KORORO NATURE RESERVE

PLAN OF MANAGEMENT

NSW National Parks and Wildlife Service

Part of the Department of Environment and Climate Change NSW

July 2008

This plan of management was adopted by the Minister for Climate Change and the Environment on 21st July 2008.

Acknowledgments

This plan of management is based on a draft plan prepared by staff of the North Coast Region of NPWS. Valuable information and comments were provided by NPWS specialists, the Regional Advisory Committee and members of the public.

Inquiries about this Kororo Nature Reserve or this plan of management should be directed to the NPWS Coffs Coast Area Office at 32 Marina Drive (PO Box J200), Coffs Harbour, NSW 2450 or by phone on (02) 66520 900.

Cover photo by Tom Denman.

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FOREWORD

Kororo Nature Reserve lies approximately three kilometres north of Coffs Harbour on the mid-north coast of NSW. It is 11 hectares in area and was gazetted in 1967 for the protection, care, propagation and promotion of the study of fauna, particularly koalas.

Vegetation in the reserve comprises tall open forest with a rainforest understorey. The dominant tree species within the reserve is tallowwood, but also present are Sydney blue gum and brush box which are tree species favoured by koalas. The reserve forms part of a regionally significant koala habitat corridor that also includes Boambee State Forest, Bruxner Park Flora Reserve and Orara East State Forest.

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

A draft plan of management for Kororo Nature Reserve was placed on public exhibition from 4 June until 20 September 2004. The submissions received were carefully considered before adopting this plan.

This plan contains a number of actions to achieve “Better environmental outcomes for native vegetation, biodiversity, land, rivers, and coastal waterways” (Priority E4 in the State Plan) including implementation of a weed control and bush regeneration program, especially after flood events to prevent reinfestation, implementation of the Koala Recovery Plan and fire management strategies for the reserve.

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

Verity Firth
Minister for Climate Change and the Environment

1. MANAGEMENT CONTEXT

1.1 LEGISLATIVE AND POLICY FRAMEWORK

The management of nature reserves in NSW is in the context of a legislative and policy framework, primarily the *National Parks and Wildlife Act 1974* (NPW Act), the *Threatened Species Conservation Act 1995* (TSC Act) and the policies of the National Parks and Wildlife Service (NPWS). Section 72AA of the NPW Act lists the matters to be considered in the preparation of a plan of management. The policies arise from the legislative background, the NPW Regulations and internationally accepted principles of park management. They relate to nature conservation, Aboriginal and historic heritage conservation, recreation, commercial use, research and communication.

Other legislation, international agreements and charters may also apply to management of the area. In particular, the *Environmental Planning and Assessment Act 1979* (EPA Act) requires the assessment and mitigation of environmental impacts of any works proposed in this plan.

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

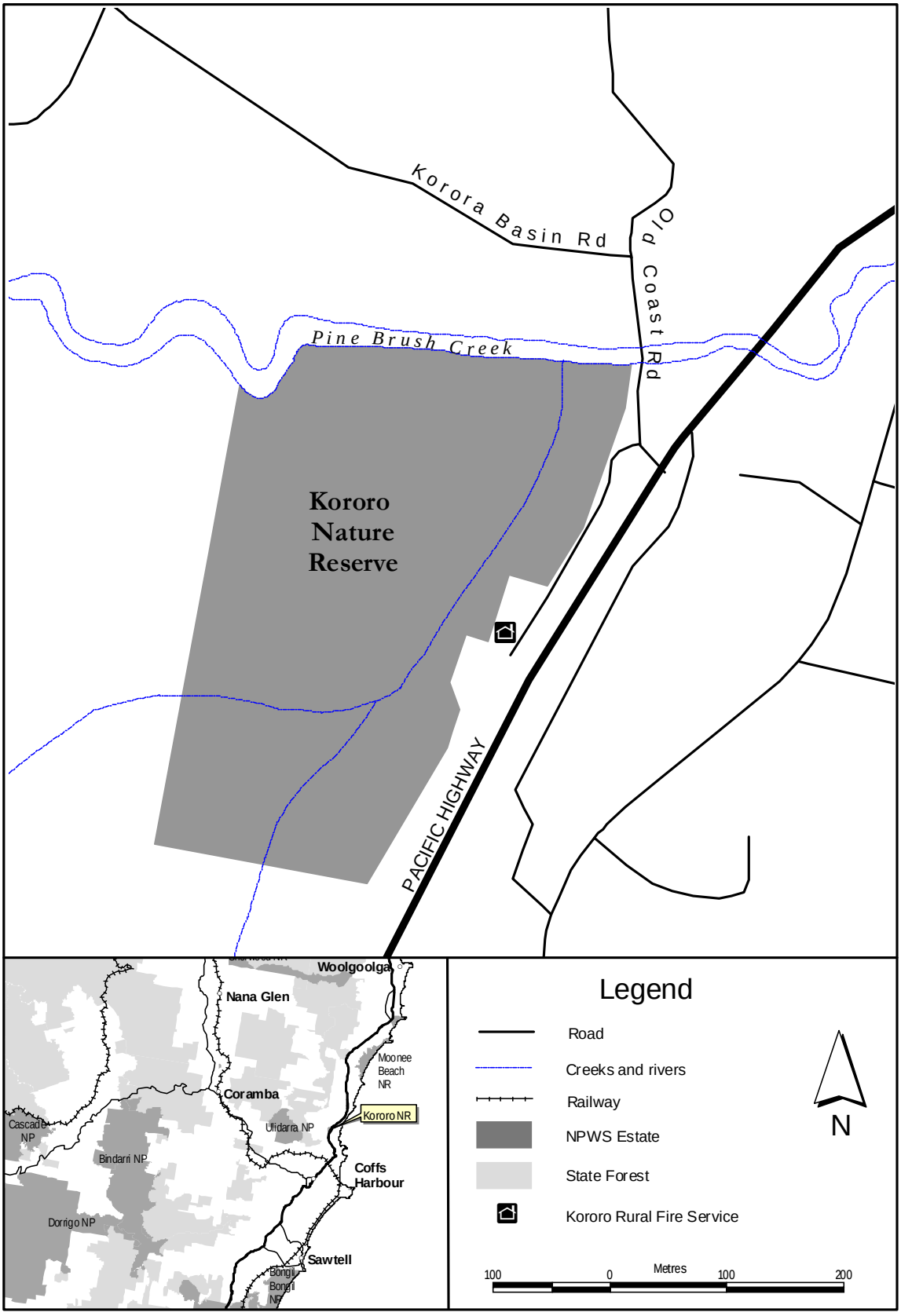
1.2 MANAGEMENT PURPOSES AND PRINCIPLES

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

Under the Act, nature reserves are managed to:

- conserve biodiversity, maintain ecosystem functions, and protect geological and geomorphological features and natural phenomena;
- conserve places, objects, features and landscapes of cultural value;
- promote public appreciation, enjoyment and understanding of the reserve's natural and cultural values; and
- provide for appropriate research and monitoring.

2. RESERVE MAP



3. KORORO NATURE RESERVE

3.1 LOCATION, RESERVATION AND REGIONAL SETTING

Kororo Nature Reserve (referred herein as 'the reserve') is located approximately 3 kilometres north of Coffs Harbour and west of the Pacific Highway, on the mid north coast of NSW (see map). The reserve is located within the boundaries of the Gumbaynggirr Aboriginal People.

The reserve is approximately 11 hectares in area and was gazetted in 1967 for the protection, care, propagation and promotion of the study of fauna, in particular the koala (*Phascolarctos cinereus)*.

Surrounding land uses include rural residential, a pine plantation, fruit orchards and banana plantations. The Korora Rural Fire Service (RFS) headquarters adjoins the reserve's eastern boundary.

The reserve is within the Coffs Harbour Local Government Area.

3.2 LANDSCAPE CONTEXT

Natural and cultural heritage and on-going use are strongly inter-related and together form the landscape of an area. Much of the Australian environment has been influenced by past Aboriginal and non-Aboriginal land use practices, and the activities of modern day Australians continue to influence bushland through recreational use, cultural practices, the presence of introduced plants and animals and in some cases air and water pollution.

The geology, landform, climate and plant and animal communities of the area, plus its location, have determined how it has been used by humans. Such uses include Aboriginal resource use, cultivation, grazing and recreation.

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

3.3 NATURAL AND CULTURAL HERITAGE

Geology, Landform, Soils and Hydrology

The reserve is approximately 30m to 40m above sea level in the Korora Basin.

The reserve is characterised by erosional landscapes, which are primarily sculpted by the erosive action of running water, and lies within the 'Coffs Range' physiographic region. Bedrock of the reserve is formed by the Coramba Beds of

Carboniferous age which comprise lithofeldspathic wacke, minor siltstone, siliceous siltstone, mudstone, metabasalt, chert and jasper, rare calcareous siltstone and felsic volcanics (Gilligan *et al.* 1992).

Dominant soils types include moderately deep to deep well drained structured Red Earths and Red Podsolic soils. There are localised occurrences of stoniness and high-localised water erosion hazard, with the soils being highly erodibile (Milford 1999).

Pine Brush Creek traverses the northern boundary of the reserve. Two other small creek lines converge in the reserve before flowing into Pine Brush Creek. The banks of the two small creeks in the reserve are steep in sections and with some minor bank erosion.

Native Plants

Vegetation within the reserve is tall open forest with a rainforest understorey and a sclerophyll overstorey (NPWS 1998). The dominant tree species within the reserve is tallowwood (*Eucalyptus microcorys*). The reserve also contains Sydney blue gum (*E. saligna*) and brush box (*Lophosteman confertus*), tree species favoured by the koala. There has not been any comprehensive flora survey work undertaken within the reserve.

The NPWS Key Habitats and Corridors project (NPWS 2001) identifies the reserve as forming part of two important subregional habitat corridors that connect the reserve to Bruxner Park Flora Reserve and Ulidarra National Park.

The moist sclerophyll tall open forest that is characteristic of the reserve is believed to have been highly modified by the frequency, intensity and season of fires (NPWS 1998).

The reserve represents an important remnant of native vegetation in an otherwise highly modified environment, as well as important habitat for koalas (refer native animals). Its long-term viability would benefit from the planting of suitable species in the vicinity of the reserve which could provide protection from edge effects such as human encroachment, weed invasion and enhance the general conservation values of the reserve. This would also strengthen the vegetative corridor that exists between the reserve and the Bruxner Park Flora Reserve.

Native Animals

The reserve was dedicated for the protection, care, propagation and promotion of the study of fauna, in particular the koala and provides important koala habitat containing vegetation communities favoured by koalas including tallowwood, Sydney blue gum (*E. saligna*) and brush box (*Lophosteman confertus*).

The Coffs Harbour City Koala Plan of Management identifies the reserve as forming part of an important regionally significant koala habitat corridor including Boambee State Forest, Bruxner Park Flora Reserve and Orara East State Forest.

The Pacific Highway in the vicinity of the reserve has been identified as a major koala road “blackspot”. As part of the highway upgrade a “floppy top” koala exclusion fence

was erected adjacent to the reserve to prevent koalas entering the highway (Lunney *et al* 1999).

A Draft Recovery Plan for the Koala (NPWS 2003) has been prepared which considers the conservation requirements of the species across its known range in NSW. It identifies actions to be taken to ensure the long-term viability of the koala in nature and provides a framework for localised koala recovery efforts. Amongst other things, the recovery actions are aimed at identifying koala habitat and prioritising on ground management actions; identifying research priorities; and increasing community and government awareness regarding the management and conservation of koalas. It is intended that the approved recovery plan will be implemented over a five year period.

There has been no systematic survey of fauna undertaken, however the reserve is thought to be important for the movement of a number of macropod species such as swamp wallabies that have been recorded within the surrounding area and may move in and out of the reserve along the vegetated corridor that links through to the Bruxner Park Flora Reserve.

Aboriginal Heritage

The reserve is located within the area of the Coffs Harbour Local Aboriginal Land Council and within the country of the Gumbaynggirr Aboriginal people.

The Aboriginal history of the reserve is not known and there are no recorded Aboriginal sites, although it is likely that the moist sclerophyll overstorey and rainforest understorey environment and the adjoining Pine Brush Creek provided a rich source of food and materials for Aboriginal people.

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

Aboriginal culture and heritage is structured as a circular existence, whereby the native plants and animals and their environments are all connected. Geology, landforms, soils, hydrology, plants and animals are all associated with Aboriginal cultural heritage. No Aboriginal cultural heritage surveys have been undertaken in the reserve and there are no recorded sites, however, it is possible that future surveys could identify sites and areas within the reserve. Recorded Aboriginal sites within the surrounding area include natural mythological (ritual) sites.

Non-Aboriginal Heritage

The first European settlement of Coffs Harbour was in the 1870s. James Small was the first to select land at Korora and one of the first residents in the Coffs Harbour district, arriving in 1880 with his sons and a couple of workers. Initially Small cut cedar and pine, which was hauled to the coast for shipment to Sydney. Later he

turned to growing sugarcane and in the mid 1880s erected a sugar mill at Korora (Yeates 1990).

The proposal to dedicate the area as a nature reserve to protect koala habitat was initiated in 1962 and included land previously reserved as a 'Water and Camping Reserve'. A formed track traversed the reserve from the eastern boundary and provided access to a small parcel of land under 'permissive occupancy' used for cultivation as a market garden. The track is no longer evident and the area under permissive occupancy was incorporated into the reserve in 1969.

There are no known relics of non-Aboriginal heritage recorded within the reserve.

3.4 VISITOR USE AND EDUCATION

Public vehicle access to the reserve is via the Pacific Highway and an unnamed sealed public road that is adjacent to the eastern boundary of the reserve and provides access to the Korora Rural Fire Service shed. There are no tracks and trails within the reserve and no visitor facilities.

Recreational activities not consistent with the study of nature and natural and cultural environments are generally considered inappropriate uses of a nature reserve. As a nature reserve, use and recreational activities should focus on the education of visitors and appreciation of the natural and cultural heritage of the reserve. However, even for these activities, it is difficult to facilitate their use given the limited access to the reserve.

3.5 THREATS TO RESERVE VALUES

Introduced Plants and Animals

The North Coast Region Pest Management Strategy (NPWS 2002) broadly identifies the weed and feral animal issues for the reserve. The significant conservation values, small size and importance of the reserve as koala habitat prompted the NPWS to develop a specific restoration program, incorporating a weed control strategy for the reserve (NPWS 1998).

The primary aim of the restoration program for the reserve is to re-establish the species composition, structure and ecological processes of the mature forest. This is to be achieved through a variety of control techniques such as pile burning (refer also fire section). A volunteer bush regeneration group currently operates within the reserve in accordance with the restoration program and is supported by the NPWS.

A total of 32 weed species were identified within the reserve, two of which, red lantana (*Lantana camara*) and crofton weed (*Ageratina adenophora*) are declared noxious in the 'Coffs Harbour Control Area' (NSW Agriculture 2002).

Lantana is densest on the forest edge with some minor occurrences in small areas of the reserve where there has been disturbance such as tree falls. A small area previously cleared and cultivated as a market garden site is dominated by lantana. Past cultivation of the former permissive occupancy has also impacted on the composition and structure of native vegetation in the reserve. A few pine wildings and

banana trees can be found scattered through the reserve and it is believed that they may have spread from adjoining pine and banana plantations.

The water courses that traverse the reserve are a continual source of weed infestation following rainfall events where a large range of herbaceous weeds are transported in run-off from surrounding farmland (NPWS 1998).

The Regional Pest Management Strategy does not identify introduced animals as a problem within the reserve, however domestic animals, such as dogs, from surrounding lands may enter the reserve from time to time.

The reserve's small size, isolation from other naturally vegetated areas and the surrounding land uses makes it continually vulnerable to impacts from introduced plant and animals.

Fire

The NPWS regards fire as a natural phenomenon and one of the continuing physical factors influencing the Australian environment. Inappropriate fire regimes have been identified as a key threatening process affecting the biological diversity of NSW.

Records on wildfire within the reserve are incomplete, however, the regeneration and weed control strategy for the reserve describes the moist sclerophyll tall open forest characteristic of the reserve as having been highly modified by fire in the past (NPWS 1998).

Under the *Rural Fires Act 1997* the NPWS is a fire authority and is responsible for controlling fires on the reserve and ensuring that they do not cause damage to other land or property. Management will aim to maintain biodiversity by restricting fires to only part of the distribution of a vegetation community at any one time and ensuring that the fire thresholds are not exceeded. The following fire regimes guidelines have been identified for the reserve:

Table 1: Fire Regime Guidelines

Vegetation community	**A decline in biodiversity is predicted if there is:**		
Wet sclerophyll forests	More than one fire every 30 years	No fires for 200 years (upper threshold under review)	
Rainforests	Any fire occurrence		

Source: NPWS, 1998 based on Bradstock et al, 1995; Keith, 1996.

The regeneration and weed control strategy for the reserve recommends the use of spot burns, fuelled by piles of dry lantana in some sections of the reserve to facilitate the regeneration of sclerophyll species. The strategy also recommends monitoring of the effects of fire in these areas.

The rainforest understorey of the reserve is sensitive to fire and repeated fire is likely to cause the rainforest to retract and change composition. Fire also has the potential to damage some types of Aboriginal relics and historic places although no sites have as yet been identified.

The bushfire danger period for the reserve is expected to be early spring to early summer based on temperature, relative humidity and rainfall trends. The reserve is classified as having a low to medium bushfire threat based on an assessment of the potential bushfire behaviour and associated factors such as slope, aspect, and fuels.

The fire hazard in the reserve is greatest during times of drought, when leaf fall is heavy and soil moisture is low. A fire could potentially spread through the reserve, however, in all but extreme conditions, fires would be expected to be contained within the reserve. A number of natural and man made barriers inhibit the spread of fire. This includes Pine Brush Creek to the north and the Pacific Highway to the east. Fire is more likely to start in surrounding land and spread into the reserve.

A review of fire management throughout the NPWS resulted in a modified approach to fire based on the level of complexity involved. In regard to Kororo Nature Reserve, the NPWS considers that it is appropriate to include the specific fire management strategies for the reserve in this plan of management. Programs are also submitted to the district Bush Fire Management Committees.

The NPWS approach to fire management planning uses a system of zones which are compatible with district bushfire risk management plans. NPWS has assessed the reserve for fire management planning purposes and has zoned the reserve as a Heritage Area Management Zone (HAMZ). The primary fire management objectives for this zone are to prevent the extinction of all species that are known to occur naturally within the reserve, and to protect culturally significant sites. The reserve has been designated as a HAMZ because of the sensitivity of rainforest and wet sclerophyll vegetation.

Isolation and Fragmentation

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

The reserve’s small size, isolation and the adjoining land uses means it is continually under threat from weed reinfestation and other impacts. These factors may also threaten the long-term viability of resident populations of native fauna in the reserve.

Conservation of remaining areas of adjoining forested land including the vegetated corridor between the reserve along the coastal range is important to maintaining biodiversity.

4. MANAGEMENT ISSUES AND STRATEGIES

Current Situation	Desired Outcomes	Strategies	Priority
Soil and water conservation Soils in the reserve have a high erosion hazard. There is some minor bank erosion along the two watercourses that converge within the reserve and flow into Pine Brush Creek. Erosion is accelerated during high rainfall and flood events.	• Soil erosion is minimised.	• Undertake all works in a manner that minimises erosion and water pollution. • Monitor bank erosion and take action if needed to arrest the erosion. • Liaise with Coffs Harbour Council and other relevant authorities to maintain and improve water quality in the reserve's catchments.	High High Ongoing
Native plant and animal conservation Vegetation within the reserve is classified as tall open forest, with a sclerophyll overstorey and rainforest understorey (NPWS 1998). There has not been any flora or fauna survey work undertaken in the reserve, but it has been identified as an important refuge area and part of a regionally significant koala habitat corridor (Lunney *et al* 1999). The draft Recovery Plan for the Koala (NPWS 2003) considers the conservation requirements of the species and provides a framework for	• All native plant and animal species and communities are conserved. • Structural diversity and habitat values are restored in disturbed areas. • Increased knowledge of fauna and flora on the reserve and their ecological requirements. • The reserve continues to provide valuable habitat for koalas.	• Implement the regeneration program and weed control strategy for the reserve to re-establish species composition, structure and ecological processes (refer Introduced Species). • Monitor vegetation recovery in accordance with the reserve restoration and weed control program (NPWS 1998). • Undertake plant and animal surveys, particularly for rare and threatened species and the vulnerable koala. • Implement the approved Recovery Plan for the Koala and recovery plans for other threatened species if relevant. • Work with neighbours, relevant authorities and vegetation management committees to encourage conservation of remnant native vegetation in the	High/ Ongoing Ongoing Medium High High

localised koala recovery efforts. The reserve forms part of an important vegetation corridor. Weeds, isolation and fragmentation of the reserve are the major threats to native species and biodiversity in the reserve and its ability to act as an important corridor for the movement of animals.		vicinity of the reserve. Promote, support and encourage volunteer bush regeneration activities. • Ensure any boundary fencing of the reserve considers the requirements and impacts on koala movements.	High
Cultural heritage There are no recorded indigenous or non-indigenous cultural heritage sites within the reserve. No surveys have been undertaken. The reserve lies within the boundaries of the Gumbaynggirr Aboriginal Peoples' and Coffs Harbour LALC.	• Any cultural features are identified, recorded, conserved and managed in accordance with their significance. • The history of the reserve and knowledge is documented and recorded.	• Protect and manage Aboriginal heritage values associated with the reserve in partnership with the local Aboriginal community including the Coffs Harbour Aboriginal Land Council (LALC), Gumbaynggirr Elders and any other relevant individuals. • Encourage studies into the reserve's cultural heritage including formal documentation of cultural resources and locations. • Consult and involve the Coffs Harbour Local Aboriginal Land Council, relevant Elders and individuals in all aspects of identifying and managing Aboriginal sites, places, values and significance. • Ensure information on the reserve's Aboriginal cultural heritage is not presented to the public without the permission of the local Aboriginal community.	Ongoing Medium Ongoing Ongoing

Visitor use Use of the reserve must be carefully managed since it is a relatively small and significant area of remnant vegetation. Access is via foot and generally from the east beside the Korora RFS shed. No formal access arrangements are currently in place. There are no recreational facilities within the reserve and visitor use is low.	• The local community is aware of the significance of the area and of management programs. • Visitor use remains low and is ecologically sustainable.	• Allow self reliant nature appreciation recreation such as walking, bird watching and nature study. • Prohibit camping, public vehicle use, commercial activities, horse riding, and cycling. • Recreational use of the reserve will not be promoted and no visitor facilities will be provided other than signage (refer below). • Promote community understanding and appreciation of the conservation values of the reserve through contact with neighbours, community groups and media releases as needed. • Install interpretive and regulatory signage at the entrance to the reserve.	Ongoing High High Ongoing Low
Introduced species A restoration program, incorporating a weed control strategy, has been prepared for the reserve. Watercourses in the reserve are a source of weed infestation, particularly following flood events. Other than domestic animals such as dogs entering the reserve, introduced animals are not a major problem. The small, isolated nature of the reserve makes it vulnerable to impacts from introduced species.	• Introduced species are controlled, and were possible eradicated from the reserve. • The impact of introduced species on native species and neighbouring lands is minimised.	• Implement the restoration program and weed control strategy for the reserve, including ongoing monitoring and priority control programs for lantana, crofton weed, pine wildings and banana trees. • Undertake weed control after flood events to prevent reinfestation. • Seek the cooperation of other authorities and neighbours in implementing weed and animal control programs. • Undertake consultation with volunteers and bush regeneration teams involved in rehabilitation of the reserve to monitor the progress of introduced species programs.	High Ongoing Medium Low

Fire management Records on wildfire within the reserve are incomplete, however it is believed that vegetation within the reserve has been highly modified by fire in the past (NPWS 1998). The rainforest understorey is sensitive to fire. Natural and man made barriers inhibit the likelihood and spread of fire on the reserve's north and eastern boundaries. The reserve is most vulnerable to fires entering from neighbouring properties. The Korora RFS is located adjacent to the reserve.	• Fire is excluded from the reserve. • Life, property and natural and cultural values within and adjacent to reserve are protected from fire. • The endangered vegetation within the reserve is protected from fire. • The potential for spread of bushfires on, from, or into the reserve is minimised.	• Manage the reserve as a Heritage Management Zone where fire is managed to protect biodiversity in accordance with the identified fire frequency thresholds for vegetation communities and any fire sensitive communities (refer Table 1). • Suppress all unplanned fires and where possible, exclude fire from the reserve. • Prohibit the lighting of fires. • Actively participate in Coffs Harbour District Bush Fire Management Committee. • Maintain coordinated and cooperative arrangements with Rural Fire Service brigades and neighbours with regard to fuel management and fire suppression works outside the reserve. • When undertaking spot burns for weed control ensure that fire thresholds are not exceeded and areas of rainforest and cultural sites are protected. • Monitor the effects of fire in those areas where the use of fire has been carried out for weed control. • Support neighbours' efforts to contain fire on their own properties, protect their own assets and report unplanned ignitions. • Provide information and advice to neighbours regarding the ecological impact of fire and fire management issues. • Negotiate with neighbours to enable the clearance of firebreaks on private land where necessary for the mutual protection of the nature reserve and private property values from wildfire. Consider potential impacts on the reserves values when locating firebreaks.	High High High Ongoing Ongoing High Ongoing High/ Ongoing High High/ Ongoing

		• Prescribed burning may be undertaken to maintain ecological values consistent with table 1 for threatened species or where research indicates it is necessary.	High
Research No surveys or studies have been undertaken in the reserve. Scientific study is needed to improve understanding of the reserve's natural and cultural heritage, the processes that affect them and the requirements for management of particular species	• Research enhances the management information base and has minimal environmental impact. • Processes and biological observations continue to be recorded.	• Undertake and/or encourage research to improve knowledge and management of natural and cultural heritage. • Encourage and guide research into the following areas: - fauna surveys and ecological studies; - Aboriginal and European cultural heritage; - bush regeneration practices; - fire history; and - pest species management.	Low Low

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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