).</p>	
<p><b>5.7 Management operations and authorised uses</b></p> <p>Management operations are limited to fire, weed and pest control programs for both reserves. Boundary signs for the planning area are in place. Trail maintenance also occurs in and adjacent to the state conservation area. There are no trails in the nature reserve.</p> <p>Andersons Trail is the only vehicle trail in the planning area. To access Chatsworth Hill State Conservation Area, NPWS uses privately maintained trails and roads, only some of which lie on public road reserves (see map). NPWS also</p>	<ul style="list-style-type: none"> <li>• Management access and operations are adequate and have minimal impact.</li> <li>• No new non-park infrastructure</li> <li>• Mining and mineral exploration</li> </ul>	<p>5.7.1 Maintain Andersons Trail as the only vehicle access in the planning area for management purposes and neighbour access. All other former vehicle tracks will be closed and rehabilitated.</p> <p>5.7.2 Formalise arrangements with neighbours and the Department of Primary Industries (Crown Lands Division) for NPWS access to the state conservation area.</p> <p>5.7.3 Formalise maintenance and access arrangements for McMahons Trail with Forests NSW to ensure it remains</p>	<p>High</p> <p>Medium</p> <p>Medium</p>

Current Situation	Desired Outcomes	Management Strategies / Actions	Priority
<p>uses McMahons Trail and a section of Andersons Trail in Gibberagee State Forest to access the western edge of the state conservation area, and carries out maintenance works on these sections of forestry trail to ensure ongoing access.</p> <p>A telecommunications facility managed by Crown Castle is located on an unnamed hill north of the state conservation area. It is generally accessed from the north via the Jackybulbin-Tullymorgan Rd and a network of trails through private property. This network is poorly signposted, and service providers can become lost and end up in the state conservation area. NPWS sometimes also uses this network of trails to access the state conservation area.</p> <p>Andersons Trail provides the only practical means of access to a neighbouring private property west of Shallow Bay. Andersons Trail may continue to be used to access the neighbouring property. Pets and livestock may be transported by vehicle along the trail provided they are en route to the private property and remain in the vehicle. Should alternative access to this property be developed, the trail's corridor will be added to the state conservation area and the trail will become a management trail, for use only by NPWS and emergency vehicles.</p> <p>The tenure of state conservation area allows for mining activity and the area is currently covered by a petroleum exploration licence. The lead authority for mining, mineral exploration and mine rehabilitation is the Department of Trade and Investment, Regional Infrastructure and Services (DTIRIS). A memorandum of understanding between NPWS and DTIRIS (Minerals) describes the arrangements associated with exploration and</p>	<p>activities have minimal impact on natural and cultural values.</p> <ul style="list-style-type: none"> <li>The planning area is appropriately identified in zoning plans.</li> </ul>	<p>trafficable for use by management and emergency vehicles.</p> <p>5.7.4 Liaise with Forests NSW and Crown Castle to improve the directional signage on the trails to the north of the state conservation area.</p> <p>5.7.5 Applications for mining or mineral exploration in the state conservation area will be subject to environmental assessment in accordance with the Memorandum of Understanding between NPWS and DTIRIS (Minerals).</p> <p>5.7.6 In liaison with Clarence Valley Council and the Department of Primary Industries (Crown Lands Division), seek the closure of the public road reserve in the south of the state conservation area and its addition to the area. Pursue consolidation of the reserve's boundary and tenure through acquisition of vacant crown land where appropriate.</p>	<p>Medium</p> <p>High</p> <p>Medium</p>

Current Situation	Desired Outcomes	Management Strategies / Actions	Priority
<p>mining in state conservation areas.</p> <p>A small public road reserve, under the control of Clarence Valley Council, lies in the south of the state conservation area, through part of the SEPP14 wetland. This road is not constructed on ground and the access it could potentially provide is duplicated by Andersons Trail.</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.

## 6. REFERENCES

- Briggs, J.D. & Leigh, J.H. (1996). *Rare or Threatened Australian Plants*. Revised edition. CSIRO, Melbourne.
- Graham, M. (2009). *The Lower Clarence Biolinks Study*. Prepared for Valley Watch Inc. Buckombil Conservation Services
- Harden, G.J. & Everett, J. (2000). Dilleniaceae. Pp.293 - 303 in G. Harden (ed.) *Flora of New South Wales, Volume 1*. Revised edition. University of New South Wales Press, Sydney
- Hart, C. (2007). *Report: Mororo Landfill Environmental Monitoring*. CodyHart Consulting PTY Ltd, Burleigh Heads
- Kenny, B., Sutherland, E., Tasker, E. & Bradstock, R. (2004). *Guidelines for Ecologically Sustainable Fire Management*. A project undertaken for the NSW Biodiversity Strategy by the NSW National Parks and Wildlife Service. NSW Government, Sydney
- McSwan, E.H. & Switzer, M. (2006). *A Thematic History of Maclean Shire, Volume 2*. Report of the Community Based Heritage Study conducted for the former Maclean Shire. Clarence Valley Council, Maclean, NSW
- Morand, D. T. (2001). *Soil Landscapes of the Woodburn 1:100 000 Sheet*. Department of Land and Water Conservation, Sydney
- NPWS (1999). *Modelling Areas of Habitat Significance for Vertebrate Fauna and Vascular Flora in North-East NSW*. A project undertaken for the Joint Commonwealth-NSW Regional Forest Agreement Steering Committee, as part of the Comprehensive Regional Assessments. NSW National Parks and Wildlife Service, Coffs Harbour, NSW
- NPWS (2007). *Fire Management Manual*. 7<sup>th</sup> revision. NSW National Parks and Wildlife Service, Hurstville
- Scotts, D. (2003). *Key Habitats and Corridors for Forest Fauna: A landscape framework for conservation in north-east New South Wales*. Occasional Paper No 32. NSW National Parks and Wildlife Service, Hurstville



## APPENDIX 1

### Significant animal species recorded or likely to occur in the planning area

Common name	Scientific name	Status*	Occurrence**	
			MC NR	CH SCA
<u>Frogs and Reptiles</u>				
Stephens' Banded Snake	<i>Hoplocephalus stephensii</i>	V	-	Predicted
Green-thighed Frog	<i>Litoria brevipalmata</i>	V	-	Predicted
<u>Birds</u>				
Regent Honeyeater	<i>Anthochaera phrygia</i>	E1 #	- ^	Predicted
Cattle Egret	<i>Ardea ibis</i>	M	Predicted	Predicted ^
Eastern Great Egret	<i>Ardea modesta</i>	M	<b>Recorded</b>	Predicted ^
Bush Stone-curlew	<i>Burhinus grallarius</i>	E1	Predicted ^	Predicted
Glossy Black-Cockatoo	<i>Calyptorhynchus lathami</i>	V	- ^	Predicted ^
Brown Treecreeper	<i>Climacteris picumnus</i>	V	-	Predicted ^
Black-necked Stork	<i>Ephippiorhynchus asiaticus</i>	E1	Predicted ^	Predicted ^
Latham's Snipe	<i>Gallinago hardwickii</i>	M	-	Predicted ^
Brolga	<i>Grus rubicunda</i>	V, M	-	Predicted ^
White-bellied Sea Eagle	<i>Haliaeetus leucogaster</i>	M	Predicted ^	Predicted ^
Comb-crested Jacana	<i>Irediparra gallinacea</i>	V	<b>Recorded</b>	Predicted ^
Black Bittern	<i>Ixobrychus flavicollis</i>	V	Predicted	Predicted ^
Swift Parrot	<i>Lathamus discolor</i>	E1 #	-	Predicted
Square-tailed Kite	<i>Lophoictinia isura</i>	V	-	Predicted
Rainbow Bee-eater	<i>Merops ornatus</i>	M	<b>Recorded</b>	Predicted ^
Barking Owl	<i>Ninox connivens</i>	V	-	Predicted ^
Powerful Owl	<i>Ninox strenua</i>	V	Predicted	Predicted
Osprey	<i>Pandion cristatus</i>	V	Predicted ^	-
Grey-crowned Babbler	<i>Pomatostomus temporalis</i>	V	- ^	Predicted ^
Masked Owl	<i>Tyto novaehollandiae</i>	V	-	Predicted
<u>Mammals</u>				
Rufous Bettong	<i>Aepyprymnus rufescens</i>	V	<b>Recorded</b>	Predicted
Common Planigale	<i>Planigale maculata</i>	V	Predicted	Predicted
Eastern Long-eared Bat	<i>Nyctophilus bifax</i>	V	Predicted ^	Predicted
Eastern Cave Bat	<i>Vespadelus troughtoni</i>	V	-	Predicted
Squirrel Glider	<i>Petaurus norfolcensis</i>	V	-	Predicted
Little Bent-wing Bat	<i>Miniopterus australis</i>	V	<b>Recorded</b>	Predicted
Large-footed Myotis	<i>Myotis macropus</i>	V	Predicted	Predicted
Eastern Long-eared Bat	<i>Nyctophilus bifax</i>	V	<b>Recorded</b>	Predicted
Brush-tailed Phascogale	<i>Phascogale tapoatafa</i>	V	Predicted	Predicted ^
Koala	<i>Phascolarctos cinereus</i>	V	Predicted	Predicted
Grey-headed Flying Fox	<i>Pteropus poliocephalus</i>	V #	- ^	Predicted
Greater Broad-nosed Bat	<i>Scoteanax rueppellii</i>	V	- ^	Predicted

\* Status is as follows:

E1 = listed as an endangered species under the TSC Act;

V = listed as Vulnerable under the TSC Act;

# = listed as threatened under the EPBC Act;

M = listed as a migratory species under the EPBC Act.

\*\* Occurrence is based on NPWS Wildlife Atlas records and assessment of habitat suitability NPWS (1999).

^ = records within 2km of reserve