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

Coxcomb, Killabakh & Goonook Nature Reserve

Plan of Management

COXCOMB, GOONOOK & KILLABAKH NATURE RESERVES

PLAN OF MANAGEMENT

NSW National Parks and Wildlife Service

Part of the Department of Environment, Climate Change and Water

February 2011

This plan of management was adopted by the Minister for Climate Change and the Environment on 15th February 2011.

Acknowledgments

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

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

Cover photo by Kevin Carter, NPWS. View over Coxcomb and Goonook Nature Reserves.

For additional information or any inquiries about these reserves or this plan of management, contact the NPWS Manning Area Office, 78 Hargreaves Street, Taree NSW 2430 or by telephone on (02) 6552 4097.

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FOREWORD

Coxcomb, Goonook and Killabakh Nature Reserves are located approximately 25 kilometres north of Taree on the Mid North Coast of New South Wales. All three reserves were established in 1999 as a result of the Lower North East Regional Forest Agreement and have a combined area of approximately 3,700 hectares.

Coxcomb, Goonook and Killabakh Nature Reserves protect important geological features, a high diversity of forest ecosystems, fragile mountain and escarpment vegetation, and a number of threatened animal species. They also have an important role as part of a wildlife corridor extending from Taree to the Great Dividing Range. The reserves are part of the traditional country of the Biripi Aboriginal people.

The New South Wales *National Parks and Wildlife Act 1974* requires that a plan of management be prepared for each nature reserve. A draft plan of management for Coxcomb, Goonook and Killabakh Nature Reserves was placed on public exhibition from 20th February until 25th May 2009. The submissions received were carefully considered before adopting this plan.

This plan contains a number of actions to achieve the State Plan priority to "Protect our native vegetation, biodiversity, land, rivers and coastal waterways", including undertaking surveys for threatened and significant native plant and animal species and communities, implementing a marker system to avoid inadvertent damage to threatened or significant plants, and implementing pest species control and bush regeneration works.

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

Frank Sartor MP
Minister for Climate Change and the Environment

1. COXCOMB, GOONOOK & KILLABAKH NATURE RESERVES

Coxcomb, Goonook and Killabakh Nature Reserves (collectively referred to as the "planning area") are located on the steep to undulating and dissected southern escarpment and associated ridge systems of the Comboyne Plateau, approximately 25 kilometres north of Taree, west of the Mid North Coast of New South Wales.

Coxcomb Nature Reserve was dedicated on 3 May 1999. Formerly a crown land reserve, it has an area of 73 hectares and includes the summit and slopes of Mount Coxcomb. The name Coxcomb is probably derived from "cocks comb" or the comb of a rooster of which Mount Coxcomb appears as a silhouette from certain aspects (Evans, pers. comm., 2004). Coxcomb Nature Reserve is located approximately 19 kilometres north of Wingham.

Goonook Nature Reserve was first dedicated on 1 January 1999, with an area of 987 hectares. The reserve was formerly part of Yarratt State Forest. Mount Goonook was added to the nature reserve on 22 February 2007. The addition of this land which was previously private property increased the total area of Goonook Nature Reserve to 1,074 hectares. The name Goonook is probably a derivation of the Kattang word "gunang" which refers to excrement (Brereton, pers. comm., 2007; Muurrbay Aboriginal Language Co-operative and Many Rivers Aboriginal Language Centre, 2005). Goonook Nature Reserve is located approximately 15 kilometres north of Wingham.

Killabakh Nature Reserve was dedicated on 1 January 1999 and comprises four separate areas of land totalling 2,644 hectares. "Keilabakh" in the Kattang language means "blue gum" (Ramsland, 2001) and the derivation – "Killabakh" is used for Killabakh Mountain and the township of Killabakh. The nature reserve includes the former Marsh State Forest (1,905 hectares) and a number of crown land reserves. Killabakh Nature Reserve is located approximately 25 kilometres north of Wingham and 9 kilometres east of Elands.

Surrounding land uses in the Wingham and Comboyne districts consist primarily of grazing, dairy and forestry operations. The region is popular with tourists visiting the towns of Wingham, Killabakh, Elands and Comboyne, the Ellenborough Falls, Tapin Tops and Cottan-Bimbang National Parks and Dingo Tops, Bulga and Doyles River State Forests.

The Lower North East Regional Forest Agreement (RFA) covers the planning area. The RFA provided for major additions to the reserve system, including the establishment of the planning area, following assessment of the natural, cultural, economic and social values of forests.

This plan also covers lands which are vested in the Minister for the purposes of Part 11 of the National Parks and Wildlife Act. These lands incorporate a number of roads (see Section 5. Management Operations and/or Other Uses) and ensure a continuation of access arrangements to neighbouring private land.

The planning area is within the Greater Taree City and Port Macquarie-Hastings Local Government Areas, the Hunter Central Rivers Catchment Management Authority and the Purfleet-Taree Local Aboriginal Land Council area.

2. MANAGEMENT CONTEXT

2.1. Legislative and Policy Framework

The management of nature reserves in NSW and any Part 11 lands is in the context of a legislative and policy framework, primarily the *National Parks and Wildlife Act 1974* (NPW Act), the NPW Regulation, the *Threatened Species Conservation Act 1995* (TSC Act) and the policies of the National Parks and Wildlife Service (NPWS). The policies are based on the legislative background and internationally accepted principles of park management. They relate to nature conservation, Aboriginal and historic heritage conservation, recreation, commercial use, research and communication.

Other legislation, international agreements and charters may also apply to management of the area. In particular, the *Environmental Planning and Assessment Act 1979* may require the assessment and mitigation of the environmental impacts of works proposed in this plan. The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) also applies in relation to actions that may impact on threatened species listed under that Act.

A plan of management is a statutory document under the NPW Act. Once the Minister has adopted a plan, no operations may be undertaken within the planning area except in accordance with this plan. This plan will also apply to any future additions to the planning area. Should management strategies or works be proposed for the planning area or any additions that are not consistent with the plan, an amendment to the plan will be required. Any such amendment will be publicly exhibited.

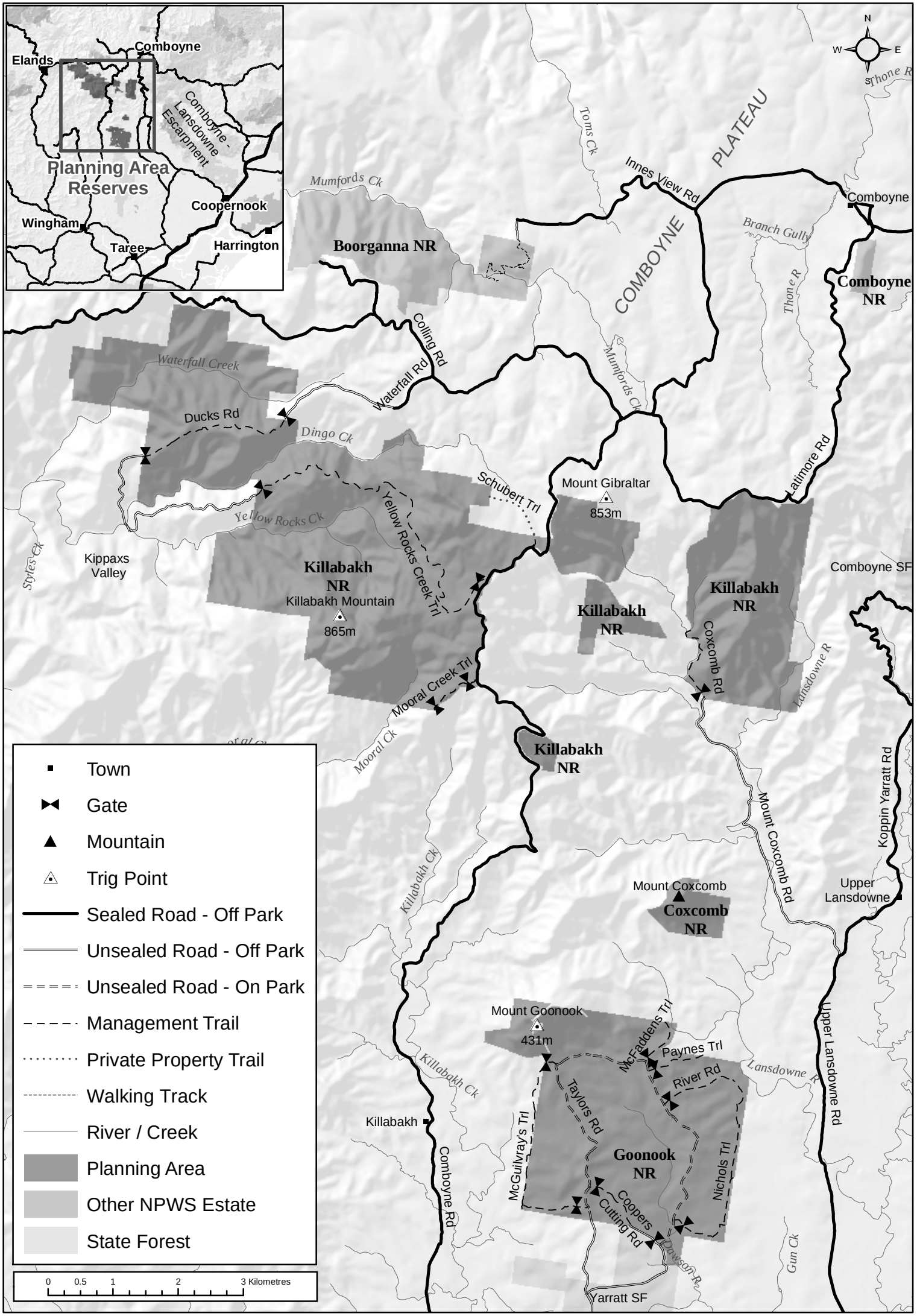
2.2. Management Purposes and Principles

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

Under the Act (section 30J), nature reserves are managed to:

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

Nature reserves differ from national parks in that they do not have as a management principle to provide for visitor use.


Comboyne
Elands
Comboyne - Lansdowne Escarpment
Planning Area Reserves
Coopernook
Wingham
Taree
Harrington
N
W
E
S
Thone R
Toms Ck
PLATEAU
Innes View Rd
Comboyne
Mumfords Ck
Boorganna NR
COMBOYNE
Branch Gully
Thone R
Comboyne NR
Colling Rd
Waterfall Creek
Waterfall Rd
Mumfords Ck
Ducks Rd
Dingo Ck
Latimore Rd
Schubert Trl
Mount Gibraltar
853m
Yellow Rocks Ck
Yellow Rocks Creek Trl
Styles Ck
Kippaxs Valley
Killabakh NR
Killabakh Mountain
865m
Killabakh NR
Killabakh NR
Comboyne SF
Coxcomb Rd
Lansdowne R
Mooral Creek Trl
Mooral Ck
Killabakh NR
Mount Coxcomb Rd
Koppin Yarratt Rd
Mount Coxcomb
Coxcomb NR
Upper Lansdowne
Killabakh Ck
Mount Goonook
431m
McFaddens Trl
Paynes Trl
River Rd
Lansdowne R
Upper Lansdowne Rd
Taylors Rd
McGuilvray's Trl
Killabakh
Goonook NR
Nichols Trl
Comboyne Rd
Coopers Cutting Rd
Dawson R
Gun Ck
Yarratt SF
Town
Gate
Mountain
Trig Point
Sealed Road - Off Park
Unsealed Road - Off Park
Unsealed Road - On Park
Management Trail
Private Property Trail
Walking Track
River / Creek
Planning Area
Other NPWS Estate
State Forest
0 0.5 1 2 3 Kilometres

2.3. Management Objectives

The specific objectives for the planning area are to:

- Protect the important geological features and associated vegetation of Killabakh Mountain, Mount Coxcomb, Mount Goonook and the rock escarpments in the upper Lansdowne valley, upper Kippaxs valley, upper Dingo Creek and Yellow Rocks Creek;

- Conserve & protect the key habitat for fauna and flora of the planning area, as an important component of the wildlife corridor between the Manning Valley alluvial floodplain and the Great Dividing Range;

- Protect water quality in the upper Lansdowne River, Dingo Creek, Yellow Rocks Creek and headwaters of the Dawson River which contributes to water quality in the Manning River catchment;

- Reduce the distribution and spread of introduced species in the planning area; and

- Continue to involve the community in the management and protection of the natural and cultural values of the planning area.

3. VALUES OF THE RESERVE

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

Goonook Nature Reserve and Killabakh Nature Reserve were previously part of forestry areas, whereas the more inaccessible Coxcomb Nature Reserve has had minimal disturbance. The peaks of Killabakh Mountain, Mount Coxcomb and Mount Goonook continue to be sites of remote self-reliant recreation, nature study and appreciation. The planning area forms part of the forested skyline viewed from many parts of the Manning Valley. It has an important role as part of a unique wildlife corridor extending from Taree to the Great Dividing Range.

3.1. Landform, Geology and Soils

The tertiary fine-grained comendite (rhyolite) volcanic peaks of Mount Coxcomb and Mount Goonook are prominent features of Coxcomb Nature Reserve and Goonook Nature Reserve (Knutson, 1975; Westerman, 2004). Both peaks are surrounded by the Permo-carboniferous mudstones, siltstones and shales of the underlying Giro Beds. The Giro Beds have weathered to form brown podzolic and lateritic podzolic soils of medium to low fertility (Evans, 2001).

Soils in Killabakh Nature Reserve are derived from the tertiary basalt and trachytes of the Comboyne Plateau and the permo-carboniferous mudstones, siltstones and shales of the underlying Giro Beds (Forestry Commission of NSW, 1979). The soils derived from basalt are at higher altitudes (greater than 600 metres above sea level) and are relatively fertile red-brown kraznozems and red podsols with high resistance to erosion. At lower altitudes there are heavy friable soils derived from the Giro Beds. Killabakh Mountain is a comendite plug located between the Yellow Rocks and Mooral creeks, in the south of the Reserve (Knutson, 1975; Westerman, 2004).

The planning area is located within the steep and dissected southern escarpment of the Comboyne Plateau and a ridgeline extending from the plateau to the headwaters of the Dawson River north of Taree. Elevation in the planning area ranges from 45 metres above sea level on the banks of the Lansdowne and Dawson rivers to 865 metres above sea level at the summit of Killabakh Mountain. Dominant features include the volcanic peaks of Killabakh Mountain, Mount Coxcomb and Mount Goonook, the deep valleys of Dingo, Mooral, Yellow Rocks, Waterfall Creek and the steep slopes of the upper Lansdowne River valley.

The planning area protects parts of the upper Lansdowne River, Dingo Creek, Yellow Rocks Creek and the headwaters of the Dawson River. It delivers high quality water to these waterways within the Manning River catchment.

3.2. Native Plants

The variety of soils and landform within the planning area supports a highly diverse range of forest ecosystems including large stands of old-growth forest. Fourteen forest ecosystems have been identified in Killabakh Nature Reserve, with rainforest and other moist forest types occupying over half of the reserve (RACD, 1999). Three forest ecosystems have been identified in Coxcomb Nature Reserve (McDonald, 2002) and five forest ecosystems are identified in that part of Goonook Nature Reserve that was formerly part of Yarratt State Forest (RACD, 1999). The addition of Mount Goonook further contributes to the floristic diversity of the planning area.

Sub-tropical rainforests are found along Dingo, Yellow Rocks and Mooral Creeks and in the upper Lansdowne and upper Dawson River catchments, particularly in those areas with southerly aspects and on talus slopes where fire has been excluded. These rainforests are dominated by figs (*Ficus* spp.), giant stingers (*Dendrocnide excelsa*), coachwoods (*Ceratopetalum apetulum*), black booyong (*Argyrodendron actinophyllum*), white beech (*Gmelina leichhardtii*) and bangalow palms (*Archontophoenix cunninghamiana*). Other moist forest types are well represented including communities of tallowwood (*Eucalyptus microcorys*) / Sydney blue gum (*E. saligna*), wet brushbox (*Lephostemon confertus*) / tallowwood / Sydney blue gum and stands of flooded gum (*E. grandis*) (Flint, 2003).

Drier forest associations are restricted to exposed ridges and escarpments and are generally at lower elevations within the planning area. Dry grassy tallowwood / small-fruited grey gum (*E. propinqua*) and small-fruited grey gum / white mahogany (*E. acmenoides*) / red bloodwood (*Corymbia gummifera*), small-fruited grey gum / grey ironbark (*E. placita*) / white mahogany are extensive. Escarpment tallowwood / red bloodwood is an uncommon forest type protected in a few discrete areas within the planning area (RACD, 1999).

The volcanic peaks within the planning area provide habitat for disjunct and unusual vegetation communities. Blue Mountains ash (*E. oreades*) occurs on Killabakh Mountain as a mature thin-stemmed “whipstick” mallee on skeletal soils and as a medium to large forest tree on adjacent deeper soils (Evans, 2001). This species occurs in the Blue Mountains of NSW and is found in disjunct stands on the mid north and north coasts of NSW (Brooker and Kleinig, 1999). The recently described and restricted shrub *Kunzea sp.* ‘Middle Brother Mountain’ occurs on Killabakh Mountain, Mount Coxcomb and Mount Goonook (Evans, pers. comm., 2004; Paget, pers. comm., 2004).

There have been no known formal vegetation surveys of the planning area and information on former crown land and private property within the planning area is limited. Two threatened plants have been recorded in Goonook Nature Reserve, trailing woodruff (*Asperula asthenes*) and brown pomaderris (*Pomaderris brunnea*). Both species have a Vulnerable status under the TSC Act and the EPBC Act. Trailing woodruff is a forb that prefers damp sites, often along river banks. Brown pomaderris is a shrub found in moist woodlands and forest on clay and alluvial soils.

A Priorities Action Statement (PAS) has been prepared that identifies strategies and actions to promote the recovery of threatened species, populations and ecological communities and manage key threatening processes (DEC, 2006).

Key PAS actions for trailing woodruff include: enhancing habitat along watercourses in areas near known populations and excluding stock; controlling weeds at known sites with appropriate control techniques (control by chemical means may not be suitable); and monitoring habitat condition at known sites. Key PAS actions for brown pomaderris include: developing operational guidelines in the reserve fire management strategy to protect this species from fire; undertaking research, particularly in regard to response to fire and other disturbance; and undertaking surveys in potential habitat.

Models developed as part of the Lower North East Comprehensive Regional Assessment (CRA) process have predicted several other threatened and significant plant species for which the planning area provides suitable habitat (See Table 1) (Richards, 1999).

Table 1. Threatened and significant plant species predicted to occur in the planning area

Common Name	Scientific name	Status	Reserve
Milky silkpod	*Parsonsia dorrigoensis*	Vulnerable*^	K, G
Tapering-leaved bottlebrush	*Callistemon acuminatus*	ROTAP	K, C
Ravine orchid	*Sarcochilus fitzgeraldii*	Vulnerable*#/ROTAP	K
Hartman's sarcochilus	*Sarcochilus hartmannii*	Vulnerable*#	K
Lesser creeping fern	*Arthropteris palisotii*	Endangered*	K
White-flowered wax plant	*Cynanchum elegans*	Endangered*^	K

* Status under TSC Act
# Denotes species listed as nationally vulnerable under the EPBC Act
^ Denotes species listed as nationally endangered under the EPBC Act
ROTAP – Denotes species listed as a Rare or Threatened Australian Plant (ROTAP) according to Briggs and Leigh (1996)
K = Killabakh Nature Reserve G = Goonook Nature Reserve C = Coxcomb Nature Reserve

3.3. Native Animals

Key habitats and corridors mapping for forest fauna has been undertaken by the NPWS to provide a landscape framework for conservation in north east NSW (Scotts, 2002). Key habitats are areas of predicted high conservation value for forest fauna mapped using fauna assemblage information (assemblages are groupings of conservation priority fauna with similar distributions). Corridors are areas mapped for their potential habitat values for resident populations or nomadic and migratory species and to provide overall landscape connectivity to facilitate fauna movement. Approximately half of the planning area has been mapped as key habitat and the majority of the planning area has been identified as part of a regional corridor between Killabakh, Comboyne and Coopernook.

Ten threatened fauna species have been recorded in the planning area through a small number of Forests NSW surveys, the Lower North East CRA survey and through incidental sightings (see Table 2). The Priorities Action Statement (PAS) also identifies strategies and actions to promote the recovery of threatened animal species, populations and ecological communities and manage key threatening processes (DEC, 2006).

Key PAS actions for stuttering barred frog include: controlling weeds in known habitat; and monitoring status of known populations. Key PAS actions for glossy black-cockatoo include: encouraging the restoration of foraging habitat that has been cleared or degraded by previous impacts.

Key PAS actions for sooty owl include: implementing a regional monitoring program. Key PAS actions for spotted-tailed quoll include: ensuring reserve fire management strategies include operational guidelines that protect rocky outcrops and riparian zones within areas of known habitat. Key PAS actions for little bentwing-bat and eastern bentwing-bat include: identifying and protecting significant roost sites in natural and artificial structures; controlling foxes, cats and goats around roosting sites; excluding prescription burns from 100 metres from caves/roost entrances; restricting access to significant roost sites; undertaking non-chemical removal of weeds to prevent obstruction of cave entrances. Key PAS actions for koala include: managing all NPWS estate to specifically provide for the protection of koalas, through plans of management, pest management plans, fire management plans and reviews of environmental factors. Key PAS actions for brush-tailed phascogale include: undertaking fox and wild dog control at priority sites. Key PAS actions for grey-headed flying fox include: conducting periodic assessments of the population size of grey-headed flying foxes to monitor population trends.

Table 2. Threatened animal species recorded in the planning area

Common name	Scientific name	Legal Status	Reserve
Amphibians			
Stuttering barred frog	*Mixophyes balbus*	Vulnerable*#	K,G
Birds			
Glossy black-cockatoo	*Calyptorhynchus lathami*	Vulnerable*^	K,G
Sooty owl	*Tyto tenebricosa*	Vulnerable*	K
Mammals			
Spotted-tailed quoll	*Dasyrurus maculatus*	Vulnerable*^	K
Golden-tipped bat	*Kerivoula papuensis*	Vulnerable*	K,G
Little bentwing-bat	*Miniopterus australis*	Vulnerable*	K,G
Eastern bentwing-bat	*Miniopterus schreibersii oceanensis*	Vulnerable*	K
Koala	*Phascolarctos cinereus*	Vulnerable*	K,G
Brush-tailed phascogale	*Phascogale tapoatafa*	Vulnerable*	G
Grey-headed flying-fox	*Pteropus poliocephalus*	Vulnerable*#	G

* Status under TSC Act
# Denotes species listed as nationally vulnerable under the EPBC Act
^ Denotes species listed as nationally endangered under the EPBC Act
K Killabakh Nature Reserve G Goonook Nature Reserve C Coxcomb Nature Reserve

The list of threatened animal species recorded in the planning area is very light on, reflecting the lack of survey work in the area (Scotts, pers. comm., 2008). Based on models developed as part of the Lower North East CRA process and nearby threatened animal records, the planning area provides suitable habitat for an additional twenty threatened animal species (see Table 3). The planning area could be highly significant for several faunal groups including fauna of the dry open forests, rainforest and wet forest fauna, and frogs generally (Scotts, pers. comm., 2008). This highlights the need for more targeted and systematic fauna surveys in the planning area.

Table 3. Threatened animal species predicted to occur in the planning area

Common name	Scientific name	Legal Status
Amphibians		
Green-thighed frog	*Litoria brevipalmata*	Vulnerable*
Davies tree frog	*Litoria daviesae*	Vulnerable*
Giant barred frog	*Mixophyes iterates*	Endangered*^
Sphagnum frog	*Philoria sphagnicolus*	Vulnerable*
Birds		
Bush stone-curlew	*Burhinus grallarius*	Endangered*
Brown treecreeper (eastern subspecies)	*Climacteris picumnus victoriae*	Vulnerable*
Square-tailed kite	*Lophoictinia isura*	Vulnerable*
Hooded robin (south-eastern form)	*Melanodryas cucullata cucullata*	Vulnerable*
Powerful owl	*Ninox strenua*	Vulnerable*
Olive whistler	*Pachycephala olivacea*	Vulnerable*
Wompoo fruit-dove	*Ptilinopus magnificus*	Vulnerable*
Masked owl	*Tyto novaehollandiae*	Vulnerable*
Mammals		
Eastern pygmy-possum	*Cercartetus nanus*	Vulnerable*
Large-eared pied bat	*Chalinolobus dwyeri*	Vulnerable*#
Parma wallaby	*Macropus parma*	Vulnerable*
Yellow-bellied glider	*Petaurus australis*	Vulnerable*
Squirrel glider	*Petaurus norfolcensis*	Vulnerable*
Long-nosed potoroo	*Potorous tridactylus*	Vulnerable*#
Greater broad-nosed bat	*Scoteanax rueppellii*	Vulnerable*
Reptiles		
Stephens' banded snake	*Hoplocephalus stephensii*	Vulnerable*

* Status under TSC Act
# Denotes species listed as nationally vulnerable under the EPBC Act
^ Denotes species listed as nationally endangered under the EPBC Act

3.4. Aboriginal Heritage

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

Killabakh Mountain, Mount Coxcomb, Mount Goonook and the Comboyne Plateau are spiritually significant features in the landscape to Aboriginal people. Two Aboriginal sites have been recorded at Mount Goonook within Goonook Nature Reserve. No other Aboriginal sites have been recorded in the planning area, however no systematic survey for cultural heritage has been undertaken. The planning area is within the Purfleet-Taree Local Aboriginal Land Council area. It is NPWS policy to involve the local Aboriginal community in the management of Aboriginal heritage in the planning area.

3.5. Historic Heritage

Prior to 1947, the area now known as Killabakh Nature Reserve was largely crown land. From 1947 the Forestry Commission of NSW acquired much of the crown land and crown leases through "piecemeal aggregation" increasing the forest from an area of 631 hectares in 1947 to 1,905 hectares in 1974 (Forestry Commission of NSW, 1979).

Little is known about the period prior to 1940, however, reports on the condition of the forest communities reflect that some areas had been ringbarked and intensively logged. The Yellow Rocks Creek Trail (formerly known as Marsh Access Road) was constructed prior to 1940 and was initially known as Cooks Road, Slaters Road and Marsh Access Road. The road from Boorganna to Kippaxs (now known as Duck Road) was constructed prior to 1947 (Forestry Commission of NSW, 1979).

The area now known as Coxcomb Nature Reserve was part of a large tract of vacant crown land prior to 1919. In 1919, the summit of Mount Coxcomb and the steep escarpments to the north and west of the summit were reserved for public recreation (Department of Lands, 2004). At the same time, the heavily forested slopes to the east and south of Mount Coxcomb were set aside as part of Homestead Farm Area Number 1044 for returned soldiers (Department of Lands, 2004). The Homestead Farm perpetual lease was exercised from 1921 to 1981 when an application was made to convert the lease to freehold title. At that time the area which now comprises the eastern and southern forested slopes of Coxcomb Nature Reserve was excluded from freehold conversion, and in 1984 it was reserved for public recreation (Department of Lands, 2004). The area was dedicated as Coxcomb Nature Reserve on 3 May 1999.

Evidence of past land use in Killabakh Nature Reserve and Goonook Nature Reserve include disused log dumps, tree stumps and a network of disused logging trails. In Killabakh Nature Reserve the remains of a small logging hut and machinery parts can be found on Yellow Rocks Creek Trail and a trigonometric station is located on Killabakh Mountain. Two bridges situated on Taylors Road in Goonook Nature Reserve, as well as Killabakh Mountain, Mount Coxcomb and the Comboyne – Lansdowne Escarpment are listed on the NPWS Historic Heritage Information Management System. Little evidence of past use is present in Coxcomb Nature Reserve.

3.6. Education, Recreation and Research Values

The planning area provides opportunities for solitude, nature study, self-reliant passive recreation and limited vehicle-based opportunities. No formal walking tracks or other visitor facilities are located in the planning area.

The main access to Killabakh and Goonook Nature Reserves is via Wingham or Comboyne. Comboyne Road provides access to the western and central portions of Killabakh Nature Reserve. Yellow Rocks Creek Trail, Coxcomb Road and Ducks Road are gated and provide walking opportunities in Killabakh Nature Reserve (see map).

Access to Goonook Nature Reserve is via Taylors Road through Yarratt State Forest (see map). Taylors Road is maintained to a dry weather two wheel drive standard in Goonook Nature Reserve.

The areas most frequently visited in the planning area include the summits of Killabakh Mountain, Mount Coxcomb and Mount Goonook, Yellow Rocks Creek and the upper Dingo Creek.

Coxcomb Nature Reserve is surrounded by private property and access to the reserve relies on approval to cross this land. As a consequence, public access is restricted to walkers and prior permission must be obtained from landholders.

Those parts of the planning area that were previously crown land and private property, have had limited study and include sites of particular scientific interest such as the disjunct and unusual vegetation surrounding the peaks of Killabakh Mountain, Mount Coxcomb and Mount Goonook.

4. THREATS TO RESERVE VALUES

4.1. Pest Species

Pest plant species recorded in the planning area are confined to areas of previous disturbance, primarily along roadways and trails. Crofton weed (*Ageratina adenophora*) is known to occur in the planning area and is listed as a noxious weed in the Greater Taree City Council (GTCC) area. It is particularly prevalent in Killabakh Nature Reserve adjacent to fire trails and roads and there is a large infestation associated with a landslip east of the Comboyne – Wingham Road. Lantana (*Lantana camara*) is predominant in the understorey of most lower altitude forest ecosystems within the planning area. Roadside infestations of crofton weed and lantana are subject to herbicide spraying.

Several pest animal species have been recorded within the planning area, including wild dog (*Canis familiaris*) and feral cat (*Felis cattus*) (Forestry Commission of NSW, 1979). The fox (*Vulpes vulpes*) and feral pig (*Sus scrofa*) are known to occur on adjacent private property (Fotheringham, pers. comm., 2003) and are likely to occur in the planning area. Predation by the feral cat and the fox, and predation, habitat degradation, competition and disease transmission by feral pigs, are listed as key threatening processes under the TSC Act and the EPBC Act. Reactive wild dog and fox baiting programs are undertaken in Goonook Nature Reserve in co-operation with neighbours and the Gloucester Rural Lands Protection Board.

Pest management is undertaken in the planning area in accordance with the NPWS Wild Dog Policy and the Mid North Coast Region Pest Management Strategy 2008-2011 (NPWS, 2008).

4.2. Fire Management

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 TSC Act.

The primary fire management objectives of the NPWS are to protect life and property and community assets from the adverse impacts of fire, whilst managing fire regimes to maintain and protect biodiversity and cultural heritage (NPWS, 2007). The NPWS uses a zoning system for bushfire management which is compatible with the zoning used by the Greater Taree District Bush Fire Management Committee (BFMC) in its bushfire risk management plan.

In regard to Killabakh Nature Reserve and Coxcomb Nature Reserve, fire management strategies are included in this plan of management. In regard to Goonook Nature Reserve, a separate fire management strategy will be prepared. Annual hazard reduction programs, which may include mechanical fuel reduction techniques, prescribed burning and fire trail works, are submitted to the BFMC.

Killabakh and Coxcomb Nature Reserves occupy the steep, dissected predominantly southerly aspect slopes of the Comboyne Plateau. Rainforests and moist forest communities dominate this landscape, with unusual plant associations found on the peaks of Killabakh Mountain and Mount Coxcomb.

The remains of the small logging hut located on Yellow Rocks Creek Fire Trail is a fire vulnerable asset. There is potential for fires to spread into both reserves from surrounding forests and cleared grasslands. Killabakh Nature Reserve has several natural and constructed barriers that may inhibit the spread of fire. These include Yellow Rocks Creek and Yellow Rocks Creek Fire Trail, Duck Road, Dingo Creek and rainforest in the upper Lansdowne River catchment. In contrast, there are few natural and no constructed barriers to inhibit the spread of fire in Coxcomb Nature Reserve.

In November 1957 and November 1968, fires that originated at Kippaxs progressed from west to east over the Wingham-Comboyne Road in the vicinity of Mount Gibraltar and into the upper Lansdowne Valley in the planning area (Forestry Commission of NSW, 1979). The 1968 fire also burnt Mount Coxcomb as it progressed towards the coast (Cox, pers. comm., 2004). During the 1957 fire, a "secondary fire" started on the Wingham-Comboyne Road and progressed north and south on the western side of the road (Forestry Commission of NSW, 1979).

Since 1999 there have been three fires recorded in the planning area. These fires have originated in neighbouring private property and entered Killabakh Nature Reserve from the west and south. Ridge-tops near the western boundary of Killabakh Nature Reserve show evidence of frequent burning. This is likely to impact on rainforest and moist forest communities in this area and change composition of native vegetation.

NPWS has assessed Killabakh and Coxcomb Nature Reserves for fire management planning purposes and both reserves have been zoned as Land Management Zones (LMZs). The primary objective within LMZs is the conservation of biodiversity and protection of culturally significant features from fire. These reserves have been designated as LMZs because they are not adjacent to built assets which would be exposed to a high level of bushfire risk and they do not have a history of bushfire ignitions or known areas of high bushfire potential.

Fire requirements for most plant species can be summarised on the basis of vegetation communities, with a threshold in fire regime variability, marking a critical change from a high species diversity to low species diversity. Table 3 shows fire regime guidelines identified for Killabakh and Coxcomb Nature Reserves.

Table 4. Fire Interval Guidelines for Protection of Vegetation Communities.

Vegetation Community	Minimum Interval (yrs)	Maximum Interval (yrs)	Notes
Rainforest	n/a	n/a	Fire should be avoided
Wet sclerophyll forest	25	60	Crown fires should be avoided at the lower end of the interval range
Grassy dry sclerophyll forest	5	50	
Scrubby dry sclerophyll forest	7	30	

Source: Bradstock *et al.* (2003).

Goonook Nature Reserve contains a variety of moist forest ecosystems, primarily on a ridge system descending into the headwaters of the Dawson River.

There have been no recorded fires in Goonook Nature Reserve since 1999 and it is unknown if the 1958 and 1968 fires in the north of the planning area extended into the area now part of the reserve. Important fire control lines include Coopers Cutting Road, and Taylors Road. The priority will be to protect the catchment values and moist forest ecosystems in the headwaters to the Dawson River and the significant vegetation on the summit and south eastern slopes of Mount Goonook.

4.3. Soil Erosion

Soil erosion is not a significant issue in the planning area. There are however, a number of minor erosion issues along some small sections of roads near drain outlets and creek crossings. A section of Yellow Rocks Creek Trail has been realigned where it crosses Yellow Rocks Creek to overcome trail instability and erosion. Other sections of this trail have steep side slopes which are prone to slumping.

Prior to Killabakh Nature Reserve being dedicated, a major slip occurred on the Comboyne Road. In order to re-open the road large amounts of rock material were pushed off the road onto the downhill side into the Reserve. This resulted in the deforestation of a considerable area below the road. This area was covered by wet hardwood forest assemblages and rainforest at the time the damage occurred, and subsequent revegetation is occurring. Though some invasive and non invasive weed species have now colonised the disturbed site.

The steep topography of the planning area contributes to the high velocity of water during rainfall events. It is possible that during these events, silt could enter the adjacent waterways.

4.4. Visitor Impacts

The three summits of Killabakh Mountain, Mount Goonook and Mount Coxcomb have fragile geology and soils and significant vegetation communities. There is therefore potential for significant impacts in the vicinity of these mountains.

Excessive vehicle use on steep tracks and trails, particularly within Goonook Nature Reserve, could result in soil erosion, damage to vegetation and negative impacts on water quality in creeks and streams. Management tracks will be gated, and informal vehicle tracks will be allowed to re-vegetate.

5. MANAGEMENT OPERATIONS AND/OR OTHER USES

In addition to the roads available for public vehicle access, there is a network of management trails in the planning area (see map). The primary purpose of the management trail system is for fire management. Management trails also provide access for operations such as pest control, research and search and rescue. Vehicle access to management trails is restricted to essential or emergency purposes, although the trails are available for use by walkers.

The planning area includes lands which are vested in the Minister for the purposes of Part 11 of the NPW Act. These lands include Comboyne Road, Coxcomb Road and Ducks Road in Killabakh Nature Reserve and Taylors Road, Coopers Cutting Road, River Road, McGuilvray's Trail, Payne's Trail and Nichols Trail in Goonook Nature Reserve. Some existing Part 11 roads will no longer be required for access to private land. There are no Part 11 lands in Coxcomb Nature Reserve.

Schubert Trail within Killabakh Nature Reserve is required for continued access to neighbouring private land (see map). Access to this property may be provided by a licence under the NPW Act.

Several road and other crown land reserves are located within the planning area. A crown road reserve enters the western boundary of Killabakh Nature Reserve, terminating in a remote area within the reserve north of Yellow Rocks Creek. Other crown road reserves link crown reserves on the summit of Mount Goonook. NPWS will seek to acquire these road reserves (see map). Trigonometric stations are located on Killabakh Mountain and Mount Goonook and are used as survey reference points. Vegetation surrounding the trigonometric points may require maintenance to ensure line of sight from surrounding areas. The trigonometric point at Killabakh Mountain is within the planning area, while the trigonometric point at Mount Goonook is excluded from the planning area. NPWS will seek to add the land occupied by the trigonometric point at Mount Goonook into the planning area to ensure consistent management of the sensitive vegetation on both summits (see map).

There are three bee keeping sites located in Goonook Nature Reserve that predate the nature reserve's dedication. The bee keeping sites will be managed in accordance with the DECC Bee Keeping Policy and the standard conditions for the operation and management of apiary sites on NPWS estate. Bee keeping sites will be repositioned in close proximity to the system of public roads and management trails in consultation with the licensed apiarists.

6. MANAGEMENT STRATEGIES AND ACTIONS

Current Situation	Desired Outcomes	Management Strategies / Actions	Priority
6.1. Soil and water conservation Soil erosion is a minor issue in the planning area. It is associated with the road and management trail network. Erosion can cause localised damage to roads and trails during high rainfall events, and silt may enter adjacent waterways. Prior to the planning area being dedicated, a major slip occurred on the Comboyne Road resulted in the deforestation of an area in what is now know as Killabakh Nature Reserve. This area was covered by wet hardwood forest assemblages and rainforest at the time the damage occurred, and subsequent revegetation is occurring. Though some invasive and non invasive weed species have now colonised the disturbed site.	Soil erosion in the planning area is minimised. Water quality and health of reserve streams is improved. The landslip site is stabilised through natural revegetation.	6.1.1 Monitor road and trail network condition. Maintain roads to an appropriate standard and investigate options for the installation of erosion protection measures along sections of roads which pose a risk to soil stability. 6.1.2 Undertake all works in a manner that minimises erosion and water pollution. 6.1.3 Visually monitor the landslip site and implement weed control works where possible.	Medium High Low
6.2. Native plant and animal conservation The planning area contains a high diversity of forest ecosystems including large stands of old-growth forest. Some of these forest ecosystems are poorly conserved within NSW. The planning area contains a number of rare, threatened and regionally significant plant and animal species. The threatened species trailing woodruff and brown pomaderris have been recorded in Goonook Nature Reserve.	Native plant and animal species, and communities are conserved. Natural processes including regeneration of forest communities, in the planning area continue.	6.2.1 Allow natural regeneration of disturbed areas. Undertake rehabilitation and weed control works where necessary. 6.2.2 Implement relevant actions in the Threatened Species Priorities Action Statement and recovery and threat abatement plans for threatened species.	Medium High

Current Situation	Desired Outcomes	Management Strategies / Actions	Priority
The planning area contains isolated populations of Blue Mountains Ash and Kunzea sp. 'Middle Brother Mountain'. Five threatened and one ROTAP plant species are also predicted to occur in the planning area. Ten vulnerable animal species have been recorded in the planning area. It also contains suitable habitat for twenty other species listed under the TSC Act. There have been no flora and fauna surveys of parts of the planning area that were previously crown land or private property. Only minor surveys have been undertaken of the remaining section of the planning area.	Improved knowledge of threatened and significant plants and animals including their ecology and habitat requirements. Areas of previous disturbance are revegetated.	6.2.3 Undertake monitoring and surveys of threatened and significant species and communities, and in particular for trailing woodruff and brown pomaderris, Blue Mountains ash and Kunzea sp. 'Middle Brother Mountain'. 6.2.4 Implement a marker system throughout the road and trail network in the planning area to avoid damage to threatened or significant plant species from road works or weed control programs. 6.2.5 Work with neighbours and vegetation management committees to encourage conservation of remnant native vegetation in the vicinity of the reserve. 6.2.6 Encourage surveys for threatened plant and animal species with priority given to predicted habitat for threatened species and areas that were formerly crown and private land.	High Medium Medium Medium
6.3. Cultural Heritage The Biripi people have a connection with the planning area. It was likely that the planning area was traditionally used by local tribes for hunting and gathering of food resources and where cultural practices such as social gatherings and ceremonies were undertaken. Two Aboriginal sites have been recorded in Goonook Nature Reserve, and there are the remains of a logging hut and logging equipment in Killabakh Nature Reserve.	Aboriginal and historic features and values are identified and protected. Aboriginal people are involved in management of the Aboriginal cultural values in the park.	6.3.1 Undertake a cultural heritage assessment prior to ground disturbance work being undertaken. 6.3.2 Encourage Aboriginal cultural heritage study of the planning area in consultation with the Purfleet-Taree Local Aboriginal Land Council. 6.3.3 Ensure that any information on Aboriginal cultural heritage in the planning area is provided to the Purfleet-Taree Local Aboriginal Land Council, Elders groups and other relevant Indigenous persons.	High Low High

Current Situation	Desired Outcomes	Management Strategies / Actions	Priority
No comprehensive surveys have been undertaken in the planning area for sites of indigenous or non-indigenous cultural significance. Other cultural sites may exist within the planning area.	Understanding of the cultural values of the park is improved.	6.3.4 Determine historic significance of logging hut and remnant logging equipment that remains in Killabakh Nature Reserve.	Low
6.4. Introduced Plants and Animals Pest plant species are located in disturbed areas and along roadsides. One noxious weed present in the planning area is crofton weed. Pest animals recorded in the planning area include wild dogs, foxes and pigs. The Regional Pest Management strategy identifies the planning area for reactive pest animal species control rather than on going regular control programs.	Introduced plants and animals are controlled and where possible eliminated. Appropriate pest management techniques are implemented. The impact of introduced species on native species and neighbouring land is minimised.	6.4.1 Undertake pest species control and bush regeneration works in accordance with the Mid North Coast Region Pest Management Strategy 2008-2011. Target crofton weed and lantana and areas of disturbance such as road and trail edges. 6.4.2 Undertake wild dog baiting programs on a needs basis in cooperation with the Gloucester Rural Lands Protection Board and surrounding landholders. 6.4.3 Monitor pest animal species and implement control programs when necessary. 6.4.4 Monitor noxious and significant environmental weeds across the planning area particularly crofton weed at the landslip on Comboyne Road, Yellow Rocks Creek Trail and Duck Road and implement control programs when necessary.	Medium High High Medium
6.5. Fire Management Vegetation communities such as rainforests and wet sclerophyll forest are fire sensitive. Fire has historically entered Killabakh Nature Reserve from the west and south. No fire is known to have occurred in Coxcomb Nature Reserve since 1968.	Fire regimes are appropriate for conservation of native plant and animal communities.	6.5.1 Manage Coxcomb and Killabakh Nature Reserves as a LMZ (refer Section 4.2). 6.5.2 Prepare and implement a Reserve Fire Management Strategy for Goonook Nature Reserve (refer section 4.2).	High High

Current Situation	Desired Outcomes	Management Strategies / Actions	Priority
Fires are generally caused by escaped rural burns. A Reserve Fire Management Strategy is required for the Goonook Nature Reserve (refer section 4.2).	Life, property including adjoining dwellings and infrastructure are protected from fire. Where possible, fire is excluded from rainforest and wet sclerophyll forests.	6.5.3 Manage fire regimes to protect biodiversity in accordance with the identified fire frequency thresholds for vegetation communities and any fire sensitive communities. This includes, where possible, excluding fire from rainforests and wet sclerophyll communities. 6.5.4 Participate in Greater Taree District Bush Fire Management Committee. Maintain coordinated and cooperative arrangements with the Rural Fire Service Brigades, GTCC and surrounding landholders with regard to fuel management and fire suppression. 6.5.5 Maintain public roads and management trails as shown on the map for fire management.	High High High
6.6. Recreational Opportunities The planning area provides destinations for solitude, nature study, self-reliant passive recreation and limited vehicle-based opportunities. No formal walking tracks or other visitor facilities are located in the planning area. Use of the planning area must be carefully managed since it contains a mosaic of significant remnant vegetation and geology. There is no evidence of horse riding within the planning area. There are numerous horse riding opportunities in nearby State Forest.	Visitor use is appropriate and ecologically sustainable. The local community is aware of the significance of the area and of management programs.	6.6.1 Provide public vehicle access in accordance with the planning area map (refer page 3). 6.6.2 Access to remote walking destinations will not be promoted in the planning area. 6.6.3 Do not allow camping or horse riding in the planning area. 6.6.4 Permit walking on all roads and management trails within the planning area. 6.6.5 Permit cycling on all public roads in the planning area.	High High High High Medium

Current Situation	Desired Outcomes	Management Strategies / Actions	Priority
Vehicle use on steep tracks and trails, particularly within Goonook Nature Reserve, could result in soil erosion, damage to vegetation and negative impacts on water quality in creeks and streams. There is uncontrolled vehicle access to parts of the road and trail network within the planning area. Some trails are inappropriate for recreational use due to public safety and impacts on the environment. Excessive public visitation to remote destinations may result in site degradation. The potential for site degradation is greatest in the vicinity of the remote walking destinations of Killabakh Mountain, Mount Goonook and Mount Coxcomb.		6.6.6 Organised group visits to the summits of Killabakh Mountain, Mount Goonook or Mount Coxcomb will require consent, which will be based on the prevailing conditions and potential impacts. 6.6.7 No commercial tour operators will be permitted in planning area. 6.6.8 Monitor levels and impacts of use.	Medium Medium Medium
6.7. Research and Monitoring The planning area is an important scientific area. Previous research activities have primarily surrounded forestry operations. Areas of previous crown land and private property have had limited study and include sites of particular scientific interest surrounding the peaks of Killabakh Mountain, Mount Coxcomb and Mount Goonook Scientific study is needed to improve understanding of the planning area's natural and cultural heritage, the processes that affect them and the requirements for management of particular species.	Research enhances the management information base and has minimal environmental impact.	6.7.1 Undertake and encourage research to improve knowledge and management of natural and cultural heritage. 6.7.2 Priorities for research are the study of the geomorphology and plant and animal associations in the vicinity of the peaks of Killabakh Mountain, Mount Coxcomb and Mount Goonook.	Medium Medium

Current Situation	Desired Outcomes	Management Strategies / Actions	Priority
6.8. Management Operations and Other Uses			
A network of management trails and publicly available park roads occur within the planning area. This network requires rationalisation to improve planning area management outcomes and private property access. A number of road and other crown land reserves which do not provide practical access to neighbouring properties or facilities are located within the planning area. The trigonometric point at Mount Goonook is excluded from the planning area. Vegetation surrounding the trigonometric points in the planning area may require vegetation management to ensure line of site visibility. Three bee keeping sites are located in Goonook Nature Reserve.	Public park roads, management trails and Part 11 lands are provided as necessary for fire management, pest species, private property access and other management purposes. Management facilities and operations adequately serve management needs and have minimal impact. No crown road nor crown land reserves within the planning area unless they provide practical access to neighbouring properties. Bee keeping sites positioned in close proximity to the system of public roads and/or management trails. LEP zonings reflect nature reserve status.	6.8.1 Maintain a strategic network of management trails (see map) to a dry weather four wheel drive standard. Trails will be signposted to provide direction and gates or bollards installed where necessary to prevent unauthorised access. All other trails will be closed and allowed to re-vegetate. 6.8.2 Develop formal agreements and licences where necessary to allow continued access to private property. 6.8.3 Seek to incorporate Part 11 lands within the planning area which are no longer required for access to private land. 6.8.4 Seek to incorporate crown road or crown land reserves within the planning area. 6.8.5 Negotiate with apiarists to ensure licensed beekeeping sites are located in close proximity to public roads and/or management trails. 6.8.6 Management of vegetation surrounding trigonometric stations will be restricted to licensed persons under NPWS staff supervision. Vegetation clearing will be kept to the minimum extent necessary.	High High High Medium Medium Medium

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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