Fire Management Plan

Crowdy Bay National Park

NSW NATIONAL PARKS AND WILDLIFE SERVICE

FIRE MANAGEMENT PLAN
CROWDY BAY NATIONAL PARK

NSW National Parks and Wildlife Service
Port Macquarie District
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ACKNOWLEDGMENTS

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1. INTRODUCTION

Under the Bush Fires Act (1949) the New South Wales National Parks and Wildlife Service (NPWS) is a prescribed organisation and is responsible for the control and suppression of fires on areas that it manages and the implementation of fuel management programs to protect life and property.

The National Parks and Wildlife Service policy on fire management in areas that it manages requires that fire management plans be prepared for each fire prone national park, nature reserve and state recreation area. These fire management plans will be prepared in accordance with a State wide program.

Crowdy Bay National Park (referred to in the plan as the reserve) lies within two Local Council areas, thus the National Parks and Wildlife Service is a member of the Hastings and Greater Taree City Bush Fire Management Committees established under Section 41A of the Bush Fires Act to develop and coordinate fire management between fire authorities in the Hastings and Greater Taree City areas. The committees are responsible for both the development of coordinated fire fighting programs and for reducing bush fire hazards. The Crowdy Bay National Park fire management plan compliments the Hastings and Greater Taree City 41A and 41B Fire Plans.

The procedure for the adoption of a reserve fire management plan involves the following:

- the NPWS Regional Manager of the area concerned gives notice that a fire management plan has been prepared

- the plan is placed on public exhibition for at least three months and during this period any person or organisation may make representations about the plan

- the plan and all the representations made during public exhibition are reviewed by the NPWS District Manager responsible for the Reserve and a report on submissions recommending changes to the fire management plan is forwarded to the NPWS Regional Manager for review

- the Regional Manager submits the plan and the report from the District Manager to the Executive Director (Operations) of the Service

- The Executive Director (Operations) may adopt the plan with or without further amendment after considering the report and recommendations of the District and Regional Managers, or may refer the plan back to the Regional Manager and District Manager for further consideration and advice.

- The plan is then resubmitted to the Executive Director Operations for adoption.

1.1 SCOPE OF THE PLAN

This fire management plan has been developed to provide direction for fire management activities and bush fire events that may occur on Crowdy Bay National Park. Although there will be major emphasis placed on protecting life and property, the plan will also provide direction for land managers to protect and maintain the biodiversity of Crowdy Bay National Park.

Fire management is one of the primary management activities carried out by the New South Wales National Parks and Wildlife Service to ensure protection of life and property within and adjoining its reserves. The management of fire in reserves for conservation purposes is also developing in line with scientific understanding of the fire adaptations of native flora and fauna.

The plan identifies priority areas for fuel management treatment. The cooperation of the community will be critical to the success of the plan. Neighbours will need to manage flammable fuels near their own assets to complement works undertaken in the national park. Where possible the Service will assist neighbours with this process.

Crowdy Bay National Park has a variety of threatened plants and animals. This plan will deal with the protection of these species by the implementation of appropriate fire management regimes for the promotion of biodiversity.

This reserve fire management plan has been developed using available information on fire histories, fauna and flora data bases, known asset locations and understanding of fire regime thresholds for the management of flora and fauna species.

Although every effort was made to ensure accuracy of details, additional information is continually being collected and management concepts evolving. Therefore, it is proposed that this plan will be kept under review to take into account changes to management concepts and ecological considerations.

In summary this fire management plan is a sub-plan to the park's Plan of Management and complements the Hastings and Greater Taree City District Bushfire Management Committee's Operational and Fuel Management Plans.

1.2 DESCRIPTION OF PARK

Crowdy Bay National Park covers eight thousand and twenty two hectares of land on the Mid-north Coast of New South Wales. It is approximately three hundred and fifty kilometres north of Sydney, twenty five kilometres north east of Taree and thirty five kilometres south of Port Macquarie - see locality map 1.2

The park extends from the coastal villages of Harrington and Crowdy Head to the south and near Laurieton and Dunbogan to the north. The reserve boundary is flanked by private property and State Forest to the west and Watson Taylors Lake to the north. The eastern boundary of the reserve is the mean high water mark of Crowdy and Dunbogan beaches . Harrington village is located near the southern boundary of the reserve.

Within the park is a diversity of natural environments, the main features include:

- the rock headland of Diamond Head and sweeping beaches of Dunbogan and Crowdy.

- the sand plains and associated wetlands, and the foreshores of Watson-Taylors Lake.

- the extensive freshwater wetland system on the sand plain with wet and dry heath communities.

- the southern known limit of *Eucalyptus planchoniana* and remnants of littoral rainforest.

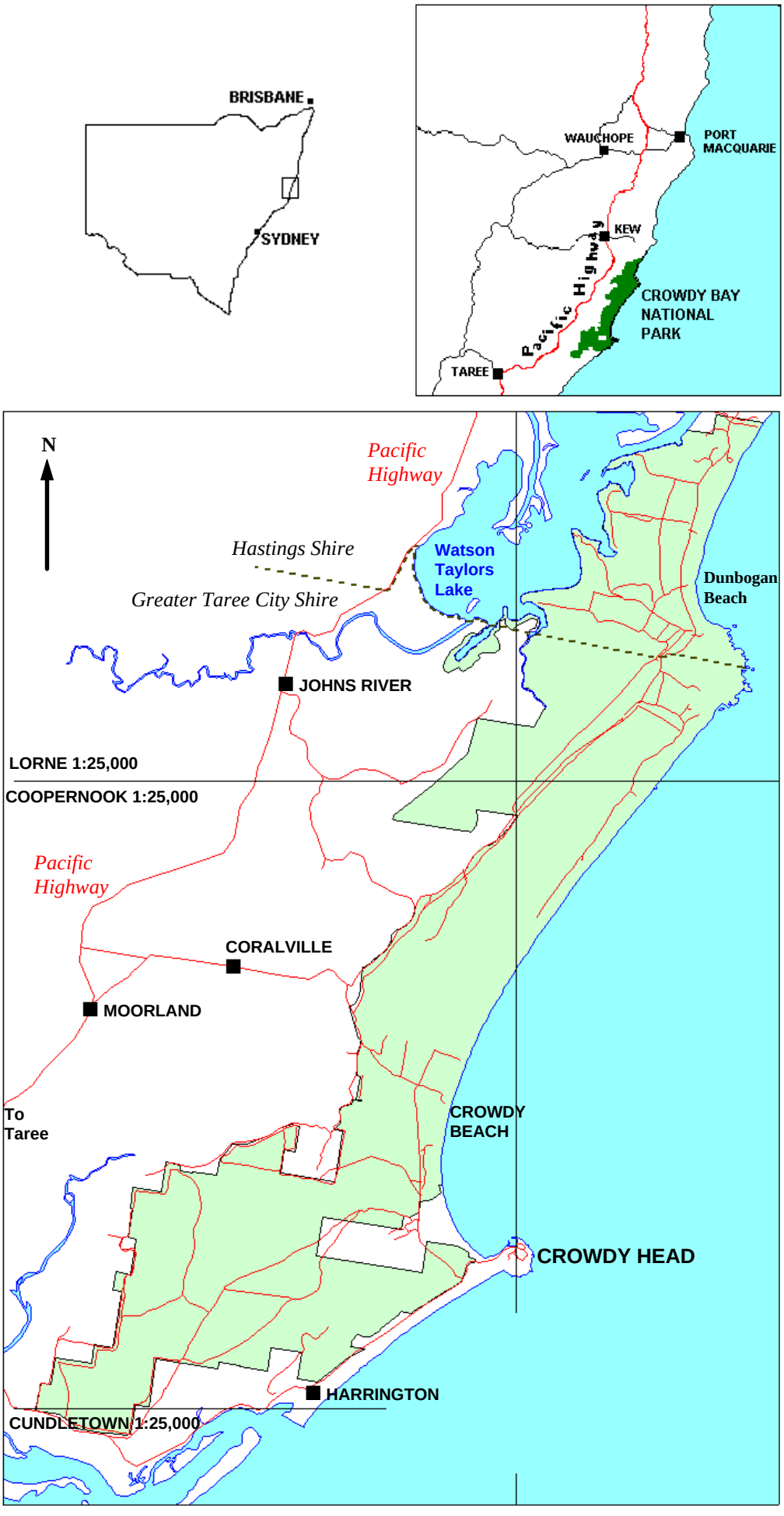
Recreational activities include camping, fishing, surfing, picnicking, snorkelling, swimming, photography, birdwatching and bushwalking. There are three walks provided in the park which are of varying lengths. The most popular and scenic walk is the Diamond Head Loop Track. The other two are the Kylies Camping Area Loop Walk and Fishermans Track Walk.

Public access from the south is via the Pacific Highway from Moorland through Coralville. From the north access is through Laurieton. Both roads are unsealed but provide all weather access.

Camping facilities are provided near Diamond Head. A number of picnic areas are located on the coastal fringe providing walking access to the Crowdy and Dunbogan beaches. Diamond Head camping area is located on the northern side of the headland.

Indian Head camping area is located on the western aspect of Diamond Head. Kylies camping area is located on the southern side of Diamond Head.

MAP 1.2 CROWDY BAY NATIONAL PARK



1.3 THE PLANNING PROCESS

1.3.1 Developing a Reserve Fire Management Plan

Crowdy Bay National Park is managed by National Parks and Wildlife Service from the Port Macquarie District Office. The northern portions of the park fall within the Hastings Council area. The southern section is covered by the Greater Taree City Council.

The Crowdy Bay National Park Plan of Management states the purpose for management is:

* the protection and preservation of scenic and natural features
* the conservation of natural processes
* the preservation of Aboriginal sites and historic features
* the provision of appropriate recreational opportunities
* the encouragement of scientific and educational interest in environmental features and processes, prehistoric and historic features, and park use patterns.

The Plan of Management also identifies the following relevant specific management objectives:

* the establishment of a fire regime consistent with maintaining plant diversity in both heath and woodland areas
* the rehabilitation of areas subject to previous mineral sand mining to as close to their natural condition as possible
* containment of bitou bush and its elimination where practicable pending developments in biological control
* the cessation of illegal grazing of livestock
* the protection of geomorphological features such as Diamond Head and significant frontal parallel sand dunes
* the protection of the freshwater wetland system including Blackfellows Bog and remnant stands of littoral rainforest at Crowdy Gap and Diamond Head
* the provision of low key camping and day use facilities associated with recreational usage of the beach front and appreciation of the natural and cultural resources of the park.

1.3.2 Bushfire Management Committees

The Bush Fires Act provides for the establishment of Bushfire Management Committees based on local government areas. This reserve is covered by two local government areas, Hastings and Greater Taree City Council.

Each Bushfire Management Committee is responsible for the preparation and implementation of a Bush Fire Management Plan, consisting of an Operations Plan and a Fuel Management Plan for its council area.

It is intended that this Fire Management Plan for Crowdy Bay National Park will form part of the NPWS input into the Operational and Fuel Management Plans for the Hastings and Greater Taree City Council areas.

1.4 COMMUNITY PARTICIPATION

The development of this fire plan has been undertaken with the assistance from the Bushfire Management Committees, Volunteer Bushfire Brigades, reserve neighbours and individuals from professional and non-professional backgrounds. There will also be continuous consultation with the community through various committees and groups which the National Parks and Wildlife Service deals with on a day to day basis.

It is proposed to work with the local community to assist neighbours in providing a level of self reliance and understanding to reduce bushfire risks to properties and individuals through Community Fire Guard programs.

Areas identified in Section 3.5 - Fire Damage Potential are targeted to receive Community Fire Guard training as a priority. Other priority areas are those remote from immediate brigade assistance. Other areas seeking Community Fire Guard involvement will be accommodated where possible.

This plan will be used by the National Parks and Wildlife Service as the basis for future fuel management plans. This information will also be used by the Hastings and Greater Taree City Council Bushfire Management Committees for the development of bush fire management plans. There are a number of major community groups represented on the Bushfire Management Committee and they will be encouraged to be involved in the implementation of the reserve Fire Plan.

1.5 POLICY ENVIRONMENT FOR FIRE PLANNING

1.5.1 Legislative Requirements

The NPWS has statutory obligations under the Bush Fires Act 1949 to protect life and property, and under the National Parks and Wildlife Act 1974, to conserve native species of animals and plants and Aboriginal and Historic Heritage. These obligations require a planned approach to fire management. They also require a process which allows appropriate recognition to be given to both environmental and community protection criteria in the light of local circumstances.

Amendments to the Bush Fires Act in 1970 designated the NPWS as a prescribed organisation and requires it to implement the provisions of Bushfire Management Plans. As a fire authority the Service can act to suppress fires up to eight kilometres from the park in collaboration with local brigades and park neighbours and in accordance with provisions of a Bushfire Management Plan.

1.5.2 National Parks and Wildlife Service Fire Policies

Service policies on fire management are contained in the fire management manual and field operation policy. The following points are drawn from those documents:

* the National Parks and Wildlife Service regards fire as a natural phenomenon; one of the continuing physical factors of the Australian environment

* the Service recognises the evolutionary adaptation of many indigenous species of plants and animals to fire regimes

* the Service accepts that fire can be a useful management tool

* fire is, and will be used, as a fuel reducing agent where this does not conflict with management objectives

* where life and property are directly threatened by fuel conditions, all steps will be taken to remove hazards with other management needs regarded as secondary consideration

All prevention and suppression works will, where possible be pre-planned and will be coordinated where possible with neighbours and other agencies likely to be affected by Service activities. The Service will undertake fire prevention programs, through public education and through local supervision and enforcement of the Acts and Regulations applying to fires.

The Service supports the principle of a cooperative and coordinated approach to fire suppression to achieve the most efficient utilisation of fire fighting resources within the community. The 1995/6-1997/8 Corporate Plan for the NPWS identifies as a strategy the need to “re-orient park and reserve management to better conserve natural biodiversity.”

This strategy is reflected in the NPWS Fire Management Manual which offers a structure for fire management plans and provides that:

* fire management operations will take into account the protection of natural resources

* the Service will collect information on the biology of native plants and animals in relation to fire

* databases on the conservation requirements of species in relation to fire may be established and reviewed as new information is acquired

* research should provide data that will be of value in making management decisions

* researchers should make available the practical applications of research.

2. FIRE MANAGEMENT OBJECTIVES AND STRATEGIES

There are two primary objectives for fire management in Crowdy bay national Park, these are to:

* protect and ensure the safety of human life, property and cultural heritage sites within and adjoining the reserve

* maintain the species and community biodiversity in the reserve by managing fire so that fire regimes stay within the thresholds appropriate to the plant and animal communities.

Strategies for managing fire in support of these objectives are to:

* implement Community Fire Guard in cooperation with the community in the isolated farming areas north of Crowdy Head Road and west of Crowdy Bay National Park and in holdings.

* maintain reduced fuel levels in asset and strategic bushfire management zone locations to protect assets and assist with control of wildfire

* protect special heritage areas such as old age coastal Banksias and wetlands from unplanned fires

* rationalise a network of fire management trails in the park and expand the trail system if considered necessary

* Undertake fuel management burns in appropriate manner to minimise the impact on biodiversity

* monitor fire sensitive plant populations

* develop a process of fuel level monitoring in asset and strategic fire management zone areas.

3. BUSHFIRE ENVIRONMENT

3.1 FIRE HISTORY

Coastal areas have, in general, a long history of unplanned fire and that of Crowdy Bay National Park is no different. Records indicate that some seventy percent of fires on Crowdy Bay National Park are illegally lit.

The remaining wildfires are a combination of fires starting from neighbours burning off on their properties and these fires entering reserve areas, and escapes from recreational camp fires and management burns .

Unplanned fires have started mainly along fire trails and roads, near bush camping areas and neighbouring properties. Historically the majority of wildfires have started at both the northern and southern ends of the reserve.

Very few fire ignitions have ever occurred in the middle of the reserve. This results from a combination of remote areas which are isolated from alternative land management uses, and limited recreational use with no vehicle access.

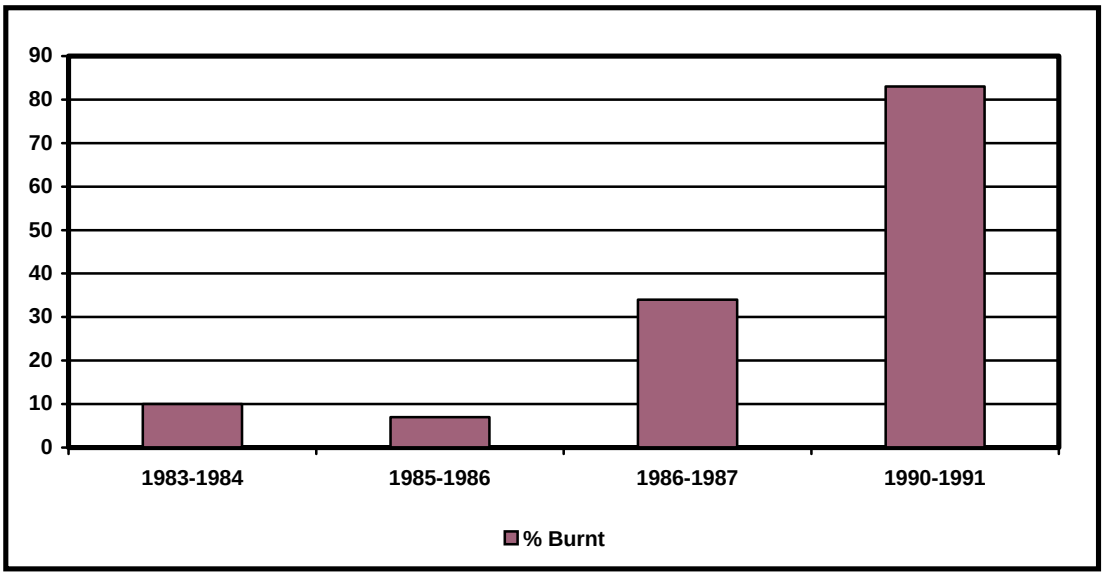
Fire records have been maintained for the National Parks Port Macquarie District since 1976. The 1990-1991 fire season was the most extreme. The fire histories indicate that approximately eighty three percent of Crowdy Bay National Park was burnt (7088 ha) by one fire illegally lit.

Prior to these fire records, considering the nature of the area and vegetation, there would have been undoubtedly similar large wildfires.

The 1986-1987 fire season was also extreme with thirty four percent of the park being burnt (2832 ha) by a number of wildfires. The next two major fire seasons occurred in 1983-1984 with almost ten percent of the park being burnt (810 ha) and in 1985-1986 when seven percent of the park was burnt (589 ha).

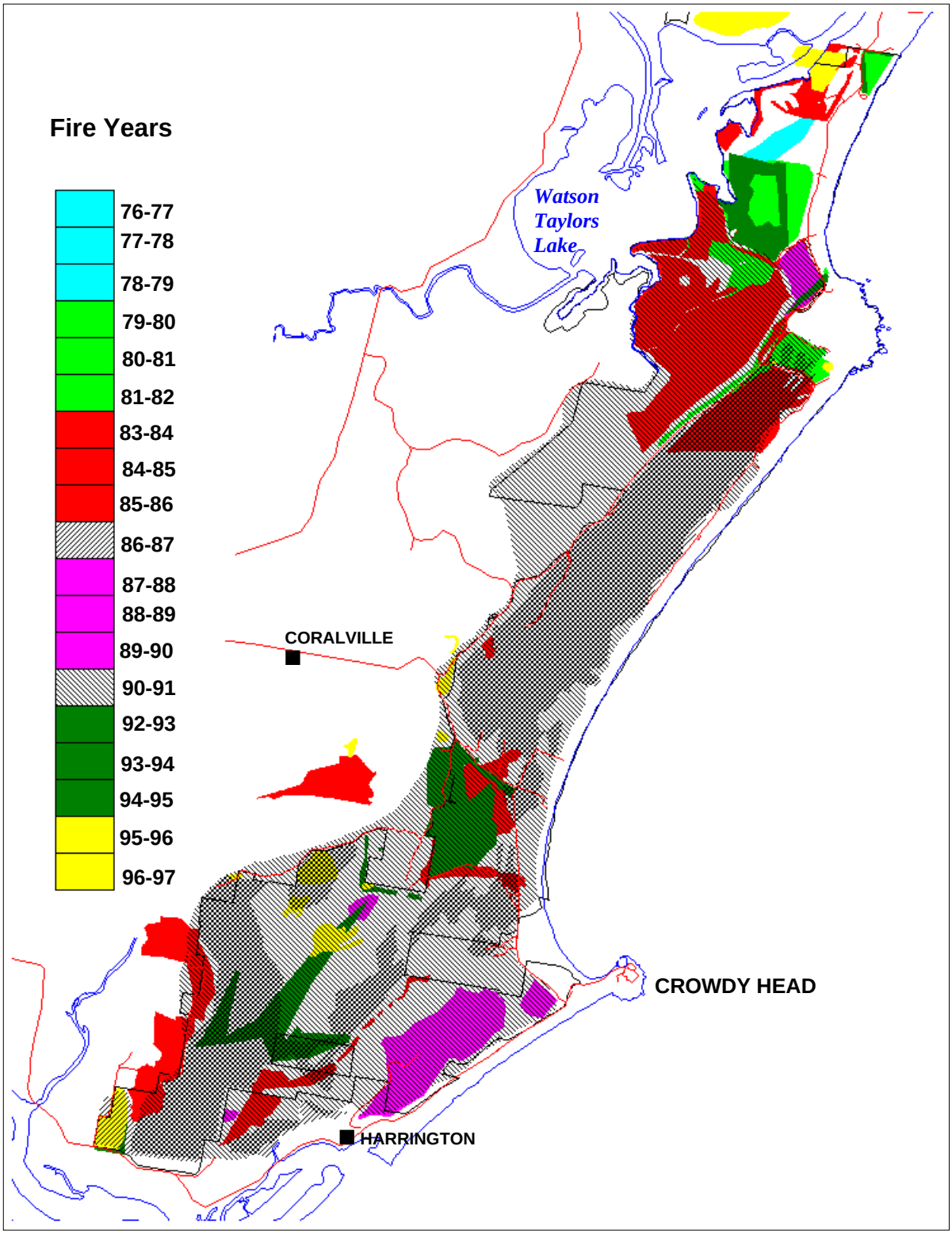
The following Graph 3.1 indicates the years when major fires occurred in Crowdy Bay National Park. Major fires are those occasions when more than two hundred hectares of park were burnt in one fire.

Graph 3.1 Percentage of Area Burnt by Major Wildfires 1977- 1996



The criteria for two hundred hectares was selected on the basis that only a small number of fires ever became larger than two hundred hectares. Those fires also became campaign fires and required considerable resources and equipment to contain them.

MAP 3.1 WILDFIRE HISTORY 1977 - 1996



3.2 FIRE FREQUENCY

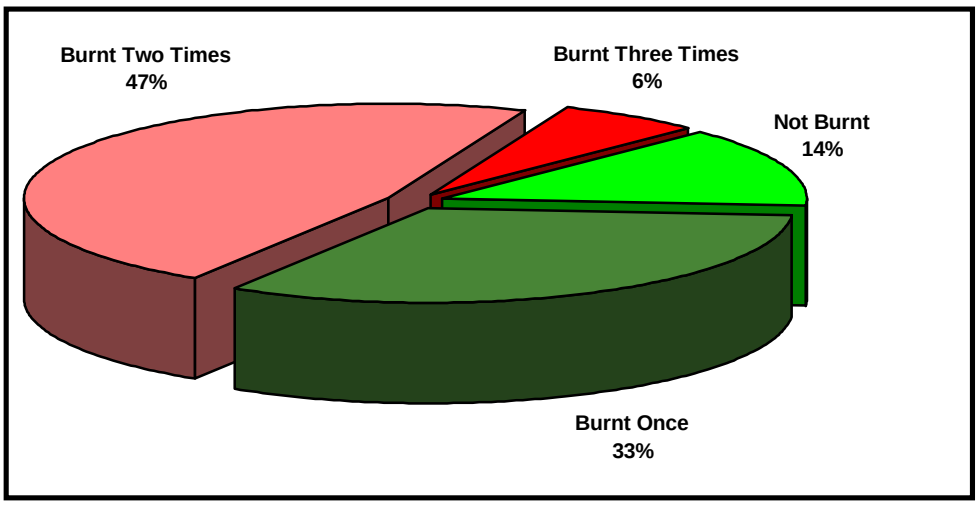
Over the past twenty years numerous wildfires have burnt over the same areas within Crowdy Bay National Park. Wildfires are generally considered to be fires which are unplanned.

It is possible to develop an understanding of the fire frequency which generally has occurred in the Crowdy Bay National Park from fire history records. Fire history records comprise information recorded by Service Officers with the assistance of Fire Control Officers and neighbours. Generally, the locations of areas burnt in wildfires have been recorded on 1:25,000 topographical maps and computer data bases.

The following chart has been generated using available fire history information.

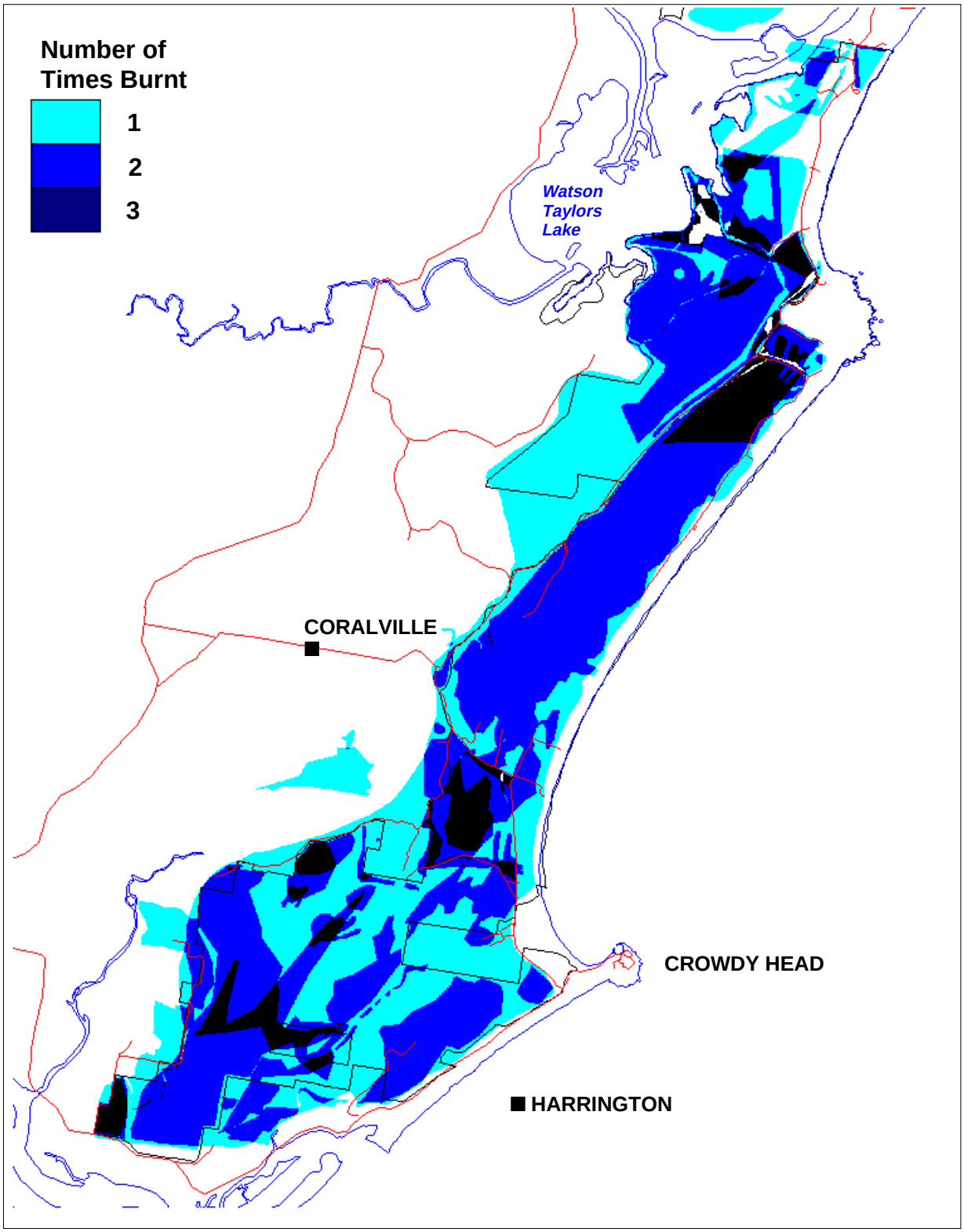
This chart provides an understanding of how many times wildfires have burnt over the same area from 1977 to 1996.

Chart 3.2 Reserve Fire Frequency 1977-1996



The following fire frequency map 3.2 provides an indication of the areas affected by wildfires from 1977 to 1996

MAP 3.2 WILDFIRE FREQUENCY 1977 - 1996



3.3 FIRE WEATHER

Crowdy Bay National Park experiences a humid subtropical climate characterised by warm summers and mild winters. The dominant winter air mass is the Polar Maritime, with its strong, cold winds originating in the south or west. The Tropical Maritime air mass dominates in summer and autumn. Its winds originate in the north or north east.

Harrington weather records provide the best representative information for Crowdy Bay National Park. Weather information collected over eleven years indicates a mean daily maximum temperature range from 18.4 c. in July to 26.2 c. in January and a mean daily minimum range from 6.7 c. in July to 18.2 c. in February.

Mean annual rainfall for Harrington is approximately 1370mm, the majority of rain falling in the months from December to June. The mean relative humidity at 3 PM ranges from 53% in July and August to 68% in February. Due to prevailing winds the event of frosts are a rare occurrence in the reserve.

Bushfires can occur on the northern New South Wales coast from the warm and dry late winter to the early summer months, with a peak in November. Summer rains in January-February often mark an end of the fire season in this part of the State.

Prevailing winds are north east which are particularly threatening for Harrington Village when fire ignitions occur on the eastern side of the reserve near the southern end of the park. Fires can also proceed in a northerly direction which is potentially threatening for the Dunbogan area. Properties and State Forest located on the western edge of the reserve are also extremely vulnerable to bushfires driven by southerly and north easterly winds.

Dry north westerly winds during spring to early summer are of major concern as during wildfire events these winds have a marked effect on fire behaviour. The reserve and community assets on the reserve boundary are vulnerable during these weather events from fires starting both on and off the reserve.

3.4 FIRE POTENTIAL

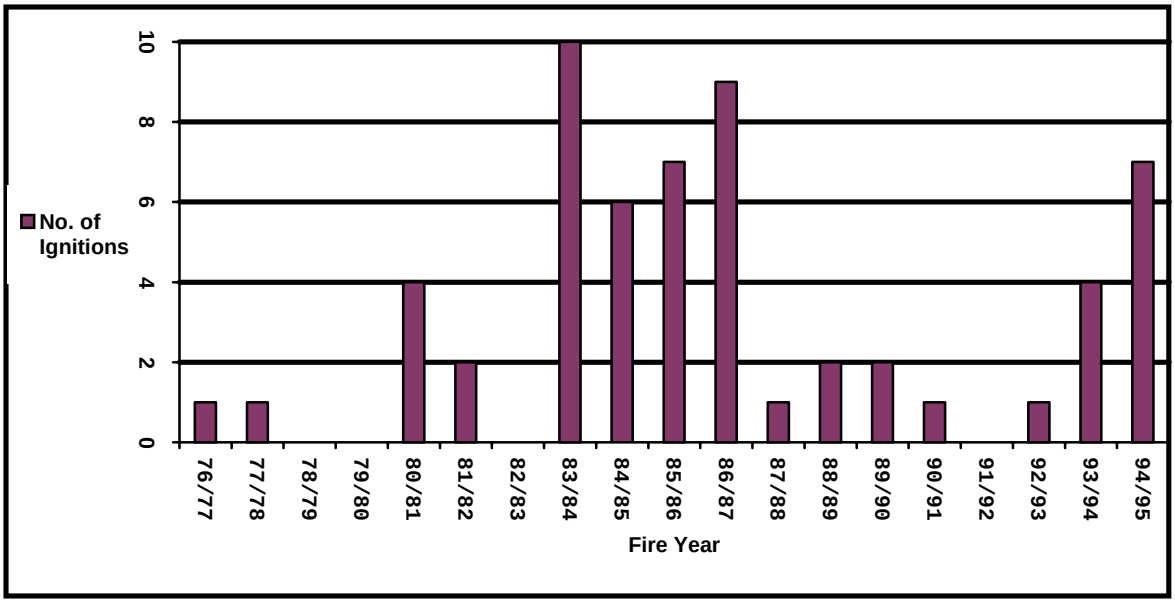
Crowdy Bay National Park is a coastal park and its vegetation consists mainly of heath and woodland plant communities. These plant communities in adverse fire weather conditions can burn intensely. The fire potential of the reserve area would be considered high to extreme depending on the weather and fuel loadings.

The major fire paths mapped over the past twenty years suggest that most areas of Crowdy Bay National Park are susceptible to fire. The prevailing weather conditions determine the major runs and can make fire suppression very difficult.

The following graph details the number of fire ignitions that occurred from 1976 to 1995. As can be seen from the graph, there was an abnormally high number of fire ignitions from 1983 to 1987.

The Service will need to increase efforts towards coordinated fire fighting arrangements to minimise the occurrence of these periods of high fire ignitions.

Graph 3.4.1 Fire Ignitions 1977-1995

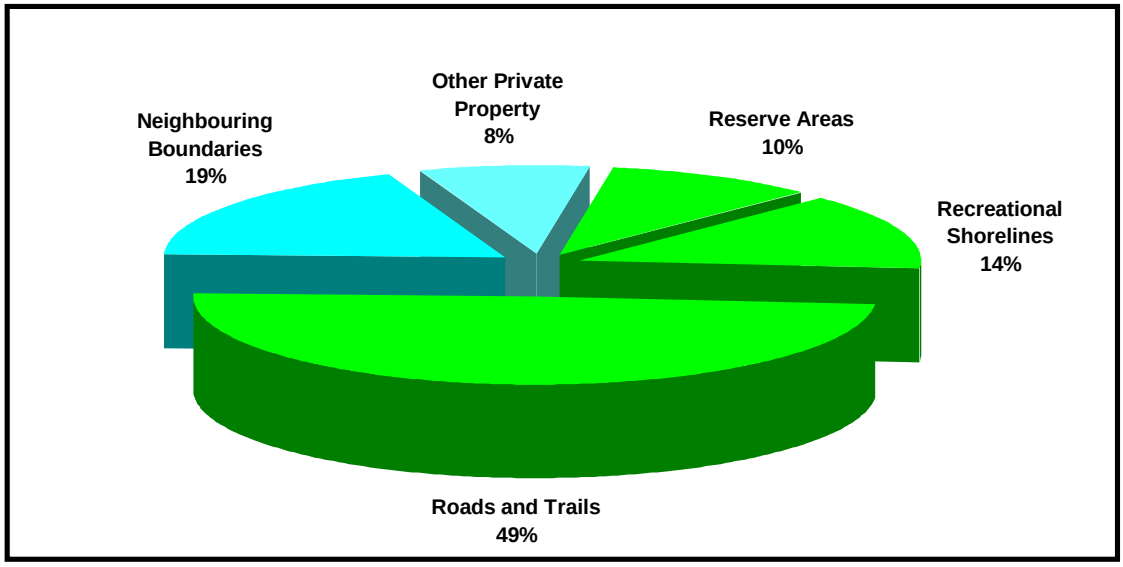


As an example of fire potential the largest single fire recorded in the above period burnt an area of more than seven thousand hectares (some 85% of the park system). This fire started on park and was illegally lit. The fire threatened the village of Harrington and nearby properties and homes.

There are few fire advantages (ie trails), that run in an east west direction within Crowdy Bay National Park. This can make wildfire containment difficult when southerly or north east winds are strong. The potential for large wildfires in these situations is high depending on the fuel loadings and fire weather.

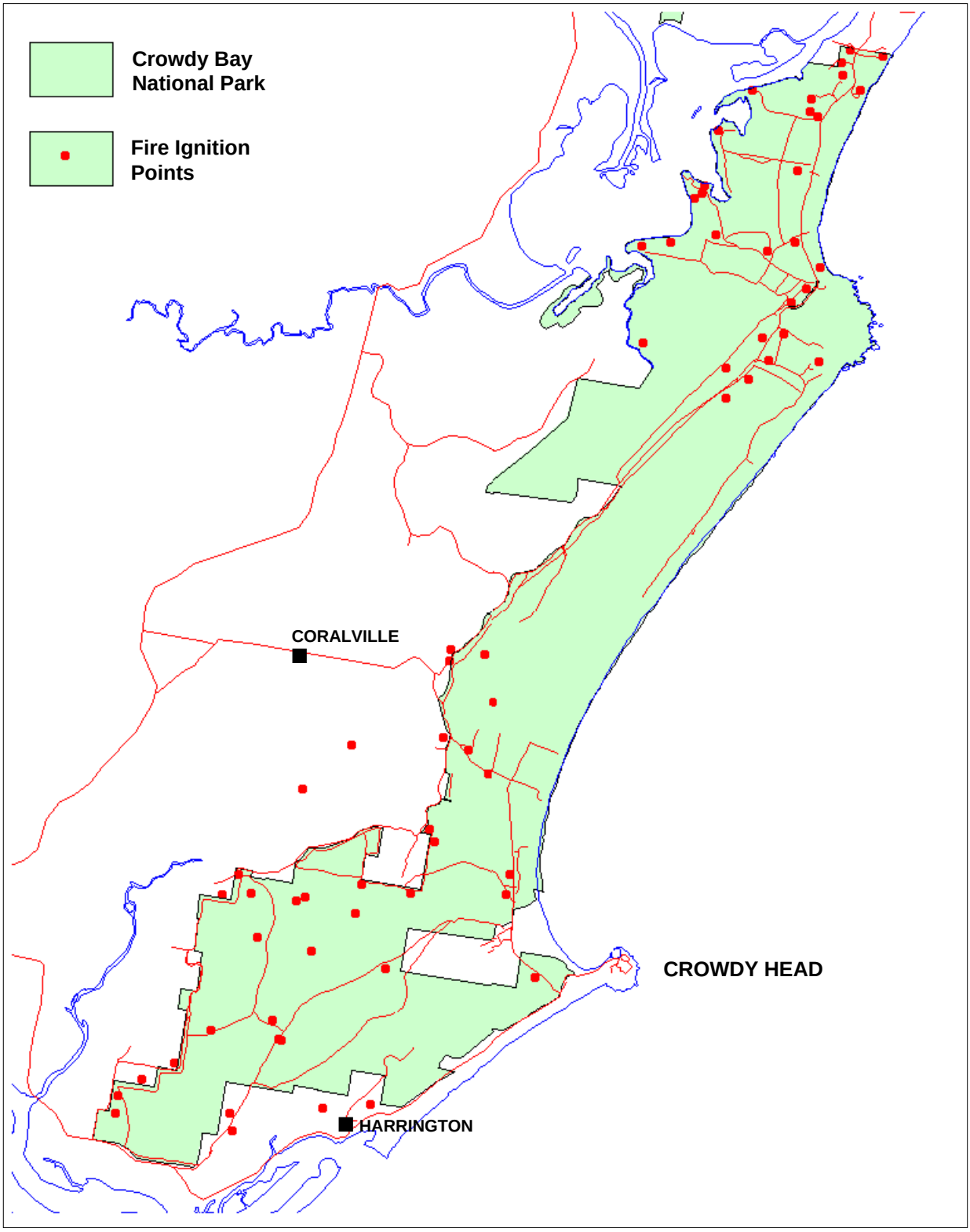
The following chart indicates that approximately fifty percent of fire ignitions from 1976 to 1995 have occurred within the reserve. Approximately twenty percent of ignitions occurred on the reserve boundary adjacent to neighbouring properties.

Chart 3.4.2 Ignition Point Locations 1976-1995



There has also been a high occurrence (approximately fifteen percent) of fire ignitions from recreational use along the shoreline of Watson Taylors Lake. The remainder of fire ignitions have occurred in areas remote from the reserve and on properties not adjacent to the reserve.

MAP 3.4 WILDFIRE IGNITION POINTS 1977 - 1996



3.5 DAMAGE POTENTIAL

The damage potential of wildfires on Crowdy Bay National Park can be placed into four categories. Life and property, natural ecosystems, cultural sites and economic activities

Life and Property

During wildfire events the Service works with the Bushfire Management Committees, Police, Volunteer Bush Fire Brigades, neighbours and other authorities to protect life and property. Crowdy Bay National Park may be closed during wildfire events and park visitors will be advised of the situation and evacuated if considered necessary.

There are a number of developments including picnic and camping areas within Crowdy Bay National Park. These assets (excluding road signs) are mainly located on the coastal edge of the reserve. Because of the clearings around most of these assets, and the positioning of existing trail systems these areas are less likely to be burnt by wildfires. Community assets mainly occur around the northern, western and southern perimeters of the reserve. Of particular concern is the village of Harrington which is located to the south east of the reserve.

The reserve boundary to the north of Harrington is located some five hundred metres from the village. Most of the vegetation to the north of the village is wetlands and privately owned. The wetland vegetation in the reserve and between the reserve and Harrington is of concern. Although vegetation in wetlands can be dry enough to burn, the ground can still be so wet that fire fighting vehicles become bogged trying to gain access to wildfires. Therefore, there is no guarantee that wildfires can be contained under all conditions and low fuel levels need to be maintained near neighbouring properties to assist in their protection. Fuel levels in this area need to be managed carefully.

To assist in the protection of Harrington village the development and maintenance of strategic bushfire management zones will be essential. As identified in the Bushfire Management Zone map, a strategic wildfire zone is located between the Harrington Trail and the Sand Track. This area will be managed on a reduced fuel level to lower the intensity of wildfires heading towards Harrington.

The Service will also work with Local Government to ensure that development and building approvals take into consideration the need for fire radiation zones and fire trail access to be built into development proposals off park in accordance with the Department of Bush Fire Services' (1991), "Planning for Bush Fire Protection", and Australian Standard, "Construction of Buildings in Bushfire-Prone Areas", AS3959-1991.

Natural ecosystems

The Crowdy Bay National Park has complex and extremely important vegetation and wildlife communities which include many threatened plant and animal species. The section on “Fire Management for the Conservation of biodiversity” outlines the guiding principles to ensure the protection of the natural ecosystems.

Cultural sites

There are a number of known Aboriginal sites that occur within Crowdy Bay National Park which include shell middens and open campsites. These Aboriginal sites are not generally affected by wildfire as they are often below the surface of the soil or of non flammable materials such as stone or shell. They can however be damaged by heavy fire fighting equipment, in particular earth moving machinery.

An Aboriginal sites register is maintained and updated by the National Parks and Wildlife Service and this can be used as a reference guide to avoid the damage of Aboriginal sites during any trail construction. All works will cease if new sites are discovered and a full assessment of the site will be undertaken.

The main European cultural site within Crowdy Bay National Park is Kylies Hut which was built (c.1945) for the noted Australian author, Kylie Tennant. This historic site is located at Indian Head camping area. Kylies Hut is within an asset protection zone which requires regular ground maintenance to reduce fuels and the possibility of wildfire threatening the site.

Economic activities

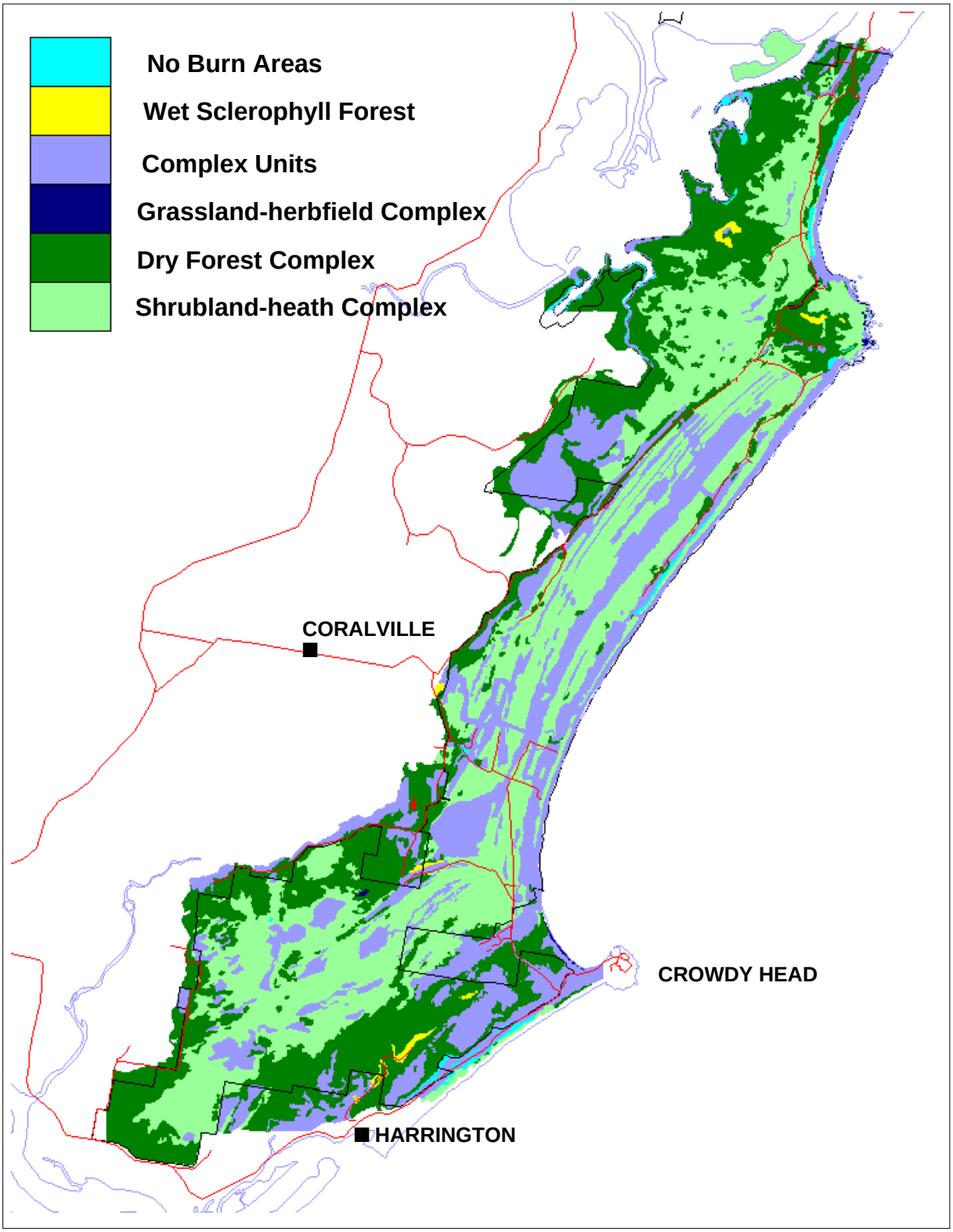
Caravan parks are located to the north and south of the reserve. Crowdy Bay National Park is one of the main attractions to visitors to those caravan parks.

Johns River State Forest is located to the south west of the reserve. The State Forest contains areas of forest plantation which are considered to be of importance to the local timber industries.

A number of properties to the west of the reserve are involved in mixed farming activities and include assets such as sheds, fencing, stock, feed and farming equipment.

The National Parks and Wildlife Service works with the community on a cooperative basis to protect these assets from bushfire. In particular, the Service works with local bushfire brigades to suppress wildfires and assist with the implementation of fuel management programs to reduce fuel loadings near park boundaries and protect these economic values.

MAP 3.5 VEGETATION



3.6 FIRE CONTROL ADVANTAGES

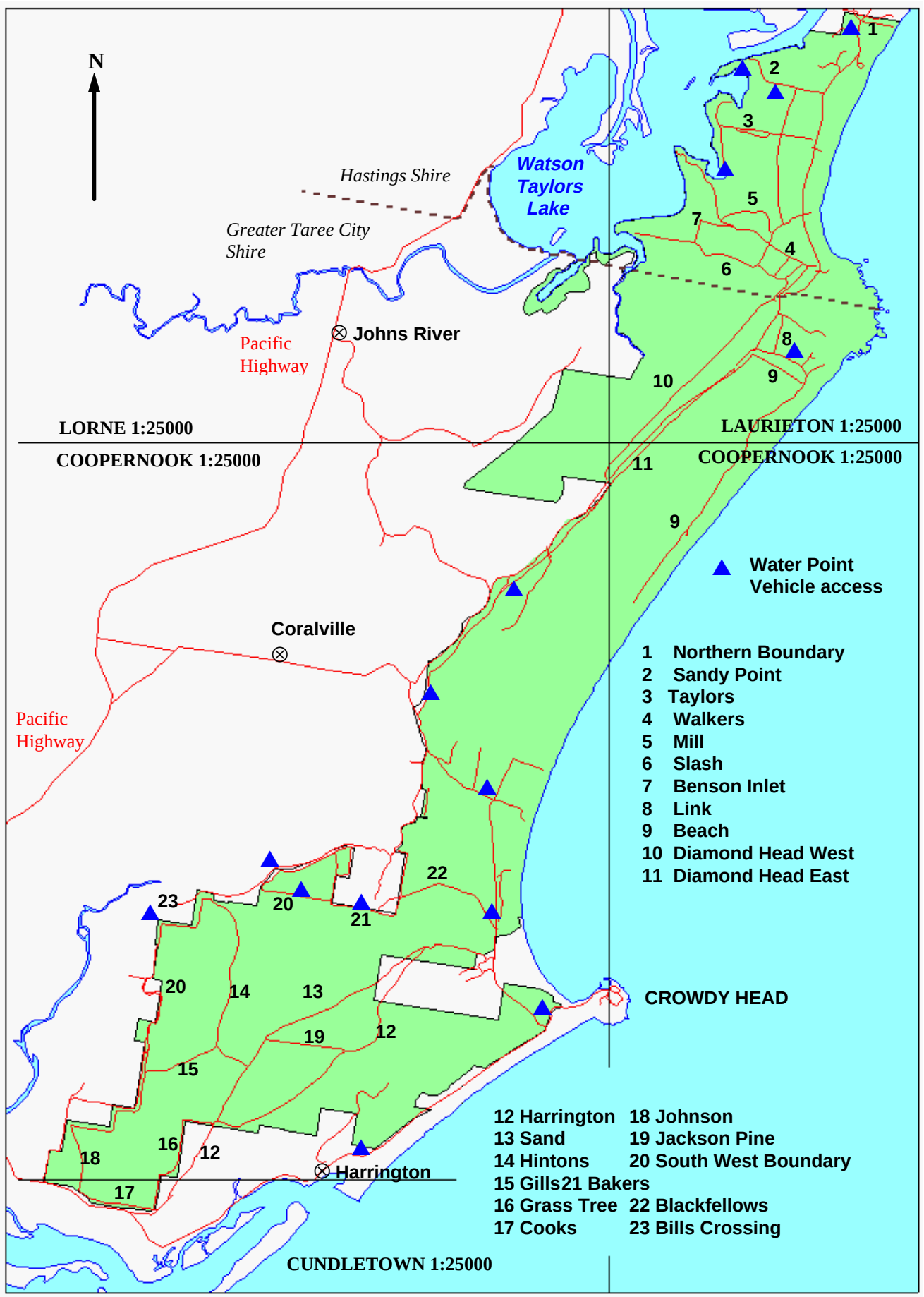
The Service will continue to maintain fire trails in Crowdy Bay National Park to protect not only assets, but also the plant and animal communities of the area. These trails are reviewed as considered necessary to ensure they are adequate for the changing needs of the reserve and surrounding area.

The Crowdy Bay National Park Plan of Management indicates no additional management trails will be constructed within the reserve. There is no obvious requirement to construct additional fire trails during the term of this Plan. However, if because of unforseen circumstances additional trails are required, then amendments to the Crowdy Bay National Park Plan of Management will need to be made.

The construction of additional fire trails to provide a fire advantage may only develop further access into remote areas where additional fire management problems may occur, in particular illegal fire ignitions. The use of aerial ignition to reduce fuel loads in mosaic patterns would be more acceptable. The potential for this type of operation will be limited by the available “windows of opportunity” (appropriate weather conditions), and available fire management resources. Aerial fire management will also be used for fire suppression when required.

Appendix 4, “Access Management Trails”, provide details on the existing fire trail system within Crowdy Bay National Park. Any additional trails will need to be planned and covered by a “Review of Environmental Factors”.

MAP 3.6 FIRE CONTROL ADVANTAGES



4. FIRE MANAGEMENT FOR THE CONSERVATION OF BIODIVERSITY

4.1 CONSERVATION OBJECTIVE

In practical terms, conservation is about the prevention of the extinction of species, especially extinctions brought about by the action of humans. To reiterate, the nature conservation objective of this plan is to;

" Manage fire to retain (avoid extinction of) all native species known to occur within the Park"

4.2 GUIDING PRINCIPLES FOR BIODIVERSITY CONSERVATION

Contemporary ecological research in fire-prone ecosystems of the kind represented in Crowdy Bay National Park has established some general principles about the fire regimes needed to avoid the extinction of species and thus conserve biodiversity.

Management of fire for nature conservation in Crowdy Bay National Park will be guided by the following general principles:

Groups of plant and animal species respond similarly to fire according to characteristics of their life-history. Therefore, it is not necessary to individually specify fire regimes for the conservation of every species. Rather an overview is needed of the requirements for broad groups of species. Requirements for most plant species can be summarised on the basis of a small number of groups. Knowledge of requirements for groups of animals is less advanced.

Animals and plants are interrelated. Plants form an essential component of habitat for animals. Fire management must consider this important interaction.

A diversity of fire regimes may be needed to maintain biodiversity. This means that over time there is a place for fires of high, low and moderate intensity, frequency and size. Extinctions may be likely when fire regimes of relatively fixed intensity, frequency and extent prevail without interruption.

For some groups of biota, thresholds separating desirable and undesirable fire regimes for conservation, can be defined. Management should therefore be targeted towards desirable fire regimes using these thresholds as a guide. Management strategies will therefore involve the manipulation of fire regimes, taking into account the occurrence of unplanned fires.

Assessment of fire regimes through mapping of the locality and characteristics of all fires will be ongoing so that strategies (manipulation of fire regimes) can be regularly reviewed, refined and adjusted. Depending on the circumstances (a function of community type and prevailing fire regimes) there may be a role for both prescribed fire and/or fire-exclusion in parts of a given reserve at different times in the future.

4.3 GUIDELINES FOR FIRE MANAGEMENT OF PLANT AND ANIMAL SPECIES

Plant communities

The following guidelines define fire regime thresholds for several major groups of plant communities (Table 4.1). These groups contain aggregations of communities distinguished and mapped by Griffith's "Vegetation of Crowdy Bay National Park" (1992). To ensure that the specified thresholds in the table below are not crossed, fire regimes will be manipulated where necessary within the Park. This will occur within constraints imposed by commitment to other objectives.

Critical fire regime thresholds for major groupings of plant communities in Crowdy Bay National Park are identified in the following table. Fire regimes beyond these thresholds will result in the decline of plant species and will cause changes in structure and vegetation cover adverse to animal species. The number code in table 4.1 relates to the identification of these plant communities in table 5.0.2.

Table 4.1 Fire Regimes for Plant Communities (Pers Com. Dr.R. Bradstock 1996)

Number Code	Plant Community	Threshold
1	Littoral rainforest	No fire acceptable
1	Mangroves	No fire acceptable
1	Chenopod shrubland	No fire acceptable
1	Wet sclerophyll forest	Decline predicted if successive fires, of any intensity, occur less than 50 years apart. Decline predicted if no fires for more than 200 years
2	Dry sclerophyll complex	Decline predicted if more than two successive fires occur at less than intervals of 5 years apart. Decline predicted if there are no fires for more than 30 years. Decline predicted if successive fires occur which totally scorch or consume the tree canopy
3	Shrubland/heath complex	Decline expected if more than two fires in succession occur at less than intervals of 8 years apart. Decline expected if more than two successive fires occur at intervals of more than 15 years apart
4	Grassland/herbfield complex	Decline expected if more than two fires in a row occur at less than intervals of 5 years apart. Decline expected if more than two fires in a row occur at intervals of more than 15 years apart

Threatened plant species

The following table outlines the impact of fire regimes on particular threatened plant species. As indicated in the table below there are two plant species of particular concern in regard to fire regimes.

Table 4.2 Threatened Plant Species

Number Code	Species	Common Name	Community	Fire Regime
1	*Thesium australe*	Austral Toadflax	Grassland-Herbfield	Plant species promoted by fires less than 10 years apart. Per. Comms. Bradstock 1996
2	*Allocasuarina defungens*	None	Shrubland-Heath Complex	Species is best maintained by infrequent low intensity fires with a 10 year between fire period Per. Comms. Bradstock.

Other plant species of concern as mentioned in Griffith's report (1992) and not included in the above group are: *Acacia baueri ssp. baueri* (Hook-leaf wattle), *Acacia quadrilateralis* (Dagger Wattle), *Leucopogon esquamatus* (Oblique Beard-heath), *Pisonia umbellifera* (Birdlime Tree).

The two *Acacia* species occur in a number of vegetation communities and are thought to require similar fire regimes to other common acacias. Hence, no specific management is required. Oblique Beard-heath occurs on Diamond Head within a "Heritage Fire Management Zone" and will be managed according to fire regime criteria specified for the resident community. The Birdlime Tree occurs within the littoral rainforest (fires to be excluded) on the southern side of Diamond Head.

Animal species

Knowledge of the fire-ecology on resident animal species is currently insufficient to formulate comprehensive fire-regime-thresholds for the management of fauna species as outlined for plant communities. However, as outlined in table 4.3, guidelines have been provided for threatened species associated with Crowdy Bay National Park. These guidelines may alter as research provides a better understanding of species needs.

Maintenance of vegetative cover and structure within plant communities in the reserve is essential for conserving viable animal populations. The information in Table 4.1 is not only a guide to conserving plant species in their own right, but is also a guide to maintaining animal habitat. Thus the table serves as a guide to conserving plant and animal species resident in various plant communities.

It is desirable that any individual fire (or set of fires at about the same time - eg. within a year), should not completely burn the whole of a particular community type or at the most, the whole reserve. Unburnt areas act as a refuge for animal species that suffer habitat loss during and soon after fire.

These areas then become extremely important for the recolonization and protection of species. However, it is not possible at present to define and quantify guidelines concerning the size of unburnt areas required as refugia for fauna.

A particular concern is for the protection of habitat for threatened animals. These species are of major concern because of their vulnerability to extinction and the need to ensure their chances of long-term survival are maximised.

Table 4.3 is a list of fire management guidelines for threatened animals that are known to occur within Crowdy Bay National Park. These guidelines are intended to augment the management of fire regimes for plant communities providing potential habitat for threatened species.

The table below provides guidelines for the habitat management of known and predicted threatened animals. Before undertaking any activities outlined in the "Works Plan" it will be necessary to refer to this table when completing the "Fire Management Works and Environmental Planning Proposal Form" (Appendix 2).

The following guidelines will also be of benefit to other native species. For example, fire management guidelines for koalas will probably also benefit other arboreal mammals. The guidelines for the habitat management for Eastern Grass Owl (*Tyto longimembris*) will also assist with the protection of Ground Parrots which inhabit similar vegetation communities.

The potential affect of fire management activities proposed in this plan on threatened species and their habitats has been assessed using the eight part test described in section 5A of the Environmental Planning and Assessment Act 1979.

The development of "Recovery Plans" is a requirement under the Act to ensure the appropriate management and planning for the conservation of threatened species. As these "Recovery Plans" are developed there may be a need to adjust the fire management guidelines provided in this plan.

Table 4.3 Threatened Animals

No.	Species	Common Name	Preferred Habitats	Management Guide
	Amphibians			
1	*Crinia tinnula*	Wallum Froglet	Wetlands	* Protect wetland from all burning in one fire event.
2	*Litoria aurea*	Green and Golden Bell Frog	Wetlands	* Protect wetland from all burning in one fire event.
	Birds			
3	*Sterna albifrons*	Little Tern	Open sands and estuaries islands	* Vehicles excluded from beaches in nesting season. - Coastal bird not affected by fires. Nesting on beach areas.
4	*Haematopus longirostris* *Haematopus fuliginosus*	Pied Oystercatcher Sooty Oystercatcher	Sand dunes beaches and muddy bays	* Vehicles excluded from beaches in nesting season. - Coastal birds not affected by fires. Nesting on beach areas.
5	*Xenorhynchus asiaticus*	Black-necked Stork	Breeding March-June nests in trees	* Pre-burn check for nests. * do not burn in nesting season near active nests. * Protect nest sites and potential nest sites (Large trees near swamps) when burning outside nesting season
6	*Pandion haliaetus*	Osprey	Nesting in tall trees	* Protect known nest sites * Protect recruitment nest trees (Large senescent trees close to estuaries) * No burn at nest sites in breeding season
7	*Tyto longimembris*	Eastern Grass Owl	Grassland-Herbfield complex	* Pre-burn check for nests. No burn near active nest. * Mosaic burn.
8	*Calyptorhynchus lathami*	Glossy Black Cockatoo	Dry forest complex and some Complex units	* Protect potential nest sites (old hollow-bearing trees) * Protect significant stands of she-oaks from all burning in one fire. * Keep fire out of canopy.
9	*Lophoictinia isura*	Square Tailed Kite	Tall and Mallee forests	* Pre-burn check for nests * Keep fire out of canopy * Do not burn at nest site during breeding season * Protect nest sites
10	*Ptilnopus magnificus*	Wompoo fruit-dove	Littoral rainforest	An itinerant species restricted to No-burn littoral rainforest
11	*Tyto novaehollandiae*	Masked Owl	Tall and Mallee forests	* Protect potential nest sites (old hollow bearing trees) * Mosaic burn * No burn near active nest sites.
12	*Burhinus neglectus* *Calidris alba*	Beach Thick-knee Sanderling	Sand dunes and beaches	Coastal birds not affected by fires. Nesting in sand dunes
13	*Dupetor flavicollis*	Black Bittern	Mangrove forest	* Protect a vegetation buffer adjacent to wetland - see Wallum froglet
14	*Coracina lineata*	Yellow-eyed Cuckoo-shrike	Littoral rainforest	Habitat entirely within Heritage Zone.

No.	Species	Common Name	Preferred Habitats	Management Guide
	Mammals			
15	*Phascolarctos cinereus*	Koala	Dry forest complex	* Pre-burn inspection for Koalas * Protect Koala location from fire * Keep fire out of canopy
16	*Syconycteris australis*	Blossom Bat	Littoral Rainforest dry forest complex and shrubland heathland complex	Roosting areas in Littoral rainforest. * Protect significant stands of Banksias from all burning in one fire event
17	*Miniopteris australis*	Little Bent-wing Bat	Potential all habitats	* Mosaic burn.
18	*Miniopterus schreibersii*	Common Bent-wing Bat	Potential all habitats	* Mosaic burn.
19	*Scoteanax rueppellii*	Greater Broad-nosed Bat	Potential all habitats	* Mosaic burn.
20	*Aepyprymmus rufescens*	Rufous Bettong	Dry forest complex	* Mosaic burn.
21	*Dasyurus maculatus*	Tiger Quoll	Most forests and woodlands	* Protect hollow logs * Mosaic burn
22	*Planigale maculata*	Common Planigale	Most forests and woodlands	* Mosaic burn
23	*Pseudomys gracilicaudatus*	Eastern Chestnut Mouse	Potential most habitats excl. wetlands	* Mosaic burn.
24	*Phascogale tapoatafa*	Brush-tailed Phascogale	Most tall forests and woodlands	* Keep fire out of canopy * Protect hollow logs * Protect old hollow bearing trees. * Mosaic burn.
25	*Petaurus norfolcensis*	Squirrel Glider	Most forests and woodlands	* Keep fire out of canopy * Protect significant stands of Banksia/Acacia from all burning in one fire event. * Protect old hollow bearing trees.

4.4 FIRE REGIME STRATEGIES FOR CONSERVATION

Evaluation of current fire regimes

The following table outlines the level of fires (fire frequency) that have occurred in particular plant communities over the last twenty years (1976-1995).

Table 4.4 Vegetation Communities Burnt 1977-1995

Plant Communities	Times Burnt	Percent Burnt	Area
No Burn Communities	0	82 %	80.5 ha.
	1	17 %	17.2 ha.
	2	1 %	0.6 ha.
Wet Sclerophyll Forest	0	15 %	7.0 ha.
	1	32 %	15.1 ha.
	2	45 %	21.4 ha.
	3	8 %	3.9 ha.
Dry Forest Complex	0	18 %	620.7 ha.
	1	49 %	1628.8 ha.
	2	30 %	1020.1 ha.
	3	3 %	82.5 ha.
Shrubland-Heath Complex	0	8 %	326.0 ha.
	1	27 %	1004.3 ha.
	2	57 %	2104.8 ha.
	3	7 %	256.4 ha.
	4	1 %	2.5 ha.
Grassland-Herbfield Complex	0	1 %	11.7 ha.
	1	37 %	420.2 ha.
	2	48 %	549.9 ha.
	3	14 %	158.6 ha.

In relation to the above table and the guidelines for “Fire Regimes for Flora Communities” (Table 4.1), it is possible to make the following evaluations of previous fire regimes.

The “Non Burn Communities” have been subjected to mainly one fire within a period of twenty years. This fire was not desirable and has impacted on approximately 18 percent of the entire non burn area.

This vegetation community does not require fire, and has probably been burnt as a result of major fires in extreme fire weather conditions penetrating from flammable neighbouring communities. Although only 18 percent was affected by major wildfire, the occurrence of further burning should be prevented if possible.

The “Wet Sclerophyll Forest” communities have been burnt beyond appropriate thresholds. This high level of fire frequency is a concern for the long term viability of plant species. Appropriate thresholds to maintain this community suggest that a decline in species is predicted if more than one fire occurs every fifty years.

Although fire records are only available for the past twenty years, three fires have already been recorded within this vegetation community. Approximately, forty five percent of this vegetation community has been burnt twice and nine percent has been burnt three times. This level of fire frequency indicates that some fifty four percent of this community is beyond the threshold for the maintenance of species diversity.

The extent of exposure of this community to frequent fires of this kind poses a serious threat to conservation objectives in the reserve. The analysis reveals that immediate action is required to redress this problem.

The “Dry Forest Complex” has experienced levels of wildfires which are currently compatible with the maintenance of floristic diversity. Also, because there is some eighteen percent of this community which has not experienced fire at all, there would appear to be a reasonable safety margin to maintain this community.

The “Shrubland-Heath Complex” has experienced a higher level of fire frequency than necessary to maintain species diversity. There has been areas burnt up to four times within twenty years. The fire regime guidelines suggest the “Shrubland-Heath Complex” community is best suited to a fire frequency of no more than two fires in a row at intervals of eight years.

However, the area exposed to an unacceptably high frequency of fire (three or four burns over 20 years) is approximately seven percent of the total “Shrubland Heath Complex”. It is therefore considered that this will have minimal impact on overall plant species diversity in this community. An increase in the proportion of this community exposed to high frequency of fire in the future would, however, be of serious concern.

The “Grassland-Herbfield Complex” has the highest exposure to fire compared with other communities. Only one percent of this community has not been burnt in the last twenty years. However, the recorded fire frequency may be currently insufficient to maintain the diversity of resident plant species.

Only forty eight percent of the community has been burnt twice in the past twenty years. Some fourteen percent has been burnt three times in that same period. Because this community should be exposed to a relatively high frequency of fire, there may be a need for active use of fire to maintain species diversity in this community grouping within the “Heritage Management Zones”.

Desirable fire regimes

The above analysis reveals that the greater proportion of all plant communities are currently experiencing fire regimes that are compatible with conservation objectives. There are, however, two exceptions that require active fire management to ameliorate exposure to fire regimes that are adverse to conservation.
The “Wet Sclerophyll Forest” is suffering from an adverse fire regime over a large proportion of its area. Action is required to lower the frequency of fire, possibly by restricting the passage of future wildfires. The manipulation of forest fuels in strategic zones as outlined elsewhere in this plan (Section 5) will assist in the protection of “Wet Sclerophyll Forest” by restricting the movement of wildfires.

The “Grassland-Herbfield Complex” may be suffering from insufficient fire (fire frequency too low). Areas of “Grassland-Herbfield Complex” which fall within the “Strategic Fire Management Zones” (approximately 90 ha.), will receive a higher level of fire frequency through the implementation of this plan. This will partly address the problem. Those other areas within “Heritage Fire Management Zones” (approximately 970 ha.), will need to be actively programmed to receive a higher level of fire frequency.

4.5 PROPOSED ACTIONS

To ensure that measures are undertaken to manage these species and communities, details regarding the guidelines for the appropriate management of species will be outlined in the following section (5. Bush Fire Management Zones).

The details outlined in the “Bush Fire Management Zones” section will provide direction and time frames to undertake specific actions necessary to maintain fire management requirements for Crowdy Bay National Park.

These details will also provide management directions to reduce the level of impact on the biodiversity whilst managing fuels to protect neighbours and park assets.

4.6 PERFORMANCE EVALUATION

Ongoing information is required to judge whether management strategies based on the guidelines contained in this Plan are successful in terms of achieving conservation objectives. The conservation guidelines (Tables 4.1, 4.2 & 4.3) are a summation of current knowledge relevant to the biodiversity contained within the Park.

As the knowledge-base evolves, these guidelines could change. Performance evaluation must therefore include provision for pinpointing where the guidelines need improvement. This being the case, it is vital that performance evaluation, where possible, is not solely directed at describing the state of fire regimes within the Park.

Thorough performance evaluation must be directed at assessing changes in species populations in relation to fire regimes so that the predictions implicit in the guidelines are tested and verified. The Service is committed to performance evaluation of its conservation guidelines and strategies in this Park, and will seek whatever assistance it needs to develop and implement a program that takes account of species dynamics and fire regimes.

4.7 FURTHER RESEARCH

In the process of developing this Plan it has become apparent that there are deficiencies in knowledge that must be addressed if fire is to be managed to conserve the biodiversity within the reserve. Briefly these are:

- knowledge of animal/fire responses, particularly the lower vertebrates and invertebrates, especially in relation to habitat characteristics;

- a basis for classifying the responses of animals to fire as a function of life-history attributes;

- a basis for predicting the long-term responses of animal populations to regimes, not just a single fire, based on direct interactions of fire regime components with demographic processes;

- a better understanding of the requirements for refuge, post-fire dispersal and recolonization of animal species which are depleted by fires in the short-term with a view to defining the thresholds of fire size and shape needed for conservation.

5. BUSH FIRE MANAGEMENT ZONES

To develop appropriate fire management planning for the Crowdy Bay National Park it is necessary to divide the reserve area into smaller manageable units or zones. This process is most useful when areas of a similar nature require similar management planning. For fire management purposes, the Crowdy Bay National Park area has been divided into three major fire zones. These zones, as described in Appendix 1 are:

- Asset Protection Zone
- Strategic fire Management Zone
- Heritage Area Fire Management Zone

These zones may be subdivided further to ensure that fire management needs for particular areas receive the appropriate consideration. A table outlining details regarding the management for fire zones is located in Appendix 1, “Bushfire Management Zone Guidelines”.

Table 5.0.2 “Management Zone Guidelines for Works Plan”, will assist with the fire management planning in Crowdy Bay National Park. This table provides details on the plant communities, threatened plants, animal species that may occur within each particular fire management zone.

To assist in the determination of fire management treatment, each area will be assessed using the Fire Management Works and Environmental Planning Proposal procedure, (Appendix 2). This will provide a guideline to follow to ensure that all necessary issues are given the appropriate consideration.

In relation to the classification and need for zone areas, the assets protection zones, and strategic fire management zones are managed for the protection of life and property, and the control of wildfires while minimising impacts on the environment. The heritage, and special heritage area management zones are maintained more on the basis of biodiversity conservation than property protection.

The (Appendix 4) “ Description of Fire Management Zones” provides details on the management aims and natural features within particular fire management zones. These details include the management objectives, strategies, actions and performance indicators for each fire management unit.

The following table provides an indication of the areas and percentage of the reserve contained within particular fire management zones.

Table 5.0.1 Percentage of Fire Management Zone Area

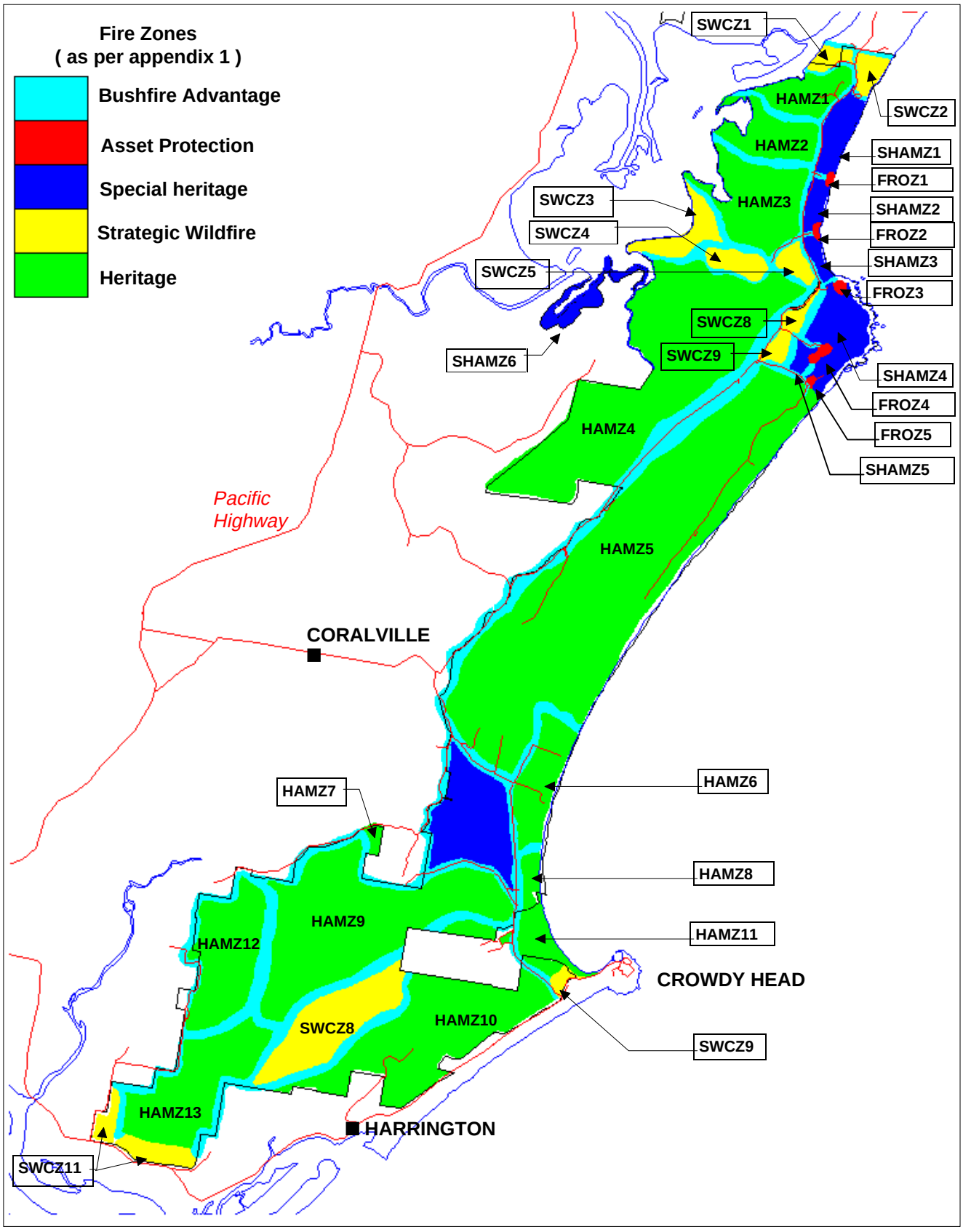
Assets Protection Zone	**Strategic Fire Management Zone**	**Heritage Fire Management Zone**
28 ha. .3 %	1753 ha. 21.8 %	6268 ha. 77.9%

The following Table provides an overview of plants and animals of special concern that need to be considered when preparing work plans for the undertaking fire management activities within Crowdy Bay National Park.

Table 5.0.2 Management Zone Guidelines for Work Plans

Fire Management Zone	Fire Regimes for Plant Communities (Table 4.1)	Threatened Plant Species (Table 4.2)	Threatened Animals Known or Likely to Occur (Table 4.3)
Asset Protection Zones			
Asset Protection 1	**2 ,3**		**3,4,12**
Asset Protection 2	**3**		**16,17,18,19,23**
Asset Protection 3	**3**		**7,16,17,18,19,23**
Asset Protection 4	**2**		**1,2,6,8,9,11,15,16,17,18,19,20,21,22,23,24,25**
Asset Protection 5	**3**		**16,17,18,19,23**
Strategic Fire Management Zones			
Bush Fire Advantage	**1,2,3,4**	**1**	**1,2,3,4,5,6,7,8,9,10,11,12,13,14,,15,16,17,18,19,20,21,22,23,24,25**
Strategic Control 1	**2**		**1,2,3,4,6,8,9,11,12,13,15,16,17,18,19,20,21,22,23,24,25**
Strategic Control 2	**2,3**		**1,2,3,4,6,8,9,11,12,15,16,17,18,19,20,21,22,23,24,25**
Strategic Control 3	**1,2,3**		**1,2,3,4,8,9,11,12,13,15,16,17,18,19,20,21,22,23,24,25**
Strategic Control 4	**2,3**		**1,2,6,8,9,11,15,16,17,18,19,20,21,22,23,24,25**
Strategic Control 5	**2,3**		**1,2,5,6,7,8,9,11,15,16,17,18,19,20,21,22,23,24,25**
Strategic Control 6	**1,2,3**		**1,2,6,8,9,11,15,16,17,18,19,20,21,22,23,24,25**
Strategic Control 7	**2,3,4**	**1**	**1,2,5,6,7,8,9,11,15,16,17,18,19,20,21,22,23,24,25**
Strategic Control 8	**2,3,4**	**1**	**1,2,5,6,7,8,9,11,15,16,17,18,19,20,21,22,23,24,25**
Strategic Control 9	**2**		**1,2,6,8,9,11,15,16,17,18,19,21,22,24,25**
Strategic Control 10	**2**		**1,2,6,8,9,11,15,16,17,18,19,21,22,24,25**
Strategic Control 11	**2,3**		**1,2,6,8,9,11,15,16,17,18,19,20,21,22,23,24,25**
Heritage Fire Management Zones			
Heritage Area 1	**2,3**	**2**	**1,2,6,7,8,9,11,15,16,17,18,19,20,21,22,23,24,25**
Heritage Area 2	**1,2,3**	**2**	**1,2,6,7,8,9,11,12,13,15,16,17,18,19,20,21,22,23,24,25**
Heritage Area 3	**1,2,3,4**	**1**	**1,2,6,8,9,11,15,16,17,18,19,20,21,22,23,24,25**
Heritage Area 4	**1,2,3,4**	**1**	**1,2,6,8,9,11,15,16,17,18,19,20,21,22,23,24,25**
Heritage Area 5	**1,2,3,4**	**1**	**1,2,3,4,6,7,8,9,10,11,12,14,15,16,17,18,19,20,21,22,23,24,25**
Heritage Area 6	**2,3,4**	**1**	**1,2,3,4,5,6,8,7,9,11,12,15,16,17,18,19,21,22,24,25**
Heritage Area 7	**2**		**1,2,6,8,9,11,15,16,17,18,19,20,21,22,23,24,25**
Heritage Area 8	**2,3**		**1,2,3,4,6,8,9,11,12,15,16,17,18,19,21,22,23,24,25**
Heritage Area 9	**2,3,4**	**1**	**1,2,5,6,7,8,9,11,15,16,17,18,19,20,21,22,23,24,25**
Heritage Area 10	**1,2,3,4**	**1**	**1,2,3,4,5,6,7,8,9,10,11,12,13,14,,15,16,17,18,19,20,21,22,23,24,25**
Heritage Area 11	**2**		**1,2,6,8,9,11,15,16,17,18,19,21,22,24,25**
Heritage Area 12	**2,3,4**	**1**	**1,2,5,6,7,8,9,11,15,16,17,18,19,20,21,22,23,24,25**
Heritage Area 13	**2,3,4**	**1**	**1,2,5,6,7,8,9,11,15,16,17,18,19,20,21,22,23,24,25**
Special Heritage 1	**1,2,3**		**1,2,3,4,6,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25**
Special Heritage 2	**1,2,3**		**1,2,3,4,6,8,9,11,15,16,17,18,19,20,21,22,23,24,25**
Special Heritage 3	**1,2,3**		**1,2,3,4,6,8,9,10,11,12,13,14,15,16,17,18,19,21,22,24,25**
Special Heritage 4	**1,2,3,4**	**1**	**1,2,6,7,8,9,10,11,14,15,16,17,18,19,20,21,22,23,24,25**
Special Heritage 5	**2,3**		**1,2,6,7,8,9,11,15,16,17,18,19,20,21,22,23,24,25**
Special Heritage 6	**1,2**		**1,2,6,8,9,11,15,16,17,18,19,20,21,22,23,24,25**
Special Heritage 7	**1,2,3,4**	**1**	**1,2,6,8,9,11,15,16,17,18,19,20,21,22,23,24,25**
			1,2,5,6,7,8,9,11,15,16,17,18,19,20,21,22,23,24,25

MAP 5.1 FIRE MANAGEMENT ZONES



6. ENVIRONMENTAL CONSIDERATIONS

6.1 INTRODUCTION

All works and activities covered in this document have been assessed to determine the level of environmental impact. Environmental assessment has been undertaken using the methodology as outlined in the booklet titled, “Is an EIS Required?” which has been produced by the NSW Department of Planning . The three steps outlined for planning are: - Identify the issue - Analyse the impacts and - Evaluate the likely environmental significance of impacts. This assessment is contained within a separate document “ Environmental Impact Assessment (fire management plan) Crowdy Bay National Park “. It includes Section 5A of the Environmental Planning an Assessment Act . An eight part test of significance which assesses the impact of the proposal on threatened species likely to occur within the park. Consideration of the system of management zones (Section 5) has been crucial to the assessment of likely impacts. However, matters such as the construction of permanent fire trails will require specific documentation such as a “Review of Environmental Factors” and are not covered by this document.

The main impacts on animal and plant species from the implementation of this plan will stem from prescribed burning and the slashing of vegetation for the maintenance of fire advantages to protect assets and fire fighters. Management guidelines for plant communities and threatened species are contained in Section 4.3

Under this plan, management will be focussed on areas within three major zones (Section 5). The asset protection and strategic fire management zones contain most of the works and activities which will require assessment of environmental impact as activity levels may exceed thresholds of fire regimes acceptable necessary for conservation of biodiversity. In contrast, works and activities within the heritage area will be targeted chiefly on the conservation of biodiversity. Activities will therefore expressly aim to maintain fire regimes within acceptable limits as defined in Section 4. Therefore, the main areas considered for detailed environmental assessment are asset protection and strategic fire management zones

As this plan has a currency period of five years, it is important to review each activity annually before commencement of works. This is necessary when dealing with dynamic ecosystems where species may re-colonise areas over a period of time. An environmental check list (see Appendix 2), “Fire Management Works and Environmental Planning Proposal Form”) will be used to evaluate all activities prior to commencement. Where threatened fauna are predicted to occur, the guidelines in Table 4.3 will be implemented.

6.2 IDENTIFICATION OF ISSUES

There are two main issues associated with the implementation of the works program outlined in this reserve fire plan:

- Prescription Burning
- Slashing of vegetation

Prescription Burning

Prescription burning will be undertaken within Asset Protection and Strategic Control zones. To maintain low levels of available fuels, there will be a need to implement burning programs on a higher level of frequency than would be normally acceptable in terms of conserving biodiversity (Section 4).

The frequency of burning within asset and strategic zones will be determined by the particular vegetation community and its ability to develop flammable fuels. Any burning proposals to be undertaken within Heritage zones will be in accordance with specified thresholds (Section 4) and should not cause any significant environmental impact (see above).

The need for asset protection and strategic wildfire control zones is extremely important for the protection of both community and conservation of biodiversity.

Assets zones have only been used where necessary near reserve picnic and camping areas to protect recreational infrastructure (there are no community dwellings on reserve boundaries).

Strategic zones have been designed to restrict and slow the movements of wildfires. These zones have been located in areas to prevent fires from entering or leaving the reserve system and to also restrict the development of major fires.

Slashing Vegetation

The slashing of vegetation is an issue because of the frequency of the activity and the complete removal of above-ground plant species. However, unlike the issue of prescription burning, slashing of vegetation is undertaken over a relatively small area of the reserve (fire trails, camping and picnic areas).

Slashing of areas will be undertaken in asset and bushfire advantage zones to protect structures and provide safe areas to manage approaching wildfires. The frequency of slashing will vary but is usually undertaken prior to the fire season. In some respects the slashing of vegetation is of more importance than prescription burning from a safety perspective in that the majority of slashing is carried out along fire trails where fire fighters are at most risk from approaching wildfires.

The slashing of fire trails also provides access to wildfires and allows fire crews quick access to remote areas of the reserve, thus preventing further damage to assets.

There are a number of other environmental issues related to the implementation of the works plan which are also important, but have a lower level of impact. These matters are considered within this fire plan and will be re-assessed before activities are undertaken using the “Fire Management Works and Environmental Planning Proposal Form”.

6.3 IMPACTS OF FIRE MANAGEMENT ACTIVITIES

The two main issues of environmental concern are for vegetation slashing and prescription burning. The issue of slashing of vegetation will create the highest level of environmental concern because of the annual regime of disturbance that is required. However, as these slashed areas have been treated over many years it is difficult to now determine which species have been affected. It is likely that woody species of plants will decline in density in response to this level of activity.

Prescription burning undertaken on a higher level of fire frequency will change the density of many species and therefore the composition of some communities. Changes may be slow and will need to be assessed, as identified in the research section. The development of a research program to monitor the changes in biodiversity will be necessary so that changes in management techniques can be considered.

The effects of high frequency fire on the floristic communities will be variable depending on the particular plant community and it’s response to fire. Table 4.1 “Fire Regimes for Plant Communities” details the levels of acceptable fire frequency necessary to maintain floristic diversity

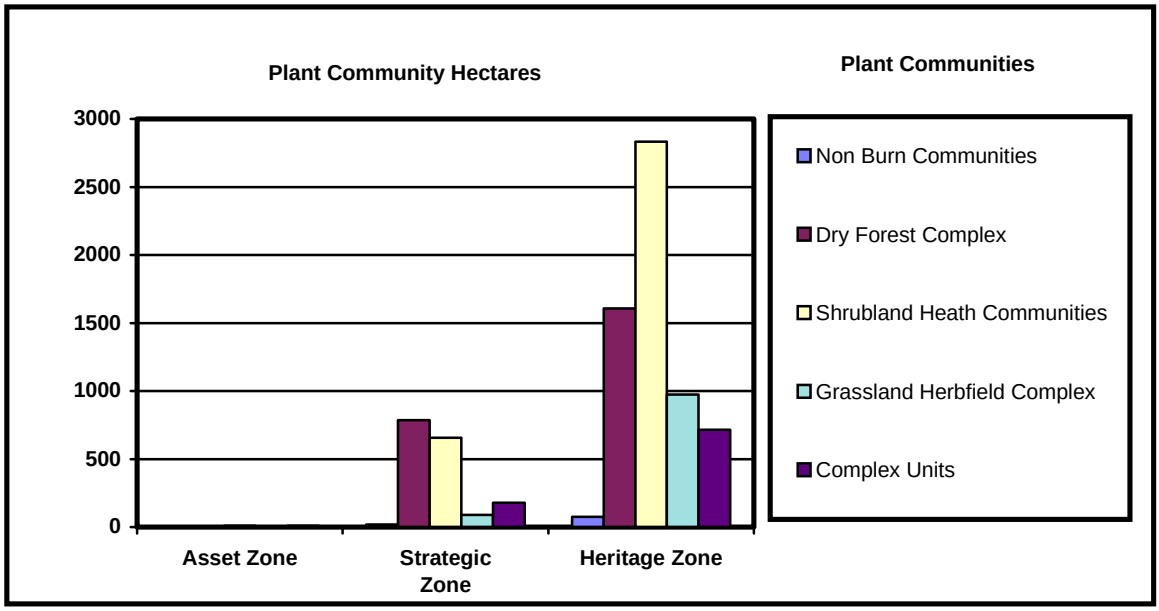
Also, table 4.2 “Threatened Plant Species” and table 4.3 “ Threatened Animals” outline factors which will assist with the protection of these species at risk within reserve areas.

These tables can be used to predict and assess the nature of impacts of management activities within the intensively managed zones described above.

6.4 SIGNIFICANCE OF IMPACTS ON AFFECTED COMMUNITIES AND SPECIES

To gain an understanding of impact of these activities it is useful to consider the type and area of vegetation community which exists within particular fire management zones. The following graph (6.4) indicates the area (ha) of vegetation communities represented in each of three major fire management zones.

Graph 6.4 Representation of Plant Communities per Fire Zone



It is most obvious from the above graph that extremely good representation of a full range of floristic communities are present within the reserve, and in particular, safely located with “Heritage Management Zones”.

Whilst management activities in the Asset Protection and the Strategic Fire Management Zone’s have been designed primarily for the protection of life and property, consideration has also been given to minimising impact on the environment and protecting biodiversity.

This level of protection should ensure that plant and animal communities are appropriately maintained and the modification of assets and strategic zones is acceptable.

However, the possible loss of any threatened plant or animal species or complete plant communities is unacceptable. To ensure that consideration is given to the protection of these species activities will only be undertaken after checking environmental considerations as outlined in section 4.3 “Fire Management Guidelines for Plant and Animal Species”.

By following these guidelines, there will be a much higher level of protection for species when implementing works plans and thus a reduction of impact on species.

6.5 MITIGATION OF ADVERSE EFFECTS

It will be essential to work within the management guidelines set out in the “Table 4.1, 4.2 and 4.3” to reduce even further impact on these species when undertaking fire management activities. Regardless of whether burning is to be undertaken within strategic or assets protection zones, it will be necessary to treat all areas within the guidelines set out above.

To also reduce impacts further, the burning of strategic and assets zones will be undertaken on the basis of mosaic burning to ensure that zones are not entirely burnt in one season. This can be achieved by not treating adjoining zones during the same year. Some of the larger zones may also be divided into smaller areas and burnt in sections over a number of years. Most treatment areas will be less than one hundred hectares

As indicated in the above sections, before any activity outlined in the works plan can commence, there must be a further check made of the site and databases to ensure that environmental considerations have not changed. To assist in this process an environmental check list will need to be completed and endorsed, (see Appendix 2) “Fire Management Works and Environmental Planning Proposal Form”.

The Service will seek the assistance of the relevant fauna protection group with any injured or smoke effected native animal, these groups are listed in the Action Fire Plan.

7. REVIEW, EVALUATION AND RESEARCH

7.1 REVIEW OF FIRE PLAN

This fire plan has been produced with the assistance of the Port Macquarie District, Northern Region and Head Office National Parks and Wildlife Service staff. The staff input has mainly been towards the management of plant and animal species and fire management within the reserve and general area.

Consultation with Bush Fire Management Committees has provided details on a broader fire management issues and has maintained a focus on coordinated approach to fuel management within the Council areas.

Local Bush Fire Brigades have provided details on local fire matters including fire histories and areas of concern where assets are close to the reserve and may be affected by wildfires. The plan will also be placed on public display for a period of three months for community comment.

There may be a need to review fire management strategies as further research into the management of animals and plants develops. To ensure that regular reviews are undertaken this fire plan has a currency period of five years. At the end of the operational life of this plan, the plan will be reviewed via a similar process as outlined above.

7.2 IMPLEMENTATION AND EVALUATION

The implementation of this plan will be driven by the need to manage fuel accumulations to prescribed levels to protect assets and maintain the plant and animal species in the reserve area.

Bush Fire Management Committees meet on a regular basis to plan annual fuel management programs with each Council area. This plan will provide the guidelines and details necessary to determine the appropriate areas needing fuel reduction annually.

District staff will monitor the fire frequency and forest fuel levels of the reserve area and in particular the assets, and strategic fire management zones to assist with the protection of life and property and to reduce the occurrence of major wildfires within the reserve.

As indicated in the section 4.6 “Performance Evaluation”, the success of this plan will be measured by the maintenance of species populations. Also, it would be anticipated that the implementation of this plan over time will reduce the occurrence of wildfires moving on and off the reserve.

There are a number of ways to evaluate the effectiveness of this plan. The monitoring of the following matters will assist in determining the level of plan implementation and how effectively the impact of adverse fire management has been reduced by the introduction of this plan:

- The maintenance of fire advantages.
- The maintenance of reduced fuel levels in prescribed areas.
- The development and implementation of research programs.
- Service involvement with community fire guard program.
- The maintenance of appropriate fire regimes.

7.3 RESEARCH

As identified in the section 4.7 “Further Research”, there is a need to continue further research to provide details where major deficiencies in knowledge occur in understanding how to managed and conserve the biodiversity within the reserve. Briefly these are;

- knowledge of animal fire responses, particularly the lower vertebrates and invertebrates, especially in relation to habitat characteristics;

- a basis for classifying the responses of animals to fire as a function of life-history attributes;

- a basis for predicting the long-term responses of animal populations to fire regimes, not just a single fire;

- a better understanding of the requirements for refuge, post-fire dispersal and recolonization of animal species which are depleted by fires in the short-term with a view to defining the thresholds of fire size and shape needed for conservation.

The National Parks and Wildlife Service, Bush Fire Research Section will design an appropriate monitoring system to manage the above research projects. The Port Macquarie District staff will assist by providing staff and resources to implement the projects. District staff will also seek the assistance of appropriate volunteer groups to aid in the collection of research data.

8. WORK PLAN

This Reserve Fire Plan will be used as the basis to program fire management activities within Crowdy Bay National Park. The works plan will be developed from the need to consider three main factors:

- The maintenance of fire trails.
- The reduction of fuels in asset protection and strategic wildfire control zones.
- The need to manage and protect heritage management area zones.

Fire Trails

On an annual basis (before the fire season), the condition of fire trails will be assessed, and maintenance will be undertaken as required to bring fire trails up to Service standards as outlined in the access section of the Service's "Fire Management Manual". There will also be regular patrols throughout the reserve to assess condition, maintain drainage and clear fallen trees.

Fuel Reduction Areas

During the five year operational period of this plan, mainly asset protection and strategic wildfire control zones will require work. Fuel accumulation curves developed by R. Conroy (1996) for vegetation in the Sydney Region will provide the first indication of when fuels within these zones may require treatment.

As a part of the annual fuel management program, those areas identified as having a projected high fuel level will be field inspected. After inspection of zones, those areas which require treatment will be scheduled for works. Regular inspections of all assets and strategic zones will be undertaken to ensure that consideration is given to other areas. The following provides an understanding of R. Conroy's (1996) fuel accumulation data.

Vegetation Complex	**Accumulation Rates**
Dry Forest Complex	15 t/ha at 6 years
Shrubland-heath complex	15 t/ha at 4 years
Grassland-herbfield complex	10 t/ha at 3 years

Heritage Management Areas

These areas will be managed as per the guidelines provided in table 4.1, "Fire Regimes for Plant Communities". Consideration may be given to introducing fire in parts of those areas at an earlier stage if agreed to by the Bushfire Management Committee as part of Sections 41A and 41B for fuel management planning process.

9. GLOSSARY

Advantage	A feature that gives an advantage to the suppression or management of fire. These may include roads, trails natural obstacles to fire and tanker watering points.
Aerial Ignition	The igniting of fine fuels for prescribed purposes by dropping incendiary devices or materials from aircraft
Aspect	The direction towards which a slope faces
Available Fuel	The portion of the total fuel that would actually burn under various specified conditions
Brigade	A unit of personnel including officers, crew and sub brigades
Campaign Fire	A fire normally of a size and/or complexity that requires substantial firefighting resources, and possibly several days or weeks to suppress
Chenopod shrubland	A shrubland or heath typified by a Saltbush shrubland, Saltbush being a member of the *Chenopodiaceae* family
Ecosystem	The interacting system of a biological community, both plant and animal, and its non living surroundings
Fire Management	All activities associated with the management of fire prone land, including the use of fire to meet land management goals and objectives
Fire Season	The period of the year during which fires are likely to occur, spread and do sufficient damage to warrant organised control. Fire occurring during the cooler months are less likely to promote regeneration of the fire
Fire Risk	Processes, occurrences or actions that increase the likelihood of fires occurring
Frequency	The number of times an area is burnt. Too frequent burning promotes the growth of pyrogenic species and has the effect of reducing the diversity of species in the understorey or heathland

Fuel:	Any material such as grass, leaf litter and live vegetation which can be ignited and sustains a fire. Fuel is usually measured in tonnes per hectare.
Fuel management	Modification of fuels by prescribed burning, or other means
Graminoid heath	A heath having a grassy appearance, derived from Gramineous meaning grassy.
Habitat	The place in which an animal or plant lives
Head Fire	The part of a fire where the rate of spread, flame height and intensity are greatest, usually when burning downwind or upslope
Ignition Point(s)	The point(s) of origin of a fire, usually a single point in an unplanned fire.
Intensity	The energy output of a fire, usually measured in kilowatts per metre squared. A regime of low intensity fires at frequent intervals may result in a grassy understorey. High intensity fires of irregular occurrence will generally promote plant recruitment and help maintain diversity.
Prescribed Burning	The controlled application of fire under specified environmental conditions to a predetermined area and at the time, intensity, and rate of spread required to attain planned resource management objectives
Prescription	A written statement defining the objectives to be attained during prescribed burning. This statement considers the condition of temperature, humidity, wind direction and speed, fuel moisture and soil moisture under which the fire will be allowed to burn. This is generally described within acceptable ranges of the various indices, and the limit of the geographical area to be covered,
Rate of Spread	The forward progress per unit time of the head fire or another specified part of the fire perimeter.
Strategy	A statement detailing how an objective is to be achieved

Unplanned Fires	A bushfire that has been ignited either by natural means; such as a lightning strike, or by man-made means such as arson; but was not started by a fire management authority for the purposes of hazard reduction (see also Wildfire).
Wildfire	An unplanned fire. A generic term which includes grass fires, forest fires and scrub fires

10. REFERENCES

Australian Fire Authorities Council (1996) *Glossary of Rural Fire Terminology*

Australian Standards(1991). *Construction of buildings in bushfire-prone areas* AS3959-1991.

Conroy, R. (1996) *Bushfire Management Zones*, NPWS unpublished paper on the fire management zone guidelines

Conroy, R. (1996) *Fuel Management Strategies for the Sydney Region*. NPWS

Department of Bushfires Services (1991) *Planning for Bushfire Protection* .

Department of Bushfires Services, Coordinating Committee of the NSW Bush Fire Council Policy Statement.(1991). *Fire Coordination Manual*.

Department of Planning (1995). *Is an EIS required?* ISBN 0 7310 3067 2

Greater Taree City Council (1996) *Operational and Fuel Management Plan*.

Griffiths, S. NPWS report (1992). *Vegetation of Crowdy Bay National Park*
.
Hastings Bush Fire Management Committee(1996). *Operational and Fuel Management Plan*

National Parks and Wildlife Service. (1995) *Fire Management Plan, Bundjalung National Park*. ISBN 0 7310 0803 0

National Parks and Wildlife Service.(1990) *Fire Management Manual*.
ISBN 0 7305 7384 2

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Appendix 1) Bushfire Management Zone Guidelines

Zone Group	Zone	Purpose	Methods	Width	Comments
Asset Protection **FROZ**	Fire Radiation (Inner Protection) Zone	to protect residential areas, cultural sites, plantations, utilities, camping areas & day use areas	fuel managed by slashing, selective shrub clearing, construction of radiation barriers, trail construction or burning	as per DBFS (1991)	should operate in conjunction with Community Fireguard
Strategic Fire Management **BAMZ**	Bushfire Advantage Management Zone	to assist in the strategic control and containment of wildfires and protection of fire fighters	maintenance of tracks, trails and cleared boundaries also includes railway lines and roads	at least 1.5 metres for pedestrian access, at least 4 metres for safe vehicle operations	creeks, rivers and cliff lines can also be used as fire advantages rainforest can be used but should not be utilised to stop intensive fires if possible
Strategic Fire Management **SWCZ**	Strategic Wildfire Control Zone	to reduce wildfire intensity and fire spotting distance	fuel managed by burning suppress or contain fires inconsistent with the fire management guidelines	100 - 3000 metres	these zones are also used to restrict the movement of fire from zone into the next
Heritage Area Fire Management **SAMZ**	Special Area Management Zone	to prevent permanent damage or destruction of heritage items by an inappropriate fire regime	suppress fires inconsistent with the fire management guidelines	appropriate for the protection of the heritage item	management of the heritage item may be subject to a plan of management, conservation plan or a species recovery plan there may be a number of different fire regimes required within one zone to cater for a number of biodiversity requirements
Heritage Area Fire Management **HAMZ**	Heritage Area Management Zone	to manage and protect natural and cultural values heritage values with appropriate fire regimes	suppress or contain fires inconsistent with the fire management guidelines	variable	similar to the above details zones managed on a biodiversity basis, not exclusively for asset protection or wildfire control

Appendix 2 Fire management Works and Environmental Planning Proposal Form

Fire Management Works and Environmental Planning Proposal Form

Authority/Brigade: **Year Proposed:**

Fuel Management Zone: **Proposal Number:**

Location:

Tenure: ☐ Private ☐ Council ☐ Crown Land ☐ Water Board ☐ National Park ☐ State Rail ☐ Other

Agencies / Community Groups involved:

Assets at Risk: (Tick those present)

Cultural: ☐ Fuel Depot ☐ Hospital ☐ School ☐ Field Study Centre ☐ Visitor Centre ☐ House(s) ☐ Powerlines ☐ Plantations ☐ Pastures/Fences ☐ .....

Natural: ☐ Rainforest ☐ Moist Eucalypt Forest ☐ Dry Forest/Woodland ☐ Shrubland-Heath Complex ☐ Grassland Herbfield

Comments:

Proposal Criteria:

Fuel Types: Litter ☐ Heavy (15-25 t/ha) ☐ Moderate (10-15t/ha) ☐ Light (<10 t/ha)

Aerial Fuels ☐ Heavy (7-15 t/ha) ☐ Moderate (3-5 t/ha) ☐ Light (<3 t/ha)

Fire Potential: **Fire Risk:**

Objectives:

Comments:

Type of Treatment:

Fire Prescriptions

	Year	Month	Season of Burn	Fire Intensity
Past Fires:				

Review of Prescriptions

Current interval (years) between now and last fire

Preferred Inter-Fire Interval (years)

Interval - adjacent burns 0-1 1-2 3-5 **Meets Policy Guidelines** Yes No

Environmental Planning and Assessment Regulation 1980
Fire Management Plan for the Area ☐Yes ☐No

Is this proposal consistant with the reserve fire management plan?

Part 7 (d & e)
Considerations *Anthropological, historic, scientific, or social sites*
☐Aboriginal Site ☐Historic Site ☐Scientific Site ☐Social Site

Other(s) .....

Part 7 (e & f) Considerations *Habitat(s) of rare and endangered plants and animals*

Possible Occurrence of Rare/Threatened Species	Preferred Habitat	Fire Regime

Part 7 (c,f,g & n) Considerations *Fire Ecology: Impact of fire on Ecosystems*
Indicator Species
Population Size
Seedbanks: Low ☐ Adequate ☐ Optimal ☐

Part 7 (h) Considerations *Degradation of the quality of the environment*
Weeds (which?)
Erosion Area of Occurrence

Significant Issues No ☐ Yes ☐

Review of Other Factors

Environmental Impacts	YES	NO	Proposed Prescriptions
(b) Transformation of the locality	☐	☐	
(d) Aesthetic, scientific or recreational impacts	☐	☐	
(i) Risk to the safety of the environment	☐	☐	
(j) Any curtailing of beneficial uses	☐	☐	
(k) Any pollution of the environment	☐	☐	
(m) Any cumulative environmental effect	☐	☐	

Prepared by..... **Approved** .....

Appendix 3) Access Management Trails

Trail Name	Length	Surface	All Weather	2wd-4wd	Tanker
Abbey Creek	2900	Gravel	No	4wd	Yes
Bakers	4300	Sand/Grass	No	4wd	No
Beach	900	Sand	No	4wd	No
Bensons Inlet	2300	Sand	No	4wd	Yes
Blackbutt	600	Gravel	No	4wd	Yes
Blackfellows Bog	2400	Gravel	No	4wd	No
Cheese Tree Picnic	300	Gravel	No	2wd	Yes
Christies	1500	Sand	No	2wd	No
Cooks	2200	Sand	No	4wd	No
Crowdy Head Road	6000a	Sealed	Yes	2wd	Yes
Diamond Head East	10200	Gravel	Yes	2wd	Yes
Diamond Head West	5200	Gravel	Yes	2wd	Yes
Diamond Head Rest	1100	Gravel	Yes	2wd	Yes
Diamond Head Road	8100	Gravel	Yes	2wd	Yes
Fig Tree Picnic Area	5300	Sand	No	2wd	Yes
Fig Tree Road	5300	Gravel	Yes	2wd	No
Gills	4100	Sand	Yes	4wd	Yes
Grass tree	2300	Gravel	No	4wd	No
Harrington	5900	Sand	No	4wd	No
Hintons	3300	Gravel	No	4wd	No
Humbug	3400	Gravel	Yes	4wd	No
Indian Head Road	1200	Gravel	Yes	2wd	Yes
Kylies Beach	500	Sand	No	2wd	No
Lake	1700	Sand	No	4wd	No
Link	800	Grass	No	4wd	No
Marshal	800	Grass	No	4wd	No
Mermaid Picnic Area	1100	Sand	No	4wd	Yes
Mills	1500	Sand	No	4wd	No
Northern Boundary	700	Bitumen\gravel	No	2wd	Yes
Sand	7000	Sand	Yes	4wd	Yes
Sandy Point Road	1800	Sand	No	4wd	Yes
Slash	1900	Grass	No	4wd	No
South West Boundary	10600	Gravel	No	4wd	No
Taylors Road	1900	Gravel	Yes	4wd	No
Walkers	1100	Sand	No	4wd	No
Water Hole	800	Sand	Yes	4wd	Yes

Appendix 4 Description of Fire Management Zones

FROZ 1 Asset Protection 1 Cheese Tree Picnic Area

Area	*Total*	*Hastings*	*Taree*	*NPWS*	*P.P.*	*Other*
ha	4	4	0	4	0	0

Subformation	ha	%res	Subformation	ha	%res
Beach Sand	4	3.08			

THREATENED ANIMALS (Likely Occurrence) as per Table 4.3 **3,4,12**
THREATENED PLANTS (Likely Occurrence)

Cultural Sites : None known **Assets :** Recreational Facilities

Objective	Strategies
To protect the users and facilities from fire To minimise the potential for fire spread to adjacent fire zones	Maintain fuel reduced area Exclude all fire
Action	**Performance Indicators**
Provide rapid initial attack on all fires threatening or within the zone Maintain slashed facility area	No fires within Zone Slashed area maintained

FROZ 2 Asset Protection 2 Geebung Picnic Area

Area	*Total*	*Hastings*	*Taree*	*NPWS*	*P.P.*	*Other*
ha	7	7	0	7	0	0

Subformation	ha	%res	Subformation	ha	%res
Dry Scl Shrubland	3	1.01	Beach Sand	4	3.08

THREATENED ANIMALS (Likely Occurrence) as per Table 4.3 **16,17,18,19,23**
THREATENED PLANTS (Likely Occurrence)

Cultural Sites : None known **Assets :** Recreational facilities

Objective	Strategies
To protect the users and facilities from fire To minimise the potential for fire spread to adjacent fire zones	Exclude all fire Maintain fuel reduced area
Actions	**Performance Indicators**
Provide rapid initial attack on all fires threatening or within the zone Maintain slashed facility area	No fires within Zone Slashed area maintained.

FROZ 3 Asset Protection 3 Diamond Head Camping Area

Area	*Total*	*Hastings*	*Taree*	*NPWS*	*P.P.*	*Other*
ha	5	5	0	5	0	0

Subformation	ha	%res	Subformation	ha	%res
Graminoid Clay Heathland	5	4.98			

THREATENED ANIMALS (Likely Occurrence) as per Table 4.3 **7,16,17,18,19,23**
THREATENED PLANTS (Likely Occurrence)

Cultural Sites : None known **Assets :** Recreational and Camping Facilities

Objectives	Strategies
To protect the users and facilities from fire To minimise the potential for fire spread to adjacent fire zones	Fire permitted in fireplaces only Maintain fuel reduced area
Actions	**Performance indicators**
Provide rapid initial attack on all fires threatening or within the zone Maintain slashed facility area	No fires within Zone Slashed area maintained

FROZ 4 Asset Protection 4 Indian Head Camping Area

Area	*Total*	*Hastings*	*Taree*	*NPWS*	*P.P.*	*Other*
ha	10	0	10	10	0	0

Subformation	ha	%res	Subformation	ha	%res
Dry Scl Forest & Woodland	1	0.08	Dry Scl Swamp Scl Ecotone	4	6.53
Swamp Scl Forest & Woodland	4	0.27	Disturbed Land	1	0.13

THREATENED ANIMALS (Likely Occurrence) as per Table 4.3 **1,2,6,8,9,11,15,16,17,18,19 20,21,22,23,25**

THREATENED PLANTS (Likely Occurrence)

Cultural Sites : Kylies Hut Historic Site **Assets :** Camping Facilities

Objectives	Strategies
To protect the users and facilities from fire To minimise the potential for fire spread to adjacent fire zones	Fire permitted in fireplaces only Maintain fuel reduced area
Actions	**Performance indicators**
Provide rapid initial attack on all fires threatening or within the zone Maintain slashed facility area	No fires within Zone Slashed area maintained

FROZ 5 Asset Protection 5 Kylies Camping Area

Area	*Total*	*Hastings*	*Taree*	*NPWS*	*P.P.*	*Other*
ha	2	0	2	2	0	0

Subformation	ha	%res	Subformation	ha	%res
Dry Scl Shrubland	2	0.67			

THREATENED ANIMALS (Likely Occurrence) as per Table 4.3 **16,17,18,19,23**

THREATENED PLANTS (Likely Occurrence)

Cultural Sites : None known **Assets :** Camping Facilities

Objectives	Strategies
To protect the users and facilities from fire To minimise the potential for fire spread to adjacent fire zones	Fire permitted in fireplaces only Maintain fuel reduced area
Actions	**Performance indicators**
Provide rapid initial attack on all fires threatening or within the zone Maintain slashed facility area	No fires within Zone Slashed area maintained

SWCZ 1 Strategic Wildfire Control 1

Area	*Total*	*Hastings*	*Taree*	*NPWS*	*P.P.*	*Other*
ha	29	29	0	11	17	0

Subformation	ha	%res	Subformation	ha	%res
Dry Scl Forest & Woodland	5	0.01	Saltmarsh Complex	5	20.59
Swamp Scl Forest & Woodland	16	0.01	Disturbed land	3	0.40

THREATENED ANIMALS (Likely Occurrence) as per Table 4.3 **1,2,3,4,6,8,9,11,12,13,15,16,17 18,19,20,21,22,23,24,25**

THREATENED PLANTS (Likely Occurrence)

Cultural Sites : None known **Assets :**

Objectives	Strategies
To prevent wildfire crossing the zone, towards Laurieton or into the reserve.	To maintain low fuel levels within the zone Liaise with Bushfire Management Committee re burning on adjoining land
Actions	**Performance indicators**
Annually monitor the fuel level within the zone Prepare prescription burn plan prior to commencement of works	No wildfires crossing the zone Fuel managed as per Bushfire Management Zone Guidelines

SWCZ 2 Strategic Wildfire Control 2

Area	*Total*	*Hastings*	*Taree*	*NPWS*	*P.P.*	*Other*
ha	36	36	0	36	0	0

Subformation	ha	%res	Subformation	ha	%res
Dry Scl Forest & Woodland	9	0.73	Foredune Complex	11	8.90
Swamp Scl Forest & Woodland	9	0.60	Beach Sand	6	4.62
Wet Heathland	1	0.06			

THREATENED ANIMALS (Likely Occurrence) as per Table 4.3 **1,2,3,4,6,8,9,11,12,15,16,17,18 19,20,21,22,23,24,25**

THREATENED PLANTS (Likely Occurrence)

Cultural Sites : None known **Assets :**

Objectives	Strategies
To prevent wildfire crossing the zone, towards Laurieton or into the reserve.	To maintain low fuel levels within the zone Liaise with Bushfire Management Committee re burning on adjoining land
Actions	**Performance indicators**
Annually monitor the fuel level within the zone Prepare prescription burn plan prior to commencement of works	No wildfires crossing the zone Fuel managed as per Bushfire Management Zone Guidelines

SWCZ 3 Strategic Wildfire Control 3

Area	*Total*	*Hastings*	*Taree*	*NPWS*	*P.P.*	*Other*
ha	87	87	0	87	0	0

Subformation	ha	%res	Subformation	ha	%res
Wet Sclerophyll Forest	2	17.90	Dry Heathland	7	0.56
Dry Scl Forest & Woodland	41	3.30	Saltmarsh Complex	7	28.82
Swamp Scl Forest & Woodland	30	2.47			

THREATENED ANIMALS (Likely Occurrence) as per Table 4.3 **1,2,3,4,8,9,11,12,13,15,16,17,18 19,20,21,22,23,24,25**

THREATENED PLANTS (Likely Occurrence)

Cultural Sites : None known **Assets:**

Objectives	Strategies
To minimise the potential of fire escaping from recreational users	To maintain low fuel levels within the zone
Actions	**Performance indicators**
Annually monitor the fuel level within the zone Provide a rapid response to unplanned fires Prepare prescription burn plan prior to commencement of works	No wildfires crossing the zone Fuel managed as per Bushfire Management Zone Guidelines

SWCZ 4 Strategic Wildfire Control 4

Area	*Total*	*Hastings*	*Taree*	*NPWS*	*P.P.*	*Other*
ha	55	55	0	55	0	0

Subformation	ha	%res	Subformation	ha	%res
Dry Scl forest & Woodland	39	3.14	Wet Heathland	6	0.34
Swamp Scl Forest & Woodland	10	0.67			

THREATENED ANIMALS (Likely Occurrence) as per Table 4.3 **1,2,6,8,9,11,15,16,17,18,19,20 21,22,23,24,25**

THREATENED PLANTS (Likely Occurrence)

Cultural Sites : None known **Assets :**

Objectives	Strategies
To minimise the potential for fire spread to the Old age Banksia	To maintain low fuel levels within the zone
Actions	**Performance indicators**
Annually monitor the fuel level within the zone Provide a rapid response to unplanned fires Prepare prescription burn plan prior to commencement of works	No wildfires crossing the zone Fuel managed as per Bushfire Management Zone Guidelines

SWCZ 5 Strategic Wildfire Control 5

Area	*Total*	*Hastings*	*Taree*	*NPWS*	*P.P.*	*Other*
ha	37	37	0	37	0	0

Subformation	ha	%res	Subformation	ha	%res
Dry Scl Forest & Woodland	1	0.08	Graminoid Clay Heathland	3	2.99
Swamp Scl Forest & Woodland	2	0.13	Wet Heathland	29	1.63
Swamp Wet Scl Shrubland	2	0.51			

THREATENED ANIMALS (Likely Occurrence) as per Table 4.3 **1,2,5,6,7,8,9,11,15,16,17,18,19 20,21,22,23,24,25**

THREATENED PLANTS (Likely Occurrence)

Cultural Sites : None known **Assets :**

Objectives	Strategies
To minimise the potential for fire spread to the Old Age Banksia	To maintain low fuel levels within the zone
Actions	**Performance indicators**
Annually monitor the fuel level within the zone Provide a rapid response to unplanned fires Prepare prescription burn plan prior to commencement of works	No wildfires crossing the zone Fuel managed as per Bushfire Management Zone Guidelines

SWCZ 6 Strategic Wildfire Control 6

Area	*Total*	*Hastings*	*Taree*	*NPWS*	*P.P.*	*Other*
ha	23	9	14	23	0	0

Subformation	ha	%res	Subformation	ha	%res
Wet Sclerophyll Forest	1	2.56	Swamp Scl Forest & Woodland	10	0.67
Dry Scl Forest & Woodland	11	0.89	Graminoid Clay Heathland	1	1.00

THREATENED ANIMALS (Likely Occurrence) as per Table 4.3 **1,2,6,8,9,11,15,16,17,18,19,20,21 22,23,24,25**

THREATENED PLANTS (Likely Occurrence)

Cultural Sites : None known **Assets :**

Objectives	Strategies
To minimise the potential for fire spread to the Old age Banksia	To maintain low fuel levels within the zone
Actions	**Performance indicators**
Annually monitor the fuel level within the zone Provide a rapid response to unplanned fires Prepare prescription burn plan prior to commencement of works	No wildfires crossing the zone Fuel managed as per Bushfire Management Zone Guidelines

SWCZ 7 Strategic Wildfire Control 7

Area	*Total*	*Hastings*	*Taree*	*NPWS*	*P.P.*	*Other*
ha	29	0	29	29	0	0

Subformation	ha	%res	Subformation	ha	%res
Dry Scl Forest & Woodland	6	0.48	Dry Heathland	5	0.40
Swamp Scl Forest & Woodland	6	0.40	Wet Heathland	8	0.45
Dry Scl Swamp Scl Ecotone	1	1.63	Sedgeland	1	0.09
Swamp Wet Scl Shrubland	1	0.25	Disturbed Land	1	0.13

THREATENED ANIMALS (Likely Occurrence) as per Table 4.3 **1,2,5,6,7,8,9,11,15,16,17,18,19 20,21,22,23,24,25**

THREATENED PLANTS (Likely Occurrence) Austral toadflax

Cultural Sites : None known **Assets :**

Objectives	Strategies
To minimise the potential for fire spread to the Old age Banksia & Kylies Hut area	To maintain low fuel levels within the zone
Actions	**Performance indicators**
Annually monitor the fuel level within the zone Provide a rapid response to unplanned fires Prepare prescription burn plan prior to commencement of works	No wildfires crossing the zone Fuel managed as per Bushfire Management Zone Guidelines

SWCZ 8 Strategic Wildfire Control 8

Area	*Total*	*Hastings*	*Taree*	*NPWS*	*P.P.*	*Other*
ha	279	0	279	203	68	8

Subformation	ha	%res	Subformation	ha	%res
Dry Scl Forest & Woodland	31	2.50	Dry Heathland	70	5.59
Swamp Scl Forest & Woodland	55	3.67	Wet Heathland	77	4.32
Dry Scl Mallee Forest & Woodland	8	28.06	Sedgeland	31	2.70
Dry Scl Shrubland	6	2.1	Disturbed Land	1	0.13

THREATENED ANIMALS (Likely Occurrence) as per Table 4.3 **1,2,5,6,7,8,9,11,15,16,17,18,19 20,21,22,23,24,25**

THREATENED PLANTS (Likely Occurrence) Austral toadflax

Cultural Sites : None known **Assets :**

Objectives	Strategies
To assist in the protection of the Township of Harrington from fire	Maintain fuel at desired levels Prepare prescription burn plan prior to commencement
Actions	**Performance indicators**
Liaise with Bushfire Management Committees re burning on adjoining land. Reduce fuel levels by prescribed burning levels	No wildfires crossing the zone Fuel managed as per Bushfire Management Zone Guidelines

SWCZ 9 Strategic Wildfire Control 9

Area	*Total*	*Hastings*	*Taree*	*NPWS*	*P.P.*	*Other*
ha	17	0	17	15	2	0

Subformation	ha	%res	Subformation	ha	%res
Open Water	1	4.73	Disturbed Land	13	1.71
Swamp Scl Forest & Woodland	3	0.20			

THREATENED ANIMALS (Likely Occurrence) as per Table 4.3 **1,2,6,8,9,11,15,16,17,18,19 21,22,24,25**

THREATENED PLANTS (Likely Occurrence)

Cultural Sites : None known **Assets :**

Objectives	Strategies
To protect the Village of Crowdy Head from fire	Liaise with Bushfire Management Committees re burning on adjoining land. Prepare prescription burn plan prior to commencement of works
Actions	**Performance indicators**
The District will annually monitor the fuel level within the zone Reduce fuel levels by prescribed burning to levels specified in the fire plan	Fuel managed as per Bushfire Management Zone Guidelines No fires leaving the Reserve

SWCZ 10 Strategic Wildfire Control 10

Area	*Total*	*Hastings*	*Taree*	*NPWS*	*P.P.*	*Other*
ha	30	0	30	30	0	0

Subformation	ha	%res	Subformation	ha	%res
Swamp Scl Forest & Woodland	30	2.00			

THREATENED ANIMALS (Likely Occurrence) as per Table 4.3 **1,2,6,8,9,11,15,16,17,18,19,21 22,24,25**

THREATENED PLANTS (Likely Occurrence)

Cultural Sites : None known **Assets :**

Objectives	Strategies
To protect life and property in the Christies Lane area from fire	Liaise with Bushfire Management Committees re burning on adjoining land. Reduce fuel levels as per Appendix 1
Actions	**Performance indicators**
Annually monitor the fuel level within the zone Prepare prescription burn plan prior to commencement of works	Fuel managed as per Bushfire Management Zone Guidelines No fires leaving the Reserve

SWCZ 11 Strategic Wildfire Control 11

Area	*Total*	*Hastings*	*Taree*	*NPWS*	*P.P.*	*Other*
ha	34	0	34	34	0	0

Subformation	ha	%res	Subformation	ha	%res
Dry Scl Forest & Woodland	16	1.29	Swamp Scl Forest & Woodland	17	1.14

THREATENED ANIMALS (Likely Occurrence) as per Table 4.3 **1,2,6,8,9,11,15,16,17,18,19 20,21,22,23,24,25**

THREATENED PLANTS (Likely Occurrence)

Cultural Sites : None known **Assets :**

Objectives	Strategies
To assist in the protection of the Harrington Caravan Park and community assets from fire	Liaise with Bushfire Management Committees re burning on adjoining land.
Actions	**Performance indicators**
Annually monitor the fuel level within the zone Prepare prescription burn plan prior to commencement of works	Fuel managed as per Bushfire Management Zone Guidelines

SAMZ 1 Special Heritage 1

Area	*Total*	*Hastings*	*Taree*	*NPWS*	*P.P.*	*Other*
ha	79	79	0	79	0	0

Subformation	ha	%res	Subformation	ha	%res
Littoral Rainforest	7	17.44	Swamp Wet Scl Shrubland	6	1.52
Dry Scl Forest & Woodland	30	2.42	Foredune Complex	9	7.28
Swamp Scl Forest & Woodland	10	0.67	Beach Sand	14	10.78
Dry Scl Shrubland	3	1.01			

THREATENED ANIMALS (Likely Occurrence) as per Table 4.3 **1,2,3,4,6,8,9,10,11,12,13,14,15,16 17,18,19,20,21,22,23,24,25**

THREATENED PLANTS (Likely Occurrence)

Cultural Sites : None known **Assets:**

Objectives	Strategies
To protect Littoral Rainforest and Old Age Banksia from fire To maintain a mosaic of older fire-aged vegetation	Exclude all fire for the currency of this plan
Actions	**Performance indicators**
Provide rapid initial attack on all fires threatening or within the zone	No wildfires leaving the zone Fuel managed as per Bushfire Management Zone Guidelines

SAMZ 2 Special Heritage 2

Area	*Total*	*Hastings*	*Taree*	*NPWS*	*P.P.*	*Other*
ha	35	35	0	35	0	0

Subformation	ha	%res	Subformation	ha	%res
Littoral Rainforest	4	9.96	Dry Scl Shrubland	3	1.01
Dry Scl Forest & Woodland	4	0.32	Swamp Wet Scl Shrubland	13	3.30
Swamp Scl Forest & Woodland	5	0.33	Beach Sand	6	4.62

THREATENED ANIMALS (Likely Occurrence) as per Table 4.3 **1,2,3,4,6,8,9,11,15,16,17,18,19 20,21,22,23,24,25**

THREATENED PLANTS (Likely Occurrence)

Cultural Sites : None known **Assets:**

Objectives	Strategies
To protect Littoral Rainforest and Old Age Banksia from fire To maintain a mosaic of older fire-aged vegetation	Exclude all fire for the currency of this plan
Actions	**Performance indicators**
Provide rapid initial attack on all fires threatening or within the zone	No fires within Zone

SAMZ 3 Special Heritage 3

Area	*Total*	*Hastings*	*Taree*	*NPWS*	*P.P.*	*Other*
ha	25	25	0	25	0	0

Subformation	ha	%res	Subformation	ha	%res
Littoral Rainforest	3	7.48	Swamp Wet Scl Shrubland	5	1.26
Swamp Scl Forest & Woodland	2	0.13	Foredune Complex	5	4.05
Dry Scl Swamp Scl Ecotone	1	1.63	Beach Sand	8	6.16
Dry Scl Shrubland	1	0.34			

THREATENED ANIMALS (Likely Occurrence) as per Table 4.3 **1,2,3,4,6,8,9,10,11,12,13,14,15 16,17,18,19,21,22,24,25**

THREATENED PLANTS (Likely Occurrence)

Cultural Sites : None known **Assets:**

Objectives	Strategies
To protect Littoral Rainforest and Old Age Banksia from fire To maintain a mosaic of older fire-aged vegetation	Exclude all fire for the currency of this plan
Actions	**Performance indicators**
Provide rapid initial attack on all fires threatening or within the zone	No fires within Zone

SAMZ 4 Special Heritage 4

Area	*Total*	*Hastings*	*Taree*	*NPWS*	*P.P.*	*Other*
ha	158	42	122	158	0	0

Subformation	ha	%res	Subformation	ha	%res
Littoral Rainforest	4	9.97	Swamp Wet Scl Shrubland	2	0.51
Wet Sclerophyll Forest	3	7.68	Graminoid Clay Heathland	61	**60.81**
Dry Scl Forest & Woodland	46	3.70	Sod Grassland	1	**100.00**
Swamp Scl Forest & Woodland	5	0.33	Headland Complex	2	**100.00**
Dry Scl Swamp Scl Ecotone	15	24.49	Beach Sand	8	0.10
Dry Scl Mallee Forest & Woodland	1	3.51	Rock	1	**100.00**
Dry Scl Shrubland	8	2.69	Disturbed Land	1	0.13

THREATENED ANIMALS (Likely Occurrence) as per Table 4.3 **1,2,6,7,8,9,10,11,14,15,16,17,18 19,20,21,22,23,24,25**

THREATENED PLANTS (Likely Occurrence) Austral toadflax

Cultural Sites : Aboriginal Midden **Assets :** Signage

Objectives	Strategies
To protect the Headland and associated vegetation from unplanned fire	Exclude all fires for the currency of this plan
Actions	**Performance indicators**
Provide rapid initial attack on all fires threatening or within the zone	No fires within zone

SAMZ 5 Special Heritage 5

Area	*Total*	*Hastings*	*Taree*	*NPWS*	*P.P.*	*Other*
ha	19	0	19	19	0	0

Subformation	ha	%res	Subformation	ha	%res
Dry Scl Forest & Woodland	2	0.16	Wet Heathland	4	0.22
Swamp Scl Forest & Woodland	2	0.13	Disturbed Land	3	0.39
Dry Scl Swamp Scl Ecotone	8	13.06			

THREATENED ANIMALS (Likely Occurrence) as per Table 4.3 **1,2,6,7,8,9,11,16,17,18,19 20,21,22,23,24,25**

THREATENED PLANTS (Likely Occurrence)

Cultural Sites : Environs Kylies Hut **Assets :**

Objective	Strategies
To protect the environment of Kylies Historic Hut	Exclude all fires for the currency of this plan
Actions	**Performance Indicators**
Provide rapid initial attack on all fires threatening or within the zone	No fires within zone

SAMZ 6 Special Heritage 6

Area	*Total*	*Hastings*	*Taree*	*NPWS*	*P.P.*	*Other*
ha	48	25	23	43	2	3

Subformation	ha	%res	Subformation	ha	%res
Mangrove Forest & Woodland	9	37.05	Swamp Scl Forest & Woodland	27	1.80
Dry Scl Forest & Woodland	12	0.97			

THREATENED ANIMALS (Likely Occurrence) as per Table 4.3 **1,2,6,8,9,11,15,16,17,18,19 20,21,22,23,24,25**

THREATENED PLANTS (Likely Occurrence)

Cultural Sites : None known **Assets :**

Objective	Strategies
To protect the Mangrove Forest from fire	Exclude all fire
Actions	**Performance Indicators**
Provide rapid initial attack on all fires threatening or within the zone Undertake coordinated fire control with State Forests	No fires within zone

SAMZ 7 Special Heritage 7 Blackfellows Bog

Area	*Total*	*Hastings*	*Taree*	*NPWS*	*P.P.*	*Other*
ha	284	0	284	284	0	0

Subformation	ha	%res	Subformation	ha	%res
Wet Sclerophyll Forest	1	2.56	Dry Heathland	64	5.11
Dry Scl Forest & Woodland	15	1.21	Wet Heathland	43	2.41
Swamp Scl Forest & Woodland	10	0.67	Sedgeland	128	11.15
Dry Scl Shrubland	2	0.67	Disturbed Land	21	2.76

THREATENED ANIMALS (Likely Occurrence) as per Table 4.3 **1,2,6,8,9,11,15,16,17,18,19 20,21,22,23,24,25**

THREATENED PLANTS (Likely Occurrence)

Cultural Sites : None known **Assets :**

Objective	Strategies
To protect the Freshwater wetland from unplanned fire To maintain the freshwater wetland	Exclude fire for the currency of this plan
Actions	**Performance Indicators**
Provide rapid initial attack on all fires threatening or within the zone Maintain fire control cooperation with neighbouring land owners	No fires within zone for the currency of this plan No damage to wetlands area by earth moving equipment

HAMZ 1 Heritage 1

Area	*Total*	*Hastings*	*Taree*	*NPWS*	*P.P.*	*Other*
ha	113	113	0	113	0	0

Subformation	ha	%res	Subformation	ha	%res
Dry Scl Forest & Woodland	60	4.83	Dry Heathland	5	0.40
Swamp Scl Forest & Woodland	15	1.00	Wet Heathland	16	0.89
Dry Scl Shrubland	1	0.34	Disturbed Land	15	1.97
Swamp Wet Scl Shrubland	1	0.25			

THREATENED ANIMALS (Likely Occurrence) as per Table 4.3 **1,2,6,7,8,9,11,15,16,17,18,19 20,21,22,23,24,25**

THREATENED PLANTS (Likely Occurrence) *Allocausuaria defungens*

Cultural Sites : None known **Assets :**

Objective	Strategies
To minimise the potential for the whole zone to burn in a single fire To allow the zone to recover from inappropriate fire frequencies To manage fire to retain all native species known to occur within the zone	Restriction of the size of unplanned fires within the zone Ensure that arrangements are in place for early detection
Actions	**Performance Indicators**
Provide rapid initial attack on all fires threatening or within the zone Assist Community Fire Guard training to provide opportunity for early fire detection	The entire zone not burnt in a single fire year Participation in Community Fire Guard workshop

HAMZ 2 Heritage 2

Area	*Total*	*Hastings*	*Taree*	*NPWS*	*P.P.*	*Other*
ha	145	145	0	145	0	0

Subformation	ha	%res	Subformation	ha	%res
Mangrove Forest and Woodlands	10	41.17	Dry Scl Mallee Shrubland	1	**100.00**
Dry Scl Forest & Woodland	52	4.19	Dry Heathland	2	0.16
Swamp Scl Forest & Woodland	36	2.40	Wet Heathland	23	1.29
Dry Scl Shrubland	5	1.88	Saltmarsh Complex	4	16.46
Swamp Wet Scl Shrubland	4	1.02	Disturbed Land	8	1.05

THREATENED ANIMALS (Likely Occurrence) as per Table 4.3 **1,2,6,7,8,9,11,12,13,15,16,17,18 19,20,21,22,23,24,25**

THREATENED PLANTS (Likely Occurrence) *Allocausuaria defungens*

Cultural Sites : None known **Assets :**

Objective	Strategies
To minimise the potential for the whole zone to burn in a single fire To allow the zone to recover from inappropriate fire frequencies To manage fire to retain all native species known to occur within the zone	Restriction of the size of unplanned fires within the zone Ensure that arrangements are in place for early detection
Actions	**Performance Indicators**
Provide rapid initial attack on all fires threatening or within the zone Assist Community Fire Guard training to provide opportunity for early fire detection	The entire zone not burnt in a single fire year Participation in Community Fire Guard workshop

HAMZ 3 Heritage 3

Area	*Total*	*Hastings*	*Taree*	*NPWS*	*P.P.*	*Other*
ha	273	273	0	273	0	0

Subformation	ha	%res	Subformation	ha	%res
Mangrove Forest and Woodlands	2	8.23	Graminoid Clay Heathland	1	1.00
Wet Sclerophyll Forest	4	10.24	Wet Heathland	97	5.44
Dry Scl Forest & Woodland	78	6.28	Sedgeland	1	0.09
Swamp Scl Forest & Woodland	74	4.94	Saltmarsh Complex	1	4.12
Swamp Wet Scl Shrubland	11	2.79	Disturbed Land	4	0.53

THREATENED ANIMALS (Likely Occurrence) as per Table 4.3 **1,2,6,8,9,11,15,16,17,18,19 20,21,22,23,24,25**

THREATENED PLANTS (Likely Occurrence) Austral toadflax

Cultural Sites : None known **Assets :**

Objective	Strategies
To minimise the potential for the whole zone to burn in a single fire To allow the zone to recover from inappropriate fire frequencies To manage fire to retain all native species known to occur within the zone	Restriction of the size of unplanned fires within the zone Ensure that arrangements are in place for early detection
Actions	**Performance Indicators**
Provide rapid initial attack on all fires threatening or within the zone Assist Community Fire Guard training to provide opportunity for early fire detection	The entire zone not burnt in a single fire year Participation in Community Fire Guard workshop

HAMZ 4 Heritage 4

Area	Total	Hastings	Taree	NPWS	P.P.	Other
ha	1056	198	858	1042		11

Subformation	ha	%res	Subformation	ha	%res
Open Water	1	5.00	Dry Heathland	71	5.67
Mangrove Forest and Woodlands	1	4.12	Graminoid Clay Heathland	8	7.97
Dry Scl Forest & Woodland	121	9.74	Wet Heathland	258	14.47
Swamp Scl Forest & Woodland	243	16.23	Sedgeland	206	17.95
Dry Scl Shrubland	57	19.14	Disturbed Land	2	0.26
Swamp Wet Scl Shrubland	88	22.34			

THREATENED ANIMALS (Likely Occurrence) as per Table 4.3 **1,2,6,8,9,11,15,16,17,18,19 20,21,22,23,24,25**

THREATENED PLANTS (Likely Occurrence) Austral toadflax

Cultural Sites : None known **Assets :**

Objective	Strategies
To minimise the potential for the whole zone to burn in a single fire To allow the zone to recover from inappropriate fire frequencies To manage fire to retain all native species known to occur within the zone	Restriction of the size of unplanned fires within the zone Ensure that arrangements are in place for early detection
Actions	**Performance Indicators**
Provide rapid initial attack on all fires threatening or within the zone Assist Community Fire Guard training to provide opportunity for early fire detection	The entire zone not burnt in a single fire year Participation in Community Fire Guard workshop

HAMZ 5 Heritage 5

Area	Total	Hastings	Taree	NPWS	P.P.	Other
ha	1793	0	1793	1783	10	0

Subformation	ha	%res	Subformation	ha	%res
Open Water	4	20.00	Dry Heathland	509	40.67
Littoral Rainforest	10	24.92	Wet Heathland	276	15.48
Dry Scl Forest & Woodland	7	0.56	Sedgeland	300	26.14
Swamp Scl Forest & Woodland	73	4.88	Fernland	2	**100.00**
Dry Scl Mallee Forest & Woodland	1	3.51	Foredune Complex	84	**68.00**
Dry Scl Shrubland	82	27.53	Beach Sand	55	42.35
Swamp Wet Scl Shrubland	122	30.97	Disturbed Land	268	35.23

THREATENED ANIMALS (Likely Occurrence) as per Table 4.3 **1,2,3,4,6,7,8,9,10,11,12,14,15,16 17,18,19,20,21,22,23,24,25**

THREATENED PLANTS (Likely Occurrence) Austral toadflax

Cultural Sites : None known **Assets :**

Objective	Strategies
To minimise the potential for the whole zone to burn in a single fire To allow the zone to recover from inappropriate fire frequencies To manage fire to retain all native species known to occur within the zone	Restriction of the size of unplanned fires within the zone Ensure that arrangements are in place for early detection
Actions	**Performance Indicators**
Provide rapid initial attack on all fires threatening or within the zone. Assist Community Fire Guard training to provide opportunity for early fire detection	The entire zone not burnt in a single fire year Participation in Community Fire Guard workshop

HAMZ 6 Heritage 6

Area	*Total*	*Hastings*	*Taree*	*NPWS*	*P.P.*	*Other*
ha	173	0	173	173	0	0

Subformation	ha	%res	Subformation	ha	%res
Open Water	1	5.00	Sedgeland	3	0.26
Swamp Scl Forest & Woodland	3	0.20	Foredune complex	2	1.62
Dry Scl Shrubland	23	7.72	Beach Sand	7	5.34
Dry Heathland	55	4.40	Disturbed Land	71	9.34
Wet Heathland	8	0.45			

THREATENED ANIMALS (Likely Occurrence) as per Table 4.3 **1,2,3,4,5,6,7,8,9,11,12,15,16,17 18,19,21,22,24,25**

THREATENED PLANTS (Likely Occurrence) Austral toadflax

Cultural Sites : Aboriginal Midden **Assets :**

Objective	Strategies
To minimise the potential for the whole zone to burn in a single fire To allow the zone to recover from inappropriate fire frequencies To manage fire to retain all native species known to occur within the zone	Restriction of the size of unplanned fires within the zone Ensure that arrangements are in place for early detection
Actions	**Performance Indicators**
Provide rapid initial attack on all fires threatening or within the zone Assist Community Fire Guard training to provide opportunity for early fire detection	The entire zone not burnt in a single fire year Participation in Community Fire Guard workshop

HAMZ 7 Heritage 7

Area	*Total*	*Hastings*	*Taree*	*NPWS*	*P.P.*	*Other*
ha	15	0	15	13	2	0

Subformation	ha	%res	Subformation	ha	%res
Dry Scl Forest & Woodland	10	0.81	Dry Scl Swamp Scl Ecotone	4	6.53
Swamp Scl Forest & Woodland	1	0.07			

THREATENED ANIMALS (Likely Occurrence) as per Table 4.3 **1,2,6,8,9,11,15,16,17,18,19,20 21,22,23,2425**

THREATENED PLANTS (Likely Occurrence)

Cultural Sites : None known **Assets :**

Objective	Strategies
To minimise the potential for the whole zone to burn in a single fire To allow the zone to recover from inappropriate fire frequencies To manage fire to retain all native species known to occur within the zone	Restriction of the size of unplanned fires within the zone Ensure that arrangements are in place for early detection
Actions	**Performance Indicators**
Provide rapid initial attack on all fires threatening or within the zone Assist Community Fire Guard training to provide opportunity for early fire detection	The entire zone not burnt in a single fire year Participation in Community Fire Guard workshop

HAMZ 8 Heritage 8

Area	Total	Hastings	Taree	NPWS	P.P.	Other
ha	41	0	41	40	1	0

Subformation	ha	%res	Subformation	ha	%res
Open Water	2	10.00	Beach Sand	8	6.16
Swamp Scl Forest & Woodland	3	1.54	Disturbed Land	22	2.89
Swamp Wet Scl Shrubland	6	1.52			

THREATENED ANIMALS (Likely Occurrence) as per Table 4.3 **1,2,3,4,6,8,9,11,12,15,16,17,18 19,21,22,23,24,25**

THREATENED PLANTS (Likely Occurrence)

Cultural Sites : Aboriginal Middens **Assets :**

Objective	Strategies
To minimise the potential for the whole zone to burn in a single fire To allow the zone to recover from inappropriate fire frequencies To manage fire to retain all native species known to occur within the zone	Restriction of the size of unplanned fires within the zone Ensure that arrangements are in place for early detection
Actions	**Performance Indicators**
Provide rapid initial attack on all fires threatening or within the zone Assist Community Fire Guard training to provide opportunity for early fire detection	The entire zone not burnt in a single fire year Participation in Community Fire Guard workshop

HAMZ 9 Heritage 9

Area	Total	Hastings	Taree	NPWS	P.P.	Other
ha	770	0	770	764	6	0

Subformation	ha	%res	Subformation	ha	%res
Dry Scl Forest & Woodland	112	9.02	Wet Heathland	307	17.22
Swamp Scl Forest & Woodland	12	0.80	Dry Heathland	144	11.50
Dry Scl Swamp Scl Ecotone	6	9.80	Tussock Grassland	3	**100.00**
Dry Scl Shrubland	39	13.10	Sedgeland	118	10.25
Swamp Wet Scl Shrubland	17	4.31	Disturbed Land	12	1.58

THREATENED ANIMALS (Likely Occurrence) as per Table 4.3 **1,2,5,6,7,8,9,11,15,16,17,18,19 20,21,22,23,24,25**

THREATENED PLANTS (Likely Occurrence) Austral toadflax

Cultural Sites : None known **Assets :**

Objective	Strategies
To minimise the potential for the whole zone to burn in a single fire To allow the zone to recover from inappropriate fire frequencies To manage fire to retain all native species known to occur within the zone	Restriction of the size of unplanned fires within the zone Ensure that arrangements are in place for early detection
Actions	**Performance Indicators**
Provide rapid initial attack on all fires threatening or within the zone Assist Community Fire Guard training to provide opportunity for early fire detection	The entire zone not burnt in a single fire year Participation in Community Fire Guard workshop

HAMZ 10 Heritage 10

Area	Total	Hastings	Taree	NPWS	P.P.	Other
ha	756		756	584	172	0

Subformation	ha	%res	Subformation	ha	%res
Open Water	10	50.00	Swamp Wet Scl Shrubland	2	0.51
Littoral Rainforest	3	7.47	Dry Heathland	6	0.52
Wet Sclerophyll Forest	18	46.07	Wet Heathland	49	2.75
Dry Scl Forest & Woodland	8	0.68	Sedgeland	160	13.94
Swamp Scl Forest & Woodland	375	25.04	Foredune Complex	1	0.81
Dry Scl Mallee Forest & Woodland	8	28.06	Disturbed Land	116	15.28

THREATENED ANIMALS (Likely Occurrence) as per Table 4.3 **1,2,3,4,5,6,7,8,9,10,11,12,13,14 15,16,17,18,19,20,21,22,23,24,25**

THREATENED PLANTS (Likely Occurrence) Austral toadflax

Cultural Sites : None known **Assets :**

Objective	Strategies
To minimise the potential for the whole zone to burn in a single fire To allow the zone to recover from inappropriate fire frequencies To manage fire to retain all native species known to occur within the zone	Restriction of the size of unplanned fires within the zone Ensure that arrangements are in place for early detection
Actions	**Performance Indicators**
Provide rapid initial attack on all fires threatening or within the zone Assist Community Fire Guard training to provide opportunity for early fire detection	The entire zone not burnt in a single fire year Participation in Community Fire Guard workshop

HAMZ 11 Heritage 11

Area	Total	Hastings	Taree	NPWS	P.P.	Other
ha	16	0	16	16	0	0

Subformation	ha	%res	Subformation	ha	%res
Swamp Scl Forest & Woodland	15	1.00	Disturbed Land	1	0.13

THREATENED ANIMALS (Likely Occurrence) as per Table 4.3 **1,2,6,8,9,11,15,16,17,18,19,21 22,24,25**

THREATENED PLANTS (Likely Occurrence)

Cultural Sites : None known **Assets :**

Objective	Strategies
To minimise the potential for the whole zone to burn in a single fire To allow the zone to recover from inappropriate fire frequencies To manage fire to retain all native species known to occur within the zone	Restriction of the size of unplanned fires within the zone Ensure that arrangements are in place for early detection
Actions	**Performance Indicators**
Provide rapid initial attack on all fires threatening or within the zone Assist Community Fire Guard training to provide opportunity for early fire detection	The entire zone not burnt in a single fire year Participation in Community Fire Guard workshop

HAMZ 12 Heritage 12

Area	*Total*	*Hastings*	*Taree*	*NPWS*	*P.P.*	*Other*
ha	302	0	302	299	3	0

Subformation	ha	%res	Subformation	ha	%res
Dry Scl Forest & Woodland	85	6.84	Swamp Wet Scl Shrubland	23	5.84
Swamp Scl Forest & Woodland	27	1.80	Dry Heathland	58	4.64
Dry Scl Swamp Scl Ecotone	5	8.16	Wet Heathland	65	**3.64**
Dry Scl Shrubland	11	3.69	Sedgeland	28	2.43

THREATENED ANIMALS (Likely Occurrence) as per Table 4.3 **1,2,5,6,7,8,9,11,15,16,17,18,19 20,21,22,23,24,25**

THREATENED PLANTS (Likely Occurrence) Austral toadflax

Cultural Sites : None known **Assets :**

Objective	Strategies
To minimise the potential for the whole zone to burn in a single fire To allow the zone to recover from inappropriate fire frequencies To manage fire to retain all native species known to occur within the zone	Restriction of the size of unplanned fires within the zone Ensure that arrangements are in place for early detection
Actions	**Performance Indicators**
Provide rapid initial attack on all fires threatening or within the zone Assist Community Fire Guard training to provide opportunity for early fire detection	The entire zone not burnt in a single fire year Participation in Community Fire Guard workshop

HAMZ 13 Heritage 13

Area	*Total*	*Hastings*	*Taree*	*NPWS*	*P.P.*	*Other*
ha	348	0	348	348	0	0

Subformation	ha	%res	Subformation	ha	%res
Dry Scl Forest & Woodland	29	2.34	Wet Heathland	205	11.50
Swamp Scl Forest & Woodland	61	4.07	Sedgeland	49	4.27
Dry Scl Shrubland	4	1.34			

THREATENED ANIMALS (Likely Occurrence) as per Table 4.3 **1,2,5,6,7,8,9,11,15,16,17,18,19 20,21,22,23,24,25**

THREATENED PLANTS (Likely Occurrence) Austral toadflax

Cultural Sites : None known **Assets :**

Objective	Strategies
To minimise the potential for the whole zone to burn in a single fire To allow the zone to recover from inappropriate fire frequencies To manage fire to retain all native species known to occur within the zone	Restriction of the size of unplanned fires within the zone Ensure that arrangements are in place for early detection
Actions	**Performance Indicators**
Provide rapid initial attack on all fires threatening or within the zone Assist Community Fire Guard training to provide opportunity for early fire detection	The entire zone not burnt in a single fire year Participation in Community Fire Guard workshop

BAMZ 1 Bushfire Advantage 1

Area	*Total*	*Hastings*	*Taree*	*NPWS*	*P.P.*	*Other*
ha	1380	690	690	1194	143	43

Subformation	ha	%res	Subformation	ha	%res
Open Water	1	5.00	Swamp Wet Scl Shrubland	70	17.77
Littoral Rainforest	7	17.44	Dry Heathland	189	15.10
Mangrove Forest and Woodlands	1	4.00	Graminoid Clay Heathland	16	15.95
Wet Sclerophyll Forest	8	20.48	Wet Heathland	215	12.06
Dry Scl Forest & Woodland	345	27.78	Sedgeland	62	5.40
Swamp Scl Forest & Woodland	236	15.76	Foredune Complex	5	4.04
Dry Scl Swamp Scl ecotone	14	22.86	Saltmarsh Complex	6	24.70
Dry Scl Mallee Forest & Woodland	9	31.57	Beach Sand	7	53.39
Dry Scl Shrubland	32	10.74	Disturbed Land	157	20.65

THREATENED ANIMALS (Likely Occurrence) as per Table 4.3 **1,2,3,4,5,6,7,8,9,10,11,12,13,14 15,16,17,18,19,20,21,22,23,24,25**

THREATENED PLANTS (Likely Occurrence) Austral toadflax

Cultural Sites : None known **Assets:**

Objective	Strategies
To provide safe areas for firefighters To provide safe fire advantage to back burn from during fire events To assist in the containment of wildfires	Maintain fuel reduced area within the zones Maintain all trail systems to Service & Soil Conservation Standards
Actions	**Performance Indicators**
Undertake fuel reduction burning and slashing along trail and road edges to reduce fuel levels Undertake regular pre fire season fire trail inspections	Fuel levels within the zone managed within zone guidelines All trails to Service & Soil Conservation Standards No unplanned fire crossing the zone

NATIONAL PARKS AND WILDLIFE SERVICE

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