

HORTONS CREEK NATURE RESERVE

PLAN OF MANAGEMENT

National Parks and Wildlife Service

Part of the Department of Environment and Conservation (NSW)

June 2006

This plan of management was adopted by the Minister for the Environment on 29th June 2006.

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.

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FOREWORD

Hortons Creek Nature Reserve is 327 hectares in size and located approximately 8 kilometres south-west of Nymboida on the Grafton-Armidale Road in north-eastern NSW. The nature reserve was reserved on 25 June 1993 following its protection under an Interim Conservation Order in 1985 and the subsequent purchase by NPWS in order to conserve the exceptionally diverse subtropical rainforest, containing trees of record size in NSW.

Although the majority of the reserve is rainforest, the reserve contains a total of five distinct vegetation communities. These are subtropical and dry rainforest, wet and dry sclerophyll forests, and woodland. Eight threatened fauna species listed under the Threatened Species Conservation Act are known to occur in the reserve, while an additional sixteen species have been recorded near the reserve or are considered likely to occur within the reserve

The *National Parks and Wildlife Act, 1974* requires a plan of management to be prepared for each park and reserve. 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 Hortons Creek Nature Reserve was placed on public exhibition from 23 April until 2 August 2004. The exhibition of the draft plan attracted 6 submissions which raised 13 issues. All submissions received were carefully considered before adopting this plan.

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

Bob Debus
Minister for the Environment

1. NATURE RESERVES IN NEW SOUTH WALES

1.1 LEGISLATIVE AND POLICY FRAMEWORK

The management of nature reserves in NSW is in the context of 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). Section 72AA of the NPW Act lists the matters to be considered in the preparation of a plan of management. The policies are compiled from 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 environmental impacts of any works proposed in this plan.

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 reserve, except in accordance with the plan. The plan will also apply to any future additions to Hortons Creek Nature 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

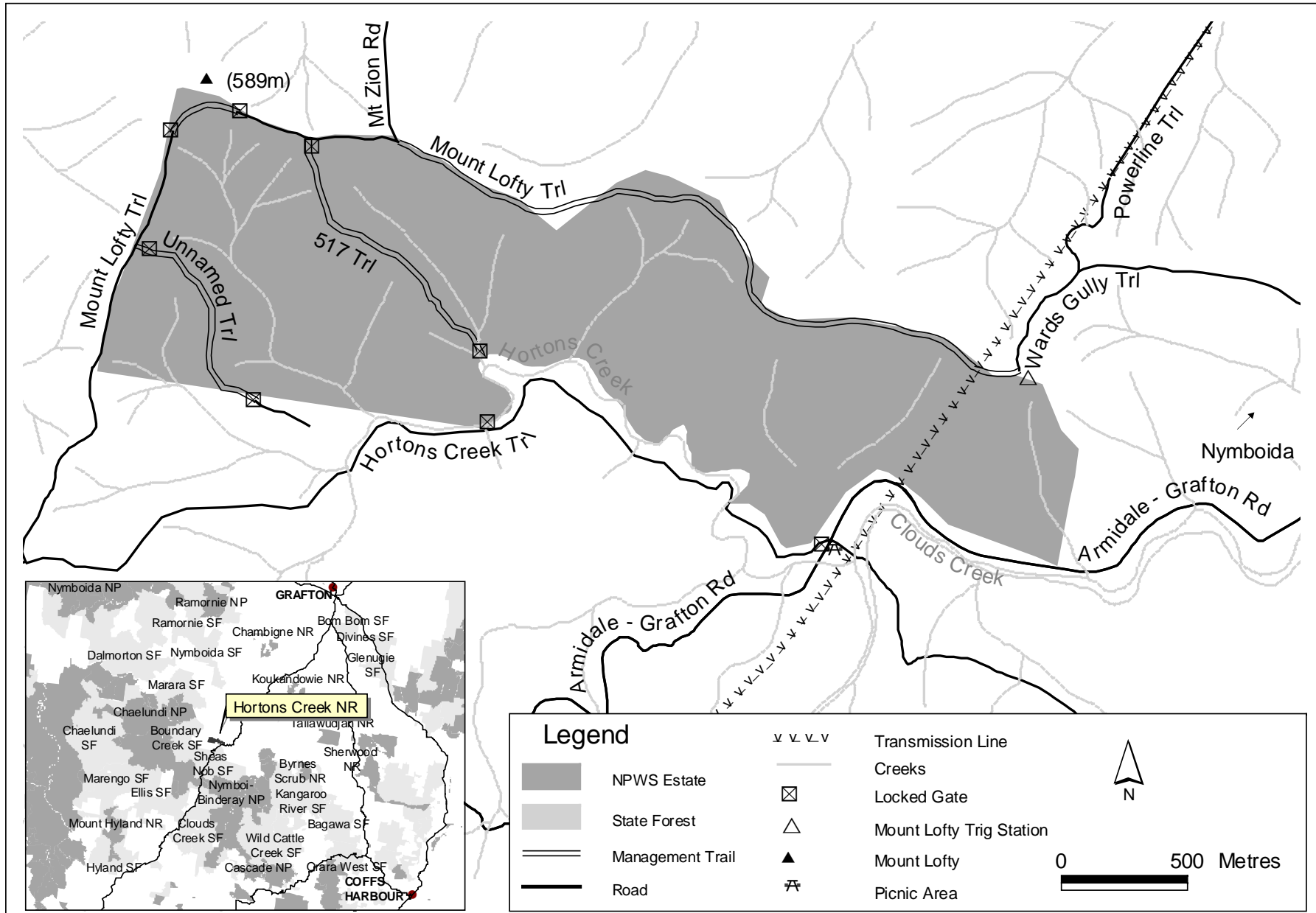
Nature reserves are reserved under the NPW Act to protect and conserve areas containing outstanding, unique or representative ecosystems, species, communities or natural phenomena.

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.

Nature reserves are valuable refuge areas, where natural processes, phenomena and wildlife can be studied. They differ from national parks, which include as a major objective the provision of appropriate recreation opportunities. Nature reserves are part of the regional pattern of land use. Management of nature reserves aims to minimise disturbance to natural and cultural heritage. Other land uses, for example agriculture, forestry and mining, are distinguished by an acceptance or encouragement of environmental modification. Nature reserves, therefore, provide for only a limited part of the range of land uses in a region.

2. HORTONS CREEK NATURE RESERVE (327 ha) AND LOCALITY MAP



3. HORTONS CREEK NATURE RESERVE

3.1 LOCATION, GAZETTAL AND REGIONAL SETTING

Hortons Creek Nature Reserve is located approximately 8 kilometres south-west of Nymboida on the Grafton-Armidale Road in north-eastern NSW (see *Reserve Map*). The reserve covers 327 hectares of what was formerly private land and was gazetted as a nature reserve on 25 June 1993.

What was locally known as the "Hortons Creek rainforest", has a long and complex history. The important conservation values of the land were first referenced to government landuse authorities in 1975 when the land tenure was converted from Crown leasehold land to freehold conditional purchase. In 1985, an Interim Conservation Order under the NSW *Heritage Act 1977* was granted, protecting the area from vegetation clearing. A Commission of Inquiry was instigated into the conservation order and the Commission found that a Permanent Conservation Order should be made over the land. Ultimately, the land was purchased by the NPWS in order to conserve the "exceptionally diverse subtropical rainforest containing trees of record size in NSW" (NSW NPWS 1998).

The reserve forms part of a regional system of conservation reserves across the landscape with Chaelundi National Park to the north-west and Nymboi-Binderay National Park to the south-east. Clouds Creek State Forest lies to the immediate south of the reserve, with Sheas Nob State Forest to the south-west and Marara State Forest to the north-west. These and other forested areas contribute to a greater corridor of native vegetation running north to south across the landscape.

Landuses within the surrounding landscape include State and private forestry operations, cattle grazing, including numerous occupational permits on State forest, as well as low levels of rural residential development. The reserve adjoins private freehold land which is largely forested and forms part of a vegetated corridor linking the reserve to other conservation areas, including Chaelundi National Park. A travelling stock reserve and a Council maintained public picnic area are located adjacent to the eastern boundary of the reserve.

The reserve is located within the boundaries of the Clarence Valley local government area, the Grafton-Ngerrie Local Aboriginal Land Council area and the Clarence Valley Zone Bushfire Management 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 humans have used it. Prior to declaration of the reserve, parts of the area were selectively logged. However, due to the declaration of a heritage protection order (refer to section 3.1), the area that is now the reserve was largely protected from extensive disturbance such as logging and grazing, which have affected the surrounding landscape to a greater degree.

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 MANAGEMENT DIRECTIONS

The following objectives apply to the management of Hortons Creek Nature Reserve.

- Management of the reserve as part of a regionally important system of protected areas.
- Conservation of rainforest vegetation communities.
- Protection of habitat for significant plant and animal species, particularly species and populations that are:
 - listed under the TSC Act or the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act);
 - endemic or regionally significant;
 - otherwise rare or threatened; or
 - at the limits of their known distribution.
- Provision of opportunities for self-reliant nature-based recreation only.
- Restriction of further non-NPWS infrastructure in the reserve.

3.4 NATURAL AND CULTURAL HERITAGE

Landform, geology and soils

The area extends in part from Hortons Creek in the south at 250m altitude up the steep slopes to the crest of a west-north-west to east-south-east ridge, from Mount Lofty (589m) in the west to Lofty Trig (523m) in the east. Except for the gentle slopes and alluvial flats in the extreme south of the reserve, the area is of steep stony topography with minor cliff lines (NPWS 1988).

The reserve drains southwards through several unnamed drainage lines into Hortons Creek, which flows in an easterly direction adjacent to the southern boundary of the reserve. Hortons Creek feeds into Clouds Creek, a tributary to the Nymboida River.

Geologically the area is classified as being of palaeozoic metamorphosed sediments of micaceous phyllites and slates with some siliceous argyllites. These have weathered to pale yellow-brown clay loam on the steep slopes and brown loam elsewhere. The appearance of these soils and their associated rainforest vegetation however are indicative of a soil enriched by basic igneous rocks such as weathered basalt capping, of which there are examples in the landscape surrounding the reserve (NPWS 1988). Soils in the reserve are subject to moderate to high surface erosion hazard, with potential for mass movement.

Native plants

The whole of the reserve is forested, except for approximately 500m of clearing under the transmission lines that traverse the eastern end of the reserve, as well as small clearings on the north bank of Hortons Creek and at a small rock face in the centre of the reserve. In contrast, adjoining lands to the south are of gentler topography and have been extensively cleared.

Rainforest within the reserve is listed as an Endangered Ecological Community under the TSC Act within the category of Lowland Rainforest on Floodplain in the NSW North Coast Bioregion. The rainforest within the reserve displays considerable variation from and is not typical of the ecological community as described in the final determination.

Although the majority of the reserve is rainforest, the reserve contains a total of five distinct vegetation communities. These include subtropical and dry rainforest, wet and dry sclerophyll forests and woodland. The five communities can be divided into twelve suballiances and associations. This diversity is the result of the combined effects of soil fertility, aspect and fire history (NPWS 1988).

The southerly aspect provides greater shading and has produced a moister vegetation type than that of the adjoining slopes of a northerly aspect. In addition, the western or east-facing slopes of the north-south tributaries of Hortons Creek are protected from the strong dry westerly winds, which further supports the persistence of well-developed dry rainforest in this area. The drier west-facing slopes support wet sclerophyll forest.

The undisturbed subtropical rainforest, although small in area, is an excellent example and contains several species of trees of record size for NSW (NPWS 1988). The previously logged red cedar (*Toona ciliata*)–white cedar (*Melia azedarach* var *australasica*)–bumpy ash (*Flindersia schottiana*) suballiance is one of only two known examples in NSW and is the most extensive. The bumpy ash is close to record height for this species in NSW. The red cedar is unique in terms of its extent and diversity of sizes. The hoop pine (*Araucaria cunninghamii*)–shatterwood (*Backhousia sciadophora*) suballiance is noted for its particularly high diversity of fig species as well as the record sizes of some species (NPWS 1988).

Dunn's white gum (*Eucalyptus dunnii*) exists in the reserve, where it is near its southernmost occurrence. This rare species is recorded at several disjunct sites in NSW, mostly on the Northern Tablelands, as well as several locations in south-east Queensland (Brooker and Kleinig 1999, NPWS 1988).

The native rainforest in and around Hortons Creek Nature Reserve is suitable habitat for the rare orchid species *Sarcochilus dilatatus*. For many years this species was thought to be extinct in NSW and was only known to be conserved in Lamington National Park, although the status of this population is uncertain. In 1998, *S. dilatatus* was recorded near Hortons Creek Nature Reserve. Both Dunn's white gum and *S. dilatatus* are listed Rare or Threatened Australian Plants (ROTAP) species.

The forest and riparian vegetation communities are likely to support a diverse range of rare and threatened fauna species (refer to *Native Animals*). The NPWS Key Habitats and Corridors project has identified Hortons Creek Nature Reserve as part of a regional vegetation corridor for fauna movement. This corridor links the reserve to other conservation areas, including Chaelundi National Park to the west and Nymboi-Binderay National Park to the south-east. State forest and vegetated private lands around the reserve are vital to the connectivity of fauna habitats in the region.

Native animals

The NPWS Key Habitats and Corridors Project (NPWS 2001) identified potential habitat for a range of threatened species and species of conservation concern across the landscape in north-eastern NSW. Much of Hortons Creek Nature Reserve has been identified as key habitat for species in the Moist Escarpment-Foothills, Wet Escarpment-Foothills and Wet Escarpment fauna assemblages. Appendix A lists the species that make up each of these fauna assemblages.

Eight threatened fauna species listed under the TSC Act are known to occur in the reserve, while an additional sixteen species, including three species listed under the Commonwealth EPBC Act, have been recorded near the reserve or are considered likely to occur within the reserve (NPWS 1999) (refer to Table 1 for significant species recorded and predicted to occur in the reserve).

The reserve incorporates vegetation covering the whole of the south-facing slope of the ridgeline, with the result that water quality generated in the reserve is quite high. Riparian vegetation in the reserve is generally in excellent condition. The drainage lines within the reserve that feed into Hortons Creek, as well as Hortons Creek itself, provide high quality habitat for a number of threatened frog species.

Table 1 Significant fauna species recorded or predicted to occur in Hortons Creek Nature Reserve

Common Name	Scientific Name	Conservation Status	Occurrence
reptiles			
white-crowned snake	<i>Cacophis harriettae</i>	Vulnerable	Predicted
birds			
black-chinned honeyeater	<i>Melithreptus gularis gularis</i>	Vulnerable	Recorded
bush stone-curlew	<i>Burhinus grallarius</i>	Endangered	Predicted
glossy black-cockatoo	<i>Calyptorhynchus lathami</i>	Vulnerable	Recorded
masked owl	<i>Tyto novaehollandiae</i>	Vulnerable	Predicted
powerful owl	<i>Ninox strenua</i>	Vulnerable	Recorded
red-tailed black-cockatoo	<i>Calyptorhynchus banksii</i>	Vulnerable	Predicted
rose-crowned fruit-dove	<i>Ptilinopus regina</i>	Vulnerable	Recorded
sooty owl	<i>Tyto tenebricosa</i>	Vulnerable	Recorded
superb fruit dove	<i>Ptilinopus superbus</i>	Vulnerable	Recorded
wompoo fruit-dove	<i>Ptilinopus magnificus</i>	Vulnerable	Recorded
mammals			
common bent-wing bat	<i>Miniopterus schreibersii</i>	Vulnerable	Predicted
common planigale	<i>Planigale maculata</i>	Vulnerable	Predicted
golden-tipped bat	<i>Kerivoula papuensis</i>	Vulnerable	Predicted
grey-headed flying fox	<i>Pteropus poliocephalus</i>	Vulnerable*	Predicted
koala	<i>Phascolarctos cinereus</i>	Vulnerable	Predicted
large-footed myotis	<i>Myotis adversus</i>	Vulnerable	Predicted
little bent-wing bat	<i>Miniopterus australis</i>	Vulnerable	Predicted
rufous bettong	<i>Aepyprymnus rufescens</i>	Vulnerable	Predicted
spotted-tailed quoll	<i>Dasyurus maculatus</i>	Vulnerable	Predicted
yellow-bellied glider	<i>Petaurus australis</i>	Vulnerable	Recorded
amphibians			
giant barred frog	<i>Mixophyes iteratus</i>	Endangered*	Predicted
green-thighed frog	<i>Litoria brevipalmata</i>	Vulnerable	Predicted
stuttering frog	<i>Mixophyes balbus</i>	Endangered Vulnerable*	Predicted

(NPWS 2001).

Vulnerable = under the TSC Act

Endangered = under the TSC Act

* = also listed as Endangered or Vulnerable under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999.

Aboriginal cultural heritage

Aboriginal communities have an association and connection to the land. The land and water biodiversity values within a whole landscape context are the centre of Aboriginal spirituality and contribute to Aboriginal identity. Aboriginal communities associate natural resources with the use and enjoyment of valued 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.

Hortons Creek Nature Reserve falls within the boundary of the Grafton-Ngerrie Local Aboriginal Land Council, and within the country of the Gumbayngirr Aboriginal

people. The reserve is part of a landscape of cultural importance to the Gumbayngirr Aboriginal people.

No formal cultural heritage survey work has been undertaken and no Aboriginal sites have been found within the reserve to date.

The use of forests as a source of food and traditional medicines by Aboriginal communities has continued since European arrival (Hall and Lomax 1993). Forests are also traditionally places of religious and spiritual value to Aboriginal people, both in terms of tracts of country and specific sites (Hall and Lomax 1993).

Historic heritage

No formal heritage assessments have been undertaken and no sites of historic significance have been recorded in the reserve to date. The rainforest vegetation of the reserve is, however, of historic and scientific value.

Several historic records relate to the origins of European names of features of the reserve. In 1851, two bullock drivers were travelling from Clouds Creek towards Nymboida, when one of their bullocks, "Lofty", suffered an accident. They named the area where the accident happened "Mount Lofty" (Laws undated) (see *Reserve Map*). Hortons Creek, or Hortons Crossing, was named after an early pioneer who mined gold in the area (Laws undated). John Horton apparently left the area in 1870 after making his fortune and later died from injuries after falling from his horse (Vincent 1912). Prior to gazettal the area now included in the reserve was known as "Hortons Rainforest".

Livestock grazing and timber production appear to be the dominant historical uses of lands surrounding Hortons Creek Nature Reserve, and of parts of the reserve prior to gazettal. Squatters, mainly cattle graziers, were the first recorded European people in the area, occupying the Orara Valley from the 1840s. Early timber-cutting operations based on cedar, and subsequently hoop pine, began around the same time. Many timber getters were drawn to the Coutts Crossing, Kangaroo Creek and Nymboida areas during the mid 1800s, with huge quantities of timber reputedly being cut following a decrease in supply closer to the Clarence River (Coutts Crossing and Nymboida Districts Historical Society 1988).

3.5 FIRE MANAGEMENT

Fire is a natural feature of the landscape in which the reserve is part and is essential to the survival of some plant communities. It is one of the continuing physical factors influencing the Australian environment. However, inappropriate fire regimes have been identified as a key threatening process affecting the biological diversity of NSW as frequent fire can cause loss of particular plant and animal species and communities. Fire can also damage cultural features, fences and threaten neighbouring land.

The fire history of the reserve is not well recorded, however the significant areas of rainforest indicate that the reserve has not been subject to extensive fires. Fires have generally affected the drier ridgelines on the northern and western boundaries.

Minor cliffs, steep stony slopes and the reserve's position in the landscape have prevented fires from moving down-slope from the ridge tops.

Only one fire has entered the reserve since gazettal, from the west, affecting a small section of the reserve. Threat of unplanned fire is considered most likely to be from fires occurring on lands to the west of the reserve.

There are several built assets within approximately one kilometre of the reserve, including rural dwellings, stockyards, fences and an electricity transmission line. Assets in the vicinity of the reserve are not considered to be at significant risk from fire within the reserve due to the protection afforded by the topography and vegetation types, as well as the low frequency of fires occurring within the reserve. The transmission line is within an established fuel reduced zone that is maintained by Transgrid (refer to section 3.8 *Other uses*).

The NPWS is a fire authority under the *Rural Fires Act 1997* and is required to implement the provisions of district Bush Fire Risk Management Plans. Management of NPWS estate is in accordance with the adopted state-wide NPWS Strategy for Fire Management (2003). An important part of NPWS fire management is participation in local cooperative fire management arrangements. The NPWS is an active member of the Clarence Valley Zone Bush Fire Management Committee (BFMC) and works closely with the local RFS brigades and land holders.

A review of fire management by NPWS has resulted in a modified approach to fire planning based on the level of complexity involved. In regard to Hortons Creek Nature Reserve, the NPWS considers that it is appropriate to include the specific fire management strategies for the reserve in this plan of management. Annual hazard reduction programs are also submitted to the district BFMC.

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 Land (Heritage Area) Management Zone (HAMZ) in accordance with the NPWS Strategy for Fire Management (2003) and the Clarence Valley Zone Bush Fire Risk Management Plan. The primary fire management objectives for this zone are to preserve the natural and cultural heritage values 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 significance of the rainforest vegetation, its sensitivity to fire (RACAC 1996) and the low risk to surrounding assets. The HAMZ focuses on those actions appropriate to conserve biodiversity and cultural heritage, including exclusion of fire from rainforest. Management of fire regimes for other communities will be in accordance with fire regime guidelines identified in Table 2.

Ecological research in Australian ecosystems has established some general principles about fire regimes and the conservation of biodiversity. That is, groups of plants and animals respond similarly to fire according to characteristics of their life history. Therefore it is not necessary to individually specify fire regimes for the conservation of every species. Requirements for most plant species can be summarised on the basis of vegetation communities and there is a threshold in fire

regime variability that marks a critical change from high species diversity to low species diversity (refer table 2).

Fire management will aim to maintain biodiversity principally by excluding fire from rainforest vegetation. Further, in adapted vegetation types the aim will be to encourage a pattern of mixed high, moderate and low intensity, frequency and extent of fire. Fire regimes of fixed intensity, frequency and extent without variation lead to biodiversity decline.

Table 2 Fire regime guidelines for Hortons Creek Nature Reserve

Vegetation type	Minimum interval	Maximum interval	Notes
Rainforest	n/a	n/a	Exclude all fire
Wet sclerophyll forest	25	60	Crown fires should be excluded in the lower end of the range
Shrubby dry sclerophyll forest	7	30	
Sclerophyll grassy woodland	5	40	

Source: Bradstock *et al.* 2003

The Unnamed Trail and Trail 517 may provide strategic fire breaks affording some protection from fires entering the reserve from the west. The northern and western boundary trails will provide key fire advantages and access during fire incidents (see *Reserve Map*).

Fire advantages that may assist in protection of the reserve from wildfire are listed in Table 3, with most shown on the *Reserve Map*.

Table 3 Fire advantages for Hortons Creek Nature Reserve

Feature	Fire advantage description	Function
Hortons Creek	Along part of southern reserve boundary	Natural barrier preventing fire entering reserve from the south
Clouds Creek	Immediate east of reserve	Possible vehicle water point for fire suppression
Nymboida River	East of reserve	Possible helicopter water point for fire suppression
Grafton-Armidale Road	Along part of the south-eastern reserve boundary	Prevent fire entering reserve from east, access to Hortons Creek Trail
Mount Lofty Trail	Along northern and western reserve boundaries and northern ridgeline	Access along northern boundary ridgeline and western boundary, possible control line for fire approaching from the west

Feature	Fire advantage description	Function
Mount Zion trail	North of reserve	Access to Mount Lofty Trail
Hortons Creek Trail	Along southern reserve boundary on private land	Southern access to reserve, possible refuge area during fire incident
Wards Gully Trail	To north-east of reserve on private land	Access to north-east reserve boundary and Mount Lofty trail. Also accesses trig point for fire lookout
Powerline easement	Traverses eastern end of reserve, runs north-east and south-west	Cleared easement approximately 50m wide, possible refuge area during fire incident
Management Trail 517 (internal)	Traverses western end of reserve, runs north-west and south-east	Narrow management trail, 4WD dry weather only. North to south one way access. Possible secondary control line for fires approaching from the west
Unnamed internal management trail	Traverses south-western corner of reserve	Narrow management trail, 4WD dry weather only. Possible primary control line for fires approaching from the south-west
Rainforest vegetation types	Gully lines feeding Hortons Creek	Natural fire control lines limiting fire spread

3.6 ACCESS AND VISITOR USE

Hortons Creek Nature Reserve offers opportunities for low impact, self-sufficient nature based recreational uses, such as bush walking and nature appreciation. Visitor car parking is available at the public picnic area located opposite the reserve on the Armidale-Grafton Road (see *Reserve Map*). There are no formed walking tracks or recreation facilities within the reserve.

Public vehicle access is not permitted within the reserve (refer to *Management Operations*). Public vehicle access is available to the reserve boundary along the Armidale-Grafton Road, Hortons Creek Trail and from the south along the Mount Lofty Trail.

Mount Zion Road to the north of the reserve does not always align with the Crown road reserve and consequently, crosses onto private land. The part of Mount Lofty Trail that lies east of Mount Zion Road enters both private land and the reserve. Both these trails are closed to public vehicles.

The reserve is currently subject to low levels of nature-based use such as bushwalking and bird watching. NPWS Discovery Tours have been conducted in the reserve during school holidays. Inappropriate activities, such as trail bike riding and horse riding, also occasionally occur in the reserve (refer to section 3.9 *Threats to reserve values*).

A number of bird species records collected in and adjacent to Hortons Creek Nature Reserve have been contributed through the observations of naturalists and special interest groups that have visited the Hortons Creek area since the early 1980s. Bird banding activities in and around the reserve pre-date gazettal and continue to be undertaken in and near Hortons Creek Nature Reserve on a semi-regular basis. The aim of bird banding is to investigate bird population dynamics in relation to habitat type and condition. Bird banding is permitted under scientific and bird banding licenses issued by the NPWS.

National parks and State forests in the region, such as Chaelundi and Nymboi-Binderay National Parks to the west and south-east of the reserve, as well as the nearby Sheas Nob and Boundary Creek State Forests to the west and south of Hortons Creek Nature Reserve, provide for a range of recreational opportunities, including camping, picnicking, canoeing, fishing, bird watching and bush-walking (NPWS and SFNSW 2001). There is also the picnic area adjoining/opposite the reserve on the Armidale-Grafton Road, which is managed by Clarence Valley Council.

Signage in the reserve is currently restricted to reserve name signs at several locations within the reserve boundary. One sign has been erected opposite the picnic area on the Armidale-Grafton Road, with another roadside sign placed along the Armidale-Grafton Road. Additional reserve signage is located at the northern entrance to the reserve at the junction of Mount Lofty Trail and 517 Trail.

3.7 MANAGEMENT OPERATIONS

Hortons Creek Nature Reserve is largely surrounded by private property, with the exception of the eastern boundary of the reserve, where it abuts the Grafton-Armidale Road.

Vehicle access to the reserve for management purposes is via Hortons Creek Trail from the south and Mount Zion Road or Powerline Trail from the north. Trails along the reserve boundary and within the reserve are also used for management purposes. No formal or long-term NPWS access agreements for trails that traverse private property are in place at present. Vehicle access within the reserve is limited to that required for management and Transgrid purposes only. Gates to the reserve currently exist at the eastern end of Hortons Creek Trail, the middle of Hortons Creek Trail and the northern end of 517 Trail to exclude unauthorised vehicles.

The southern section of Trail 517 is extremely steep, slippery and prone to erosion and is not used for routine management purposes. The trail provides a one-way route from north to south (downslope) that is only used occasionally during emergencies or for fire suppression. In addition, an unnamed management trail in the south-western corner of the reserve provides dry weather 4 wheel drive access to that part of the reserve. This trail is currently in good repair and will be retained as a strategic fire advantage and management access.

The section of Mount Lofty Trail on the northern boundary meanders in and out of the reserve and the adjoining private property.

Approximately half of the reserve boundary has been fenced to exclude livestock from the reserve. Boundary fencing in the remainder of the reserve is inadequate or absent, occasionally resulting in livestock from adjacent lands straying into the nature reserve. (refer to *Introduced plants and animals*).

Under the Nymboida Local Environmental Plan (LEP) 1986, Hortons Creek Nature Reserve is zoned 7(d) Scenic Protection, with the objective of preserving ridgeline and prominent topography within the Nymboida River valley, which is of high aesthetic value. This zoning also provides for development of tourism and recreation activities that are compatible with the natural environment and character of the area. While this zoning was appropriate prior to gazettal of the reserve, land under NPWS tenure should be zoned 8(a) "Existing National Parks and Nature Reserves".

3.8 OTHER USES

An electricity transmission line and associated poles traverses the eastern end of the reserve in a north-south direction. A formal easement for the line was granted prior to gazettal in 1968 under the *Public Works Act 1912*. Access by Transgrid to the power line for maintenance and management purposes is via Powerline Trail. This trail traverses private property to the north of the reserve and is not available for public access.

Transmission lines and associated developments generate impacts such as clearing or trimming of vegetation, use of herbicides and the maintenance of access trails, as well as the visual impact of the lines and towers. A state-wide agreement between TransGrid and the NPWS for inspection and maintenance of existing transmission lines and infrastructure was implemented in October 2002.

3.9 THREATS TO RESERVE VALUES

Introduced plants and animals

A number of weed species have been recorded in Hortons Creek Nature Reserve including red and pink lantana (*Lantana camara*), crofton weed (*Ageratina adenophora*), smooth senna (*Senna x floribunda*), narrow-leaved cotton bush (*Gomphocarpus fruticosus*), blackberry (*Rubus fruticosus*), tobacco bush (*Solanum mauritianum*), wild cucumber (*Zehneria cunninghamii*) and white passionfruit (*Passiflora subpeltata*). Red lantana, crofton weed, and blackberry are listed as noxious weeds in the Clarence Valley local government area. As such, these species are a priority in the reserve, in accordance with the Draft North Coast Regional Pest Management Strategy (2002). Several lemon trees as well as several exotic grasses and herbaceous weeds remain within the reserve boundary from previous land uses, but are of lesser concern.

No pest animals have been recorded in the reserve to date, however, wild dogs (*Canis familiaris*), foxes (*Vulpes vulpes*) and feral cats (*Felis catus*) have been observed on adjacent properties. These animals may also occur in Hortons Creek Nature Reserve, although at relatively low densities. Predation by these species may impact on the population sizes of a range of native wildlife, including mammals, ground nesting birds and reptiles (NPWS 2002).

Livestock and domestic animals from adjacent lands may occasionally stray into parts of the reserve where fencing is inadequate or absent. Although not bound by legislation to provide for fencing of NPWS estate, the NPWS recognises that cooperative boundary fencing may enhance conservation values and resolve management problems within reserves. NPWS policy on boundary fencing covers fencing adjacent to private property, leasehold and Crown lands.

There are no licensed apiary sites within the reserve, however, the area may be within the foraging range of bees as part of apiary operations located on adjacent forested lands.

Native vegetation disturbance

Previous landuse activities such as logging and road construction have created gaps in the rainforest canopy in some parts of the reserve. Disturbed areas are regenerating naturally, but in some instances, regeneration has been hampered by a proliferation of a genus of native vine (*Cissus* sp.). The vine has formed a thick ground cover, blocking sunlight from reaching the ground, thereby preventing other species establishing. To maintain the structural and floristic integrity of a rainforest community, it is important that these gaps regenerate with appropriate species that will grow to restore the upper canopy.

Isolation and fragmentation

Clearing of vegetation within the bioregion has resulted in a high loss of biodiversity and fragmentation of habitat. Long term conservation of biodiversity depends upon the protection, enhancement and connection of remaining habitat across the landscape, involving vegetation remnants on both public and private lands. Nearby and adjoining vegetated areas consolidate the habitat values of the reserve and provide ecological corridors to other surrounding forested areas.

Fire

Due to the sensitivity of rainforest to fire and the small size of the reserve, fire is a particular threat to the values of Hortons Creek Nature Reserve. Refer to Section 3.4 *Fire Management* above for more detail.

Inappropriate use

The reserve is closed to public vehicle access, as all trails within the reserve are for management use only and some trails leading to the reserve traverse private property. The reserve is currently gated at the main vehicle entry points (refer to section 3.7), however, as much of the reserve boundary is not fenced, some management trails are used for recreational trail bike riding and horse riding. These activities are inappropriate uses in Hortons Creek Nature Reserve due to management principles for nature reserves (section 1.2), negative impacts on native vegetation and water quality, pressures on erodible soils and management trails, as well as the import and spread of weeds.

4. MANAGEMENT ISSUES AND ACTIONS

CURRENT SITUATION	DESIRED OUTCOMES	ACTIONS	PRIORITY
<p>Soil and water conservation</p> <p>Soils in the reserve are prone to a range of erosion hazard levels. The majority of soils in the reserve have a moderate to high potential hazard for erosion.</p> <p>Disturbed areas exist within the reserve as a result of past logging activities and road construction. Erosion on steep slopes in the reserve may cause instability and sedimentation of Hortons Creek.</p>	<p>There is no evidence of increased soil erosion from reserve management activities and visitor use.</p> <p>There is no reduction in the water quality and health of watercourses in the reserve.</p> <p>Natural flow regimes are maintained.</p>	<ul style="list-style-type: none"> • Undertake all works, such as trail maintenance and fire management, in a manner that minimises soil erosion and water pollution. 	<p>High</p>

CURRENT SITUATION	DESIRED OUTCOMES	ACTIONS	PRIORITY
<p>Native plants and animals</p> <p>Eight threatened animal species are known to occur in the reserve, and another sixteen are likely to occur. Rainforest within the reserve is listed as an Endangered Ecological Community. Vegetation associations have been mapped in detail, however further surveys are required to identify significant plant and animal species in the reserve.</p> <p>Previous uses of the reserve such as logging and road development have resulted in disturbance in some areas of the reserve. Native vines are preventing regeneration of rainforest canopy species in some of these areas (refer to 3.9 - <i>Native vegetation disturbance</i>).</p> <p>Vegetated areas on adjacent private property are important in providing connectivity between vegetated communities and habitats.</p>	<p>There is an increased understanding and knowledge of the ecological functions and characteristics of the reserve, with particular emphasis on threatened species.</p> <p>There is no reduction in the diversity or population size of native plants and animals in the reserve, particularly significant species, or reduction in habitat diversity.</p> <p>Conservation and corridor values of the reserve are enhanced by retention of vegetated areas on adjacent private land.</p> <p>Cleared and disturbed areas not required for management purposes are rehabilitated to restore structural diversity and habitat values.</p>	<ul style="list-style-type: none"> • Undertake or support surveys for threatened plant and animal species and other appropriate research that increases knowledge of native plants and animals within the reserve, their populations, distribution and ecological needs (refer to <i>Research</i>). • Implement relevant Recovery Plans and Threat Abatement Plans for threatened species in the reserve. • Work with relevant neighbours, Landcare groups and vegetation management committees to promote, support and encourage conservation of native vegetation in the vicinity of the reserve through appropriate conservation mechanisms, particularly in those areas identified as forming corridors or containing key habitat for fauna (NPWS 2001). • Promote and monitor regeneration of native vegetation in disturbed or degraded areas. Natural regeneration may be assisted, as required, through weed control, site preparation and rehabilitation programs, including control of native vines that are suppressing regeneration in disturbed areas. 	<p>Medium</p> <p>High</p> <p>Medium</p> <p>Medium</p>

CURRENT SITUATION	DESIRED OUTCOMES	ACTIONS	PRIORITY
<p>Introduced species</p> <p>Noxious weed species recorded in the reserve include lantana, blackberry and crofton weed.</p> <p>Although no pest animal species are recorded in the reserve, red foxes, wild dogs and cats may exist within the reserve at relatively low densities. Stock also stray into the reserve (refer to <i>Management Operations</i>).</p> <p>A draft Pest Management Strategy (NPWS 2002) has been developed for the region as a whole. This strategy identified pest populations, priorities for control and outlines suggested control methods. There is currently no reserve specific pest management strategy.</p>	<p>The impact of introduced species on native species and neighbouring lands is minimised.</p> <p>Pest species are controlled and, where practical, eradicated.</p> <p>Population and distribution of introduced species will not expand beyond their current extent.</p> <p>Community awareness of the impacts from, and appropriate measures for control of pest species is increased.</p> <p>Control of introduced species has minimal negative impact on native species.</p>	<ul style="list-style-type: none"> • Monitor, control and, where practical, eradicate introduced plants and animals, in accordance with the Regional Pest Management Strategy. Priority will be given to the control of red lantana, blackberry and crofton weed. • Undertake or encourage research into the distribution and impact of pest species, effectiveness of control programs and appropriate control measures within the reserve. • Prepare and implement a pest management strategy for the reserve. • Continue to liaise with neighbours, the Grafton Rural Lands Protection Board, Clarence Valley Council, the Clarence Valley Weeds Authority and other stakeholders in implementing coordinated weed and pest animal control programs. • Provide information to the community regarding the impacts of pest species and encourage off-park control programs to assist in management of introduced species. • Remove any livestock found within the reserve. 	<p>Medium</p> <p>Low</p> <p>Low</p> <p>Medium</p> <p>Low</p> <p>High</p>

CURRENT SITUATION	DESIRED OUTCOMES	ACTIONS	PRIORITY
<p>Cultural heritage</p> <p>No comprehensive surveys or other research has been undertaken within the reserve for sites or values of Aboriginal or historic heritage significance. No sites of cultural heritage significance have been recorded.</p> <p>It is important that the local Aboriginal community is involved in the protection of Aboriginal cultural values that may be subsequently identified in the reserve.</p>	<p>Cultural features are identified, conserved and managed in accordance with their significance.</p> <p>Aboriginal heritage values are protected in partnership with the local Aboriginal community.</p>	<ul style="list-style-type: none"> • Work with the local Aboriginal community, the Grafton-Ngerrie Local Aboriginal Land Council and knowledge holders to identify and manage Aboriginal cultural heritage sites, places and values. • Undertake or encourage appropriate cultural heritage surveys and other appropriate research within or regarding the reserve to identify and record Aboriginal or historic cultural sites and values (refer to <i>Research</i>). • Assess the significance of any sites found and, where relevant, protect them from disturbance, natural processes and fire if the values are likely to be threatened. 	<p>High</p> <p>Medium</p> <p>Medium</p>
<p>Research</p> <p>Further research 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, sites or areas.</p> <p>Bird banding activities are continuing in the reserve under licenses issued by the NPWS.</p>	<p>Research enhances the management information base and has minimal environmental impact.</p>	<ul style="list-style-type: none"> • Undertake and encourage research to improve knowledge and management of natural and cultural heritage, as identified within this plan (refer to <i>Native plants and animals, Introduced plants and animals, and Cultural heritage</i>). • The NPWS will continue to review and assess new research findings and species records as they become available. 	<p>Medium</p> <p>Medium</p>

CURRENT SITUATION	DESIRED OUTCOMES	ACTIONS	PRIORITY
<p>Fire management</p> <p>Inappropriate fire regimes are considered a threat to the survival of plant species and communities within the reserve, particularly rainforest communities. Fire can also damage cultural features and boundary fences, and threaten neighbouring land.</p> <p>Since gazettal, one fire has entered the reserve from the west. No other fires have been recorded in the reserve.</p> <p>Fires within the reserve are unlikely to threaten neighbouring lands. Fires originating from neighbouring land, particularly to the west, may affect the reserve if not adequately contained.</p> <p>A number of fire advantages consisting of roads / trails, ridgelines and creeks exist along boundaries of and within the reserve. (refer to section 3.5).</p>	<p>Life, property and natural and cultural values in and adjacent to the reserve is protected from unplanned fire.</p> <p>Fire regimes are appropriate for conservation and enhancement of native plant and animal communities.</p> <p>The potential for spread of unplanned fires on or into the reserve is reduced.</p> <p>Neighbours and nearby communities appreciate the requirement for and cooperate in applying fire management objectives for the reserve.</p>	<ul style="list-style-type: none"> • Aim to exclude fire from the rainforest and rainforest margins in the reserve. Manage other vegetation types in accordance with the fire regime guidelines shown in Table 2 and vary burn patterns to protect biodiversity values (Section 3.5) • Implement fire management strategies for the reserve. This may involve the maintenance of trail surfaces, clearing, or slashing of vegetation along trails and control lines as required (refer to <i>Management operations</i>). • Continue to participate in Clarence Valley Zone Bush Fire Management Committees. Maintain coordination and cooperation with Rural Fire Service brigades, Clarence Valley Council fire control officers, SFNSW and neighbours with regard to fuel management and fire suppression. 	<p>High</p> <p>High</p> <p>High</p>

CURRENT SITUATION	DESIRED OUTCOMES	ACTIONS	PRIORITY
<p>Access and visitor use</p> <p>Public access to the reserve is from the Council picnic area on the Armidale-Grafton Road, or from Hortons Creek Trail and the southern section of Mount Lofty Trail. Public vehicle access is not permitted within the reserve.</p> <p>Use of the reserve must be carefully managed since it is a relatively small and significant area of remnant vegetation.</p> <p>The reserve receives low levels of use for bushwalking and education. Inappropriate use such as horse riding or trail bike riding has the potential to impact upon reserve values and conflict with other users.</p> <p>There are no formed walking tracks or visitor facilities within the reserve.</p> <p>Promotion of community understanding and appreciation of the conservation values of the reserve will be important for minimising damaging activities and maximising visitor enjoyment.</p>	<p>The local community is aware of the significance of the area and of management programs.</p> <p>Visitor use is low key, self-reliant and ecologically sustainable, in accordance with management principles (section 1.2).</p> <p>Educational opportunities are provided, consistent with reserve values.</p>	<ul style="list-style-type: none"> • Provide low-level interpretive, regulatory and minimal impact use information at the entrance to the reserve opposite the Council picnic area and at the reserve entrance from Hortons Creek Trail (see <i>Reserve Map</i>). • Install locked gates at the reserve boundary where Mount Lofty Trail enters the reserve at two locations in the north-west corner, the northern end of Unnamed Trail, as well as at the southern end of both Unnamed Trail and 517 Trail, to prevent unauthorised access to the management trail system (see <i>Reserve Map</i>). • Permit organised group educational visits, subject to limits on numbers and other conditions if necessary to minimise impacts. • Prohibit camping, fires, horse riding, bicycling, trail bike riding and other unauthorised vehicles within the reserve. • Monitor levels and impacts of use through regular inspections of the reserve and undertake appropriate measures to reduce impacts where they are found to be unacceptable. • Liaise with Clarence Valley Council on providing facilities at the Council picnic area adjacent to Hortons Creek Nature Reserve. 	<p>Low</p> <p>High</p> <p>Medium</p> <p>High</p> <p>Low</p> <p>High</p>

CURRENT SITUATION	DESIRED OUTCOMES	ACTIONS	PRIORITY
<p>Management operations and non-NPWS uses</p> <p>Two management trails exist within the reserve, whilst additional trails along the reserve boundary enter both the reserve and adjoining privately owned lands. Trail 517 allows only one-way access due to the steep slope.</p> <p>A pre-existing electricity transmission line crosses the reserve (see <i>Reserve Map</i>) and is managed in accordance with a state-wide agreement with Transgrid.</p> <p>Boundary fencing is inadequate for much of the reserve, resulting in stock incursions.</p> <p>The reserve is currently zoned 7 (d) Scenic protection under the Nymboida LEP, which provides for development of recreation and tourism in that zone.</p>	<p>Management trails adequately serve management needs and have minimal impact on the natural and cultural values of the reserve.</p> <p>Formal reserve access agreements with private land holders are in place to provide for management activities.</p> <p>Use and maintenance of the transmission line and associated easements occurs in accordance with formal agreements and has minimal impact on the reserve.</p> <p>No further non-NPWS infrastructure or uses are permitted within the reserve unless the development is for purposes consistent with the NPW Act.</p> <p>The reserve boundary is fenced to a stock-proof standard.</p> <p>The reserve is appropriately zoned to reflect the gazetted use of the area.</p>	<ul style="list-style-type: none"> • Negotiate formal access agreements with relevant reserve neighbours to provide ongoing access for management purposes. • Repair and/or maintain trails required for management purposes (see <i>Reserve Map</i>) to four-wheel drive dry-weather standard, in accordance with formal access agreements with neighbours. Trail 517 will be maintained as a one-way access trail. • Gate the southern end of Trail 517 to ensure one-way access is maintained for management vehicles. Other locked gates will be installed as specified in <i>Access and Visitor Use</i>. • Assess reserve boundary fences for their condition, and prioritise areas for new fencing. • Where appropriate, negotiate agreements with neighbours to install and maintain reserve boundary fencing to exclude stock in accordance with the NPWS Boundary Fencing policy and priorities identified for the reserve (refer also to <i>Introduced species</i>). This may involve some clearing and or slashing of vegetation. • Authorised access for use and maintenance of the transmission line will be permitted. • Apply to Clarence Valley Council to rezone the reserve as 8 (a) Existing National Parks or Nature Reserves under any future revision of the Nymboida LEP. 	<p>Medium</p> <p>High</p> <p>High</p> <p>High</p> <p>High</p> <p>Medium</p>

Legend for priorities

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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APPENDIX A: KEY HABITAT AND CORRIDOR PRIORITY FAUNA ASSEMBLAGES

Table 4: Fauna species assemblages for key habitat within Hortons Creek Nature Reserve

Common name	Scientific name
Moist Escarpment – Foothills assemblage	
glossy black-cockatoo	<i>Calyptorhynchus lathami</i>
powerful owl	<i>Ninox strenua</i>
masked owl	<i>Tyto novaehollandiae</i>
spotted-tail quoll	<i>Dasyurus maculatus</i>
koala	<i>Phascolarctos cinereus</i>
greater glider	<i>Petauroides volans</i>
yellow-bellied glider	<i>Petaurus australis</i>
rufous bettong	<i>Aepyprymnus rufescens</i>
grey-headed flying-fox	<i>Pteropus poliocephalus</i>
white-striped mastiff-bat	<i>Nyctinomus australis</i>
little bentwing-bat	<i>Miniopterus australis</i>
common bentwing-bat	<i>Miniopterus schreibersii</i>
little vespadelus	<i>Vespadelus pumilus</i>
Wet Escarpment – Foothills assemblage	
pouched frog	<i>Assa darlingtoni</i>
	<i>Mixophyes fleayi</i>
leaf-tailed gecko	<i>Saltuarius swaini</i>
southern angle-headed dragon	<i>Hypsilurus spinipes</i>
	<i>Ophioscincus truncatus</i>
	<i>Saproscincus challengerii</i>
Stephens' banded snake	<i>Hoplocephalus stephensii</i>
rose-crowned fruit-dove	<i>Ptilinopus regina</i>
superb fruit-dove	<i>Ptilinopus superbus</i>
wompoo fruit-dove	<i>Ptilinopus magnificus</i>
marbled frogmouth	<i>Podargus ocellatus</i>
Albert's lyrebird	<i>Menura alberti</i>
pale-yellow robin	<i>Tregallasio capito</i>
little shrike thrush	<i>Colluricincla megarhyncha</i>
white-eared monarch	<i>Monarcha leucotis</i>
barred cuckoo-shrike	<i>Coracina lineata</i>
dusky antechinus	<i>Antechinus swainsonii</i>
red-legged pademelon	<i>Thylogale stigmatica</i>
Queensland tube-nosed bat	<i>Nyctimene robinsoni</i>
Wet Escarpment assemblage	
giant barred frog	<i>Mixophyes iteratus</i>
Murray's skink	<i>Eulamprus murrayi</i>
barred-sided skink	<i>Eulamprus tenuis</i>
sooty owl	<i>Tyto tenebricosa</i>
paradise riflebird	<i>Ptiloris paradiseus</i>
eastern pygmy possum	<i>Cercartetus nanus</i>
long-nosed potoroo	<i>Potorous tridactylus</i>
eastern horseshoe bat	<i>Rhinolophus megaphyllus</i>
eastern little mastiff-bat	<i>Mormopterus norfolkensis</i>
large pied bat	<i>Chalinolobus dwyeri</i>
greater broad-nosed bat	<i>Scoteanax rueppellii</i>

Source: NPWS 2001.