NSW GOVERNMENT
Environment, Climate Change & Water
National Parks & Wildlife Service

Warragai Creek Nature Reserve

Plan of Management

WARRAGAI CREEK NATURE RESERVE

PLAN OF MANAGEMENT

NSW National Parks and Wildlife Service
Part of the Department of Environment, Climate Change and Water

August 2010

This plan of management was adopted by the Minister for Climate Change and the Environment on 2nd August 2010.

Acknowledgments
The NPWS acknowledges that this reserve lies in the traditional country of the Bundjalung / Yaegl people.

This plan is based on a draft plan prepared by staff of the North Coast Region of the NSW National Parks and Wildlife Service, part of the Department of Environment, Climate Change and Water. Valuable information and comments were provided by members of the Regional Advisory Committee.

Cover photograph by Louise Feltus, NPWS.

Further information
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FOREWORD

Warragai Creek Nature Reserve is located approximately 17 kilometres north-east of Grafton and covers an area of 186 hectares.

Warragai Creek Nature Reserve is considered to be significant in conserving the Clarence Lowlands Spotted Gum Forest Ecosystem, an ecosystem that has been extensively cleared and is poorly conserved. It also contains the only reserved population in the Clarence Valley of the endangered weeping paperbark, and is a key component of an area containing a regionally significant population of koalas.

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

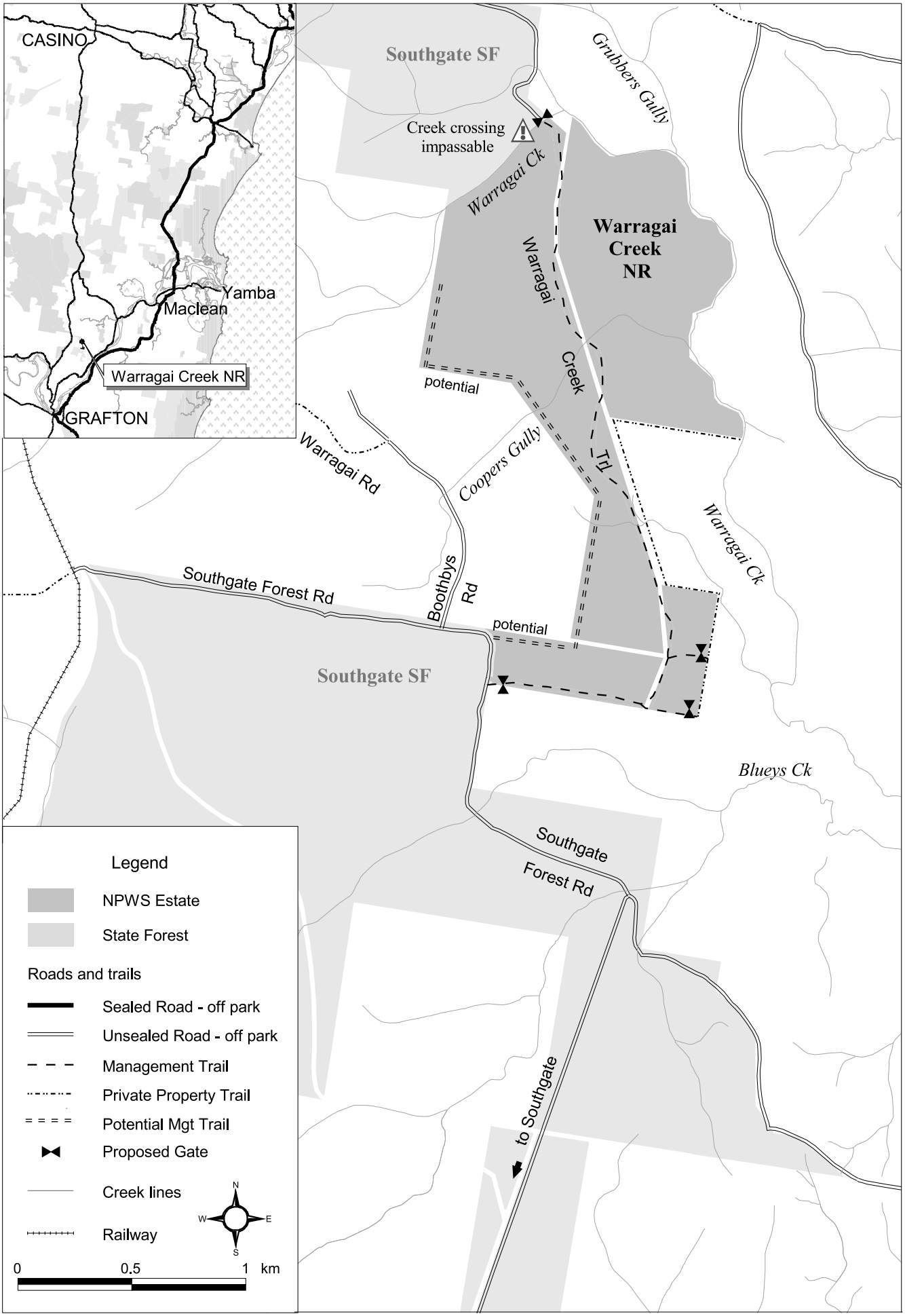
A draft plan of management for Warragai Creek Nature Reserve was placed on public exhibition from 30th January until 11th May 2009. The submissions received were carefully considered before adopting this plan.

This plan contains a number of actions to achieve the State Plan priority to "Protect our native vegetation, biodiversity, land, rivers and coastal waterways", including identification of trailside populations of threatened plant species so that road works avoid plants where possible, research into the koala population, and control of pest plant and animal species.

This plan of management establishes the scheme of operations for Warragai Creek 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

RESERVE MAP


CASINO
Yamba
Maclean
Warragai Creek NR
GRAFTON
Southgate SF
Grubbers Gully
Creek crossing impassable
Warragai Ck
Warragai Creek NR
Warragai Creek Trl
potential
Warragai Rd
Coopers Gully
Warragai Ck
Southgate Forest Rd
Boothbys Rd
potential
Southgate SF
Blueys Ck
Southgate Forest Rd
to Southgate
Legend
NPWS Estate
State Forest
Roads and trails
Sealed Road - off park
Unsealed Road - off park
Management Trail
Private Property Trail
Potential Mgt Trail
Proposed Gate
Creek lines
Railway
N
W
E
S
0
0.5
1 km

1 WARRAGAI CREEK NATURE RESERVE

Warragai Creek Nature Reserve is situated approximately 17 kilometres north-east of Grafton (29°41.4'S, 152°55.8'E) in the lowland foothills of the Clarence Valley (see map). The reserve was created on 1 January 1999, originally under the name 'Waragai Creek Nature Reserve', by the *Forestry and National Park Estate Act 1998*. The spelling of the name was corrected by a gazette notice in 2007.

The reserve is named for Warragai Creek, which defines the reserve's northern boundary and part of its eastern boundary, and gives its name to the locality to the west of the reserve.

The North-East Regional Forest Agreement (RFA), signed in 2000, covers the reserve. The process leading up to this RFA provided for major additions to the reserve system, following a regional assessment of the natural, cultural, economic and social values of public forests. These major additions included the establishment of Warragai Creek Nature Reserve.

Covering an area of 186 hectares, the reserve was formerly part of Southgate State Forest, and is bounded to the north and south by that forest. The reserve has been heavily logged and grazed in the past but is considered to be significant in conserving the Clarence Lowlands Spotted Gum Forest Ecosystem at low elevation – an ecosystem that has been extensively cleared and is poorly conserved. The reserve also provides habitat for a number of threatened species, including the endangered weeping paperbark (*Melaleuca irbyana*) and native milkwort (*Polygala linariifolia*), and is a key component of an area containing a regionally significant population of koalas (*Phascolarctos cinereus*).

To the east and west, the reserve abuts private land comprising a mixture of predominantly timbered land to the west and cleared land used for grazing and timber plantations to the east. There is also some rural residential development in the vicinity of the reserve.

The reserve lies within the areas of the Yaegl Local Aboriginal Land Council (LALC) and the Northern Rivers Catchment Management Authority. The local government authority is Clarence Valley Council.

As well as the gazetted reserve, the area subject to this plan (referred to as the 'planning area') includes the majority of Warragai Creek Trail. While part of Warragai Creek Trail lies on a Crown road reserve administered by the Land and Property Management Authority, most of it lies on Crown land that is vested in the Minister administering the *National Parks and Wildlife Act 1974* (NPW Act) under Part 11 of the Act. This road was excluded from the reserve to ensure that access arrangements which existed immediately before the reserve's creation (in this case, timber hauling from the neighbouring state forest) could continue. As there is alternative access to both sections of Southgate State Forest, the road is not currently used for this purpose.

As shown on the map, there is another short Crown road reserve in the southern part of the reserve which has not been constructed and is not marked on the ground. This unmade road reserve is administered by Clarence Valley Council.

2 MANAGEMENT CONTEXT

2.1 Legislative and Policy Framework

The management of nature reserves in NSW and any Part 11 lands 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).

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 of 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 matters of National Environmental Significance, such as migratory and threatened 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 the planning area (i.e. in the nature reserve and the associated Part 11 lands) except in accordance with this plan. This plan will also apply to any future additions to the reserve. Should management strategies or works be proposed for the planning area or any reserve 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.

2.3 Specific Management Directions

The main objective of this plan is the conservation of the natural and cultural values of Warragai Creek Nature Reserve. In order to achieve this objective, the following specific management directions will be applied:

- Manage the incidence and spread of fire to reduce its impacts on reserve values, and to establish a range of fire-age classes within the reserve.
- Control weeds to enhance the habitat value of the reserve for significant flora and fauna.
- Improve the level of understanding of the population dynamics of the reserve's koalas.
- Take measures to address the increasing fragmentation and isolation of the reserve from areas of adjacent forest.
- Provide assistance to ensure boundary fencing is effective in excluding straying cattle.
- Allow low-key and self-reliant recreation in the reserve but do not promote visitation or provide any visitor facilities.

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, Geology and Soils

As in much of the Clarence Basin, the bed rocks underlying the planning area are the interbedded sandstones, claystones and siltstones of the Grafton Formation, which date from the Jurassic era. These are evident over much of the reserve, with only a small area of more recent alluvial deposits present along Warragai Creek. The geology over the rest of the planning area consists of feldspathic sandstone which has been indurated with iron (Veness & Associates 1994).

These sandstones weather to form yellow podsols or hard acid yellow mottled duplex soils with scattered stone fragments. They are generally of fairly low fertility and susceptible to erosion along the steeply incised banks of Warragai Creek. However, the majority of the reserve is relatively flat, with an average slope of less than 10 degrees and altitudes ranging from 8 to 30 metres above sea level.

A small drainage line known as Coopers Gully runs through the centre of the reserve from west to east and flows into Warragai Creek. Several other ephemeral drainage lines through the reserve also flow into Warragai Creek. Warragai Creek flows into the Everlasting Swamp, a wetland of national importance and one of the largest open meadow wetlands in New South Wales, before reaching the estuary of the Clarence River.

3.2 Native Flora

Warragai Creek Nature Reserve is dominated by two forest ecosystems:

- Clarence lowlands spotted gum forest, dominated by large-fruited spotted gum (*Corymbia henryi*); and
- Northern open grassy blackbutt forest, dominated by coastal blackbutt (*Eucalyptus pilularis*).

These forest ecosystems have been extensively cleared or modified elsewhere in northern NSW. The majority of the reserve has been classed as disturbed mature forest, reflecting its previous history of extensive logging and grazing, and associated use of fire (see section 4.1), however, one third of the Clarence lowlands spotted gum forest present in the reserve is in an old-growth condition, with some smaller areas classed as candidate old-growth forest or disturbed old forest. Old growth forest is important for biodiversity because many of its structural attributes (e.g. hollows in trees) provide important fauna habitat, and some plants and animals are restricted to forest in the old-growth stages (JANIS 1997).

A small area of another poorly reserved ecosystem, grassy woodland dominated by forest red gum (*E. tereticornis*) and narrow-leaved red gum (*E. seeana*), occurs along the unnamed drainage line south of Coopers Gully.

The reserve has small populations of two endangered plants listed under the TSC Act, weeping paperbark (*Melaleuca irbyana*) and native milkwort (*Polygala linariifolia*). This is the only reserved population of weeping paperbark in the Clarence Valley. The vulnerable

trees, square-fruited ironbark (*E. tetrapleura*) and slaty red gum (*E. glaucina*), grow in the southern section of Southgate State Forest near the reserve and may also be present in the reserve. The shrub, *Sauropus hirtellus*, may also be present in the reserve. This species is poorly known from NSW but is recorded in both the northern and southern sections of Southgate State Forest and on private property to the east of the reserve.

3.3 Native Fauna

Warragai Creek Nature Reserve occupies part of a regional vegetation corridor for fauna movement, which links the reserve to Fortis Creek National Park to the north-west and then north along the Richmond Range (Scotts 2003). This habitat connectivity is particularly important for maintaining viable populations of threatened animal species. Four species of animal known to occur in Warragai Creek Nature Reserve are listed as threatened under the TSC Act (Table 1). Although quite small, the reserve also contains predicted high quality habitat for several other threatened fauna species (Table 2).

The reserve and the nearby eastern part of Fortis Creek National Park form part of one of the isolated areas in the Clarence Valley known to have breeding populations of koalas (*Phascolarctos cinereus*) (Reed & Lunney 1990). The north east of the reserve in particular is considered a high use area for koalas. Primary food tree species identified in the recovery plan for the koala (NPWS 2008a) and known to occur in the reserve include forest red gum and tallowwood (*E. microcorys*); however the long-term viability of the koala population in the reserve is highly reliant on habitat and food resources on neighbouring lands.

Habitat for the red goshawk (*Erythrotriorchris radiatus*), which is listed as critically endangered under the TSC Act, occurs in the reserve but there have been no confirmed sightings of this species in the vicinity of the reserve for a long time.

Table 1. Threatened animal species known to occur in the reserve

Common Name	Scientific Name	TSC Act Status
Glossy black-cockatoo	*Calyptorhynchus lathami*	Vulnerable
Rufous bettong	*Aepyprymnus rufescens*	Vulnerable
Koala	*Phascolarctos cinereus*	Vulnerable
Little bent-wing bat	*Miniopterus australis*	Vulnerable

Table 2. Threatened animal species predicted to occur in the reserve

Common Name	Scientific Name	TSC Act Status
Green-thighed frog	*Litoria brevipalmata*	Vulnerable
Pale-headed snake	*Hoplocephalus bitorquatus*	Vulnerable
Bush stone-curlew	*Burhinus grallarius*	Endangered
Regent honeyeater	*Xanthomyza phrygia*	Endangered #
Swift parrot	*Lathamus discolor*	Vulnerable #
Squirrel glider	*Petaurus norfolcensis*	Vulnerable
Brush-tailed phascogale	*Phascogale tapoatafa*	Vulnerable
Grey-headed flying fox	*Pteropus poliocephalus*	Vulnerable #
Hoary wattled bat	*Chalinolobus nigrogriseus*	Vulnerable

also listed as threatened under the EPBC Act

3.4 Aboriginal Heritage

There are no recorded Aboriginal sites within the planning area, however it is known that Aboriginal communities have an association with and connection to the land and forests, and that biodiversity values within a landscape are central to Aboriginal spirituality and contribute to Aboriginal identity. Aboriginal communities associate natural resources with the use and enjoyment of foods and medicines, caring for the land, passing on cultural knowledge and strengthening social bonds. Aboriginal heritage and nature are inseparable from each other and need to be managed in an integrated manner across the landscape.

Warragai Creek Nature Reserve is located within the area represented by the Yaegl Local Aboriginal Land Council (LALC) and lies within the Bundjalung traditional lands. A registered Native Title claim on behalf of the Bandjalang people covers the reserve (NC98/19).

3.5 Historic Heritage

European settlement in the Clarence River Valley started in the late 1830s with cedar cutters moving into the area, soon followed by settlers who cleared the arable land. The slopes and valleys were gradually cleared for pasture and crops with only the steeper slopes and isolated ranges retaining the natural forest cover (Reed & Lunney 1990).

Southgate State Forest was dedicated in 1940 and the portion that has become Warragai Creek Nature Reserve was an extension to the original state forest dedicated in 1943. The majority of the state forest was extensively logged with the most recent logging operation occurring in 1998.

The planning area formed part of the Southgate Run in 1848 (Blackmore & Associates 1993) and cattle grazing was also an important land use in the planning area until 1998. Evidence of this past land use includes internal fence lines and a set of cattle yards in the south of the reserve. There are also reports of a former homestead, slaughter house and graveyards in the north east of the reserve which are yet to be located.

4 THREATS TO RESERVE VALUES

4.1 Inappropriate Fire Regimes

The NPWS regards fire as a natural feature of the landscape of which the reserve is part. It is one of the continuing physical factors influencing the Australian environment and is considered essential to the survival of some plant communities. However, high frequency fire has been identified as a key threatening process. Frequent or regular fire of similar intensity can cause the loss of plant and animal species and communities.

Ecological research in fire-prone ecosystems has established some general principles about fire regimes and the conservation of biodiversity. Contemporary understanding is that it is not necessary to specify individual fire regimes for the conservation of every species, as requirements for most plant species can be summarised on the basis of vegetation communities (see Table 3 for those communities found in the reserve). The suggested fire intervals are used as a guide and are broadly applicable for each vegetation type. It is assumed that meeting the needs of plant species will provide the necessary habitat for the needs of animal species. It is generally accepted that fire intervals should vary within the suggested range and should be ultimately constrained by the ability of the flora and fauna to recover between fires.

Table 3. Fire Interval Guidelines for Protection of Vegetation Communities

Vegetation Community	Minimum Interval	Maximum Interval
Grassy sclerophyll woodland	5 years	40 years
Grassy dry sclerophyll forest	5 years	50 years
Shrubby dry sclerophyll forest	7 years	30 years

Source: Kenny *et al.* (2004)

Observation of the sparse understorey existing over much of the reserve suggests that fire frequencies have generally exceeded those required to maximise biodiversity. There is limited diversity amongst the shrub and herb layer with substantial areas supporting a uniform cover of blady grass (*Imperata cylindrica*) and introduced grasses. The use of frequent, low intensity fire associated with cattle grazing may have contributed to this simplified structure. Too frequent fire is considered to be a threat to weeping paperbark and native milkwort.

The fire history of the reserve has not been documented. The only recorded wildfire in the reserve occurred in the south and south east of the reserve in October 2005. The rest of the reserve appears to have a similar, earlier fire-age class. Given the small size of the reserve and the increasing fragmentation of the forest cover on surrounding lands, the modification or removal of habitat by one wildfire event across the majority of the reserve area is a major threat to the biodiversity values of the reserve.

It is considered the most likely direction for fire to enter the reserve is from the north-west under seasonal conditions that bring hot, dry, north-westerly winds. Aside from fences, there are few assets in the reserve. On neighbouring lands, houses and hardwood plantations may be threatened by fire. Potential containment lines are Warragai Creek Trail, Warragai Creek and selected boundary trails (see map).

4.2 Introduced Plants and Animals

Feral animals known to occur in the reserve from time to time include wild dogs (*Canis lupus dingo*, *C. lupus familiaris* or their hybrids), European red foxes (*Vulpes vulpes*), feral cats (*Felis cattus*), European rabbits (*Oryctolagus cuniculus*) and feral pigs (*Sus scrofa*). Neighbouring landowners periodically lay baits for wild dogs.

Cattle (*Bos taurus*) stray into the reserve from neighbouring properties due to damaged or missing sections of fencing on the reserve boundary. Cattle impact on reserve values by trampling and browsing native vegetation, restricting the regeneration of native species, introducing weed species, compacting and eroding soils, and by impacting upon water quality.

An exotic plant species survey for the reserve was undertaken in 2000. The most serious weed infestation detected was groundsel bush (*Baccharis halimifolia*) which has since been controlled. Current problems are lantana (*Lantana camara*) in the north-east of the reserve, camphor laurel (*Cinnamomum camphora*) along Warragai Creek and giant Parramatta grass (*Sporobolus fertilis*) and annual ragweed (*Ambrosia artemisiifolia*) along Warragai Creek Trail. These weeds are declared noxious in the Clarence Valley Local Government Area. The area infested with lantana overlaps in part with the area identified as the koala high use area. A heavy infestation of South African pigeon grass (*Setaria sphacelata*) occurs along an unnamed water course south of Coopers Gully in the narrowest section of the reserve.

The threat of weed invasion is increased by the reserve's narrow and elongated shape, which has a high perimeter to area ratio. Water-borne weed propagules are likely to enter the reserve via Warragai Creek, Coopers Gully and other watercourses.

4.3 Isolation and Fragmentation

Long term conservation of biodiversity in the reserve 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 enhance the habitat values of the reserve and provide genetic resources and ecological corridors to other forested areas.

Land use change from large rural holdings to rural residential settlement in some areas adjacent to the reserve has been associated with extensive clearing. Ongoing rural residential development in the area is likely to result in the fragmentation of existing habitat corridors and increased isolation of the reserve. Maintaining the integrity of the remaining habitat within the reserve and, where possible, linking this to adjacent areas of bushland to facilitate wildlife corridors is important in supporting the reserve's biological and habitat values.

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, 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 occurrences of flood and severe storm events.

Climate change may significantly affect native biodiversity by changing the distribution of species, modifying species composition, and altering the geographical extent of habitats and ecosystems. Species most at risk are those unable to migrate or adapt, particularly those with small population sizes, slow growth rates or low fecundity. 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 will help reduce the severity of the effects of climate change.

5 MANAGEMENT ISSUES AND STRATEGIES

Current situation	Desired Outcomes	Management response	Priority
5.1 Soils and Hydrology Watercourses in the reserve flow into an important wetland area, the Everlasting Swamp, and thence into the Clarence estuary. Soils in the reserve are susceptible to erosion, particularly along the steeply incised banks of Warragai Creek. Straying stock contribute to bank erosion along the creek (see section 5.6). Warragai Creek Trail at Warragai Creek is generally impassable due to erosion, effectively making the trail a dead end. In other parts of the reserve, the trail network can be well maintained by regular slashing. Unregulated vehicular traffic, particularly in wet weather, has the potential to seriously damage trail surfaces in the reserve, exacerbating erosion and siltation loads in watercourses.	• Water quality in reserve streams is maintained or improved. • Anthropogenic erosion is minimised.	5.1.1 Undertake all works in a manner that minimises erosion and water pollution. 5.1.2 Maintain the management trail network shown on the map primarily through slashing and minimal soil disturbance. 5.1.3 Restrict vehicle use of the reserve's trails to that required by NPWS and others authorised by NPWS (e.g. Forests NSW) for essential management purposes. Reduce use of trails during periods of wet weather.	Ongoing High Ongoing
5.2 Native Flora and Fauna The reserve is part of a regional vegetation corridor for forest fauna, and is dominated by poorly-conserved vegetation communities. While some sections are classed as old growth, evidence of previous disturbances from grazing and logging remain, including two former log dumps that are slowly revegetating and a large clearing surrounding the old cattle yards in the south of the reserve. A licensed apiary site is regularly mown (see section 5.7). A flora survey was conducted in the reserve in 2004, which identified trailside populations of the endangered weeping paperbark. This is the only reserved population	• The diversity of native species within the reserve is maintained and enhanced. • The condition and structural diversity of previously disturbed ecosystems is	5.2.1 Identify and mark trailside populations of threatened plant species and ensure road works avoid plants where possible. 5.2.2 Encourage/ undertake fauna surveys in the reserve, including targeted research on significant species, particularly koalas. 5.2.3 Work with neighbours and Clarence Valley Council to encourage conservation of remnant native vegetation in the vicinity of the reserve to maintain/ establish vegetation corridors for fauna. 5.2.4 Monitor and encourage improvement in the condition of previously disturbed areas, and assist	High Medium High Medium

Current situation	Desired Outcomes	Management response	Priority
of weeping paperbark in the Clarence Valley. There is also a single record of the endangered native milkwort from the reserve. No recent fauna surveys have been undertaken in the reserve. While it is known that the reserve is part of an area known to contain koalas, there is little information available on the health and size of the population, and its use of the reserve. It is believed that a major threat to this population, and to other forest-dependent wildlife in the reserve, is the increasing fragmentation and isolation of the reserve. Recovery actions for threatened species are given in recovery plans (where prepared) and the Priorities Action Statement (PAS). The PAS currently contains strategies for the native milkwort, square-fruited ironbark, slaty red gum and a number of fauna species found or predicted to occur in the park.	improved. • Linkages with other forested areas are maintained and enhanced.	revegetation where necessary through soil disturbance or planting. 5.2.5 Implement other relevant strategies and recovery actions in the Priorities Action Statement for threatened species.	 Medium
5.3 Cultural Heritage The reserve falls within the Bundjalung traditional lands, and is subject to a native title claim on behalf of the Bandjalang people. It lies in the area represented by the Yaegl Local Aboriginal Land Council (LALC). There are no records of any archaeological or anthropological surveys having been conducted in the reserve. While there is evidence of Aboriginal use and habitation in the vicinity of the reserve, there is little documentation about the cultural values of the reserve itself. No Aboriginal sites are known to occur in the reserve. Historic sites known to occur in the reserve are old fence lines and a set of cattle yards. There are also reports of an old homestead in the north-east of the reserve.	• Cultural features are identified, conserved and managed in accordance with their significance. • Management partnerships are fostered with Aboriginal communities.	5.3.1 Encourage research into the reserve's cultural values and history. 5.3.2 Undertake appropriate environmental and cultural assessments prior to all ground disturbance work . 5.3.3 Consult and involve native title claimants, the Yaegl LALC and other relevant Aboriginal community members and organisations in the management of the reserve. NPWS will support opportunities for Aboriginal people to access the reserve. 5.3.4 Establish the origin of the name 'Warragai Creek'. 5.3.5 Using available text and oral histories,	Medium High Ongoing Medium Medium

Current situation	Desired Outcomes	Management response	Priority
		investigate and document the origin of the cattle yards and the reported presence of homestead remains, slaughterhouse ruins and graveyards. Develop and implement appropriate conservation strategies based on significance.	
5.4 Visitor Use The location of the reserve is generally not well known or signposted, and there are no outstanding features in the reserve likely to attract visitors. Use of the reserve is therefore not high. The low level of visitation that does occur is mostly restricted to local bushwalkers, cyclists and birdwatchers. Large groups are not generally appropriate in the reserve. Motorbike riding and 4WD touring are occasionally undertaken along Warragai Creek Trail and off trail in the reserve. These activities have severely damaged roads and trails immediately outside the reserve. They have the potential to cause trail damage, exacerbate existing erosion problems and sedimentation of water courses and are therefore not considered appropriate for the planning area. In addition, the generally impassable nature of the creek crossing on the northern boundary of the reserve is a safety concern. Opportunities for these recreation activities in a safer environment are provided in the adjacent Southgate State Forest. Public access to the reserve is from the south via Southgate Forest Road.	• Visitor use does not impact on the values of the reserve.	5.4.1 Limit recreational opportunities to passive, self-reliant activities such as bushwalking and bird watching. Cycling is permitted on management trails but public vehicles are not permitted. 5.4.2 Install directional and regulatory signage at the boundary of the reserve to identify the reserve and inform users which activities may/ may not occur within the reserve. 5.4.3 With the agreement of the Land and Property Management Authority, install gates on Warragai Creek Trail as necessary to restrict public vehicular access. 5.4.4 Seek the agreement of Forests NSW for NPWS to install and maintain signage in Southgate State Forest north of Warragai Creek advising of the Warragai Creek Trail's closure in the reserve. 5.4.5 Groups larger than 20 people will require permission to enter the reserve. Consent may be issued subject to conditions to limit impacts on the reserve and neighbours.	Ongoing High High Medium Ongoing
5.5 Fire Management The primary fire management objectives of the NPWS are to protect life and property from the adverse impacts of fire, while managing fire regimes to maintain and	• Fire management is carried out on a	5.5.1 Continue to participate in the Clarence Valley Bush Fire Management Committee. 5.5.2 Maintain cooperative arrangements with the	High/ Ongoing High/

Current situation	Desired Outcomes	Management response	Priority
protect biodiversity and cultural heritage (NPWS 2007). NPWS is an active member of the Clarence Valley Bush Fire Management Committee (BFMC) and regards cooperative arrangements with neighbours and other fire authorities to be of prime importance. The Clarence Valley Bush Fire Risk Management Plan (CVBFMC 2002) identifies fire exclusion zones in close proximity to the eastern boundary of the reserve due to the presence of private property assets, namely several sizeable hardwood plantations. While sufficient asset protection zones for these areas exist on private property to the east of the reserve, fire management practices in the reserve will also assist in protecting these assets. The maintenance of existing boundary trails and, if necessary, the provision of new boundary trails in selected areas are important for fire management in the reserve. In accordance with the Bush Fire Risk Management Plan, the NPWS uses a system of zones to identify its fire management objectives in the reserve. The majority of the planning area will be managed as a Land Management Zone (LMZ). The primary objective of this zone is to prevent the extinction of any species that is known to occur naturally within the reserve. LMZs generally do not require intensive fire management as fire management actions focus on providing a fire regime which maximises the conservation of biodiversity and cultural heritage. Little information has been recorded on the fire history of the reserve apart from a wildfire in the south of the reserve in October 2005. Field evidence however suggests a history of frequent low-intensity fire and most	cooperative basis • Life and property are protected from bushfire. • Fire regimes are appropriate for the conservation of plant and animal communities. • Fire history of the reserve is documented • Cultural assets are protected from fire	Rural Fire Service, local brigades, Forests NSW and other neighbours with regard to fuel management and fire suppression. 5.5.3 Work cooperatively with neighbours to identify existing potential fire breaks on private property, particularly to the west of the reserve, which can be used as fire management advantages. 5.5.4 In liaison with neighbours and the RFS, assess the need for boundary management trails along the western boundary of the reserve (as shown on the map) to provide additional fire management advantages. Construct if deemed essential, primarily through slashing, as secondary fire access trails. 5.5.5 Manage the majority of the planning area as a Land Management Zone (LMZ) in accordance with the Clarence Valley Bush Fire Risk Management Plan. 5.5.6 Suppress unplanned fires and, where possible, exclude fire from fire-sensitive areas including recently burnt areas and riparian vegetation. 5.5.7 Use prescribed fire to achieve a variety of fire regimes in appropriate vegetation types and maintain suitable habitat for species with specific fire requirements. 5.5.8 Document the fire history of the reserve (recording fire date, season, extent & severity) to allow analysis of the impact of the fire regime on reserve values. 5.5.9 Encourage further research into the ecological effects of fire on reserve values. 5.5.10 Identify cultural values at risk and implement appropriate fire management practices to protect these assets. These practices may include the provision of	Ongoing High Medium High/ Ongoing High/ Ongoing High/ Ongoing High/ Ongoing Low High

Current situation	Desired Outcomes	Management response	Priority
of the reserve appears to be of uniform fire-age class. Cultural assets of unknown value may be at risk from damage from fire.		small asset protection zones, maintained by periodic slashing.	
5.6 Introduced Species The North Coast Region Pest Management Strategy (DECC 2008b) informs NPWS management of pest plants and animals across the North Coast Region. It identifies scattered infestations of wild dogs and European red foxes in the reserve. It also identifies that a range of weeds are present, mostly at low levels. Following the control of groundsel bush in the reserve, the most serious pest management issue is the major infestation of lantana in the north-eastern section of the reserve. Other problems are giant Parramatta grass and annual ragweed along Warragai Creek Trail. The threat of weed invasion is increased in the reserve due to its narrow and elongated shape. Watercourses are also likely vectors for the transport of weed propagules; camphor laurels grow along the banks of Warragai Creek. Fencing along the reserve boundary is inadequate in some places, allowing stock to stray into the reserve.	• The impacts of pest species on reserve values and the values of neighbouring lands are reduced and limited in extent. • Domestic stock is excluded from the reserve.	5.6.1 Control pest plant and animal species in accordance with the North Coast Region Pest Management Strategy. 5.6.2 Ensure straying cattle are removed from the reserve. 5.6.3 In accordance with NPWS policy, negotiate fencing agreements with neighbours as necessary to establish effective stock-proof boundary fences. 5.6.4 Seek the cooperation of other authorities and neighbours in implementing weed and pest animal control programs. 5.6.5 Encourage and support adjacent landowners to control pest species on their lands which have the potential to invade or decrease the values of the reserve. 5.6.6 Monitor the planning area for weeds and treat any new outbreaks of noxious or significant environmental weeds.	High High Medium Medium Medium High
5.7 Management Operations and Other Uses The management trail network in the reserve is used for fire control and other management purposes in the reserve. Additional boundary trails along the western boundary may be constructed if deemed essential for fire management (see strategy 5.5.4). Warragai Creek Trail lies on Crown land, part of which is	• Management facilities have acceptable impact. • Management trails provide	5.7.1 Maintain/ construct the management trail network shown on the map, primarily through slashing. All other tracks and trails will be closed and where necessary rehabilitated. 5.7.2 In liaison with the Land and Property Management Authority and Clarence Valley Council,	High Medium

Current situation	Desired Outcomes	Management response	Priority
a public road reserve and the rest being managed by NPWS under Part 11 of the NPW Act. This public road reserve also adjoins part of the eastern boundary of the reserve. The purpose of excluding the corridor of Warragai Creek Trail from the reserve's area was to facilitate ongoing access to Southgate State Forest by Forests NSW. It is not used for this purpose. Another public road reserve further fragments the reserve. No road has been constructed on this road reserve and it does not link to other access trails outside the reserve and so does not serve any purpose. A licensed apiary site is located within the reserve. This site is recognised as an existing interest under the NPW Act and is managed in accordance with NPWS policy. The NPWS policy on beekeeping permits existing apiary sites to continue, but does not allow the development of new or additional sites. The site is limited in size and is maintained by mowing or slashing. Access to the site is via a management trail and a short mown access trail within the reserve.	necessary access for management purposes. • Existing non-NPWS uses are managed to minimise impacts on the planning area's values and infrastructure.	pursue transfer of the crown road reserves within and adjoining the reserve to NPWS control. 5.7.3 Seek to have the corridor of Warragai Creek Trail added to the reserve once it is no longer needed for forestry access. 5.7.4 Continue to license and manage the apiary site within the reserve in accordance with NPWS policy. If it significantly compromises the environmental values of the area it will be relocated in consultation with licensee.	Low Ongoing/ High

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

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

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

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