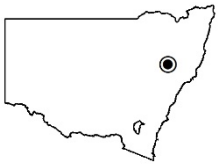
NSW NATIONAL PARKS & WILDLIFE SERVICE

Murrurundi Pass National Park Community Conservation Area Zone 1

Plan of Management



This plan of management was adopted by the Minister for the Environment on 8 August 2019.

DPIE acknowledges this park is in the traditional Country of the Wonnarua Aboriginal People.

This plan of management was prepared by the staff of the NSW National Parks and Wildlife Service (NPWS).

For additional information or any inquiries about this park or this plan of management, contact the NPWS Barrington Tops Area Office at 137 Kelly Street, Scone NSW 2337, or by telephone on (02) 6540 2300.

Cover photo: Cyperoid soak, Murrurundi Pass National Park. DPIE

Published by:

Environment, Energy and Science
Department of Planning, Industry and Environment
59 Goulburn Street, Sydney NSW 2000
PO Box A290, Sydney South NSW 1232
Phone: +61 2 9995 5000 (switchboard)
Phone: 1300 361 967 (Environment, Energy and Science enquiries)
TTY users: phone 133 677, then ask for 1300 361 967
Speak and listen users: phone 1300 555 727, then ask for 1300 361 967
Email: info@environment.nsw.gov.au
Website: www.environment.nsw.gov.au

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ISBN 978-1-922317-04-9
EES 2019/ 0489
September 2019

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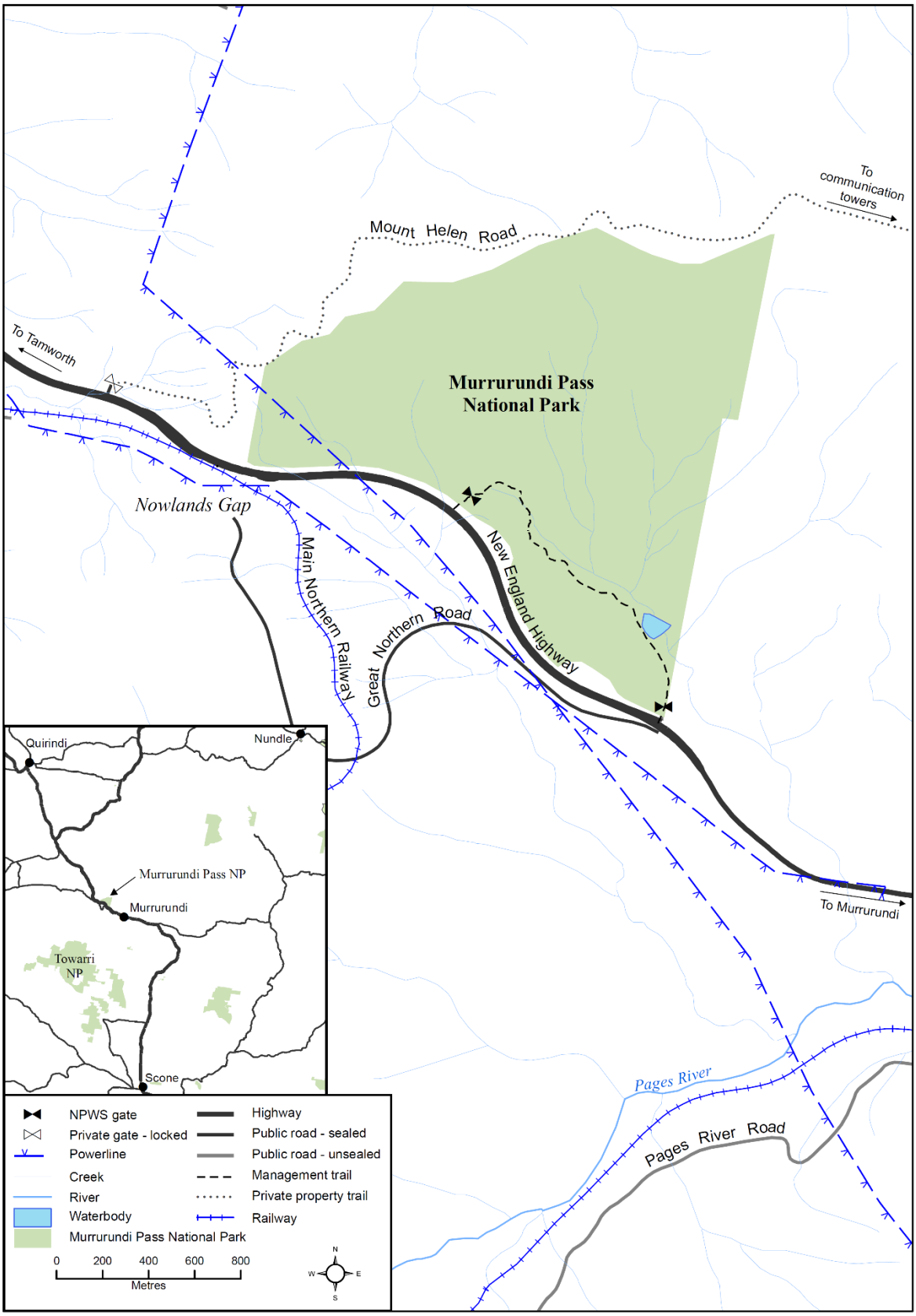

Figure 1: Murrurundi Pass National Park

1. Introduction

1.1 Location, reservation and regional setting

Features	Description
Location	Murrurundi Pass National Park Community Conservation Area Zone 1, commonly known as Murrurundi Pass National Park and referred to as the 'park' in this plan, is located on the south-east side of the Liverpool Range. It is immediately east of Nowlands Gap (also known as Murrurundi Pass), two kilometres north-west of Murrurundi in the Upper Hunter district of New South Wales.
Area	The park is 215 hectares. It is bounded to the south-west by the New England Highway, to the north by the watershed of the Liverpool Range, and to the east by private property.
Reservation date	1 December 2005
Previous tenure	Murrurundi Pass National Park was previously part of the Murrurundi Common, a permanent common dedicated in 1873 also known as the 'Big Common', which was managed by the Common Reserves Trust. The name *Murrurundi* comes from the Wonnarua Aboriginal language Murrumdoorandi, however, there is uncertainty about what it means. McCarthy (1963) suggests 'mountain'. Upper Hunter Shire Council (2012) gives 'nestling in the valley', 'five fingers' or 'meeting place at the five fingers' as possible meanings. The fingers refer to five unusual rock formations at the northern end of the Murrurundi township, of which four remain.
Regional context	
Biogeographic region	The park is located in the north-west corner of the Hunter subregion of the Sydney Basin Bioregion, where it joins the Brigalow Belt South and Nandewar bioregions. It is part of a chain of reserves that lie along the Liverpool Range of the Great Dividing Range, from Coolah Tops National Park in the west, to Ben Halls Gap National Park in the east.
Surrounding land use	The township of Murrurundi is two kilometres south-east of the park. The New England Highway forms the south-west boundary of the park. The part of Murrurundi Common that was not reserved as part of the park is located on the opposite side of the highway. The Main North Railway crosses the Liverpool Range through the Ardglen Tunnel, which is almost underneath the north-west corner of the park. Adjoining land uses are grazing of sheep, cattle and horses. A large hard-rock quarry operates at Ardglen, approximately two kilometres west of the park. Significant communication infrastructure, including radio, television and emergency services repeater towers, are located at Mount Helen, approximately three kilometres east of the park.
Other authorities	The park is located within the administrative areas of the Wanaruah Local Aboriginal Land Council, Hunter Local Land Services and Upper Hunter Shire Council.

1.2 Statement of significance

Murrurundi Pass National Park is significant because of its natural and cultural values, including:

Landscape and catchment values

- The park is part of a visual landscape of dramatic mountain scenery that provides an important backdrop to the Upper Hunter Valley. There are scenic views down the Hunter Valley from the park.
- The park lies on the watershed between the Namoi and Hunter catchments, and drains into the headwaters of the Hunter River.

Biological values

- The park contains the only known reserved occurrence of the rare Murrurundi stringybark (*Eucalyptus conjuncta*).
- The park has a high diversity of plants and animals due to its location on the junction of the Sydney Basin, Brigalow Belt South and Nandewar bioregions.
- The park forms a stepping stone on a regional corridor along the Liverpool Range as well as a potential subregional corridor linking with the Wingen Maid, a locally and culturally significant landscape feature to the south, and may provide habitat for a range of threatened species.

Aboriginal heritage values

- The park lies within the traditional Country of the Wonnarua People.

Historic values

- Historic values reflect early exploration, settlement and use of the land by the Murrurundi community. Before reservation, the park was part of the Murrurundi Common.

2. Management context

2.1 Legislative and policy framework

The management of the community conservation area is in the context of a legislative and policy framework, primarily the NSW *National Parks and Wildlife Act 1974* and Regulation, the Community Conservation Area Agreement developed under the NSW *Brigalow and Nandewar Community Conservation Area Act 2005*, the NSW *Biodiversity Conservation Act 2016* and the policies of the National Parks and Wildlife Service (NPWS).

Other legislation, strategies and international agreements may also apply to management of the area. The NSW *Environmental Planning and Assessment Act 1979* may require assessment of environmental impact of works proposed in this plan. The NSW *Heritage Act 1977* may apply to the excavation of known archaeological sites or sites with potential to contain historical archaeological relics. The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* may apply in relation to actions that impact 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 National Parks and Wildlife Act. Once the Minister has adopted a plan, the plan must be carried out and no operations may be undertaken within the park except in accordance with the plan. This plan will also apply to any future additions to Murrurundi Pass National Park. Should management strategies or works be proposed in future that are not consistent with this plan, an amendment to the plan will be required.

2.2 Management purposes and principles

Community conservation areas

The Brigalow and Nandewar Community Conservation Area Act identifies Murrurundi National Park as a Zone 1 community conservation area. Community conservation areas are established under the *Brigalow and Nandewar Community Conservation Area Act 2005* (BNCCA Act). This provides for four dedicated management zones of which zones 1, 2 and 3 relate to land reserved under the National Parks and Wildlife Act as a national park, Aboriginal area or a state conservation area, respectively. Their management is consistent with the principles set out in the National Parks and Wildlife Act.

Zone 1 national parks

Zone 1 community conservation areas relate to national parks under the National Parks and Wildlife Act. They are reserved to protect and conserve areas containing outstanding or representative ecosystems, natural or cultural features or landscapes or phenomena that provide opportunities for public appreciation and inspiration and sustainable visitor use.

Under section 30E of the National Parks and Wildlife Act, Zone 1 community conservation areas are therefore managed to:

- conserve biodiversity, maintain ecosystem functions, protect geological and geomorphological features and natural phenomena and maintain natural landscapes
- conserve places, objects, features and landscapes of cultural value
- protect the ecological integrity of one or more ecosystems for present and future generations
- promote public appreciation and understanding of the park's natural and cultural values

- provide for sustainable visitor use and enjoyment that is compatible with conservation of natural and cultural values
- provide for sustainable use (including adaptive reuse) of any buildings or structures or modified natural areas having regard to conservation of natural and cultural values
- provide for appropriate research and monitoring.

The primary purpose of Zone 1 community conservation areas is to conserve nature and cultural heritage. In doing so, opportunities are provided for appropriate and sustainable recreation. As required by the Community Conservation Area Agreement, the Central West Community Conservation Area Advisory Committee has been involved in development of this plan of management.

2.3 Specific management directions

In addition to the general principles for the management of Zone 1 community conservation areas (see Section 2.2), the following specific management directions apply to the management of the park:

- protect and manage the Aboriginal cultural values through consultation with Aboriginal communities regarding the protection of known values and the identification of additional values
- manage fire regimes to ensure communities and habitat are protected
- protect other natural values, especially Murrurundi stringybark and habitat for threatened species, by limiting disturbance and implementing control programs for pest species
- improve community understanding of the significant values of the park through the installation of interpretive signs and provision of information.

3. Values

This plan aims to conserve both natural and cultural values of the park. The location, landforms and plant and animal communities of an area have determined how it has been used and valued by both Aboriginal and non-Aboriginal people. 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. To make the document clear and easy to use, various aspects of natural heritage, cultural heritage, threats and ongoing use are dealt with individually but their interrelationships are recognised.

3.1 Geology, landscape and hydrology

The park borders on the watershed between the Namoi and Hunter rivers and forms part of the headwaters of the Hunter catchment. The elevation ranges from 540 metres above sea level near the entrance at the south of the park to 960 metres above sea level in the north-east of the park.

Murrurundi Pass National Park is located within the New England Fold Belt adjacent to its boundary with the Gunnedah Basin.

The most recent rock types are the undifferentiated basalts of the Liverpool Range Volcanics which occur along the spine of the Liverpool Range down to about 800 metres above sea level in a band about 500 metres wide within the park. The basalts of the Liverpool Range Volcanics are rich in magnesium and iron and date to the late Eocene, being formed 38 to 40 million years ago (Dawson et al. 2004).

Lower down the slope from approximately 600 to 800 metres above sea level is a band of undifferentiated clastic sedimentary rock of the Currabubula Formation, dominated by paraconglomerate. This was formed in the Carboniferous Period of the Palaeozoic Era (about 360 to 300 million years ago) and is the oldest rock type in the park.

Within this band there are three small areas (1 to 3 hectares) of an unnamed volcaniclastic tuff unit of the Currabubula Formation.

The northernmost extent of the Murulla Beds occurs in the lower area of the park along the main (unnamed) creek line. The Murulla Beds include coal seams, claystone, siltstone, sandstone and conglomerate from the Permian Period of the Palaeozoic Era (about 300 to 250 million years ago). Virtually all of the cleared area of the park occurs over the Murulla Beds.

Distinctive outcrops of pebbly sandstone of the Narrabeen Group occur on a small ridge line on the western edge of the lower slopes. These date to the Triassic Period of the Mesozoic Era (about 250 to 200 million years ago) and overlie the Murulla Beds. The rare Murrurundi stringybark (*Eucalyptus conjuncta*) occurs only in this area within the park.

The Murrurundi Fault Zone, part of the Hunter-Mooki Thrust, runs through the park. It is about 5 to 20 metres wide. The fault roughly coincides with the junction between the Murulla Beds and the sandstone ridge (RTA 1994).

A number of small creeks drain into a third order (unnamed) creek within the park which then drains into the Pages River, a major tributary of the Hunter River. The main creek is blocked by a substantial dam, the construction of which pre-dates reservation of the park.

Almost half the park has a slope over 18 degrees and is classified as steep and vulnerable to erosion.

The Coober Bulga colluvial soil landscape occurs along the ridge line in the north of the park, and across the centre of the park, separated by a narrow strip (about 150–300 metres wide) of the Ant Hill variant erosional soil landscape. These soil landscapes are characterised by low permeability, high erodibility and mass movement hazard. Most of the steep slopes within the park occur with the Coober Bulga colluvial soils.

Tinagroo erosional soil landscape occurs south-west of the main creek line and includes the sandstone ridge line. Cressfield Road erosional soil landscape occurs on the northern side of the main creek line and has generally low fertility. The northernmost occurrence of both Tinagroo and Cressfield Road erosional soil landscapes occurs in Murrurundi Pass National Park. The cleared area is on these soils.

Kangaroo Ridge colluvial soil landscape occurs uphill from these and includes some of the steep and highly erodible soils (McInnes-Clarke 2002).

Issues

- One of the drains from the New England Highway empties into a small sediment dam located in the park. The overflow channel from this dam regularly washes away the management trail near the southern entrance to the park due to intense water flows in extreme rainfall events (see Section 5.2).
- Disturbed areas, particularly along trails, have the potential to erode and degrade water quality in streams.
- Fire can decrease ground cover and promote erosion, and fire suppression activities can create disturbance, erosion and degrade water quality (see Section 4.2).
- Unauthorised access by cars and trail bikes, especially when soil is wet, can lead to soil erosion and sedimentation of creeks (see Section 4.5).

Desired outcomes

- Soil erosion is minimised.
- The contribution of the park to protecting water quality and the health of streams within the catchment is maintained or improved, where possible.
- Landscape values are maintained or enhanced.

Management response

3.1.1 Ensure management activities (especially road maintenance) are carried out in a manner that minimises soil erosion and water pollution.

3.2 Native plants

The park is located in the Northern Tablelands Botanical Division at the junction of the North West Slopes Botanical Division. It has an important role in the conservation of high elevation vegetation in the region.

A comprehensive vegetation survey of the park was undertaken in 2009 (Bell 2009) which recorded 224 native plant species and 49 weed species. The park's vegetation can be described by the following six vegetation communities.

Murrurundi Stringybark Forest: occurs at low elevation on a small ridge line of conglomerate geology. It is dominated by Murrurundi stringybark with a dense or scattered shrub layer of *Cassinia quinquefaria* and kangaroo thorn (*Acacia paradoxa*), and a ground layer dominated by poison rock fern (*Cheilanthes sieberi* subsp. *sieberi*), purple wiregrass (*Aristida ramosa*), kidney weed (*Dichondra repens*), bushy hedgehog-grass (*Echinopogon caespitosus*), three-awn speargrass (*Aristida vagans*) and a sedge (*Carex inversa*).

Murrurundi Stringybark Forest is considered highly significant because it has a restricted distribution and the population in the park is the only known occurrence within a reserve (Briggs & Leigh 1996). Apart from this population, the Murrurundi stringybark is restricted to dry sclerophyll woodland on poor, shallow, sandy soils only in the Murrurundi district.

High Elevation Yellow Box – Stringybark Grassy Woodland: occurs at elevations above 750 metres above sea level. It is dominated by yellow box (*Eucalyptus melliodora*), silver-top stringybark (*E. laevopinea*), apple box (*E. bridgesiana*), rough-barked apple (*Angophora floribunda*), and in places forest oak (*Allocasuarina torulosa*), Blakely's red gum (*E. blakelyi*) and white box (*E. albens*). In most locations, there is a moderately dense to scattered understorey of sweet pittosporum (*Pittosporum undulatum*) but, where this is absent, a range of grasses, graminoids and herbs dominate the ground layer.

Low Elevation Yellow Box – Stringybark Grassy Woodland: occurs at lower elevations, below 750 metres above sea level. Silver-top stringybark is less dominant and Blakely's red gum more dominant than higher elevation woodlands. Yellow box, white box and rough-barked apple occur along drainage lines. Small stands of black cypress pine (*Callitris endlicheri*) occur at the lowest elevations. The ground layer is characteristically dominated by grasses other than *Poa,* species including a wallaby grass (*Austrodanthonia racemosa*), wheatgrass (*Elymus scaber*), three-awn speargrass, kangaroo grass (*Themeda triandra*), barbed wire grass (*Cymbopogon refractus*), weeping grass (*Microlaena stipoides* var. *stipoides*) and red grass (*Bothriochloa macra*). In some locations, the native shrub *Cassinia quinquefaria* forms very dense stands in the shrub layer.

White Gum – Mountain Grey Gum Forest: occurs only in well-sheltered gully heads and amphitheatres at high elevations where it is dominated by ribbon gum (*E. nobilis*). Characteristically, it co-occurs with dense stands of sweet pittosporum, which appears to be advancing through the wider forests and woodlands in the absence of regular fire events. Other characteristic species include scattered occurrences of monkey gum (*E. cypellocarpa*), silver-top stringybark, weeping grass, tussock grass (*Poa labillardieri*), slender tick trefoil (*Desmodium gunnii*), kidney weed, tree violet (*Melicytus dentatus*) and a fern (*Adiantum atroviride*).

Cyperoid Soak: highly restricted in distribution, this community occurs on gently sloping or near-level ground on basalt soils with impeded drainage and waterlogged soils. It is dominated by sedge species such as *Cyperus sphaeroideus,* stiff flat-sedge (*C. vaginatus*), *Juncus holoschoenus* and *J. homalocaulis.* Tree and shrub species are absent.

Tablelands Vine Thicket: occurs in two rocky drainage lines on steep slopes. The community was formerly more widespread but clearing and grazing has restricted its distribution. Dominated by large-leaved rainforest plants, including native frangipani (*Hymenosporum flavum*), bleeding heart (*Homalanthus populifolius*), *Daphnandra apatela* and sweet pittosporum. There are also vines such as water vine (*Cissus antarctica*), and other common species found in these thickets include common maidenhair fern (*Adiantum aethiopicum*), prickly rasp fern (*Doodia aspera*), weeping grass and rock felt fern (*Pyrrosia rupestris*).

A number of threatened plants occur in the wider area, some of which could occur in the park, however, Bell's 2009 survey did not identify any of these species. In particular, the survey was not conducted at a time conducive to finding orchid species. Should any threatened species be discovered in the park, their management will be guided by the statewide *Biodiversity Conservation Program* (formerly known as the *Threatened Species Priorities Action Statement* [DECC 2007a]), which sets out strategies for the recovery of threatened species, populations and ecological communities. These actions are currently prioritised and implemented through the *Saving our Species* program which aims to maximise the number of threatened species that can be secured in the wild in New South Wales for 100 years (OEH 2013c).

Sweet pittosporum has been identified in other places as an invasive species. It appears to be spreading as part of a natural succession in the absence of fire, to the detriment of existing species composition. More research is required to understand this process and whether management actions, including the use of fire, are required (see Section 4.2).

Much of the original timber within the park was cleared for building timber and firewood for the township of Murrurundi in the 1800s, and to open up pasture for grazing. Fifty years ago the hills from the highway to Mount Helen were still basically denuded of trees. Large old trees are scattered throughout the park, with much of the vegetation in early stages of regeneration.

Issues

- Little is known of the natural history of the Murrurundi stringybark.
- Spread of sweet pittosporum may be impacting existing vegetation communities and is little understood.
- The condition of some areas of vegetation have been impacted by past land use.

Desired outcomes

- Populations of significant plant species and ecological communities are conserved.
- Negative impacts on threatened species are minimised.
- The habitat and populations of all threatened plant species are protected and maintained.
- Structural diversity and habitat values are restored in degraded areas.
- Diversity of vegetation communities is maintained.

Management response

3.2.1 Implement the *Biodiversity Conservation Program* and recovery plans for any threatened plant species, populations and ecological communities identified in the park.

3.2.2 Encourage natural regeneration of previously disturbed areas. Undertake revegetation programs in more seriously degraded areas if required. Use only local seed stock of species indigenous to the park in any rehabilitation programs.

3.2.3 Encourage research into the Murrurundi stringybark community, especially its fire response.

3.2.4 Encourage research into the distribution and potential impacts of sweet pittosporum in this environment and implement any management recommendations if required.

3.3 Native animals

Murrurundi Pass, at 695 metres above sea level, is the lowest point on the Liverpool Range for several kilometres. Other low points are Cedar Brush Gap, about 21 kilometres west, at 825 metres above sea level, and Crawney Pass, about 35 kilometres east at 975 metres above sea level. These lower altitude passes (saddles) allow ease of migration across the range between inland and coastal habitats.

The park lies within a regional corridor along the Liverpool Range and a potential subregional corridor linking with Wingen Maid Nature Reserve to the south. Regional corridors provide habitat for species with small ranges and supplementary habitat for species with large ranges as well as enabling animals to disperse across the landscape (Scotts 2003).

The park contributes to an area known as the Nandewar Southern Ranges key habitat which also includes Wallabadah Nature Reserve and Crawney Pass and Ben Halls Gap national

parks. Key habitats are areas that are important for the conservation of animal populations and maintenance of ecological processes. These may include small areas of isolated habitats such as those found on fertile soils where remaining native forest and woodland cover is extremely sparse and highly fragmented (Scotts 2003).

No formal fauna surveys have been conducted in the park, and there are limited incidental observations. The vulnerable magpie goose (*Anseranas semipalmata*) has been recorded in the park, with a further 19 sightings in the surrounding area. Numerous species of birds, mammals and reptiles have been recorded in the surrounding area and may occur in the park. Several other species have modelled distribution in the area (NPWS 1999). Suitable habitat for many species occurs in the park, or is likely to exist in the future, when vegetation regenerates sufficiently for suitable-sized hollows to develop (see Table 1).

Table 1: Significant animal species recorded or predicted to occur in the park

Common name	Scientific name	BC Act status	Status within park
Birds			
Australasian bittern	*Botaurus poiciloptilus*	Endangered ^	Known within 10km of the park
Barking owl	*Ninox connivens*	Vulnerable	Predicted to occur; unlikely to breed in park due to absence of large hollow-bearing trees
Black-chinned honeyeater	*Melithreptus gularis gularis*	Vulnerable	Predicted to occur; habitat suitable; known within 20km of the park
Brown treecreeper	*Climacteris picumnus victoriae*	Vulnerable	Known within 10km of the park
Bush stone-curlew	*Burhinus grallarius*	Endangered	Known within 20km of the park
Diamond firetail	*Stagonopleura guttata*	Vulnerable	Known within 10km of the park
Flame robin	*Petroica phoenicea*	Vulnerable	Known within 10km of the park
Glossy black-cockatoo	*Calyptorhynchus lathami*	Vulnerable	Known within 10km of the park
Grey-crowned babbler	*Pomatostomus temporalis temporalis*	Vulnerable	Known within 20km of the park
Hooded robin	*Melanodryas cucullata cucullata*	Vulnerable	Predicted to occur; habitat suitable; known within 20km of the park
Little lorikeet	*Glossopsitta pusilla*	Vulnerable	Known within 10km of the park
Magpie goose	*Anseranas semipalmata*	Vulnerable	Known in the park
Masked owl	*Tyto novaehollandiae*	Vulnerable	Known in Nandewar Southern Ranges (SR) key habitat; currently unlikely due to absence of large hollow-bearing trees
Painted honeyeater	*Grantiella picta*	Vulnerable	Potential in Nandewar SR key habitat; possible habitat
Powerful owl	*Ninox strenua*	Vulnerable	Known in Nandewar SR key habitat; unlikely in park due to absence of large hollow-bearing trees
Red goshawk	*Erythrotriorchis radiatus*	Critically endangered ^	Known within 20km of the park

Common name	Scientific name	BC Act status	Status within park
Regent honeyeater	*Anthochaera phrygia*	Critically endangered ^	Known within 10km of the park
Scarlet robin	*Petroica boodang*	Vulnerable	Known within 10km of the park
Speckled warbler	*Chthonicola sagittata*	Vulnerable	Known within 10km of the park
Square-tailed kite	*Lophoictinia isura*	Vulnerable	Potential in Nandewar SR key habitat; habitat available; known within 20km of the park
Swift parrot	*Lathamus discolor*	Endangered ^	Potential in Nandewar SR key habitat; unlikely in park but possible
Turquoise parrot	*Neophema pulchella*	Vulnerable	Likely in Nandewar SR key habitat; habitat suitable
Mammals			
Koala	*Phascolarctos cinereus*	Vulnerable ^	Likely in Nandewar SR key habitat; occurs elsewhere on the Liverpool Range; known within 20km of the park
Spotted-tailed quoll	*Dasyurus maculatus*	Vulnerable ^	Known within 10km of the park
Squirrel glider	*Petaurus norfolcensis*	Vulnerable	Potential in Nandewar SR key habitat; possible habitat, but unlikely to breed in park due to absence of large hollow-bearing trees
Wombat	*Vombatus ursinus*	-	Known in park; locally significant population
Eastern bentwing-bat	*Miniopterus schreibersii oceanensis*	Vulnerable	Likely in Nandewar SR key habitat
Eastern false pipistrelle	*Falsistrellus tasmaniensis*	Vulnerable	Known in Nandewar SR key habitat; habitat suitable
Grey-headed flying-fox	*Pteropus poliocephalus*	Vulnerable ^	Likely in Nandewar SR key habitat
Large-eared pied bat	*Chalinolobus dwyeri*	Vulnerable ^	Potential in Nandewar SR key habitat; suitable habitat
Southern myotis	*Myotis macropus*	Vulnerable	Known within 20km of the park
Yellow-bellied sheathtail-bat	*Saccolaimus flaviventris*	Vulnerable	Known within 10km of the park

BC Act = Biodiversity Conservation Act
^ Denotes species listed as nationally threatened under the Environment Protection and Biodiversity Conservation Act.

Several declining bird species of temperate woodlands occur in the area around the park. The neighbouring Nandewar Bioregion appears to be a stronghold for the diamond firetail and speckled warbler, and suitable habitat for both exists in the park.

Wetland habitat in the Nandewar Bioregion is extensively degraded. The large dam in the park provides a certain level of habitat, especially as a drought refuge, although there is little vegetative cover for permanent occupation. The records of the magpie goose from the park probably reflect a vagrant making use of the dam in dry times. Waterbirds such as the Australasian bittern are generally highly mobile and occasionally irruptive (i.e. they can unpredictably and suddenly arrive in an area where suitable habitat occurs).

The glossy black-cockatoo, swift parrot and turquoise parrot, as well as the masked and barn owls, are hollow-dependent. The glossy black-cockatoo is uncommon in the area, however, there are significant populations nearby on the Liverpool Range at Crawney Pass. Glossy black-cockatoos feed almost exclusively on she-oak (*Allocasuarina* spp.), including forest oak (*A. torulosa*) which occurs in the park.

The brown treecreeper is susceptible to the loss of old trees because it is also hollow-dependent and also uses bark as a major foraging substrate.

In the 1820s, one of the early European settlers in the area noted that 'kangaroos, wallabies, possums and koalas' were plentiful, and that there were a few 'native cats', that is, spotted-tailed quolls (McLellan 1957, cited in Suters Architects & Planners 1988).

The wombat has declined throughout northern New South Wales and also along the Liverpool Range.

Several bat species occur in the general area, with many considered to be of conservation significance. Many of these depend on old-growth trees which provide roosting hollows.

The close proximity of the park to the New England Highway presents a barrier to movement for ground-dwelling species, although there is some facility for movement via an old road that passes under the highway.

As for native plants, strategies for the recovery of threatened animal species and populations are set out in a statewide *Biodiversity Conservation Program* (formerly known as the *Threatened Species Priorities Action Statement* [DECC 2007a]) which is currently prioritised and implemented through the *Saving our Species* program.

Issues

- The park is located close to the New England Highway and Murrurundi township, which are potential sources of dogs and cats that could impact various native species (see Section 4.4).
- The highway and associated traffic limits east–west movement to and from the park (see Section 4.4).
- A large dam is occasionally used by wetland species. It is used in the management of fire within the park (see Section 5.1).

Desired outcomes

- Populations of significant animal species and ecological communities are conserved.
- Negative impacts on threatened species are minimised.
- The habitat and populations of all threatened animal species are protected and maintained.
- Structural diversity and habitat values are restored in degraded areas.

Management response

3.3.1 Implement relevant recovery actions in the *Biodiversity Conservation Program* and recovery plans for any threatened animal species and populations identified in the park.

3.3.2 Assist natural regeneration of degraded habitats where needed to improve the habitat values of the park.

3.3.3 Undertake fauna surveys to identify species present in the park, including targeting those threatened and significant species predicted to occur.

3.4 Aboriginal heritage

The park lies within the traditional Country of the Wonnarua People. The land, water, plants and animals within a landscape are central to Aboriginal spirituality and contribute to Aboriginal identity. Aboriginal communities associate natural resources with the use and enjoyment of foods and medicines, caring for the land, passing on cultural knowledge, kinship systems and strengthening social bonds. Aboriginal heritage and connection to nature are inseparable and need to be managed in an integrated manner across the landscape.

Aboriginal sites are places with evidence of Aboriginal occupation or that are related to other aspects of Aboriginal culture. They are important as evidence of Aboriginal history and as part of the culture of local Aboriginal people.

The traditional Country of the Wonnarua People in the Hunter Valley bordered the traditional Country of the Gomeroi People in the vicinity of the Liverpool Range. It is likely that Murrurundi Pass was part of a traditional trading route between the two groups. There are reports of groups of about 200 Aboriginal people camping near the river at Murrurundi for corroborees in the mid-1800s (Juchau 2004). Burning Mountain and the Wingen Maid, about 20 kilometres south of the park, are highly significant sites.

The road corridor immediately south and west of the park was subject to an archaeological survey as part of the environmental assessment for the highway realignment in the early 1990s. No artefacts were found, and it was considered unlikely that any persist due to the history of disturbance since the 1830s. In addition, level sites where artefacts are likely to occur are isolated and do not coincide with the route used along or across the range. Wanaruah and Nungaroo local Aboriginal land council representatives verified this conclusion (Officer 1993).

Various species known to have been used by Aboriginal people occur in the park. These include wombat berry (*Eustrephus latifolius*), sweet pittosporum and most animal species. The wedge-tailed eagle (*Aquila audax*) — the totem of the Wonnarua People — is frequently seen gliding on the updrafts along the range, providing a link with cultural values.

While the NSW Government has legal responsibility for the protection of Aboriginal sites and places, it acknowledges the right of Aboriginal people to make decisions about their own heritage. Aboriginal communities will be consulted and involved in managing Aboriginal sites, places and related issues, and in promoting and presenting Aboriginal culture and history.

The park is part of the Gomeroi Native Title Claim (NC2011/006) which is yet to be determined.

Issues

- Very little is known about Aboriginal use of the area or its significance to the local people.
- Sites and cultural values could be inadvertently impacted due to lack of knowledge of the Aboriginal landscape and use.

Desired outcomes

- Significant Aboriginal places and values are identified and protected.
- Aboriginal people are involved in management of the Aboriginal cultural values of the park.
- Impacts on Aboriginal heritage values are minimised.
- Understanding of the cultural values of the park is improved.

Management response

3.4.1 Continue to consult and involve the Wanaruah Local Aboriginal Land Council, Wonnarua Tribal Council, Gomeroi Native Title Applicant and other relevant Aboriginal community organisations in the management of their Country, including the management of Aboriginal sites and places, and cultural and natural values.

3.4.2 Undertake an archaeological survey and cultural assessment before all works with the potential to impact Aboriginal sites or values.

3.4.3 Encourage further research into the Aboriginal heritage values of the park with the Wanaruah Local Aboriginal Land Council, Wonnarua Tribal Council, Gomeroi Native Title Applicant and other relevant Aboriginal community organisations.

3.4.4 Promote a broader understanding of the cultural and spiritual relationship attached to the physical landscape of the Upper Hunter Valley, the Liverpool Plains and the Liverpool Range.

3.5 Historic heritage

Heritage places and landscapes are made up of living stories as well as connections to the past which individuals and communities have inherited and wish to conserve for current and future generations, and can include natural resources, objects, customs and traditions. Cultural heritage comprises places and items that may have historical, scientific, cultural, social, archaeological, architectural, natural or aesthetic significance. NPWS conserves the significant heritage features of NSW parks.

In 1827 William Nowland traversed the pass across the Liverpool Range that now bears his name, Nowlands Gap (see Figure 1). The Great North Road was constructed over the pass (also known as Murrurundi Gap) to support transport between Sydney and Newcastle and the Liverpool Plains and beyond. This eventually became the New England Highway.

Before 1827, Murrurundi was at the northern extent of colonial settlement, in County Brisbane, one of the original ‘nineteen counties’. For many years it was at the end of the railway line and was a commercial hub.

Ben Hall, the bushranger, was born in Murrurundi and lived there until he was 13 years old, so he may well have spent time in the park as a child. The less well-known Jewboy Gang of bushrangers is also linked to the area. The gang was led by a Jewish man, Edward Davis, and operated in the Hunter Valley and Central Coast in 1839 and 1840. They were captured at Doughboy Hollow (now Ardglen) in 1840 after killing a man at Scone and holding-up about 30 people in Murrurundi (Roope & Gregson 2002). They had ridden over Nowlands Gap after leaving Murrurundi, and would have passed through or near the land that is now the park.

Notes from 1870 refer to the government setting aside a tract of land as ‘commonage for Murrurundi’ (‘Jumbuck’ 1870). A permanent common (referred to as Murrurundi Common) of 1927 acres (780 hectares) was dedicated in 1873 and includes the land that is now the park. The common was managed by a trust and used by locals for grazing their stock. There are references to cattle and horses being grazed, and in 1870 there is a report of a flock of more than 3000 sheep using the area (‘Jumbuck’ 1870). Although the exact size of the common at that time is not clear, this would be extremely overstocked based on current practices.

Sometime between 1906 and 1916, the eastern section of the common was removed, leaving an area of about 308 hectares. Immediately before the park’s reservation, the land was known as ‘Big Common’ and ‘Little Common’, with the sections separated by the New England Highway. Only ‘Big Common’ was reserved as the park.

There are many artefacts of the park's previous use as common grazing land: remains of logs with timber fencing splits removed; trees felled for future firewood use; general clearing and introduced pasture species. No built items of potential historic heritage have been identified in the park. Old stockyards were demolished and removed prior to reservation of the park.

Between 1884 and 1890 a permit to mine for coal and shale was issued over an area of approximately 130 hectares in the central part of what is now the park. The permit was cancelled during the 1890s. Old diggings or fence posts may remain, but no evidence has been found. Any finds will be assessed to determine their historic significance and managed accordingly.

About half the park is included in the Murrurundi Urban Conservation Area which was entered on the Register of the National Estate in 1989. The Liverpool Range provides a dramatic visual backdrop to the town and defines the Pages River Valley. On a broader landscape scale, the park is part of the Murrurundi–Blandford Rural Landscape Conservation Area which has historical associations with explorers seeking a route across the range onto the Liverpool Plains, as well as early settlement during the 1820s (Suters Architects & Planners 1988).

Issues

- Unauthorised activities which are related to its previous use as a common still occur in the park, for example firewood collection (see Section 4.5).
- Information about the historical use and values of the park is limited.

Desired outcomes

- Understanding of the cultural values of the park is improved.
- Negative impacts on historic heritage values are minimised.

Management response

3.5.1 Record historic sites and stories and assess their significance. Manage sites in accordance with their assessed level of significance.

3.5.2 Promote public understanding and appreciation of the historic heritage values of the park.

3.5.3 Undertake an archaeological survey and cultural assessment before any works with the potential to impact historic sites and places.

3.6 Visitor use

NPWS parks provide a range of visitor opportunities. NPWS aims to ensure that visitors enjoy, experience and appreciate parks while park values are conserved and protected.

There is currently no safe public access to the park so the ability to provide opportunities for visitors is limited. The only entrance is from the north and it is particularly hazardous because it crosses the emergency stopping bed on the New England Highway and there is no facility for vehicle parking.

Vehicle use of trails within the park (see Figure 1) is restricted to authorised management purposes only, including access for firefighting and pest control. While not open for public vehicle access, they may be used by walkers.

The park generally experiences low levels of visitation and no visitor facilities are provided. While low-key self-reliant use such as bushwalking or birdwatching is considered

appropriate, they are not currently promoted due to safety issues associated with access. Other areas managed by NPWS, other authorities and private operators in the region provide opportunities for a greater range of recreation activities. These include: bushwalking in Burning Mountain Nature Reserve; camping and picnicking in Towarri National Park, Paradise Park at Murrurundi and First Fleet Memorial Park at Wallabadah; birdwatching at old Quipolly Dam near Quirindi; and fishing and boating at Lake Glenbawn State Park.

There is a rest area in a viewing bay off the southbound lane of the New England Highway adjacent to the park. Foot access into the park would require a stairway to be constructed over very steep terrain.

Horse riding

Horse riding is a popular recreational activity that has cultural associations for many Australians. The NPWS *Strategic Directions for Horse Riding in NSW National Parks* (OEH 2012b) provides a framework to improve riding opportunities in eight priority regions in New South Wales, including the Central Coast Hunter Region.

According to the previous management agency (NSW Department of Industry – Lands and Forestry, previously known as Department of Lands), horse riding was not an authorised use when the park was part of Murrurundi Common and there is no known history of recreational horse riding in the park.

Most of the park is steep with high conservation values and, given there is no safe public access and the size of the usable area limits the scope and attraction of this activity, recreational horse riding will not be permitted within the park. Horse riding opportunities in numerous other national parks in the region are being progressed in accordance with the *Central Coast Hunter Region Horse Riding Work Plan 2013* (OEH 2013a).

Mountain biking

There is no known history of mountain biking being undertaken on the land when it was part of the Murrurundi Common and there has been no demand for the provision of mountain biking in Murrurundi Pass National Park. Erodible soils make the park unsuitable for mountain biking, consistent with the *Sustainable Mountain Biking Strategy* (OEH 2011). The lack of safe public access to the park also restricts opportunities for mountain biking.

Issues

- There is no public vehicle access to the park.
- Unauthorised access and use is impacting park values (see Section 4.5).
- The park's location close to Murrurundi township and the New England Highway, with scenic views down the Hunter Valley, offers potential opportunities for low-key day use, should current access issues be overcome.

Desired outcomes

- Visitor use of the park is appropriate and ecologically sustainable.
- Negative impacts of visitors on park values are minimised.
- Visitor opportunities encourage appreciation and awareness of the park's values and their conservation.

Management response

3.6.1 Do not encourage visitor use of the park while there is no safe access. Thereafter, support low-impact self-reliant uses such as bushwalking and birdwatching.

3.6.2 Liaise with Roads and Maritime Services regarding options for safe access to the park.

3.7 Information and education

Information provision assists the protection of natural and cultural heritage, promotes support for conservation, and increases the enjoyment and satisfaction of visitors. Currently, there is limited interpretive information provided about the park, its values and its management. The proximity of the park to Murrurundi township provides an opportunity for involving the community in the park's management.

Public information is needed to address the incidence of unauthorised activities (see Section 4.5).

Issues

- There is limited regulatory signage on the park's boundaries to inform the public of unauthorised uses (see Section 4.5).
- There is limited information provided about the park and its values.

Desired outcomes

- There is community understanding and appreciation of the park's natural and cultural values.
- An appropriate level of information about the park is provided to the public.

Management response

3.7.1 Consistent with level of provision of safe public access to the park, develop visitor information which encourages appreciation of the park's values, including its Aboriginal and historic heritage and contemporary significance to Aboriginal people.

3.7.2 Investigate community interest in the management of the park such as whether a 'friends of the park' community-based group should be established.

4. Threats

4.1 Pests

Pest species are plants and animals that have negative environmental, economic and social impacts; commonly they are introduced species. Pests can have impacts across the range of park values, including impacts on biodiversity, cultural heritage, catchment and scenic values.

The *Biosecurity Act 2015* and its regulations provide specific legal requirements for the response, management and control of biosecurity risks, including weeds and pest animals. These requirements apply equally to public and privately-owned land. Under this framework, Local Land Services has prepared regional strategic weed management plans and regional strategic pest animal management plans for each of its 11 regions, including the Hunter Region (Hunter LLS 2017 and Hunter LLS 2018).

The LLS plans identify priority weeds and pest animals in each of the regions, plus the appropriate management response for the region (i.e. prevention/alert, eradication, containment or asset protection).

NPWS prepares pest management strategies for each region which identify pest species across that region's parks and priorities for control, including actions listed in the *Biodiversity Conservation Program* (see Sections 3.2 and 3.3), threat abatement plans, and other strategies such as the NSW *Biodiversity Priorities for Widespread Weeds* (NSW DPI & OEH 2011) and the *NSW Biosecurity Strategy 2013–2021* (DPI 2013).

The NPWS regional pest management strategy for the Central Coast Hunter Region (OEH 2012a) identifies pest species and priority programs for this park. The overriding objective of the pest management strategy is to minimise adverse impacts of introduced species on biodiversity and other park and community values while complying with legislative responsibilities. The strategy also identifies where other site- or pest-specific plans or strategies need to be developed to provide a more detailed approach.

Weeds

Significant weeds known from the park are listed in Table 2. Most are common throughout the district. In addition to the species listed in Table 2, there is also a range of introduced pasture species that mainly occur in the cleared area of the park.

Table 2: Weed species recorded in the park

Common name	Scientific name	Comment
Blackberry [AB]	*Rubus fruticosus* agg.	Occurs on several creek lines, especially in formerly cleared areas and can impede access. Provides habitat suitable for introduced species.
Coolatai grass [C]	*Hyparrhenia hirta*	Highly invasive species capable of invading relatively undisturbed vegetation; highly flammable. Occurs at the park entrance and may spread throughout the park, particularly stringybark forest.
Paterson's curse [C]	*Echium plantagineum*	Occurs predominantly in the formerly cleared areas and out-competes native species becoming dominant in a range of habitats. Toxic to livestock.
Blue heliotrope [D]	*Heliotropium amplexicaule*	Occurs predominantly in the formerly cleared areas.

Common name	Scientific name	Comment
St John's Wort [D]	*Hypericum perforatum*	Occurs predominantly in the formerly cleared areas and competes with native species during regeneration. Impacts agricultural production by causing photosensitivity in cattle.
Tree of heaven [D]	*Ailanthus altissima*	Occurs along two creek lines. Prevents the re-establishment of native species and adversely impacts existing native vegetation. Capable of rapid colonisation.
Sweet pittosporum	*Pittosporum undulatum*	Widespread throughout the park and thought to be affecting natural regeneration.

[A] Declared Weed of National Significance.
[B] 'State priority weed' Hunter LLS 2017.
[C] 'Regional priority weed' Hunter LLS 2017.
[D] Identified 'Additional species of concern' Hunter LLS 2017.

Significant progress has been made in controlling the state priority and regional priority weed blackberry. Considerable effort has also been made in the control of St John's wort.

Coolatai grass is a highly invasive grass with the potential to replace all native grasses and ground cover plants. It is capable of invading relatively undisturbed vegetation and is rapidly spreading in many parts of New South Wales. Coolatai grass has recently appeared in the Hunter Valley and is identified as a regional priority weed (Hunter LLS 2017). The infestation in the park is likely to have washed into the park from vehicles travelling on the New England Highway. The major activities which increase the general distribution of this grass are road construction and maintenance; and the movement of cars, cattle and sheep which carry seed from road edges where the grass commonly occurs. Ongoing monitoring and treatment is required to prevent the infestation spreading within the park. Coolatai grass is highly flammable and is a bushfire threat given the close proximity of potential ignition sources on the New England Highway (see Section 4.2 Fire).

Pest animals

Several significant pest animal species are known to occur in the park (Table 3). Control techniques are limited due to the park's proximity to the urban interface, the New England Highway and dense canopy.

Table 3: Pest animals recorded in the park

Common name	Scientific name	Comment
Pig [A B C E]	*Sus scrofa*	Isolated occurrences restricted to a small area of park. Areas disturbed by pigs are at risk of subsequent weed invasion.
Goat [A B C]	*Capra hircus*	Scattered populations throughout the park. Grazing and browsing by goats have significant impacts on native vegetation. This can lead to changes in species composition and a decrease in overall cover.
Fallow deer [A E] Red deer [A B E]	*Dama dama* *Cervus elaphus*	Scattered populations throughout the park. Deer can destroy native plants through trampling, grazing and ring-barking small trees, fouling watercourses and causing soil erosion.
Wild dog [A B E]	*Canis lupus* subspp.	Scattered population throughout the district occasionally uses the park. Wild dogs can cause substantial losses of livestock, especially sheep. Impacts on native species appear to be greatest for large mammals, such as kangaroos and swamp wallabies, and large ground-dwelling birds.

Common name	Scientific name	Comment
Fox [A B D E]	*Vulpes vulpes*	Established scattered population throughout the park. Foxes devastate native fauna, particularly small to medium-sized (450–5000g) ground-dwelling and semi-arboreal mammals, ground-nesting birds and freshwater turtles. Foxes are significant predators of domestic stock including lambs and poultry, with the potential to reduce lambing rates significantly. They are a potential vector for weeds.
Rabbit [A B E]	*Oryctolagus cuniculus*	Scattered population throughout the park may be increasing as the effectiveness of calicivirus diminishes. Rabbits compete with native fauna for habitat and their grazing can alter vegetation structure and cause land degradation.
Cat [A B C E]	*Felis catus*	Possible scattered populations throughout the park.

[A] Regional priority pest animal (LLS 2018)
[B] Key threatening process under Biodiversity Conservation Act
[C] Key threatening process under Commonwealth Environment Protection and Biodiversity Conservation Act
[D] Threat abatement plan endorsed for this species
[E] Management category- Asset based protection (LLS 2018)

The following key threatening processes are relevant to Murrurundi Pass National Park:

- Predation, habitat degradation, competition and disease transmission by feral pigs is listed as a key threatening process under the Biodiversity Conservation Act (NSW SC 2004c) and Environment Protection and Biodiversity Conservation Act (TSSC 2001b). A national threat abatement plan (DEH 2005) has been prepared which provides a framework for coordinated actions to address this threatening process.
- Competition and habitat degradation by feral goats is listed as a key threatening process under the Biodiversity Conservation Act (NSW SC 2004a) and Environment Protection and Biodiversity Conservation Act (DoE 2009).
- Predation by European red foxes is listed as a key threatening process under the Biodiversity Conservation Act (NSW SC 1998) and Environment Protection and Biodiversity Conservation Act (DoE 2009).
- Herbivory and environmental degradation caused by feral deer (various species) is listed as a key threatening process under the Biodiversity Conservation Act (NSW SC 2004b).

The park is included in a cross-tenure aerial baiting program, coordinated by Hunter Local Land Services, which has allowed baits to be more closely aligned with wild dog pathways not accessible on the ground. Reactive ground baiting has also been undertaken in conjunction with neighbours.

Issues

- Proximity of the park to Murrurundi township and the New England Highway limits methods that can be used to control pest animal species.

Desired outcomes

- Pest plants and animals are controlled and where possible eliminated.
- Negative impacts of pest plants and animals on park values are minimised.

Management response

4.1.1 Manage pest species in accordance with pest management strategies relevant to the park.

4.1.2 Seek the cooperation of neighbours in implementing weed and pest control programs. Undertake control in cooperation with Hunter and North West Local Land Services, Upper Hunter Shire Council and Upper Hunter Weeds Authority.

4.1.3 Implement cooperative fox control programs with neighbours.

4.1.4 Assist Hunter and North West Local Land Services in the implementation of wild dog management plans relevant to the park.

4.1.5 Wash down management vehicles after leaving the park to prevent the spread of Coolatai grass.

4.2 Fire

The primary objectives of NPWS fire management are to protect life, property, community assets and cultural heritage from the adverse impacts of fire, while also managing fire regimes in parks to maintain and enhance biodiversity. NPWS also assists in developing fire management practices that contribute to conserving biodiversity and cultural heritage across the landscape, and implements cooperative and coordinated fire management arrangements with other fire authorities, neighbours and the community (OEH 2013b).

Fire is a natural feature of many environments and is essential for the survival of some plant communities. However, inappropriate fire regimes can lead to loss of particular plant and animal species and communities, and high frequency fires have been listed as a key threatening process under the Biodiversity Conservation Act (NSW SC 2000b).

Historically, fire in what is now the park is uncommon. The southern aspect and generally moist vegetation means that severe wildfires are only likely to occur during extreme drought. Assets at risk include significant telecommunications infrastructure located at Mount Helen, only three kilometres east of the park. This is a major communication facility for emergency services as well as public broadcasters. Several rural dwellings and other structures are also near the park. The New England Highway could form a major containment line to fires moving west to east along the Liverpool Range.

A fire management strategy which defines the fire management approach for the park has been prepared (DECC 2009). The fire management strategy outlines the recent fire history of the park, key assets within and adjoining the park including sites of natural and cultural heritage value, fire management zones and fire control advantages such as management trails and water supply points. It also contains fire regime guidelines for conservation of the park's vegetation communities, and supports research into the fire response of the Murrurundi stringybark.

It is important that any containment lines constructed to suppress wildfires are rehabilitated quickly due to the steep terrain and potential for erosion.

NPWS maintains cooperative arrangements with surrounding landowners and the Rural Fire Service and is actively involved with the Liverpool Range Bush Fire Management Committee. Cooperative arrangements include fire planning, fuel management and information sharing. Hazard reduction programs, ecological burning proposals and fire trail works are submitted annually to the committee.

Desired outcomes

- Negative impacts of fire on life, property and the environment are minimised.
- The role of fire in relation to the Murrurundi stringybark population is understood and factored into fire management planning.

- The potential for spread of bushfires on, from or into the park is minimised.
- Fire regimes are appropriate for conservation of native plant and animal communities.

Management response

4.2.1 Implement the park's fire management strategy.

4.2.2 Continue to be involved with the Liverpool Range Bush Fire Management Committee. Develop and maintain cooperative arrangements with local Rural Fire Service brigades and other fire authorities and surrounding landowners regarding fuel management and fire suppression.

4.2.3 Monitor the ability of native plants to recover between fires, and review fire regimes as required.

4.2.4 Rehabilitate areas disturbed by fire suppression operations as soon as practical after any fire.

4.2.5 Encourage research into the fire response of Murrurundi stringybark and the use of fire to control the spread of sweet pittosporum.

4.3 Climate change

Human-induced climate change has been listed as a key threatening process under the Biodiversity Conservation Act (NSW SC 2000) and the associated loss of habitat is listed on the Environment Protection and Biodiversity Conservation Act (TSSC 2001a). The latest information on projected changes to climate are from the NSW and ACT Regional Climate Modelling (NARClim) project (OEH 2014b). The climate projections for 2020–39 are described as 'near future'; and projections for 2060–79 are described as 'far future'. The snapshot shown in Table 4 is for the Hunter Region which includes Murrurundi Pass National Park (OEH 2014b).

Table 4: Hunter climate change snapshot

Projected temperature changes	
Maximum temperatures are projected to **increase** in the near future by 0.4–1.0°C	Maximum temperatures are projected to **increase** in the far future by 1.6–2.6°C
Minimum temperatures are projected to **increase** in the near future by 0.5–0.9°C	Minimum temperatures are projected to **increase** in the far future by 1.5–2.5°C
The number of hot days (i.e. > 35°C) will **increase**	The number of cold nights (i.e. < 2°C) will **decrease**
Projected rainfall changes	
Rainfall is projected to **decrease** in spring and winter	Rainfall is projected to **increase** in autumn
Projected Forest Fire Danger Index changes	
Average fire weather is projected to **increase** in summer, spring and winter	Severe fire weather is projected to **increase** in summer and spring

The projected increases in temperature, number of hot days and severe fire weather days (OEH 2014b) are likely to lead to greater intensity and frequency of fires across the Hunter Region (DECCW 2010). Annual rainfall is projected to increase. Overall, a slight increase in

runoff is projected, with a substantial increase in summer, a minor increase in autumn, and decreases in winter and spring. These changes are likely to lead to more severe droughts, slightly increased runoff, greater incidence of flash and riverine flooding, and increased erosion (DECCW 2010).

Climate change may significantly affect biodiversity by changing the size of populations and the distribution of species, and altering the geographical extent and species composition of habitats and ecosystems. Species most at risk are those unable to migrate or adapt, particularly those with small population sizes or with slow growth rates.

The potential impact of climate change on the park is difficult to assess since it depends on the compounding effects of other pressures, particularly barriers to migration and pressure from introduced animals. Highly cleared and fragmented ecosystems are likely to be at greater risk than more intact ecosystems. Programs to reduce the pressures arising from other threats, such as habitat fragmentation, invasive species, bushfires and pollution, will help reduce the severity of the effects of climate change.

Murrurundi Pass National Park is located within the Great Eastern Tablelands Corridor, a key buffer and linkage for wildlife movement in response to climate change, especially for woodland birds (DECC 2007b). Within the park, the altitudinal range from 540 to 960 metres above sea level enables altitudinal movement.

The Australian Museum is currently undertaking research into landscape scale impacts of climate change that can help explain species' distribution and responses to variable and changing climates. A total of 260 small weather stations take hourly readings around the Hunter and Macquarie valleys and surrounding areas. Two of these are located in Murrurundi Pass National Park. They will enable more detailed and realistic estimates of climate change at the regional scale than the more widely distributed Bureau of Meteorology weather stations. In another part of this study, ants are being collected at the climate recording sites to determine how climate variability affects their community structure and temporal turnover.

Desired outcomes

- The adverse effects of climate change on natural systems are minimised.

Management response

4.3.1 Continue existing fire, pest and weed management programs to increase the park's ability to cope with future disturbances, including climate change, and encourage research into appropriate indicators to monitor the effects of climate change.

4.3.2 Support research into the impacts of climate change.

4.4 Isolation and fragmentation

The area surrounding the park has been extensively cleared, which has resulted in a high loss of biodiversity and fragmentation of habitat. The Hunter Remnant Vegetation project (Peake 2006) noted that much of the pre-European vegetation had been cleared, especially on the valley floor, with remnant vegetation mainly occurring on steep slopes or land not suitable for agriculture. This study of the central Hunter Region extended to Wingen, about 20 kilometres south of the park, but it is reasonable to assume that its findings apply to the park as well. Early photographs show extensive clearing of the hills around Murrurundi (Suters Architects & Planners 1988). The park itself is relatively small and isolated, and edge effects make it vulnerable to disturbance. Adjacent land uses place pressure on parks through the incursion of non-native plant and animal species. In Murrurundi Pass National Park, weed incursions are predominantly pasture species, and Coolatai grass which occurs on the edge of the New England Highway (see Section 4.1).

Nearby urbanised land also places pressure on the park through a range of activities such as predation by pests and straying pets, and unauthorised recreational activities.

Cooperative arrangements with neighbours are important for the management of fire, weeds and pest animals (see Sections 4.1, 4.2). Additionally, long-term conservation of biodiversity depends on the protection, enhancement and connection of remaining habitat across the landscape, incorporating vegetation remnants on both public and private lands.

One of Australia's largest conservation corridors is being established through the Great Eastern Ranges Initiative, a program that will help people, plants and animals adapt to future environmental threats by maintaining, improving and reconnecting 'islands' of natural vegetation along the Great Eastern Ranges. These ranges are 2800 kilometres long and extend from the Alps in Victoria to north of Cairns in Queensland. The Hunter Valley has been identified as one of 10 priority areas (OEH 2014a). Murrurundi Pass National Park lies along this corridor.

Desired outcomes

- The negative impacts of isolation and fragmentation are reduced.

Management response

4.4.1 Develop and maintain cooperative arrangements with nearby landholders regarding fire and pest species management, and the management of pets.

4.4.2 Encourage protection and enhancement of native vegetation on public and private lands near the park.

4.4.3 Liaise with neighbours, Roads and Maritime Services, Upper Hunter Shire Council and NSW Department of Industry – Lands and Forestry to encourage the retention and appropriate management of key habitat and corridors adjacent to the park.

4.5 Other issues

There is occasional unauthorised vehicle use of management trails in the park and evidence of informal tracks developing as a result of trail bike use.

There have also been incidences of illegal removal of firewood and tree felling, possibly for firewood. Collecting firewood can result in the loss of woody debris and fallen logs, reducing or eliminating the availability of this material as habitat. The removal of deadwood and dead trees has been identified as having a significant negative impact on habitat availability and ecosystem functioning, and is listed as a key threatening process under the Biodiversity Conservation Act (NSW SC 2003).

There have been reports of unauthorised shooting and bow-hunting within the park. Occasionally rubbish is dumped within the park and on the adjacent highway corridor near the park entrance. There are limited signs and information about appropriate activities and access to the park (see Section 3.7).

Desired outcomes

- The impacts of unauthorised access and use of the park are minimised.

Management response

4.5.1 Continue to liaise with the NSW Police and undertake periodic patrols to reduce unauthorised activity.

4.5.2 Install regulatory signage at strategic locations on the park’s boundary to reduce unauthorised activities.

5. Management operations and other uses

5.1 Management facilities and operations

Trails within the park provide access for management purposes, and maintaining them requires a major commitment of resources. A network of trails concentrated in the southern section of the park pre-dates its reservation. Most these will be allowed to close and revegetate under natural processes. The management trail to be retained for management access is shown on Figure 1. In accordance with NPWS policy, vehicle use of management trails is only available for NPWS-authorised activities, mostly associated with essential park management. A former dormant trail may be re-opened for fire management, if required, and later rehabilitated and allowed to revegetate to limit soil erosion.

The park's terrain is too steep to economically construct and maintain a trail to access the northern section of the park at the top of the range. This section of park is most efficiently accessed via the Mount Helen Road. However, Mount Helen Road is a private road and there is no legal park management access along it. Furthermore, there is no legal access to the park boundary from this road.

A large dam in the south of the park has been identified as a water source for firefighting purposes. Although not a natural feature, it also serves as animal habitat (see Section 3.3).

Much of the park is fenced to a reasonable standard. A small section on the eastern boundary is unfenced and there are occasional incursions of straying stock.

Issues

- The steep terrain restricts construction of additional trails.
- There is no legal access to the northern section of park at the top of the range.
- The structural integrity of the large dam has not been assessed.
- Occasional stock incursions occur as a result of inadequate fencing.

Desired outcomes

- The dam and other management facilities have minimal impact on the park's values.

Management response

5.1.1 Maintain trails for management purposes as shown on Figure 1.

5.1.2 Do not permit pets or stock in the park. Allow the use of horses for mustering straying stock with NPWS consent.

5.1.3 Subject to available resourcing, assist neighbours to install stock-proof park boundary fencing in accordance with the NPWS Boundary Fencing Policy. Prioritise assistance to those areas where stock incursions are having the greatest impacts.

5.1.4 Seek to develop formal arrangements for park management access along Mount Helen Road and for access from Mount Helen Road to the northern section of the park for management purposes.

5.2 Non-NPWS uses and operations

Some uses unrelated to park management pre-date the park's reservation and are regarded as existing interests. These include a major powerline and some infrastructure associated with the New England Highway.

TransGrid operates a high-voltage electricity transmission line traversing the western section of the park for about 450 metres as shown on Figure 1. The line is covered by a formal easement granted before the park's reservation. Transmission lines and associated management activities generate impacts, including 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. These impacts are minimised through a statewide agreement between TransGrid and NPWS for inspection and maintenance of existing transmission lines and infrastructure.

A drain from the highway leads to a sediment dam located in the park. Overflows from this dam have regularly caused erosion of the main management trail. The legal status of the sediment dam is unclear, though it does pre-date reservation of the park.

Desired outcomes

- Non-NPWS uses and activities are managed to minimise impacts on park values and infrastructure.
- TransGrid transmission lines within the park are managed in accordance with the statewide easement and maintenance agreement.

Management response

5.2.1 Continue to liaise with TransGrid regarding access and maintenance needs in accordance with the statewide easement and maintenance agreement.

5.2.2 Liaise with the Roads and Maritime Services regarding the status and management of the sediment dam. If appropriate, formalise its status and negotiate management arrangements to improve the drainage of the overflow and limit impacts on the management trail.

6. Implementation

This plan of management establishes a scheme of operations for Murrurundi Pass National Park. Implementation of this plan will be undertaken within the annual work program of the NPWS Central Coast Hunter Region.

Identified activities for implementation are listed in Table 4. Relative priorities are allocated to each activity as follows:

- **High priority** activities are imperative to achieve the objectives and desired outcomes of this plan, and must be undertaken in the near future to avoid significant deterioration in natural, cultural or management resources.
- **Medium priority** activities are necessary to achieve the objectives and desired outcomes of the plan, but they are not urgent.
- **Low priority** activities are desirable to achieve management objectives and desired outcomes but can wait until resources become available.
- **Ongoing** activities are undertaken on an annual basis, or are statements of management intent that will direct the management response if an issue arises.

This plan of management does not have a specific term and will stay in force, and apply to any additions to Murrurundi Pass National Park, until amended or replaced in accordance with the National Parks and Wildlife Act.

Table 5: Management response and priorities

Plan reference	Management response	Priority
3.1.1	Ensure management activities (especially road maintenance) are carried out in a manner that minimises soil erosion and water pollution.	Ongoing
3.2.1	Implement the *Biodiversity Conservation Program* and recovery plans for any threatened plant species, populations and ecological communities identified in the park.	High
3.2.2	Encourage natural regeneration of previously disturbed areas. Undertake revegetation programs in more seriously degraded areas if required. Use only local seed stock of species indigenous to the park in any rehabilitation programs.	Medium
3.2.3	Encourage research into the Murrurundi stringybark community, especially its fire response.	Low
3.2.4	Encourage research into the distribution and potential impacts of sweet pittosporum in this environment and implement any management recommendations if required.	Low
3.3.1	Implement relevant recovery actions in the *Biodiversity Conservation Program* and recovery plans for any threatened animal species and populations identified in the park.	High
3.3.2	Assist natural regeneration of degraded habitats where needed to improve the habitat values of the park.	Medium
3.3.3	Undertake fauna surveys to identify species present in the park, including targeting those threatened and significant species predicted to occur.	Low
3.4.1	Continue to consult and involve the Wanaruah Local Aboriginal Land Council, Wonnarua Tribal Council, Gomeroi Native Title Applicant and other relevant Aboriginal community organisations in the management of their Country, including the management of Aboriginal sites and places, and cultural and natural values.	High

Plan reference	Management response	Priority
3.4.2	Undertake an archaeological survey and cultural assessment before all works with the potential to impact Aboriginal sites or values.	Ongoing
3.4.3	Encourage further research into the Aboriginal heritage values of the park with the Wanaruah Local Aboriginal Land Council, Wonnarua Tribal Council, Gomeroi Native Title Applicant and other relevant Aboriginal community organisations.	Medium
3.4.4	Promote a broader understanding of the cultural and spiritual relationship attached to the physical landscape of the Upper Hunter Valley, the Liverpool Plains and the Liverpool Range.	Low
3.5.1	Record historic sites and stories and assess their significance. Manage sites in accordance with their assessed level of significance.	Medium
3.5.2	Promote public understanding and appreciation of the historic heritage values of the park.	Low
3.5.3	Undertake an archaeological survey and cultural assessment before any works with the potential to impact historic sites and places.	Ongoing
3.6.1	Do not encourage visitor use of the park while there is no safe access. Thereafter, support low-impact self-reliant uses such as bushwalking and birdwatching.	Ongoing
3.6.2	Liaise with Roads and Maritime Services regarding options for safe access to the park.	High
3.7.1	Consistent with level of provision of safe public access to the park, develop visitor information which encourages appreciation of the park's values, including its Aboriginal and historic heritage and contemporary significance to Aboriginal people.	Low
3.7.2	Investigate community interest in the management of the park such as whether a 'friends of the park' community-based group should be established.	Low
4.1.1	Manage pest species in accordance with pest management strategies relevant to the park.	Ongoing
4.1.2	Seek the cooperation of neighbours in implementing weed and pest control programs. Undertake control in cooperation with Hunter and North West Local Land Services, Upper Hunter Shire Council and Upper Hunter Weeds Authority.	High
4.1.3	Implement cooperative fox control programs with neighbours.	High
4.1.4	Assist Hunter and North West Local Land Services in the implementation of wild dog management plans relevant to the park.	High
4.1.5	Wash down management vehicles after leaving the park to prevent the spread of Coolatai grass.	High
4.2.1	Implement the park's fire management strategy.	High
4.2.2	Continue to be involved with the Liverpool Range Bush Fire Management Committee. Develop and maintain cooperative arrangements with local Rural Fire Service brigades and other fire authorities and surrounding landowners regarding fuel management and fire suppression.	Ongoing
4.2.3	Monitor the ability of native plants to recover between fires, and review fire regimes as required.	Medium
4.2.4	Rehabilitate areas disturbed by fire suppression operations as soon as practical after any fire.	Medium
4.2.5	Encourage research into the fire response of Murrurundi stringybark and the use of fire to control the spread of sweet pittosporum.	Low

Plan reference	Management response	Priority
4.3.1	Continue existing fire, pest and weed management programs to increase the park's ability to cope with future disturbances, including climate change, and encourage research into appropriate indicators to monitor the effects of climate change.	Ongoing
4.3.2	Support research into the impacts of climate change.	Medium
4.4.1	Develop and maintain cooperative arrangements with nearby landholders regarding fire and pest species management, and the management of pets.	Ongoing
4.4.2	Encourage protection and enhancement of native vegetation on public and private lands near the park.	Low
4.4.3	Liaise with neighbours, Roads and Maritime Services, Upper Hunter Shire Council and NSW Department of Industry – Lands and Forestry to encourage the retention and appropriate management of key habitat and corridors adjacent to the park.	Low
4.5.1	Continue to liaise with the NSW Police and undertake periodic patrols to reduce unauthorised activity.	Ongoing
4.5.2	Install regulatory signage at strategic locations on the park's boundary to reduce unauthorised activities.	High
5.1.1	Maintain trails for management purposes as shown on Figure 1.	High
5.1.2	Do not permit pets or stock in the park. Allow the use of horses for mustering straying stock with NPWS consent.	Ongoing
5.1.3	Subject to available resourcing, assist neighbours to install stock-proof park boundary fencing in accordance with the NPWS Boundary Fencing Policy. Prioritise assistance to those areas where stock incursions are having the greatest impacts.	Medium
5.1.4	Seek to develop formal arrangements for park management access along Mount Helen Road and for access from Mount Helen Road to the northern section of the park for management purposes.	Medium
5.2.1	Continue to liaise with TransGrid regarding access and maintenance needs in accordance with the statewide easement and maintenance agreement.	Ongoing
5.2.2	Liaise with the Roads and Maritime Services regarding the status and management of the sediment dam. If appropriate, formalise its status and negotiate management arrangements to improve the drainage of the overflow and limit impacts on the management trail.	High

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