

# DEE WHY LAGOON WILDLIFE REFUGE FIRE REGIME MANAGEMENT PLAN



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Prepared by	Darren James	Cate Gillies
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**Warringah Council:** Steve Atkins, Stuart Withington

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**Department of Environment and Conservation:** Tony Auld

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## Glossary of Terms

<b>APZ</b>	An Asset Protection Zone (APZ) is an area around a development offering protection to reduce the bush fire hazard. It can consist of an Inner Protection Area (IPA) and an Outer Protection Area (OPA). Hazard reduction techniques can include slashing, raking, bush regeneration and burning.
<b>Biodiversity fire regime thresholds</b>	These thresholds are a range of appropriate fire frequency intervals, intensities and seasons to sustain the ecology of each vegetation community. Where fire regimes are outside the threshold, significant declines in species populations can be expected, particularly if the fire regime prevails over greater than 50% of the community area.
<b>Ecosystem</b>	An interactive system between living organisms (plants and animals) and their non living surroundings.
<b>FEZ</b>	Fire Exclusion Zones (FEZ) are areas that contain fire intolerant species. Fires in these areas should be avoided and quick fire suppression should occur in the case of fire.
<b>Fine fuels</b>	Bark, grass, leaves and twigs less than six millimetres in diameter.
<b>Fire regime</b>	The history of fire in a particular area, including the frequency, intensity and season of burning.
<b>Fuel</b>	Any material capable of being ignited and sustaining fire. Such as grass, live vegetation, leaf litter and bark. Generally measured in tonnes per hectare of dry weight.
<b>Hazard reduction</b>	Works designed to attain planned resource management objectives, primarily the reduction of fire threat. Activities include: <ul style="list-style-type: none"> <li>• Manual and mechanical thinning of vegetation (NOT broad scale clearing)</li> <li>• Controlled burning of a predetermined area, carried out under specified weather and environmental conditions</li> </ul>
<b>Inter-fire period</b>	The period of time between successive burns.
<b>IPA</b>	Inner Protection Areas (IPA) are parts of an Asset Protection Zone (APZ). They are designed to eliminate the threat of fire radiation to the development, and use techniques such as slashing, shrub clearing, and construction of barriers or hazard reduction burning to reduce fuel loads.

<b>LMZ</b>	Land Management Zones (LMZ) are broader areas of the landscape, which do not satisfy the criteria for Strategic Fire Management Zones (SFMZ) or Asset Protection Zones (APZ). Fire in these areas should be managed to meet conservation objectives for species, habitats, populations and cultural heritage values.
<b>Minimum Fire Threshold</b>	The minimum fire frequency permitted before a decline in biodiversity is expected.
<b>Maximum Fire Threshold</b>	The maximum fire frequency permitted before a decline in biodiversity is expected.
<b>OPA</b>	Outer Protection Areas (OPA) are parts of an Asset Protection Zone (APZ). They are designed to reduce the speed and intensity of an approaching bush fire. Techniques such as hazard reduction burning or selective shrub clearing are used to reduce fuel load.
<b>Prescribed burning</b>	A controlled burn to a predetermined area, carried out under specified weather and environmental conditions, designed to achieve planned resource management objectives.
<b>Quick succession</b>	Events occurring within five years of each other.
<b>SFAZ</b>	Strategic Fire Advantage Zones (SFAZ) are usually adjacent to, and compliment, Asset Protection Zones (APZ). They are managed to protect community assets and ecological sustainability.
<b>Treatment Area</b>	Area of land subject to removal or reduction of fuel by manual or mechanical means, or by prescribed burning.
<b>Wildfire</b>	An unplanned fire.

## **Executive Summary**

Dee Why Lagoon Wildlife Refuge is located in Sydney's Northern Beaches district, approximately 16 km from the centre of Sydney. The reserve is approximately 77 ha in area, including Dee Why Lagoon (30ha) and is known to support seven Endangered Ecological Communities (EECs) and four threatened fauna species.

The reserve incorporates remnant native bushland, car parking, grassed landscape areas, a playground, Dee Why Surf Life Saving Club, James Meehan Reserve, a dune system and a portion of Dee Why Beach. Surrounding land uses include residential dwellings and commercial uses.

Creation of additional tracks including boardwalks / viewing platforms / seating etc along the back of the dunes and the southern boundary of the Lagoon is planned (as per Warringah Council 2002). The existing trail system within the reserve is considered sufficient to provide for adequate response to fire events, provided existing and planned trails are maintained.

The Management Plan divides the reserve into management zones which include Asset Protection Zones (APZ), Fire Exclusion Zones (FEZ) and Land Management Zones (LMZ). Existing tracks, natural features and cleared areas have been used for fire management boundaries where available, with proposed management zones covering both Council owned/managed and privately owned land.

The Plan contains a prescribed operations schedule that specifies treatments, timing and other characteristics. It prescribes a number of hazard reduction burns between 2007 and 2015 as well as weed control and hand removal of fuels within areas of build up.

# 1 Introduction

Eco Logical Australia was contracted by Warringah Council in March 2004 to prepare a 10 year Fire Management Plan from 2006 to 2016 for Dee Why Lagoon Wildlife Refuge.

## 1.1 Reserve Outline

Dee Why Lagoon Wildlife Refuge is located in Sydney's Northern Beaches district, approximately 16 km from the centre of Sydney. The reserve is approximately 77 ha in area, including Dee Why Lagoon (30ha). See Figure 1.

The reserve incorporates remnant native bushland, James Meehan Reserve, car parking, grassed landscape areas, a playground, Dee Why Surf Life Saving Club, the dune system and a portion of Dee Why beach.

Surrounding land uses include residential dwellings and commercial uses.

The Dee Why Lagoon Wildlife Refuge comprises a crown reserve and primarily Council owned freehold land (community land) (see Warringah Council (2002) for further tenure information). Management of the reserve is undertaken by Warringah Council.

## 1.2 Management Plan Objectives

- To provide recommendations for:
  - New fire management zones
  - Suitable alternatives for fuel management
  - Strategies to protect the existing infrastructure located within the reserve
  - Strategies to protect persons and property within, or immediately adjacent to the reserve
- Creation of:
  - A comprehensive fire history for the reserve
  - A plan that is acceptable to and can be implemented by Council and the NSW Rural Fire Service (RFS)
  - An ecologically based strategy for fuel management, incorporating requirements for:
    - Mosaic burn patterns
    - Fire regimes in line with vegetation community thresholds, endangered ecological communities and identified threatened species, as well as locally or regionally significant species
  - A strategy to enable the effective planning of Hazard Reduction (HR) burns with regard to:
    - Endangered ecological communities
    - Endangered populations



- Threatened, locally or regionally significant species
- Aboriginal sites and culturally significant features known to exist within the reserve
- Assets and infrastructure

### **1.3 Report Structure**

The Fire Regime Management Plan for Dee Why Lagoon Wildlife Refuge comprises two separate documents:

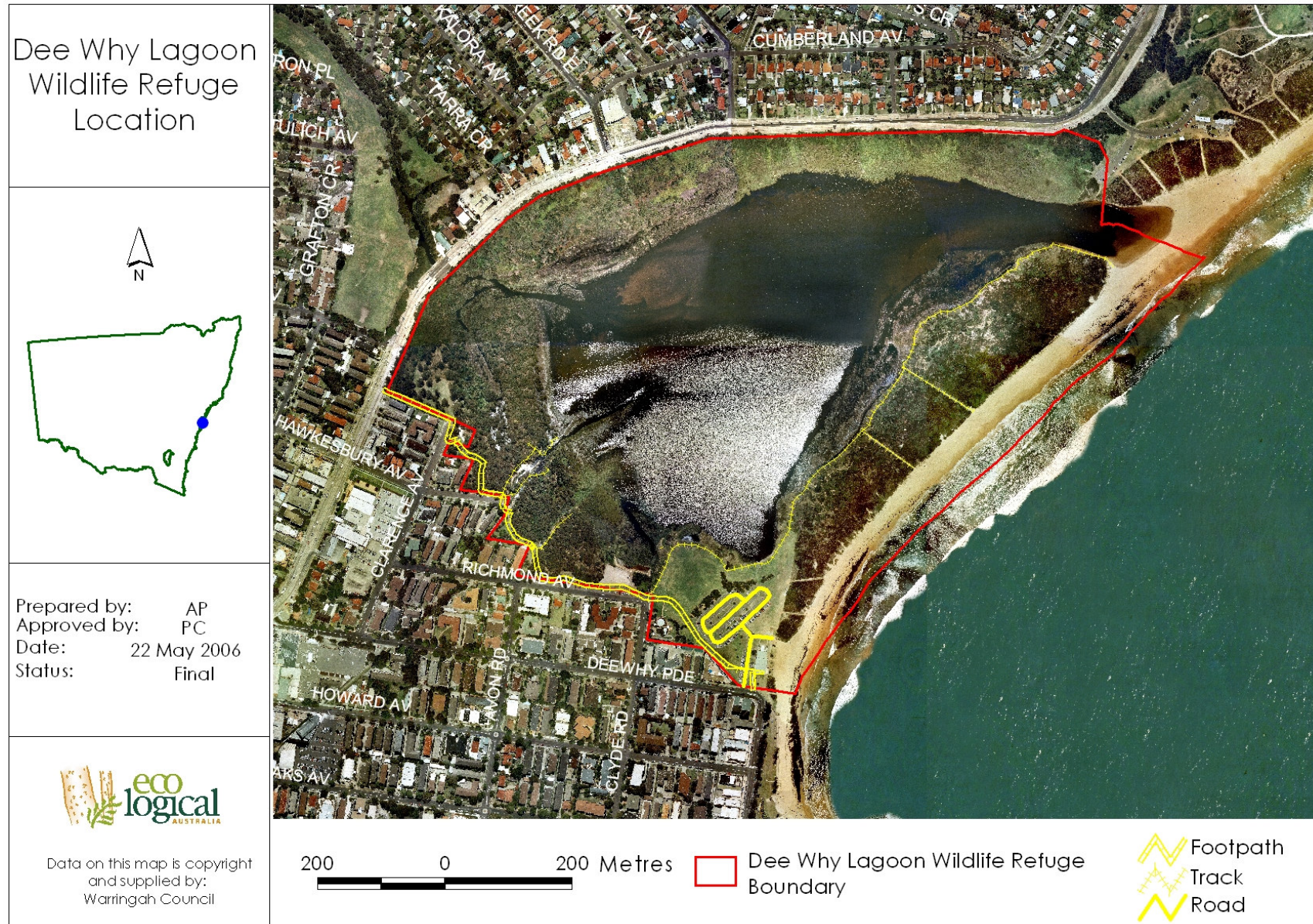
- 1) This report
- 2) An A0 sized poster showing a series of relevant maps and tables

This report identifies the fire management framework, identifies and assesses fire related issues and risks within the reserve, and provides an operational schedule and performance measures. It is intended that this written report be used in conjunction with the "Dee Why Lagoon Wildlife Refuge Fire Regime Management Poster" (Appendix 7, ELA 2006).

### **1.4 Assumptions**

Vegetation fuel loads and structure were derived from Vegetation Mapping by P & J Smith (2003). Whilst limited opportunistic on-ground validation of vegetation communities was undertaken, it was assumed this mapping was generally accurate.

Figure 1 Site Location



## **2 Legislative and Planning Instruments**

Fire management activities on the site are constrained by numerous Acts, plans and guidelines. The most relevant documents are reviewed below.

The majority of the legislation and planning instruments listed below impact HR planning requirements. Further information regarding this process may be seen in the 'Warringah Local Government Area Hazard Reduction Guidelines' (Appendix 6).

### **2.1 Local Government Act 1993**

The NSW *Local Government Act 1993* provides for management of land within a Local Government Area. Under the Act plans of management must be prepared for 'community land'. The plans should address a variety of factors including biodiversity conservation and management. Councils must adopt a specific plan of management for community land affected by a recovery plan, threat abatement plan or containing critical habitat identified under the TSC Act.

Dee Why Lagoon Wildlife Refuge is managed as 'community land' under this Act and has a current Plan of Management (Warringah 2002 – see next section for a review).

### **2.2 Dee Why Lagoon Wildlife Refuge Plan of Management**

This plan was created by Warringah Council and adopted in August 2002 as required under the *Local Government Act, 1993*. It provides a framework for managing Dee Why Lagoon Wildlife Refuge and includes strategies and work schedules. This plan is due to be reviewed in 2007.

The plan proposes:

- The development of a fire management regime and encouraging ecological burns where appropriate
- That when the dual objective of protecting life and property or protecting the environment are at odds, priority be given to protection of life and property
- That HR planning be undertaken prior to fire management activities

### **2.3 Management Strategy for Weed Control and Fire Management Access Zones<sup>1</sup>**

This document, created in 1996, sets out aims and objectives for the management of fire and weeds within the Warringah Council Local Government Area (LGA).

Fire management objectives include:

- Ensuring that fire management access zones are of dimensions that can be maintained in the long term
- Ensuring that methods of construction and maintenance of fire management access zones are environmentally sensitive
- Carrying out of community education in conjunction with Fire Control, and of fire hazard reduction techniques

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<sup>1</sup> Council has acknowledged that this document is outdated and that changes are required to bring it up to current standards.



- Co-ordinating with Fire Control on the fire hazard reduction issues

These objectives have been considered during the creation of this plan.

## **2.4 Rural Fires Act 1997**

The objectives of the Rural Fires Act (RF Act) 1997 are to provide for:

- The prevention, mitigation and suppression of fires
- Coordination of bush fire fighting and prevention
- Protection of people and property from fires
- Protection of the environment

The RF Act requires the creation of a Bush Fire Co-ordinating Committee and a Bush Fire Risk Management Plan (outlined below).

Obligations are imposed on Council and other land management agencies to:

- Protect life and property
- Prevent fire from leaving land vested in or under its control
- Implement the provisions of Bush Fire Management Plans

## **2.5 Warringah Pittwater Bush Fire Risk Management Plan**

Required under Section 52 of the RF Act, the Warringah Pittwater Bush Fire Risk Management Plan outlines the importance of bush fire management zones to assist in reducing bush fire risk and damage to assets. The plan also emphasises fire management priorities. Where areas are faced with an extreme bush fire risk, it will be given the highest management priority and allocation of resources.

The plans are required to consider threatened species conservation and may restrict or prohibit the use of fire and other fire hazard reduction activities. This is particularly relevant for threatened species habitat.

The responsibility to implement asset protection is placed on the owners of the land which is subject to the bush fire threat. It is also Council's responsibility to ensure that the owners or occupiers of private property have taken the required steps to reduce bush fire hazards on their land. This can be enforced by the RFS through Section 66 of the RF Act.

Council is responsible for environmental assessment of land prior to commencing any fire management activities (on Council owned or managed land). This is achieved through issuing a Bush Fire Hazard Reduction Certificate, obtained under the *Environmental Planning and Assessment Act 1979* (EP&A Act), or through the Bush Fire Environment Assessment Code (RFS 2006).

## **2.6 Bush Fire Environment Assessment Code**

This code provides a stream-lined environmental assessment process for use in determining applications for Bush Fire Hazard Reduction Certificates and provides

standards for the conduct of HR works for areas zoned under the Bush Fire Risk Management Plan (WPBFMC 2000).

The code consists of and refers to standards and guidelines that relate to the conduct and planning of managed hazard reduction activities.

Requirements for the code are specified under Section 100J of the RF Act, including land restrictions and exclusions for environmentally sensitive areas (Sections 2 and 3, BFEAC 2006).

The land covered by Dee Why Lagoon Wildlife Refuge is zoned as a Land Management Zone (LMZ) under the Bush Fire Risk Management Plan (WPBFMC 2000). The existing Bush Fire Environment Assessment Code (RFS 2006) does apply to Dee Why Lagoon Wildlife Refuge, with restrictions within areas of Coastal Dune Swamp and within 100m of Coastal Wattle Heath, Coastal Banksia-Eucalypt Scrub and Spinifex Grassland.

## **2.7 Planning for Bush Fire Protection 2001**

Planning for Bush Fire Protection (PBP), prepared by the Rural Fire Service and Planning NSW, is the key bush fire planning document for the state. The document identifies requirements and strategies for new developments to help protect them from bush fire hazards. It details the location and depth of asset protection zones, fire trails and perimeter roads, water supply and building standards in bush fire risk areas.

## **2.8 National Parks and Wildlife Act 1974**

Aboriginal and cultural heritage sites are protected under this Act, as well as threatened flora, fauna and endangered ecological plant communities. The Department of Environment and Conservation (DEC) are named as the responsible authority under the Act, which extends to the protection of items outside the reserve system.

The reserve is a declared wildlife refuge under the this Act. See Dee Why Lagoon Wildlife Refuge Plan of Management (Warringah Council 2002) for further details.

## **2.9 Environment Protection & Biodiversity Conservation Act 1999**

The Commonwealth *Environment Protection & Biodiversity Conservation Act 1999* (EPBC Act) stipulates that approval from the Commonwealth Environment Minister is required if a development is likely to have a significant impact on matters considered to be of National Environmental Significance.

## **2.10 Environmental Planning and Assessment Act 1979**

The NSW EP&A Act is the principal planning legislation for the state, providing a framework for the overall environmental planning and assessment of development proposals and activities.

### **2.11 Threatened Species Conservation Act 1995**

The NSW *Threatened Species Conservation Act 1995* (TSC Act) aims to protect and encourage the recovery of threatened species, populations and communities listed under the Act. The TSC Act is integrated with the EP&A Act and requires consideration of whether a development or an activity (such as mechanical hazard reduction) is likely to significantly affect threatened species, populations and ecological communities or their habitat.

The Atlas of NSW Wildlife (DEC 2004) was utilised to identify known threatened flora within 5 km and threatened fauna within 10 km of the Dee Why Lagoon Refuge (see Appendix 2), with fire ecology requirements of those species being considered.

### **2.12 Noxious Weeds Act 1993**

This Act requires Council to control noxious weeds and destroy notifiable weeds within areas under its control, and ensure that private landholders do the same.

Management of noxious weeds should be considered as a component of fire planning.

### **2.13 Rivers and Foreshores Improvement Act 1948**

The NSW *Rivers and Foreshores Improvement Act 1948* (RFI Act) aims to provide effective controls on activities that could harm sensitive waterway and foreshore environments. The Act has provisions that require a permit for excavations, fill and other works within 40m of the top of the bank for rivers, estuaries and lakes as it is recognised that they can have significant detrimental environmental impacts on habitat, water quality, flooding and erosion. This Act exempts 'local authorities' from the need to obtain a permit.

A Part 3a permit would be required under the RFI Act for works listed above. The RFI Act is soon to be repealed and replaced by the *Water Management Act, 2002* but the provisions under this Act are likely to be similar to the RFI Act. A notable exception, however, is that 'local authorities' will no longer be exempt from the need to obtain a permit.

### **2.14 State Environmental Planning Policy 19 (SEPP 19) – Bushland in Urban Areas**

SEPP 19 is designed to protect bushland in public open space zones and reserves, as part of preservation for natural heritage, or for recreational, educational and scientific purposes. It ensures that bush preservation is given a high priority when local environmental plans for urban development are prepared. Under SEPP 19 'bushland' means land on which there is vegetation that is either a remainder of the natural vegetation of the land or, if altered, is still representative of the structure and floristic integrity of the natural vegetation.

This reserve is zoned as public open space. As such, future hazard reduction work must address this legislation.

### **3 Bush Fire Risk**

#### **3.1 Bush Fire History**

Warringah Council and the NSW Rural Fire Service supplied fire history mapping for both wildfire and Hazard Reduction burning. Field validation, completed in January 2005, was undertaken to increase the reliability of the data. Spatial accuracy for the data was found to be low, particularly for older fires.

Additional fire history data was assessed, including:

- Digital data from the Department of Environment and Conservation (incorporated into fire mapping, post site validation)
- Written data from the NSW Fire Brigade, consisting of records for Hazard Reduction burning over the last 5 years and unplanned vegetation fires for the past 10 years (provided to Council)

Fire history data from all sources ranged in date from 1952 to 2006.

Fire history mapping prior to 2000 was often not undertaken or consisted of approximate desktop estimates. As such past fire history data may be incomplete.

An analysis of available mapped fire history data showed that 1.2% of Dee Why Lagoon Wildlife Reserve has been burnt since 1952. The most recent burn occurred in 2006 and was the result of arson. This unplanned burn occurred to the east of Dee Why Lagoon within the Fire Exclusion Zone (FEZ) one and burnt approximately 0.43 ha.

Small spot fires mapped outside the reserve were not included within fire history analysis.

It has been suggested that areas within LMZ 1, LMZ 2, LMZ 5, LMZ 7 were burnt in 1984 (per. comm. Tony Auld (DEC), 30/5/05) (see Figure 6 for zone locations).

See the Dee Why Lagoon Wildlife Refuge Fire Regime Management Poster (Appendix 7, ELA 2006) for mapped fire history.

#### **3.2 Fuel Load Assessment**

An assessment of fuel loads has been undertaken in ArcView GIS using an extension to predict fuel loads based on vegetation type and time since fire. This software uses fuel accumulation curves for structural vegetation types prepared for NPWS (Conroy 1994). This information was then analysed in relation to time since the last fire to provide an estimate of fuel loads across the study area.

This information has been used to assist in the identification of priority areas for hazard reduction burns. Fuel loads will vary as new fires occur and vegetation regenerates.

Fuel modelling has been based on fire history data from 1952 to 2005 fire seasons and vegetation as mapped by P & J Smith (2003). Predicted fuel loads for the reserve are shown in Figure 3.

### 3.2.1 Limitations

The following is a basic list of the limitations of the fuel model:

- The model is based on topography, vegetation mapping and fire history. Any inaccuracies or gaps in this data will be persistent throughout the fuel model
- Current fire history records do not include any indication of fire intensity. The model assumes a starting fuel load of 0 tonnes per hectare. After any fire this is unlikely and in the case of a cool burn, much of the available fuel may remain
- Fire history records before the mid 1980s were not systematically recorded
- Years of drought and very poor ridge-top soil conditions may result in a much slower rate of vegetation growth and fuel accumulation
- Areas of cleared or highly disturbed vegetation were excluded from the fuel load assessment
- In some areas manual Hazard Reduction (HR) works have not been mapped. This has resulted in higher fuel load predictions than that which is actually on the ground
- The 2006 fire was not included within fuel load assessments

### 3.2.2 Algorithms

The following vegetation fuel classes are used:

- 1 = grass (not included in model at this stage)
- 2 = shrub / heathland
- 3 = woodland
- 4 = open forest
- 5 = rainforest (not included in model)
- 0 = cleared, disturbed, not vegetated, swamp, reedland, saltmarsh (not included in model)

The following fuel accumulation algorithms are used:

$$\text{Shrubland: } F = 40 - (e^{-0.01169 * t} * 36.6345)$$

$$\text{Woodland: } F = 22.3 - (e^{-0.1634 * t} * 16.878)$$

$$\text{Forests: } F = 23 - (e^{-0.112 * t} * 16.346)$$

Where:

F = Fuel Load in tonnes/hectare

T = Time since last fire (in years)



### **3.3 Assets at Risk from Fire**

#### **3.3.1 Built and Cultural Assets**

The reserve contains numerous built assets including a playground, Dee Why Surf Life Saving Club and stormwater drains. Protection of these assets has been incorporated within zone management requirements.

Future plans within the reserve include the installation of new boardwalks / viewing platforms / seating etc along the back of the dunes and the southern boundary of the Lagoon (Warringah Council 2002).

Identification of cultural assets including known European and Aboriginal heritage sites have been undertaken using information from the Aboriginal Heritage Information Management System (AHIMS – DEC 2004a), Council data and the reserves management plan (LandArc 2000). This information has been provided in digital GIS format and is intended to flag known cultural heritage issues for consideration during the HR planning process.

The entire reserve is listed on the State Heritage Register. No known items of Aboriginal heritage were identified.

#### **3.3.2 Natural Heritage Assets**

Information on natural heritage values has been sourced from the following:

- Atlas of NSW Wildlife (DEC 2004)
- Warringah Vegetation Mapping (P & J Smith 2003, supplied in digital format by Council)
- Warringah Natural Area Survey: Vegetation communities and Plant Species (P & J Smith 2003)
- Dee Why Lagoon Wildlife Refuge Plan of Management (Warringah 2002)

##### **3.3.2.1 Vegetation Communities**

The reserve contains seven vegetation types that are listed as Endangered Ecological Communities (EECs) under the TSC Act. No EPBC Act listed communities occur within the reserve.

Table 1 contains a list of communities, their legal status in NSW and their priority within Warringah LGA (P & J Smith 2003). See Figure 2 for vegetation communities and Appendix 1 for an explanation of vegetation priority. A transparent overlay of vegetation communities may also be seen in Appendix 6.

**Table 1 Vegetation Communities of Dee Why Lagoon Wildlife Refuge**

<b>Vegetation Community</b>	<b>State Legislative Status (TSC Act 1995)</b>	<b>LGA Priority</b>
Coastal Banksia-Eucalypt Scrub	EEC - Bangalay sand forest, Sydney Basin and South East Corner bioregion	1
Coastal Dune Swamp	EEC - Sydney Freshwater Wetlands in the Sydney Basin bioregions	1
Coastal Wattle Heath	Not listed	2
Estuarine Paperbark Scrub	EEC - Swamp sclerophyll forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions	1
Estuarine Reedland	EEC - Swamp sclerophyll forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions	1
Highly disturbed vegetation	Not listed	0
Saltmarsh	EEC - Coastal saltmarsh in the NSW North Coast, Sydney Basin and South East Corner bioregions	1
Spinifex Grassland	Not listed	2
Swamp Mahogany Forest	EEC - Swamp sclerophyll forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions	1
Swamp Oak Forest	EEC - Swamp oak floodplain forest of the NSW North Coast, Sydney Basin and South East Corner bioregions	1

### **3.3.2.2 Managed Regeneration Areas**

Consideration should be given to the vulnerability of bush regeneration areas within the reserve at HR planning stage as well as during wildfire response, where possible.

### **3.3.2.3 Threatened Flora and Fauna**

A search of the Atlas of NSW Wildlife was conducted for:

- Threatened flora listed under the TSC Act 1995, and flora indicated by P & J Smith (2003) as being nationally, regionally or locally significant. Search area was within 5km of the Reserve; and
- Threatened fauna listed under the TSC Act 1995, and fauna indicated by P & J Smith (2005) as being nationally, regionally or locally significant. Search area was within 10km of the Reserve.

Species identified within the above proximity may be seen in Appendices 2 and 3 and include:

- 39 threatened fauna species
- 43 national, regional or locally significant fauna species
- 4 threatened flora species
- 7 national, regional or locally significant flora species

Species recorded within the reserve include Black Bittern (*Ixobrychus flavicollis*), Sanderling (*Calidris alba*), Great Knot (*Calidris tenuirostris*) and Pied Oystercatcher (*Haematopus longirostris*).

Fire requirements for threatened species identified within the reserve were considered during creation of the operational schedule. These included requirements identified within relevant recovery plans for each species.

Protection of locally and regionally significant species, as well as threatened species identified as occurring outside the reserve, was aimed at maintaining the structure and floristic integrity of the plant communities within which they occur.

Additional management requirements for all species identified (see Appendix 2) should be considered during HR planning. This includes fire intensity, burn season, escape routes and internal burning boundaries to ensure protection of breeding areas and habitat.

Fire ecology requirements of threatened flora within 5 km and threatened fauna within 10 km of the reserve have been assessed and provided to Council within the Warringah Reserve Threatened Flora/Fauna Fire Ecology spreadsheets (ELA 2005a, ELA 2005b).

Additional information including species habitat distribution/condition and population age (for flora species) is required to enable effective HR planning. Field assessment is therefore advised at HR planning stage.

To assist in future management, it is recommended that Council obtain mapping of:

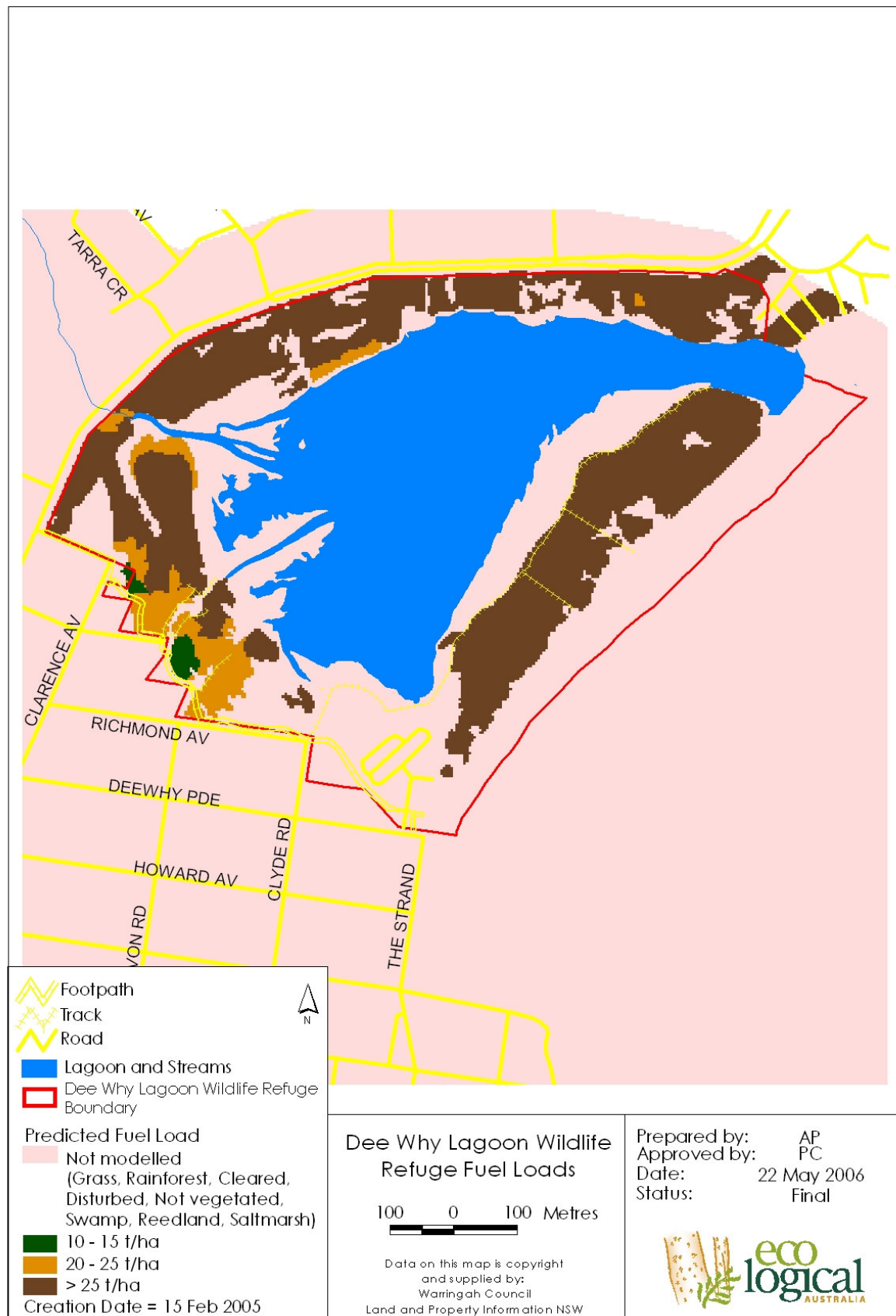
- Potential reserve areas for amphibians, reptiles and mammals (considering the existence of barriers such as fences)
- Distribution and abundance of habitat features for which protective measures can be implemented, including:
  - Ephemeral areas
  - Hollow bearing trees/ significant stands

Figure 2 Vegetation Communities





Figure 2 Predicted Fuel Loads



## **4 Fire Management Issues**

### **4.1 Fire Management Boundaries**

The reserve boundary used within this plan has been compiled from both cadastral and reserve management boundaries (as proposed within the Dee Why Lagoon Wildlife Refuge Plan of Management (Warringah 2002)). Areas where the reserve management boundary is seen to deviate outside of the cadastral boundary have been included.

### **4.2 Management Responsibilities**

Fire management within the areas is co-ordinated on a landscape scale by the Warringah Pittwater Bush Fire Management Committee (BFMC). This committee is responsible for providing a coordinated, agreed approach to major issues in preparing plans for operations, and bush fire risk management within the district and is made up of Warringah Council, DEC and other key stakeholders.

Overall management of the reserve is the sole responsibility of Warringah Council. The NSW Fire Brigade is responsible for fire suppression efforts in the reserve and for mapping any fires that occur.

This plan has divided the reserve into a number of different management zones. Management within zones that adjoin or include private/commercial properties may require landowner's co-operation. Council have no responsibility for land not under their management.

### **4.3 Fire Trails and Tracks**

Signage is recommended for interpretive purposes under the Reserve's Plan of Management (Warringah 2002). It is also recommended that a map of walking trails be included.

Additional tracks within the reserve are likely to result from plans to build new boardwalks / viewing platforms / seating etc along the back of the dunes and the southern boundary of the Lagoon (as per Warringah Council 2002).

The current fire trail layout is sufficient and as such no new trails are recommended for fire access purpose. However existing and planned trails must be maintained.

Fire trail management should be undertaken in accordance with the Bush Fire Coordinating Committees' Policy (no. 1/03), Guidelines for the Classification of Fire Trails and Guidelines for Fire Trail Signage (BFCC 2003). Additionally a Fire Trail Register is maintained by the BFMC.

### **4.4 Introduced Species Management**

#### **4.4.1 Weed management**

Interactions between fire and weed species include:

- Increased fuel levels, with some weed species being particularly flammable (Eg. Pampas grass)

- Decreased likelihood of effective burn intensities, due to fire retardant species (Eg. Privet and mesic species)
- Potential for weed mortality by fire;
- Encouraged proliferation of weeds, due to seed stimulation and ecological conditions post fire

To ensure appropriate weed management, weed control should be considered during HR planning. This should include an assessment of:

- Removal of weed species over natives during creation of APZ areas
- Pre-fire weed preparation requirements. Factors to consider include weed type, species, moisture content and desired fire intensity

Management of weeds within APZ areas must incorporate ecological, stabilisation, and fire considerations.

Appropriate techniques are to be employed to prevent weed dispersal by equipment such as mowers, and the removal of dead vines from trees, as these features can act as wicks for fire to spread into canopy.

#### **4.4.2 Feral fauna management**

Fire may increase the impact of feral fauna species by a reduction in protective ground cover for prey species. Control of feral species should therefore be considered during HR planning works.

No evidence of feral species were observed during field surveys.

### **4.5 Fire Management Zones**

The Fire Management Zones used in this plan are based on those used in the Warringah Pittwater Bush Fire Risk Management Plan (WPBFMC 2000). These zones are briefly described below.

#### **4.5.1 Asset Protection Zones (APZ)**

##### Description

- Area surrounding a development and managed to reduce bush fire hazard
- Often has inner protection area (IPA) and outer protection area (OPA)
- APZ widths and fuel reduction treatment will be determined by slope and existing nature of assets
- Reduction techniques will include:
  - raking and slashing
  - bush regeneration, involving initial weed removal and long term weed management. This method should be combined with hand removal of ground fuels and manual removal of shrub and middle story layers
  - burning

#### Aims

- To protect human life and property
- To protect highly valued assets

#### Prescriptions

- To maintain reduced ground fuel loads and maintain understorey to less than 50 cm in height, with discontinuous shrub and canopy layers, by:
  - removal/ suppression of weeds
  - thinning of regrowth
  - hand removal
  - raking and slashing
- Trees should not over-hang buildings
- APZ areas may be burnt as appropriate dependant on management issues

### **4.5.2 Land Management Zone (LMZ)**

#### Description

- Broader areas of the landscape, incorporating those areas not satisfying the criteria for inclusion in Strategic Fire Management Zones or Asset Protection Zones
- Reduction techniques will include:
  - burning
  - weed control

#### Aims

- Protection of natural and cultural heritage values
- Maintenance of ecological processes

#### Prescription

- Fire management to meet conservation objectives for species, habitats, populations and cultural heritage values, including:
  - control of breaches in minimum fire thresholds and address maintenance of fire age (vegetation age) mosaic, including maximum fire thresholds
  - implementation of cultural heritage and threatened species management within areas where cultural heritage and threatened species sites are known or likely to occur



#### **4.5.3 Strategic Fire Advantage Zones (SFAZ)**

##### Description

- Usually adjacent to and complementing asset protection zones
- Managed to protect community assets and ecological sustainability
- Reduction techniques will include:
  - burning
  - manual fuel reduction techniques such as raking, slashing, hand removal of ground fuels and manual removal of shrub and canopy layers; emphasis placed on weed species where appropriate
  - weed control

##### Aims

- To restrict fire movement into and out of reserves
- Reduce the speed and intensity of fire
- Reduce the potential for spot fire development

##### Prescription

- A general prescription for maximum fire fuel loading within a range of 8 – 18 tonnes per hectare
- To be managed consistently with the following applications:
  - to provide fuel reduced areas which enable the protection of assets by fire fighters when Asset Protection Zones are not in place
  - to complement Asset Protection Zones where insufficient protection is provided
  - to provide fuel reduced zones in areas of high ignition potential (eg. along roads, rail lines, power lines etc.) to slow the development of fires, reduce their spread, and provide for safe suppression
  - to provide strategically located fuel reduced areas to reduce the vulnerability of assets which are susceptible to fire
  - to attain a fire regime consistent with the requirements for the preservation of biodiversity within vegetation communities

#### **4.5.4 Fire Exclusion Zones (FEZ)**

##### Description

- Areas containing fire intolerant species and assets

#### Aims

- To exclude fires (both wildfires and hazard reduction burning) due to the presence of fire intolerant assets, including:
  - fire intolerant vegetation communities
  - riparian buffers
  - cultural/historic sites

#### Prescription

- Exclude fire and undertake rapid suppression of unplanned fires to maintain fire intolerant species and assets

### **4.6 Biodiversity Fire Regime Thresholds**

Biodiversity fire regime thresholds are intended to ensure there is no loss of biodiversity through senescence or insufficient recruitment as a result of fires being too frequent. Additionally, varying inter-fire periods across the landscape ensures greater heterogeneity of lifecycles and growth stages, enhancing habitat value.

Minimum and maximum inter-fire periods have been defined for vegetation communities known to occur within the reserve. These are shown in Table 3.

Revegetation areas within the reserve have not been included within this assessment process. Due to the potentially young age of these communities it is noted that prescribed biodiversity thresholds may have detrimental effects. These factors need to be considered during future HR planning conducted prior to burning.

An evaluation of fire history and biodiversity fire regime thresholds for mapped vegetation communities has been undertaken for the entire reserve. This assessment did not include the 2006 fire event.

The current fire threshold status and resultant ecological fire requirements for vegetation within the reserve have been determined and may be seen in Figures 4 and 5 respectively. An explanation of these categories can be seen in Table 2.

The information above has been considered in determining the operation schedule (see Section 5).

An indication of the number of burns permitted within the life of the plan has been provided where the minimum inter-fire threshold has not been reached (i.e. it has not been burnt too frequently).

Fire should be excluded from areas where the minimum inter-fire threshold has been reached.

Where the minimum inter-fire threshold has been exceeded (that is, it has been burnt too frequently), strategies to facilitate recovery should be implemented. These may include:

- Immediate response and rapid suppression in the event of a wildfire, to minimise the burnt area
- Use of prescribed burning to reduce the threat of wildfire whilst maintaining varying fire ages

When identifying if an area has breached, reached or not reached its minimum inter-fire threshold the precautionary approach was adopted. It was not possible, with the data available, to identify whether a fire had occurred at the start or end of a calendar year (some fires are recorded by fire season, which actually occurs over 2 calendar years). Therefore, when calculating the minimum inter-fire threshold, areas on the fringe of the threshold were included. For example, if an area had a minimum threshold of >2 fires in <5 years, and was burnt in 1999 and 2004, we would identify this area as having reached its minimum threshold, even though the fires may have actually occurred 6 years apart (Eg. January 1999 and December 2004). This precautionary approach means areas for future burning were not identified if they were on the verge of reaching their minimum threshold.

Where frequent fire is identified in a Recovery Plan as a threatening process, relevant pre-existing Threat Abatement Plans should be implemented.

**Table 2 Ecological Threshold and Ecological Fire Requirement Explanation**

<b>Ecological Thresholds</b>	<b>Explanation</b>	<b>Ecological Fire Requirements</b>
Threshold breached	This includes areas of vegetation where fire frequency has either been too infrequent, or too frequent for the maintenance of optimum biodiversity, as recommended within vegetation community fire thresholds.	<p>• Actions for areas will depend upon whether the minimum threshold (i.e. burnt too frequently) or the maximum threshold (i.e. not burnt frequently enough) has been reached.</p> <p><u>Minimum threshold breached:</u> Suppression priority. Exclude prescribed burning for a minimum of 10 years in forest, heathland / tall shrubland and woodland.</p> <p>For other community types prevent successive fires until community is within threshold.</p> <p><u>Maximum threshold breached:</u> Prescribed burning to be undertaken ensuring sufficient areas of old age class communities are left within the reserve. Managed as for Prescribed Fire Management Zone (see Section 5.1).</p>
Threshold reached	This includes areas of vegetation where fire occurrence has reached the limit of identified vegetation community fire thresholds.	<p><u>Minimum threshold reached:</u> Prevent successive fires until community is within threshold.</p> <p><u>Maximum threshold reached:</u> Monitor vegetation community to determine age distribution. Prescribed burning may be undertaken, ensuring sufficient areas of old-age class communities are left within the reserve. Managed as for Prescribed Fire Management Zone (see Section 5.1).</p>
Threshold not reached	This includes areas of vegetation where fire has occurred at a frequency within the identified vegetation community fire thresholds.	An indication of the number of fires permitted within the life of the plan before threshold is reached is provided.

Ecological Thresholds	Explanation	<b>Ecological Fire Requirements</b> <ul style="list-style-type: none"> <li>• Actions for areas will depend upon whether the minimum threshold (i.e. burnt too frequently) or the maximum threshold (i.e. not burnt frequently enough) has been reached.</li> </ul>
Nearing maximum, no fire recorded	This includes areas of vegetation where a fire has not been recorded in the data provided. Area should be managed to ensure that a mosaic of fire ages within the area exist.	Prescribed burning to be undertaken, ensuring sufficient areas of old age class communities are left within the reserve. Managed as for assigned fire management zone - see Section 5.1).
Threshold not reached (reached >10 years ago)	This includes areas of vegetation where a fire has occurred at a frequency within the identified vegetation fire thresholds, however the threshold was reached in the past (i.e. >10 years ago).	An indication of the number of fires permitted within the life of the plan before threshold is reached is provided.
Threshold not reached (breached >10 years ago)	This includes areas of vegetation where a fire has occurred at a frequency within the identified vegetation fire thresholds, however the threshold was breached in the past (i.e. >10 years ago).	An indication of the number of fires permitted within the life of the plan before threshold is reached is provided.
Not addressed	This includes water bodies and areas mapped as highly disturbed or cleared vegetation. These areas have no identified vegetation community fire thresholds.	Not applicable.

Figure 3 Vegetation Fire Threshold

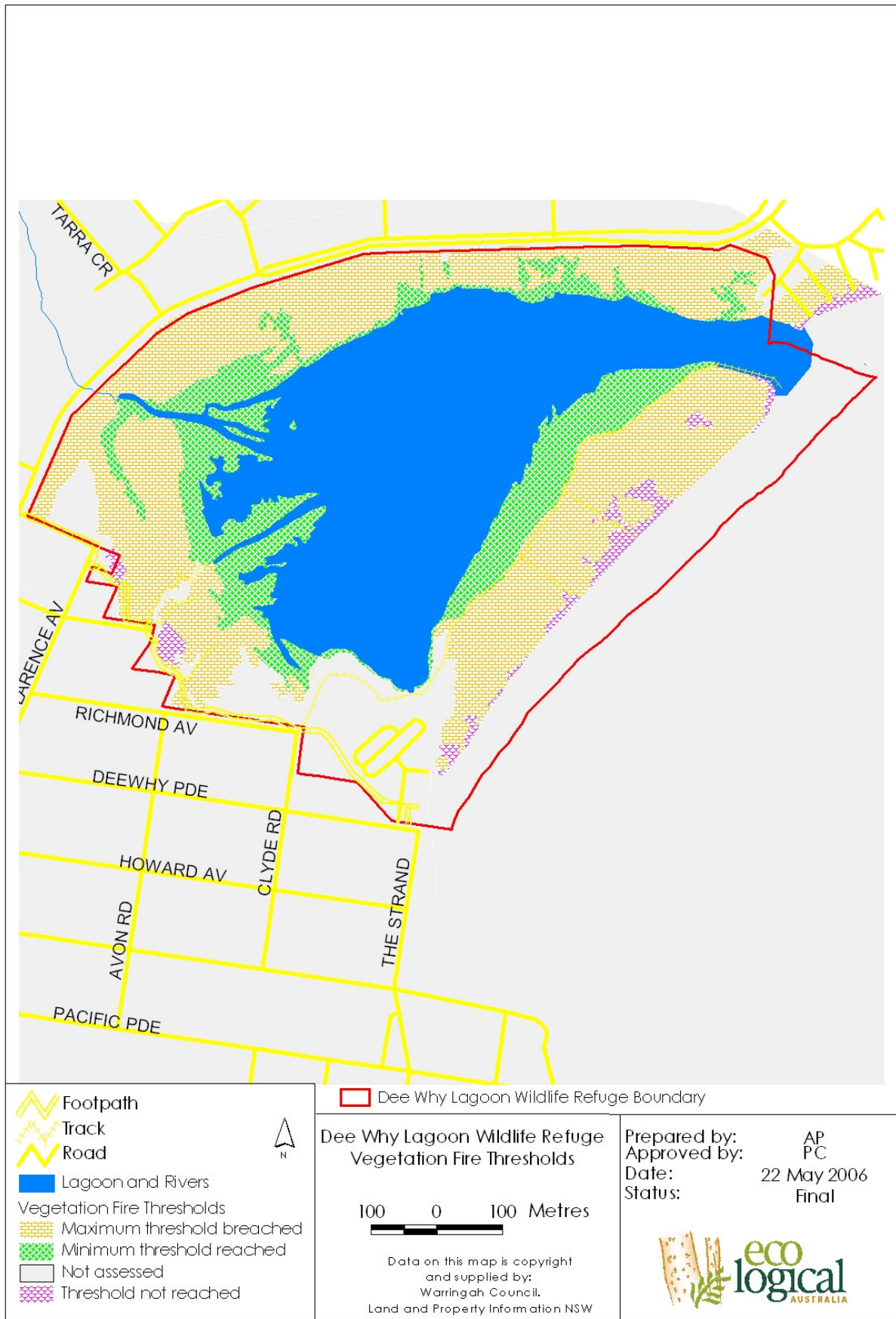
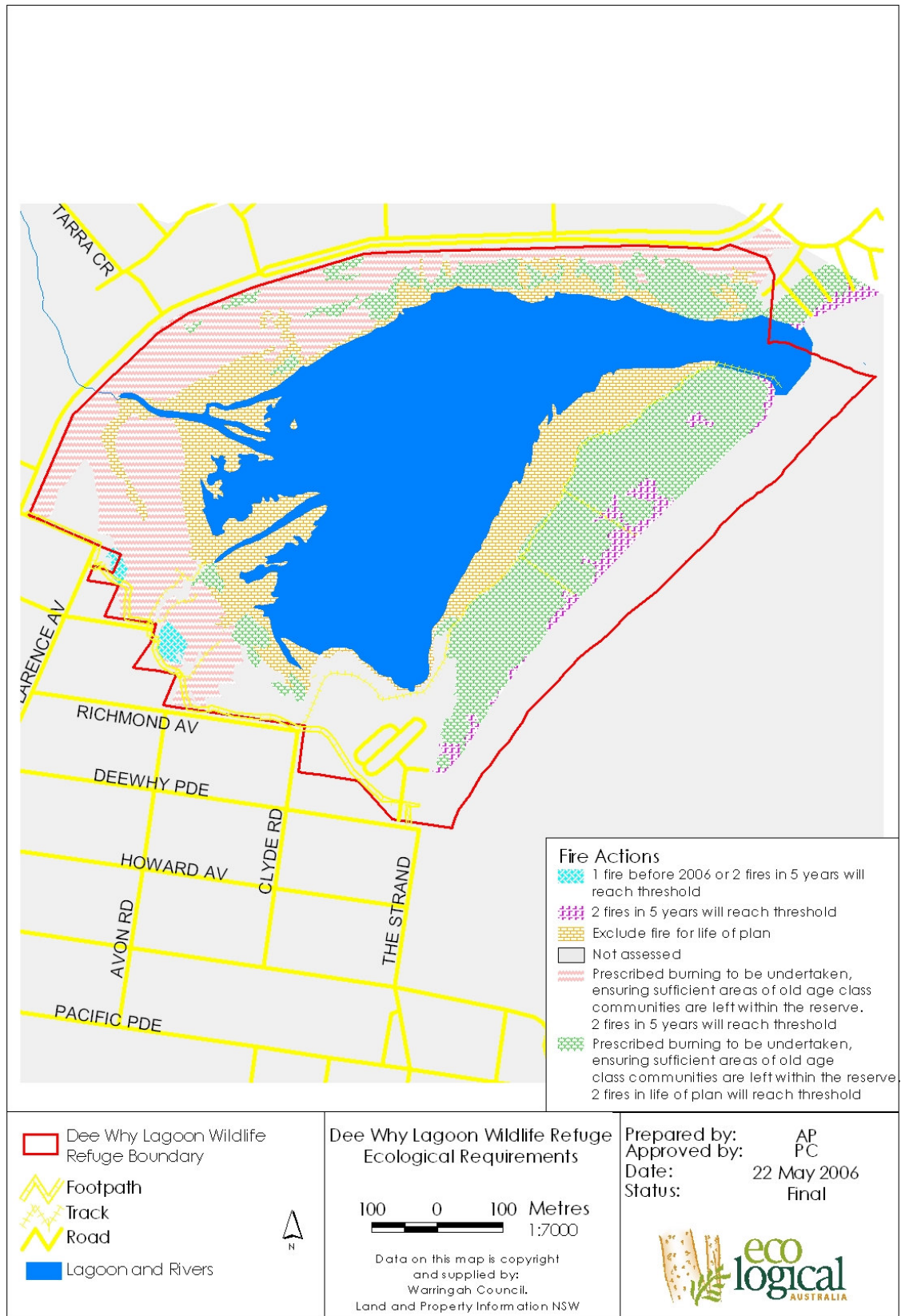


Figure 4 Ecological Fire Requirements



**Table 3 Biodiversity Fire Regime Thresholds for Vegetation Communities identified within Dee Why Lagoon Wildlife Refuge**

<b>Vegetation community</b>	<b>Priority</b>	<b>Minimum Fire Interval</b>	<b>Maximum Fire Interval</b>	<b>Fire Restrictions</b>	<b>Reference</b>
Coastal Banksia-Eucalypt Scrub	1	> 2 successive fires in < 5yr intervals	>30	Decline predicted if successive fires occur which totally scorch or consume the tree canopy. Avoid successive fires of intensity sufficient to scorch or consume dominant tree crown	(Bradstock NPWS 1996 cited in Conacher Travers Pty Ltd 2002), (WPBFMC 2000)
Coastal Dune Swamp	1	Variable frequency, >2 in 8 yr interval, 2 consecutive fires >15 apart. No more than 2 consecutive fires where < 10 t/ha fuel consumed.	>30	-	(Bradstock NPWS 1996 cited in Conacher Travers Pty Ltd 2002)
Saltmarsh	1	No fires acceptable	No fires acceptable	-	
Spinifex Grassland	2	> 2 successive fires in < 5yr intervals	2 fires occur > 15 yr intervals	-	(Bradstock NPWS 1996 cited in Conacher Travers Pty Ltd 2002), (SEC 2003)
Swamp Mahogany Forest	1	> 2 successive fires in < 5yr intervals	>30	Decline predicted if successive fires occur which totally scorch or consume the tree canopy. Avoid successive fires of intensity sufficient to scorch or consume dominant tree crown	(Bradstock NPWS 1996 cited in Conacher Travers Pty Ltd 2002), (WPBFMC 2000)



## 5 Operational Schedule

The operational schedule is explained below and is made up of the:

- Prescribed Fire Management Zones
- Prescribed Works Schedule

This may be seen in:

- Figure 6 and 7
- Table 4
- The "Dee Why Lagoon Wildlife Refuge Fire Regime Management Poster" (Appendix 7, ELA 2006)

### 5.1 Prescribed Fire Management Zones

The following fire management zones have been applied (see Figure 6, Section 4.5):

- Asset Protection Zones (APZ)
- Land Management Zones (LMZ)
- Fire Exclusion Zones (FEZ)

Prescribed APZ widths may be seen in Table 4.

LMZ have been divided up into fire management zones, to ensure the maintenance of fire age mosaic and required threshold regimes.

In order to minimise impacts and to allow for effective management, existing tracks, natural features and cleared areas have been used for fire management boundaries where available.

### 5.2 Prescribed Works Schedule

The prescribed works schedule lists the actions required by Council to facilitate implementation of this Plan's objectives.

Prescribed burning within LMZ has been proposed for selected areas where biodiversity fire regime thresholds are near to or have been exceeded (that is, if the vegetation has not been burned for a long time and is in danger of senescing and losing biodiversity values). Assessed threshold explanation, status and proposed action status can be seen in the following:

- Sections 4.6
- Figure 4, 5
- Table 2

It has been suggested areas within LMZ 1, LMZ 2, LMZ 5, LMZ 7 may have been burnt in 1984 (per. comm. Tony Auld (DEC), 30/5/05). The time since the last fire occurred within these areas should be validated. This may be undertaken by an assessment of growth characteristics of *Banksia ericifolia*, in accordance with Jenkins *et al* 2005 and Lamont 1985.

If it is determined that these areas were burnt within the last 30 years, proposed burns should not be undertaken.

Water quality within the reserve should be protected by the restriction of fire or by limiting fire intensity from within 20 m of watercourses where possible.

Figure 5 Prescribed Fire Management Zones





Figure 6 Prescribed Works Schedule



Table 4 Operation Schedule for Dee Why Lagoon Wildlife Refuge

Name	Zone Type	Treatment	Management	HR Treatment Priority*	HR Treatment Year	Assets	Threatened Species and Endangered Ecological Communities	Aboriginal or Cultural Sites	Land Tenure	APZ Widths
APZ 1	APZ	Initial weed removal and long term weed suppression, slashing/hand removal of fuels within areas of build up	-	-	Subject to Council's FMAZ program priorities ♦	tracks, road, playground, car park, Dee Why Surf Life Saving Club	-	Listed on the State Heritage Register	Council	Applied to logical boundary
APZ 2	APZ	Long term weed suppression, slashing/hand removal of fuels within areas of build up	-	-	Subject to Council's FMAZ program priorities ♦	Sydney Water Infrastructure	Swamp Sclerophyll Forest EEC - Swamp Mahogany Forest	Listed on the State Heritage Register	Sydney Water	Applied to logical boundary

Name	Zone Type	Treatment	Management	HR Treatment Priority*	HR Treatment Year	Assets	Threatened Species and Endangered Ecological Communities	Aboriginal or Cultural Sites	Land Tenure	APZ Widths
APZ 3	APZ	Initial weed removal and long term weed suppression, slashing/hand removal of fuels within areas of build up	-	-	Subject to Council's FMAZ program priorities♦	Signs	Swamp Sclerophyll Forest EEC - Swamp Mahogany Forest; Bangalay Sand Forest EEC - Coastal Banksia-Eucalypt Scrub	Listed on the State Heritage Register	Council	30m
FEZ 1	FEZ	Exclude fire/quick suppression	-	-	-	-	Swamp Sclerophyll Forest EEC - Estuarine Paperbark Scrub & Estuarine Reedland; Bangalay Sand Forest EEC - Coastal Banksia-Eucalypt Scrub; Coastal saltmarsh EEC - Saltmarsh ; Black Bittern	Listed on the State Heritage Register	Council	-

Name	Zone Type	Treatment	Management	HR Treatment Priority*	HR Treatment Year	Assets	Threatened Species and Endangered Ecological Communities	Aboriginal or Cultural Sites	Land Tenure	APZ Widths
LMZ 1	LMZ	Burning	Validation of Time Since Last Fire (TSLF) should be undertaken at HR planning stage. If TSLF < 30 years, don't conduct proposed burn	3	2010	Track	Bangalay Sand Forest EEC - Coastal Banksia-Eucalypt Scrub; Swamp Sclerophyll Forest EEC - Estuarine Paperbark Scrub & Swamp Mahogany Forest; Sydney Freshwater Wetlands EEC - Coastal Dune Swamp	Listed on the State Heritage Register	Council	-
LMZ 2	LMZ	Burning	Validation of Time Since Last Fire (TSLF) should be undertaken at HR planning stage. If TSLF < 30 years, don't conduct proposed burn	4	2012	Stormwater drains	Bangalay Sand Forest EEC - Coastal Banksia-Eucalypt Scrub; Sydney Freshwater Wetlands EEC - Coastal Dune Swamp; Swamp Oak Floodplain EEC - Swamp Oak Forest	Listed on the State Heritage Register	Council; Community Land, Crown Reserve (managed by Council)	-
LMZ 3	LMZ	Burning	-	5	2013	Track	Coastal Saltmarsh EEC - Saltmarsh	Listed on the State Heritage Register	Council; Community Land, Crown Reserve (managed by Council)	-

Name	Zone Type	Treatment	Management	HR Treatment Priority*	HR Treatment Year	Assets	Threatened Species and Endangered Ecological Communities	Aboriginal or Cultural Sites	Land Tenure	APZ Widths
LMZ 4	LMZ	Burning	-	6	2015	Track	Coastal Saltmarsh EEC - Saltmarsh	Listed on the State Heritage Register	Council; Community Land, Crown Reserve (managed by Council)	-
LMZ 5	LMZ	Burning	Validation of Time Since Last Fire (TSLF) should be undertaken at HR planning stage. If TSLF < 30 years, don't conduct proposed burn	2	2009	Stormwater drains, car park	Bangalay Sand Forest EEC - Coastal Banksia-Eucalypt Scrub; Sydney Freshwater Wetlands EEC - Coastal Dune Swamp; Swamp Sclerophyll Forest EEC - Estuarine Paperbark Scrub; Swamp Oak Floodplain Forest EEC - Swamp Oak Forest	Listed on the State Heritage Register	Council	-
LMZ 6	LMZ	-	-	-	-	-	-	Listed on the State Heritage Register	Council	-



Name	Zone Type	Treatment	Management	HR Treatment Priority*	HR Treatment Year	Assets	Threatened Species and Endangered Ecological Communities	Aboriginal or Cultural Sites	Land Tenure	APZ Widths
LMZ 7	LMZ	Burning	Validation of Time Since Last Fire (TSLF) should be undertaken at HR planning stage. If TSLF < 30 years, don't conduct proposed burn	1	2007	Track	Bangalay Sand Forest EEC - Coastal Banksia-Eucalypt Scrub; Swamp Sclerophyll Forest - Swamp Mahogany Forest; Swamp Oak Floodplain EEC - Swamp Oak Forest	Listed on the State Heritage Register	Council;	-

\* Year of burn may vary due to weather and environmental conditions and resource availability

◆ Fire Management Access Zone (FMAZ) priorities dependent on available funds

Note:

- Significant species Short-tailed Shearwater found within LMZ 6
- Three threatened species have been recorded within DeeWhy Lagoon, including: Sanderling (*Calidris alba*), Great Knot (*Calidris tenuirostris*) and Pied Oystercatcher (*Haematopus longirostris*)

## **6 Performance measures**

### **6.1 Environmental Assessment of Scheduled Works**

All works proposed within the fire management plan will be assessed for environmental and heritage impacts at the HR planning stage. This will be conducted either under the EP&A Act or under the Bush Fire Environmental Assessment Code (see Section 2.6). The "Warringah Local Government Area Hazard Reduction Guidelines" (Appendix 4) may be used to assist this process.

### **6.2 Monitoring Fire Regimes and Changes to Biodiversity**

Fire records should be updated as fire incidents occur.

Changes to fire threshold status that result from fire occurrences after June 2005 should be assessed annually and at the beginning of HR planning to determine potential management requirements. This assessment should involve a comparison of required and actual vegetation community and threatened species thresholds and require:

- Updated fire records
- Determination of fire age
- Consideration of required threshold
- Assessment of current threshold status

Assessment of vegetation community threshold status was undertaken in 2005 (see Section 4.6) and is included within:

- Figure 4, 5
- Digital data provided to Council

### **6.3 Fire Management Plan Review**

The goal of this plan is to guide the management of fire in Dee Why Lagoon Wildlife Refuge for the next 10 years and to provide a sustainable balance between asset protection and ecosystem management.

#### **6.3.1 Prescribed works schedule assessment**

Assessment of the prescribed works schedule (Section 5.2) and the Warringah Reserve Threatened Flora/Fauna Fire Ecology spreadsheets (ELA 2005a, ELA 2005b) should be undertaken on an annual basis and during HR planning. This should include:

- Incorporation of additional developments in the management of native flora and fauna with respect to fire
- Alterations in fire thresholds (see Section 6.2)

#### **6.3.2 Fire management plan evaluation**

It is recommended that an evaluation of this plan be conducted at the end of 10 years. The evaluation should involve stakeholder (RFS and DEC) assessment and include:

*Quantitative assessment:*

- Minimum fire thresholds not exceeded
- Number of hectares burnt outside ecological threshold for HR and wildfires
- Maintenance of a mosaic of fire age (vegetation age)
- Maintenance of fuel free and fuel reduced APZ's
- All activities proposed within the Prescribed Work Schedule accepted by the NSW Rural Fire Service (RFS)

*Qualitative assessment:*

- Provision of effective and user friendly instructional guidelines to enable other planning processes, including:
  - proficient/successful HR planning
  - prevention of fire damage to infrastructure
  - prevention of fire damage to threatened, locally or regionally significant species, endangered populations or endangered ecological communities
  - protection of Aboriginal and culturally significant sites from fire damage
  - evaluate current social attitudes to determine success of proposed management strategies
  - evaluate feasibility and practicality of prescribed operational schedule

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## Appendix 1 – Vegetation Priority Explanation

Priority 1	EEC (under <i>TSC Act 1995</i> ), or represent potentially important habitat for threatened flora or fauna species (listed under <i>TSC Act 1995</i> ). Particularly if the community is absent or poorly represented in Garigal and Ku-ring-gai Chase National Parks.
Priority 2	Important for conservation of biodiversity at the local level. Communities with a restricted distribution in the Warringah LGA and are absent or poorly represented in Garigal and Ku-ring-gai Chase National Parks. Stands of these communities warrant first priority if they support populations of threatened fauna or flora species.
Priority 3	Communities that are well represented in Garigal and Ku-ring-gai Chase National Parks and common in Warringah. Stands of these communities warrant first priority if they support populations of threatened fauna or flora species.

**Source:** P & J Smith 2003

## Appendix 2 – Known Threatened Flora Within 5 km and Threatened Fauna Within 10 km of Dee Why Lagoon Wildlife Refuge

**Table 1: Known threatened flora within 5 km of Dee Why Lagoon Wildlife Refuge\***

Scientific Name
<i>Chamaesyce psammogeton</i>
<i>Genoplesium baueri</i>
<i>Syzygium paniculatum</i>
<i>Tetratheca glandulosa</i>

**\*Source:** DEC 2004    **\*No** threatened species recorded within the Refuge

**Table 2: Known threatened fauna within 10 km of Dee Why Lagoon Wildlife Refuge\***

Scientific Name	Common Name	Recorded Within Reserve
<i>Botaurus poiciloptilus</i>	Australasian Bittern	X
<i>Calidris alba</i>	Sanderling	X
<i>Calidris tenuirostris</i>	Great Knot	X
<i>Calyptorhynchus lathami</i>	Glossy Black-Cockatoo	
<i>Charadrius leschenaultii</i>	Greater Sand Plover	
<i>Charadrius mongolus</i>	Lesser Sand Plover	
<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	
<i>Diomedea exulans</i>	Wandering Albatross	
<i>Esacus neglectus</i>	Beach Stone-curlew	
<i>Gygis alba</i>	White Tern	
<i>Haematopus fuliginosus</i>	Sooty Oystercatcher	
<i>Haematopus longirostris</i>	Pied Oystercatcher	X
<i>Heleioporus australiacus</i>	Giant Burrowing Frog	
<i>Isodon obesulus obesulus</i>	Southern Brown Bandicoot (eastern)	
<i>Ixobrychus flavicollis</i>	Black Bittern	
<i>Lathamus discolor</i>	Swift Parrot	
<i>Litoria aurea</i>	Green and Golden Bell Frog	
<i>Macronectes giganteus</i>	Southern Giant-Petrel	
<i>Macronectes halli</i>	Northern Giant-Petrel	
<i>Miniopterus schreibersii oceanensis</i>	Eastern Bent-wing Bat	
<i>Mormopterus norfolkensis</i>	Eastern Freetail-bat	
<i>Ninox strenua</i>	Powerful Owl	
<i>Pandion haliaetus</i>	Osprey	
<i>Phascolarctos cinereus</i>	Koala	
<i>Phoebastria fusca</i>	Sooty Albatross	
<i>Pseudophryne australis</i>	Red-crowned Toadlet	
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	
<i>Ptilinopus magnificus</i>	Wompoo Fruit-Dove	
<i>Ptilinopus superbus</i>	Superb Fruit-Dove	
<i>Puffinus assimilis</i>	Little Shearwater	
<i>Puffinus carneipes</i>	Flesh-footed Shearwater	
<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	
<i>Sterna albifrons</i>	Little Tern	
<i>Sterna fuscata</i>	Sooty Tern	
<i>Thalassarche cauta</i>	Shy Albatross	
<i>Thalassarche melanophrys</i>	Black-browed Albatross	
<i>Tyto novaehollandiae</i>	Masked Owl	
<i>Varanus rosenbergi</i>	Rosenberg's Goanna	
<i>Xanthomyza Phrygia</i>	Regent Honeyeater	

\*Source: DEC 2004



### Appendix 3 – Known Significant Flora Within 5 km and Significant Fauna Within 10 km of Dee Why Lagoon Wildfire Refuge

**Table 1 Known significant flora within 5km of Dee Why Lagoon Wildfire Refuge\***

Scientific Name	Common Name	Significance
<i>Boronia fraseri</i>		Nationally significant species
<i>Darwinia procera</i>		Nationally significant species
<i>Eucalyptus luehmanniana</i>	Yellow-top Ash	Nationally significant species
<i>Gonocarpus salsoloides</i>		Nationally significant species
<i>Plantago hispida</i>		Threatened in northern Sydney
<i>Rulingia hermanniifolia</i>		Nationally significant species
<i>Scaevola calendulacea</i>		Threatened in northern Sydney

**\*Source:** DEC 2004    **\*No** significant species recorded within the Refuge

**Table 2 Known significant fauna within 10 km of Dee Why Lagoon Wildfire Refuge\***

<b>Scientific Name</b>	<b>Common Name</b>	<b>Significance</b>	<b>Recorded Within Reserve</b>
<i>Anous stolidus</i>	Common Noddy	Migratory	
<i>Antechinus swainsonii</i>	Dusky Antechinus	Threatened in northern Sydney	
<i>Apus pacificus</i>	Fork-tailed Swift	Migratory	
<i>Arenaria interpres</i>	Ruddy Turnstone	Migratory	
<i>Calidris ruficollis</i>	Red-necked Stint	Migratory	
<i>Charadrius bicinctus</i>	Double-banded Plover	Migratory	
<i>Chlidonias leucopterus</i>	White-winged Black Tern	Migratory	
<i>Diplodactylus vittatus</i>	Eastern Stone Gecko	Threatened in northern Sydney	
<i>Egretta sacra</i>	Eastern Reef Egret	Migratory	<b>X</b>
<i>Furina diadema</i>	Red-naped Snake	Threatened in northern Sydney	
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	Migratory	<b>X</b>
<i>Heteroscelus brevipes</i>	Grey-tailed Tattler	Migratory	
<i>Heteroscelus incanus</i>	Wandering Tattler	Migratory	
<i>Hirundapus caudacutus</i>	White-throated Needletail	Migratory	
<i>Lialis burtonis</i>	Burton's Snake-lizard	Threatened in Warringah	
<i>Limnodynastes dumerilii</i>	Bullfrog	Threatened in northern Sydney	
<i>Limnodynastes tasmaniensis</i>	Spotted Marsh Frog	Threatened in northern Sydney	
<i>Limosa lapponica</i>	Bar-tailed Godwit	Migratory	<b>X</b>
<i>Litoria freycineti</i>	Freycinet's Frog	Threatened in northern Sydney	
<i>Monarcha melanopsis</i>	Black-faced Monarch	Migratory	
<i>Myiagra cyanoleuca</i>	Satin Flycatcher	Migratory	
<i>Numenius madagascariensis</i>	Eastern Curlew	Migratory	
<i>Origma solitaria</i>	Rockwarbler	Biogeographically Significant	
<i>Philomachus pugnax</i>	Ruff	Migratory	<b>X</b>
<i>Phyllurus platurus</i>	Broad-tailed Gecko	Biogeographically Significant	
<i>Plegadis falcinellus</i>	Glossy Ibis	Migratory	<b>X</b>
<i>Pluvialis squatarola</i>	Grey Plover	Migratory	<b>X</b>
<i>Pogona barbata</i>	Eastern Bearded Dragon	Threatened in Warringah	
<i>Pseudophryne bibronii</i>	Bibron's Toadlet	Threatened in northern Sydney	
<i>Puffinus griseus</i>	Sooty Shearwater	Migratory	
<i>Puffinus pacificus</i>	Wedge-tailed Shearwater	Migratory	
<i>Puffinus tenuirostris</i>	Short-tailed Shearwater	Migratory	<b>X</b>
<i>Rattus lutreolus</i>	Swamp Rat	Threatened in northern Sydney	
<i>Rhipidura rufifrons</i>	Rufous Fantail	Migratory	
<i>Sericornis magnirostris</i>	Large-billed Scrubwren	Threatened in northern Sydney	
<i>Stercorarius longicaudus</i>	Long-tailed Jaeger	Migratory	
<i>Stercorarius parasiticus</i>	Arctic Jaeger	Migratory	
<i>Stercorarius pomarinus</i>	Pomarine Jaeger	Migratory	
<i>Sterna caspia</i>	Caspian Tern	Migratory	

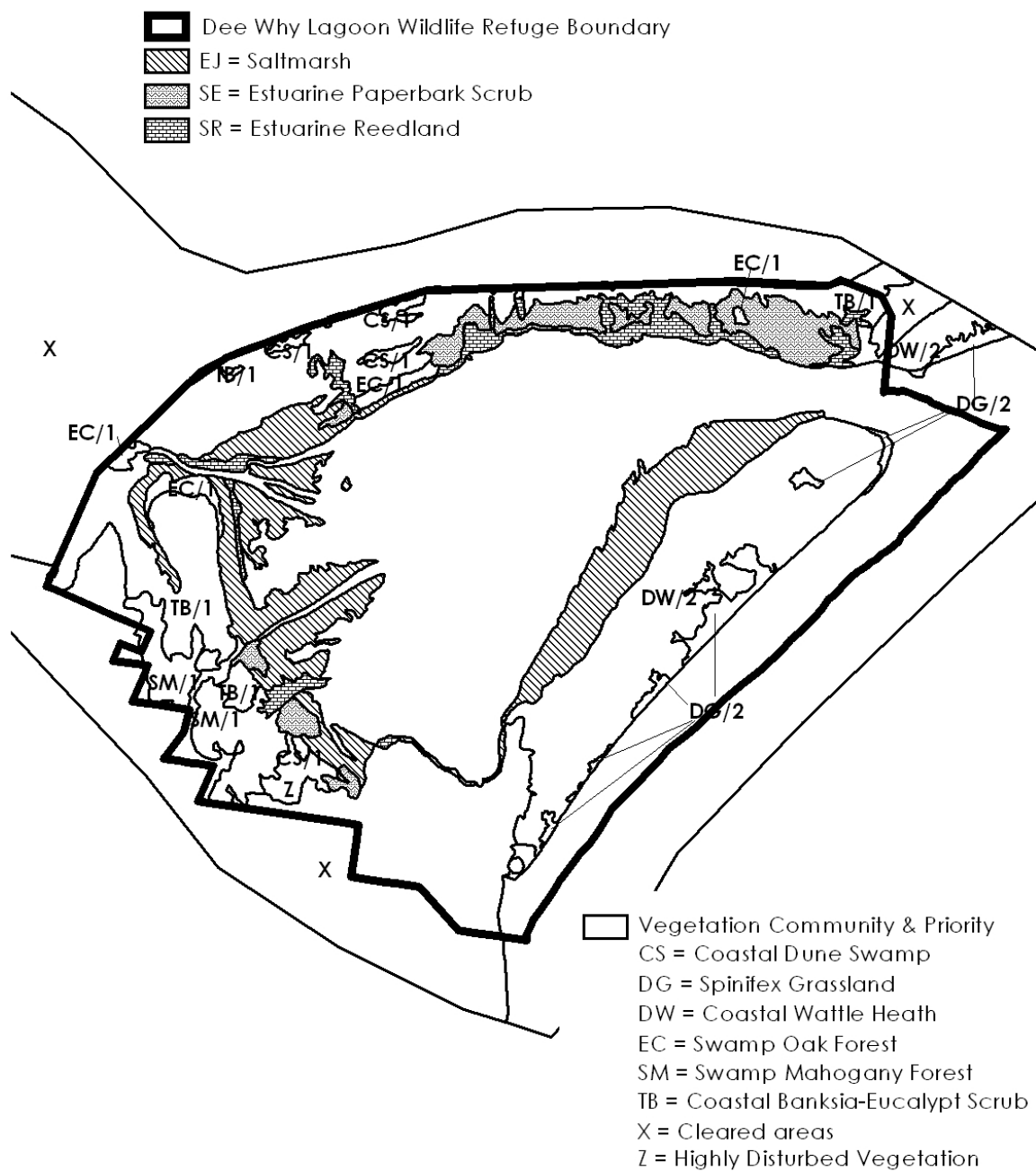
Scientific Name	Common Name	Significance	Recorded Within Reserve
<i>Sterna hirundo</i>	Common Tern	Migratory	
<i>Sterna paradisaea</i>	Arctic Tern	Migratory	
<i>Tringa nebularia</i>	Common Greenshank	Migratory	<b>X</b>
<i>Tringa stagnatilis</i>	Marsh Sandpiper	Migratory	<b>X</b>

**\*Source:** DEC 2004

## **Appendix 4 – Warringah Local Government Area Hazard Reduction Guidelines**

## **Appendix 5 – Fire Management Plan Methodology**

## Appendix 6 –Vegetation Community Overlay



## **Appendix 7 – Dee Why Lagoon Wildlife Refuge Fire Regime Management Poster**