DURAL NATURE RESERVE

DRAFT PLAN OF MANAGEMENT

NSW National Parks and Wildlife Service

Part of the Department of Environment, Climate Change and Water

September, 2009

Acknowledgements

The NPWS acknowledges that this reserve is in the traditional country of the Darug language group and Guringai people.

This plan of management was prepared by staff of the Sydney North Region of the NSW National Parks and Wildlife Service (NPWS), part of the Department of Environment and Climate Change.

For additional information or any inquiries about this reserve or this plan of management, contact the NPWS Lower Hawkesbury Area Office, PO Box 3056, Asquith NSW 2077 or by telephone on 9472 9321.

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INVITATION TO COMMENT

The *National Parks and Wildlife Act 1974* (NPW Act) requires that a plan of management be prepared that outlines how an area will be managed by the NSW National Parks and Wildlife Service (NPWS).

The procedures for the exhibition and adoption of plans of management are specified under Part 5 of the NPW Act and involve the following stages:

- The draft plan is placed on public exhibition for at least 90 days and any person may comment on it;
- The plan and submissions received on the plan are referred to the Regional Advisory Committee for consideration;
- The plan, submissions and any advice from the Regional Advisory Committee are referred to the National Parks and Wildlife Advisory Council for consideration;
- The plan, submissions and the recommendations of the Advisory Council are referred to the Minister administering the NPW Act, and a copy referred to the Regional Advisory Committee;
- After considering the submissions, the recommendations of the Advisory Council and any advice from the Regional Advisory Committee, the Minister may adopt the plan or may refer the plan back to the NPWS and Council for further consideration.

Members of the public, whether as individuals or as members of community interest groups, are invited to comment in writing on this plan of management.

Comments should be forwarded to:

The Ranger Dural Nature Reserve
NPWS
PO Box 3056
Asquith NSW 2077

Comments may also be sent via email. Refer to www.environment.nsw.gov.au and then "Find document for comment", then go to "conservation plans".

The closing date for comments on the plan is Monday 18th January 2010.

All submissions received by NPWS are a matter of public record and are available for public inspection upon request to NPWS. Your comments on this draft plan of management may contain information that is defined as "personal information" under the NSW *Privacy and Personal Information Protection Act 1998*. The submission of personal information with your comments is voluntary.

1. LOCATION, GAZETTAL AND REGIONAL CONTEXT

Dural Nature Reserve is located on the Hornsby Plateau, 5 kilometres south-east of Dural and 7 kilometres north-west of West Pennant Hills in north-west Sydney.

Dural Nature Reserve, then comprising 26.28 hectares, was reserved on 1st January 2003 over what was formerly Dural State Forest. On 22nd August 2008 another 9.3 hectares were added to the reserve, comprised of 8.1 hectares donated by the Foundation for National Parks and Wildlife and 1.2 hectares of unformed Crown road reserve. The reserve now totals 35.58 hectares.

The reserve consists of deep forested valleys surrounded by undulating cleared plateaus. The area was originally gazetted in 1974 as Dural State Forest, Number 4 extension to Cumberland State Forest, for the purposes of “Experimental propagation of oil-producing plants of the sandstone series,” however the area was never used for this purpose (Forestry Commission of NSW 1984). The plateau area was partially cleared for mixed farming and dairying while the valleys and slopes were used for timber getting. There were timber leases within the area of the reserve up to the 1960s.

Dural Nature Reserve is surrounded by a number of different land uses (refer to Figure 1). The north-western boundary adjoins an area of rapidly developing light industrial complexes. The eastern and northern boundaries adjoin hobby farms and other open, cleared areas, while to the south the reserve borders an extensive residential area. James Henty Park and bushland adjoin the south-western boundary of the reserve and Pyes Creek bushland adjoins the south-eastern boundary and abuts Berowra Valley Regional Park to its east. The reserve is within the Hornsby Shire Local Government Area, the Hawkesbury-Nepean Catchment, and the area of the Metropolitan Local Aboriginal Land Council.

Figure 1: Dural Nature Reserve

2. MANAGEMENT CONTEXT

2.1 LEGISLATIVE AND POLICY FRAMEWORK

The management of nature reserves in NSW is in the context of a legislative and policy framework, primarily the NPW Act, the NPW Regulation, the *Threatened Species Conservation Act 1995* (TSC Act) and the policies of the NPWS.

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) may require the assessment and mitigation of the environmental impacts of 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 Dural Nature Reserve except in accordance with this plan. This plan will also apply to any future additions to Dural Nature Reserve. Should management strategies or works be proposed for Dural Nature Reserve or any additions that are not consistent with this plan, an amendment to this plan or a new plan will be prepared and exhibited for public comment.

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 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 the provision of recreation as a management principle.

2.3 STATEMENT OF SIGNIFICANCE

Dural Nature Reserve is considered to be of significance for:

- Biological Values: Conservation of a vegetation community dominated by *Eucalyptus pilularis / Angophora costata* Tall Open Forest. This vegetation community is becoming increasingly rare across its original range on the Hornsby Plateau;

- Landscape/Catchment Values: The reserve is in the Georges Creek system, a tributary of Berowra Creek and part of the Hawkesbury-Nepean Catchment; the tall open forest has scenic beauty;
- Historic Heritage Values: Presence of early 20th Century farming relics that form part of the farming heritage of the Pennant Hills / Dural area;
- Research and Education Values: Geological processes, significant plant communities, cultural features and a variety of management issues in the planning area such as fire regimes on the reserve's vegetation communities and the effectiveness of weed suppression programs provide numerous opportunities for research and education; and
- Recreation Values: Attractive natural bushland area popular with visitors for bushwalking and nature appreciation.

2.4 SPECIFIC MANAGEMENT DIRECTIONS

Management of the reserve will focus on the conservation of natural, landscape and cultural heritage values in the reserve. Strategies to achieve these objectives are:

- protection and maintenance of biodiversity and conservation of all threatened and endangered species inhabiting the reserve;
- removal of noxious and environmental weeds and restoration of the degraded perimeters of the reserve;
- reduction of the incursion of polluted, nutrient rich stormwater through the establishment of gross pollutant traps and wetland systems;
- protection of historic heritage through identifying, recording and conserving historic resources;
- recognition and protection of traditional and contemporary Aboriginal cultural heritage; and
- improved knowledge of natural and cultural heritage, corresponding threats and evaluation of management programs through research and monitoring.

3. VALUES

The location, landforms and plant and animal communities of an area have determined how it has been used and valued. 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, various aspects of natural heritage, cultural heritage, threats and on-going use are dealt with individually, but their inter-relationships are recognised.

3.1 GEOLOGY, LANDSCAPE AND HYDROLOGY

Dural Nature Reserve is located on the Hornsby Plateau on Hawkesbury Sandstone, with the overlying Ashfield Shale of the Wianamatta Group on the upper reaches and perimeters of the reserve.

The reserve is within the catchment of Berowra Creek, and contains several ephemeral streams leading into Georges Creek which drains into Berowra Creek. These creeks have eroded into the underlying Hawkesbury Sandstone, creating a highly dissected landscape. These deep valleys discouraged early European settlers from clearing and farming much of the area that is now the reserve.

The soils derived from the interaction of the land forming process have led to the development of Hawkesbury Soils within the valleys. West Pennant Hills Soils intrude into the reserve along the western and north-eastern perimeters. Deep Creek Soils are found along the larger gullies and streams within the reserve. The Hawkesbury Soils are highly erodible.

Sudden large volumes of water flow arising from storm overflow off hard surfaces, such as dwellings and roads, can cause stream bank erosion and deposition of sediment downstream. Inappropriate fire regimes can lead to a loss of native vegetation and result in increased soil erosion and weeds, change the soil structure and modify geological features through chemical and physical weathering.

3.2 NATIVE PLANTS

The vegetation of the reserve mainly consists of Tall Open forest, described by Smith and Smith (2007) as Blackbutt Gully Forest, with the main upper canopy species being Blackbutt (*Eucalyptus pilularis)*, Sydney Red Gum *(Angophora costata)* and Turpentine *(Syncarpia glomulifera)*.

Red Bloodwood *(Corymbia gummifera)*, Sydney Peppermint *(Eucalyptus piperita)* and Red Mahogany *(Eucalyptus resinifera)* are less commonly found within the reserve. Grey Gum *(Eucalyptus punctata*) can be found towards the perimeter of the reserve and Sydney Blue Gum *(Eucalyptus saligna*) grows on the better soils adjoining the streams flowing through the reserve.

Mid to low canopy species include Flax-leafed Wattle *(Acacia linifolia)*, Black She-Oak (*Allocasuarina littoralis)*, Forest She-Oak (*Allocasuarina torulosa)*, Old Man Banksia (*Banksia serrata), Black Wattle (Callicoma serratifolia)*, NSW Christmas Bush (*Ceratopetalum gummiferum)*, Common Hop Bush (*Dodonaea triquetra)*, Blueberry Ash (*Elaeocarpus reticulatus)*, White Spider Flower (*Grevillea linearifolia)*, Paperbark Tea–tree (*Leptospermum trinervium*), Narrow-leaved Geebung (*Persoonia linearis)*, Sweet Pittosporum (*Pittosporum undulatum)* and Graceful Bush-Pea (*Pultenaea flexilis)*.

Ground cover species include False Bracken Fern (*Calochlaena dubia)*, Blue Flax Lily (*Dianella caerulea*), Wiry Grass (*Entolasia stricta)*, Matt Rush (*Lomandra longifolia)*, Weeping Grass (*Microlaena stipoides)*, White Root (*Pratia purpurascens)*, Bracken (*Pteridium esculentum)* and Woolly Xanthosia (*Xanthosia pilosa)*.

Additionally, climbers and scramblers include Apple Berry Dumplings (*Billardiera scandens)*, Common Devils Twine (*Cassytha pubescens)* and Native Sarsaparilla (*Smilax glyciphylla)* (Smith and Smith 2007). The shrub layer and ground cover plants have been suppressed and in many areas are absent from the reserve. The shrub layer and ground cover provide differing habitats (foraging and shelter) for invertebrates and vertebrates. The absence of these layers is reducing biodiversity across the reserve. Shrub layer and ground cover seeds need to receive the appropriate stimulus to germinate and adequate light, space and nutrients to survive. This can be achieved through appropriate fire management, as discussed in section 4.2.

There are several locations where the reserve boarders directly onto stands of Sydney Turpentine Ironbark Forest (STIF). This is listed as a critically endangered ecological community under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*. Though degraded, there are some components of STIF found within the reserve. The small size of the area of STIF may make the long term viability of this community difficult to conserve, thus the area should be monitored and species replaced with plants grown from indigenous, local plants.

Epacris purpurascens var. *purpurascens,* which is listed as a vulnerable species under the TSC Act, has been recorded in an area directly adjoining the western boundary of the reserve. Several examples of *Tetratheca glandulosa,* which is also listed as vulnerable, are located on the eastern-facing slope in the reserve adjoining Bellenden Drive, Dural.

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. Recovery plans may also be prepared. Actions in the PAS relevant to native plants in the reserve involve undertaking identified priority threat management works including weed control, restricting access, stormwater management works and habitat management.

3.3 NATIVE ANIMALS

A number of threatened fauna, listed under the TSC Act, have been recorded in the vicinity of the reserve, including the Red Crowned Toadlet (*Pseudophryne australis*), Powerful Owl (*Ninox strenua*), Gang Gang Cockatoo (*Callocephalon fimbriatum*), and Southern Brown Bandicoot (*Isoodon obesulus*).

There is also evidence, in the form of scats, of macropod activity. The size and shape of some scats suggest the presence of the Grey Kangaroo (*Macropus giganteus*). These may not be indigenous to the area but rather releases or escapees from the kangaroo sanctuary that was located, until recently, directly adjoining the reserve on New Line Road.

Small mammals recorded in the reserve include the Brown Antechinus (*Antechinus stuartii*) and Bush Rat (*Rattus fuscipes)*. The numbers of these animals recorded in recent years are less then previously recorded, most likely due to the long period without fire treatment and/or predation by the Powerful Owl. Diamond Python (*Morelia spilota)* have also been observed sunning at various locations within the

reserve and Common Eastern Froglet (*Crinia signifera)* have been recorded actively calling along all streams.

The reserve has become a breeding ground refuge for four species of parrot as well as a foraging source for the endangered population of the Gang Gang Cockatoo. Both breeding and foraging is reliant on the continued development of mature upper storey trees with suitable hollows. Replacement of these mature trees as they decline and die appears to have diminished.

Actions in the PAS and recovery plans relevant to native animals in the reserve include habitat rehabilitation and restoration and/or regeneration.

3.4 ABORIGINAL HERITAGE

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

The area, within which Dural Nature Reserve is located, is in the traditional country of the Aboriginal people of the Darug language group and Guringai, who inhabited the area for 15,000-20,000 years before white occupation. Within 50 years of European occupation in the Hornsby area, most of the Aboriginal people had been forced from their lands severing important relationships between land, culture, custom and ceremonies (Hornsby Shire Council 2008).

Several families in the Dural area are descended from the original Aboriginal inhabitants and there is a very active group of Darug and associated Tribal Elders involved with Hornsby Area Residents for Reconciliation.

To date there has been very little research into locating items of Aboriginal heritage value or areas of archaeological interest within the boundaries of the reserve. Hornsby Shire Council commissioned Margrit Koettig (1996) to conduct a survey of Aboriginal sites within the Shire. This report identified that the bushland areas in Hornsby Shire were of “high potential” to contain Aboriginal sites and identified many locations with evidence of Aboriginal activity in close proximity to Dural Nature Reserve, including nearby Quarry Road, Tunks Ridge and New Line Road, Cherrybrook, however no areas were identified within the reserve.

Despite this, Aboriginal people would probably have used the biophysical resources of the reserve. The tall trees growing in the valley would have provided refuge and food for animals hunted by the local Aboriginal people and the creeks would have provided water. The west facing, wind blown caves would have provided excellent shelter during the colder winter months. Several caves have been identified as potential archaeological sites. There also appears to be at least one highly eroded set of axe grinding grooves on the main creek flowing through the reserve. These

potential sites should be investigated along with other places / items of potential Aboriginal heritage in the reserve.

3.5 HISTORIC HERITAGE

In the 1800s European settlers described Dural as a desirable location for agricultural activities, with timber getting and fruit growing activities subsequently established throughout Dural. These land uses were, and continue to be, an important influence on the local landscape. Today there are 26 items listed by Hornsby Shire Council as being of local heritage significance in the suburb of Dural. The historic items range in nature from a bushland reserve, landscaped gardens and reservoirs to privately owned houses, roadside trees, churches and a windbreak (NSW Heritage Office 2008).

The land covered by Dural Nature Reserve was partially cleared for mixed farming and dairying while the reserve's valleys and slopes were used for timber getting. Research shows that there were timber leases within the now reserved area up until the 1960s.

In 1974 the reserve was gazetted as Dural State Forest as an extension to the Cumberland State Forest. The purpose of the reserve was "experimental propagation of oil producing plants of the sandstone series", however the area was never used for this purpose.

There is now very little evidence of past timber getting activities or any other European activities within the reserve apart from some tracks and trails established during timber getting activities and large decaying stumps of felled trees within parts of the reserve.

There are signs of a vehicular track entering the reserve on the western boundary but its age and use is unknown. In the area of bushland adjoining Barrington Drive there are several badly corroded iron shipping containers of the 1890s. These containers were used commonly on farms as water tanks and storage bins. In the same location there is a corroded galvanised water tank of the early 20th Century. It is probable that these articles were used on farms now covered by the residential area (Hornsby Shire Council 2008).

3.6 VISITOR USE, EDUCATION AND RESEARCH

Dural Nature Reserve is surrounded by urban, light industrial and semi-rural areas (refer to Figure 1). The urban area adjacent to the reserve continues to expand. In 2005 there were 157,911 people living in the Hornsby Local Government Area. This population is predicted to increase by 14, 555 people by 2025 (NSW Department of Health 2006).

Although there are a number of open space areas and parklands managed by Hornsby Shire Council, what sets Dural Nature Reserve apart from much of this land, and makes it a desirable destination to visit, is the scenic beauty of the Tall Open Forest found within a narrow gully.

Despite the existence of no formal walking tracks, bushwalking is one of the more common recreation activities undertaken in the reserve. This has resulted in a number of tracks throughout the reserve. To better cater for this activity and minimise environmental damage, it is proposed to investigate the need for establishment of a single walking track system through the reserve. This investigation should also take into account a possible link to an existing Hornsby Shire Council track on Fallon Drive as well as a platform for an interpretation program.

Bike jumps and 'cubby houses' have been constructed in the reserve in the vicinity of Barrington Drive and James Henty Drive. These are causing loss of vegetation and soil erosion. It is necessary to remove the bike jumps and cubby house material and to stabilise these areas. To prevent the return of such activities, an education campaign is needed to engage local children and encourage them to use the reserve differently.

There is also evidence of the reserve being used for golfing practice and other inappropriate activities. Golfing appears to be occurring from the farm properties on the eastern boundary of the reserve as is archery practice. Golf balls from both the driving range and indiscriminate practice throughout the reserve are occurring. Stray arrows are a safety hazard for reserve visitors and animals. Again, education is required to discourage such unacceptable activities in the reserve.

The close proximity of several primary and secondary schools suggests that there may be a demand for an educational interpretive program in the reserve. Interpretive programs could relate to the now locally rare forest type and structure as well as the management of watercourses within a restricted catchment. Further education opportunities may arise with local schools and through the Streamwatch Program.

The purpose of research and monitoring programs is to improve understanding of the reserve's natural and cultural heritage and the processes that impact on them. Research and monitoring is also relevant to visitor management, so visitors' needs and expectations can be better understood and fulfilled. NPWS research efforts must be directed towards the areas of greatest need and will concentrate on areas of need identified within this section and elsewhere in this plan of management. Research by other organisations and students may provide valuable information for management and will be considered.

Four potential research projects have been identified:

1. Research into use of the reserve as a breeding area for parrot species, including the Gang Gang Cockatoo, species using the reserve including population stability and the long-term viability of breeding trees;
2. Monitoring of the effects of fire on old growth vegetation in the reserve;
3. Assessment of the effect on water quality of the proposed gross pollutant traps and wetland nutrient sinks. This study could incorporate an analysis of the spread of weed species before and after the installation of the proposed facilities, assessing whether the traps capture weed propagules as well as removing additional nutrients; and

4. Assessment of the success of differing weed control methods. This would be to assess the differences between the aggressive herbicide and burning weed control regime as opposed to the passive modified “Bradley” method.

4. ISSUES

4.1 WEEDS AND PEST ANIMALS

An introduced species is defined in this plan as any plant or animal species not native to the reserve. Introduced plant species within Dural Nature Reserve and on adjoining land are of concern because they have potentially detrimental effects on ecological values and can spread to and from neighbouring land. In addition, the *Noxious Weeds Act 1993* (NW Act) places an obligation upon public authorities to control noxious weeds on land that they occupy to the extent necessary to prevent such weeds spreading to adjoining lands. Factors such as the past agricultural use of area and its close proximity to urban and semi-rural residential development mean that a large number of introduced species are found within the reserve.

Considerable weed plumes have developed on the eastern and north-eastern boundaries, extending 30 metres into the reserve. These weed plumes are of such a size and scale that they are moving rapidly into un-colonised areas of the reserve. Their size and age indicate that extensive seed reserves and other propagules exist within the area. The western and southern boundaries of the reserve have a light to medium weed infestation up to five metres into the reserve. Small weed plumes are located along the urban interface of Bellenden and Barrington Drives, behind the industrial areas bordering New Line Road and along the urban interface of Jenner Road and James Henty Drive. Georges Creek, including a small tributary behind Barrington Drive, and other watercourses and tributaries within the reserve have infestations either side of the watercourses.

The weed plumes have been supported by increased nutrient loads in the streams and waterways entering the reserve. The allotments adjoining the western boundary extending from New Line Road are infested by a large number of weed species, including Lantana (*Lantana camara)*, Broad-leaf Privet (*Ligustrum lucidum)*, Narrow-leaf Privet (*Ligustrum sinensis),* Crofton Weed *(Ageratina adenophora)*, Cassia (*Senna pendula)*, Camphor Laurel (*Cinnamomum camphora)* and Morning Glory (*Ipomoea indica)*. *Ludwigia peruviana,* a highly aggressive water weed, is known in the general area. It has been found in the adjoining constructed wetland off Millstream Grove. Ludwigia has the potential to occur in the sediment basin on the recent reserve addition and needs to be monitored. All the above, except Crofton Weed and Cassia, are listed as noxious in the Hornsby Shire Council area under the NW Act.

A buffer zone has been established between developments along New Line Road, Dural and the reserve as part of a Bushland Management Plan required by Hornsby Shire Council in relation to development approval. In the area controlled by Sydney Water the buffer zone is well maintained. However, outside of the Sydney Water estate the buffer zone has not been maintained and soil from this zone is eroding into the reserve. Further, where the reserve directly adjoins Bellenden Place, Dural, on

the south-western boundary, small weed plumes of Lantana, Crofton Weed, Wild Tobacco (*Solanum mauritianum)* and Castor Oil Plant (*Ricinus communis)* have developed. These plumes are starting to progress further into the reserve.

There is also evidence of feral animal predation within the reserve. European Red Fox (*Vulpes vulpes*) and Cat (*Felis catus*) activities can be readily observed. Feral predators can reduce populations of small to medium ground and arboreal native animals to below self-sustaining levels. There is evidence of Rabbit (*Oryctolagus cuniculus*) activity in the reserve, particularly along the northern and eastern boundaries where most hobby farms are located.

The European Red Fox population within Hornsby Shire Council has been controlled through the Fox Baiting Program currently undertaken by NPWS and local councils on the North Shore of Sydney. Dural Nature Reserve has not been baited in this program, however nearby areas including Tunks Ridge and parts of Cherrybrook and Thornleigh have been targeted for European Red Fox control. This will have had a flow on effect on the European Red Fox population that predates or shelters in the reserve. Rabbit populations are monitored and managed by the Cumberland Livestock Health and Pest Authority (formerly Rural Lands Protection Board).

Domestic Cat and Dog (*Canis lupus familiaris)* individuals from the surrounding suburbs also enter and hunt within the reserve. There is some evidence of hunting activities on the western and eastern boundaries. It is probable that domestic animals are not being sufficiently controlled and are entering the reserve and predating on native animals.

4.2 FIRE

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.

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. Fire can also damage cultural heritage, recreation and management facilities and can threaten visitors and neighbouring land.

A fire management strategy has been prepared for the reserve (NPWS 2006). The fire management strategy outlines the recent fire history of the reserve, key assets within and adjoining the reserve including sites of natural and cultural heritage value, fire management zones which may include asset protection zones, and fire control advantages such as management trails and water supply points. Hazard reduction programs, ecological burning proposals and fire trail works are submitted annually to the Hornsby Ku-ring-gai Bush Fire Management Committee.

The fire history of the reserve is not well known but it is believed the greater part of the reserve has not been burnt for almost 50 years, since the mid to late 1960s. The eastern section of the recent reserve additions has had at least two prescribed burns

in recent times (1990 and 2001 / 02). The most recent wildfire in the general area occurred in 1976, however this did not enter the reserve. Whilst the absence of fire can lead to interesting floristic and ecological developments, in the case of this reserve there has been a decline in biodiversity due to the lack of fire and there are fewer plant species in comparison to nearby areas that have been burnt more regularly.

A diversity of fire regimes is required to maintain biodiversity. Management of fire should ideally aim to provide a pattern of fires of high, moderate and low intensity, frequency and extent. Extinctions are most likely when fire regimes of relatively fixed intensity, frequency and extent prevail without variation. Further, areas burnt too frequently are reduced to pyrogenic species. This includes Bladey Grass *(Imperata cylindrica)* and Bracken (*Pteridium esculentum*), an understorey that accumulates fuel quickly and is capable of further frequent burning.

4.3 ISOLATION AND FRAGMENTATION

The area surrounding Dural Nature Reserve has been extensively cleared, which has resulted in a high loss of biodiversity and fragmentation of habitat in the region. Long term conservation of biodiversity depends upon the protection, enhancement and connection of remaining habitat across the landscape, incorporating vegetation remnants on both public and private lands. Nearby vegetated areas contribute to the habitat values of the reserve and provide ecological corridors to other vegetated areas. Maintaining the integrity of the remaining habitat within the reserve and, where possible, linking to adjacent vegetated, natural areas is important for the long term viability of the reserve's biological values.

The agricultural and timber getting activities that occurred throughout the local area, and the more recent semi-rural, urban and light industrial land uses, have resulted in the reserve having an extensive boundary with activities that are of long term detriment to the reserve. This includes clearing into the reserve on the pretext of fire safety and waste disposal.

Although the reserve is largely isolated from other bushland, it is connected to small areas of Crown, Council and private lands along Georges Creek and eventually to Berowra Valley Regional Park. This has enhanced the reserve's viability and means it fulfils an important corridor function linking remnant bushland to protect threatened species and catchment values (Hornsby Shire Council 2006).

There are no visible boundary markers for the reserve, making it difficult to locate. This is particularly an issue on the north-eastern and eastern boundaries and consequently encroachment has occurred. Encroachment is an issue in the vicinity of the Australian Equestrian Centre and other semi-rural properties along the north and north-eastern boundaries.

The illegal dumping of litter and garden refuse in the reserve, in particular along the western and southern boundaries near Bellenden and Barrington Drives, can lead to both visual and chemical pollution of the environment. Garden refuse also introduces weed propagules in addition to causing nutrient plumes which encourage further weed growth.

4.4 CLIMATE CHANGE

Climate change has been listed as a key threatening process under the TSC Act. Projections of future changes in climate for NSW include higher temperatures, increasing sea levels and water temperatures, elevated CO_2, more intense but possibly reduced annual average rainfall, increased temperature extremes and higher evaporative demand. These changes are likely to lead to greater intensity and frequency of fires, more severe droughts, reduced river runoff and water availability, regional flooding, increased erosion and ocean acidification.

Climate change may significantly affect biodiversity by changing population size and distribution of species, modifying species composition, and altering the geographical extent of habitats and ecosystems. The potential impact of climate change is difficult to assess since it depends on the compounding effects of other pressures, particularly barriers to migration and pressure from feral animals. Species most at risk are those unable to migrate or adapt, particularly those with small population sizes or with slow growth rates.

Programs to reduce the pressures arising from other threats, such as habitat fragmentation, invasive species, bushfires, pollution and urban expansion, will help reduce the severity of the effects of climate change.

4.5 INCREASED NUTRIENT LOAD

Surrounding farms, light industrial areas and runoff from major roads have caused increased sediments and nutrients to enter the waterways of the reserve. Increased nutrients promote the spread of weeds. In addition, litter can build up along the waterlines creating both a degraded environment and visual pollution. This issue is significant along the western, New Line Road, boundary of the reserve and where stormwater enters from residential areas along the southern boundary. Gross pollutant traps, to reduce sediments, litter and weeds in the reserve, are required at:

1. the junction of the stormwater from 252 to 254 New Line Road, Dural and the main creek flowing through the reserve;
2. the source of a tributary of the main creek behind the farming properties on the north eastern boundary;
3. the small watercourse emanating from 248 to 250 New Line Road, Dural and entering the reserve through the Sydney Water managed lands; and
4. the junction of Georges Creek and New Line Road, to supplement an existing facility on the Baulkham Hills Shire-side of New Line Road.

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6. IMPLEMENTATION

Current Situation	Desired Outcomes	Management Response	Priority*
6.1 On-Park Ecological Conservation			
The reserve is located on the Hornsby Plateau. The Hawkesbury Soils are highly erodible. The reserve is an integral component of a bush corridor joining Berowra Valley Regional Park. The reserve contributes to the conservation of a vegetation community dominated by *Eucalyptus / pilularis Angophora costata* Tall Open Forest, which is becoming increasingly rare across its original range. Though degraded, there are components of the critically endangered Sydney Turpentine Ironbark Forest ecological community within the reserve (EPBC Act). *Epacris purpurascens* var. *purpurascens,* listed as vulnerable under the TSC Act, has been recorded in an area adjoining the reserve. Several *Tetratheca glandulosa* plants, also listed as	Landscape and catchment values are protected. Human-induced soil erosion is minimised. Sediments, nutrients and litter entering the reserve are minimised. The water quality and health of streams in the reserve are improved. The viability and diversity of native species and ecological communities are maintained and enhanced. Identified threatened species, populations and ecological communities remain viable or are enhanced. All native animals in the reserve are protected.	6.1.1 Undertake all land management activities on the reserve in a manner that minimises soil erosion and where necessary undertake erosion control works and rehabilitation of native vegetation. 6.1.2 Establish gross pollutant traps to capture excess water and slowly release the water over a longer period of time. 6.1.3 Implement a prescribed burning program, consistent with the Fire Management Strategy, to maintain biodiversity values. 6.1.4 Liaise with Hornsby Shire Council to construct and maintain “wetland” gross pollutant traps at the four locations. 6.1.5 Control the key threatening process of weed invasion to ensure the long term viability of native vegetation communities and flora species in the reserve. 6.1.6 Limit activities in the reserve to those which do not significantly impact on threatened species, populations or ecological communities found in the reserve. 6.1.7 Ensure that revegetation programs for degraded areas only use native species that naturally occur in the local area. All seed stock will be sourced from the reserve and taken from sources as close as possible to planting sites. 6.1.8 Implement the PAS and recovery plans for threatened species, populations and communities which are known or	Med High High High High Med High

Current Situation	Desired Outcomes	Management Response	Priority*
vulnerable, are found in the reserve. Threatened fauna, listed under the TSC Act, have been recorded in the vicinity of the reserve, including the Red Crowned Toadlet (*Pseudophryne australis*), Powerful Owl (*Ninox strenua*), Gang Gang Cockatoo (*Callocephalon fimbriatum*), and Southern Brown Bandicoot (*Isoodon obesulus*). Ongoing threats to ecological conservation include increased nutrient loads, other pollutants and rubbish in waterways, drainage areas and reserve edges. The effect of these impacts may be compounded by climate change. Research by other organisations and students may provide valuable information for management.	The effects of climate change on natural systems are reduced. Research enhances the reserve's information base and assists management of the reserve. Monitoring programs are in place to detect any changes in the status of reserve's resources.	expected to occur in the reserve. 6.1.9 Develop and implement a monitoring program for assessing changes in the vegetation of the reserve. 6.1.10 Monitor the Sydney Turpentine Ironbark Forest. 6.1.11 Control the key threatening processes of predation and competition by feral animals to enhance the long term viability of the native fauna populations of the reserve. 6.1.12 Develop and implement a native animal species monitoring program including bi-annual monitoring of small to medium ground vertebrates to assess the success of Fox baiting programs. 6.1.13 Assess research proposals on their individual merit and endorse those that support desired outcomes. 6.1.14 Encourage research into monitoring of the endangered Gang Gang Cockatoo population; monitoring of reserve vegetation before and after fire treatment; assessment of the effect on water quality of the proposed gross pollutant traps and wetland nutrient sinks; and assessment of the success of differing weed control methods.	 Med High Ongoing Ongoing Low Ongoing
6.2 Cultural Heritage The reserve is located in the traditional country of the Darug language group and Guringai people. Descendents live in the local area and the Darug and associated Tribal	Aboriginal places and values are identified and protected. Aboriginal people are involved in management of the Aboriginal cultural	6.2.1 Encourage research into the Aboriginal heritage of the reserve. 6.2.2 Identify Aboriginal sites in the reserve and protect and manage them in consultation with local Aboriginal communities. 6.2.3 Precede any works with the potential to impact on Aboriginal	High High High

Current Situation	Desired Outcomes	Management Response	Priority*
Elders are involved with Hornsby Area Residents for Reconciliation. Knowledge of the reserve's Aboriginal heritage values is minimal. Several caves have been identified as potential archaeological sites and there appears to be a highly eroded set of axe grinding grooves. There is a high potential that the reserve contains other Aboriginal sites. Past uses of the reserve's land were mixed farming, dairying and timber getting. Corroded iron shipping containers (1890s) and an early 20th Century water tank are found in the reserve.	values of the park. Items and places of historic heritage significance are recorded and appropriately conserved. Understanding of the cultural heritage of the reserve is improved. Negative impacts on Aboriginal and historic heritage values are stable or diminishing.	sites by a cultural heritage assessment and consultation with the local Aboriginal communities and the Aboriginal Land Council. 6.2.4 Investigate caves as potential archaeological deposit sites (PADS). 6.2.5 Involve interested Aboriginal persons in reserve management. 6.2.6 Record the remaining examples of European land uses in the reserve. 6.2.7 Assess the significance of the containers and tank, and any other historic items found in the reserve, and determine whether restoration work or other conservation measures are warranted. 6.2.8 Encourage research into this history of the reserve and its surrounds, including families who farmed the area.	 High High High Med Med
6.3 Visitor Use The narrow gully of Tall Open Forest is attractive for bushwalking. Although formal walking tracks are absent, bushwalking is one of the more common recreation activities in the reserve. Bike jumps and 'cubby houses' constructed in the reserve are causing damage.	Visitor use is appropriate and ecologically sustainable. Negative impacts of visitors on park values are stable or diminishing. Visitation to the reserve is limited to conservation, nature appreciation,	6.3.1 Investigate the need for establishment of a walking track through the reserve. 6.3.2 Promote passive recreation activities. 6.3.3 Remove and stabilise the 'bike jump' area and remove the 'cubby house' material. 6.3.4 Golfing and archery will not be permitted in the reserve. 6.3.5 Encourage access to the reserve for education, science, conservation or appreciation of natural landscape and cultural	Med Low Low Low Med

Current Situation	Desired Outcomes	Management Response	Priority*
There is evidence of golfing practice, archery and other inappropriate activities. Stray arrows and golf balls are a safety hazard.	educational and research purposes.	values.	
6.4 Community Programs and Education The close proximity of primary and secondary schools may create demand for an interpretive program in the reserve. Education opportunities may arise from local schools and through the Streamwatch program. Reducing rubbish dumping and encroachments in the reserve requires community and neighbour cooperation.	There is increased understanding and appreciation by reserve users, neighbours and local schools of the area's natural and cultural values. Neighbours and users of the reserve respect the reserve's values. Illegal dumping, encroachments and activities are reduced.	6.4.1 Develop an interpretive display for the reserve. 6.4.2 Involve local schools in conservation programs. 6.4.3 Develop educational programs to inform neighbours of the consequences of failure to control weeds and domestic animals and the impacts of dumping refuse on the reserve and other public lands. 6.4.4 Seek the co-operation of relevant land use authorities and neighbours to prevent pollution and run-off entering the reserve. 6.4.5 Seek the co-operation of neighbouring landowners and Hornsby Shire Council to implement effective weed control programs and control domestic animals. 6.4.6 Encourage volunteer bush regeneration and weed control programs, and a volunteer bush regeneration group for the nature reserve. 6.4.7 Survey the reserve boundaries and erect signs and/or markers to assist in the management of boundary issues such as encroachments and illegal rubbish dumping. 6.4.8 Inspect the reserve's boundaries on a six monthly basis for any illegal incursions.	Low Ongoing Med Low Med Ongoing High Ongoing

Current Situation	Desired Outcomes	Management Response	Priority*
		6.4.9 Require all encroachments to be removed and the areas revegetated.	Med
		6.4.10 Remove dumped rubbish and monitor illegal activities with the assistance of volunteers.	Ongoing
		6.4.11 Undertake an education campaign and work with neighbours to minimise the occurrence of illegal rubbish dumping in the reserve.	Low
6.5 Weeds and Pest Animals A large number of introduced species are found within the reserve.	Introduced plants and animals are controlled and where possible eliminated. Negative impacts of weeds on park values are stable or diminishing. Regeneration of the native vegetation within designated areas is apparent and incremental. Negative impacts of pest animals on park values are stable or diminishing.	6.5.1 Dogs, cats, horses and other introduced animals will not be permitted in the reserve with the exception of registered assistance animals.	High
		6.5.2 Control and/or eliminate pest species on a priority basis, taking into consideration their threat to biodiversity. Priority will be given to Feral Cats and Foxes. Recovery plans and priority actions for the identified threatened species, populations and communities present in the reserve will be used to guide activities.	Medium
		6.5.3 Spray weed plumes with suitable herbicide and then burn in situ. Monitor sites for propagule germination and, after a suitable period, respray.	High
		6.5.4 Establish a buffer zone of approximately five (5) metres wide between the reserve and adjoining allotments where not currently provided. Tritter the buffer zone on a monthly basis and revegetate the area adjoining the trittered area using plant material derived from local species.	High
		6.5.5 Remove weed plumes by hand along creek lines using assisted bush regeneration to protect threatened species and	High

Current Situation	Desired Outcomes	Management Response	Priority*
		catchment values.	
6.6 Fire Management Fire is a natural feature of many environments but inappropriate fire regimes can lead to loss of particular plant and animal communities. The reserve is covered by the Fire Management Strategy - Berowra Valley Regional Park and Dural Nature Reserve 2005 to 2010.	Life, property and natural and cultural values are protected from fire. Fire regimes are appropriate for conservation of native plant and animal communities. Negative impacts of fire on natural and cultural heritage values are stable or diminishing.	6.6.1 Maintain close contact and cooperation with land use planning authorities and neighbours, and promote awareness of fire and conservation management issues, including responsible urban and property design, maintenance of planning constraints and property protection practice. 6.6.2 Define and maintain asset protection zones adjacent to private properties along the boundaries of the reserve. 6.6.3 Implement the Fire Management Strategy.	High High High

* **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.

Ongoing is for activities that are undertaken on an annual basis or statements of management intent that will direct the management response to an issue should it arise.