

Wellington Park Management Trust

Fire Management Strategy

For

Wellington Park

Revision 1

March 2006

Wellington Park Management Trust

Fire Management Strategy

For

Wellington Park

Revision 1

March 2006

By

ABN 53 202 252 651
553 Dorans Road, Sandford 7020
Mobile: 041 2141955

AVK Environmental Management

ABN 53 202 252 651
553 Dorans Road, Sandford 7020
Mobile: 041 2141955

Table of Contents

	Page
1. Introduction.....	1
1.1 Wellington Park	2
1.2 Aim and Scope	4
1.3 Structure of the Fire Management Strategy	5
1.4 Wellington Park Act and Management Plan	5
1.4.1 Wellington Park Regulations	6
1.5 Other Statutory Responsibilities.....	7
1.6 National Standards and Guidelines	11
2. Fire Management.....	12
2.1 Fire Hazard Reduction.....	12
2.2 Use of Fire in the Sustainable Management of Bushland	13
2.2.1 Habitat Management.....	13
2.2.2 Weed Control	14
3. Methodology	15
3.1 Literature Review	15
3.2 Approach	15
3.2.1 Hazard Assessment and Management	15
3.2.2 Bushland Management	18
3.2.3 Water Catchment Protection	20
3.3 Fieldwork Procedures	21
3.4 Assessment References and Standards.....	21
3.5 Stakeholder and Community Consultation.....	23
4. Fire Management Issues	25

	Page
4.1 Natural Features	25
4.2 Flora and Fauna	27
4.2.1 Indigenous Vegetation	27
4.2.2 Plant Communities of Conservation Value.....	32
4.2.3 Threatened Plant Species	35
4.2.4 Weed Species	43
4.2.5 Threatened Fauna Species	46
4.2.6 Other Significant Fauna and Habitats.....	48
4.2.7 Conservation of Biodiversity	51
4.3 Park Usage	54
4.3.1 Recreation	54
4.3.2 Water Catchment	56
4.3.3 Infrastructure within the Park.....	59
4.4 Adjoining Land Uses.....	59
4.5 Fire History and Hazard Levels	60
4.5.1 The 1967 Wildfire.....	60
4.5.2 Fires Since 1967	61
4.5.3 Causes of Fires in Wellington Park	65
4.5.4 Fire Climate and Fire Weather	68
4.5.5 Hazard Levels.....	68
4.6 Protecting Assets From Fire	69
4.6.1 Assets Within the Park	70
4.6.2 Assets Outside the Park	75
4.6.3 Proposed Development of The Springs	78
4.7 Fire Management Practices	79
4.7.1 Fire Detection	79
4.7.2 Fire Suppression.....	79
4.7.3 Fire Management Areas	80
4.7.4 Prescribed Burning	80
4.7.5 Defendable Spaces	81
4.7.6 Vehicle Access and Fire Trails.....	82

	Page
4.7.7 Foot Tracks.....	89
4.7.8 Fire Breaks.....	89
4.7.9 Water Supply	91
4.8 Bushland Management	92
4.9 Stakeholder and Community Concerns	94
5. Fire Management Objectives	96
6. Plan Implementation	98
6.1 Community Education, Awareness and Involvement.....	98
6.1.1 Information Sheet.....	98
6.1.2 Approaches to Special Groups.....	99
6.2 Fire Management Units	99
6.3 Prescribed Fire Regimes.....	100
6.4 Administration	104
6.4.1 Fire Management Responsibilities.....	105
6.5 Monitoring And Evaluation.....	106
6.5.1 Threatened Species	106
6.5.2 Plant Community Structure	106
6.5.3 Performance Indicators	107
6.5.4 Review of the Fire Management Strategy.....	107
6.6 Record Keeping.....	108
7. Pre-fire Suppression Plan	110
7.1 Maintaining GIS Records.....	110
7.1.1 Annual Update.....	110
7.1.2 Update After Fires	110
8. Further Research.....	111

9. Management Action Summary.....	112
--	------------

BIBLIOGRAPHY

GLOSSARY

In Separate Volume:

Appendix A: Management Procedures (MP)

1. Fire trail construction
2. Fire trail inspection and maintenance
3. Fire trail closure and rehabilitation
4. Foot track construction, inspection and maintenance
5. Construction and maintenance of stored water supplies
6. Creating a defensible space from bushfires
7. Maintaining a defensible space
8. Prescribed burning
9. Weed control before and after burning
10. Coordinating fire management activities in Wellington Park
11. Recording wildfires in Wellington Park
12. Recording fire management activities in Wellington Park
13. Planning guidelines for developments bordering Wellington Park
14. Post-wildfire recovery
15. Access protocol for Tasmania Fire Service vehicles.

Appendix B: Pre-fire Suppression Plan

Appendix C: Fuel Load Assessment Procedure

Appendix D: Fire Risk Assessment Procedure

Appendix E: Community Information Leaflet

Appendix F: Community and Agency Consultation

List of Tables

	<i>Page</i>
TABLE 1 - CONSERVATION VALUE OF THE FOREST TYPES IN WELLINGTON PARK.....	33
TABLE 2 - FIRE MANAGEMENT REQUIREMENTS OF PLANT COMMUNITIES IN WELLINGTON PARK	36
TABLE 3 - THREATENED PLANT SPECIES IN WELLINGTON PARK	38
TABLE 4 - THREATENED FAUNA IN WELLINGTON PARK	46
TABLE 5 - FAUNA OF CONSERVATION VALUE IN WELLINGTON PARK.....	49
TABLE 6 - ESTIMATED DISTRIBUTION OF RECREATIONAL USAGE OF WELLINGTON PARK.....	55
TABLE 7 - DOMESTIC WATER SUPPLY CATCHMENTS WITHIN WELLINGTON PARK	58
TABLE 8 - CAUSES OF FIRES IN AND NEAR WELLINGTON PARK	65
TABLE 9 - FUEL LOADS IN WELLINGTON PARK (1999)	69
TABLE 10 - FIRE PROTECTION OF BUILT ASSETS WITHIN AND SURROUNDING WELLINGTON PARK	72
TABLE 11 - FIRE MANAGEMENT REQUIREMENTS OF SPECIFIC BIOLOGICAL ASSETS IN WELLINGTON PARK ...	73
TABLE 12 - CONDITION AND MAINTENANCE OF FIRE TRAILS IN WELLINGTON PARK	86
TABLE 13 - FIRE FIGHTING WATER POINTS IN WELLINGTON PARK	92
TABLE 14 - CHARACTERISTICS OF FIRE MANAGEMENT UNITS.....	102
TABLE 15 - BURNING REGIMES FOR WELLINGTON PARK	103
TABLE 16 - FIRE MANAGEMENT STRATEGY REVISION PROCEDURES.....	107

List of Figures

	<i>Page</i>
FIGURE 1 - LOCATION OF WELLINGTON PARK	3
FIGURE 2 - MEAN ANNUAL RAINFALL IN WELLINGTON PARK	26
FIGURE 3 - DISTRIBUTION OF FIRE MANAGEMENT CLASSES	28
FIGURE 4 - FIRE MANAGEMENT REQUIREMENTS OF PLANT COMMUNITIES IN WELLINGTON PARK	37
FIGURE 5 - ASSETS AT RISK FROM FIRE IN WELLINGTON PARK	39
FIGURE 6 - CATCHMENT AREAS IN WELLINGTON PARK.....	57
FIGURE 7 - FIRES BURNING IN WELLINGTON PARK ON 7 FEBRUARY 1967.....	62
FIGURE 8 - FIRES IN WELLINGTON PARK SINCE 1967.....	63
FIGURE 9 - LOCATION OF FIRES IN AND AROUND WELLINGTON PARK (TFS DATABASE).....	67
FIGURE 10 - VEHICLE ACCESS POINTS AND FIRE TRAILS IN WELLINGTON PARK.....	85
FIGURE 11 - FIRE BREAKS IN WELLINGTON PARK.....	90
FIGURE 12 - FIRE MANAGEMENT UNITS.....	101

Project Team

Mr Axel von Krusenstierna	- fire management
Mr Tony Fearnside	- fire management
Mr Andrew North	- flora habitat and fire ecology
Mr Raymond Brereton	- fauna habitat and fire ecology
Mr Jerry de Gryse	- community consultation
Mr John Hepper	- community consultation
Professor Jamie Kirkpatrick	- review of the original draft strategy prior to public exhibition

TERMINOLOGY

PLEASE NOTE:

The bushfire and weed-related terminology used in this strategy can mean different things to different people. A glossary of key terms has been included at the end of the strategy.

1. Introduction

The original fire management strategy for Wellington Park was prepared for the Wellington Park Management Trust by AVK Environmental Management and IFERM Pty. Ltd. in February 2000. This revised strategy has been prepared by AVK Environmental Management and is the first of the 5-yearly revisions recommended in the strategy. This revision follows a review of the implementation of the fire management strategy carried out by AVK Environmental Management and incorporates the changes recommended in the review. It also brings all tables and figures up to date and includes a proposed addition to the Park along New Town Rivulet.

The fire management strategy complements the Wellington Park Management Plan, which is currently being revised, and is consistent with the fire management policies, strategies and plans of Hobart City Council, Glenorchy City Council and the Tasmania Parks and Wildlife Service, thus contributing to a coordinated regional approach to fire management.

Fires within Wellington Park are a potential threat to surrounding property and vice versa. Therefore this fire management strategy also considers private property within and adjacent to the Park, and, where necessary, identifies works to reduce the threat to life and property in these areas. A fire management plan for the Goat Hills, an area of bushland adjoining Wellington Park on its north-eastern boundary, has been prepared to complement this strategy. This will ensure a coordinated approach to fire management over the whole of the Wellington Range.

This fire management strategy will assist the Wellington Park Management Trust to meet its fire management responsibilities under the Wellington Park Act, 1993, and the Wellington Park Management Plan (WPMT, 1997). The strategy is designed to be a working document, containing all the maps and information necessary for its immediate implementation.

In general, the various land owners or managers within or surrounding Wellington Park will be responsible for implementing the relevant parts of this fire management strategy. The Wellington Park Management Trust will coordinate the implementation of the strategy, and undertake periodic 'audits' and reviews to ensure the strategy is being successfully implemented.

The duration of this fire management strategy is 15 years. This will allow the Wellington Park Management Trust sufficient time to implement the strategy, and to collect enough information for an informed assessment and review. However, the strategy includes procedures to ensure that key components of the strategy are continuously updated.

1.1 Wellington Park

The following background information about Wellington Park has been taken from the Wellington Park Management Plan (WPMT, 1997).

Wellington Park and the Wellington Park Management Trust were established through the Wellington Park Act of 1993. The Park, 18,250 hectares in size, includes Mount Wellington and most of the area of the Wellington Range (Figure 1). The eastern boundary of the Park is approximately 5 kilometres from the centre of Hobart.

About one-third of the Park is reserved and unallocated Crown land, one-third is vested in the Glenorchy and Hobart City Councils, and the remaining third is freehold land owned by the Hobart and Glenorchy City Councils (see Map 1 of the Wellington Park Management Plan). Much of the land was originally reserved to provide water for domestic supplies.

Wellington Park was reserved for the following purposes:

1. the provision of recreational and tourism uses and opportunities consistent with the purposes specified in paragraphs (b) to (e);
2. the preservation or protection of the fauna or flora contained in or on the land;
3. the preservation or protection of the natural beauty of the land or of any features of the land of natural beauty or scenic interest;
4. the preservation or protection of any features of the land being features of historical, Aboriginal, archaeological, scientific, architectural or geomorphological interest; and
5. the protection of the water catchment values of the land.

The Wellington Park Act, 1993, not only establishes Wellington Park but provides for its "protection, use and management".

The Wellington Park Management Trust is the managing authority for the Park and under the Act has the responsibility, amongst other functions, to:

- provide for the management and maintenance of Wellington Park in a manner that is consistent with the purposes for which it is set aside; and
- give effect to any management plan in force for Wellington Park.

Figure 1 - Location of Wellington Park

Since the Act was passed in 1993, agencies with previous management responsibilities for land within Wellington Park have continued their day to day management. These agencies include the Parks and Wildlife Service (for Crown land areas in the Park), Hobart City Council (for Mountain Park), Glenorchy City Council (for their freehold land), Hobart Water (for water storage critical to bulk water supply), Tasmania Fire Service (for fire suppression) and a number of other government agencies such as Transend.

1.2 Aim and Scope

The aims of this fire management strategy are to:

- a) provide recommendations for consistent fire management policy, and maintenance and operational procedures to minimise the threats posed by bushfires to:
 - life and property
 - ecological diversity; and
 - sustainability of natural systems
- b) be in accordance with the policies and actions outlined in the Wellington Park Management Plan (WPMT, 1997)
- c) involve the community in fire management within and adjoining the Park.

It must be noted that it will be impossible to prevent wildfires occurring within and adjacent to Wellington Park. Unless these fires are suppressed when small and accessible (close to trails) it is inevitable that a large fire will occur. Such fires are likely to burn a substantial area of the Park causing damage to assets and environmental values, or even loss of life and property. These fires may also travel onto adjoining lands, further threatening life and property.

However, this strategy sets out to lessen these risks by minimising the risk of fires starting in the Park, and minimising the risk of loss of life, or damage to assets, both within and outside the Park. To allow the Wellington Park Management Trust to fulfil its primary role of protecting the significant natural values of the Park, the works required to protect life and property in areas adjacent to the Park will mostly need to be carried out on land adjoining the Park, rather than within the Park.

This strategy also provides for the use of fire as a management tool to:

- reduce fire hazard to protect assets from wildfires
- maintain plant communities and individual species of conservation value within the Park that require fire in order to ensure their long-term viability
- assist in the removal of weeds within the Park and the regeneration of degraded bushland.

1.3 Structure of the Fire Management Strategy

The strategy includes:

- Multiple Geographic Information System (GIS) map layers showing information relevant to fire suppression and fire hazard management.
- A printed report which includes background information on the strategy, management objectives, a summary of management actions, copies of the GIS maps, and a series of management procedures (MPs) for implementing various parts of the strategy.
- A GIS-based pre-fire suppression plan to assist the Tasmania Fire Service and other emergency services during wildfire events. The GIS maps and data sheets will be updated regularly so that emergency services operating within the Park during a wildfire have access to the latest fire management information.

Use of a GIS system to record the basic information for the strategy will allow it to be easily updated and revised. This is essential to the adaptive management approach used in this strategy, as there will be a need to modify the strategy in response to:

- new information on the fire ecology of the flora and fauna in the Park
- the results of implementation monitoring and performance evaluations
- unplanned incidents, such as wildfires within the Park
- changes in policy affecting fire management in the Park.

1.4 Wellington Park Act and Management Plan

The aspects of the Wellington Park Act, 1993, and Wellington Park Management Plan that relate to fire management are discussed below.

Section 27 of the Wellington Park Act, 1993, states:

“It is the duty of all owners or occupiers of land in Wellington Park to exercise their functions and powers, and to use and manage the land in a manner that is consistent with the purposes for which it is set aside and with any management plan.”

Management and development of Wellington Park is therefore governed by the provisions of the Wellington Park Management Plan completed in 1997. This plan is a statutory document prepared by the Wellington Park Management Trust in accordance with the provisions of Part IV, Division 1 of the Wellington Park Act, 1993, it is currently being revised.

Section 10.3 of the Wellington Park Management Plan lists the fire management objectives for the Park as:

- “ • protect life and property;

- reduce the potential for fire to invade or escape Wellington Park;
- manage fire in such a way that Park values are preserved and impact on water quality is minimised;
- improve the information base on which fire management decisions are made; and
- develop integrated and coordinated policies and guidelines for fire management."

Section 10.4 of the Wellington Park Management Plan includes a series of fire management policies and actions for the Park. A number of these relate to preparation of this fire management strategy, and the remainder are specific actions. These form the basis of this fire management strategy, however, as provided for in the Wellington Park Management Plan, some of the policies and actions have been amended in light of further information gathered during the preparation of this strategy. The proposed amendments to the Wellington Park Management Plan included deleting a number of fire management related actions that are now covered by this fire management strategy. These were:

- Action 10.4.17 relating to Council planning policies for bushfire prone areas adjoining the Park
- Action 10.4.18 relating to bushfire hazard reduction methods
- Action 10.4.19 relating to application of hazard reduction methods in different part of the Park
- Action 10.4.21 relating to maintenance of fire trails
- Action 10.4.22 relating to closure of trails not required for fire management or other purposes
- Action 10.16.6 relating to cleaning vehicles and machinery before entering the Park to reduce the risk of spreading soil pathogens and weeds.

1.4.1 Wellington Park Regulations

Division 6 of the Wellington Park Regulations, 1999, prohibits the lighting of fires within Wellington Park unless authorised by a permit, in a designated fireplace, or in an emergency. Fires can only be lit in designated fireplaces for cooking or warmth, and must not be left unattended until extinguished. The Regulations require any person lighting a fire in the Park to take all reasonable steps to prevent the fire from spreading.

The Regulations also give the Trust the power to issue prohibitions, restrictions and directions regarding the lighting of fires in the Park, and to fine offenders. The Regulations also allow the Trust to erect signs to prohibit entry to any part of the Park if such a prohibition is necessary for the proper care, control or management of that part of Wellington Park. This would allow the Trust to close sections of the Park when prescribed burning is being undertaken, during wildfire suppression operations, or during periods of extreme fire danger.

1.5 Other Statutory Responsibilities

The Wellington Park Management Trust, as a land management agency, has a general legal responsibility to take all reasonable steps to minimise the risk of fires originating within the Park causing personal injury, damage to adjoining property, or damage to items of natural or heritage value protected by government legislation. The Trust also has responsibilities under specific Acts of Parliament regarding fire management, fire hazard abatement, and the conservation and management of native flora and fauna.

Fire Service Act, 1979

The Wellington Park Management Trust's main responsibilities under the Fire Service Act, 1979, are:

- to take diligent steps to extinguish or control any unauthorised fire within the Park during a fire permit period, and to report that fire to the Tasmania Fire Service, or the Police (Section 64)
- to take all reasonable precautions to prevent any fire lit within the Park from spreading onto neighbouring land (Section 63)
- to nominate a representative to sit on the Hobart Special Fire Area Committee (Section 55).

It should also be noted that Section 49 of the Act authorises officers of the Tasmania Fire Service to enter and inspect land for any fire hazard. Where a fire hazard is detected, the Act further empowers the State Fire Commission or an authorised officer to:

“by notice in the prescribed form given to the occupier of the land or premises, require the occupier to take such steps as the Commission or authorised officer may require, and as may be specified in the notice for the -

- (a) trimming, cutting back, or removal of the hedge; or
- (b) burning off, or removal of, the vegetation, rubbish, or matter.”

Sections 8 and 55 of the Act require the State Fire Commission, and any Special Fire Area Committee that includes all or part of Wellington Park, to

“perform its functions in respect of Wellington Park in a manner that is consistent with the purposes for which Wellington Park is set aside under the Wellington Park Act 1993 and with any management plan in force in respect of Wellington Park”.

Threatened Species Protection Act, 1995

The Threatened Species Protection Act (TSPA), 1995, provides for “the protection and management of threatened native flora and fauna, and to enable and promote the conservation of native flora and fauna”. Section 5 of the Act requires that:

“A person who performs a function, or exercises a power, in the administration of a public authority must in so doing have regard to the objectives specified in Schedule 1 for the conservation and management of native flora and fauna”.

Schedule 1 lists the objectives of the resource management and planning system of Tasmania, and the threatened species protection system established by the Act. These objectives include the principles of 'sustainable development'. This Act makes protection of threatened species a major objective of any fire management plan in the State.

Section 51 (a) of the TSPA states that: "A person must not knowingly, without a permit - take, trade in, keep or process any listed flora or fauna". The TSPA defines 'take' as including: "kill, injure, catch, damage, destroy and collect". The Wellington Park Management Trust, Hobart City Council or Glenorchy City Council, as land managers within the Park, may therefore be required to obtain a permit from the Tasmania Parks and Wildlife Service to carry out prescribed burns that may affect any of the species listed in the Act.

Land Use Planning and Approvals Act, 1993

The councils bordering Wellington Park have a responsibility under this Act to produce planning schemes, and other legal planning documents, to guide the development of their local government areas. Although fire protection is not specifically mentioned in this Act, Section 20 - 1c & 2f of the Act gives a Council the power to define areas of bushfire hazard within the Council area, and implement the development planning and approval procedures in the Land Use Planning Review Panel's *Planning Note No. 11 - Bushfire Hazard Minimisation Planning* (1997).

Local Government (Building and Miscellaneous Provisions) Act, 1993

Under Section 55 of this Act, a Council has the power to attach "any terms and conditions it considers appropriate" to a building approval. This would include provisions relating to fire protection. Section 56 of this Act gives a Council the power to impose "any restrictions, limitations or conditions it considers appropriate" on developments.

Environmental Management and Pollution Control Act, 1994

The objectives of the Act as stated in Schedule 1 of the Act includes;

"3(c) to regulate, reduce or eliminate the discharge of pollutants and hazardous substances to air, land or water consistent with maintaining environmental quality"

Section 96C of this Act allows Parliament to make environment protection policies for the purpose of furthering any of the objectives of the Act. Policies that affect fire management activities include the State Air Quality Policy and the State Water Quality Management Policy.

Environment Protection Policy (Air Quality), 2004

Clause 17 of the State Air Quality Policy covers "planned burning" which includes low intensity burning for fuel reduction and ecological management, but does not include backburning to control wildfires. Clause 17 of the policy states that:

“(2) Persons or organisations involved in the conduct of planned burning or in the preparation of management guidelines for such operations must take account of the health and amenity impacts of smoke pollution on individuals and the community.

(3) Best practice environmental management should be employed by those persons undertaking planned burning to minimise the effects of smoke pollution on individuals and the community. This includes, but is not limited to, complying with the State Fire Management Council Guidelines on high intensity and low intensity burning.

(4) Where practicable, agencies, companies or organisations undertaking burning on a regular basis or on a large scale should:

- (a) adopt efficient and effective air quality monitoring programmes;
- (b) adopt a uniform approach to recording and assessing complaints;
- (c) focus upon minimising the impact of smoke on the community in terms of health, amenity and safety;
- (d) encourage the planning and execution of planned burning in a way that minimises the generation of smoke and improves the management of the effects of smoke; and
- (e) require a responsible person involved in planned burning for land management to be competent in relevant burning procedures.”

The State Fire Management Council Guidelines for low intensity prescribed burning advises that:

“The effects of smoke from planned fires should be considered when preparing burning plans, taking account of the probable wind direction. Where practicable, smoke mitigation strategies should be used including: prescribing favourable wind direction; ensuring that fuels are dry; limiting the size of the burning area; limiting the number of areas lit at the same time within the same airshed; allowing time for areas to burn out prior to evening inversions, particularly late in autumn ; avoiding planned fires coinciding with public events; avoiding week-ends and Public holidays; providing information to the public.”

Draft Tasmanian Air Quality Strategy, 2005

The Tasmanian Air Quality Strategy has been established under the Environment Protection Policy (Air Quality) to guide the management of air quality in Tasmania. The overall aim of the Air quality Strategy is to “to achieve compliance with the National Environment Protection (Ambient Air Quality) Measure Standard and Goal for PM₁₀ particles, in line with the stated requirements of the Environment Protection Policy (Air Quality)”.

Objective 14 of the draft strategy deals with smoke management from planned fires and aims to:

“Improve the management of smoke from planned burning by:

- (a) Establishing smoke management procedures for planned burning;
- (b) Incorporating smoke management procedures into the Forest Practices Code;
- (c) Improving the co-ordination of planned burning to minimise smoke impacts; and
- (d) Investigating the most appropriate way to manage and respond to complaints relating to planned burning.”

The draft strategy estimates that only about 3% of particulate (PM₁₀) emissions come from management burns and wildfires, however it also notes that poor planning and coordination of planned burns can lead to short-term exceedence of air quality targets.

Implementing the air quality policy and strategy will require management burns in Wellington Park to be coordinated with other management burns in the area, and to be carried out when weather conditions will help to disperse the smoke.

State Water Quality Management Policy, 1997

One of the objectives of the State Water Quality Management Policy is to:

“6.1(b) Ensure that diffuse source and point source pollution does not prejudice the achievement of water quality objectives and that pollutants discharged to waterways are reduced as far as is reasonable and practical by the use of best practice environmental management”

Clause 31.4 of the policy under the section dealing with diffuse sources of pollution states that:

“Codes of practice or guidelines required by this Policy in respect of specific activities with the potential to impact on stream-side land should pay specific attention to defining appropriate stream-side buffer strips and acceptable management practices within these strips. Strategies and incentives, including economic instruments, to encourage the retention and/or improved management of streamside vegetation should be investigated.”

In relation to the construction and maintenance of fire trails, Clause 35.1 of the policy states that:

“35.1 Road construction and maintenance operations will be carried out in accordance with the guidelines or code of practice developed pursuant to clause 31.3 of this Policy, or employ other measures consistent with best practice environmental management, to prevent erosion and the pollution of streams and waterways by runoff from sites of road construction and maintenance.”

The only codes of practice under the Water Quality Management Policy that are relevant to construction and maintenance of fire trails is the *Wetlands and Waterways Works Manual* (DPIWE, 2003).

Aboriginal Relics Act, 1975

Section 9 (1) of the Act provides for the protection of sites with Aboriginal relics:

“9. (1) Except in accordance with the terms of a permit granted by the Director, no person –

- (a) shall destroy, damage, disfigure, conceal, uncover, expose, excavate, or otherwise interfere with a protected object;
- (b) shall carry out an act likely to endanger a protected object; or
- (c) shall destroy, damage, or deface, or otherwise interfere with any fencing or notice erected, or any other work carried out, in or in respect of a protected site in pursuance of this Act.

(2) Except in accordance with the terms of a permit granted by the Minister on the recommendation of the Director, no person shall remove a protected object from a protected site."

A permit will therefore be required for any fire management works that may affect Aboriginal relics within Wellington Park.

Weed Management Act, 1999

This act provides a legislative framework for weed management throughout Tasmania. It includes a list of "Declared Weeds" which have statutory "Weed Management Plans" outlining how they are to be controlled. Actions in Weed Management Plans can be enforced through the Act.

1.6 National Standards and Guidelines

The following documents prepared by Standards Australia deal with protection of buildings from bushfires:

- Australian Standard 3959 - 1999, Construction of Buildings in Bushfire Prone Areas
- Standards Australia Handbook 36 - 1993, Building in Bushfire Prone Areas.

Australian Standard 3959 is referenced in the Building Code of Australia and provides construction techniques to improve building resistance to varying levels of bushfire attack by wind-blown burning debris, radiant heat and direct flame contact. The Standards Australia Handbook 36 (Ramsay and Dawkins, 1993) provides general advice on siting, landscaping, design and construction of buildings in bushfire prone areas.

2. Fire Management

Wildfires are a threat to life and property, as well as natural heritage and cultural assets. The wildfires in February 1967 showed the extent of the damage that can be caused by fires in and around Wellington Park. Since that time various techniques have been developed to reduce the risk of loss of life and property during fires. Fire has also been found to be a useful tool for managing native bushland areas.

2.1 Fire Hazard Reduction

As the intensity of a bushfire increases it becomes progressively more difficult to contain and suppress the fire. Very high intensity ($> 4000 \text{ kW/m}$) fires with flame heights greater than 10 m are generally uncontrollable (NSW Rural Fire Service, 1997). The threat from a bushfire therefore increases as its intensity increases. Fire intensity is directly related to the quantity, and to some extent the distribution, of fine fuel (live and dead plant matter less than 6 mm diameter) available to the fire. Other factors, such as slope and moisture content of the fuel, also influence fire intensity, but the only factor that can be effectively controlled to limit fire intensity is fine fuel load (usually expressed in tonnes per hectare).

The fire threat to infrastructure and built assets, such as dwellings, can be reduced by creating a buffer zone around the asset where fine fuel loads are maintained at low levels. Generally, these buffers consist of an inner zone around the asset with minimal fine fuel loads, and an outer zone with reduced fine fuel loads. The purpose of the outer zone is to reduce the intensity of any bushfire approaching an asset. The purpose of the inner zone is to protect the asset from flame contact and intense radiant heat. The inner zone is called the 'building protection zone' and the outer zone the 'fuel modified buffer zone'. The whole buffer can be termed a 'defendable space'. Slashing, mowing, or hand cutting of vegetation are generally the most effective methods for establishing and maintaining small defendable spaces around isolated assets, or long, narrow, fuel modified buffer zones and building protection zones along urban/bushland perimeters.

Protection of other assets and values, such as water catchments, views, and threatened species, is generally more difficult, and requires strategies that minimise the risk of wildfires starting and spreading. The main strategies are to:

- minimise the risk of wildfires igniting by removing or limiting as many potential causes of fire as possible
- maximising the ability of fire suppression agencies to detect and control any wildfires that do start.

Maintaining fuel loads at a low level will limit the intensity and rate of spread of wildfires, and make it easier for fire brigades to control and suppress them. Prescribed burning is generally the

most effective way to reduce fuel loads over relatively large areas, or where other methods of fuel management, such as slashing, are not feasible. However, there is always a risk of prescribed burns escaping control lines and becoming destructive wildfires. In addition, some vegetation types accumulate fuel very rapidly and therefore require frequent burning to maintain fuel reduced conditions. Frequent burning can have adverse side affects, such as loss of plant communities and fauna habitat, increased erosion, and loss of visual amenity.

2.2 Use of Fire in the Sustainable Management of Bushland

Inappropriate fire regimes (season, intensity, type and frequency of fires) can cause progressive and sometimes irreversible changes in indigenous plant communities, including a loss of biodiversity (the variety of life). On the other hand, identification and implementation of an appropriate prescribed fire regime can be used to:

- manage indigenous flora and fauna habitats in a sustainable manner
- maintain biodiversity
- control selected weed species and promote natural regeneration in dry forest communities.

2.2.1 Habitat Management

Wildfires can pose a risk to fire sensitive plant communities in areas like Wellington Park as burning of large areas in one high intensity fire event, such as the 1967 fires, could remove species, and even whole plant communities, from the Park. Extensive, frequent and indiscriminate hazard reduction burning can have a similar effect. The potential risks to flora and fauna habitats from wildfire can be managed by minimising the risk of ignitions, maintaining adequate fire trails and other control lines within the Park, and by burning suitable areas of vegetation at different times to create a mosaic of vegetation units at different stages of recovery from fire. Adoption of a mosaic burning pattern would have the following advantages:

- increased habitat diversity
- reduced overall fuel loads
- help in the suppression of wildfires.

Within the mosaic of burning units the fire regime (frequency, season and intensity of fire) can be manipulated to achieve some or all of the following objectives:

- removal of woody and herbaceous weeds and weed seeds from mid-storey, leaf litter, and soil surface
- reduction in the levels of plant nutrients, such as phosphorus and nitrogen, which may be contributing to weed invasion

- manipulation of ecological processes such as; species composition (via the promotion of selected species or communities), regeneration of senescent vegetation, and the creation of suitable conditions for native seed germination
- protection of species of conservation value by maintaining habitat elements that are critical for their survival.

2.2.2 Weed Control

In general, fire will increase an existing weed problem. Many woody weeds re-sprout rapidly from rootstock after fire, often coppicing densely (hawthorn, gorse). Herbaceous species (including many grasses) respond in a similar way, regenerating from growth buds on a network of robust underground rhizomes (pampas grass, browntop). Seed germination is usually prolific after fire, a response which necessitates prompt control measures, on-going monitoring, and site maintenance (gorse, boneseed, broom).

In rural areas frequent burning is sometimes used to control woody weeds, and this method can also be helpful in native grasslands. However, as with all weed control methods, follow-up treatment is essential.

In bushland fire can be used to stimulate germination of indigenous plant seeds. She-oaks, most Eucalypts, Acacias, members of the pea family (*Fabaceae*) and many species from other families frequently germinate in areas which have been burnt. However, the burnt area will also be open to weed invasion and must be carefully monitored. Therefore, where weeds are already a problem, prescribed burning should only be carried out after weeds have been treated, and follow up weed control can be carried out. In general, weed infested bushland areas should not be burnt if resources for post-fire weeding are not available. The exception to this is high fire hazard areas close to dwellings where burning is the only feasible method of hazard reduction.

Burning weed debris, stacked in clear, plant-free areas, is an efficient method of disposing of unwanted material and will help to create conditions favourable for the germination of indigenous species, provided seeds are present. However, the fire will also stimulate germination of many weed species and follow-up treatment will be required.

3. Methodology

3.1 Literature Review

Prior to the development of the fire management strategy, a review of existing literature relevant to fire management planning in Tasmania was carried out. This review included an assessment of: the Wellington Park Management Plan (WPMT, 1997) and associated documents; other planning documents covering all or parts of Wellington Park; relevant government legislation, policies and guidelines; published scientific literature; other consultant's reports; and general literature.

3.2 Approach

3.2.1 Hazard Assessment and Management

Fire Behaviour Potential

Information on the fire history of Wellington Park (wildfires and prescribed burning) was gathered from an analysis of available records, discussions with Tasmania Fire Service personnel and others, and aerial photo interpretation. This investigation was generally limited to the period from the 1967 fires to the present. This provided information on the causes of past fires and past fire regimes in the Park, however, there was relatively little information on the intensity of past fires.

Fire weather patterns in the Park were determined through an analysis of fire regimes, temperature, rainfall records, and consideration of the SDI (an index derived from meteorological parameters which is widely used as a surrogate for actual fuel dryness).

Bushfire behaviour potential was assessed by considering slope, aspect, vegetation classes, likely ignition sources, and likely fire paths to predict areas where severe fire behaviour can be expected.

Fire Threat Assessment

The potential fire threat to the various economic and cultural heritage assets within and surrounding Wellington Park was assessed by reviewing the behaviour and known effects of past large scale fires in and near the Park, and then assessing the relative risk to each asset taking into account its location, vulnerability, impact of likely fire damage, and any fire protection measures currently in place.

Where necessary a more detailed assessment of the fire risk for specific assets was carried out using the Tasmania Fire Service risk assessment procedure (Appendix D). Based on the threat analysis a fire protection strategy has been determined for individual assets, or groups of assets.

Fire Hazard Management

A program for strategic fuel management was developed for the Park based on:

- the objectives of the Wellington Park Management Plan (WPMT, 1997)

- fire threat assessments for individual assets
- fire behaviour potential modelling
- consideration of regional and local conditions.

To implement the fuel management program, areas of the Park identified as requiring fuel management were divided into a number of fire management units. The fire hazard management techniques (burning, mechanical or manual fuel removal) that are most appropriate to the location of the unit, and the vegetation that it contains, were then determined. In areas where prescribed burning is the most appropriate means of reducing fire hazard, the units allow implementation of a mosaic burning pattern, and optimisation of the fire regime for each vegetation type.

The following criteria were used for determining the most appropriate boundaries for each fire management unit:

- wherever possible units are bounded by roads, fire trails, walking tracks, or natural features that can be used as fire control lines
- unit boundaries correspond with existing management plan boundaries wherever possible
- each unit comprises a relatively uniform vegetation type to which a single burning prescription can be applied
- each unit is small enough to be burnt in one day using ground ignition.

Burning Prescriptions

Burning prescriptions were developed for each area of the Park identified as requiring burning for hazard reduction and/or habitat management. These prescriptions cover:

- vegetation type and fuel loads
- fire frequency and intensity
- sequencing of burns
- weather conditions
- equipment and personnel requirements
- ignition procedures and fire control
- associated bushland management works such as weed control
- record keeping.

Fire Management Assets

All fire management assets within, and adjacent to, Wellington Park were located, and their current condition assessed. These include:

- vehicle access points

- public roads and fire trails
- fire breaks
- potential water supply points within the Park
- suitable sites for staging areas and command centres
- shelters and refuge areas
- areas that can be used for helicopter operations.

The overall requirements for fire service vehicle access and fire breaks was assessed and rationalised with reference to the Wellington Park Management Plan. This included:

- identification of fire trails that need to be re-opened or upgraded
- fire trails that can be closed
- new fire trails to improve access or replace existing trails
- an inspection and maintenance schedule for fire trails.

Fire trails that need to be maintained were classified as follows:

trail width; 1w - single lane, 2w - double lane

trail access; alt - alternative access, dead - dead end

fire service tanker type; L - light tanker only, H - light and heavy tanker.

This classification was based on the suitability of the fire trail if properly maintained, not necessarily its condition at the time of inspection.

Fire trails were mapped and prioritised for maintenance purposes. The criteria used for prioritising was:

High priority - major access routes and fire control lines

Medium priority - important access and escape routes and minor fire control lines

Low priority - minor access routes and boundaries of fire management units.

A series of management procedures (MPs) were developed to standardise construction and/or maintenance of fire management assets in the Park. These include:

- fire trail construction, inspection and maintenance
- fire trail closure and rehabilitation
- maintenance of stored water supplies
- defensible space construction and maintenance.

Management of Fire Hazard on the Interface with Adjoining Property

The adequacy of existing fire protection measures and access along the interface with adjoining property was assessed, particularly where residential areas adjoin the Park. The standard used was the Tasmania Fire Service document *Guidelines for Development in Bushfire Prone Areas of Tasmania* (2005). Where current fire protection measures did not meet these standards, the approach adopted was to examine both sides of the interface and determine the most appropriate location for the required fuel modified buffer zones and access routes. Where hazard reduction is required on adjoining property, the most appropriate method has been specified.

3.2.2 Bushland Management

The long-term effects of fire on the habitats of native flora and fauna in Australia are still poorly understood. However, available information on the fire ecology of plant communities, and indigenous flora and fauna species within the Park, has been incorporated into the strategy. Where the required information has not been available, recommendations in the strategy are based on the 'precautionary principle'. The 'adaptive management' approach used in this strategy will help overcome the lack of information on the long-term responses of the vegetation in the Park to fire. The monitoring and evaluation component of the strategy will provide the information required to progressively refine the strategy to ensure it is achieving its desired outcomes.

Conservation of Biodiversity

Fire sensitive plant communities were identified and mapped, as well as plant communities that require periodic fire for their long-term survival.

A burning regime (fire frequency, season, extent and intensity) has been prescribed for the plant communities within the Park that are known to require relatively frequent fire to maintain their structure and floristics. These regimes aim to ensure the long-term viability of these plant communities, and are based on the latest available information on the fire ecology of each community, and any species of particular conservation value known to occur within them.

Plant communities which are either fire sensitive, or have optimal fire frequencies longer than the duration of this strategy, have been excluded from the prescribed burning program.

Vegetation Mapping

Information on the type and distribution of the plant communities within Wellington Park is available from a number of sources, however the detail and reliability of the information is highly variable. The sources used for this study included:

- Field reconnaissance targeted at areas known, or considered likely to contain fire sensitive plant communities, or communities that require management burning during the period of this strategy

-
- Kirkpatrick and McDonald (1996) for vegetation in the north-eastern portion of the Park managed by Glenorchy City Council
 - Johnson (1994) for vegetation in the Mountain Park section of Wellington Park (Mount Wellington and its eastern slopes)
 - vegetation mapping of Hobart suburbs (North & Freeman 1996, North 1997 and North 1998)
 - mapping of vegetation (TasVeg 2000) for the ongoing Vegetation Management Strategy, Parks & Wildlife Service (Collinsvale and Longley 1:25 000 map sheets only).

In addition, the following people were consulted during the research into the possible effects of fire on the flora and fauna of the Park:

- Richard Schahinger - botanist with a good knowledge of the Park
- Adrian Pyrke - Resource Management and Conservation Branch, Department of Primary Industries, Water and the Environment (DPIWE)
- Sally Bryant - Resource Management and Conservation Branch, DPIWE
- Fred Duncan - Forest Practices Board - botanist who worked on the Wellington Park Management Plan
- Louise Gilfedder - Resource Management and Conservation Branch, DPIWE.
- Grant Hall - Ranger, Parks & Wildlife Service
- Yvonne Menadue, Plant Science, University of Tasmania - confirmation identification of *Epacris virgata*.

Detailed vegetation mapping of the whole of the Park was beyond the scope of this fire management strategy. However, sufficient information was obtained from the sources listed above to group the vegetation in the Park into the following fire management categories in terms of the fire frequency thresholds required to maintain that vegetation type:

- fire sensitive vegetation that should be protected from fire
- vegetation that has fire frequency thresholds substantially greater than the 15 year period of this strategy
- vegetation with fire frequency thresholds between 15 and 25 years
- vegetation with fire frequency thresholds between 10 and 20 years
- vegetation with fire frequency thresholds between 5 and 10 years
- vegetation with a fire frequency threshold of less than 5 years.

Threatened Flora

Existing botanical surveys, literature, and databases were reviewed to identify and locate known populations of threatened plant species within the Park. Some of these threatened plant species are associated with specific plant communities and therefore their potential distribution is likely to be reflected in the extent of suitable habitat. This information has been used to tentatively predict their possible distribution in less well surveyed portions of Wellington Park. In addition, reconnaissance surveys were carried out in areas considered likely to contain as yet unrecorded populations of threatened species.

Recommendations in any recovery plans for threatened species within the Park have been used as the basis for fire management of the habitats of those species.

Fauna Habitats

In general the fire management strategy aims to preserve existing fauna habitats within the Park. Where possible critical habitat elements for threatened fauna species have been identified, and measures to reduce the risk of damage by fire included in the strategy.

Areas recommended for fuel reduction burning for the protection of property have been investigated to ensure that sites which retain complexity, (tree hollows, rotting wood etc.) are excluded from prescribed burns, and protected from wildfires where possible.

Environmental Risks

Areas that are at risk from soil erosion or weed invasion have been identified and fire management activities in these areas modified so that these activities will not exacerbate existing problems. Where possible fire regimes have been prescribed that will reduce existing risks, or can be coordinated with other control measures to maximise their effectiveness.

3.2.3 Water Catchment Protection

The impact of past fire management practices on water quality within the Park was assessed by identifying any areas where the vegetation cover has been degraded by too frequent, or inappropriate burning. Areas that are important for maintaining water quality (such as swamplands and peat beds) were identified and the risk of damage from fire assessed.

Fire management strategies and actions have been recommended to help ensure the delivery of a high quality, reliable, and adequate water supply to communities surrounding the Park.

Fire trails in water catchment areas were assessed to determine if they are contributing to catchment degradation through erosion, landslip, weed invasion, or inappropriate use. Where necessary, on-ground works have been recommended to reduce erosion or inappropriate use of trails, and to close and rehabilitate trails that are not essential for fire management.

3.3 Fieldwork Procedures

Site inspections of Wellington Park were undertaken by the project team in April, May and September 1999, a further site inspection was undertaken in 2005 as part of the first revision of the strategy. Issues addressed during these inspections included:

- current condition of the bushland, and major management issues
- fuel types, bushfire hazard, and fire threat
- fauna habitat type, and classification of plant communities
- likely presence and distribution of threatened flora and fauna
- facilities and other assets that may be at risk from fire within, and surrounding, the Park
- type and general distribution of weeds
- likely usage of different parts of the Park
- areas requiring exclusion of fire
- existing fire control assets, such as fire trails, water points and fire control lines
- other information required for the pre-fire suppression plan.

Fuel loads were assessed at various points in the Park using the procedure in the Forestry Tasmania course in fuel reduction burning (Appendix C). These were used to develop a general prediction of likely fuel loads based on vegetation type and time since the last fire.

3.4 Assessment References and Standards

The Tasmania Fire Service document *Guidelines for Development in Bushfire Prone Areas of Tasmania* (Tasmania Fire Service, 2005) was used as the standard for assessing the adequacy of existing fire protection measures for assets within the Park, and on surrounding properties.

The Wellington Park Management Plan (WPMT, 1997) and the Draft Wellington Park Values, Use and Management Inventory (WPMT, 1996) was used as a guide to environmental weeds within the Park.

Threatened flora and fauna species in Tasmania are listed in Schedules 3 (endangered) and 4 (vulnerable) of the Threatened Species Protection Act (TSPA), 1995. A selection of rare species that are considered to be 'at risk' are listed in Schedule 5 of the Act. These three categories are defined in Section 15 of the Act.

1. "An extant taxon of native flora or fauna may be listed as **endangered** if it is in danger of extinction because long-term survival is unlikely while the factors causing it to be endangered continue operating.

2. A taxon of native flora or fauna may be listed as **vulnerable** if it is likely to become an endangered taxon while the factors causing it to be vulnerable continue operating.
3. A taxon of native flora or fauna may be listed as **rare** if it has a small population in Tasmania that is not endangered or vulnerable but is at risk."

The Scientific Advisory Committee established under the TSPA advises on the listing and de-listing of species, threatening processes and the criteria to be followed in determining critical habitats.

The conservation value of a given species at the State level has been determined by the Flora Advisory Committee (1994), The Vertebrate Advisory Committee (1994), and the Invertebrate Advisory Committee (1994) which provide lists of species according to various categories of threat and rarity. Three of the conservation categories are the same as those used in the TSPA, the two additional categories are:

requiring monitoring - A species which does not meet the criteria for listing as a threatened species, but there is some doubt as to the long-term status of the species (fauna only).

unknown risk status - A species where there is insufficient information to determine conservation status.

Plant communities were classified according to the TasVeg 2005 system.

Forest communities at a dominance level have been accorded conservation status as part of the Regional Forest Agreement 1997 (PLUC 1996). Criteria for the conservation status of plant communities used in the Regional Forest Agreement are as follows:

Rare communities

R1 - total area generally less than 10,000 ha

R2 - total area generally less than 1000 ha

R3 - patch sizes generally less than 100 ha

Vulnerable communities

V1 - approaching greater than 70% depletion

V2 - where threatening processes have caused either loss or significant decline in species that play a major role within the ecosystem, or have caused a significant alteration to the ecosystem process

Endangered communities

E1 - distribution has contracted to less than 10% of pre-1750 range

E2 - less than 10% of pre-1750 area remains

E3 - 90% of area is in small patches and is subject to threatening processes

Assessment of the statewide conservation value of forest communities within Wellington Park is based on the target levels of reservation proposed to achieve a Comprehensive, Adequate and Representative Reserve System for forests in Australia (JANIS) (Forest Taskforce, 1995). JANIS criteria are based on a proportional reservation of the forest estate based on the inferred extent of different forest plant communities prior to European settlement (given as pre-1750 for conformity with the IUCN guidelines). Fifteen per cent of the pre-1750 area of each forest type has been proposed, except for rare and vulnerable communities (60% of existing area) and endangered communities (100% of existing area). In the community tables, the State and regional conservation priorities are indicated.

3.5 Stakeholder and Community Consultation

Development of this fire management strategy included an extensive consultation program to ensure that stakeholders and the general community were aware of, and had the opportunity to have an input into, the development of the strategy. The consultation program had four main phases, although there was consultation with particular stakeholders and experts, as required, throughout the preparation of the strategy.

Phase 1

Initial consultation was carried out in April 1999 and was targeted primarily at the Tasmania Fire Service and land managers within the Park (Parks and Wildlife Service, Hobart City Council, Glenorchy City Council). The objective of this round of consultation was to gain an appreciation of the fire history of the Park, and past and current fire management activities.

Phase 2

The second phase of consultation was carried out in May 1999 and was focussed on key stakeholders and communities surrounding the Park to ensure that their concerns were addressed in the draft fire management strategy.

This phase included:

- general community forums in three locations - Fern Tree, Mountain River and Collinsvale
- a presentation to the Hobart Special Fire Area Committee
- a series of roundtable discussions with;
 - scientific and other interest groups
 - landcare and catchment management committees
 - government agencies

- follow-up meetings with individuals from various stakeholder groups.

A copy of the leaflet used to announce this phase of the consultation program, and a sample of the invitation letter sent to stakeholder and interest groups, are included in Appendix E. An advertisement announcing the preparation of the strategy and the community forums was also placed in the Mercury.

A list of the stakeholder and interest groups invited to participate in this phase of the consultation program is given in Appendix F.

Attendees at the forums and workshops were informed of the process to be followed in developing the fire management strategy, and invited to raise any issues they felt should be addressed in the strategy.

Phase 3

A preliminary draft of the fire management strategy was reviewed by the Wellington Park Management Advisory Committee, the Hobart Special Fire Area Committee, and relevant government agencies. The preliminary draft of the strategy was also reviewed by Professor Jamie Kirkpatrick of the University of Tasmania. Comments from this review were incorporated into the draft strategy prior to public exhibition.

Phase 4

A draft of the fire management strategy was put on public exhibition during November 1999. All community members who responded to the leaflet sent out at the beginning of the strategy were informed that the draft strategy was available for comment. A brochure summarising the key findings of the strategy, including the recommendations, was prepared for general public distribution. The brochure included details of where the full report could be obtained, how to make submissions, and a response form.

Submissions received were summarised in a Schedule of Submissions and a response provided to each issue raised. The fire management strategy was amended, where required, to address issues raised in the comments, or incorporate additional information provided in the comments.

Revision 1, 2005

Further consultation with the main stakeholders was undertaken during the first review and revision of the fire management strategy in 2005.

4. Fire Management Issues

4.1 Natural Features

Wellington Park is situated immediately to the west of Hobart and extends for some 25 kilometres along the Wellington Range from the foothills of Mount Wellington in the east, to the hills in the vicinity of White Timber Mountain to the west. It includes the outliers of Mount Hull in the north, and in the south, Cathedral Rock, Betts Hill and Buzzietop. Due to the large variations in climate, topography and soils, Wellington Park (and Mount Wellington in particular) is one of the most biologically diverse areas of its size in Tasmania.

The total area of Wellington Park is 18,250 ha. Elevation ranges from about 300 metres near Betts Road to 1240 metres at the top of Mount Wellington. Much of the Park is on the Wellington Range above an altitude of 600 m.

The boundary of the Park is highly convoluted and follows property lines rather than natural boundaries such as watersheds or drainage lines (Figure 1). Generally, the forests of the Park extend on to neighbouring rural or residential properties since many of the private properties immediately adjoining the Park boundary are uncleared, or only partly cleared. The eastern boundary of the Park is only 5 km from the centre of Hobart, but the Park is separated from urban areas by other reserves, except at Fern Tree and Glenorchy.

The mean annual rainfall in Wellington Park ranges from about 750 mm along the northern and southern foothills to about 1500 mm on the higher peaks. The distribution of rainfall across the Park, based on information on isohyets provided by the Bureau of Meteorology, is shown in Figure 2. Snow falls can occur in the Park in any season, however the actual number of snow days is relatively low, even in winter. Rainfall is evenly distributed throughout the year but there are large differences between the highest and lowest rainfalls recorded for each month. Winds are predominantly from the west and north-west throughout the year (WPMT, 1996) and extreme fire weather conditions can occur when strong, dry, north-westerly winds coincide with summer heat waves.

The dominant geomorphic processes that have shaped the surface of the range are subaerial weathering and fluvial erosion. However, many of the features on the upper surfaces of the range have been shaped by periglacial freeze-thaw processes during the Pleistocene glacial stages. These processes are generally inactive today (WPMT, 1996).

Figure 2 - Mean annual rainfall in Wellington Park.

Geology, along with altitude and aspect, are the major determinants of the vegetation types found within the Park, though in some areas the relationship is complicated by extensive downslope movement of dolerite derived colluvial material. Much of the Wellington Range is capped by Jurassic dolerite which is approximately 350 m thick on Mount Wellington and is underlain by late Permian and Triassic terrestrial sediments (mainly quartz sandstones) which in turn are underlain by Permian glacio-marine sediments (glacial tillites, marine mudstones, siltstones, impure limestones, and sandstones) (WPMT, 1996).

Further details on the natural features of Wellington Park can be found in the Draft Wellington Park Values, Use and Management Inventory (WPMT, 1996).

4.2 Flora and Fauna

4.2.1 Indigenous Vegetation

Descriptions of the flora and fauna of Wellington Park are given in the values, use and management inventory prepared as part of the Wellington Park Management Plan (WPMT, 1996). This fire management strategy provides further information on the impact of fire on the vegetation in the Park. However, it should be noted that the reliability and level of detail of the existing information on the flora of the Park is highly variable. The Mountain Park section of Wellington Park, which includes Mount Wellington and the slopes above Hobart, has been mapped in detail by Johnson (1994) and the section of the Park managed by Glenorchy City Council by Kirkpatrick and McDonald, (1996). The latter study also included recommendations for fire management of the bushlands within Glenorchy City. The remainder of the Park has not been surveyed and mapped in detail. The TasVeg maps of the western portion of the Park is based on mapping undertaken for the Regional Forest Agreement and was found to be unreliable both in terms of the types of forest identified and their distribution.

More than 40 plant communities have been identified in Wellington Park. Many of these have a similar response to fire and have been grouped into a number of fire management classes for the purposes of fire management planning. These classes are shown in Figure 3, and their fire ecology is discussed below.

Figure 3 - Distribution of Fire Management Classes

Alpine Heaths, Herbfields and Sphagnum Bogs

This group includes at least 7 communities which occupy the highest parts of the Wellington Range. These communities are all considered fire sensitive, with communities on peat being the most vulnerable to damage. Heath communities unburnt since 1914 appear to still be recovering from the effects of fire, and are continuing to change in species composition (J. Kirkpatrick pers. comm.). A number of fire sensitive species (eg. creeping pine *Microcachrys tetragona*) previously recorded on the Wellington Range no longer exist in the Park. The exception is *Ozothamnus ledifolius* heath which has benefited from an increased frequency of fire and dominates much of the summit plateau.

Sub-alpine Woodlands and Shrublands

This group includes communities dominated by Tasmanian snow gum (*Eucalyptus coccifera*), urn gum (*E. urnigera*) and occasionally myrtle (*Nothofagus cunninghamii*). These communities do not appear to require fire for their long-term survival, although in the total absence of fire there may be reduced regeneration of eucalypts. The eucalypts in these communities, as well as *Nothofagus cunninghamii*, are relatively tolerant of fire, with trees regenerating through coppice regrowth, although at very slow rates.

Buttongrass Moorland

Buttongrass (*Gymnoschoenus sphaerocephalus*) is confined to the far western portion of Wellington Park and includes a 17 ha site at Long Marsh beside Jefferys Track. It should be noted that other areas mapped as "buttongrass" or "buttongrass with scrub" on the Forestry Tasmania PI Vegetation Maps covering the western portion of the Park do not contain buttongrass (R. Schahinger pers. comm.).

Information on fire frequency thresholds in buttongrass communities is inconclusive. Buttongrass moorlands with extensive fire free periods (>60 years) show successional processes towards shrubland (A. Pyrke pers. comm.), and transitions from moorland to rainforest have been observed (J. Kirkpatrick pers. comm.). It has been suggested that many moorlands are human artefacts (Jackson, 1968). However, it has also been proposed that poor drainage and nutrient deficiencies are the main factors preventing forest development in some moorland communities (Jackson, 1968). Frequent burning (<10 years) of buttongrass moorlands may reduce the soil seed bank of heathy species and limit the habitat of some small mammals and invertebrates (J. Marsden-Smedley pers. comm.). Buttongrass moorlands develop a peat horizon over time. Fires following prolonged dry periods may ignite the peat and the resulting ground fire would have a significant adverse impact on the vegetation (Balmer, 1991). Significant invasion of the buttongrass moorland by woody shrubs was noted between inspections in 1999 and 2005. This invasion is likely to continue in the absence of fire leading to a reduction in the extent of the buttongrass.

Wet Heath

There are two facies of this community. One on sandstone in the east of the Park, and the other on dolerite in the far western portion of the Park.

The most extensive area (116 ha) of wet heath on sandstone occurs at Snake Plains. Johnson (1994) also describes a small patch (2.5 ha) of a similar community within Mountain Park. This vegetation type is maintained by regular burning which may at some stage have been coincident with environmental conditions (such as waterlogging) unfavourable for eucalypt regeneration. This vegetation type is also often pyrogenic. It is possible that Tasmanian yellow gum (*Eucalyptus johnstonii*) would predominate over much of the area if fire was absent for an extended period. The relatively low plant species diversity and evidence of scattered eucalypt stumps suggests the community at Snake Plains may not have existed for much longer than the period since European settlement. It does not equate directly to any described communities although it is analogous to several, including depauperate tea-tree scrub (Pannell, 1992), and wet eastern heathy moorland (Jarman et al., 1988) without the buttongrass. It consists of a 1-2 m high dense shrub layer dominated by *Leptospermum scoparium* with *Oxylobium ellipticum* sub-dominant. These overlay a heathy layer (0.5 m) of *Melaleuca squamea*, *Epacris lanuginosa* and *Sprengelia incarnata*. Sedges are dominated by *Empodisma minus* with *Gahnia grandis* and *Lepyrodia tasmanica* amongst the coral fern (*Gleichenia dicarpa*).

There are several patches of wet heath on dolerite (15 to 50 ha in size) at the far western end of the Wellington Range. These occur on poorly drained sites where conditions (possibly an interaction of fire and waterlogging) have inhibited eucalypt establishment or regeneration. Typically sites have a shrub layer which includes *Leptospermum lanigerum*, *Melaleuca squamea*, *Callistemon viridiflorus*, and *Baeckea gunniana*. Graminoids can be abundant and include *Empodisma minus*, *Restio australis*, and *Gahnia grandis*. Other species that are locally prominent include *Astelia alpina* and *Gleichenia alpina*. Small patches of sphagnum were also recorded. It is likely that there are several distinct floristic communities within this broad vegetation type that could be related to alpine communities described by Kirkpatrick (1986). *Eucalyptus gunnii* is scattered through some of the patches and often forms a dense stand on the margins of the heath. The degree of fire dependence of this community is uncertain, although it is reasonable to assume that areas already supporting a shrub layer would revert to forest in the long term if fire were to be excluded. The sphagnum and fern dominated communities are likely to be fire sensitive.

Rainforest Gully Scrub

Notable for the absence of eucalypts, these are areas of rainforest which have suffered sufficient burning to eliminate many of the rainforest elements, although tiny relicts of rainforest species may be present in deep gullies. Prominent broadleaf shrubs are blanket leaf (*Bedfordia salicina*) and

musk (*Olearia argophylla*) with silver wattle (*Acacia dealbata*) sometimes emergent. The rainforest remnants are highly sensitive to fire.

Wet Forest and Mixed Forests

These are dominated by white-top (*Eucalyptus delegatensis*) at higher altitudes, yellow gum (*E. johnstonii*) on moist sandstone sites, swamp gum (*E. regnans*) on wet mid and low altitude sites, and stringybark (*E. obliqua*), blue gum (*E. globulus*) and very occasionally white gum (*E. viminalis*) at lower altitudes. The mesophytic rich communities are confined to the most fire protected sites. Rainforest elements are often much reduced or absent from areas where rainfall would typically support them. Many of the examples of these communities within Wellington Park include regrowth with scattered emergent overmature trees showing signs of fire damage. Although these communities are reliant on high intensity fire to ensure regeneration of eucalypts, such an event need only occur every 100 to 400 years. If these communities are burnt frequently they are usually replaced by shrubby dry sclerophyll forests.

High Altitude Dry Sclerophyll Forest

This includes forests which grade downslope from the true sub-alpine communities. Dominated by *Eucalyptus delegatensis* they predominantly occur on dry and often shallow soils which accounts for the sclerophyllous nature of the vegetation. Due to the slow regeneration rates at higher altitudes this vegetation type has a longer fire interval than dry sclerophyll forest at lower altitudes. Some of the sites occupied by this community are an artefact of relatively frequent burning, and are likely to revert to wet and possibly mixed forest communities in the extended absence of fire. East of Jefferys Track the community has a grassy ground layer over deeper soils. This community requires fire at regular, though not frequent, intervals to maintain the existing floristic composition.

Shrubby and Heathy Low Altitude Dry Sclerophyll Forests

These communities include forests dominated by *Eucalyptus obliqua*, *E. globulus*. and white peppermint (*E. pulchella*) on dolerite, and by *E. obliqua*, silver peppermint (*E. tenuiramis*) and black peppermint (*E. amygdalina*) on sediments. They typically occupy warmer, drier aspects than wet forest. These communities generally require fires every 15 to 25 years and appear to have expanded their range within Wellington Park due to the increased frequency of wildfires this century. Heathy communities generally occupy warmer aspects or less fertile soils on sediments, particularly where fire has been regular and frequent. Wetter and less frequently burnt sites tend to have shrubs dominant in the understorey.

Grassy Woodlands and Open Forests

These communities are generally found on relatively fertile soils derived from dolerite, usually on relatively gentle lower slopes. These communities are dominated by *Eucalyptus globulus*, *E.*

pulchella, or occasionally *E. ovata*. The grassy understorey in these communities is maintained by relatively frequent fires. In the absence of fire the grasses are replaced by shrubs.

She-oak Forest

This community occupies steep, rocky, north-facing slopes on dolerite. Small patches occur close to the boundary of the Park with one larger area on slopes above Islet Rivulet at Glenorchy. She-oak forests are maintained by regular fire, although the dominant species *Allocasuarina verticillata* can reproduce without fire. The prolonged absence of fire can lead to a dense canopy and the formation of a deep litter layer which excludes most other plant species. Frequent low intensity fires may favour she-oak over eucalypts, as she-oak saplings have been reported to be less susceptible to fire than the more flammable eucalypts (Kirkpatrick, 1985). She-oak seedlings have also been observed to be more successful than eucalypt seedlings in competition with perennial grasses (Kirkpatrick, 1985). However, the dominance of she-oak on steep rocky north-facing slopes can also be explained by their higher level of drought resistance than eucalypts (Kirkpatrick, 1996).

4.2.2 Plant Communities of Conservation Value

As suggested in the Wellington Park management inventory (WPMT, 1996), the significance of the vegetation in Wellington Park is the integrity of all the constituent plant communities. The management inventory notes that the plant communities in the Park can be considered to have conservation value for a number of reasons.

- They are unreserved or poorly reserved elsewhere in Tasmania, (ten of these communities are listed in the Wellington Park Management Plan).
- They are mostly confined to Wellington Park; these include *Eucalyptus johnstonii* forest, *E. urnigera* forest and *Ozothamnus ledifolius* heath.
- They contain species of conservation significance; for example *Brachyglottis brunonis*.
- They have a very localised distribution; for example *Gleichenia alpina* - *Empodisma minus* fernland near Fools Tarn.
- They are outlying occurrences of relatively widespread communities; for example *E. coccifera* forest.
- They are especially fragile environments; for example alpine peatlands and wetlands.
- They are rare throughout their range; for example *E. cordata* open scrub/open forest.

In addition to this, the vegetation on Mount Wellington has social and scientific value. The plateau area has a long history of scientific studies including a number of ongoing long-term research projects. Mount Wellington is also highly accessible and provides the only experience of alpine vegetation for the vast majority of visitors to the Park.

Forest communities at a dominance level have been accorded conservation significance as part of the Regional Forest Agreement (RFA) 1997 (PLUC, 1996), and attributed conservation priorities in different regions (CARSAG, 1999) to assist the RFA Private Reserve Program compare candidate sites. Wellington Park falls into two bioregions, Central Highlands and Midlands, divided at the 300 m contour. Conservation priority is based on a score range from 0 to 28 with the higher number indicating a higher priority. For most communities areas of old growth have a higher conservation value than regrowth. Table 1 shows the conservation priority of the forest communities in Wellington Park under this system (CARSAG, 1999).

Table 1 - Conservation Value of the Forest Types in Wellington Park.

Old Vegcode	New TasVeg	Description	Extent (Ha)	Conservation Value	
				Statewide	Regional
AC	DAC	<i>Eucalyptus amygdalina</i> coastal forest and woodland	52.7	-	Rare
AD Ea	DAD	<i>Eucalyptus amygdalina</i> forest and woodland on dolerite	137.1	-	-
AI	DAM	<i>Eucalyptus amygdalina</i> forest and woodland on mudstone	100.6	-	Rare
AS	DAS	<i>Eucalyptus amygdalina</i> forest and woodland on sandstone	35.7	Vulnerable	Vulnerable
C Ec	DCO	<i>Eucalyptus coccifera</i> forest and woodland	4113.8	-	Rare
CO	DCR	<i>Eucalyptus cordata</i> forest	8.5	Rare	Rare
D Ed	DDE	<i>Eucalyptus delegatensis</i> dry forest and woodland	3709.3	-	-
DSC	DSC	<i>Eucalyptus amygdalina</i> - <i>Eucalyptus obliqua</i> damp sclerophyll forest	36.7	-	Rare
DT	WDU	<i>Eucalyptus delegatensis</i> wet forest (undifferentiated)	3707.7	-	-
GG	DGL	<i>Eucalyptus globulus</i> dry forest and woodland	59.7	Vulnerable	Rare
O Em	DOB	<i>Eucalyptus obliqua</i> dry forest and woodland	1916.1	-	-
OT	WOU	<i>Eucalyptus obliqua</i> wet forest (undifferentiated)	1272.5	-	-
OV Eo	DOV	<i>Eucalyptus ovata</i> forest and woodland	15.4	Endangered	Endangered
P	DPU	<i>Eucalyptus pulchella</i> forest and woodland	456.3	-	-

Old Vegcode	New TasVeg	Description	Extent (Ha)	Conservation Value	
				Statewide	Regional
R	WRE	<i>Eucalyptus regnans</i> forest	916.0	-	-
SU	WSU	<i>Eucalyptus subcrenulata</i> forest and woodland	74.0	-	-
TI Et	DTO	<i>Eucalyptus tenuiramis</i> forest and woodland on sediments	216.7	Vulnerable	Rare
V Ew	DVG	<i>Eucalyptus viminalis</i> grassy forest and woodland	26.6	-	-
AV	NAV	<i>Allocasuarina verticillata</i> forest	40.2	-	Rare
Ta	NAL	<i>Allocasuarina littoralis</i> forest	9.7	-	Rare
Tw	NBA	Bursaria - Acacia woodland and scrub	26.2	-	Rare
SI	NAD	<i>Acacia dealbata</i> forest	66.1	-	-
Sb	SBR	Broadleaf scrub	315.2	-	-
St	SLW	Leptospermum scrub	27.4	-	Rare
Sw	SLW	Leptospermum scrub	21.8	-	-
Ae	HUE	Eastern alpine vegetation (undifferentiated)	203.1	-	Rare
Bb	MBU	Buttongrass moorland (undifferentiated)	11.7	-	-
Gn	GCL	Lowland grassland complex	16.2	-	-
Gsl	GSL	Lowland sedgy grassland	0.8	-	Rare
Ha	SHA	subalpine heathland	643.9	-	Rare
Hg	SHL	lowland sedgy heathland	21.0	-	Rare
Hh	SHU	Inland heathland (undifferentiated)	29.5	Vulnerable	Rare
Hs	MDS	Subalpine <i>Diplarrena latifolia</i> rushland	200.1	-	Rare
Hw	SHW	wet heathland	8.0	-	Rare
Ps	MSP	Sphagnum peatland	2.8	-	-
Ro	ORO	Lichen lithosphere	214.9	-	-
Rs	OSM	sand, mud	2.4	-	-
Fi	FAG	Agricultural land	34.0	-	-
Fj	FRG	Regenerating cleared land	31.3	-	-

Old Vegcode	New TasVeg	Description	Extent (Ha)	Conservation Value	
				Statewide	Regional
PL	FPL	Plantations for silviculture	62.4	-	-
Uc	FUM	Extra-urban miscellaneous	73.0	-	-
Ue	FPE	Permanent easements	3.2	-	-
Ur	FUR	Urban areas	25.0	-	-
W	OAQ	water	12.0	-	-
Total			18957		

Implications for Fire Management Planning

Some of the plant communities of conservation value in Wellington Park can be damaged by fire, so this strategy includes measures to minimise the fire risk to these communities. Other communities require relatively frequent fire to maintain their structure and floristics. The fire management requirements of these communities is summarised in Table 2. Communities with similar management requirements are shown in Figure 4.

4.2.3 Threatened Plant Species

Plant species listed in the schedules of the Tasmanian *Threatened Species Protection Act 1995*, which are known, or considered likely, to occur within Wellington Park and its immediate environs, are listed in Table 3. Information on the likely response of each species to fire is also given where known. Locations of known populations of these species are shown in Figure 5.

This strategy proposes measures to ensure that fire does not adversely affect populations of threatened species. However, although Wellington Park contains a relatively high concentration of threatened species, the implications for fire management planning should not be overstated. The continued presence of a given species in a habitat subject to repeated fire suggests that it has the capacity to at least survive such events. The presence or absence of a threatened species should not necessarily be the only consideration of fire management planning. For example, although there is evidence that some threatened species benefit from fire, some environments, such as the alpine zone, would be better excluded from fire for the maintenance of other more important values, and the populations of any threatened species monitored.

The following threatened species are considered to require special consideration in this fire management strategy.

Table 2 - Fire Management Requirements of Plant Communities in Wellington Park

Figure 4 - Fire Management Requirements of Plant Communities in Wellington Park

Table 3 - Threatened Plant Species in Wellington Park

Figure 5 - Assets at Risk from Fire in Wellington Park

***Epacris acuminata* & *Epacris virgata* 'Kettering'**

A recovery plan for Tasmania's forest epacrids, including the endemics *Epacris acuminata* and *E. virgata* 'Kettering', was prepared in the late 1990s (Keith 1998), with implementation by the Tasmanian Department of Primary Industries, Water and Environment (DPIWE) during the period 1998–2003. A revised forest epacrids recovery plan for the period 2006–2010 is in draft form (DPIWE 2005a); any management decisions for sites supporting *Epacris acuminata* and *E. virgata* 'Kettering' will need to be made in consultation with DPIWE's Threatened Species Unit. The original recovery plan recommended that several significant populations be selected for special management, with fires at prescribed intervals of between 8 and 25 years.

Within Wellington Park *Epacris acuminata* occurs in a range of different habitats, including riparian sites, midslopes, and mountain summits; most sites are characterised by shallow to skeletal soils over dolerite bedrock. Part of the large *E. acuminata* population to the north of Knights Creek reservoir (those areas between Chapel Street Trail (W8) and the electricity transmission line (Figure 5a) was burnt by wildfire in January 1997. Inspections in 1998 and 1999 showed no evidence of recruitment of the species in the burnt areas, raising some concerns as to the population's future. However, subsequent surveys by the Threatened Species Unit have shown that recruitment occurred 3 to 4 years after fire (presumed to be predominantly from soil-stored seed), with good regeneration throughout the previously occupied burnt areas.

A single population of *Epacris virgata* 'Kettering' occurs within Wellington Park to the southeast of Knights Creek reservoir (Figure 5a). This population is considered to be significant for the conservation of the species as it is one of the largest in Tasmania, represents the species' northern extent, and is the only one within a secure reserve. It provides one of the best opportunities for securing the conservation of the species in Tasmania and is therefore considered strategically important to the Forest Epacrids Recovery Program.

A management plan for threatened *Epacrids* in Wellington Park is in preparation (Schahinger, 2005) and any recommendations pertaining to fire management should be considered for inclusion in this strategy. In the interim, this strategy will adopt the guidelines in the original recovery plan for forest epacrids that are relevant to fire management (Keith, 1998). A fire regime has been prescribed for selected populations of *Epacris acuminata* and *E. virgata* 'Kettering' within the Park, bearing in mind (as noted above) that recruitment following fire may be delayed by a number of years. Populations chosen are those that have relatively easy access and good fire control lines. Other populations will not be burnt for the duration of this fire management strategy, but may be burnt in the strategy's next cycle.

The following guidelines will be applied to known populations of *Epacris acuminata* and *E. virgata* 'Kettering'.

Criteria for recovery that are relevant to fire management include:

- "1.1 Fire regimes likely to cause population declines are excluded.
- 1.2 Disease hygiene protocols for hazard reduction and fire fighting are implemented during all fire operations carried out in the vicinity of all populations of threatened *Epacris* taxa."

Recovery Action 1.1 gives the following guidelines to minimise the risk of population declines due to inappropriate fire regimes:

- i) Allow the length of fire intervals to vary within the thresholds of 8–25 years;
- ii) Minimise the occurrence of fires when droughts are predicted in the spring–summer period of the following two years;
- iii) Exclude fire from management areas containing populations infected by *Phytophthora cinnamomi* for at least 6–10 yrs after initial infection; and
- iv) Avoid the occurrence of three or more low intensity fires (consuming < 0.6 kg/m² ground fuel) in succession."

The recovery plan notes that these guidelines should be incorporated into fire management plans where necessary.

Given the importance of moist conditions for post-fire regeneration of *Epacris* species, sites with known populations of *E. virgata* and *E. acuminata* should not be burnt in drought years, or when the Bureau of Meteorology predicts the onset of drought conditions within the next two years.

The introduced Spanish heath (*Erica lusitanica*) occurs in the same area as *Epacris acuminata* and *E. virgata* 'Kettering' and has the potential to displace both species. Apart from any general weed control program, any sites known to contain *E. acuminata* and *E. virgata* 'Kettering' populations should be inspected prior to any prescribed burns and appropriate pre- and post-fire weed control carried out. The sites should also be inspected following any wildfires, and appropriate weed control carried out. Some weed control work was undertaken within the *E. virgata* 'Kettering' population in 2001 (including Spanish heath and pine wildlings), though follow-up work is necessary prior to any prescribed burns. In addition, Spanish heath infestations in and around the *Epacris acuminata* populations to the north of Knights Creek reservoir are being targeted in 2005/6 as part of an Envirofund project.

Epacris acuminata and *E. virgata* 'Kettering' are both susceptible to the introduced fungus *Phytophthora cinnamomi*. Periodic burning of the litter layer can increase the susceptibility of forest plants to *P. cinnamomi* infection. The Department of Primary Industries, Water and Environment has produced hygiene protocols to minimise the spread of soil-borne diseases such as *Phytophthora cinnamomi* during fire operations (DPIWE, 2004).

The sites of the known lowland populations of *Epacris acuminata* and *E. virgata* 'Kettering' should be checked for *Phytophthora cinnamomi*, and if the areas are not already infected the following precautions will need to be applied:

- Vehicles must be cleaned before entering sites, particularly vehicle underbodies;
- Vehicle movements during fire fighting and prescribed burning activities should be avoided as much as possible;
- Additional tracks and firebreaks must not be constructed through the sites;
- Material imported for track construction and maintenance must be sourced from a confirmed *Phytophthora cinnamomi* free source;
- Track work, including table drain maintenance, must be undertaken in dry conditions only;
- Run-off from tracks must be directed away from known sites of *Epacris acuminata* and *E. virgata* 'Kettering'.

Other official users of the track should be informed of the hygiene protocols, particularly the requirement to wash down vehicles prior to accessing the sites.

Euphrasia scabra

This endangered species has not been recorded within Wellington Park, however a population occurs in the Brushy Hill area just outside the Park boundary and suitable habitat also occurs within the Park. It is therefore possible that this species exists, undetected, in the Park, or may colonise areas in the Park in the future. A recovery plan for this species has recently been prepared by the Tasmanian Department of Primary Industries, Water and Environment (Potts, 2000). Should this species be located within the Park, relevant recommendations in the recovery plan should be incorporated into this fire management strategy. As this species colonises disturbed ground, any areas burnt within the Park close to Brushy Hill should be monitored to see if the species has colonised the area.

Anogramma leptophylla

This diminutive annual fern is known from only five or six populations statewide (Garrett, 1997), and has been recommended for reclassification as vulnerable in the Tasmanian *Threatened Species Protection Act 1995* (DPIWE 2005b). A small population of this species was thought to occur within Fire Management Unit 7, with prescriptions in place in the fire management strategy to ensure its spring sporulation process was not disrupted. However, recent information indicates that the previously recorded site is well outside prescribed burn areas, viz., a dolerite cliff face close to the north of Fire Management Unit 7 (Garrett, pers. comm.). The species could not be relocated at its known site during surveys in September and October 2005, and may well have succumbed to competition from exotic grasses and herbs (Schahinger, pers. comm.).

Brachyglottis brunonis

Mount Wellington is the stronghold for this species, which is otherwise known only from Mount Dromedary and Mount Faulkner. Evidence of pulse regeneration of this species suggests some adaptation to fire. However, there is also evidence of its failure to recolonise burnt sites, and therefore it is difficult to determine an optimal fire regime for this species in the Park. *Brachyglottis brunonis* occurs in wet forest habitats that generally have a relatively low frequency of fire, although this has not necessarily been the case in Wellington Park. This strategy has excluded fire from the wet forest habitat of this species for the 15-year duration of this strategy, and it is not considered necessary to burn any particular populations of *B. brunonis* during this period. The condition of this species within the Park, and information on its fire ecology, should be reviewed during the revision of this strategy after the first 15-year cycle.

Implications for Fire Management Planning

This fire management strategy is based on current knowledge of the effects of fire on threatened species known, or considered likely, to occur in Wellington Park. Where there is a lack of information about the fire ecology of a particular threatened species, a fire regime has been applied that aims to conserve their habitat by maintaining the structure and floristics of the particular plant community in which they occur. The monitoring and review procedures in the strategy will allow for modification of fire regimes as new information on the ecology of threatened species becomes available.

Although some individuals of particular threatened species may be killed in the prescribed fires lit according to this strategy, the management prescriptions should have an overall beneficial effect on threatened species as a whole by ensuring the long-term conservation of their habitats, and reducing the risk of large wildfires eliminating isolated populations.

4.2.4 Weed Species

Control and eradication of weeds in Tasmania is governed by the Weed Management Act, 1999. This act provides for the development of management plans for specific weeds prior to their proclamation as a 'noxious weed'. The objectives of the weed management Act, 1999, are to:

- “(a) minimise the deleterious effects of weeds on the sustainability of Tasmania’s productive capacity and natural ecosystems; and
- (b) promote a strategic and sustainable approach to weed management; and
- (c) encourage community involvement in weed management; and
- (d) promote the sharing of responsibility for weed management between the different spheres of government, natural resource managers, the community and industry in Tasmania.”

There are currently statutory management plans for 73 weeds including most of the common weeds in the Park such as *Erica lusitanica* (Spanish heath), *Ulex europaeus* (gorse) and

Chrysanthemoides monilifera (boneseed). In addition to declared weeds, there are a wide range of introduced plant species that can be considered environmental weeds due to their ability to invade native bushland and displace indigenous species.

A revised edition of Tasmania's weed management strategy "WeedPlan" was released in April 2005 (Tasmanian Weed Management Committee, 2005).

"Weedplan outlines a strategic approach to weed management with the overall objective of coordinating and integrating the available weed components to better manage weeds and lessen the impact of weeds on Tasmania's environment and production sector. It reflects at a State level the operating principles of the National Weed Strategy thus complementing strategic weed management at the national level. It stresses the need to identify and prioritise existing and potential weed problems and recognise the roles and responsibilities of all stakeholders. It covers weeds of all terrestrial and aquatic ecosystems."

A detailed survey of weeds in Wellington Park was not carried out as part of the current study. However, weed infestations observed during fieldwork for this strategy were noted to gain an impression of which weeds are likely to present the greatest risk to the native ecosystems in the Park, and which plant communities are most at risk from weed invasion following fire.

Weeds in the Park range from ubiquitous small herbs to large trees, and from isolated occurrences in the high altitude areas to significant infestations around developed areas and disturbed sites. The draft values, use and management inventory for the Park (WPMT, 1996) notes that over 130 introduced species have been recorded from predominantly natural vegetation on the Wellington Range. The inventory discusses the general distribution of exotic species as well as some specific species, however it does not include a species list, or a map showing weed distribution.

A list of introduced species on Mount Wellington compiled by Ratkowsky and Ratkowsky (1976) is now probably in need of revision. Parks and Wildlife Service staff have recorded weed populations on a 1:25 000 scale map. However, this is not a systematic survey but a working document used to plan weed control activities along fire trails and other access routes. It focuses primarily on existing trails with some additional mapping of major weed infestations on the Goat Hills.

Based on these sources the following general picture of the weed situation within and surrounding Wellington Park has emerged:

- The area with the highest density and diversity of weed species is the area to the south-east of Tolosa Park where there had been earlier settlement. The highest concentrations of exotic species are generally around former house sites. Other areas with relatively high concentrations of weeds are:
 - the Barossa Creek catchment at Lenah Valley
 - developed areas along the Pipeline Track at Fern Tree

- the electricity transmission line easements on Goat Hills
 - along the sides of roads and fire trails, particularly those radiating out from large weed infestations
 - the slashed fire break along the eastern boundary of Mountain Park.
- The most widespread weed in the Park is Spanish heath (*Erica lusitanica*). Other relatively widespread weeds include blackberry (*Rubus fruticosus*) and Elisha's tears (*Leycesteria formosa*).
 - The following weeds show an ability to invade relatively undisturbed native vegetation; Spanish heath, boneseed (*Chrysanthemoides monilifera*), Elisha's tears and radiata pine (*Pinus radiata*). Gorse (*Ulex europaeus*) is also known to invade relatively undisturbed native vegetation but is currently relatively uncommon in the Park.
 - Certain weed species appear to have an affinity for particular habitats:
 - Boneseed is most common in she-oak woodlands
 - Spanish heath is most common in powerline easements, heathy sclerophyll forests and grassy woodlands
 - Elisha's tears is confined to creek banks and shaded boggy sites
 - Pampas grass (*Cortaderia selloana*) occurs as a coloniser of quarry sites, borrow pits, road sides, and other previously disturbed sites.
 - The native plant communities currently most at risk from weed invasion are the heathy and grassy dry sclerophyll forests and woodlands on dolerite, and riparian vegetation.
 - *Eucalyptus tenuiramis* forest on mudstone, and similar plant communities on dry sites with low nutrient soils, appear to have a relatively low risk of weed invasion.

Implications for Fire Management Planning

Fire can provide the disturbance that many introduced species need to spread to new areas, as well as to expand existing populations. Other fire management activities, such as construction and maintenance of fire trails, and bulldozing of fire breaks during fire suppression, can also provide opportunities for weeds to colonise native bushland.

Fire can also be used as a tool for the management of weed infestations. Some species are best controlled by herbicide application to regrowth following a fire. Other species can sometimes be controlled by application of a fire regime that stimulates germination of seed but kills the regrowth before it has been able to flower. It was observed that a relatively high intensity fire behind Tolosa Park in 1998 burnt a patch of grassy white peppermint (*Eucalyptus pulchella*) forest which also included Spanish heath (*Erica lusitanica*). Six months after the event there was evidence of numerous native species regenerating, but no germination of Spanish heath, although some plants

were resprouting. A further inspection of this area in 2005 showed the Spanish heath was present, but at a relatively low density. This indicates that fire may be helpful in controlling this species, however there is currently not enough information to recommend a particular fire regime for control of this species.

The prescribed burning program and its associated weed control activities in this strategy will need to be integrated with the Introduced Species Management Strategy to be prepared under Section 10.10 of the Wellington Park Management Plan. (WPMT, 1997). The likely response to fire of the weed species known, or considered likely, to occur within Wellington Park is summarised in Management Procedure 9 in Appendix A.

4.2.5 Threatened Fauna Species

Wellington Park contains habitats for a number of fauna species listed in the Threatened Species Protection Act, 1995. Threatened fauna known to occur in Wellington Park are listed in Table 4.

Table 4 - Threatened Fauna in Wellington Park

Species	Conservation Status (TSP 1995/ EPBC 1999) ¹	Habitat in Wellington Park
<i>Accipiter novaehollandiae</i> grey goshawk	Endangered -	Lowland old growth wet forest including rainforest and blackwood swamp forest. Nest sites are usually situated below 300 m altitude in riparian forest or swamp forest. Blackwood <i>Acacia melanoxylon</i> is the preferred nest tree species (Mooney & Holdsworth 1988, Brereton & Mooney 1994). Nest sites are therefore unlikely to occur inside the Park, although the possibility of their occurrence cannot be discounted as individuals have been sighted within the Park boundary.
<i>Aquila audax fleayi</i> wedge-tailed eagle	Endangered ENDANGERED	Feeds in a wide range of habitats but only nests in mature trees in native forest, usually in patches of old growth forest, although these can be quite small. Nests are located in sheltered positions on leeward slopes (Mooney & Holdsworth 1991, Brown & Mooney 1997). Several nest sites occur within the Park, and birds have territories across much of the Wellington Range.
<i>Lathamus discolor</i> swift parrot	Endangered ENDANGERED	Forages on flowering eucalypts, especially <i>Eucalyptus globulus</i> , within 5 km of the coast. Birds are often recorded on the Hobart foothills of Mount Wellington. Nests in tree hollows in old <i>E. obliqua</i> forest just outside the Park at Fern Tree. Birds may forage in flowering <i>E. obliqua</i> and <i>E. regnans</i> after breeding (Brereton, 1997). Habitat for potential nest sites occurs within the Park, particularly where there are old growth forest elements below 500 m.

Species	Conservation Status (TSP 1995/ EPBC 1999) ¹	Habitat in Wellington Park
<i>Lissotes menalcas</i> Mount Mangana stag beetle	Vulnerable -	Decaying logs in wet forest where it feeds on wood rotting fungi (Meggs, 1996).
<i>Roblinella agnewi</i> silky snail	Rare -	Recorded in litter in damp sites at moderately high altitudes on the eastern face of Mount Wellington (Taylor & McQuillan 1994), possibly associated with the rare tree daisy <i>Brachyglottis brunonis</i> . Two recent recordings on scree slopes below Pinnacle Road. Likely to be endemic to Mount Wellington (WPMT, 1996).
<i>Sarcophilus harrisii</i> Tasmanian devil	Vulnerable -	The recent threatened status of this species is the result of a currently undiagnosed face tumour disease that has decimated local populations in the eastern half of Tasmania. There are however no obvious implications for habitat management.

1 - For an explanation of the conservation categories refer to Section 3.4

Wedge-tailed eagles require old growth eucalypt forest for nest sites, and typically occupy the largest trees at a site. Wedge-tailed eagles are very timid nesters and can desert a nest if disturbed (Mooney & Holdsworth, 1991). A recovery plan has been prepared for this species (Bell & Mooney, 1998) which identifies disturbance of nest sites as a major limiting factor for the population. Standard practice in the forest industry is to protect nest sites with a 10 ha reserve and to keep disturbances at least 500 m from the nest (Forest Practices Board, 1998). Approximate locations of known wedge-tailed eagle nests in Wellington Park are shown in Figure 5. Nests are re-used over a long period, some having been used for over 50 years (Forest Practices Board, 1998). This strategy will minimise the fire risk to known wedge-tailed eagle nest sites by restricting the use of fire in the vicinity of the nest site.

Potential swift parrot nesting habitat is mainly confined to the eastern slopes of Mount Wellington where the tall mature forests with high hollow densities that are favoured by this communally nesting bird occur. Any groups of mature trees on upper slopes and ridges below 500 m altitude should be protected from wildfire to ensure this resource is not further diminished. The swift parrot feeds in the tree canopy and therefore an extensive, high-intensity fire which scorched the canopy could reduce the potential food resources for this species within the Park. However, a temporary loss of food resources in the Park due to fire is unlikely to have a significant impact on regional food sources for this species. The fire regimes prescribed in this fire management strategy aim to minimise canopy scorch, as well as reducing the risk of major wildfires. Potential nesting sites have been excluded from the prescribed burning program, or fires limited to low intensity burns outside the nesting season.

The two threatened invertebrate species, *Roblinella agnewi* and *Lissotes menalcas* are restricted to wet forests with well developed litter layers and rotting logs. Increased fire frequencies may result in the loss of these habitats and the associated invertebrates as the wet forests become drier and more open. Locations of these threatened species have not been mapped as it is considered that conservation of suitable habitat for these species is more important than managing specific sites.

Implications for Fire Management Planning

Fire can adversely affect threatened fauna by killing individual animals, removing their habitat or removing specific elements in their habitats, such as nest sites and feeding areas. This strategy has identified known critical habitat elements for threatened species in the Park that may be damaged by fire. Where possible measures to minimise the risk of these being damaged by fire have been specified. In general, the strategy aims to conserve the known habitats of threatened species within the Park, either by excluding fire, or prescribing an appropriate fire regime to ensure the long-term viability of the species.

4.2.6 Other Significant Fauna and Habitats

Wellington Park contains a high diversity of fauna habitats. Fauna species and habitats of conservation value are discussed in detail in Chapter 3 of the Draft Wellington Park Values, Use and Management Inventory (WPMT, 1996). Since completion of the inventory, a mammal survey of Gum Top Spur in the far north west of the Park has been carried out by Hird and Hammer (1995). Fauna species not listed in the Threatened Species Protection Act (1995) but still considered to have conservation value in Wellington Park are listed in Table 5.

Potential habitat for threatened fauna, and other fauna of conservation value within the Hobart City Council area has been modeled by Northbarker Ecosystem Services (2004). These potential habitat areas are shown in Figure 5b.

Table 5 - Fauna of Conservation Value in Wellington Park

Species	Conservation Status ¹	Habitat in Wellington Park
<i>Acanthornis magnus</i> scrubtit		Confined to the most mesophytic gullies, such as at Fern Tree and Collinsvale, this species is regionally significant with few populations in the vicinity of Hobart.
<i>Aegotheles cristatus</i> Australian owl nightjar	Unknown risk status	An uncommon species which inhabits dry forests. Roosts and nests in tree hollows.
<i>Anaspides tasmaniae</i> shrimp		Aquatic species restricted to permanent streams at high altitude.
<i>Apteropanorpa tasmanica</i> alpine Tasmanian scorpion fly		Summit of Mount Wellington.
<i>Bettongia gaimardi</i> Tasmanian bettong	Requires monitoring	Dry sclerophyll forest. Recorded from <i>Eucalyptus tenuiramis</i> and <i>E. amygdalina</i> forest on mudstone in Lenah Valley (A. North personal observation) and Goat Hills (Hammer, 1997).
<i>Cercartetus lepidus</i> little pygmy possum	Requires monitoring	Inhabits dry forest, wet forest and heathland. This species has a restricted distribution on the Australian mainland and is uncommon in Tasmania.
<i>Dasyurus viverrinus</i> eastern quoll	Requires monitoring	Areas where there is a mosaic of open forest, woodland and grasslands (Stoddardt & Challis 1991, Jones & Rose 1996). Found to be abundant in wet forest on Gum Top Spur (Hird & Hammer, 1995).
<i>Falco peregrinus</i> peregrine falcon	Requires monitoring	An uncommon species which nests on cliff ledges. Three pairs are known to nest in the Park.
<i>Gallinago hardwickii</i> Latham's snipe	Requires monitoring	Treeless marshlands at high altitude. Migratory wetland species listed on Japan-Australian Migratory Bird Agreement.
<i>Neophema chrysostoma</i> blue-winged parrot		Uncommon in southern Tasmania, it is known to breed in the Fern Tree area. Nests in hollows in old growth eucalypts.
<i>Nesoxenica leprea</i> leprea brown butterfly		Rainforest specialist restricted to damp gullies supporting hook sedge (<i>Uncinia tenella</i>).

Species	Conservation Status ¹	Habitat in Wellington Park
<i>Ornithorhynchus anatinus</i> platypus		Although widespread in permanent waterways across Tasmania, there is concern about this species because it is affected by the potentially fatal ulcerative fungal disease (<i>Mucor amphiborun</i>) (Stewart & Munday 1999). The species is also sensitive to disturbance of riparian habitat where they construct their burrows. Increased turbidity and sedimentation associated with fire damage in some upper catchments could also have an adverse impact.
<i>Perameles gunnii</i> eastern barred bandicoot	Requires Monitoring	Grasslands, both native and introduced, associated with cleared areas such as The Springs (Taylor & McQuillan 1994). Also in forest on Gum Top Spur (Hird & Hammer, 1995).
<i>Pezoporus wallicus</i> ground parrot	Requires monitoring	High altitude marshy areas such as Pond Plain, Midsky Swamp and marsh areas between Mount Connection and Collins Bonnet (Bryant, 1991). Also recorded from Snake Plains (Ratkowsky, 1984). This species is in decline in south-east Tasmania.
<i>Stenocapha vitrinaformis</i> snail		Mount Wellington is an important area for this localised species (Brereton, 1998).
<i>Tympanocryptis diemensis</i> mountain dragon	Unknown risk status	Dry open forests on lower slopes.

1 - Vertebrate Advisory Committee (1994), Invertebrate Advisory Committee (1994).

The Tasmanian bettong (*Bettongia gaimardi*) has been recorded as reappearing on burnt sites in the Hobart area, following a number of years absence (Hird, 1995). Two possible reasons for this are:

1. There is evidence that fire plays a role in stimulating the fruiting of many species of fungi that are an important food source for bettongs (Johnson, 1997).
2. Bettongs appear to prefer areas with an open understorey and these are often maintained by frequent fire (Taylor, 1993).

However, the relationship between bettong abundance and fire is not clear cut. Fire is thought to synchronise fruiting cycles within populations of fungi so that they trigger a pulse sporocarp production, however, this is often followed by years of low sporocarp production (Johnson, 1997). It has also been suggested that frequent firing of habitat may cause a decline in the species richness and abundance of soil fungi (Johnson, 1997). These fungal species are associated with the litter layer and organic matter near the soil surface, and are thus sensitive to fire.

The eastern barred bandicoot (*Perameles gunnii*) is listed as nationally vulnerable (Schedule 1 of the Commonwealth Environment Protection and Biodiversity Protection Act, 1999), but is not listed in the Tasmanian Threatened Species Protection Act, 1995. In Tasmania the eastern barred bandicoot is often found in highly modified landscapes, and populations known to inhabit native vegetation are considered important. This species requires areas of dense grass and shrub cover for shelter. The mosaic burning pattern that will be implemented in this fire management strategy will help to ensure that there will always be some areas with suitable cover for this species within Wellington Park.

Implications for Fire Management Planning

In Tasmania the primary habitat for many of the species listed in Tables 4 and 5 is much reduced from its former extent. This is partly due to the history of repeated wildfires which have taken their toll of old growth forest, rainforest and other fire sensitive habitats. Consequently there is now concern over the future availability of habitat for species that require old trees with hollows for nesting and/or shelter. Although there are a considerable number of overmature and dead trees in Wellington Park, and therefore a likely increase in the density of hollows due to wildfires, this is a short term phenomenon. Many of the trees killed during or subsequent to the 1967 wildfire have already disappeared from the canopy. Beneath this broken canopy is typically a dense regrowth layer of 30 year old trees. It is likely that in the medium term there will be a shortage of old growth trees as the existing ones die out, and there are few mature trees to replace them. Further large wildfires in the Park are likely to exacerbate the future shortage of this important habitat element. Intense wildfires can also have the effect of reducing tree hollow size due to the elimination of overmature trees and the onset of premature damage to younger trees (Inions et al., 1989).

This fire management strategy aims to ensure that unburnt areas of habitat for fauna of conservation value will be available at all times to ensure whole populations are not eliminated.

4.2.7 Conservation of Biodiversity

Fire plays an important role in maintaining biodiversity in Australia. Changes in the fire regime (season, frequency, type and intensity of fire) can cause progressive changes in plant communities. High fire frequencies and long-term exclusion of fire have both been shown to lead to progressive changes in plant community structure, and a reduction in biodiversity. Failure to use fire properly as a management tool can be considered one of the threats to some of the natural habitats within Wellington Park.

Frequent burning of native forests is known to reduce species diversity and make it more vulnerable to weed invasion (Williams, 1991). A high fire frequency (less than 5 years) will usually favour grasses in the understorey at the expense of shrubs, and severely restrict the re-establishment of canopy species.

Due to the large variations in climate, topography and soils, Wellington Park, and Mount Wellington in particular, is one of the most biologically diverse areas of its size in Tasmania (Kirkpatrick, 1996). The characteristics of the vegetation have also been shaped by fire which has imposed a more significant influence over the past century than it perhaps did in the past. The Park is best known for its distinctive alpine plant communities which experience lower rainfall than most other alpine vegetation in Tasmania. The Park is also significant for the altitudinal changes in the vegetation which demonstrates steep ecological gradients. Many of the plant communities in the Park are fire sensitive, and there is evidence to suggest that structural complexity, age diversity and species composition has been adversely impacted by frequent burning this century. Several vegetation types, including alpine heaths and rainforest, are much reduced in extent due to fire.

Relatively frequent hazard reduction burning in some parts of the Park in the past is likely to have caused changes in the vegetation cover, such as a reduction in the extent of wet forest, thinning of the shrub understorey, and establishment of grassy woodlands.

The general principle for fire management planning will be to reduce fire frequency, minimise the risk of severe wildfires, and protect those diminished, highly fire sensitive plant communities from unnecessary burning. The exceptions to this are some of the dry forest plant communities in the north-eastern part of the Park which benefit from a regular, though not overfrequent, fire regime.

It has been found that sites with accumulated forest litter support a larger and more diverse invertebrate fauna than sites where fire has reduced the litter (Suckling et al., 1985). Several groups of invertebrates have disappeared from Wellington Park, or have significantly declined in numbers since early records (WPMT, 1996). The relatively high frequency of wildfires this century is considered a likely factor in this decline by producing changes in the forest microclimate and removing forest litter. The summit plateau includes a significant habitat for invertebrates in the Park (WPMT, 1996).

Aquatic invertebrates can be indirectly affected by fire. Invertebrate marshland fauna are susceptible to wildfire through siltation, shade removal and subsequent increased evaporation leading to the drying out of smaller water bodies (WPMT, 1996). Stream invertebrates can be adversely affected by fire damage to gully and riparian vegetation, and through increased siltation. Fire fighting foams used in fire management operations can also have a detrimental effect on aquatic invertebrates, and great care needs to be taken to ensure that chemicals associated with foams do not enter waterways.

To maintain a wide range of invertebrate species in the Park it is important that some areas remain unburnt. These sites provide essential refugia from which recolonisation can occur (Campbell & Tanton, 1981). Optimal timing of fire for invertebrates in dry forest habitats maintained by

relatively frequent burning is inconclusive, although Hammer (1997) concludes that in dry sclerophyll forest late spring burning is likely to have the least adverse impact.

Implications for Fire Management Planning

Fuel reduction burning is identified in the Wellington Park Management Plan (WPMT, 1997) as risking adverse impacts to faunal values through:

- simplification of undergrowth leading to loss of habitat
- reduction in logs and litter
- reduction in the extent of wet forest.

However, it should be noted that these adverse impacts are due to inappropriate burning prescriptions, rather than fire itself which is essential to the long-term maintenance of many fauna habitats. The fire regimes that are most likely to threaten zoological values within the Park are those that lead to a loss of important habitats, or particular habitat elements within the Park. Similarly, extensive wildfires that burn whole areas of isolated habitat in one event can result in the temporary, and in extreme cases the permanent, disappearance of sensitive species from that area. This strategy aims to maintain existing fauna habitats through the exclusion of fire, or the application of appropriate fire regimes.

Areas of old growth forest are a diminishing localised resource in Wellington Park and are considered to be 'assets' worth protecting from high intensity wildfires. However, it is unlikely that low intensity prescribed burns would have an adverse impact upon the old growth elements in forests in the Park.

The wet sclerophyll forest communities within Wellington Park naturally have a very low fire frequency. Burning these plant communities at even the frequency of 15 years available under this fire management strategy would be likely to cause changes in understorey structure, and loss of species (Fensham, 1991). This strategy therefore aims to exclude fire from these plant communities for at least the 15 year of its duration, except where burning may be required to protect other assets. Some areas of wet forest may be considered for burning in future cycles of the fire management strategy for the Park.

The drier open forest, woodland, and grassland plant communities in Wellington Park are considered to be dependant on fire for their long-term survival. Periodic burning will help to maintain diversity in the understorey, and allow fire dependant species to germinate and establish. However, there is a need to protect important habitat elements (such as dead trees, old logs and stumps) during these burns, and to ensure adequate retention of unburnt patches of each forest type to act as refugia for recolonisation of burnt habitats. The management procedure for prescribed burning in Appendix A of this strategy includes the retention of dead trees, logs, and stumps as one of its prescribed outcomes.

Currently there is some debate over the optimal season for burning dry forests, grassy woodlands and grasslands. In fact it is likely that they benefit from a varied fire regime. The season of burning specified in this strategy has therefore been deliberately varied, except where there has been a specific need, such as avoiding the flowering time of a threatened species.

4.3 Park Usage

4.3.1 Recreation

Past land uses in Wellington Park have included grazing, timber getting and quarrying. These uses ended with the declaration of Wellington Park in 1993. Tourism and recreation are now the dominant uses of the Park and are described in detail in Part 3 of the Wellington Park Management Plan (WPMT, 1997) and Chapters 6 and 7 of the Draft Values, Use and Management Inventory (WPMT, 1996).

Tourism is concentrated on the summit of Mount Wellington with an estimated 250,000 visits each year. The summit is one of the four top tourist attractions in Tasmania in terms of tourist numbers. Tourist visits are expected to increase in number and duration if a proposed new development at The Springs goes ahead.

The management inventory for the Park (WPMT, 1996) lists a wide range of recreational activities in Wellington Park. While there are no reliable figures for the amount of recreation use, this is considerable, with walking (often with dogs) and mountain bike riding being the most popular. The intensity of recreational usage of Wellington Park is highest in the eastern part of the Park, particularly the eastern slopes of Mount Wellington. Almost all recreational activities in the Park involve day trips from various access points into the Park. It is rare for users to stay overnight in the Park.

The main user groups likely to be affected by fire management in the Park are listed in Table 6 along with the part of the Park they frequent and a rough estimate of numbers.

Table 6 - Estimated Distribution of Recreational Usage of Wellington Park

Use	Zone				Probable level of use
	summit	peri-urban	Mountain Park	remote areas	
Sightseeing	•••	-	-	-	estimated as 250,000 visits annually
Walking ¹	-	•••	•••	•	several thousand visits per year
Horse riding	-	•	•	?	currently limited use
Bike riding ²	-	••	••	-	several thousand visits per year
Four wheel driving	-	•	•	•	hundreds of visits per year, controlled by permits
Trail bike riding	-	•	-	-	unauthorised use only
Picnicking	•	•	•	-	concentrated on facilities at The Springs and Myrtle Forest

Relative level of usage:

- High
- Medium
- Low
- None or infrequent

1 - Includes running, bushwalking, nature study, camping, orienteering, exercising dogs.

2 - Mainly mountain bikes but some road cycling.

A purpose built mountain bike park has recently been completed at the end of Tolosa Street, Glenorchy.

Four wheel drive touring is strictly controlled within the Park by locked gates and a permit system. The only part of the Park with completely unrestricted vehicle access is Pinnacle Road to the summit of Mount Wellington. Jefferys Track, White Timber Trail and other tracks in the western portion of the Park are also unrestricted, but the condition of the trails limits usage to four wheel drive vehicles.

Trail bike riding is prohibited within the Park but still occurs, particularly in the part of the Park close to urban areas in Glenorchy.

Implications for Fire Management Planning

The recreational experience for all users could be severely impaired by fires in the Park, particularly extensive, high-intensity wildfires. The recreation activities that are of particular relevance to this fire management strategy are:

- activities that can cause damage to fire trails (eg, four wheel drive touring and trail bike riding)

- activities that increase the risk of fires starting in the Park (eg, picnicking, camping)
- recreation activities that could result in people being injured by fires (eg, walking, rock climbing, camping).

The summit of Mount Wellington has by far the greatest usage of any part of the Park. Tourists and sightseers may be at risk if a large wildfire cut Pinnacle Road, or even covered it with smoke. In this situation, it would be safer for visitors to stay at the car park at the summit which is large enough to provide a safe refuge from wildfires, rather than trying to 'escape' by hurriedly driving down the road.

This fire management strategy aims to enhance recreational usage of Wellington Park by minimising the risk of large wildfires which reduce the amenity of the Park, and reducing the risk of recreational users being injured by fires. This will be accomplished by:

- ensuring Park users abide by Regulation 17 of the Wellington Park Regulations, 1999, which prohibits the lighting of fires in the Park, including picnic fires and campfires, except in designated fire places, or in an emergency
- including basic personal fire protection advice in the information section on the back of the Wellington Park Walking Map
- erecting suitable signage to advise walkers not to enter the Park on days with total fire bans
- not issuing four wheel drive/horse permits on days with total fire bans.
- provision of gas or electric barbeques at picnic areas within and adjoining the Park to replace existing wood fire places (The Springs, Myrtle Forest, Lenah Valley, Strickland Falls, Fern Tree and Fern Tree Bower). In the interim signs should be provided stating that fire places should not be used when the Fire Danger Index is high, very high, or extreme.
- closing, or controlling traffic on Pinnacle Road if there are uncontrolled wildfires burning in the eastern portion of the Park which could affect public safety on this road.

4.3.2 Water Catchment

The main catchment areas in Wellington Park are shown in Figure 6. Some of these have been used as sources of high quality water for domestic use since the earliest days of European settlement. Hobart Water, as well as Huon and New Norfolk Councils, currently harvest water for domestic use from the Park. The catchments currently being used for domestic water supply are listed in Table 7. The attractiveness of the Park as a source of domestic water is the high quality of the raw water, and therefore the low cost of the supply relative to other sources.

Figure 6 - Catchment areas in Wellington Park

Table 7 - Domestic Water Supply Catchments within Wellington Park

Catchment	Area Serviced	Comments
North West Bay River and Browns River	• Fern Tree • Kingborough Council • Hobart Council	• Fern Tree obtains all its water from this source. • Supplies the reservoirs at Ridgeway which are used to supply part of Hobart's water and nearly all of Kingborough Council's water.
Illa Brook	Derwent Valley Council	
Humphrey Rivulet	• Glenorchy Council • Hobart Council	Water from Humphrey Rivulet may be taken directly into the reticulation system or diverted into Limekiln Gull Reservoir
Limekiln Gully	• Glenorchy Council • Hobart Council	Small catchment with only intermittent flow. Limekiln Gully Reservoir is supplied from Humphrey Rivulet.
Knights Creek	• Glenorchy Council • Hobart Council	Knights Creek Reservoir is not currently in use due to heavy siltation from a large landslip in the catchment.
Rocky Creek	Huon Valley Council	

Although Hobart Water currently draws only about 20% of its total raw water from catchments in Wellington Park, it should be noted that some areas, such as Fern Tree and parts of the Kingborough Council area, rely entirely on the catchments in the Park for their drinking water supply. Hobart Water has recently installed a by-pass pipeline around Ridgeway Dam that allows water to be fed directly from the Derwent water supply distribution system to Kingston should Ridgeway Dam be out of service for short periods of time. However, this option involves an approximately 700% increase in water supply costs due largely to the energy required to pump treated water from sea-level up to the elevation of Ridgeway Reservoir.

The Cascade Brewery Company Pty. Ltd. draws water from Hobart Rivulet. In addition, many landowners surrounding the Park source water directly from the various watercourses running out of the Park. The Draft Wellington Park Values, Use and Management Inventory (WPMT. 1996) lists the main watercourses used for private water supplies as:

- Sorrell Creek
- Lachlan River
- Crabtree Creek
- Stephenson Creek
- Mountain River
- North West Bay River
- Glen Dhu Rivulet
- Sawyers Creek.

Implications for Fire Management Planning

Wildfires, and to a lesser extent low intensity hazard reduction and other management fires, have the potential to affect both water quality and yield from catchments. Water quality can be affected by increased sediment loads and ash in runoff from burnt catchments. Water yield may be affected by changes in infiltration rates, evapotranspiration rates, and reduced storage in swamps and peat beds following fires. The effects of fire on water quality are likely to be relatively short term (months), however effects on water yield may be long term (years to decades).

The likely effects of fire on water quality and yield can range from negligible to severe depending on a number of factors including:

- the frequency of burning
- the intensity of burning
- the erodability of the soils in the catchment
- the slope of the catchment
- the intensity of the rainfall events following the fire
- the time taken for the vegetation in the catchment to recover
- the stage of vegetation recovery following fire.

A worst case scenario for catchment degradation would be frequent, high intensity fires in a steep, high altitude catchment with highly erodable soils in an area with frequent high intensity rainfall events.

4.3.3 Infrastructure within the Park

The main infrastructure items in the Park are the two television and radio transmitters at the summit of Mount Wellington and their associated towers. Electricity for the transmitters is supplied via an overhead 11,000 volt transmission line from Fern Tree via The Springs. There are also a number of high voltage transmission lines running across Goat Hills in the north-eastern corner of the Park, and along the eastern boundary of the Park.

4.4 Adjoining Land Uses

Land uses adjoining Wellington Park include:

- cleared and uncleared rural properties
- urban areas
- state forests
- private forests
- council reserves
- a small abattoir

- Hobart Council landfill at McRobies Gully
- Glenorchy Council landfill north of Tolosa Park
- a limestone quarry.

Implications for Fire Management Planning

Wildfires originating in, or passing through, Wellington Park have the potential to severely affect many of these land uses; conversely many of these land uses can be a source of fires which can severely damage assets in the Park.

4.5 Fire History and Hazard Levels

The fire history of Wellington Park before the arrival of European man is not known precisely, however, it is accepted that fire over a period of thousands of years has been instrumental in affecting the present distribution of vegetation types in Tasmania (Tasmanian Fire Review Committee, 1994) with more fire resistant types on drier sites, moderately resistant types on moister sites, and types that are vulnerable to even very infrequent fires on higher, alpine sites. Generally, Aboriginal Tasmanians were shrewd users of fire and used it widely for hunting and access, however it is not known whether they used the Park extensively or not. If they did, it is likely that there would have been low intensity fires in the lower dry forest areas at relatively frequent intervals.

It is known that the frequency of fires in some Tasmanian vegetation types increased after Europeans arrived, at least until the 1970s. Parts of Wellington Park (generally the dry forests and woodlands) have burnt in most years since European settlement began to influence the occurrence of bush fires towards the end of the 19th century, and there have been widespread fires in years when fuels in the wet forests within the Park have been dry. Prior to the disastrous fires of 1967, large fires in the vicinity of Mount Wellington were reported in 1806, 1851, 1897, 1914, 1934 and 1945 (de Quincy, quoted in Pyrke, 1989). The extent and intensity of these earlier fires is not known.

4.5.1 The 1967 Wildfire

On 7 February 1967, virtually the whole of Wellington Park was burnt by about 17¹ separate wildfires that were driven by gale force winds from the north-west (see Figure 7). The few areas that escaped burning were often the areas that had been burnt in the previous year or so. These fires burnt in a south-easterly direction until the wind changed to the south-west later in the day.

These fires caused moderate to severe defoliation over much of the Wellington Range, particularly at the junctions of fire fronts and where main fires linked up with spot fires. Areas that escaped

¹ The Collins Bonnet or Sleeping Beauty fire which had five or more ignition points is counted as one fire.

severe burning were either in deep moist valleys, or in areas that burnt late in the day after the change in wind direction brought cooler conditions.

The widespread damage in Hobart was due mainly to the Limekiln Gully Fire which started at the western end of Tolosa Street near an area that had been burning prior to 7 February. The evidence suggested that there was only one fire in this area on 7 February which was first reported at about 7.30 am. It burnt in rough country which was inaccessible to the available fire fighting vehicles. The wind reached gale-force at about 11.45 am and by 2.30 pm the fire had covered a large area from north of Lenah Valley to Ridgeway. Two head fires developed, the eastern headfire spread rapidly up-slope into Mount Nelson, while the western headfire merged with the Turnip Fields Fire and continued in a south-easterly direction until the wind changed at about 3.30 pm. Meanwhile the Sleeping Beauty Fire had burnt the hotel at The Springs. By about 4 pm the two fires joined near the junction of Huon Road and Pillinger Drive causing large fire whirlwinds in the timbered country and burning property at Fern Tree. Eventually, the area burnt by the Limekiln Gully (or Hobart) Fire was 16,500 acres (6,500 ha), and 135 houses and the Cascade Brewery were destroyed.

Most damage in the Park was done by the Sleeping Beauty Fire. This fire combined with a fire that started near Collins Cap and then burnt over about 50% of the Park, much of the area being burnt after the wind changed direction from the north-west to south-west (see Figure 7).

4.5.2 Fires Since 1967

Information on the incidence of fires in and near Wellington Park was taken from a number of sources including; overlay maps maintained by Hobart and Glenorchy Councils, information from the Parks and Wildlife Service and Tasmania Fire Service, aerial photo interpretation, and field observations in March, May and September 1999. It should be noted that the various sources differ on the exact boundaries of the areas burnt at different times, and detailed records have only been kept since the 1980s. The boundaries of burnt areas shown on Figure 8 are therefore approximate only. It is almost certain that there have been smaller fires in the Park that have not been recorded, and therefore Figure 8 is likely to underestimate the extent and frequency of fires in the Park.

The fire records for Mountain Park maintained by the Mountain Park Field Manager differentiate between wildfires and hazard reduction burns, however records for other parts of the Park have not always distinguished between the two types of fires. It is considered safe to assume that fires to the west of the summit of Mount Wellington have all been wildfires, and fires recorded in the Glenorchy, Goat Hills and Mount Hull areas are likely to be a mixture of wildfires and hazard reduction burns.

Figure 7 - Fires Burning in Wellington Park on 7 February 1967

Figure 8 - Fires in Wellington Park Since 1967

Between 1980 and 1990, 27 fires were recorded in the Park, and some of these also burnt in adjacent areas. From 1983 to 1999, a large number of vegetation fires were reported by the Tasmania Fire Service from the urban/rural interface with the Park with the greatest concentration being in the peri-urban fringes to the west and north-west of Glenorchy, and to a lesser extent, Hobart.

The Ridgeway fire of 17 January 1998 perhaps gives a better indication of a likely future scenario than the 1967 fires, since the present likelihood of having many fires smouldering and likely to cause multiple massive fires under the influence of strong winds is remote due to stricter regulations, better organised fire services, and more modern equipment. The Ridgeway fire was reported just before 3 pm, starting near the site of an earlier fire it burnt into patchy forest fuels on steep slopes. The fire quickly burnt from Ridgeway to the outskirts of Kingston, with the head fire, driven by strong north-westerly winds, moving towards Taroona. Meanwhile, the back fire burnt up steep slopes towards Fern Tree. The wind shifted to the south-west in the early hours of the next day, turning the fire towards Sandy Bay and over Mount Nelson. The area burnt was about 4,000 ha, and seven houses were lost out of the several thousand that were threatened. As is all too common in bad fire weather periods, the Tasmania Fire Service had to attend many other outbreaks at the same time. The houses lost were deficient in defensible space, access and water, or were not attended by able-bodied residents or firefighters (Chladil, 1999).

Since the start of this fire management strategy there has been a major bushfire on the eastern face of Mount Wellington (February 2001), and a smaller fire between Mount Charles and Jefferys Track (November 2003). The extent of these fires is shown in Figure 8. Both fires were deliberately lit though the Mount Charles fire originated on private property and moved into the Park. There are no reports of assets being damaged by either of these fires.

Most of the dry forest areas along the eastern perimeter of the Park have been burnt by a series of hazard reduction fires during the 1970s and 80s. However, the scale of the hazard reduction program has declined considerably over the last 10 years. Seven management burns have been carried out in the Park since the start of the fire management strategy in 2000. In general scheduled management burns have been kept within containment lines, and have generally been within the prescriptions in the strategy.

Implications for Fire Management Planning

Bad fire weather can be expected from time to time in southern Tasmania when multiple outbreaks can be expected. Dry winters and springs can be followed by summers where fuels are very dry. Under these conditions, fires can be expected to move quickly under strong north-westerly winds and then move more or less at right angles on a broad front when the south-westerly wind change affects the fire. The strategy for fire suppression under these conditions should be to concentrate on the eastern flank fire.

Fires starting under extreme conditions in Wellington Park can be expected to threaten urban areas as did the Sleeping Beauty Fire of 1967. Since these fires can be expected to recur, it is necessary for property owners to ensure that buildings likely to be in the path of large bushfires are defensible.

4.5.3 Causes of Fires in Wellington Park

Data supplied by the Tasmania Fire Service were used to analyse the causes of fires in Wellington Park and nearby areas from July 1993 to June 1999. The results are given in Table 8.

Table 8 - Causes of Fires in and near Wellington Park

CAUSE	Rural Areas (72 fires)		Urban Areas (180 fires)	
	number	%	number	%
Fuel reduction/rubbish burning	32	44.4	28	15.6
Suspicious/malicious	8	11.1	67	37.2
Land management	8	11.1	1	0.6
Recreation	2	2.8	5	2.8
Lightning	2	2.8	0	0.0
Children playing	1	1.4	8	4.4
Smoking	1	1.4	0	0.0
Roadside fires	0	0	4	2.2
Construction & maintenance	0	0	3	1.7
Undetermined & other causes	18	25.0	64	35.6
total	72	100	180	100

In the more rural brigade areas (Bushy Park, Collinsvale, Grove, Lachlan, New Norfolk, Molesworth and Sandfly) 72 fires were reported that burnt in open areas (forest, scrub, grassland, etc). Of these, 32 (44%) were caused by hazard reduction burns or burning rubbish (often on days when there were high winds). In contrast, in the more urban brigade areas (Hobart, Wellington, Fern Tree and Summerleas) there were 180 fires of which 28 (16%) were caused by hazard reduction and rubbish burning. On the other hand there was a much higher proportion of malicious or suspicious fires in the more urban areas: 67 fires (37%) compared with only 8 such fires in the more rural areas (11%).

Data were also available for 142 fires in the same areas from January 1988 to June 1993, however this data set could not be directly compared with the later set because the reporting format was not the same. In this case, the causes were: suspicious 36 (25.4%), children 28 (19.7%), re-kindles

14 (9.9%), escapes 12 (8.5%), incendiary 6 (4.2%), rubbish disposal etc 6 (4.2%), smoking 5 (3.5%) others (eg, engine backfire) 12 (8.5%), undetected/unreported 23 (16.2%).

This information suggests that the most likely cause of fires burning into the Park would be escapes from hazard reduction and rubbish burning, and that suspicious/malicious lighting would be the most likely cause in the urban fringe. Prevention and public awareness efforts will need to be directed to these causes accordingly.

There were 14 fires caused by burning vehicles in the 1993 to 1999 data set, 5 of which were deliberately lit (eg, as part of car wrecking or stripping) and 6 were accidental, with the cause being unknown in 3 cases. There were also 46 "mobile property" fires - fires from exhausts or sparks. None of these were recorded from within Wellington Park, or are likely to have caused fires that spread into the Park.

It should be noted that the incidence of fires started by the main natural cause of fires, lightning strike, in and around the Park was very low. This confirms that it is unusual, though not impossible, for bushfires to be caused by lightning in and near Wellington Park.

The locations of the vegetation and vehicle fires in and around Wellington Park recorded on the Tasmania Fire Service data base are shown in Figure 9. There is an obvious clustering of fires around the Park perimeter in the Glenorchy area. This area contains relatively flammable dry forest and grassy woodland vegetation, and therefore is the part of the Park with the highest fire risk (hazard and likelihood of ignition). Fire prevention and control measures have been targeted at this area in the strategy.

Implications for Fire Management Planning

Fire prevention efforts need to concentrate on reducing the number of escapes from burning off and rubbish disposal in rural areas, particularly on the north-western boundary of the Park. An educational program which highlights the management uses of fires in rural areas, use of the permit system, fire safety, and the dangers fires pose to the natural heritage and cultural values of the Park may reduce the number of fires which start in suspicious circumstances. This latter strategy should also be employed in the urban and peri-urban areas.

Figure 9 - Location of Fires in and around Wellington Park (TFS database)

4.5.4 Fire Climate and Fire Weather

In summer the strong north-westerly winds that often precede cold fronts can contain dry air from the Australian interior. These winds pick up some surface moisture crossing Bass Strait, but as the air stream descends from the Central Highlands dry air at a higher altitude descends to the surface resulting in extremely low humidity. This combination of strong winds and low humidity creates the ideal meteorological conditions for major wildfires. If a high pressure system is blocked in the Tasman Sea, strong dry northerly winds can persist for days (Kirkpatrick, 1996).

As is usual in mountainous areas, the mass of Mount Wellington and the Wellington Range also act to modify the prevailing winds creating eddies in the wind flow and localised areas of increased wind velocity. These can have a strong influence on fire behaviour.

4.5.5 Hazard Levels

The higher the intensity of a wildfire the greater its destructiveness and the more difficult it is to control. Fire intensity is a function of the heat content of the fuel, the quantity (load) of fuel, and the rate of spread of the fire. The heat content of vegetation fuels is roughly the same, and rate of spread is largely a function of slope and weather conditions (wind speed and relative humidity).

It has been found that fine fuels are the main factor influencing fire behaviour. Larger fuels burn during a fire but do not contribute significantly to the spread of a fire. Fine fuels consist of live and dead plant matter (including grasses, bracken, leaves, bark, and twigs and branches) less than 6 mm in diameter. Fine fuel load (measured in tonnes per hectare) is therefore used as a convenient measure of the underlying fire hazard in areas dominated by woody vegetation. The fine fuel load at any given time is a balance between of the rate of fuel buildup, and factors that remove fuel, such as litter decomposition and fire. In the absence of fire, fuel loads build up to a maximum level where the rate of fuel production equals the rate of decomposition. This theoretical maximum varies for different vegetation types, however it is rare for dry eucalypt forests and woodlands in Tasmania to reach their maximum fuel loadings due to relatively frequent fires.

The degree of danger presented by a fire at any particular time is a combination of the underlying hazard and the prevalent weather conditions. The actual risk of a fire causing damage is a function of the underlying hazard, the degree of danger as controlled by weather conditions and slope, the probability of a fire igniting, and any measures taken to prevent the fire causing damage.

Table 9 shows the fuel loadings for the broad vegetation types within Wellington Park described in Section 4.2.1. This is only a general guide to current fuel loadings in the Park and there will be a number of local variations. Fuel loads have been categorised according to the Tasmania Fire Service fire risk assessment procedure (Appendix D).

This categorises fuel loads as follows:

Low - < 5 tonnes per hectare

Medium - 5 to 15 tonnes per hectare

High - >15 tonnes per hectare.

Table 9 - Fuel Loads in Wellington Park (1999)

Fire Management Class	Current Fuel Loads	Comments
Alpine zone	Low	Most of these plant communities have not been burnt since the 1967 fire.
Sub- alpine woodland and shrubland	Medium	Most of these forests have not been burnt since the 1967 fire.
Buttongrass moorland	Medium	Restricted to two small patches to the west of Jefferys Track.
Wet heath	Medium to High	Restricted to Snake Plains and isolated patches in the western portion of the Park.
Rainforest/gully scrub	Medium	This fuel type is restricted to small scattered pockets that have not burnt for an extended period, or have only experienced low intensity fires.
Wet and mixed forest	High	Most of these forests have not been burnt since the 1967 fire.
High altitude dry sclerophyll forest	Medium	Most of these forests have not been burnt since the 1967 fire.
Shrubby and heathy low altitude dry sclerophyll forest	Medium to High	Most of these forests have been regularly burnt, either for hazard reduction or by small wildfires.
Grassy/shrubby open forest	Medium	Most of these forests have been regularly burnt, either for hazard reduction or by small wildfires.
Grassland/grassy woodland	Medium	Most of these forests have been regularly burnt, either for hazard reduction or by small wildfires.
She-oak forest	Low	The largest area of this vegetation type in the Park was burnt in January 1997.

4.6 Protecting Assets From Fire

In general protection of assets within and around Wellington Park is the responsibility of the owner of the asset. However, the Wellington Park Trust and the managers of the different parts of the Park, Hobart City Council, Glenorchy City Council and the Parks and Wildlife Service, have an obligation to reduce fire hazard where it is a threat to neighbouring properties. Adjoining landowners have a responsibility to ensure they do not start fires that damage the Park.

4.6.1 Assets Within the Park

Fire management must be based on Wellington Park's considerable values, and should aim to add to them rather than to diminish them. These values include high quality water, landscape, recreation, wildlife, solitude, sites for telecommunications facilities and tourism. The Park is a unique natural area in close proximity to Hobart whose value is difficult to quantify in money terms but which is an icon that is highly prized by local residents and Tasmanians in general.

Assets in the Park that are potentially at risk from bushfire include infrastructure and other items, such as ornamental plantings, which would cost money to replace, and items of cultural and natural heritage value which could be damaged or destroyed by fire.

Built Assets

The major infrastructure items in Wellington Park that are potentially at risk from fire are the radio and television transmitters at the summit of Mount Wellington and their power supply line from Fern Tree, and the high voltage electricity transmission lines on Goat Hills and along the eastern boundary of the Park. The electricity transmission lines in the Park are located in cleared easements managed by the electricity authority that owns them. These provide some degree of protection from fire depending on the width of clearing and the amount of fuel in, or directly adjacent to, the easement. This strategy will improve the existing protection measures for these assets by minimising the risk of wildfires in the Park.

The other built assets in the Park are mainly recreational facilities and include:

- picnic facilities including shelters and fire places at:
 - The Springs
 - Fern Tree
 - Fern Tree Bower
 - Strickland Falls
 - Pillinger Drive
 - Lenah Valley
 - Myrtle Forest
- the lookout interpretation area at the summit
- a number of specially constructed walks and tracks
- a number of small shelters and huts, mainly in Mountain Park.

An inventory of all the huts and shelters in Wellington Park was completed in 2001 (Abrahams, 2001). This inventory included the current condition and recommended maintenance for 12 designated huts. The inventory also noted that many huts were damaged or destroyed in the 1967

bushfire, although there were a few 'miraculous' survivals. Some of the huts have been repaired a number of times after bushfires.

The majority of the huts and shelters within the Park have stone walls and corrugated iron roofs supported by wooden rafters. The others have corrugated iron walls and roofs. One of the huts, Junction Cabin, has an approximately 20 m wide clearing around the hut that would provide protection from most fires and would make the hut a relatively safe refuge during a fire. The other huts have no fire protection measures and would require similar clearances to Junction Cabin to ensure protection from fire. It will be more cost effective to plan to repair any of these huts that are damaged by fire than to establish and maintain defensible spaces around them.

Wellington Park also contains a number of minor, scattered infrastructure items, such as seats, railings, fences, board walks, foot bridges and signage, that have varying degrees of risk from fire depending on their location. It is not considered feasible to provide specific fire protection measures for each of these items, apart from the general protection provided by a fire hazard management program, provision of adequate access and water supply to assist in the quick control and suppression of wildfires, and removal of flammable material from near the assets during routine maintenance.

Fire risks for significant built assets considered to be at risk from fire within, or surrounding, Wellington Park have been assessed using Tasmania Fire Service procedures (see Appendix D), and are shown in Table 10 along with appropriate fire protection measures.

Natural Heritage Assets

The main natural heritage asset of Wellington Park is its diversity of microclimates, landscape, flora and fauna. The scenic and landscape values of the Park could be severely affected by fire. The scenic backdrop formed by the eastern face of Mount Wellington is highly valued by the inhabitants of Hobart, as is the peri-urban fringe on a more local scale. This area is highly visible and would be unsightly for several months or years if burnt severely. This strategy minimises the risk of fire damaging these assets through measures to minimise the risk of wildfires in the Park, and ensuring that any prescribed burns are of low intensity to limit canopy scorching.

A number of threatened flora and fauna species, and plant communities of conservation value, are known to occur within Wellington Park. Fire management measures for these assets are given in Table 11.

Table 10 - Fire Protection of Built Assets Within and Surrounding Wellington Park

Table 11 - Fire Management Requirements of Specific Biological Assets in Wellington Park

Cultural Heritage Assets

Currently no Aboriginal heritage sites have been identified within the Park, although no comprehensive survey has been carried out. European heritage items consist of existing huts, and ruins of buildings including huts, The Springs Hotel, and dwellings and other farm buildings at "Upper Merton", a former farming settlement along Humphries Rivulet. A preliminary assessment of the historical heritage of the Upper Merton site (McConnell and Scripps, 2005), identified 11 historical heritage features in the area including; building foundations, roads, bridges, drystone walling, fences, drains, artefact scatters, an old car body, and ornamental plantings associated with the former farms, but the report noted that there are likely to be additional heritage features in the area. McConnell and Scripps (2005) concluded that the Upper Merton site as a whole has historical, scientific, social and aesthetic significance to varying degrees at the local level. The only features considered to have high scientific significance in the assessment were "Farleys Road" (Fire Trail W32) and a number of ornamental plants associated with the farms that may be uncommon or rare varieties.

The preliminary assessment of the Upper Merton site (McConnell and Scripps, 2005) notes that most of the identified physical remains are not combustible and are unlikely to be damaged by fire. However, fire management activities could cause damage to the heritage features in the area, and personnel carrying out works in the area will need to consult with the Trust's historical heritage advisor to ensure the physical remains are not damaged. In particular, the assessment recommended that "Farleys Road" (Fire Trail W32) should not be damaged during fire management activities, or during fire fighting operations. The assessment noted that "Farleys Road" is of robust construction and should not be adversely affected by occasional usage by fire brigade or management vehicles. The assessment also noted that there may be additional historical sites and features in the area, and personnel carrying out works in the area need to be made aware of this.

Water Quality and Supply

Wellington Park contains important water supply catchments, and it is therefore important to ensure that fire management activities do not adversely affect water quality, especially as some of these catchments have soils which are considered to have a moderate to high risk of erosion (WPMT, 1996), and/or are on steep land which is susceptible to land slides. Section 5(e) of the Wellington Park Act, 1993, provides for the protection of the water catchment values of the Park.

The Wellington Park inventory (WPMT, 1996) notes that soil erosion following relatively frequent burning may be a factor contributing to relatively high turbidity levels in the Limekiln Gully Reservoir, although it was acknowledged that there had not been any studies to confirm a link. It was also noted during an inspection of the area that some of the fire trails in the catchment have been eroding due to lack of maintenance, and this may also be contributing to high turbidity levels in the reservoir.

The measures adopted to minimise the impact of fires and fire management activities on water quality and yield from catchments in Wellington Park are to:

- minimise the risk of wildfires starting and spreading in the Park
- ensure proper maintenance of fire trails within the Park
- rehabilitate vehicle trails in the Park that are not required for fire management
- not carry out any prescribed burns above water off takes in the following catchments:
 - North West Bay River
 - Browns River
 - Rocky Creek
 - Illa Brook
 - Humphrey Rivulet (Merton Weir)
 - Hobart Rivulet
- reduce the frequency of prescribed burns in the catchments of Knights Creek Reservoir and Limekiln Gully Reservoir to the minimum required for habitat management.

Despite these measures it is inevitable that large wildfires will occur in the water catchments within Wellington Park. The possible impacts of such fires include:

- decreased water quality
- changes in water yield
- short-term depletion of reservoirs due to water being drawn out of the system for fire fighting
- damage to infrastructure including pumps and treatment facilities
- damage to the power supply to pumps and treatment facilities.

The wildfire in February 2001 burnt approximately a quarter of the Humphrey Rivulet catchment above Merton Weir, and a small portion of the Limekiln Gully Dam catchment. Hobart Water advised that there was deterioration in the quality of the water at Merton Weir following the wildfire, and they were not able to use it for more than a year. No fire control lines were constructed in the Merton Weir catchment during the fire, and the loss of water quality appears to have been due to increased sediment runoff from burnt areas.

Hobart Water are currently developing contingency plans to deal with the possible effects on their water supply system of a major wildfire in Wellington Park.

4.6.2 Assets Outside the Park

The risk of high intensity wildfires occurring in Wellington Park cannot be eliminated, even if it was possible to carry out extensive hazard reduction burning within the Park. Assets adjoining

Wellington Park that could potentially be at risk of damage from fires within, or moving out of, the Park include:

- adjoining bushland reserves
- urban areas at Fern Tree, Glenorchy and Lenah Valley
- dwellings in bushland on the ridge to the north of New Town Rivulet
- rural properties and associated buildings to the north and south of the Park
- State and private forests adjoining the western portion of the Park.

The potential for damage to buildings in the path of large wildfires burning out of the Park will depend largely on:

- whether the fire will approach upslope or downslope
- the quantity and distribution of fuel surrounding the building
- whether they are attended during the fire
- their design
- the materials from which they are constructed
- how well they have been maintained.

Rural properties in the Lachlan and Collinsvale areas are unlikely to be affected by wildfires originating in the Park as they are both downslope and downwind of the Park. Fires moving out of the Park in this direction would be of comparatively low intensity and relatively easy to control. These properties are more likely to be threatened by large fires coming from the north-west as occurred during the 1967 fires, or by escaped burn offs within the area.

Rural properties in the Crabtree, Mountain River and Longley areas are downwind of the Park and were affected by fires moving out of the Park during the 1967 fires. However, fires moving out of the Park in this direction would be moving down relatively steep slopes that would reduce their intensity in all but the most extreme conditions. The Park boundary in this area is highly convoluted, and although desirable it is not possible to provide a perimeter fire trail to assist in the control of wildfires in this area. It is also impractical to reduce fuel loads in the wet forest plant communities that dominate the southern boundary of the Park, since they are too wet to burn in most years, and when they are dry enough for burning the high intensity of the fire would make it very difficult to control. It is therefore necessary for residents on rural properties to the north and south of the Park to provide for their own fire protection by reducing fire hazards, maintaining defensible spaces around all buildings, and ensuring that they are adequately equipped to defend their properties.

The Councils surrounding Wellington Park have the power under Section 200 of the Local Government Act, 1993, to require landowners to reduce fire hazards on their properties. The Trust

will need to liaise with Councils adjoining the Park to ensure they regularly inspect properties adjoining the Park and issue hazard abatement notices as required. It should be noted that fire hazard management on properties adjoining the Park will significantly reduce the risk of wildfires entering the Park. Fire Permit Officers also have an important role to play in ensuring that fires lit under permit are unlikely to escape and become wildfires.

It should be noted that the costs of complying with a hazard abatement notice can be significant, and some residents may lack the resources required to carry out adequate hazard reduction. This will need to be considered by the responsible agencies to ensure that decisions are fair and reasonable. Co-operative options could be considered in some instances to spread costs and improve fire protection.

Wellington Park adjoins three other conservation reserves; the N. R. Pierce Memorial Reserve on Goat Hills, the McRobies Gully Reserve, and a small Hobart Council reserve in the Barossa Creek catchment to the west of Kalang Avenue at Lenah Valley. A fire management plan for the Goat Hills area has been prepared in conjunction with this strategy and there is already a fire management plan in operation for McRobies Gully (von Krusenstierna and Rawling, 1998). This plan has been checked to ensure that measures in this strategy do not conflict. The small reserve in the Barossa Creek catchment has been included in this fire management strategy.

Private and State owned forests bordering the portion of Wellington Park to the west of Jefferys Track could be damaged by fires moving out of the Park. However, under the usual fire weather conditions (hot north-westerly winds) fires in this part of the Park would move away from adjoining forests. Due to a lack of access and control lines it would be difficult to conduct hazard reduction burning within this area. In fact, the relative isolation of this area is probably the best protection against fires given the negligible risk of lightning fires. However, it is appropriate that the Wellington Park Management Trust should cooperate with any fire management measures proposed by Forestry Tasmania, or private forestry companies adjoining this portion of the Park. This would include allowing them to include portions of the Park in hazard reduction burns if they could demonstrate that these were necessary to protect their resource, and the proposed fire regimes would not adversely affect the natural heritage values of the Park.

All dwellings bordering bushland areas face a degree of risk from fire, however those with bushland on the downslope side face a relatively greater risk, particularly on north facing slopes. The houses on the crest of the ridge to the north of Lenah Valley Road would therefore have a relatively high risk of damage from wildfires originating in or moving through the north-eastern portion of the Park. It is unfortunate that these developments were allowed to proceed.

Other dwellings in urban and bushland areas along the eastern boundary of Wellington Park have varying degrees of risk from fires in the Park. These have been assessed in detail in Table 10, and

appropriate protection measures specified. The protection measures recommended in this strategy will reduce the fire risk to these, and other dwellings surrounding the Park. However, the locations listed above are likely to remain at a relatively high risk from bushfires. It is therefore essential that residents in these areas take the utmost care to minimise fire hazards on their properties. Residents should also seriously consider measures to reduce the risk of ignition of their dwellings, such as installation of shutters on windows and exterior sprinkler systems.

4.6.3 Proposed Development of The Springs

The Wellington Park Management Trust and Hobart City Council have invited proposals for development of The Springs area on Pinnacle Road. The Springs was the site of a former hotel that burnt down in the 1967 fires. To facilitate development planning, the Trust and Hobart City Council prepared a development plan for the site (WPMT, 1998).

The Springs Site Development Plan included an assessment of the bushfire hazard on the site based on a combination of slope and vegetation. This analysis indicated that most of the site had a moderate fire hazard and existing cleared areas a low hazard. It should be noted that these results are misleading and would only apply to fires burning under relatively mild conditions. Under extreme fire weather conditions, such as during the 1967 fires, the whole of the site would have a high fire risk.

The reasons for this are as follows:

- The Springs is surrounded by dense regrowth wet forest which currently has high fuel loads.
- The site is very exposed and would be subject to the full force of the prevailing winds during a major fire.
- There is a long 'run' of forest, with high fuel loads on steep slopes, on the main fire approach to the site (from the north-east).
- Examination of aerial photos flown after the 1967 fires showed that the forests surrounding The Springs were burnt by a crown fire. These would have generated flame heights some 10s of metres above the tops of the trees.

Any future development at the Springs should incorporate the following fire protection measures as a minimum:

- Building protection zones and fuel-modified buffer zones around all habitable buildings to the specifications in the Tasmania Fire Service document Guidelines for Development in Bushfire Prone areas of Tasmania.
- Construction of all buildings to Australian Standard 3959 - Construction in Bushfire Prone Areas.

- A water supply of at least 20,000 litres dedicated to fire fighting. This supply must be located so as to be accessible by Tasmania Fire Service vehicles, and must be reserved for their use only. An additional supply would be required if a sprinkler system is installed.

The current proposal for The Springs is for a day centre incorporating an interpretation centre and shop, and a cafe. The proposal does not include accommodation. It is recommended that the proposed development be provided with at least a defensible space to reduce the risk from bushfires. If this cannot be provided it will be necessary to budget for replacement of the asset as it will be at high risk from bushfires.

4.7 Fire Management Practices

A detailed discussion of past fire management practices in Wellington Park is given in Section 9.2.6 of the draft Wellington Park Values, Use and Management Inventory (WPMT, 1996).

4.7.1 Fire Detection

There is a good fire detection system for Wellington Park, based on fire towers at Mount Lloyd to the north-west of the Park, Mount Faulkner to the north-east, and Doodys Hill to the south. These are supplemented by aerial reconnaissance flights on bad fire days which pass over the area on take off and landing at Hobart Airport. Fires on the eastern slopes of Mount Wellington and near the urban interface are usually reported promptly by residents. In addition, aircrew on commercial flights landing and taking off from Hobart Airport usually report any sightings of bushfires.

4.7.2 Fire Suppression

Responsibility for suppression of wildfires in Tasmania is shared between the Department of Primary Industries, Water and Environment, the Tasmania Fire Service (TFS) and Forestry Tasmania. The division of responsibility amongst these agencies is set out in the *Inter-agency Fire Management Protocol* (2004-05).

Clause 1.3 of the Protocol states that:

“TFS is responsible for all structural fire suppression statewide, and for fire suppression on all private lands and in the Wellington Park.”

However, Clause 3.1 of the Protocol also states that:

“The guiding principle is that; “the most able fire fighting crew of any agency will respond immediately to a reported fire as a priority”, regardless of the land tenure involved.”

Rapid suppression of small wildfires should be possible in sections of Wellington Park close to urban areas where there is good vehicle access. However, suppression of fires in remote areas of

the Park is likely to take longer and require a high commitment of resources. It should be noted that the risk of fires starting in the remote areas of the Park is much lower than in parts of the Park close to urban areas.

The GIS-based pre-fire suppression plan included in this strategy will help to ensure that emergency services fighting wildfires in the Park have access to the information they require for planning effective fire control strategies.

4.7.3 Fire Management Areas

Section 10.4 of the Wellington Park Management Plan divided the Park into four broad Fire Management Areas as a guide to fire management in the Park (WPMT, 1997). These are shown on Map 5 of the management plan. Further investigations undertaken as part of this strategy, and the result of recent vegetation surveys in the Park, have allowed this initial zoning to be modified and expanded into the system of fire management classes that include vegetation types with similar fire management requirements. These are detailed in Section 4.2.1 of this strategy.

4.7.4 Prescribed Burning

Following the 1967 fires most of the bushland around the urban perimeter of Hobart was burnt at regular intervals to reduce fuel loads (Sutton, 1985). This included the eastern perimeter of the Park where there is a system of fire trails. These areas were burnt relatively frequently in the 1970s and 80s, however there has been a marked decline in the frequency of hazard reduction burning in the last ten years. It should be noted that the primary aim of all these burns was hazard reduction.

Section 10 of the Wellington Park Management Plan (WPMT 1997) contained a number of actions relating to prescribed burning. These were based on the fire management areas shown on Map 5 of the management plan. As noted in the previous section, this zoning system has been modified and expanded to provide the basis for the detailed prescribed burning program in this strategy.

The approach adopted in this strategy is to restrict prescribed burning primarily for fire hazard reduction (ie maintaining fuel loads below 8 tonnes per hectare) to the immediate vicinity of assets within and adjoining the Park that require protection. Prescribed burning in other areas is primarily aimed at ecosystem management, but will have the additional benefit of reducing hazard for a period following each fire. Prescribed burning will be generally confined to dry forest plant communities on the lower slopes in the Hobart and Glenorchy Council areas. Prescribed burning is not considered appropriate for other parts of the Park for the following reasons:

- Alpine and sub-alpine plant communities are relatively fire sensitive and would be damaged by frequent burning. In addition, frequent burning in these areas would adversely affect water quality and yield in the water supply catchments within the Park.

- Wet and mixed forests naturally have a low fire frequency and will not require burning for ecosystem management during the period of this strategy. It is also very difficult to ensure a low intensity fire when burning these communities. By the time these areas have dried out sufficiently to carry a fire, the weather conditions are usually too dry, and the fuel loads too high, for them to be burnt safely. These communities also contain fire sensitive species and there are few control lines available to stop hazard reduction burns in these vegetation types from burning upslope into fire sensitive sub alpine and alpine plant communities. In addition, many of these forests are in water supply catchments.

The fire threat from these areas has been managed by the creation of defendable spaces around assets at risk, or prescribed burning of surrounding areas of dry forest.

The prescribed burning program in this strategy is based on the division of the dry forest habitats that require burning into a mosaic of management units which can be burnt at a frequency, season and intensity that is optimal for the plant community within each unit.

It should be noted that there are risks associated with prescribed burning, including escape of the fire beyond control lines, increased erosion, and weed invasion. The precautions that will be taken to minimise these risks are detailed in the management procedures in Appendix A.

4.7.5 Defendable Spaces

The higher the intensity of a bushfire approaching a building, or other asset, the greater the risk of ignition. Fire intensity is controlled by a number of factors including temperature, humidity, wind speed, slope, and quantity of fine fuel. The only one of these factors that we can control is fuel load. It is therefore possible to reduce the risk of a building or other asset igniting or being damaged in a bushfire by creating a zone around the building where the amount of flammable fine fuel is kept at a low level. These defendable spaces consist of an inner building protection zone immediately adjacent to a dwelling or other asset at risk from fire, and an outer fuel modified buffer zone between the building protection zone and bushland with a high fire hazard. The width of both these zones must be increased as slope increases in order to maintain a reasonable degree of fire protection.

The main of these two zones is to ensure that there is a reduction in the intensity of a bushfire as it approaches a dwelling, or other asset at risk from fire. Defendable spaces also provide:

- safe access for firefighters
- a control line for firefighting operations
- a relatively safe refuge area for firefighters and residents.

Building protection zones are normally established within individual lots and maintained by the landowner or resident. Fuel modified buffer zones may be required on large lots, and in some areas need to be maintained on adjoining private property, or public reserves.

It must be stressed that fire hazard reduction on individual properties adjoining the Park is essential for fire protection. Fuel modified buffer zones within the Park will be of little use if there are high fuel loads on neighbouring privately owned lots. The Trust and individual landowners must cooperate to provide and maintain adequate fire protection. Wherever a defensible space is specified in this fire management strategy, individual landowners adjoining those zones must maintain building protection zones, and, where necessary, fuel modified buffer zones within their lots. Where landowners are unwilling to cooperate, Glenorchy and Hobart Councils must exercise their powers under the Local Government Act, 1993, to ensure that adequate defensible spaces are established and maintained. Procedures for establishing and maintaining defensible spaces are given in Appendix A.

4.7.6 Vehicle Access and Fire Trails

Prior to the fires in February 1967 there were many trails on the lower slopes of the Wellington Range, mostly associated with tree harvesting for sawn timber and firewood. However, there were almost no trails in the more remote, high altitude parts of the range (Tasmania Fire Service, 1986)

Following the 1967 fires, which burnt almost all of the Wellington Range, a large fire trail construction program was initiated by the Rural Fires Board. This was in response to the report of the Commission of Inquiry into the 1967 fires which emphasised the need to control fires burning in remote areas. Trails were constructed quickly to formation earthworks only, with an assumption that they would be progressively upgraded in the future. The prime consideration at the time was to take advantage of the open landscape following the fires to quickly establish a network of trails (Tasmania Fire Service, 1986).

Fire Trails within the Park are currently maintained by the three management agencies within the Park; Hobart City Council, Glenorchy City Council and the Parks and Wildlife Service. There are also a number of trails used and maintained by electricity and water supply authorities that also function as fire trails. In the past the Tasmania Fire Service has also contributed to maintenance of fire trails within the Park.

The fire trails in the Mountain Park section of Wellington Park are well maintained by a skilled plant operator, and are generally in excellent condition. In other parts of the Park the maintenance program has not kept pace with deterioration of some of the trails, particularly in recent years. Consequently, a number of trails have deteriorated to the point where they have become impassable. To some extent there has been a natural culling of trails within Wellington Park with trails that were poorly located, or required a lot of maintenance, becoming impassable and being

closed. The trails that remain open within the Park generally represent those that are reasonably well located and relatively easy to maintain.

Currently there is relatively easy access for fire fighting in the eastern portion of the Park close to urban areas in Hobart, but the remainder of the Park cannot be accessed quickly, or is inaccessible by vehicles. The East-West Trail is the main access route through the Park along the top of the Wellington Range. There are currently four links from the East-West Trail to the northern perimeter of the Park but only one trafficable link from this trail to the south. This means that it is generally more effective for brigades from the northern side of the Park to respond to fires in the Park than brigades from the south.

In the late 1980's the Hobart Special Fire Area Committee, as part of its responsibility for fire suppression in Wellington Park, upgraded much of the East-West Trail. Following these works the committee expressed concern about the damage caused to fire trails by the uncontrolled use of recreational vehicles within the Park. In addition, some landowners adjoining the Park were denying access to the Park across their properties. As a result, in 1989 the then Department of Parks, Wildlife and Heritage erected gates on the fire trail system west of Big Bend, and introduced a permit system to control access by recreational vehicles. The Department also formalised access over portions of the fire trails that crossed private property or council land adjoining the Park.

One of the actions specified in Section 10.4 of the Wellington Park Management Plan (WPMT, 1997) is to "maintain an effective system of fire trails within the Park". The vehicle trails within and adjoining Wellington Park that are required for fire management purposes are shown in Figure 10. All other vehicle trails within the Park can be closed and rehabilitated unless required for other purposes.

Fire trails within the Park have been coded according to their access characteristics, and prioritised for maintenance purposes in Table 12. Table 12 also contains an assessment of the current condition of each trail and a works program.

Actions 21 and 22 in Section 10.4 of the Wellington Park Management Plan list a number of trails that should remain open, and others that should be closed. However the management plan noted that these closures should be subject to detailed assessment in the fire management strategy. This strategy proposes the following variations to these actions:

- The Cathedral Rock Trail is currently closed and there would be no advantage in reopening it for fire management purposes.
- The following trails shown on Map 5a of the Wellington Park Management Plan (WPMT, 1997) should remain open;
 - the trail incorrectly labelled as "Old Farm Track" (Ref. 4 in Map 5a)

- Fingerpost Track west of the water reservoir (Ref. 5 in Map 5a)
- Middle Track downslope of the Fern Tree reservoir (Ref. 10 in Map 5a).

Figure 10 - Vehicle Access Points and Fire Trails in Wellington Park

Table 12 - Condition and Maintenance of Fire Trails in Wellington Park

Figure 10 also includes a number of smaller trails in the north-east section of the Park that were not considered in the management plan. These trails are being retained to provide control lines for prescribed burns and controlling wildfires. The fire history of Wellington Park has indicated that this part of the Park has the highest risk of wildfires.

Guidelines for the construction, repair and maintenance of fire trails within Wellington Park are given in Management Procedures (MP) 1 and 2 in Appendix A. In general, the fire trails in the Mountain Park section of Wellington Park can be used as a model for the rest of the Park. Closure of fire trails in mountainous or hilly terrain requires that they be 'put to bed' properly in order to minimise the risk of erosion. Guidelines for rehabilitating fire trails are given in MP 3 in Appendix A.

Effective control of access to the fire trail system is considered important as excessive usage, particularly when trails are wet, can cause considerable damage, thereby increasing maintenance costs and possibly resulting in trails being impassable when needed. All but two of the access points to the fire trail system within Wellington Park from public roads currently have locked gates or bollards to prevent unauthorised usage. These measures are probably effective against vehicles, but will probably not stop trail bikes. Keys for all the entry gates into Wellington Park need to be available to emergency services, such as police, fire service and ambulance, and other authorities with a legitimate need to have access to the Park. An access protocol for Tasmania Fire Service usage of the fire trails within the Park when not responding to a fire is given in MP 15 in Appendix A.

During the initial community consultation phase of this strategy it became apparent that there were conflicting views regarding three of the fire trails in the Park. These views and the position adopted in this strategy are discussed in more detail below.

Big Bend Trail

This trail links the Big Bend on Pinnacle Road to the East-West Trail and connects with the western end of the Knights Creek Trail (Figure 10). This trail had fallen into disrepair and was not usable as a fire trail when this fire management strategy was prepared. The main arguments for closing this trail completely are that it reduces the natural aesthetics of the alpine/subalpine plateau, and traverses the headwaters of two water supply catchments (Humphrey Rivulet and Knights Creek) so that runoff from the trail may affect water quality. It will also be relatively expensive to maintain this trail. On the other hand there was a general consensus in the Tasmania Fire Service that this trail was an important access route to the East-West Trail, and also a valuable escape route from the East-West Trail. This trail is also the only control line for stopping fires in the Knights Creek and Humphrey Rivulet catchments moving upslope into the sensitive alpine ecosystems on Mount Wellington.

For these reasons it was considered that this trail should be repaired and upgraded for use as a fire trail. Repairs to the trail have been carried out and it is now in reasonable condition.

Mountain River Trail

This trail runs from the end of Mountain River Road to the East-West Trail. It has been closed for a number of years. Fire brigades to the south of Wellington Park pointed out that this trail had been their only access route onto the East-West Trail, other than Jefferys Track further to the west. It was also noted that this trail had provided a potential escape route from the East-West Trail. On the other hand there is evidence that this trail was poorly located and prone to washouts.

It is considered that this trail should remain closed with the option of reopening sections, or all of the route if required to control a major wildfire. The reason for this are:

- This trail was primarily for access and was not a significant fire control line.
- This strategy proposes to upgrade the Big Bend Trail to provide an access route to the East-West Trail from the south.
- As large fires will travel in a southerly direction across the Park, it is considered more appropriate to use brigades from the north and the east to respond to fires within the Park. Brigades to the south of the Park will need to be prepared to carry out property protection along the southern boundary of the Park if a fire cannot be contained within the Park.

Knights Creek Trail

This trail runs along a narrow ridge from the Knights Creek Reservoir to the Big Bend Trail. This trail is currently impassable due to a number of washouts and fallen trees. The main argument for keeping this trail is that it provides the only fire control line on the eastern side of Mount Wellington between the Goat Hills and Fern Tree. The arguments against keeping this trail are that it runs along the divide between two water supply catchments and there is evidence that concentrated runoff from the trail may have contributed to a major landslide in the Knights Creek catchment that has silted the reservoir requiring it to be closed until the slip has stabilised. The lower part of the trail runs along the top of a narrow, steep-sided ridge and it is doubtful that it would be an effective control line unless the vegetation on the north facing slope was maintained in a fuel reduced state by frequent burning. However, this would be likely to lead to on-going erosion that could permanently close the Knights Creek Reservoir.

On the balance of these arguments it is considered that existing washouts on this trail should be repaired, the trail properly drained to reduce the risk of future landslips and then closed as a fire trail. This will allow the option of re-opening the trail quickly with a bulldozer if it is required as a fire control line in the future.

Fire Trail Signage

All fire trails within the Park need to be clearly signposted to avoid confusion when out of town fire service brigades and other emergency services are operating in the area. At a minimum the fire trail numbers should be able to be clearly read from the cab of a Tasmania Fire Service vehicle from a distance of at least 10 m during the day, and in headlights or torch light at night. Intersections on smaller trails may also need to be signposted where fire trail continuity is not obvious. Fire trail signs should also indicate the size of TFS vehicles that can use the trail (eg W31/5 for light tankers, or W31/3 for heavy tankers).

4.7.7 Foot Tracks

There is a network of both formal and informal foot tracks within Wellington Park. Some of these tracks are useful in fire management as they can be used as control lines for prescribed burning or for backburning to contain small, low intensity wildfires. Use of existing tracks reduces the need to cut control lines through the bush with hand tools.

It is not considered necessary for fire management purposes to upgrade all the existing informal foot tracks in the Park to the guidelines in Management Procedure 4 (Appendix A). However, any track maintenance carried out should follow these guidelines, and new tracks should be constructed to these guidelines.

4.7.8 Fire Breaks

A number of fire breaks have been established and maintained along the eastern perimeter of Mountain Park for many years. Existing fire breaks within and close to the Park are shown in Figure 11. These breaks consist of approximately 30 metre wide clearings bordering fire trails. They enhance the effectiveness of the fire trails as fire control lines, and make it safer for fire fighters to operate along these trails.

The most important of these fire breaks are the ones along Inglewood Road, and the Bracken Lane Fire Trail. These breaks, and their associated fire trails, provide important control lines for stopping fires moving towards Fern Tree from the north. Without these breaks it would be dangerous for fire fighters to attempt backburning and other fire control operations in these areas.

This strategy aims to maintain the current system of fire breaks within the Park.

Figure 11 - Fire breaks in Wellington Park

4.7.9 Water Supply

Water supplies for prescribed burning or wildfire suppression in Wellington Park are available from:

- fire plugs in surrounding suburban areas
- a series of specially constructed waterholes and dams along the main fire trails within the Park
- the Knights Creek and Limekiln Gully Reservoirs
- creek crossings along fire trails within and adjoining the Park.

It should be noted that these water sources vary in their reliability, and some may not be useable for fire fighting following long droughts. Even the reticulated water supply system may fail during a large wildfire.

The locations of these water supply points are included in the GIS database for the pre-fire suppression plan. The characteristics of the waterholes is given in Table 13 including the approximate capacity in terms of fire service Category 3 tanker loads (approximately 3000 litres) and likely reliability. The two reservoirs and some of the larger waterholes and dams are capable of being used to supply water for helicopter borne fire fighting.

Most of the waterholes and dams in the Park are close to fire trails, and tankers should be able to draw water directly from the waterhole. Some of the waterholes that are further from fire trails may require portable pumps. It should be noted that all major waterholes and dams require a nearby turning area for fire service tankers. It is important that waterholes are marked so they can be easily located in the dark. For consistency the Forestry Tasmania marking system should be used (see MP 5 in Appendix A).

Some deep waterholes with sheer sides have been fenced for safety reasons, and some additional waterholes may need to be fenced, or provided with a sloping side during maintenance.

There are two potable water storage reservoirs within the Park, one on the ridge above Fern Tree, and one at the end of Curtis Avenue off Strickland Avenue. However, only the Fern Tree reservoir has a fire plug at the reservoir. Hobart Council advised that it was not feasible to install a fire plug close to the Curtis Avenue reservoir.

The First Officer of Fern Tree Fire Brigade, Don Jones, noted that it would also be an advantage to have a fire plug at the end of Grays Road. Hobart Council advised that due to low pressure in the system a fire plug at the end of Grays Road would not meet the requirements of AS 2419.

Table 13 - Fire Fighting Water Points in Wellington Park

Some areas in the Park do not have sufficient water points to meet the criteria in MP 5, ie no point on a fire trail should be more than 10 minutes drive from a water point with an ample supply. The following potential waterhole sites should be examined and waterholes constructed if feasible:

East-West Trail (W1)

514860; 5253360 – on north side of trail

510810; 5251980 – on south side of trail

Ringwood Trail (W3)

508130; 5253920 – at creek crossing

507790; 5254670

506910; 5255780 – near turning area

Big Bend Trail (W15)

0516370; 5252050 – on north side of trail

515780; 5252310 – on north side of trail

515890; 5252260 – on south side of trail in borrow pit.

4.8 Bushland Management

Weed control within Wellington Park is carried out on a 'needs' basis by the three management agencies within the Park, and by Transend within its electricity transmission line easements. Weed control is generally confined to the sides of fire trails and around picnic areas, usually targeting 'high profile' weeds like gorse (*Ulex europaeus*) and pampas grass (*Cortaderia selloana*). The Wellington Park Management Plan (WPMT, 1997) recommends preparation of an Introduced Species Management Plan (Section 10.10), as well as a strategy for rehabilitation of disturbed sites.

This strategy includes guidelines for weed management in areas burnt by wildfires, or for management purposes. These guidelines should ensure that fires in the Park do not worsen existing weed problems, or cause weeds to spread. This program will need to be incorporated into the Introduced Species Management Plan when it is prepared.

It should be noted that bush regeneration plantings in previously cleared areas may increase the fire hazard. Any proposals for bush regeneration within the Park should be carefully compared to this fire management strategy to ensure that they do not compromise fire protection measures in this strategy. In general plantings should not be allowed:

- in defensible spaces established around assets at risk
- in fire breaks
- within 1 m of the edge of fire trails.

In some cases it may be possible to landscape defensible spaces and fire breaks to reduce their visual impact. Guidelines for landscaping in defensible spaces are given in MP 6 in Appendix A.

4.9 Stakeholder and Community Concerns

Summaries of the issues raised at the roundtable discussions and community forums held as part of the consultation program for this strategy are included in the Schedule of Submissions prepared following the public exhibition of the draft fire management strategy. This is available as a separate document.

During the initial round of consultation the following major concerns regarding fire management in Wellington Park were noted:

- Tasmania Fire Service (TFS) were concerned about the condition of fire trails within the Park, and access to the fire trail system in the Park for training and familiarisation.
- TFS brigades to the south of the Park were concerned about lack of access into the Park now that the Mountain River Trail is closed and Jefferys Track is in poor condition.
- TFS brigades were concerned that their existing heavy tankers are not suited to the rugged conditions in the Park. Light tankers are seen as more effective.
- Community education regarding fire safety, hazard reduction, evacuation etc. Tasmania Fire Service personnel noted that many new residents around the Park were naive about the risks from bushfires.
- The recovery phase after a major wildfire needs to be addressed in the management strategy.
- Electricity authorities were concerned about maintaining access to their easements and problems that could arise if prescribed burning is carried out under power lines (flashover caused by smoke, sagging of lines, damage to poles and insulators).
- Water supply authorities and catchment management groups expressed concern about possible degradation of catchment areas by fire, including increased erosion and landslips.
- Progress associations and Tasmania Fire Service brigades were concerned about the impact of fire on developments in and around the Park, including lack of enforcement of existing planning guidelines by councils.
- Concerns about the reliability of the water supply for fighting fires on the fringe of the Park, and at The Springs if this area is developed.
- Concerns about possible adverse effects of hazard reduction burning, particularly in sensitive areas, but also concerns expressed about a lack of hazard reduction close to urban areas.

- Open fires in the Park may increase the risk of fires, a fuel stove only policy with all barbeques converted to gas or electric was suggested.
- Lack of fire hazard management on private lots, particularly those with absentee landowners could put neighbours at risk.

A preliminary draft of this fire management strategy was provided to government agencies with an interest in the management of Wellington Park in September 1999. Responses were received from:

- Parks and Wildlife Service
- Hobart City Council
- Glenorchy City Council
- Tasmania Fire Service
- Hobart Water
- Transend.

These responses were incorporated into a second draft of the fire management strategy which was made available to the public for comment during November 1999. Seventeen submissions were received, 8 from members of the public and the remainder from the following organisations:

- Hobart Water
- the Fern Tree Community Association
- Fletcher Challenge Paper
- Glenorchy City Council
- New Town Rivulet Catchment Care Group
- Aurora Energy
- Threatened Species Unit, Department of Primary Industries, Water and Environment
- Cascade Brewery Company
- Tasmania Fire Service.

These submissions are summarised in a separate Schedule of Submissions along with comments and proposed changes to the strategy. These changes have been included in the final strategy.

5. Fire Management Objectives

Specific fire management objectives recommended for Wellington Park for the 15 year duration of this fire management strategy are as follows:

- 1) Minimise the risk of fire damaging built assets within and surrounding Wellington Park as outlined in Table 10.
- 2) Minimise the risk of fire damaging specific biological assets within Wellington Park as outlined in Table 11.
- 3) Maintenance of existing fire breaks shown in Figure 11.
- 4) Minimise the impact of fire and fire management activities on the domestic water supplies being drawn from various catchments in the Park.
- 5) Ensure water supply authorities have contingency plans for dealing with fires in their catchments.
- 6) Minimise the risk of fires starting within Wellington Park.
- 7) Minimise the risk of fire to Park users.
- 8) Implement planning controls on new developments in and adjoining Wellington Park to ensure they incorporate adequate fire protection measures.
- 9) Maintenance of existing emergency vehicle access points and fire trails shown in Figure 10 in a trafficable condition.
- 10) Minimise damage to the fire trail system by restricting vehicle access.
- 11) Signpost all fire trails at their access points.
- 12) Close and rehabilitate all vehicle trails not designated as fire trails in Figure 10, and not required for other management purposes.
- 13) Maintenance of an adequate water supply for fire fighting.
- 14) Maintenance of existing foot tracks that can be used as minor fire control lines.
- 15) Exclusion of fire from sub-alpine woodland and shrubland, wet and mixed forest, wet heath and high altitude dry sclerophyll forest for the duration of this strategy.

- 16) Implementation of a mosaic burning program in selected dry forest plant communities to maintain and enhance existing habitat diversity, and reduce overall fuel loads in bushland areas.
- 17) Reduction in the number and distribution of unwanted plant species, and promotion of regrowth of indigenous species through coordinating fire management, bush regeneration, and weed control activities.
- 18) Manage populations of threatened forest epacrids in accordance with the Forest Epacrids Recovery Plan (Keith, 1998)
- 19) Coordinate the fire management activities of the three management authorities within Wellington Park and other stakeholders.
- 20) Develop, assist development of, or utilise existing education programs and materials aimed at:
 - reducing arson
 - informing residents adjacent to the Park of fire safety issues, and measures to improve protection of themselves and their property
 - informing residents of adjoining properties about the potential impact of their fuel management activities on environmental and other values
 - interpreting Park fire management activities for the public, particularly the role of fire in maintaining the biodiversity of the flora, and protecting the urban fringe adjacent to the Park.
- 21) Maintain up-to-date information on location of dwellings, fire trails and their condition, water supply points, defensible spaces, and areas burnt in prescribed fires and wildfires. Include updated information in the pre-fire suppression plan for the Park.
- 22) Ensure that all personnel carrying out fire management activities in Wellington Park are to be suitably trained and equipped.
- 23) Monitor the impact of fire management activities within Wellington Park. Adjust practices to achieve relevant objectives, and periodically review the fire management strategy.

The actions recommended to achieve these objectives are given in the management action summary table in Section 9.

6. Plan Implementation

6.1 Community Education, Awareness and Involvement

A community education, awareness and involvement program will be constrained by low budgets and small staff numbers. It is therefore necessary to implement a realistic set of low cost activities that will achieve the aims of informing key sectors of the community about fire management in Wellington Park, and involving those with special interests in the Park, or whose activities can affect the Park. An information sheet should be prepared for distribution to the community, but opportunities should also be sought to include aspects of fire management in the newsletters of clubs and associations that regularly use the Park.

The Fern Tree Fire Brigade already prepares and distributes a leaflet on fire protection issues at the beginning of the fire danger period. Such an approach by a local brigade can be very effective in raising public awareness of fire management issues. A number of community fireguard groups have recently been formed in areas bordering the Park and these should be approached to assist in getting information on fire management in the Park to nearby residents. The Wellington Park Management Trust should encourage the TFS to form new community fireguard groups in areas where they do not already exist.

6.1.1 Information Sheet

The local community, especially recreation and other community groups with an interest in Wellington Park, should be made aware of the Wellington Park Management Trust's fire management objectives, and the fire management strategy and its implications. This could be accomplished with a well-designed but succinct information sheet provided to clubs and associations with an interest in the Park, and to adjoining residents.

The information sheet should contain:

- a brief statement of the Trust's fire management policy
- broad fire management objectives for Wellington Park
- an outline of how the fire management objectives will be met
- a note that fire trails are important for fire protection, and that any blockages on fire trails (such as wash-outs, fallen trees, dumped rubbish etc.) should be reported to the appropriate management agency
- information on personal protection in bushfires
- an invitation to comment on fire management in the Park, with an address

- information on publications that will help residents to manage fire hazards on their properties, and to reduce the risks to their dwellings during wildfires
- a short list of reports that have information on fire management in the Park
- a request to report all unauthorised fires
- a reminder of the penalties for illegal lighting of fires
- telephone numbers to report fires, illegal activities and blocked trails, etc.

The next edition of the Mountain Park Walking Map should at least include basic personal fire protection advice in the information section on the back. This should warn Park users that remaining in the Park during a major fire could be very dangerous, and note that the only safe refuge area in the Park during a fire is the car park at the summit. If there is space, additional information about fire management in the Park could be included.

6.1.2 Approaches to Special Groups

Given the high percentage (44%) of fires that have been reported as starting from escapes from burning off and rubbish disposal, a separate effort should be made to inform landowners on the northern side of the Park of the Park's values, and that on occasions (such as the 1967 fires and the 1998 Ridgeway fire) houses, lives and property can be threatened, and that those who light fires could be liable for any damage they cause. Landowners should be informed of the need to avoid burning when strong winds are forecast and when fuel moisture contents are very low, and provided with relevant information on these topics. This information should be sent by mail-out well before the start of the fire danger period, but need only be sent occasionally rather than on an annual basis. The Trust should be prepared to follow up these efforts by attending community meetings, etc in these areas.

The other group that is harder to identify and approach are those responsible for the large number of fires (about 37%) in urban fringe areas reported as caused by malicious or suspicious acts. In this case informing people of the high natural values of the Park, by such means as mail outs, and information packages targeted at school children, could reduced the incidence of these fires.

Wherever possible information about fire management in Wellington Park should be incorporated into any appropriate education and community awareness programs run by the Tasmania Fire Service and local government.

6.2 Fire Management Units

In order to implement the prescribed burning component of the fire management strategy, dry forest plant communities in and surrounding Wellington Park have been divided into 37 fire management units (see Figure 12). Two additional units have been provided for management of

an area of buttongrass moorland in the west of the Park. These units allow for implementation of the most appropriate methods for managing fire hazard whilst ensuring the maintenance of biodiversity. The fire management characteristics of each unit are detailed in Table 14.

Wherever possible existing roads, tracks and suitable natural features have been used for unit boundaries. Use of these existing fire control lines should reduce the amount of preparation required prior to burning. In some instances plant community boundaries have been used for fire management unit boundaries.

In order to provide practical boundaries for fire management units, some units include bushland on private property or other reserves adjoining Wellington Park. Successful implementation of this plan will therefore require the cooperation of these landowners.

6.3 Prescribed Fire Regimes

This fire management strategy will cover a 15 year period, after which a major review is recommended. Burns have been scheduled within five 3-year periods as shown in Table 15. To allow for flexibility in budgeting and planning, the burns can take place at any suitable time during the specified 3-year period. If a wildfire burns more than half of a unit, the next prescribed burn in the unit should be rescheduled according to the optimal fire frequency given in Table 14. In order to create a mosaic of native bushland with different fire histories, adjoining units should generally not be burnt in the same 3-year period. Where adjacent units have been scheduled for burning in the same 3-year period they should not be burnt in the same year.

Fire management units scheduled for burning should be inspected some months prior to the proposed burn to check that the scheduling and burning prescription is still appropriate, and to determine the extent of weed treatment required prior to burning. Where treatment of weeds is required prior to burning, it should be carried out at least 2 months in advance of the burn to allow treated weeds time to desiccate.

Figure 12 - Fire Management Units

Table 14 - Characteristics of Fire Management Units

Table 15 - Burning Regimes for Wellington Park

6.4 Administration

The Wellington Park Management Trust will be responsible for the overall implementation of this fire management strategy and coordinating the activities of the three agencies (Parks and Wildlife Service, Hobart City Council and Glenorchy City Council) that are responsible for managing different sections of the Park.

Management Procedure (MP) 10 in Appendix A provides guidelines to ensure effective coordination of fire management activities in Wellington Park amongst the various stakeholders. MPs 11 and 12 include appropriate forms for recording fire management activities within the Park.

Appendix A also includes guidelines (MP 13) to assist Councils adjoining the Park in determining appropriate fire management policies and protection measures for new developments bordering the Park. The Trust should not be placed in the position of having to maintain defensible spaces with the Park for new developments on adjoining properties.

Successful implementation of the prescribed burns in this strategy requires trained personnel and special equipment. The equipment and level of expertise required for the crews carrying out prescribed burns in the Park is given in MP 8 in Appendix A. Minimum crew strengths are also specified.

Prescribed burns can be carried out by management agency crews that have the required level of training and equipment, by the Tasmania Fire Service, or by contractors. If the prescribed burning is contracted out, the contractor must be able to meet the required training, crew and equipment levels specified in MP 8, as well as demonstrate experience in carrying out ecosystem management burns.

Weed management before and after prescribed burns will require personnel trained in bush regeneration techniques, either agency staff or outside contractors. It would be ideal to have the weed control and the burning carried out by the same crew. Hobart City Council has this capability but not Glenorchy City Council. As most of the prescribed burns specified in this strategy are in the section of the Park managed by Glenorchy City Council they should seriously consider acquiring an in-house capability to carry out both the weed control and prescribed burning recommended in this strategy.

A number of the prescribed burns in the section of Wellington Park managed by Glenorchy City Council will include known populations of threatened plant species (see Table 3 and Figure 5). The preparation, implementation and follow up for these burns must be supervised by someone with botanical qualifications who is familiar with the species and any recovery plan in force. Preparation for these burns must include liaison with the Threatened Species Unit of DPIWE.

6.4.1 Fire Management Responsibilities

The responsibilities for of the various agencies managing Wellington Park for implementing this fire management strategy are as follows:

Wellington Park Management Trust

- Prepare and periodically review the Wellington Park Fire Management Strategy.
- Carry out research and monitoring associated with implementing the strategy, including preparation of site and species specific management plans.
- Carry out inspections, audits and reviews to ensure that the agencies managing assets in the Park are implementing the strategy.
- Collect and store information on wildfires and fire management activities in the Park for use in reviewing the strategy, planning fire suppression operations, and demonstrating due diligence in fire management. This information should be on an electronic database, such as a Geographic Information System (GIS), where possible so that it is readily available.
- Provide the Tasmania Fire Service with up to date information on the condition of fire management assets and bushfire hazard reduction to enable them to plan containment strategies in the event of wildfires.
- Coordinate the activities of the agencies and community groups carrying out works and other activities in the Park.
- Approve fire management works within the Park including management burns. This does not include routine maintenance of fire management assets.
- Prepare and disseminate fire management and safety information to Park users, neighbouring landowners and the general community.
- Liaise with landowners and Councils adjoining the Park to ensure that appropriate hazard reduction is carried out on land adjoining the Park, and that new developments adjoining the Park do not require additional hazard reduction within the Park.
- Ensure that any proposed developments within the Park incorporate appropriate bushfire protection measures.

Parks and Wildlife Service, Hobart and Glenorchy Councils, and other agencies

- Plan, finance, and carry out all on-ground works required to implement the strategy, including management burns, construction and maintenance of fire management assets, weed control before and after burning, protection of built and natural assets.

- Ensure that fire management activities in the Park are carried out by appropriately trained and equipped personnel.
- Carry out environmental impact and risk assessments of proposed works within the Park.
- Maintain records of fire management activities carried out in the Park and forward copies of these records to the Wellington Park Management Trust.
- Assist the Tasmania Fire Service during wildfire suppression operations in the Park (road closure and traffic control, machinery, water cartage etc.).
- Carry out post-fire recovery as detailed in Management Procedure (MP) 14.
- Control unauthorised access to the Park.
- Erect and maintain signage recommended in the fire management strategy.

Tasmania Fire Service

- Suppress wildfires within the Park.
- Provide information on wildfires in the Park to the Wellington Park Management Trust.

6.5 Monitoring And Evaluation

Details of any prescribed burning or wildfires within the area covered by this fire management strategy should be recorded according to MPs 11 and 12 in Appendix A.

6.5.1 Threatened Species

It is important that fires in Wellington Park do not negatively impact upon known populations of threatened species. The fire regimes prescribed in this strategy are based on current knowledge of the fire management requirements of the threatened species known to occur in the Park. However, given the uncertainties in our knowledge of the fire ecology of some of the threatened plants, known populations should be monitored for any changes in population size.

Accurate mapping and determination of existing population sizes followed by periodic recounts should be considered. In particular, it is recommended that the populations of the threatened epacrids *Epacris virgata* and *E. acuminata* be closely monitored. A suitable monitoring program should be developed in consultation with the Parks and Wildlife Service officer in charge of the forest epacrids recovery program.

6.5.2 Plant Community Structure

A photographic record of the vegetation in each fire management unit should be set up to monitor major changes in plant community structure over time. Photos should be taken of a representative section of each fire management unit at the beginning of each 3-year period of the strategy. Photos should be taken from the same location in each unit and show the same area of bushland. This will

require a marked vantage point in each unit, and specifications as to the film type and camera settings to be used. Ideally the same camera should be used throughout the monitoring period.

6.5.3 Performance Indicators

Performance indicators have been set for actions, or groups of actions, in the management action summary in Section 9. Desired outcomes for prescribed burns are given in the prescriptions in MP 8 in Appendix A, and in Table 15. The performance indicators should be used to determine if the specific objectives of this fire management strategy have been achieved. They should be monitored every 5 years during the operation of the strategy. Where performance targets are not being achieved, a review of the relevant portion of the strategy should be undertaken.

6.5.4 Review of the Fire Management Strategy

Minor reviews should be undertaken approximately every 5 years, and when any of the triggers listed in Table 16 are encountered. A full review of the fire management strategy should be undertaken after all the burns prescribed for the fifth 3-year period of the strategy have been completed.

The review should include:

- an audit to ascertain if procedures have been properly carried out and performance targets have been achieved
- a review of fire management and fire ecology literature to incorporate the latest information into the strategy
- comparison of the condition of burnt and unburnt fire management units
- assessment of any changes in plant community structure as a result of fire
- preparation of a revised fire management strategy to cover the next 15 years.

Table 16 - Fire Management Strategy Revision Procedures

ASSESSMENT	REVIEW TRIGGER	RECOMMENDED ACTION
Monitoring of wildfires in the Park.	Wildfire burns more than half of any single fire management unit in the Park.	Consider the whole of the unit to have been burnt and reschedule the next burn according to the optimal fire frequency given in Table 14.
Monitoring of wildfires in the Park.	Wildfire burns more than 50% of the fire management units in the Park in any single year.	Completely revise the burning schedule.
Flora and fauna surveys or incidental recordings.	Further threatened species considered sensitive to fire recorded in the Park.	Revise the burning prescription and/or burning schedule to ensure that the newly identified threatened species is not adversely affected.
At the end of each 3-year	Burning prescription not	Revise burning prescription based on

ASSESSMENT	REVIEW TRIGGER	RECOMMENDED ACTION
period check that each burn has produced the desired outcomes.	producing the desired outcomes.	information recorded during the burn to ensure outcomes can be achieved.
General weed monitoring.	Post-fire weed treatment has not been successful in controlling target weeds.	Carry out follow-up treatments until target weeds are under control.
Property acquisition.	Additional bushland areas added to the Park that are not already covered by the fire management strategy.	Assess the fire management requirements of the newly acquired area and divide into appropriate fire management units. Include the new fire management units in the burning schedule at a frequency appropriate to the vegetation type.
Review of ecological literature.	Research shows that the optimal fire frequencies for particular plant communities or threatened species needs revision.	Revise burning schedules for the fire management units containing the particular species or plant community.

6.6 Record Keeping

The agencies managing Wellington Park need to maintain records of fire management activities carried out within the Park, including inspection and maintenance. Some of this information needs to be regularly forwarded to the Wellington Park Management Trust (WPMT) so that it can provide up-to-date information to the Tasmania Fire Service and other emergency services, review the implementation of the fire management strategy, and demonstrate due diligence in fire management.

Major works and activities, such as fire trail construction and management burning, are recorded on forms provided by the WPMT (see MPs 11 & 12). However, records also need to be kept of inspection and maintenance activities, and the following information forwarded to the WPMT:

- date of inspection
- location of inspection
- person carrying out the inspection
- item inspected (condition of fire trail, water point, defensible space, gate etc.)
- condition of the item inspected
- any maintenance carried out, when, and by whom.

The results of any inspection should be forwarded to the WPMT, even if no maintenance was required.

Initially information on fire management activities will be sent to the WPMT electronically or in hard copy, and entered into data fields on the WPMT GIS system. To reduce the time required for this the WPMT should investigate ways of allowing agencies direct access to the GIS data fields so they can enter information directly.

7. Pre-fire Suppression Plan

A pre-fire suppression plan has been developed for use by the Tasmania Fire Service and other emergency services during wildfire suppression operations in the Park (Appendix B). The pre-fire suppression plan is GIS based so it can be easily updated and distributed. The plan includes operational strategies as well as information on:

- vehicle access points, roads and fire trails
- assets at risk from fire
- stored water supplies
- fire observation points
- helicopter landing sites
- fire breaks and defensible spaces
- hazard reduction burns and wildfires over the last 10 years.

7.1 Maintaining GIS Records

7.1.1 Annual Update

The following items should be inspected at the beginning of the annual bushfire season (September) and the GIS maps and data sheets updated as required:

- condition of vehicle access points and gates
- condition of fire trails and any new trails
- condition of waterholes/dams and approximate capacity
- date of last maintenance of fire breaks and defensible spaces
- assets at risk from fires (delete assets no longer present and add new assets).

7.1.2 Update After Fires

After each prescribed burn or wildfire in the area covered by this fire management strategy the extent of the burn and the date should be entered in the GIS.

8. Further Research

There has been a great deal of research into bushfires in Australia over the years. Initially the emphasis was on understanding fire behaviour, but recently more emphasis has been placed on fire ecology, and particularly the effects of fire on native flora and fauna, and native ecosystems. However, most of these studies have only been short-term, and Whelan (1995) states that: "There are very few long-term experimental studies of the effects of fire on any level of organisation - individual organism, population or community". Whelan (1995) goes on to state that: "The need for validation of models of long-term change based on short-term studies is becoming urgent". Valid models of long-term change will obviously contribute greatly to effective fire management in bushland reserves. However, even if new studies are begun today, useful results may not be available for decades, and even then may not be applicable to the situation in Wellington Park.

The fire management activities in this strategy are based on current scientific knowledge, however, they also provide an opportunity for research into the problems of managing fire hazard while at the same time maintaining the aesthetic, nature conservation and recreational values of important reserves like Wellington Park. The results of any such research would be directly applicable to the management of Wellington Park.

Appendix C of the Wellington Park Management Plan (WPMT, 1996) lists two research topics that would assist fire management in the Park. Additional topics include:

- effects of fires on weeds in the Park
- methods of controlling specific weeds using fire, or incorporating fire into an overall weed control strategy
- comparison of the effects on particular ecosystems of low intensity verses high intensity burning
- methods for creating fuel modified buffer zones which minimise environmental impact, and to what extent natural environments can be retained in these zones
- effects of prescribed burning on water quality.

The monitoring program outlined in this strategy should provide good data for many of these studies.

9. Management Action Summary

The management actions recommended in this strategy have been summarised in the following table. Each action has been prioritised using the following criteria:

- URGENT** - Actions required to reduce a very high risk to life or property.
- HIGH** - Actions required to improve inadequate fire protection measures in high risk areas.
- Actions that are essential for control & suppression of wildfires, and/or conservation of threatened species.
- MEDIUM** - Actions required to improve inadequate fire protection measures in moderate risk areas.
- Actions required to ensure on-going effective fire management, or conservation of biodiversity.
- LOW** - Actions that will assist in fire management but are not essential for protection of life and property, or conservation of biodiversity.

Urgent actions need to be undertaken as soon as possible.

Where applicable the desirable timing of other actions has been coded as follows:

- A** - Inspect and maintain annually, or as specified in the relevant management procedure (MP)
- A/S** - Timing as specified in the fire management strategy
- 1, 2, etc** - Carry out action within the time period specified (years)
- 1A, 2A etc** - Construct within the next 1, 2 etc years and then inspect and maintain annually, or as specified in the relevant MP.

It should be noted that this prioritisation is based on the importance of an action for fire management purposes. It does not include priorities for other uses.

BIBLIOGRAPHY

- Abrahams J. (2001) *Wellington Park Mountain Huts Inventory*. Report prepared for the Wellington Park Management Trust.
- Adams R. and Simmons D. (1993) The Impact of Fire Intensity on Litter Loads and Understorey Floristics in an Urban Fringe Dry Sclerophyll Forest and Implications for Management. In *Proceedings of a Conference, Fire and Biodiversity: The Effect and Effectiveness of Fire Management*. Victorian National Parks Association, Melbourne.
- AFAC (1996) *Prescribed Burning 1*. Australian Fire Authorities Council and Longman, Melbourne.
- ANCA (1994) *Endangered Species Protection Act 1992: An outline*. Australian Nature Conservation Agency, Canberra.
- ANZECC (1995) *List of Endangered Vertebrate Fauna*. CONCOM ad hoc working group on endangered fauna. Australian National Parks and Wildlife Service, Canberra.
- Auld B. A. and Medd R. W. (1987) *Weeds: An Illustrated Guide to the Weeds of Australia*. Inkata Press, Melbourne.
- Balmer J. (1991) Buttongrass moorland vegetation. In Kirkpatrick J. B. (Ed) *Tasmanian Native Bush: A Management Handbook*. Tasmanian Environment Centre, Hobart.
- Bell P. and Mooney N. (1998) *Wedge-tailed Eagle Recovery Plan - 1998-2003*. Parks & Wildlife Service, DPIWE, Hobart.
- Brereton R. (1996) *The Swift Parrot Recovery Plan: 1997-1999*. Parks & Wildlife Service, DPIWE, Hobart.
- Brereton R. (1997) *Management Prescriptions for the Swift Parrot in Production Forests*. Report to Tasmanian RFA Environment and Heritage Technical Committee, Hobart.
- Brereton R. (1998) *Fern Tree Local Area Plan - Fauna and Habitat Overview*. Unpublished report for Hobart City Council.
- Brereton R. and Mooney N. (1994) Conservation of the nesting habitat of the grey goshawk (*Acipiter novaehollandiae*) in Tasmanian State Forests. *Tasforests* **6**, 79-89.
- Bresneham S. J. and Pyrk A. (1998) *Dry Forest Fuels in South-east Tasmania*. Parks and Wildlife Service, Hobart.

-
- Brown W. E. and Mooney N. J. (1997) *Modelling of the nesting habitat of the Wedge-tailed Eagle (Aquila audax) in Tasmania*. Report to the Tasmanian RFA Environment and Heritage Technical Committee, Hobart.
- Buchanan A. M. (1995) *A Census of the Vascular Plants of Tasmania & Index to The Student's Flora of Tasmania*. Tasmanian Herbarium Occasional Publication No. 5, Hobart.
- Buchanan R. A. (1989) *Bush Regeneration - Recovering Australian Landscapes*. TAFE Learning Publications and Inkata Press, Sydney.
- Bushfire Management Planning Group (1999) *Draft Guidelines for Development in Bushfire Prone Areas for Tasmania*. Tasmania Fire Service, Hobart.
- Campbell A. J. and Tanton M. T. (1981) Effects of Fire on the Invertebrate Fauna of Soil and Litter of Eucalypt Forest. In Gill A. M., Groves R. H. and Noble I. R. (Eds), *Fire and the Australian Biota*, pp 273-310, Australian Academy of Science, Canberra.
- CARSAG (1999) *Strategic process for the integrated identification of reservation priorities on private land*. Regional Forest Agreement Private Reserve Program Scientific Advisory Group Draft Report, Hobart.
- Chladil M. (1991) Fire management for nature conservation. In Kirkpatrick J. B. (Ed) *Tasmanian Native Bush: A Management Handbook*. Tasmanian Environment Centre, Hobart.
- Chladil M. (1999) *A Planning Case Study: The House Losses of the Urban Interface Fire near Hobart Tasmania, January 1998*. Poster paper presented at the Bushfire 99 Conference, Albury, July 1999.
- Chladil M. and Sheridan J. (1997) *Fire Retardant Garden Plants for the Urban Fringe and Rural Areas*. Tasmania Fire Research Fund and the Royal Tasmanian Botanical Gardens, Hobart.
- Conroy B. (1988) Bushfire management planning in natural areas. In proceedings of the conference - *Caring for Warringah's Bushland*. Warringah Council, Dee Why, NSW.
- Crowden R. K. and Menadue Y. (1990) Variations in the 'Epacris tasmanica Complex'. *Australian Systematic Botany*, 253-264.
- Curtis W. M. (1963) *The Students Flora of Tasmania, Part 2 -Angiospermae: Lythraceae to Epacridaceae*. Government Printer, Hobart.
- Curtis W. M. (1967) *The Students Flora of Tasmania, Part 3 - Angiospermae: Plumbaginaceae to Salicaceae*. Government Printer, Hobart.
-

- Curtis W. M. and Morris D. I. (1975) *The Students Flora of Tasmania, Part 1 (Second edition). Gymnospermae and Angiospermae: Ranunculaceae to Myrtaceae*. Government Printer, Hobart.
- Curtis W. M. and Morris D. I. (1994) *The Students Flora of Tasmania, Part 4B. Angiospermae: Alismataceae to Burmanniaceae*. Government Printer, Hobart.
- Department of Agriculture (undated) *Importation of Plants and Seeds into Tasmania: Prohibition of Potential Weeds*. No 60, Agdex No 640. Quarantine & Quality Assurance Branch/Scientific Services Branch. Department of Agriculture, Hobart.
- Department of Lands, Parks and Wildlife (1988) *Glenorchy Water Reserve Wildlife Sanctuary, Draft Management Plan*. Department of Primary Industry, Water and Environment, Hobart.
- Dickinson K. J. M. and Kirkpatrick J. B. (1985) The flammability and energy content of some important plant species and fuel components in the forests of south-eastern Tasmania. *Journal of Biogeography*, **12**, 121-134.
- DPIWE (2004). *Tasmanian Washdown Guidelines for Weed and Disease Control. Machinery, Vehicles & Equipment. Edition 1*. Tasmanian Department of Primary Industries, Water and Environment, Forestry Tasmania and the Agricultural Contractors Association of Tasmania.
- DPIWE (2005a) *Draft Flora Recovery Plan: Tasmanian Forest Epacrids 2006–2010*. Threatened Species Section, Department of Primary Industries, Water and Environment, Hobart.
- DPIWE (2005b) *Draft Flora Recovery Plan: Tasmanian Ferns 2006–2010*. Threatened Species Section, Department of Primary Industries, Water and Environment, Hobart.
- Driessen M. M., Taylor R. J. and Hocking G. J. (1991) Trends in abundance of three marsupials after fire. *Australian Mammalogy*, **14**, 121-4.
- Fensham R. J. (1991) *Fire Management in Hobart's Bushlands*. Unpublished report for Hobart City Council, Hobart.
- Fensham R. J. (1992) The management implications of fine fuel dynamics in bushlands surrounding Hobart, Tasmania. *Journal of Environmental Management*, **36**, 301-320.
- Flora Advisory Committee (1994) *Native Higher Plant Taxa which are Rare or Threatened in Tasmania*. Parks & Wildlife Service, Hobart.
- Forest Practices Board (1998) *Threatened Fauna Manual For Production Forests In Tasmania. (revised version)*. Forest Practices Board, Hobart.

-
- Forest Taskforce (1995) *Interim Forest Areas - Tasmania*. A report for the IFA Assessment Process. Department of the Prime Minister and Cabinet, Canberra.
- Forestry Tasmania (1996) *Fuel Reduction Burning; Course Notes*. Forestry Tasmania, Hobart.
- Garrett M. (1997) *Rare or Threatened Tasmanian Forest Ferns*. Report to the Tasmanian RFA Environment and Heritage Technical Committee. Hobart.
- Gilfedder L. (1991) Management Plan Case Study: Waverley Flora Park, Tasmania. Chapter 11 in *Tasmanian Native Bush: A Management Handbook*. Ed: J. B. Kirkpatrick. Tasmanian Environment Centre, Hobart.
- Hammer T. (1997) *The Effects of Fire on Vertebrate and Invertebrate Fauna. Results of a Mammal Survey In the N. R. Pierce Memorial Reserve*. Unpublished report to Glenorchy City Council.
- Hird D. (1995) Vertebrates of Lambert Park / Skyline Reserve on Mount Nelson in southern Tasmania. In *The Tasmanian Naturalist*. **117**, 52-66.
- Hird D. and Hammer T. (1995) Mammals of Gum Top Spur in the north-west of Wellington Park with comments on a new habitat type for the barred bandicoot. In *The Tasmanian Naturalist*. **117**, 32-38.
- Hutchinson M. (1994) *The Snakes and Lizards of Tasmania*. Fauna of Tasmania Handbook No. 9, University of Tasmania, Hobart.
- Hyde-Wyatt B. H. and Morris D. I. (1980) *The Noxious and Secondary Weeds of Tasmania*. Department of Agriculture, Hobart.
- Inions G. B., Tanton M. T. and Davey S. M. (1989) Effect of fire on the availability of hollows in trees, used by the Common Brushtail Possum (*Trychosurus vulpecula*), Kerr 1792, and the Ring-tailed Possum (*Pseudocheirus peregrinus*), Baddaerts, 1785. *Australian Wildlife Research.*, **16**, 449-458.
- Invertebrate Advisory Committee. (1994). Interim List of Native Invertebrates which are Rare or Threatened in Tasmania. Edition 1. *Species at Risk, Tasmania - Invertebrates*. Parks and Wildlife Service, Tasmania.
- Jackson W. D. (1968) Fire, air, water, and earth - An elemental ecology of Tasmania. *Proceedings of the Ecological Society of Australia*, **3**, 9-16.
- Jarman S. J., Kantvilas G. and Brown M. J. (1988) *Buttongrass Moorland In Tasmania*. Research Report No. 2, Tasmanian Forest Research Council, Hobart.
-

-
- Johnson C. N. (1997) Fire and habitat management for a mycophagous marsupial, the Tasmanian bettong *Bettongia gaimardi*. *Australian Journal of Ecology* **22**, 101-105.
- Johnson D. J. (1994) *Mapping the Vegetation of Hobart: The Application of Synusiae Based Mapping for the Purpose of Conservation Management*. Unpublished Master of Environmental Studies thesis for the Department of Geography and Environmental Studies, University of Tasmania, Hobart.
- Jones M. E. and Rose R. K. (1996) *Preliminary Assessment of Distribution and Habitat Associations of the Spotted-tailed Quoll (*Dasyurus maculatus maculatus*) and Eastern Quoll (*D. viverrinus*) in Tasmania to Determine Conservation and Reservation Status*. Report to the Tasmanian RFA Environment and Heritage Technical Committee, Hobart.
- Keith D. (1998) *A Recovery Plan - Tasmanian Forest Epacrids, 1999-2004*. Parks and Wildlife Service, Hobart.
- Kirkpatrick J. B. (1985) The viability of bush in cities - ten years of change in an urban grassy woodland. *Australian Journal of Botany*, **34**, 691-708.
- Kirkpatrick J. B. (1986) Conservation of plant species, alliances and associations of the treeless high country of Tasmania, Australia. *Biological Conservation*, **37**, 43-57.
- Kirkpatrick J. B. (1996) Natural history of the mountain. In *On the Mountain*, West Wind Press, Hobart.
- Kirkpatrick J. B. and McDonald M. (1996) *The Glenorchy Vegetation Map and its Implications For Conservation Planning*. A report from Unitas Pty Ltd to the Glenorchy City Council.
- Kirkpatrick J. B., Barker P., Brown M. J., Harris S., and Mackie R. (1995) *The Reservation Status of Tasmanian Vascular Plant Communities*. Wildlife Scientific Report 95/4. Parks and Wildlife Service, Hobart.
- Kirkpatrick J. B., Gilfedder L. and Fensham R. (1988a) *City Parks and Cemeteries, Tasmania's Remnant Grasslands and Grassy Woodlands*. Tasmanian Conservation Trust, Hobart.
- Kirkpatrick J. B., Gilfedder L., Hickey J. and Harris S. (1991) *Reservation and Conservation Status of Tasmanian Native Higher Plants*. Wildlife Division Scientific Report 91/2. Parks and Wildlife Service, Hobart.
- Kirkpatrick J. B., Peacock R. J., Cullen P. J., Neyland M. G. (1988b) *The Wet Eucalypt Forests of Tasmania*. Tasmanian Conservation Trust, Hobart.
-

-
- Lunt I. D. and Morgan J. W. (1998) *Second Generation Management of Grassland Reserves: Lessons from First Generation Reserves*. A report to the Victorian Grassy Ecosystem Reference Group. Unpublished Draft Report.
- Marsden-Smedley J. B., Rudman T., Pyrk A., & Catchpole W. R. (1999) Buttongrass Moorland Fire Behaviour Prediction and Management. *Tasforests* **11**, 87-107.
- Martin A. A. and Littlejohn M. J. (1982) *Tasmanian Amphibians*. Fauna of Tasmania Handbook No. 9, University of Tasmania, Hobart.
- Maxwell S., Burbidge A. A. and Morris K. (1996) *The Action Plan for Australian Marsupials and Monotremes*. Australasian Marsupial and Monotreme Specialist Group, IUCN Species Survival Commission. National Parks and Wildlife Service, Canberra.
- McConnell A. and Scripps S. (2005) *Wellington Park historic heritage audit: preliminary assessment of the historical heritage of Upper Merton*. Report prepared for the Wellington Park Management Trust, Hobart.
- Meggs J. M. (1996) *Distribution and Conservation Status of Two Threatened Species of Lucanid in Tasmania*. National Estate Grants Program Report, Forestry Tasmania, Hobart.
- Mooney N. J. and Holdsworth M. (1988) Observations on the use of habitat by the grey goshawk in Tasmania. *Tasmanian Bird Report*, **17**, 1-12.
- Mooney N. J. and Holdsworth M. (1991) The effects of disturbance on nesting wedge-tailed eagles (*Aquila audax fleayi*) in Tasmania. *Tasforests*, **3**, 15-31.
- North A. J. (1997) *Botanical Survey of Hobart Bushland, Stage 2*. Unpublished report for Hobart City Council.
- North A. J. (1998) *Botanical Survey Of Hobart Bushland, Stage 3*. Unpublished draft report for Hobart City Council.
- North A. J. and Freeman S. (1996) *Botanical Survey of Hobart Bushland - Stage 1*. Unpublished report for Hobart City Council.
- NorthBarker Ecosystem Services (2004) *Flora and Fauna Habitat Identification and Assessment Process*. Report prepared for Hobart City Council.
- NSW Rural Fire Service (1991) *Planning for Bushfire Protection*. NSW Rural Fire Service, Sydney.
- NSW Rural Fire Service (1997) *Prescribed Burning Course Manual*. NSW Rural Fire Service, Sydney.
- Pannell J. R. (1992) *Swamp Forests of Tasmania*. Tasmanian Forestry Commission, Hobart.
-

-
- Parsons W. T. and Cuthbertson E. G. (1992) *Noxious Weeds of Australia*. Inkata Press, Melbourne.
- PLUC (1996) *Environment and Heritage Report. Background Report Part C Vol I-V*. For Tasmanian-Commonwealth Regional Forest Agreement. Tasmanian Public Land Use Commission, Hobart.
- Potts W. C. (2000) Recovery Plan for Threatened Tasmanian Lowland Euphrasia Species. Department of Primary Industries, Water and Environment, Hobart.
- Pyrke A. (1989) The growth rate responses of some Eucalypts on Mount Wellington. BSc thesis, University of Tasmania, Hobart.
- Ramsay C. and Dawkins D. (1993) *Building in Bushfire-prone Areas - Information and Advice*. CSIRO and Standards Australia, SAA HB 36-1993.
- Ratkowsky A. V. (1984) The birds of Snake Plains, a sandstone outcropping on Mt Wellington. *The Tasmanian Naturalist*, **77**.
- Ratkowsky D. A. and Ratkowsky A. V. (1976) Changes in the abundance of the vascular plants of the Mount Wellington Range, Tasmania following a severe fire. *Papers and Proceedings of the Royal Society of Tasmania*, **110**, 63-67.
- Robin J. (1991) Control of environmental weeds. In Kirkpatrick J. B. (Ed) *Tasmanian Native Bush: A Management Handbook*. Tasmanian Environment Centre, Hobart.
- Rudman T., Tucker D, and French D. (2004) *Tasmanian Washdown Guidelines for Weed and Disease Control*. Edition 1. Department of Primary Industries, Water and Environment, Hobart.
- Schahinger R. B. (2005). Management of threatened Epacrids in Wellington Park (In prep.). Report prepared for the Wellington Park Management Trust, Hobart.
- SGAP (1994) *Garden Plants are Going Bush and Becoming Environmental Weeds*. Brochure produced by the Society for Growing Australian Plants, Tasmania.
- Specht R. L., Roe E. M. and Boughton V. H. (1974) Conservation of major plant communities in Australia and Papua-New-Guinea. *Australian Journal of Botany Supplement*, **7**, 1-667.
- Stoddardt D. M. and Challis G. (1991) *The Habitat and Field Biology of the Long-tailed Mouse (Pseudomys higginsii)*. Research Report No. 6, Tasmanian Forest Research Council, Hobart.
- Sutton J. H. (1985) *Bushfire Risk in the Hobart Environs, a Critical Assessment of Bushfire Management in the Hobart Municipality*. Hobart City Council, Hobart.
- Tasmania Fire Service (1984) *Guidelines for Fuel Reduction Burning Under Dry Forests*. Tasmania Fire Service, Hobart.
-

-
- Tasmania Fire Service (1986) *Hobart Special Fire Area Fire Management Plan*. Tasmania Fire Service, Hobart.
- Tasmania Fire Service (1995) *Will you Survive? A Guide to Lowering Risk from Bushfires - what to do before Fire Threatens and during a Bushfire Emergency to Help Save Lives and Property*. Tasmania Fire Service, Hobart.
- Tasmania Fire Service (2005) *Guidelines for Development in Bushfire Prone Areas of Tasmania*. Tasmania Fire Service, Hobart.
- Tasmanian Fire Review Committee (1994) *Review of Vegetation-based Fire in Tasmania*. Tasmanian Fire Review Committee, Hobart.
- Tasmanian Weed Management Committee (2005) *WeedPlan, Tasmania's Weed Management Strategy (second edition)*. The Tasmanian Weed Management Committee, Hobart.
- Taylor R. J. (1993) Habitat requirements of the Tasmanian bettong (*Bettongia gaimardi*), a mycophagous marsupial. *Wildlife Research*, **20**, 699-710.
- Taylor R. J. and McQuillan P. B. (1994) Fauna of Mount Wellington. *The Tasmanian Naturalist*, **116**, 2-19.
- Thomas D. (1979) *Tasmanian Bird Atlas*. University of Tasmania, Hobart.
- Tolhurst K. (1993) Effects of fuel reduction burning on flora in a dry sclerophyll forest. In *Proceedings of the Conference, Fire and Biodiversity: Effects and Effectiveness*, Victorian National Parks Association, Melbourne.
- TPLUC (1996) *Environment and Heritage Report. Background Report Part C Vols. I, II, IV and Supplements*. For Tasmanian-Commonwealth Regional Forest Agreement. Tasmanian Public Land Use Commission, Hobart.
- Vertebrate Advisory Committee (1994) *Native Vertebrates which are Rare or Threatened in Tasmania. Edition 1. Species at Risk, Tasmania-Vertebrates*. Parks and Wildlife Service, Hobart, Tasmania.
- Victorian National Parks Association (1996) *Proceedings of the Conference, Fire and Biodiversity: The Effect and Effectiveness of Fire Management* held in Melbourne 8-9 October 1993.
- von Krusenstierna A. and Rawling J. L. (1997) *Fire Management Plan, Cataract Gorge Reserve*. Unpublished report for Launceston City Council, Launceston.
- Watts D. (1987) *Tasmanian Mammals: a Field Guide*. Tasmanian Conservation Trust, Hobart.
- Whelan R. J. (1995) *The Ecology of Fire*. Cambridge University Press, Melbourne.
-

- Williams K. (1991) Dry sclerophyll vegetation. In Kirkpatrick J. B. (Ed) *Tasmanian Native Bush: A Management Handbook*. Tasmanian Environment Centre, Hobart.
- Withers J. (1979) Studies on the status of unburnt *Eucalyptus* woodland at Ocean Grove, Victoria. IV. The effect of shading on seedling establishment. *Australian Journal of Botany*, **27**, 47-66.
- WPMT (1996) *Draft Wellington Park Values, Use and Management Inventory for Public Comment*. Wellington Park Management Trust, Hobart.
- WPMT (1997) *Wellington Park Management Plan*. Wellington Park Management Trust, Hobart.
- WPMT (1998) *Springs Site Development Plan*, Wellington Park Management Trust, Hobart.

Glossary

The following descriptions of bushfire related terms used in this plan are taken or adapted from:

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

Forestry Tasmania (undated) *Fuel Reduction Burning; Course Notes*.

NSW National Parks and Wildlife Service (1990) *Fire Management Manual*.

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

NSW Department of Environment and Planning Circular No C10 *Planning in Fire Prone Areas*.

Ramsay C & Dawkins D (1993) *Building in Bushfire-prone Areas - Information and Advice*. CSIRO and Standards Australia, SAA HB 36-1993.

Tasmania Fire Service (1995) *Planning Conditions and Guidelines for Subdivisions in Bushfire Prone Areas*.

Bushfire Management Planning Group (1999) *Draft Guidelines for Development in Bushfire Prone Areas for Tasmania*.

Warringah/Pittwater Bush Fire Management Committee (1994) *Draft Fuel Management Plan*.

Backburning

A fire started intentionally along the inner edge of a fire control line to consume the fuel in the path of a wildfire. This is usually the only method for controlling large wildfires, or fires of high intensity.

Building Protection Zone

An area between buildings and the fuel modified buffer zone, where fine fuels are maintained in a minimum fuel condition to ensure that the zone acts as a barrier between the building and a fire.

Bushfire

A fire burning in plantations, forests, mallee, grasslands and other vegetation types. Usually classified as either a 'wildfire' or a 'prescribed fire'.

Bushfire Hazard

Synonymous with static risk, a relative assessment of the likely difficulty of controlling and suppressing a bushfire in an area. Bushfire hazard is a function of slope, access and vegetation type.

Bushfire Prone

Refers to the potential for the vegetation in an area to carry a bushfire at reasonable frequencies. Bushfire frequency is generally determined by a combination of risk and hazard.

Bushfire Risk

In general, bushfire risk is the probability of a wildfire starting and spreading. This can be quantified as a Total Risk Rating comprising a Static Risk (hazard) Rating plus a Total Fuel Score which varies over time.

Defendable Space

An area of managed fuel around a dwelling or asset at risk that reduces the risk of damage by fire. Consists of a Building Protection Zone and a Fuel Modified Buffer Zone.

Fine Fuel

Live and dead plant matter (including grasses, bracken, leaves, bark, and twigs and branches) less than 6 mm in diameter. Fine fuel is what burns at the fire front and contributes directly to fire behaviour. Increasing fine fuel loads increases the rate of spread and intensity of fire fronts.

Fire Break

Any natural or constructed discontinuity in a fuel bed used to segregate, stop, and control the spread of a wildfire, or to provide a fire control line from which to suppress a fire.

Fire Control Line

A natural or constructed barrier, or treated fire edge, used in fire suppression and prescribed burning to limit the spread of a fire. Fire control lines can include constructed trails, roads, cleared areas and environmental features such as watercourses and rock outcrops.

Fire Danger Rating (FDR)

A relative number denoting an evaluation of rate of spread, or suppression difficulty for specific combinations of fuel, fuel moisture and wind speed. FDRs range from 1 (low danger) to 100 (extreme danger). The FDR is used for general fire danger forecasting and is based on the expected behaviour of fires burning in eucalypt forest carrying a fuel loading of 12.5 tonnes per hectare and travelling over level to undulating ground.

Fire Intensity

The rate of energy output per unit length of fire perimeter, usually measured in kilowatts per metre. It is a function of the heat yield of the fuel (H), the weight of the fuel consumed (W), and the rate of spread of the fire (R) ie $I = HWR$.

Fire Regime

The pattern of fire occurrence within an area described by the frequency, intensity, and season of fire occurrence.

Fuel Load

The quantity of fine fuel in an area, usually measured in tonnes per hectare of dried fine fuel.

Fuel Modified Buffer Zone

A zone between a building protection zone and a bushfire hazard that can include an area of minimum fine fuel, or an area of vegetation (forest, grassland etc) that is maintained in a fuel reduced condition, or both. Provision of an inner building protection zone and an outer fuel

modified buffer zone will ensure that there is a progressive reduction of fine fuel between a bushfire hazard and any combustible structures.

Fuel Reduced Condition

A condition where fine fuel is maintained below a maximum height of 100 mm in grasslands, or below 8 tonnes per hectare in other fuel types.

Hazard Reduction

Reduction of the average fuel load over an area by burning (prescribed burn or wildfire), chemical, mechanical, or manual means.

Indigenous Vegetation

A term used to describe the plant species and/or plant communities which occur naturally in a locality. The term 'indigenous' excludes Australian species from another locality or region, as well as non-native species, that have been introduced to a locality.

Introduced Species

Species of plants or animals that have been deliberately, or accidentally, brought to an area in which they did not naturally occur.

Minimum Fuel Conditions

A condition where fine fuels are minimised to the extent that the passage of a fire will be prevented or severely restricted. This generally requires the removal of dead fine fuel and control of live fuel, breaks in the continuity of any fuel, maintenance of a high moisture content in vegetation, or replacement of vegetation with roads, paths, etc.

Prescribed Burn

(Synonymous with prescribed fire, controlled burn, prescription burn, scheduled fire or management burn) 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. It is undertaken in specified environmental conditions.

Soil Dryness Index (SDI)

A measure of the average dryness of an area in terms of the number of millimetres of rainfall required to thoroughly wet the soil.

Spotting, Spot Fire

Isolated fires started ahead of the main fire by sparks, embers, or other ignited material carried by the wind, sometimes to a distance of several kilometres.

Target Weed

Weed species which require priority action in any bush regeneration/weed control program. Target weeds are those which have the capability to invade undisturbed bushland, persist once disturbance events are arrested, displace indigenous species through competition, and permanently alter habitat values.

Wildfire

A bushfire which is not burning according to management prescriptions or requirements.