



Environment,
Climate Change & Water
National Parks & Wildlife Service



Yaegl Nature Reserve

Plan of Management



YAEGL NATURE RESERVE

PLAN OF MANAGEMENT

NSW National Parks and Wildlife Service

Part of the Department of Environment, Climate Change and Water

February 2011

This plan of management was adopted by the Minister for Climate Change and the Environment on 21st February 2011.

Acknowledgments

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

This plan of management was prepared by the staff of the North Coast Region of the NSW National Parks and Wildlife Service (NPWS), part of the Department of Environment, Climate Change and Water.

For additional information or any inquiries about this reserve or this plan of management, contact the NPWS Clarence North Area, PO Box 361, Grafton NSW 2460 or by telephone on 02 6641 1500.

Cover photographs by Louise Feltus, NPWS.

Photograph 1 Yaegl Nature Reserve as seen from Maclean Lookout

Photograph 2 Swamp sclerophyll forest.

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FOREWORD

Yaegl Nature Reserve is located near Maclean on the NSW North Coast. It was reserved in 2003 and has an area of 313 hectares.

Yaegl Nature Reserve protects a large and important area of floodplain paperbark forest and an area of coastal saltmarsh, each of which is listed as an endangered ecological community. The reserve also provides important habitat and winter food resources for a range of native fauna, including the threatened grey-headed flying-fox, the grey-crowned babbler and the brolga.

Yaegl Nature Reserve also contains an Aboriginal keeping place for the Yaegl people.

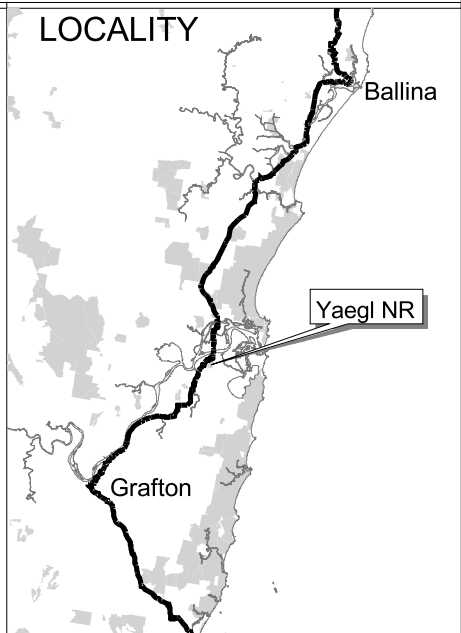
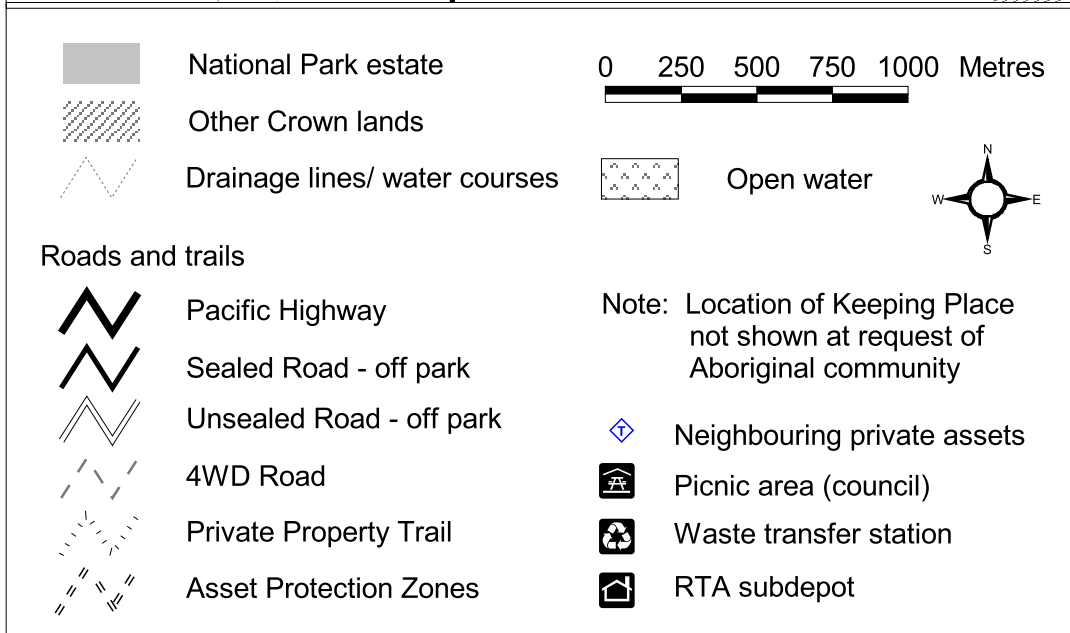
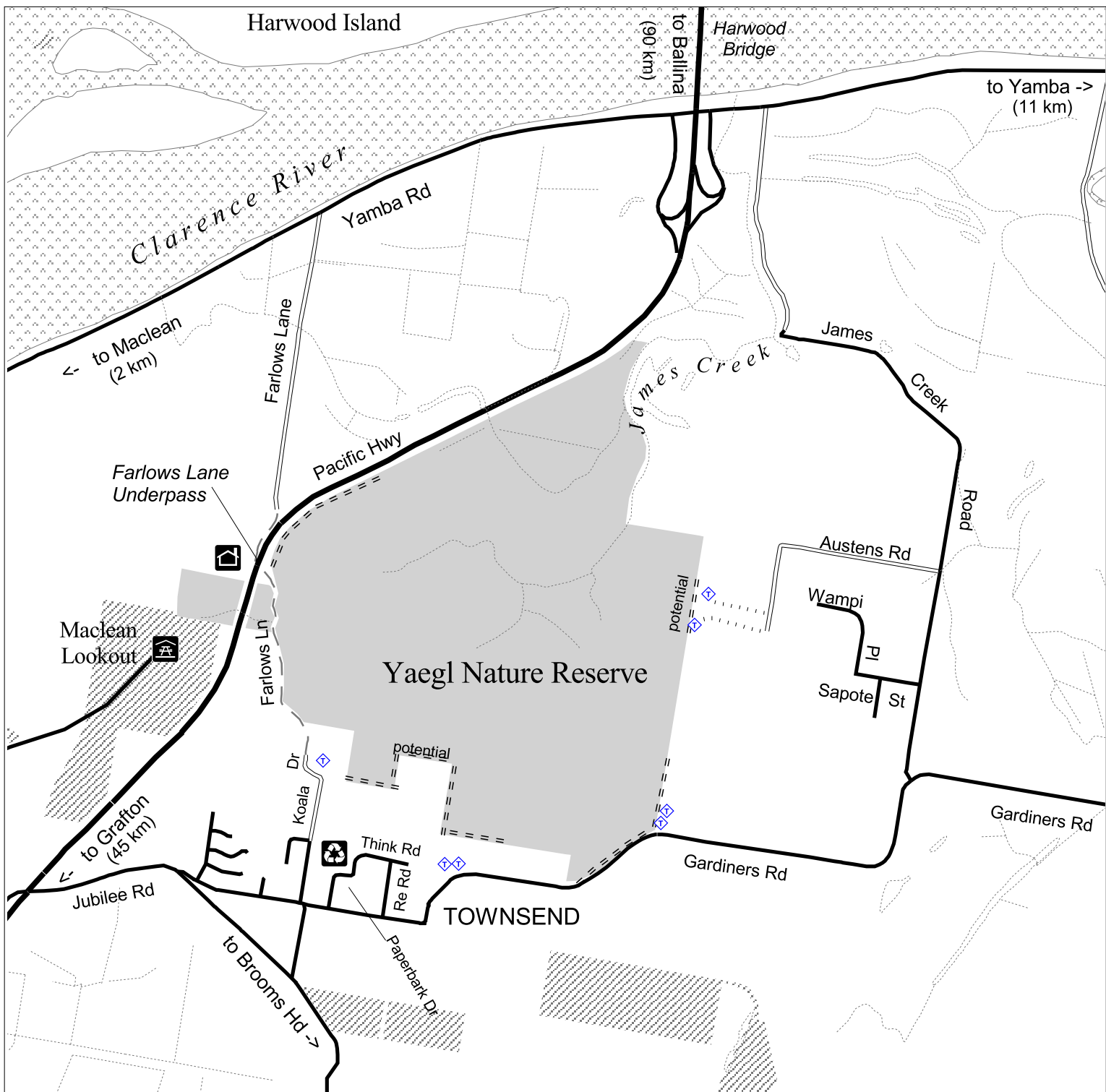
The New South Wales *National Parks and Wildlife Act 1974* requires that a plan of management be prepared for each nature reserve. A draft plan of management for Yaegl Nature Reserve was placed on public exhibition from 30th January until 11th May 2009. The submissions received were carefully considered before adopting this plan.

The plan contains a number of actions to achieve the State Plan priority to “Protect native vegetation, biodiversity, land, rivers and coastal waterways”, including actions to prevent pollution of waterways, undertaking surveys for threatened plant and animal species, implementing weed control measures, and preparation of a separate fire management strategy for the reserve.

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



Frank Sartor MP
Minister for Climate Change and the Environment



1. YAEGL NATURE RESERVE

Yaegl Nature Reserve is situated on the lower Clarence floodplain in northern NSW, approximately 1 kilometre east of the town of Maclean (29°27.6'S, 153°12'E). The reserve covers an area of approximately 313 hectares, the majority of which is located on the eastern side of the Pacific Highway (see map).

The reserve protects a large and important wetland, commonly known as Farlows Swamp or the Maclean Wetlands, which was listed under State Environmental Planning Policy Number 14 (Coastal Wetlands) in 1986. This large remnant of floodplain paperbark forest – a vegetation community that has been extensively cleared and is poorly represented in the NSW reserve system (Keith 2004) – is of high regional significance. It was formerly freehold land which was offered for sale to the NSW Government by its previous owners so that it could be managed as a wetland for future generations. The land was purchased in 1999 with assistance from the Australian Government through the Natural Heritage Trust's National Reserve System Program.

The land was reserved as Yaegl Nature Reserve in 2003. The origin of the name relates to the Yaegl people, the Aboriginal group whose land includes the area of the reserve. A small section of the reserve has been identified as a keeping place for the Yaegl people, and is used for the repatriation of Aboriginal cultural remains. In 2006 it was the site of the first repatriation of material to an Aboriginal community on the north coast of NSW.

Surrounding land uses include agriculture, rural residential and industrial development, including the Maclean Sub-depot of the Roads and Traffic Authority (RTA) and a council waste transfer station on the site of a former landfill. The reserve also abuts approximately 36 hectares of crown land surrounding Maclean Scenic Lookout and Pinnacle. This area of crown land comprises three reserves for future public requirements and a reserve for public recreation, which is managed by Clarence Valley Council with most of the area (apart from the area immediately surrounding the picnic area and trig station) managed for vegetation protection (CVC 2005). Together, these crown reserves and Yaegl Nature Reserve form an important 'island' of native vegetation, largely isolated from other vegetated remnants.

Yaegl Nature Reserve falls within the areas of the Clarence Valley Council, the Northern Rivers Catchment Management Authority, and the Yaegl Local Aboriginal Land Council.

2. MANAGEMENT CONTEXT

2.1 Legislative and Policy Framework

The management of nature reserves in NSW is in the context of a legislative and policy framework, primarily the *National Parks and Wildlife Act 1974* (NPW Act), the 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, 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 have

significant impacts on matters of national environmental significance, such as threatened species and 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 Yaegl Nature Reserve except in accordance with this plan. This plan will also apply to any future additions to Yaegl Nature Reserve. Should management strategies or works be proposed for the Nature Reserve or any additions that are not consistent with the plan, an amendment to the plan will be required.

2.2 Management Purposes and Principles

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

Under the Act (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 they do not have the provision for visitor use as a management principle.

2.3 Specific Management Directions

The primary emphasis of this plan is the conservation of the reserve's natural and cultural values. The following specific directions apply to the management of Yaegl Nature Reserve:

- Conserve the full range of native flora and fauna, with an emphasis on the conservation of significant species and vegetation communities, and improved understanding of the use of the area by flying-foxes.
- Work with Aboriginal community in the maintenance, use and protection of the keeping place.
- Protect life and property adjacent to the reserve while promoting a fire regime which enhances the biodiversity values of the reserve.
- Reduce the impacts of inappropriate recreational uses, rubbish dumping and arson.
- Allow low impact, self-reliant recreation such as bird-watching and bushwalking, but do not promote nor provide facilities for recreation in the reserve.
- Protect water quality in James Creek.
- Interpret the reserve's values at suitable sites off the reserve, such as Maclean Lookout.

3. VALUES OF THE RESERVE

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 heritage, cultural heritage, threats and on-going use are dealt with individually, but their inter-relationships are recognised.

3.1 Landform, Hydrology and Soils

Yaegl Nature Reserve is situated on the Lower Clarence floodplain and primarily consists of an estuarine back swamp which forms a large proportion of the catchment of James Creek. The majority of the reserve is less than 5 metres above sea level. However, a small sand ridge, approximately 10 hectares in size and 15 metres high, occurs in the south east of the reserve and, to the west of the Pacific Highway, a small and very steep outlier of the reserve (approximately 6 hectares in size) protects part of the eastern slope of Maclean Lookout, with the western boundary of the reserve at approximately 95 metres above sea level.

The hydrological regimes in the surrounding floodplain have been altered dramatically, with numerous artificial drains discharging into the Clarence River. That part of James Creek within the reserve is one of the few tributaries of the Clarence River floodplain which has not been subject to intensive flood mitigation works. Apart from some crude and shallow drains on its western edge and a narrow drain in the north, the reserve's hydrological regimes are largely natural, and the reserve has an important role for filtering run off and for contributing to the quality of freshwater flows into the creek. The narrow drain in the north of the reserve is entirely within the reserve. Any overflow from the drain runs onto wetlands on adjacent freehold land to the east. The drain has not been maintained for many years and is not licensed or utilised by any public or private authority. The intent is to allow vegetation to naturally regenerate. No earthworks are proposed in relation to the drain as these would have the potential to disturb acid sulphate soils.

Soils in the reserve are mostly deep and poorly drained alluvial deposits, with acid sulphate soil materials likely to be present. These remain relatively inert unless disturbed or drained. The James Creek catchment, including the reserve, is not mapped as a priority area for management of acid sulphate soils in the Lower Clarence Floodplain (Tulau 1999).

Soils on the upper slopes of Maclean Lookout are shallow, stony yellow podzols, earthy sands, siliceous sands and lithosols, reflecting the underlying quartz sandstone. These have moderate to very high erosion hazard. On the lower slopes, soils are deeper and moderately well-drained siliceous sands, and display high sheet and gully erosion risk (Morand 2001).

3.2 Native Plants

The dominant vegetation community within 90% of the reserve is swamp sclerophyll forest, of which broad-leafed paperbark (*Melaleuca quinquinervia*) forms the only canopy species. The understorey consists of ferns and grasses such as swamp water fern (*Blechnum indicum*), mud grass (*Pseudoraphis spinescens*), barnyard grass (*Echinochloe colonum*) and water couch (*Paspalum paspaloides*), and sedges, rushes and reeds such as common reed (*Phragmites australis*) and cumbungi (*Typha* spp.). Aquatic species such as giant waterlilies (*Nymphaea gigantea*) are also present. Paperbark swamp forest of this type once occurred throughout the floodplains on the NSW north coast but most has been cleared for high intensity agriculture such as sugarcane production. Swamp sclerophyll forest on coastal floodplains has been listed as an endangered ecological community (EEC) under the TSC Act and there are few examples in the reserve system.

A natural salt pan supporting a saltmarsh community of grasses and sedges dominated by *Lepironia articulata* occurs in the northern section of the reserve. Coastal saltmarsh is also recognised as an EEC under the TSC Act.

A small rise in the south east of the reserve, adjacent to Gardiners Road, supports a mixed sclerophyll forest community where dominant canopy species include white mahogany (*Eucalyptus acmenoides*), grey ironbark (*E. siderophloia*), tallowwood (*E. microcorys*), forest red gum (*E. tereticornis*) and grey gum (*E. propinqua*). The steep slope in the western section of the reserve was previously cleared, and the regrowth is dominated by wattles (including *Acacia maidenii*), cypress pine (*Callitris rhomboidea*), foambark tree (*Jagera pseudorhus*) and native rosella (*Hibiscus heterophyllus*), with a small gully of dry rainforest on the lower slopes. This may have merged into what was probably lowland subtropical rainforest between the hill and the swamp, however much of this area, which lies adjacent to the Pacific Highway, remains open pasture. Cleared for cattle grazing, this area is mainly covered by exotic grasses and herbaceous weeds.

A comprehensive flora survey has not been undertaken in the reserve. The only threatened plant species known to occur in the reserve is rough-shelled bush nut (*Macadamia tetraphylla*) but this is suspected to have been planted as it occurs with other garden plants (see section 3.5). A number of other significant plant species have been recorded in proximity to the reserve, including the rare native wisteria (*Callerya australis*) and the endangered basket fern (*Drynaria rigidula*). Suitable habitat for these species occurs in the reserve, particularly in the small forested section of the reserve west of the highway.

3.3 Native Animals

The reserve represents important habitat for fauna. Broad-leaved paperbarks typically flower heavily over winter and produce high levels of nectar. This reserve therefore provides important winter food resources for a range of fauna species, including migrant bird, flying-fox and microchiropteran bat species. Yaegl Nature Reserve also contains significant habitat for a range of waterbird species. A comprehensive fauna survey has not been carried out in the reserve, however it is considered that the reserve contains suitable habitat for up to eleven additional threatened species, listed in Table 1.

Table 1 Threatened fauna known and predicted to occur in Yaegl Nature Reserve

Common Name	Scientific Name	Legal Status*
Species known to occur within the reserve		
Brolga	<i>Grus rubicunda</i>	Vulnerable ^
Grey-crowned babbler	<i>Pomatostomus temporalis temporalis</i>	Vulnerable
Grey-headed flying-fox	<i>Pteropus poliocephalus</i>	Vulnerable #
Species predicted to occur within the reserve		
Birds		
Bush stone-curlew	<i>Burhinus grallarius</i>	Endangered
Black-necked stork	<i>Ephippiorhynchus asiaticus</i>	Endangered
Black bittern	<i>Ixobrychus flavicollis</i>	Vulnerable
Square-tailed kite	<i>Lophoictinia isura</i>	Vulnerable
Eastern osprey	<i>Pandion cristatus</i>	Vulnerable
Eastern grass owl	<i>Tyto capensis</i>	Vulnerable
Masked owl	<i>Tyto novaehollandiae</i>	Vulnerable
Mammals		
Little bent-wing bat	<i>Miniopterus australis</i>	Vulnerable
Eastern bent-wing bat	<i>Miniopterus schreibersii oceanensis</i>	Vulnerable
Eastern freetail-bat	<i>Mormopterus norfolkensis</i>	Vulnerable
Squirrel glider	<i>Petaurus norfolcensis</i>	Vulnerable

* Status under TSC Act;

Denotes species also listed as nationally threatened under the EPBC Act.

^ Denotes species also listed as a migratory species under the EPBC Act.

Flying-fox populations reside seasonally in the Clarence Valley, following the flowering of native plants. Flying-foxes are important pollinators of eucalypts and other tree species, and are considered essential to the health and continuation of our native forests. It was observed that Farlows Swamp was used by higher than normal numbers of flying-foxes when noise disturbance was being used to remove them from the rainforest reserve adjacent to Maclean High School (Tidemann 2002), and the reserve has been identified as a potential alternative roost site for flying-foxes that roost at the rainforest reserve and elsewhere in Maclean (Tanton 1999; Nelson 2008). However, while there is evidence of repeated use of Yaegl Nature Reserve by flying-foxes for roosting and foraging, this use is irregular, on a seasonal basis (generally between February and May) and appears to be primarily by little red flying-foxes (*Pteropus scapulatus*) (Roberts 2006). The reserve currently does not have those characteristics that would make it suitable as an alternative maternity camp site for flying-foxes (Roberts 2005; Nelson 2008).

3.4 Aboriginal Heritage

Aboriginal communities have an association and connection to the land. The land and water 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, 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 reserve has significant cultural and spiritual values for the Yaegl community, which places special emphasis on the Clarence floodplain.

In September 2003 the nature reserve was officially 'opened' by local Yaegl Elders at a public ceremony. The celebration was an acknowledgment of the natural and cultural values of the area, and the contemporary connection of the Yaegl community to the land.

A small section of the reserve (less than 1 hectare in size) has been recognised as a 'keeping place' for the repatriation of Aboriginal cultural material. The identification of this area has been a collaborative project undertaken in conjunction with the Yaegl Aboriginal community. The keeping place concept was agreed on to provide an area where the Yaegl community can return cultural material which either requires relocating or where its place of origin is unknown.

The Australian Museum holds many collections of Aboriginal cultural materials which it is attempting to return to Aboriginal people throughout NSW. However, the exact origin of some of the materials is not known, having been catalogued by tribal boundaries or townships. This has posed a problem for Aboriginal communities wishing to have these collections returned. Having a general area for returning these materials has greatly assisted the Yaegl people, and given them the confidence to seek the return of their local Museum collections.

A small unobtrusive plaque in the south eastern corner of the reserve commemorates this 'keeping place'. In April 2006 the keeping place was used for the repatriation of Yaegl cultural materials which had been found in the Clarence River near Maclean. This was the first repatriation to the reserve of materials which were considered highly significant to the local Aboriginal people.

Archaeological surveys have not been conducted in the reserve and therefore no Aboriginal sites or artefacts have been recorded in the reserve outside the keeping place, although sites are known to occur in close proximity to the reserve. There are considerable areas of cultural significance to the Yaegl people in the surrounding area, including on adjacent crown land.

3.5 Historic Heritage

European settlement in the Clarence River valley started in the early 1830s with cedar cutters moving into the area's rainforests. These cedar cutters were in turn followed by farmers and pastoralists who commenced clearing the arable land. The floodplain, valleys and gentle slopes were gradually cleared for pasture and crops, and many of the floodplain's swamps were cleared and drained to support agriculture and dairying activities.

The reserve is locally known as Farlows Swamp in recognition of the previous land owners. The primary use of the land while under their ownership was grazing beef cattle, and remnants of fences can be found in the reserve. Large amounts of paperbarks were ringbarked during the 1930s (R. Farlow, pers. comm. 1996) but the forest has regenerated over the past 70 years and the canopy is currently almost closed. As a result of this ring-barking operation, the forest is of an even-age. It is considered that, as a result of tree fall and other natural disturbances, this uniform forest structure will change over time into a mixed age stand which will create improved habitat and increase biodiversity within the reserve.

A number of garden trees, presumably planted near a former homestead, occur in the western part of the reserve close to the Pacific Highway. These include a mango (*Mangifera indica*), loquat (*Eriobotrya japonica*) and a rough-shelled bush nut (*Macadamia tetraphylla*). A prominent bunya pine (*Araucaria bidwillii*) is also located close by, on the opposite side of the Pacific Highway, just outside the reserve's boundary.

4. THREATS TO RESERVE VALUES

4.1 Introduced Species

Yaegl Nature Reserve contains a number of weed species and, given its location on the floodplain and near residential areas, there is continuing potential for new weed species to be dispersed to the reserve. Exotic vines, such as Madeira vine (*Anredera cordifolia*), are a major concern in the reserve as they can smother the canopy and kill trees, and reduce the suitability of the forest as a flying-fox camp. Invasion and establishment of exotic vines and scramblers has been listed as a key threatening process under the TSC Act. There are also a number of exotic grasses in the reserve, particularly in the cleared parts near the highway, which limits the re-establishment of native vegetation. Invasion of native plant communities by exotic perennial grasses is also listed as a key threatening process.

The weed species of present management concern are listed in Table 2. In addition to these species, which are subject of current control programs in the reserve, NPWS has previously controlled populations of bitou bush (*Chrysanthemoides monilifera*) and narrow-leaf cotton bush (*Gomphocarpus physocarpus*) in the reserve.

Table 2 Weed species of current concern in Yaegl Nature Reserve

Common Name	Scientific Name	Legal Status *
Madeira vine	<i>Anredera cordifolia</i>	KTP
Dutchmans pipe	<i>Aristolochia elegans</i>	KTP
Groundsel bush	<i>Baccharis halimifolia</i>	Noxious
Lantana	<i>Lantana camara</i>	Noxious, KTP

* Legal status is given under *Noxious Weeds Act 1993* or under TSC Act (KTP = key threatening process).

Vertebrate pest species recorded within the reserve include the European red fox (*Vulpes vulpes*) and the European rabbit (*Oryctolagus cuniculus*). Stray cattle and domestic pets have also been recorded in the reserve. There have been recent reports of cane toads near the reserve at the Townsend waste transfer station and at several points along Gardiners Road, including the southern end of James Creek Road. It is possible that cane toads may also be present in the reserve.

4.2 Inappropriate Fire Regimes

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

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 a high species diversity to low species diversity. The regime guidelines given in Table 3 have been identified for the reserve. The suggested fire intervals are used as a guide and are broadly applicable for each vegetation type, being ultimately constrained by the ability of the flora to recover between fires.

Table 3 Suggested fire regimes for defined vegetation communities

Community	Suggested Fire Regimes
Swamp sclerophyll forest	Minimum interval 7 years/ Maximum interval 35 years
Saline wetland (saltmarsh)	No fire
Sclerophyll grassy forest/ woodland	Minimum interval 5 years/ Maximum interval 40 years
Rainforest	No fire

Source: Kenny *et al.* 2004

The fire history in what is now the reserve is only partially known. Large fires burnt through the swamp forest in 1967, 1980 and 1991 (Tanton 1999). The last of these is believed to have originated from the Townsend tip (see section 4.3.4) and is described as ‘a huge one that wiped the swamp out entirely’ (Judith Little quoted in Tanton 1999, p.16). Currently, the most likely direction for fire to enter the reserve is thought to be from the rural residential areas to the south-east of the reserve, or from the highway and neighbouring cane farms to the north-west. While James Creek potentially forms a natural containment line under most circumstances, the swamp forest present in the reserve has carried intense fires under hot, dry and windy conditions. The primary fire management objectives of the NPWS are to protect life and property and community assets from the adverse impacts of fire, while managing fire regimes to maintain and protect biodiversity and cultural heritage (NPWS 2007).

4.3 Adjacent uses

4.3.1 Isolation and Fragmentation

The area surrounding Yaegl Nature Reserve has been extensively cleared, which has resulted in a high loss of biodiversity and fragmentation of habitat in the region. Continuing development for residential and industrial purposes in the Gulmarrad and Townsend areas is further reducing areas of available of habitat and linkages between them.

Long term conservation of biodiversity depends upon the protection, enhancement and connection of remaining habitat across the landscape, incorporating vegetation remnants on both public and private lands. Nearby vegetated areas contribute to the habitat values of the reserve and could provide ecological corridors to other forested areas. Maintaining

the integrity of the remaining habitat within the reserve and, where possible, linking this to other areas of bushland to facilitate wildlife corridors is important in ensuring long term viability of the reserve's biological values.

4.3.2 Pacific Highway

The Pacific Highway runs north-south along the western boundary of Yaegl Nature Reserve, isolating a small section of reserve. This section of highway, by-passing Maclean, was built at the time of the Harwood Bridge and opened in 1966. The close proximity of the highway increases the level of litter that pollutes the reserve, is a potential source of fire when cigarette butts are thrown from vehicles, and is a major barrier to fauna movement.

An upgrade of Pacific Highway to motorway standard is currently being proposed for construction some time after 2014. At this stage, the RTA's preferred route in the vicinity of the reserve will involve widening the highway within its current easement to a dual carriageway. This upgrade may offer the opportunity to mitigate and reduce some of the existing impacts of the highway on the reserve particularly in relation to movement of fauna between habitat areas.

4.3.3 Rural Residential Development

Some areas adjacent to the reserve have been or are being developed for residential and rural residential purposes. The increasing pressures from residential development along the interface with the reserve have implications for the management of the reserve including:

- the straying of domestic pets into the reserve;
- the dumping of rubbish, including green waste which is often a source of weed invasion;
- increased nutrient, sediment and litter from run off; and
- pressure for more intensive fire management.

4.3.4 Former Townsend Tip

A council tip formerly operated at what is now the site of the Townsend waste transfer facility near the southern boundary of the reserve. It received garbage until 1991 and septic effluent until 2001, and both areas are now covered with clay and considered safe. The closure of the garbage tip coincided with the large fire that spread through the swamp forest in what is now the reserve (see section 4.2). It is likely that there may have been some contamination of ground and surface waters during the tip's operation. After its closure, soil monitoring at various depths downstream of the facility was undertaken for 6 months from November 2001 to assess if any environmental harm may result from the leachate emanating from the waste stored at the facility. This found there is little risk to the wetlands adjacent to or within Yaegl Nature Reserve (Codyhart Consulting 2002).

An impending threat from the ongoing operation of the waste transfer station is its potential to be a source point for the introduction of cane toads (*Bufo marinus*) into the reserve. Cane toads have been sighted at the waste transfer station, and are believed to have been transported to the site in rubbish and mulch. However, cane toads have also been observed at points further east (e.g. along Gardiners Road).

4.4 Climate Change

Anthropogenic climate change has been listed as a key threatening process under the TSC Act. Projections of future changes in climate for NSW include higher temperatures, increasing sea levels, more intense but possibly reduced annual average rainfall, increased temperature extremes and higher evaporation. These changes are likely to lead to greater intensity, duration and frequency of fires, more severe droughts and increased regional flooding and severe storm events.

The potential impact of climate change on the reserve's values is difficult to assess 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 may help reduce the severity of the effects of climate change.

It is likely however that rising sea levels and increasing occurrence of storm surges will increase the incursion of saltwater into the reserve, and this will cause die-back of broad-leaved paperbarks and a reduction in the extent of the paperbark forest. This may be replaced by a forest of more salt-tolerant species or saltmarsh.

5. MANAGEMENT STRATEGIES AND ACTIONS

Current Situation	Desired Outcomes	Management Strategies / Actions	Priority
<p>5.1 Soil and Water Conservation</p> <p>Currently there is no significant threat of soil erosion occurring in the reserve, however soils display a high erosion hazard on the slopes of Maclean Lookout in the western part of the reserve, and the soils in the swamp areas are likely to display acid sulphate soil potential if disturbed. Management of the reserve therefore seeks to undertake all works in a manner that minimises disturbance, erosion and any impacts on water quality.</p> <p>Water quality in the reserve is high, reflecting the intact vegetation community and the limited extent of artificial drains in the reserve. A narrow drain in the north of the reserve has not been maintained for many years and the intent is to allow vegetation to naturally regenerate (refer 3.1). The Pacific Highway is an ongoing source of litter which pollutes the waterways of the reserve. A former council tip, now capped and managed as a waste transfer facility, is located near the southern boundary of the reserve and is not considered to pose any future threat to the reserve.</p> <p>Downstream of the reserve, there are concerns regarding slow flood recession times in James Creek. This results in the Pacific Highway being closed for extended periods of time and prolonged inundation of farmland during major floods (e.g. in March 2001). While works to improve flood drainage would not directly impact on the reserve, they may impact on the reserve's water quality through increased tidal saltwater influence in the reserve.</p>	<p>Soil erosion is minimised.</p> <p>Water quality and health of reserve streams is improved.</p>	<p>5.1.1 Continue to liaise with Clarence Valley Council to reduce the potential for activities off reserve to impact on water quality in James Creek.</p> <p>5.1.2 Encourage further research into the hydrology of the reserve.</p> <p>5.1.3 Liaise with the RTA to introduce litter traps or other mechanisms along the highway to prevent road-side litter polluting the reserve and its waterways.</p>	<p>Medium</p> <p>Low</p> <p>Medium</p>
<p>5.2 Native Plants</p> <p>The nature reserve, together with the crown reserves surrounding Maclean Lookout, is an island of intact native vegetation in an area largely cleared or modified for agriculture and residential/ industrial purposes.</p>	<p>Native plant species and communities are conserved.</p>	<p>5.2.1 Liaise with neighbours and Clarence Valley Council to encourage the enhancement of remaining native vegetation adjacent to the reserve to improve wildlife corridors.</p>	<p>High</p>

Current Situation	Desired Outcomes	Management Strategies / Actions	Priority
<p>The dominant vegetation community within the reserve is swamp sclerophyll forest, which is recognised as an endangered ecological community. This is dominated by broad-leaved paperbark, and is largely an even-aged stand, reflecting extensive ringbarking of the forest in the 1930s. Natural processes will restore a more natural structure over time. Coastal saltmarsh, another endangered ecological community, also occurs in the north of the reserve.</p> <p>One threatened species is recorded in the reserve, although this is suspected to have been planted (see section 5.4). Flora surveys have not been undertaken in most of the reserve and are required to identify whether other significant species are present within the reserve.</p> <p>Threats to the vegetation of the reserve include weed infestations (see section 5.5), inappropriate fire regimes (see section 5.4) and the progressive isolation of the reserve.</p>	<p>Structural diversity and habitat values are restored in areas subject to past disturbance.</p>	<p>5.2.2 Encourage flora surveys for predicted threatened plant species.</p> <p>5.2.3 Implement relevant recovery actions for the endangered ecological communities and threatened species, particularly weed and fire control measures (see also sections 5.5 and 5.6).</p>	<p>High</p> <p>High</p>
<p>5.3 Native Animals</p> <p>Threatened fauna recorded in the reserve the grey-headed flying-fox, the grey-crowned babbler and brolga. Another 11 threatened species are predicted to occur but surveys are required to confirm their presence within the reserve.</p> <p>The reserve includes an important seasonal flying-fox camp, which is usually only occupied for a few months of the year. Nelson (2008) suggested that the reserve's habitat values for flying-foxes could be enhanced (or 'developed'). Geolink (2010) however assessed that development of the reserve to improve its suitability as a flying-fox maternity site would not be feasible due to statutory considerations (because of the impact on an endangered ecological community and potentially other threatened species) and would be cost prohibitive.</p> <p>Existing habitat values in the reserve may be enhanced through management of fire, introduced species and reducing</p>	<p>The habitat of native animal species is conserved and improved.</p> <p>There is greater understanding of species diversity, distribution and ecological requirements.</p>	<p>5.3.1 Implement relevant recovery actions in the Priorities Action Statement and recovery plans for threatened species as prepared.</p> <p>5.3.2 Encourage surveys for predicted threatened fauna species.</p>	<p>High</p> <p>High</p>

Current Situation	Desired Outcomes	Management Strategies / Actions	Priority
<p>rubbish dumping as outlined in sections 5.5, 5.6 and 5.8. Recovery plans and/or Priorities Action Statement direct recovery actions for threatened species in the reserve.</p>			
<p>5.4 Cultural Heritage</p> <p>The reserve has cultural significance for the local Yaegl Aboriginal people through its position in the surrounding Clarence floodplain landscape. This significance is partially recognised through the name of the reserve.</p> <p>A small section of the reserve has been identified as a 'keeping place' for the repatriation of Aboriginal cultural material. The first repatriation occurred in April 2006 and the keeping place is identified on the reserve by a small plaque. Management is in accordance with NPWS policy 'Repatriation of Aboriginal Cultural Material'. Re-burial of Aboriginal remains may occur within the reserve consistent with NPWS policy on burials.</p> <p>No comprehensive surveys have been undertaken within the reserve for sites of Aboriginal or historic cultural significance. A few old garden trees and some remnants of fencing are the only known historic features known to occur in the reserve.</p>	<p>Aboriginal and historic features and values are identified and protected.</p> <p>Aboriginal people are involved in management of the Aboriginal cultural values in the park.</p> <p>Understanding of the cultural values of the park is improved.</p>	<p>5.4.1 Consult and involve the Yaegl Local Aboriginal Land Council, the Yaegl Elders group and other relevant Aboriginal community organisations in the management of the reserve, in particular the keeping place and associated repatriated cultural material.</p> <p>5.4.2 Retain the old fence posts but remove any associated remaining wire.</p> <p>5.4.3 Assess the garden trees for their cultural significance and their potential to become weeds. Remove if they have no significant cultural values or if they have the potential to spread. Otherwise, allow them to senesce but do not replace.</p>	<p>High</p> <p>Low</p> <p>Low</p>
<p>5.5 Introduced Plants and Animals</p> <p>A number of weed species are known to be present as scattered infestations in the reserve. The main species of current concern include groundsel bush, lantana and exotic vines.</p> <p>Cattle occasionally stray into the reserve where fencing is in poor condition, and have the potential to damage vegetation, introduce weed species and increase soil compaction in swamp areas. Predators, such as foxes and straying domestic pets, are also present, posing a risk to ground-nesting/foraging birds. Integrated pest animal control programs will be carried out as required with the Rural Lands Protection Board and neighbours.</p>	<p>The impacts of introduced plants and animals are controlled and where possible eliminated.</p> <p>Control programs are undertaken in consultation with neighbours and in a manner which has minimal impact</p>	<p>5.5.1 Implement the Regional Pest Management Strategy, to manage introduced species, promote habitat development and regeneration of native species.</p> <p>5.5.2 Provide fencing assistance in accordance with NPWS policy to ensure that effective boundary fencing is installed and maintained by neighbours.</p>	<p>Medium</p> <p>Medium</p>

Current Situation	Desired Outcomes	Management Strategies / Actions	Priority
<p>NPWS pest control activity within the reserve is guided by the North Coast Region Pest Management Strategy (DECC 2008). Under this strategy, priority control programs include the control of exotic vines in swamp forests and flying-fox camps, and the control of noxious woody weeds such as groundsel bush. Cane toads are an emerging pest in the area surrounding the reserve and the Pest Strategy addresses surveys and control programs as necessary.</p>	<p>on native species.</p>		
<p>5.6 Fire Management</p> <p>The primary fire management objectives of the NPWS are to protect life and property and community assets from the adverse impacts of fire, while 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).</p> <p>NPWS has assessed Yaegl Nature Reserve for fire management planning purposes and has zoned the reserve primarily as a Land Management Zone (LMZ). The primary fire management objectives for a LMZ are to protect cultural heritage sites and to conserve biodiversity. Recommended fire regimes are given in table 3. Heavy machinery is not permitted in the south-east of the reserve to protect the Aboriginal keeping place (see section 5.4).</p> <p>The reserve has a low fire frequency due to its position on the floodplain. The alienation of this area by roads and urban and commercial development has also seen the frequency of fire reduced. While the fire history of the reserve was not mapped in detail prior to the land's purchase in 1999, it is known that large fires occurred in the swamp forest in 1967, 1980 and 1991 (Tanton 1999).</p> <p>Two boundary Asset Protection Zones (APZs) are in place, along the north west and south east corners of the reserve. These are maintained at low fuel levels by slashing to provide</p>	<p>Life, property and natural and cultural values are protected from fire.</p> <p>Fire frequencies are appropriate for conservation of native plant and animal communities.</p>	<p>5.6.1 Prepare a separate Fire Management Strategy for the reserve. Implement the revised strategy once approved. Pending approval, implement the current strategy.</p> <p>5.6.1 Continue to participate in the Clarence Valley BFMC. Maintain cooperative arrangements with the Rural Fire Service (RFS) and local brigades with regard to fuel management and fire suppression</p> <p>5.6.2 Encourage further research into the ecological effects of fire in the reserve.</p>	<p>High</p> <p>High</p> <p>Low</p>

Current Situation	Desired Outcomes	Management Strategies / Actions	Priority
<p>potential fire control lines. Another two areas next to existing developments have been identified as potentially requiring APZs (see map).</p> <p>With increasing residential and industrial development in the area, there may be future pressure for further APZs to be created in order to protect life and property. For new developments, these must be located on neighbouring private property and not in the reserve.</p> <p>The need for additional APZs between the reserve and existing neighbouring assets (currently indicated as potential APZs on the map) will be determined in consultation with neighbours and the RFS. Any changes will be incorporated into an updated separate Fire Management Strategy for the reserve.</p>			
<p>5.7 Visitor Opportunities</p> <p>There are no recreational facilities within Yaegl Nature Reserve. The edges of the reserve can be accessed from Farlows Lane and Gardiners Road. Signage identifying the reserve is located at the most convenient vantage points adjacent to the Pacific Highway and on Gardiners Road.</p> <p>The reserve currently receives low levels of visitation from birdwatchers and bushwalkers, and such uses can continue without the need for consent, as long as group size is kept small. Groups larger than 10 people will require consent. Recreational activities not consistent with the study of nature and natural environments are not appropriate in nature reserves and are prohibited.</p> <p>Other parks and reserves in the region provide for a diverse range of nature-based recreation opportunities and many provide facilities for camping and day use. In this context, and given the importance of the wetland communities, it is not appropriate for visitation to Yaegl Nature Reserve to be promoted or for visitor facilities to be provided.</p>	<p>Visitor use is not encouraged and has no impacts on the values of the reserve.</p> <p>The local community is aware of the reserve's significance and its management programs.</p>	<p>5.7.1 Liaise with Clarence Valley Council about opportunities to improve the interpretation of the Clarence floodplain and the reserve's values at the Maclean Lookout picnic area.</p>	<p>Low</p>

Current Situation	Desired Outcomes	Management Strategies / Actions	Priority
<p>The picnic area at Maclean Lookout provides a vantage point to view the reserve and to promote its cultural significance and its value as an isolated forested remnant on the floodplain.</p>			
<p>5.8 Management Operations</p> <p>There are no trails or other management facilities in the reserve, although vehicle access can occur along the boundary APZs accessed from Gardiners Road and Farlows Lane. These provide access to the reserve's boundary for management purposes, such as fire management, boundary management and weed control, but also can provide access for illegal activities such as the dumping of rubbish and green waste. Regular patrols and law enforcement are used to deter illegal activities.</p> <p>Management infrastructure includes boundary fencing and signs.</p> <p>The section of Farlows Lane between the highway underpass and Koala Drive lies on a council road reserve but is not maintained by council. Part of this road reserve cuts through the reserve. The ongoing unregulated use of this section of Farlows Lane by 4WD vehicles, particularly in wet weather, is damaging the road surface and limits its ability to be used when required by management and emergency vehicles.</p>	<p>Management facilities and operations adequately serve needs and have minimal impact.</p> <p>The incidence of illegal activities declines.</p>	<p>5.8.1 Install boundary regulatory signage to identify the reserve.</p> <p>5.8.2 No permanent trails will be developed in the reserve.</p> <p>5.8.3 In liaison with Clarence Valley Council and Department of Lands, seek the closure of Farlows Lane in the vicinity of the reserve and, following its incorporation within the reserve, maintain as a management trail and gate to exclude public vehicles.</p>	<p>High</p> <p>High</p> <p>High</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

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