

**WINGHAM BRUSH NATURE RESERVE
PLAN OF MANAGEMENT**

**NSW National Parks and Wildlife Service
November 2003**

This plan of management was adopted by the Minister for the Environment on 5th November 2003.

For additional information or enquires on any aspect of the plan, contact the National Parks and Wildlife Service, Mid North Coast Regional Office, 152 Horton Street, Port Macquarie NSW 2444, or phone (02) 6586 8300.

NSW National Parks and Wildlife Service

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NATURE RESERVES IN NEW SOUTH WALES

Legislative and policy framework

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

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

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

MANAGEMENT OBJECTIVES

General objective for Nature Reserves

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

Under the Act, nature reserves are managed to:

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

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

Specific objectives for Wingham Brush Nature Reserve

The specific objectives for Wingham Brush Nature Reserve are to:

- conserve one of the few remnants of lowland rainforest on floodplain in NSW, which is listed as an endangered ecological community under the TSC Act;
- present Wingham Brush Nature Reserve as part of a network of rainforest remnants within the Manning Valley;
- promote the reserve as the first scientifically assessed rainforest regeneration project in Australia;
- recognise the reserve as a potential seed source to expand rainforests in the region;
- reduce the distribution and spread of pest species on the reserve;
- continue to involve the community in the management and protection of the natural and cultural values of the reserve;
- protect the grey-headed flying fox roosting / maternity colony;
- manage for protection of the reserve through controlled visitation;
- manage the reserve in the context of its connection with the adjoining Riverside Crown Reserve;
- continue education programs in conjunction with the Department of Education and Training and the Wingham Brush Environmental Learning Centre; and
- promote research into improving techniques for assisted rainforest regeneration.

WINGHAM BRUSH NATURE RESERVE

Location, gazettal and regional setting

Wingham Brush Nature Reserve (“the reserve”) is located in the township of Wingham, approximately 12 kilometres north west of Taree on the mid-north coast of NSW (see map, page 14). The reserve covers an area of approximately 9 hectares. Prior to its dedication as a nature reserve in 2000, Wingham Brush was Crown land managed by the Greater Taree City Council (GTCC).

Surrounding land use in the Wingham district consists primarily of grazing and dairy farms. Popular tourist attractions in the region include Wingham Brush Nature Reserve; Wingham Museum, Ellenborough Falls, Tapin Tops and Cottan-Bimbang National Parks, and Dingo Tops, Bulga and Doyles River State Forests.

Urban development in the vicinity of the reserve places significant pressure on the conservation and management of Wingham Brush. To the north of the reserve is a road reserve and Wingham High School Farm, and to the east is Wingham sewerage treatment plant. The Manning River and a riverbank recreational reserve are located to the south and south east, and Wingham Brush Primary School is located to the west of the reserve (see the map). A fence encloses the reserve and also a small area of land to the north east of the reserve and a portion of a crown reserve below the sewerage treatment plant.

Landscape Context

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

The geology, landform, climate and plant and animal communities of the area, plus its location, have determined how it has been used by humans. The reserves past history as a wharfage reserve protected it from being totally cleared in the 1800s however, selective logging, stock grazing, attempts to eradicate flying foxes and planting of introduced species have impacted on the reserve.

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

Significance of the reserve

Wingham Brush Nature Reserve is a remnant of lowland rainforest on floodplain in the NSW north coast bioregion, which is listed as an endangered ecological community under the TSC Act. Floodplain rainforest was extensively cleared throughout the Manning Valley during the 1800s primarily for agriculture. Wingham Brush was not totally cleared during this period because it was part of a wharfage reserve, which under the Government regulations at the time could not be legally logged.

Wingham Brush Nature Reserve consists primarily of floodplain subtropical rainforest, which was once an extensive vegetation community and now covers less than 100 hectares in NSW (NPWS, 1979), with all remnants being small and isolated. Wingham Brush Nature Reserve, and nearby Coocumbac Island Nature Reserve, are two of the few remaining remnants of floodplain subtropical rainforest between the Hunter and Bellinger Rivers.

Wingham Brush has gained national recognition as the site of the first scientifically assessed rainforest regeneration program in Australia. The technique developed at the site, known as the 'Wingham Brush Method', aims to obtain a weed free canopy, and then assists canopy closure and promotes rainforest succession. At the start of this program in 1980 the reserve was infested with pest plants which had smothered most of the rainforest canopy and posed a major threat to the conservation of the site.

The success of the program is attributed to dedicated community volunteers and bush regenerators who have worked on the project over many years. Due to the outstanding success of the project, the Wingham Brush Method has become a model for the restoration of other important rainforest areas. A similar regeneration project is now occurring on Coocumbac Island Nature Reserve.

NATURAL AND CULTURAL HERITAGE

Soils, landform and hydrology

The reserve is located on a floodplain of alluvial and sedimentary soils. Underlying rocks in the Manning Valley are sedimentary and metasedimentary rocks, including metashale, mudstone, siltstone, sandstone, quartzite and limestone (Rolls, 2001).

The topography of the reserve is slightly undulating with altitudes from 8 metres rising in the north-west to 20 metres above sea level.

Wingham Brush Nature Reserve lies within the Manning River catchment. A small tidal lagoon that is open to the Manning River is located in the south-east of the reserve. A network of drainage lines in the reserve, and in the reclaimed extension of Isabella Street, channels water flow through the reserve in a south-easterly direction to the lagoon and the Manning River. The southern section of the reserve is prone to frequent flooding, however, during major floods most of the reserve is inundated.

Native plants

The vegetation of Wingham Brush Nature Reserve includes both subtropical and dry rainforest. The majority of the reserve consists of floodplain subtropical rainforest classified by Floyd (1990) as suballiance No.3 “pepperberry - giant stinger - fig” (*Cryptocarya obovata* - *Dendrocnide excelsa* - *Ficus* sp). Wingham Brush contains approximately 10% of the floodplain subtropical rainforest remaining in NSW and is the southern limit for this suballiance (Floyd, 1990). Large emergent trees include Moreton Bay fig (*Ficus macrophylla*) and the upper canopy is of giant stinging tree (*Dendrocnide excelsa*), white cedar (*Melia azedarach*), black apple (*Planchonella australis*), pepperberry (*Cryptocarya obovata*), shiny-leaved stinging tree (*Dendrocnide photinophylla*) and hairy rosewood (*Dysoxylum rufum*).

Located in the southern section of the reserve near the riverbank reserve is a small section of dry rainforest, suballiance No.26 “weeping lilly pilli – watergum” (*Waterhousia floribunda* – *Tristaniopsis laurina*). Before extensive plantings in the 1990s, this riparian dry rainforest had been almost completely cleared with only scattered remnant trees of weeping lilly pilli remaining along the edge of the nature reserve and in the riverbank reserve (Stockard, 1992). Currently, there are very few protected examples of this suballiance.

There is also a small area of dry rainforest, suballiance No.28 “shatterwood – stinging tree – yellow tulip” (*Backhousia sciadophora* – *Dendrocnide* – *Drypetes*) (Floyd, 1990), in the higher areas of the reserve (Stockard, 1992). This suballiance is generally found on dry, steep, stony slopes.

Suballiance No.3 and No.26 are lowland rainforest on floodplain, which is listed as an endangered ecological community under the TSC Act.

The vegetation at Wingham Brush has a high floristic diversity with over 195 plant species recorded (Harden & Fox, 1990), including more than 70 tree species (Williams, 1993). Wingham Brush has been described as being floristically the richest of the floodplain rainforest remnants in the Manning Valley (Williams, 1993). There are no threatened plants known to occur in the reserve, though there are a number of native

plants at or near their geographical limit of distribution, such as grey handlewood (*Aphananthe philippinensis*), blush walnut (*Beilschmiedia obtusifolia*), native plum (*Guilfoylia monostylis*), foambark (*Jagera pseudorhus*) and mat-rush (*Lomandra hystrix*) (Floyd, 1989; Harden, 1991-93). The largest known blush walnut tree in Australia has been recorded in the reserve, with a height of 37m and a diameter of 107cm.

The lagoon is open water edged by dry rainforest to the south and subtropical rainforest to the north, both communities being interspersed with plantings of river oak (*Casuarina cunninghamiana*).

Native Animals

The reserve is well known as a major maternity site for the grey-headed flying fox (*Pteropus poliocephalus*). The grey-headed flying fox is listed as vulnerable under the TSC Act and the Commonwealth's *Environment Protection and Biodiversity Conservation Act 1999*. The NSW Scientific Committee (2001) estimated that counts of flying fox populations over the preceding decade had declined by up to 30% and predicted that populations will continue to decrease given the continuation of habitat loss and culling.

The reserve is the only known continuously occupied site for the grey-headed flying fox between Coffs Harbour and the Hunter Valley (Dr Peggy Eby *pers.comm*). In NSW, only 5% of roost sites for flying foxes occur in conservation reserves (NSW Scientific Committee, 2001). The site is also one of the few sites in NSW used for releasing injured or orphaned flying foxes. Flying foxes are valuable in dispersing pollen and rainforest seeds over great distances and thus assisting in the regeneration of different forest communities along the east coast.

A range of management issues often result from the proximity of flying fox camps to urban areas (Eby, 1995). Flying foxes are vulnerable to loud noise and disturbance, particularly during the final weeks of pregnancy which can result in spontaneous abortions and also during early maternity when females have been known to drop dependent young (Eby, 1995).

Other vulnerable species that have been recorded in the reserve include the osprey (*Pandion haliaetus*), black-necked stork or jabiru (*Ephippiorhynchus asiaticus*) and wompoo fruit-dove (*Ptilinopus magnificus*). The mountain brushtail possum (*Trichosurus caninus*), green catbird (*Ailuroedus crassirostris*), land mullet (*Egernia major*), regent bowerbird (*Sericulus chrysocephalus*), little red flying fox (*Pteropus scapulatus*) and nearly 100 bird species have also been recorded. The Australian brush-turkey (*Alectura lathami*) has been reintroduced to the reserve.

The reserve is an important winter foraging area for seasonal altitudinal migrants, such as fruit pigeons, bowerbirds and bats. The continued existence of these species depends upon the resources of lowland rainforest remnants. Thus the reserve complements and supports higher altitude rainforest areas, including those on the World Heritage listed Central Eastern Rainforest Reserves of Australia.

A number of scientific studies of invertebrates have been undertaken in the reserve. Wingham Brush is the type locality for two beetle species, *Castiarina williamsi* (G. Williams *pers.comm*) and *Cardiothorax alternatus* (Watkins, 1999).

Aboriginal heritage

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

Prior to European occupation, the rainforest in the reserve would have extended over much of the floodplains of the Manning Valley. The Biripi people are known to have used rainforests for a variety of cultural purposes such as the gathering of plants and animals for food and medicinal purposes. There is one recorded Aboriginal site in the reserve.

The Purfleet -Taree Local Aboriginal Land Council, the Giuiwan Elders, the Biripi people and other indigenous persons represent contemporary Aboriginal involvement in Wingham Brush Nature Reserve. It is NPWS policy to involve the Aboriginal community in the management of the reserve's Aboriginal heritage.

Previous land use and historic heritage

Since European settlement the reserve has experienced a variety of different land use practices. In the 1830s surveyor Clement Hodgkinson visited the Manning and other coastal rivers in northern NSW and wrote that "the luxurious and vigorous character of the Brush, on alluvial land in the northern part of NSW cannot be surpassed in any tropical region" (NPWS, 1977).

Around the mid 1800s the reserve was selectively logged for timber, especially red cedar (*Toona ciliata*). Two cedar saw pits remain in the reserve as evidence of these operations. Although selectively logged, the reserve was not cleared because it was set-aside for a wharf and associated facilities. The wharf, which is located east of the reserve, was constructed in the mid 1800s and is listed as a heritage item under the Hunter Regional Environmental Plan.

The reserve was dedicated for the preservation of native flora and public recreation in 1906, and there was an addition to this area in 1916. It continued to be used, however, for stock grazing and for special events such as church services and as a backdrop for musical concerts. The reserve was dissected by unsealed roads and trails throughout its interior, and horses, motor bikes and bicycles were regularly ridden through the reserve.

From the late 1800s through to the 1960s, there were many unsuccessful attempts by the community to eradicate the flying foxes from the reserve, and a number of plants not native to the Manning Valley were planted in the reserve.

It is historically significant that the reserve was the first formal attempt to restore a degraded rainforest in Australia, (Stockard, 1999) and possibly the world (Hunter, 1998). The regeneration program in Wingham Brush started in 1980 with the formation of the Wingham Brush Regeneration Team under the auspices of the National Trust of NSW. Since this time the restoration of Wingham Brush to its current condition has

involved a number of dedicated and skilled bush regenerators, volunteers and support from organisations such as the National Herbarium, the National Trust, the Wingham Brush Society Inc., GTCC and Monsanto. In particular, Dr John Stockard has been dedicated to the restoration program since 1980, and continues to provide support and knowledge to the regeneration program and the conservation of the reserve.

The lower section of the walking track parallel to Farquhar St has been dedicated to the memory of Graham Allen, who was an early campaigner for the preservation of rainforests and campaigned for the conservation and restoration of Wingham Brush.

Wingham Brush Nature Reserve is listed as part of the Wingham Urban Conservation Area on the Register of the National Estate. The Conservation Area encompasses approximately 30 hectares and includes other sections of Wingham township. It was listed on the Register in 1989 due to its historical, environmental and streetscape significance.

A teak tree (*Flindersia australis*) located in the south east corner of the reserve near the sewerage treatment plant is believed to have some historic significance as a memorial tree planted by a captain of a coastal steamer.

Recreation and education

Wingham Brush Nature Reserve is of “outstanding scientific, education and recreational value” (National Trust, 1981) and is a popular destination for school groups, tourists and the local community. The proximity of the reserve to Wingham township, and to the riverbank recreational reserve, ensures its continuing popularity.

In 1991, the NSW Education Department established the Wingham Brush Environmental Learning Centre at Wingham Brush Primary School. A Field Studies Officer at the Learning Centre is jointly funded by the NSW Department of Education and Training and NPWS (through the NPWS Discovery program) to undertake organised group tours through the reserve. Educational material on Wingham Brush and Coocumbac Island Nature Reserve is also housed at the Learning Centre.

School groups who tour the reserve often also visit the Wingham Urban Wetlands (managed by the GTCC). This enables school children to view practical examples of different ecosystems on a day trip.

There are three entry points to the reserve. The Rowley Street entrance has been closed since the construction of an “All Access” walking track through the reserve which provides improved visitor access and minimises impacts on reserve values.

Visitors to the reserve often use the day use facilities located in the adjacent riverbank reserve, which is managed by the GTCC. This reserve also has facilities for people with physical disabilities.

Research and monitoring

Wingham Brush is an important scientific reference area, having been used for a range of research projects with particular emphasis on the regeneration and conservation of rainforest remnants. There is detailed documentation on the techniques and the

progress of the rainforest regeneration program and a number of scientific papers have been produced on this topic.

In 1990, the National Herbarium published the first scientific assessment of a rainforest regeneration program in Australia at Wingham Brush (Harden & Fox, 1990). Information has also been compiled on flying fox populations and the ecology of invertebrates. Most scientific studies have been undertaken by students from tertiary institutions and through projects funded by external sources such as the National Herbarium and the Australian Museum.

Since 1998, every autumn and winter, a number of volunteers and organisations such as the Flying Fox Information Conservation Network have undertaken counts of the population of grey-headed flying foxes at Wingham Brush. This is part of a national research project to monitor population numbers for flying foxes at camps throughout their range in Queensland, NSW and Victoria.

The bush regeneration team working at the reserve regularly records flowering and fruiting plants and fauna sightings during their weekly visits.

THREATS TO THE RESERVE

Pest species

In 1976 rainforest ecologist Alex Floyd inspected the area and reported that “weeds are seriously threatening the viability of this area by smothering any regeneration in the openings. The present type of management must inevitably cause the complete destruction of this rainforest.” The most prolific weeds that threatened Wingham Brush were cats claw creeper (*Macfadyena unguis-cati*), madeira vine (*Anredera cordifolia*) and balloon vine (*Cardiospermum grandiflorum*). These vines dominated the canopy and smothered the vegetation, often resulting in tree mortality (Stockard *et al.*, 1985).

Today, most exotic vines have been removed from the forest canopy, though some tuberous root systems of madeira vine and cats claw creeper are still present. Wingham Brush is subject to the reinfestation by a number of exotic weed species through floodwaters and dispersal by animals. Green cestrum (*Cestrum parqui*) is the only weed present in the reserve that is listed as a noxious weed in the Greater Taree City Council area.

A number of trees not native to the area were planted in the reserve, including bunya pine (*Araucaria bidwillii*), hoop pine (*Araucaria cunninghamii*), jacaranda (*Jacaranda mimosifolia*) and bougainvillea (*Bougainvillea sp.*). Over the last two decades the regeneration program has removed most of the introduced trees. The only species remaining include three bunya pines, a teak (*Flindersia australis*), a silky oak (*Grevillea robusta*), and a firewheel tree (*Stenocarpus sinuatus*). It is not proposed to remove the teak tree because it is thought to have historical significance and seedlings from this tree are not spreading in the reserve (refer Previous land use and historic heritage). All the other introduced trees (other than the teak) will be assessed for their heritage significance and managed to ensure the floristic integrity of the reserve is maintained.

Pest animals of concern to management in the reserve include feral and domestic cats (*Felis catus*), feral honeybees (*Apis mellifera*), foxes (*Vulpes vulpes*) and black rats (*Rattus rattus*). Feral honeybees and foxes have been listed as key threatening processes under the TSC Act. Domestic dogs (*Canis familiaris*) are also often sighted in or near the reserve. Introduced animals can impact native wildlife through predation, disturbance and competition for habitat and food resources.

Visitation and urban influences

Wingham Brush has suffered considerable disturbance because it is within the township boundaries (Stockard *et al.*, 1985). The river is a popular recreation site for the community of Wingham and many people access the river from the town through the reserve.

Current use patterns have led to compaction of soil on walking tracks, vandalism to infrastructure and vegetation, and disturbance to fauna, especially the flying foxes. In particular, the Rowley Street entrance was often used as a thoroughfare by people wanting to access areas other than the nature reserve. Bicycles are regularly ridden through the reserve and it is not uncommon for some people to deliberately disturb the flying fox colony. In order to minimise damage in this vicinity, the Rowley Street entrance has been closed.

The hydrological processes of the reserve have been significantly modified due to urban development and infrastructure. There are three urban stormwater drains that directly discharge into the reserve. During high rainfall periods, the high velocity of stormwater entering the reserve causes localised erosion at the discharge points. Other impacts caused by the discharge of urban stormwater include the importation of pollutants and weed propagules.

Non NPWS uses

A transformer and an underground cable are located in the south-east section of the reserve. Future maintenance of the cable may require disturbance to vegetation and soil in this area. In the southern section of the reserve are two floodlights, one is located in the reserve and another is situated on the riverside reserve near the lagoon. It is not known what impact the floodlights may be having on the flying fox colony.

An above-ground sewerage pipeline, that transports raw sewage to the sewerage treatment plant, is located along the northern boundary of the reserve near Combined Street. Also in this vicinity is the High School Farm that contains a number of agricultural animals. Pollutants and weeds may enter the reserve from these areas.

Natural events

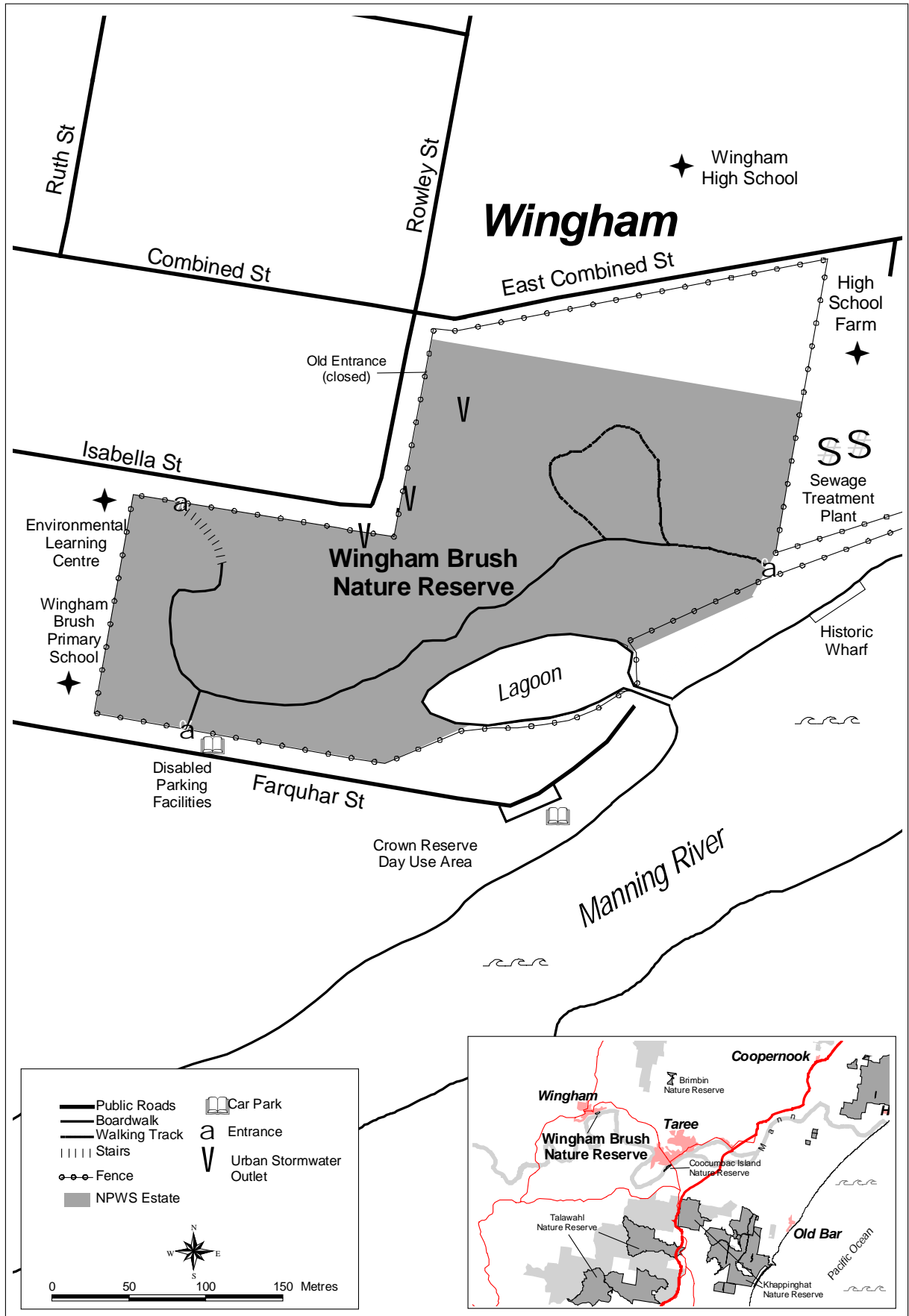
Natural events such as floods, storms, lightning strikes and fire may have a significant effect on the reserve. To minimise this impact, there is a need for prompt remedial works immediately after such events.

The NPWS approach to fire management planning uses a system of zones which are compatible with district bushfire risk management plans. NPWS has assessed the reserve for fire management planning purposes and has zoned the reserve as a Heritage Area Management Zone (HAMZ). The primary fire management objectives for this zone are to prevent the extinction of all species that are known to occur naturally within the reserve, and to protect culturally significant sites. The reserve has been designated as a HAMZ because of the sensitivity of endangered rainforest vegetation and grey-headed flying fox maternity colony. The HAMZ does not require intensive management and focuses on those actions appropriate to conserve biodiversity and cultural heritage including exclusion of fire from the reserve.

Impacts from floods are generally concentrated on the lowest terrace close to the Manning River, though during a major flood virtually the entire reserve can be inundated. The major impacts are damage to vegetation and infrastructure and the importation of weed propagules from other areas in the catchment. Pollutants, rubbish and soil are also often deposited on the reserve by floods.

The clearing of large areas of rainforest on the NSW north coast has produced a shortage of roosting sites for flying foxes, resulting in damage to the small remnants such as Wingham Brush (Floyd, 1990). Flying fox population numbers fluctuate in the reserve. In the summer of 1995, it was estimated that over 450,000 little red flying foxes camped in the reserve for three months (Anthony Greenland *pers.comm*; Stockard, 1996). Damage to the rainforest canopy can result from a large flying fox population. Little red flying foxes have been known to cause the most damage, as they collect in large groups in the canopy. This impact tends to be short term but should be monitored.

Map: Wingham Brush Nature Reserve and its regional setting



MANAGEMENT STRATEGIES

Current Situation	Desired Outcomes	Strategies	Priority
<p>Soil and water conservation</p> <p>Three urban stormwater outlets that drain directly into the reserve are contributing to soil erosion in the vicinity of the drains.</p> <p>The lower portion of the reserve is regularly inundated by floodwaters causing damage to vegetation and reserve infrastructure.</p> <p>Stormwater, surface run-off and floods are also contributing to pollutants, rubbish and weed propagules entering the reserve. The Greater Taree Urban Stormwater Management Plan (GTCC, 2000) has proposed to install a pollutant trap or litter sock on one of the stormwater outlets in the reserve. The NPWS preferred option is a trap or litter sock outside the reserve. Installation of a trap or litter sock is likely to remain a low priority for GTCC unless specific funding becomes available. Community education would assist in minimising input of pollutants into the storm water outlets.</p>	<p>Soil erosion arising from the stormwater outlets is minimised.</p> <p>Nutrients, weed propagules and other pollutants entering the reserve are minimised.</p>	<p>Undertake all works in a manner that minimises erosion and water pollution.</p> <p>Consult with GTCC about the Greater Taree Urban Stormwater Management Plan regarding the preparation of a feasibility study on the maintenance and improvement to stormwater outlets in the reserve.</p> <p>Based on the feasibility study and an acceptable environmental assessment, implement works that will dissipate the velocity of stormwater entering the reserve and minimise erosion at discharge points with priority given to the two drains adjacent to Rowley Street.</p> <p>Liaise with GTCC to implement public education and stormwater management methods to minimise the discharge of litter carried in stormwater from entering the reserve.</p> <p>Liaise with Mid Coast Water to ensure the sewerage treatment plant has no impact on the reserve.</p> <p>Support GTCC and the EPA in encouraging the community to reduce nutrient inputs and pollutants entering the Wingham Brush catchment.</p> <p>Continue to work with the Lower North Coast Catchment Management Board to improve the level of weed control, the integrity of riparian vegetation and the water quality in the catchment.</p>	<p>High</p> <p>High</p> <p>High</p> <p>Medium</p> <p>Low</p> <p>Medium</p> <p>Medium</p>

Current Situation	Desired Outcomes	Strategies	Priority
<p>Native animals</p> <p>Studies and surveys undertaken in the reserve have focused on flying foxes, birds and invertebrates. The reserve is a major roosting and maternity site for the grey-headed flying fox.</p> <p>Other threatened species recorded in the reserve include the osprey, black-necked stork and the wompoo fruit-dove.</p>	<p>The habitat for native fauna is conserved.</p> <p>The grey-headed flying fox colony is protected from disturbance.</p> <p>Threatened fauna populations do not decline.</p> <p>There is increased knowledge of the reserve's fauna and their requirements.</p>	<p>Encourage education campaigns about the flying fox colony that provide the following information:</p> <ul style="list-style-type: none"> • threats to the flying fox colony, especially from human disturbance; • conservation issues and the importance of the reserve as a major maternity site for the grey-headed flying fox; and • the need to expand floodplain subtropical rainforest as habitat for flying fox camps to prevent unsustainable damage to existing rainforest remnants. <p>Monitor the flying fox colony, their habitat requirements and their impact on the rainforest canopy.</p>	<p>Medium</p> <p>Medium</p>
<p>Native plants</p> <p>The reserve contains lowland rainforest on floodplain, which is listed as an endangered ecological community under the TSC Act. The reserve is situated in the township of Wingham and is isolated from other rainforest remnants.</p> <p>A number of native plants recorded on the reserve are at their geographical limit of distribution. There are no known threatened plants recorded on the reserve.</p> <p>A rainforest regeneration program by GTCC and the local landcare group on the Crown Reserve to the south west of the nature reserve will hopefully result in extending the area of the lowland rainforest on floodplain.</p>	<p>The floristic integrity of the reserve is maintained and improved.</p> <p>Native vegetation on bordering land is regenerated to provide links to the lowland remnant and as habitat for wildlife.</p>	<p>Continue ongoing rainforest regeneration and weed control programs to re establish species composition, structure and ecological processes (refer Pest species).</p> <p>Implement measures included in recovery plans for lowland rainforest on floodplain or any threatened species when prepared.</p> <p>Work with the GTCC and the community to encourage conservation and expansion of native vegetation in the vicinity of the reserve and throughout the catchment.</p> <p>Promote and support volunteer rainforest regeneration activities in the reserve (refer also Pest species).</p>	<p>High</p> <p>Medium</p> <p>Medium</p> <p>Medium</p>

Current Situation	Desired Outcomes	Strategies	Priority
<p>Pest species</p> <p>Weeds have been a major problem at Wingham Brush. Their impact has been greatly reduced through a concerted bush regeneration program. Currently, a team of contractors undertakes the rainforest regeneration program in accordance with an interim plan. It is envisaged that it will take at least 10 years to eradicate madeira vine and cats claw creeper. Regular on-going control work is essential because Wingham Brush is prone to reinfestation from outside the reserve (especially from floods).</p> <p>Some tree species in the reserve are not endemic to the Manning Valley. One of these trees is a teak (<i>Flindersia australis</i>), that is thought to have historical significance and does not pose a threat to the reserve as seedlings are not spreading (refer Cultural heritage).</p> <p>A regional pest strategy addressing some of the introduced animal species found in the reserve has been prepared by NPWS. Successful fox control programs have previously been undertaken.</p>	<p>Pest flora and fauna are controlled and where possible eradicated.</p> <p>The rainforest regeneration program is on-going to keep pest plants under control.</p> <p>The amount of weed propagules entering the reserve is reduced.</p> <p>Noxious and environmental weeds are removed or brought under control.</p>	<p>Rainforest regeneration and weed eradication programs will continue in the reserve.</p> <p>Prepare and implement a pest species management plan (which will replace the consultant's interim plan) for the reserve that outlines:</p> <ul style="list-style-type: none"> • appropriate methods for weed control and rainforest regeneration; • options and techniques for feral animal control; and • mechanisms for monitoring pest species and the rainforest regeneration program. <p>Record the remaining introduced trees, assess for their heritage significance and manage to ensure the floristic integrity of the reserve is maintained. Allow the teak and any other trees of heritage significance that are not spreading to die naturally. Remove all other introduced trees and any seedlings should they occur.</p> <p>Encourage volunteers to be involved in bush regeneration in the reserve.</p> <p>Liaise with GTCC to encourage neighbours to control environmental weeds and pest animals on adjacent and nearby land.</p> <p>Undertake pest animal control programs in accordance with the regional pest strategy with priority programs on the fox and cat.</p> <p>Manage feral honeybees in accordance with the Threat Abatement Plan when it is prepared and eradicate hives where possible.</p>	<p>High</p> <p>High</p> <p>Medium</p> <p>High</p> <p>Medium</p> <p>Medium</p> <p>Low</p>

Current Situation	Desired Outcomes	Strategies	Priority
<p>Fire</p> <p>The reserve has been designated as a HAMZ because of the sensitivity of endangered rainforest vegetation and grey headed-flying fox maternity colony.</p>	<ul style="list-style-type: none"> • Life, property, natural and cultural values in and adjacent to the reserve are protected from fire. • Fire is excluded from the reserve. 	<p>Manage the reserve as a Heritage Management Zone where unplanned fire is excluded from the reserve.</p>	<p>High</p>
<p>Cultural heritage</p> <p>The Biripi people are known to have used Wingham Brush for a variety of cultural purposes. There is one recorded Aboriginal site in the reserve.</p> <p>The rainforest regeneration program undertaken in the reserve is considered to be of historic interest.</p> <p>Wingham Brush Nature Reserve is listed on the Register of the National Estate as part of the Wingham Urban Conservation Area.</p> <p>A section of the walking track has been dedicated in remembrance of Graham Allen, who was a campaigner for the preservation of rainforests in the Manning Valley and restoration of Wingham Brush.</p> <p>There are two former cedar sawpits remaining in the reserve.</p>	<p>The cultural heritage of the reserve is recorded and sites protected.</p> <p>Relevant community members and groups are involved in the consultation and preservation of cultural heritage sites and information.</p>	<p>The Purfleet -Taree Local Aboriginal Land Council, the Giuiwan Elders, the Biripi and other relevant people will be consulted in the management of Aboriginal cultural heritage sites, places and values.</p> <p>The Purfleet -Taree Aboriginal Land Council and the Giuiwan Elders will be consulted about the protection of the recorded site, and whether they want the site and/or any other cultural places in the reserve interpreted to the public.</p> <p>A photographic record of the historic rainforest regeneration program of Wingham Brush will be prepared and maintained.</p> <p>An archeological site investigation will be undertaken in areas where any new developments or earthworks are proposed.</p> <p>An explanation of who Graham Allen was and his work will be included in future interpretive information.</p>	<p>High</p> <p>High</p> <p>Medium</p> <p>Medium</p> <p>Medium</p>

Current Situation	Desired Outcomes	Strategies	Priority
<p>A teak tree located in the south east corner of the reserve is thought to have historical significance.</p>		<p>The two former cedar saw pits in the reserve will be protected and interpreted.</p> <p>Record the location of the teak tree and allow to die naturally (refer also Pest species)</p>	<p>High</p> <p>Medium</p>
<p>Recreation and Education</p> <p>Use of the reserve should be low key and nature-based. Access to the reserve will be reduced to three entry points: two in Farquhar Street and one in Isabella Street.</p> <p>The Wingham Brush Environmental Learning Centre conducts regular school tours through the reserve. Educational material on Wingham Brush and Cocumbac Island Nature Reserve is also housed at the Learning Centre. The reserve is also used for the NPWS Discovery Program.</p> <p>There are currently no licensed commercial tour operators using the reserve.</p> <p>Carpark, toilet and picnic facilities are located on the adjacent riverside reserve managed by GTCC (see “stakeholder involvement” section below).</p> <p>The walking track parallel to the river and Farquhar Street has been upgraded to an ‘All Access’ (class 1) walking track.</p> <p>A separate walking track, leading off the main track, accesses two large fig trees and the flying fox colony (the location of which can change within the reserve) which are popular</p>	<p>Visitors are aware of the significance of the reserve and the conservation programs undertaken.</p> <p>The reserve continues to be used as an educational resource.</p> <p>Soil compaction and erosion of the walking tracks is minimised.</p> <p>An All Access (class 1) walking track traverses the reserve.</p> <p>Visitor use is nature based and ecologically sustainable.</p>	<p>Promote the reserve as an educational resource, focusing on:</p> <ul style="list-style-type: none"> • the endangered ecological community; • vulnerable fauna; and • the site of the first scientifically assessed rainforest regeneration program in Australia. <p>Continue to support and encourage educational groups to visit the reserve and the Wingham Brush Environmental Learning Centre, through joint management with the Department of Education and Training.</p> <p>Update educational material as necessary to ensure it remains relevant and meets changing needs.</p> <p>Maintain the “All Access” (class 1) walking track.</p> <p>Construct a loop walking track in the northern section of the reserve near the current flying fox colony. Close the proposed loop walking track during certain periods of the breeding season if necessary to minimise disturbance to the grey-headed flying fox colony.</p> <p>Monitor visitor numbers in the reserve.</p> <p>Park entry fees will not apply to the reserve.</p> <p>Liaise with the Department of Education and Training,</p>	<p>High</p> <p>High</p> <p>Low</p> <p>High</p> <p>Medium</p> <p>Medium</p> <p>High</p> <p>High</p>

Current Situation	Desired Outcomes	Strategies	Priority
<p>features sought after by visitors. This track will be upgraded to prevent degradation to the surrounding forest and will be extended westward to create a circuit track to improve pedestrian access. The map shows the proposed walking track network.</p> <p>Vandalism and disturbance to wildlife occurs in the reserve, mostly near the old Rowley Street entrance.</p>		<p>Police and the local community to promote appropriate visitor behaviour to minimise disturbance and vandalism.</p>	
<p>Interpretation and signage</p> <p>There are formal interpretation bays located at the entrances to the reserve off Isabella Street and the western end of Farquhar Street. A number of interpretation signs are located throughout the reserve.</p> <p>The current signage is considered inadequate and is in need of upgrading and maintenance. Some signs have been vandalised.</p>	<p>The importance of the natural and cultural heritage of the reserve is promoted through appropriate interpretation.</p> <p>Vandalism and poor visitor behaviour is significantly reduced through improved interpretation and enforcement.</p> <p>Interpretation highlights threats to the reserve's values.</p>	<p>Interpretation signs throughout the reserve will be updated and replaced where required.</p> <p>Install a third interpretation display at the entrance near the wharf, in an area that is not subject to high velocity floodwaters.</p> <p>Interpretation will highlight:</p> <ul style="list-style-type: none"> • the success of the rainforest regeneration project; • the contribution of community groups in the rainforest regeneration project; • the importance of lowland rainforest on floodplain; • the reserve as a major maternity site for the grey-headed flying fox and the impacts of disturbance on the species. <p>Increase NPWS law enforcement and media coverage to address vandalism in the reserve.</p>	<p>High</p> <p>Medium</p> <p>High</p> <p>High</p>

Current Situation	Desired Outcomes	Strategies	Priority
<p>Research and monitoring</p> <p>The reserve has been used for a range of research projects with emphasis on the regeneration and conservation of rainforest remnants, flying fox populations and the ecology of invertebrates. Most scientific studies have been undertaken by students from tertiary institutions.</p> <p>In addition to the scientific studies, there have been biannual flying fox counts since 1998 and the bush regeneration team undertakes weekly observations of the reserve's plants and animals.</p>	<p>Research enhances the knowledge and management of the reserve.</p> <p>Research has minimal environmental impact</p> <p>The Aboriginal community is involved in research of their cultural heritage.</p> <p>Natural processes and biological observations continues to be recorded.</p>	<p>Encourage research into topics of relevance to management including:</p> <ul style="list-style-type: none"> • an updated plant survey and species list; • management of stormwater in the reserve; and • the long term conservation of flying foxes and their habitat requirements. <p>Ensure research involving Aboriginal heritage or culture is carried out in consultation with the Aboriginal community.</p> <p>Continue to encourage and support the monitoring of grey-headed flying fox numbers in the reserve.</p> <p>Enter all species records obtained from the bush regeneration team and other groups or individuals in the NPWS NSW Wildlife Atlas database.</p>	<p>Medium</p> <p>High</p> <p>High</p> <p>High</p>
<p>Reserve boundary</p> <p>The reserve was fenced in 1988 through a Bicentennial project grant. However, the fenced area includes a small section of unused road reserve, crown land and a portion of land held by the Department of Education and Training. Bush regeneration activities are occurring within the whole of the fenced area. The addition of these lands to the nature reserve would formalise their current management by NPWS and enhance the reserve's viability.</p>	<p>The reserve is expanded to include the adjacent areas of lowland rainforest.</p>	<p>Liaise with relevant authorities to have the land within the fenced area incorporated into the reserve (see the map).</p> <p>Maintain the reserve's boundary fence.</p>	<p>High</p> <p>High</p>

Current Situation	Desired Outcomes	Strategies	Priority
<p>Non NPWS uses</p> <p>An electricity transformer and an underground power cable are located in the south-east of the reserve.</p> <p>A major above ground sewerage pipeline is located along the northern boundary of the reserve and connects to the sewerage treatment plant outside the reserve. The area is under rainforest regeneration and is currently vegetated with rainforest species. The pipeline is a critical component in the collection system and if the system failed access with machinery may be required to undertake repairs.</p>	<p>Non NPWS infrastructure is relocated, but if not possible, it is licensed and has minimal or no impact on the reserve's values.</p>	<p>Pursue options for the relocation of the electricity transformer and underground cable to outside the reserve.</p> <p>Consult with Mid Coast Water on the management of the sewerage treatment plant and the pipeline including procedures required during emergency operations, any new works proposed and general maintenance of the facilities.</p> <p>Pursue options for the relocation of the sewerage pipeline to outside the bush regeneration area.</p> <p>An authority under the NPW Act, preferably in the form of a licence with conditions, will be required for all non-NPWS infrastructure.</p>	<p>Low</p> <p>Medium</p> <p>Medium</p> <p>Low</p>
<p>Stakeholder Involvement</p> <p>The adjacent riverside reserve, managed by the GTCC, forms a gateway to the reserve. Reserve visitors often use the facilities provided on the riverside reserve. Coordinated and complementary management of these areas would enhance visitor satisfaction and further assist by enhancing the sustainability of the reserve ecosystem.</p>	<p>There is cooperative management between adjacent lands and the nature reserve.</p> <p>There are ongoing opportunities for stakeholder consultation in reserve management</p>	<p>Establish a 'Friends of Wingham Brush Nature Reserve' to facilitate community and government input into the management of the reserve and the adjacent lands.</p> <p>Pursue with GTCC options to prepare a joint landscape plan for Wingham Brush and the riverside reserve.</p>	<p>Medium</p> <p>Medium</p>

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 are available.

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GLOSSARY

Biodiversity	Biological diversity, namely the variety of life forms: the different plants, animals and microorganisms, the genes they contain, and the ecosystems they form. It is usually considered at three levels: genetic diversity, species diversity and ecosystem.
Bioregion	A complex land area defined by a combination of biological and geographic criteria rather than geopolitical considerations and composed of a cluster of ecosystems and communities that are repeated in similar form throughout. Bioregions vary in size, with larger regions found where areas have subdued terrain, and low variability in soil types, geology, vegetation and climate. Also known as biogeographic regions.
Conservation	All the processes and actions of looking after a place (such as protection, maintenance, management, sustainable use and restoration) so as to retain its natural and cultural significance. Conservation is based on respect for biodiversity and ecological processes, and requires an increased understanding of an area's values. Conservation is an obligation under the World Heritage Convention.
Cultural heritage	Encompasses past and present cultural associations of all people in Australia, including tradition, knowledge and customs. It can be tangible (i.e. have physical manifestations in the form of art, buildings etc.) or intangible (i.e. spiritual or social associations, songs, stories and cultural practices). Cultural significance includes values that are social, spiritual, aesthetic, historic and scientific. When natural resources acquire meaning for a particular group, they become cultural resources as well.
Ecological community	An assemblage of species occupying a particular area.
Endangered ecological community	An ecological community specified in Part 3 of Schedule 1 of the TSC Act.
Endangered	A species, population or ecological community that is listed in Schedule 1 of the TSC Act as in danger of becoming extinct.
Fauna	Any mammal, bird, reptile or amphibian. NPWS has responsibility for the conservation of fauna. Note this definition excludes fish or invertebrates.
Regeneration	The recovery of natural integrity following disturbance or degradation. This can be achieved through totally natural processes or an assisted process, where human intervention (through removing weeds or planting seedlings) accelerates recovery.
Suballiance	A suballiance is a classification of rainforest vegetation based on key species, plant structure and environmental characteristics of each site such as climate, topography and soil. Floyd (1990) has applied this classification system throughout NSW.
Succession	The process of replacement over time of one ecological community by another, usually in an area that has previously been disturbed.
Type Locality	The locality in which the specimen that serves for the original description of the species is located.