

# Tasmanian Wilderness World Heritage Area Bushfire and Climate Change Research Project

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A research project to investigate the impact of climate change on bushfire risk to Tasmania's wilderness areas and appropriate management and firefighting responses

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## Acknowledgements

This independent Final Report has been prepared for the Tasmanian Government.

As an independent Chair, I chaired a Steering Committee consisting of the head of agency of the Tasmanian Government Departments of Premier and Cabinet; Primary Industries, Parks, Water and Environment; and Police, Fire and Emergency Management, and the First Assistant Secretary of the Australian Government Department of the Environment and Energy. The Steering Committee was supported by a Technical Working Group with representatives from the Tasmanian Government Departments of Primary Industries, Parks, Water and Environment, and Police, Fire and Emergency Management.

The work of the Chair was supported the Department of Premier and Cabinet's Tasmanian Climate Change Office.

I would like to thank Dr Adrian Pyrke, consultant to the Research Project; and Ms Shona Prior, Ms Jane Colton and staff of the Tasmanian Climate Change Office, for their considerable efforts in compiling and drafting this Report.

I also want to thank the Research Project's Steering Committee and Technical Working Group for their valued input to the draft Report and their guidance in developing project priorities.

The Research Project has involved extensive engagement with, and input from, a multitude of key stakeholders including the Tasmanian Government and its fire management agencies, the Australian Government, the research community, TWWHA landowners, conservation groups and non-government organisations.

I would particularly like to thank the research community for generously providing the knowledge and expertise that underpins this Report. The contribution and efforts of researchers at the Antarctic Climate and Ecosystems Cooperative Research Centre (Dr Peter Love, Dr Rebecca Harris, Dr Tom Remenyi and Professor Nathan Bindoff), the Bureau of Meteorology's Dr Paul Fox-Hughes, Distinguished Professor Jamie Kirkpatrick and Dr Jon Marsden-Smedley are greatly appreciated.

Responsibility for the content of this Report and its recommendations rests with me.

AJ (Tony) Press

## EXECUTIVE SUMMARY

### Introduction

The Tasmanian Wilderness World Heritage Area (TWWHA) is one of Tasmania's iconic places. It contains globally significant examples of natural and cultural heritage and is an important natural, cultural, economic and social State asset.

Bushfire has been a natural and persistent phenomenon in the TWWHA for millennia. Prior to European colonisation, Aboriginal people actively used fire to manage vegetation in many parts of the region.

Large, landscape-scale bushfires have been reported as early as the 1850s for parts of the TWWHA. Since the 1930s there have been at least 12 fires in or near the TWWHA that were greater than 20,000 hectares in size.

In January and February 2016, Tasmania recorded thousands of lightning strikes, which started multiple fires in exceptionally dry climatic conditions. From 13 January to 15 March 2016, a total of 145 vegetation fires affected approximately 126,800 hectares across Tasmania, including an estimated 19,800 hectares (around 1.3 per cent) of the TWWHA.

The most significant impact to the natural values in the TWWHA from the 2016 bushfires occurred as a result of the fires in the Lake Mackenzie, February Plains and Lake Bill areas. These fires occurred within the fire-sensitive alpine and subalpine vegetation areas and affected 85 hectares of one of the TWWHA's most significant flora values, the pencil pine. This species is an iconic example of Gondwanic legacy in the TWWHA, which contributes to the property's Outstanding Universal Value. The proportion of pencil pines impacted by the 2016 fires comprised a very small percentage of the total extent of pencil pines in the TWWHA, while the majority of the areas affected were composed of vegetation types and fauna that are adapted or resilient to fire.

The scale of the 2016 bushfires, both in number and geographic extent, presented a particularly complex and resource-intensive fire-management challenge for the TWWHA. The 2016 firefighting response involved an unprecedented effort of more than 5,600 Tasmanian volunteer and career firefighters, 1,000 interstate or overseas firefighters, and as many as 40 aircraft assisting each day during the peak. The cost of the 2016 bushfires has been estimated at \$52.6 million<sup>1</sup>.

### TWWHA Bushfire and Climate Change Research Project

The Tasmanian Government established the TWWHA Bushfire and Climate Change Research Project in March 2016. It committed \$250,000 to investigate the impact of climate change on Tasmania's wilderness areas and to identify ways to improve how Tasmania prepares for and responds to bushfires in the TWWHA.

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<sup>1</sup> Estimate provided by the Tasmania Fire Service in November 2016.

The objectives of the Research Project (as outlined in the Terms of Reference provided at Attachment 3) are to:

- examine how climate change will affect future fire danger and other variables that may lead to an increased risk of bushfire, and its impacts on the TWWHA;
- provide recommendations on the most appropriate methods for monitoring and recording vegetation dryness levels within the TWWHA; and
- examine firefighting techniques, interventions and resources that can be safely and effectively employed by the Tasmania Parks and Wildlife Service and the Tasmania Fire Service to prepare for, and respond to, bushfires in the TWWHA, including the most appropriate methods to extinguish fire within alpine areas.

The outcomes of the Research Project are to improve understanding of how climate change will impact bushfire risk in the TWWHA; and improve the ability to prepare for, and respond to, bushfires in the TWWHA.

### **Research undertaken through the Research Project**

The Research Project has undertaken a comprehensive review and gap analysis of research and activities relating to bushfires in the TWWHA. This review and gap analysis considered the 'Prevention, Preparedness, Response and Recovery' (PPRR) risk management model. As a result, this Report identifies current operational practice, current work and research underway, and areas for further work or research relating to these broad areas.

High-priority research needs were identified through this review process. A number of these needs were addressed by commissioning new research through this Research Project. This new research examined:

- the history of lightning fires in the TWWHA and adjacent areas (findings of this research are presented in the 'Preparedness' section of the Executive Summary);
- the impact of climate change on weather-related fire risk factors in the TWWHA (findings of this research are presented in the 'Preparedness' section of the Executive Summary); and
- the impact and effectiveness of fire suppression chemicals in the TWWHA (this research continues to be undertaken at the time of publication of this Report).

In addition to these new research projects, two synthesis studies were commissioned to bring together current understanding of bushfire in the TWWHA. These examined the impact of climate change on:

- future fire behaviour in different vegetation types in the TWWHA (results of this research are presented in 'Values in the TWWHA' of the Executive Summary and
- future fire regimes for natural values (results of this research are presented in 'Values in the TWWHA' of the Executive Summary).

The Research Project has been underpinned by extensive engagement with, and input from, a multitude of key stakeholders, including the Tasmanian Government and its fire management agencies, the Australian Government, the research community, TWWHA managers, conservation groups and non-government organisations.

### **Initiatives undertaken in response to the 2016 bushfires**

Following the 2016 bushfires, Tasmanian fire agencies (Tasmania Fire Service, Tasmania Parks and Wildlife Service, and Forestry Tasmania) have undertaken a number of initiatives. These initiatives include commissioning this Research Project, undertaking post-fire surveys of fire-affected areas, establishing monitoring sites, and consulting with the research community to inform responses in key fire-affected areas.

Post-fire data has been incorporated into Tasmania Parks and Wildlife Service's risk assessment models, and mapping of fire boundaries and natural values has been improved. Interested groups and organisations have been consulted in relation to fire preparedness and protection of assets. Scoping of options for increased volunteer support for firefighting efforts has been initiated, and the Tasmania Fire Service has expanded its skills training in remote area firefighting. Lessons from the 2016 bushfires have been incorporated into pre-season briefings for State and regional personnel involved in fire management.

## **Values in the TWWHA**

### **Overview**

The Tasmanian Wilderness is inscribed on the World Heritage List under four criteria for “natural heritage” and three criteria for “cultural heritage”.

Identifying and understanding the natural and cultural values of significance in the TWWHA, particularly those that are fire-sensitive, is important because their protection has implications for fire management in the TWWHA. Bushfire presents one of the biggest challenges to managing and protecting the values that are recognised as significant to the TWWHA's World Heritage status. The knowledge and management of buttongrass vegetation is particularly important to the successful management of bushfire risk in the TWWHA. This is because buttongrass is extremely flammable and extensive, and is the main vegetation type targeted for planned burning, yet it has intrinsic natural values that also require protection.

Many of the values can be significantly harmed or lost following a single bushfire or by an unfavourable fire regime. Some species are fire-sensitive, while others may be lost or altered in the complete absence of fire. Maintaining and protecting TWWHA values requires the deliberate application of appropriate fire regimes to some areas, while excluding fire, as far as practical, from other areas.

### **Report findings**

The major impacts projected to occur from climate change are related to increases in vegetation and soil dryness and flammability, as indicated by projections for the Mount Soil Dryness Index and increased dry periods. Increases in soil dryness are likely to be already occurring (ie within the 2010-2030 time period) and manifest as increased occurrence of lightning ignitions and areas

burnt, and increased fire occurrence in organic soils. The upward trend in dryness and flammability is expected to continue.

The values in the TWWHA that are most threatened by an increase in fire frequency are fire-sensitive palaeoendemic species; alpine ecosystems; rainforest ecosystems; and organic soils and landforms.

## **Fire management arrangements for the TWWHA**

The Tasmania Parks and Wildlife Service is the management authority for the TWWHA and meets its responsibility for managing bushfire in the TWWHA through a combination of activities. These activities are guided by the TWWHA Management Plan 2016 and other well-developed policies and plans that cover bushfire prevention, preparedness, response and recovery.

The Australian Government provides the Tasmanian Government with \$3.4 million per annum (baseline funding until 2018) to assist with management of the TWWHA under a World Heritage Grants Funding Agreement. The Tasmanian Government contributes a minimum \$4.9 million per annum. In 2015, the Australian Government committed to supporting Tasmania to strengthen its management of the TWWHA by providing an additional \$10.2 million, over four years from 2014-15, for its protection, conservation, presentation and rehabilitation. Fire management arrangements for the TWWHA sit within the broader context of Tasmania's fire management arrangements.

The Tasmania Fire Service supports and works closely with the Tasmania Parks and Wildlife Service in fire management in the TWWHA, but does not take a direct operational role for response in the TWWHA, except when very large fires occur, fire threatens human settlements or the fire operational capacity of the Tasmania Parks and Wildlife Service is exceeded. The Tasmania Fire Service has a collaborative role in terms of preparedness and may have a support role in recovery from some bushfires in the TWWHA. Forestry Tasmania also works closely and cooperatively with the Tasmania Parks and Wildlife Service in many aspects of fire management.

## **Report findings and recommendations**

Current fire management arrangements for the TWWHA are well-developed and the Tasmanian fire agencies have sound protocols and practices for working together in bushfire prevention, preparedness, response and recovery. The scale of the 2016 bushfires was significant in terms of the number of ignitions and the extent of area impacted. The firefighting effort in response was extraordinary in terms of financial, physical and human resources applied from Tasmania and other jurisdictions.

This Report concludes that the risks of bushfire to the TWWHA will increase in coming years under the influence of climate change. It is likely that climatic conditions like those in 2016 will re-occur, and other aspects of fire risk will also increase. It is therefore important to take the lessons learned from the 2016 bushfires, and the climate projections referred to in this Report, to prepare for a future where fire management in the TWWHA is expected to be more challenging. The increase in bushfire risk has already started, and changes to management are needed now and well into the future.

## **Recommendation 1 – Comprehensive fire management planning**

*Clear, well-defined objectives for fire management should be incorporated into a Fire Management Plan for the TWWHA. These objectives should identify how fire management (fire suppression, 'let go' and management fires) will be used to protect and conserve the natural and cultural heritage values in the TWWHA.*

*The Fire Management Plan for the TWWHA should clearly set out the circumstances in which priority will be given to protecting the Outstanding Universal Value of the TWWHA over built assets within its boundaries.*

## **Prevention**

### **Current operational practice**

The Tasmania Parks and Wildlife Service's Strategic Fire Management Plans present strategies for preventing and mitigating bushfires in the TWWHA.

Bushfire risk assessment and modelling is an important risk management tool. The risk assessment informs the management of risk by identifying and prioritising areas that may be suitable for risk mitigation activities such as fuel reduction burning. It also identifies areas that are not suitable for risk mitigation, but can be prioritised for suppression or other response activities when bushfires approach or threaten particular values.

In recent years, the development of the Bushfire Risk Assessment Model (BRAM) has been important for planning and fire response in the TWWHA. BRAM is a computer mapping system that models and maps the risk of bushfire at 100-metre grid resolution. Data used by BRAM comes from many sources and is combined and analysed to calculate risk scores for the State, including the TWWHA. The final product is a map of bushfire risk across Tasmania.

Planned burning is used as a management tool in the TWWHA, where it is appropriate to do so and where funding permits, to achieve a number of key objectives.

Bushfires spreading accidentally from campfires are a significant risk to the natural values of the TWWHA. The statutory regulation of campfires is covered under *the Fire Service Act 1979*, and for the TWWHA under the *National Parks and Reserved Land Regulations 2009*. Most of the TWWHA has been declared a Fuel Stove Only Area to protect natural values, and fires are totally banned in these areas. Additional restrictions on campfires are imposed by the Tasmania Parks and Wildlife Service at times of very high fire danger, triggered by criteria that are more stringent than those typically used for the declaration of Total Fire Bans by the Tasmania Fire Service.

### **Recent work and research**

In the early 1990s, the Tasmania Parks and Wildlife Service started work to improve knowledge of fire behaviour in buttongrass moorland, in order to increase the effectiveness of fire operations; both suppression and planned burning. This has included collecting data from small, experimental fires, planned burns and bushfires. These studies were published in a series of scientific papers, and the operational findings informed the development of fire behaviour equations, the Moorland Fire Danger Index and prescriptions for planned burning. The buttongrass fire

behaviour model now underpins fire operational practice for all buttongrass vegetation in Tasmania.

A landscape fire-spread modelling tool, FIRESCAPE-SWTAS, has been developed for South-West Tasmania. It explores how much benefit, in terms of reduction of damage to natural values such as rainforest, is provided by differing amounts of planned burning.

An understanding of the fire ecology of ecosystems present in the TWWHA is necessary to develop sustainable planned burning programs, and to protect fire-sensitive and fire-dependent values. Fire ecology research and monitoring undertaken by the Department of Primary Industries, Parks, Water and Environment (DPIPWE) has prioritised the unique buttongrass moorland vegetation, where planned burning plays both a crucial ecological and fire protection role. Numerous studies have contributed to Tasmania's understanding of buttongrass vegetation ecology and therefore planned burning.

Fire appears to be important in the maintenance of at least some of Tasmania's grassy vegetation, particularly in highland areas (montane grasslands), where other environmental influences such as frost and poor drainage are insufficient to prevent invasion by shrubs and trees. A draft montane grassland fire management strategy and plan has been prepared with the following aims: (1) to maintain or increase the area of montane grassland in the public reserve estate, (2) to ensure a diversity of structure and floristics that will support all known rare or threatened species that occur within montane grassland, and (3) to maintain cultural traditions that achieve the above objectives.

The Warra Long Term Ecological Research site of 15,900 hectares was established in 1995 to encourage long-term ecological research and monitoring in wet eucalypt forests in Tasmania. Following the extensions to the TWWHA of 2013, 80 per cent of the Warra site is now in the TWWHA, while the remainder is on Permanent Timber Production Zone land managed by Forestry Tasmania. Warra is a scientific research site of national and international importance. The significant value of the investment in the infrastructure and already established data collection at Warra cannot be overstated. The site contributes to the understanding of many aspects of land management and climate change science.

The Antarctic Climate & Ecosystems Cooperative Research Centre (ACE CRC) is currently investigating the changing opportunities for planned burning in Tasmania under climate change, with a focus on particular aspects that could affect the future viability of planned burning.

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## Report findings and recommendations

### **Recommendation 2 – The Bushfire Risk Assessment Model (BRAM)**

*The Tasmania Parks and Wildlife Service and DPIPW should maintain an ongoing program of investment in and development of fire management tools, including the BRAM and the Bushfire Operational Hazard Model (BOHM). As the BRAM is used across all agencies and tenures in Tasmania, it is imperative that it is fully auditable, and that its structure, inputs and operability are regularly reviewed.*

*BRAM should be fully integrated as a whole-of-government decision-support system with appropriate governance structures established accordingly; and readily accessible by all Tasmanian fire agencies and incident management teams.*

BRAM should be supported to a greater extent than it is at the present time. The current level of operation means that its full capacities are not being used and the incorporation of new information and programming is restricted. It should be noted that while BRAM is an excellent tool to consider the spatial arrangement of risk, other risk modelling tools are available that simulate the spread of fire and these are now routinely used in fire management. BRAM cannot be considered as the sole bushfire risk assessment tool available for the TWWHA.

The current design of BRAM, however, limits the practical availability and use of the system to a small group of fire management officers within the Tasmania Parks and Wildlife Service. There would be significant benefit in increasing the accessibility of BRAM by rebuilding it as a new computer system that is available to inform fire managers in the Parks and Wildlife Service, Forestry Tasmania and the Tasmania Fire Service, and from wherever they may be operating, to make critical decisions on priorities and dispatch in conjunction with other fire behaviour modelling tools. The provision of training on BRAM to a wider range of operational users is also required.

It is imperative that that BRAM continues to incorporate the best knowledge of fire behaviour models. Enhancement of the system should include use of appropriate fire-spread simulation tools for new vegetation types (such as moorland) when they are developed. Existing fire behaviour models and fire simulators should not be misused, that is, used beyond the vegetation types and fuels for which they have been validated.

### **Recommendation 3 – Objectives for planned burns**

*Clear objectives (at the strategic and program levels) should be set for management burning in the TWWHA.*

*The short, medium and long-term results of management fires should be monitored to evaluate the fires against specified objectives, and the findings used to retain, improve or modify approaches taken to management burning.*

*Burning programs should reflect the best available evidence. Fire simulation modelling tools should be used to guide the development of planned burning programs to meet objectives and new data incorporated into the models as they become available.*

As with other management activities, the monitoring of management burns should be actively incorporated into the adaptive management framework for the TWWHA.

Similarly, the re-introduction of Indigenous burning practices should have clear objectives, and monitoring should be incorporated into the adaptive management framework for the TWWHA.

### **Recommendation 4 – Monitoring the consequences of fire**

*The short, medium and long-term impacts of planned and unplanned fires should be monitored in order to understand the consequences of fire for the natural and cultural values of the TWWHA.*

*The findings of this monitoring should be used to plan future response to bushfires and to inform decisions about the use of management burning.*

As with other management activities, monitoring the impacts of bushfire management should be actively incorporated into the adaptive management framework for the TWWHA.

## **Preparedness**

### **Current operational practice**

The Tasmania Parks and Wildlife Service has, for 20 years, employed firefighters specifically trained in remote area firefighting and has developed techniques, specialised equipment and expertise to support this activity. In more recent years, the Tasmania Parks and Wildlife Service has increased the number of other specialist fire staff.

Remote area firefighting is a highly specialised field for both firefighting crews and pilots and requires a high level of fitness. Aircraft, primarily helicopters, are available for firefighting in the TWWHA through shared contracting arrangements coordinated by the Tasmania Fire Service. The Tasmania Parks and Wildlife Service operates a Fire Duty Officer system to manage daily fire preparedness and response.

Early fire detection and response time is critical for the successful delivery of any fire management program. The smaller the fire, and less vigorous the fire behaviour, the greater the probability that initial attack crews will be able to suppress or contain the fire. For example,

bushfires in buttongrass can grow within less than an hour to a size where suppression is no longer practical.

In Tasmania, bushfire detection is generally undertaken by ground-based staff or public reporting through the Tasmania Fire Service FireComm branch (000 emergency calls), or through operational detection systems including fire towers, aerial spotter flights, monitoring systems such as cameras, and websites that present satellite data, such as Sentinel, Weatherzone or Landgate Firewatch.

When advance notice is possible, the Bureau of Meteorology provides lightning warning forecasts to the Tasmania Parks and Wildlife Service. Lightning occurrence tracking is paramount to early detection and response to any remote fire or fires caused by lightning strike. Information available from monitoring systems, both pre- and post-lightning events, is used in association with information and advice from the Bureau of Meteorology forecasters to guide timing and location of fire-spotter flight paths.

### **Recent work and research**

The Tasmania Parks and Wildlife Service is augmenting the operational capacity of the Bushfire Risk Assessment Model (BRAM) to support decision-making. This involves developing a Bushfire Operational Hazard Model (BOHM) that takes into account the daily and forecasted weather observations to calculate fire weather indices and fire behaviour values, based on vegetation types and fuel loads. This system will assist personnel making resource deployment decisions, based on risk and the availability of resources, to prepare for and dispatch in response to bushfires.

Research undertaken through the Research Project indicates that the occurrence of lightning fires in the TWWHA and adjacent areas has greatly increased over the past 45 years, and particularly in the past 15 years. All of the recorded lightning fires between 1980-81 and 2015-16 were ignited in long unburnt vegetation. It is probable that the risk of lightning ignition in buttongrass increases with time post-fire.

Research undertaken by the Antarctic Climate and Ecosystems Cooperative Research Centre (ACE CRC) through the Research Project indicates that climate change will impact on a number of weather-related climate risk factors. Specifically, the research indicated:

- an increase in fire danger ratings towards the end of the century for dry eucalypt and buttongrass moorlands;
- an increase in soil dryness that continues from now and throughout the rest of the century, as indicated by the Mount Soil Dryness Index (MSDI) and identified thresholds of flammability;
- a rapid transition between summer and winter (ie a longer summer and a shorter autumn), with more intense conditions in summer;
- a slight decline in lightning-conductive conditions, but no change to extreme dry-lightning conditions; and
- a likelihood that extreme dry-lightning conditions will peak in summer, coinciding with peak increases in dryness indicators.

## Report findings and recommendations

The findings of this research have significant implications for future fire management in the TWWHA, as the conditions that led to the 2016 bushfires are expected to become more frequent as the century progresses. Increased spring and summer dryness, lower rainfall, higher temperatures and increased occurrence of lightning fires, combined, pose a major challenge to fire management in the TWWHA and the long-term protection of its natural and cultural values.

### ***Recommendation 5 – Research on fire and natural and cultural heritage values***

*An ongoing program of scientific research and monitoring should be maintained in the TWWHA that supports understanding:*

- *the interaction between climate change and the natural and cultural values of the TWWHA; and*
- *the evolving relationship between climate change and the projected impacts of fire on natural and cultural values in the TWWHA.*

This research should focus, in the first instance, on those values that are expected to be most vulnerable in the short term (for example relict Gondwanan flora).

This program of research should involve a broad spectrum of the research community, as well as personnel from DPIPWE and other Tasmanian Government agencies.

The program of research should be regularly reviewed and audited. The ‘DPIPWE TWWHA Bushfire Research Group’ should continue to be actively engaged in the process of developing objectives for this research program.

Attachment 9 sets out a prospective list of priority research to support fire management in, and the understanding of the impacts of fire on, the World Heritage values of the TWWHA.

### **Recommendation 6 – Research on fire vulnerability, fire behaviour and fire model inputs**

*In the short to medium-term, significant research effort should be directed to:*

- *further understanding the consequential interactions of climate change with fire vulnerability, behaviour and impact;*
- *understanding fire behaviour and flammability thresholds, particularly in dry conditions, of organic soils and the interaction between climate change, fire and organic soils;*
- *developing a comprehensive understanding of soil and fuel moisture in the various vegetation communities in the TWWHA; efficient methods to monitor and model soil and fuel moisture across the vegetation types in the TWWHA; and the development of reliable soil moisture indices for the TWWHA that can then be incorporated into fire behaviour models and fire danger indices;*
- *developing techniques for more accurately assessing fuel loads and mapping fuel types in different vegetation communities in the TWWHA and incorporating these into fire behaviour models; and*
- *developing fire behaviour models and associated fire spread simulators for peatlands, grasslands, wet eucalypt forest, coniferous rainforest, rainforest without conifers, and other vegetation communities in the TWWHA.*

This research should take into account national initiatives that are currently underway in the development of bushfire indices, and modelling and fire behaviour tools. The research should concentrate on those areas, soils and vegetation communities in the TWWHA that are not currently well represented in fire behaviour models and fire danger indices.

### **Recommendation 7 – Lightning and ignition detection**

*The Tasmanian fire agencies, in consultation with the Australian Bureau of Meteorology, should keep abreast of emerging technologies for predicting and detecting lightning strikes and ignitions.*

*If and when new technologies become available, these should be incorporated into preparedness and response planning for bushfire in the TWWHA.*

*A detection strategy should be developed that details the bushfire detection arrangements for the TWWHA, based on contemporary ignition risks and detection methods.*

## Recommendation 8 – Capital investment

*The Tasmanian fire agencies should develop a whole-of-government program of investment in facilities and equipment that enhance fire management capabilities in the TWWHA and more generally in Tasmania.*

*This program should include:*

- *identification and evaluation of options for installing new automatic weather stations in the TWWHA and nearby areas to improve weather and data records for the region; remote area sensors for monitoring local rainfall and soil moisture; and early detection facilities such as fire-watch installations;*
- *firefighting equipment available to fire agencies in different regions of Tasmania;*
- *improved communication facilities (that is for the radio network), to enable better communication between agencies, and for remote firefighting teams; and*
- *investment in facilities and equipment to enhance aerial firefighting efforts.*

This investment program should be developed on a whole-of government basis to maximise the benefits to all fire agencies and the Tasmanian community. Organisations such as the Bureau of Meteorology should be involved in order to ensure the fire agencies obtain the highest benefits from Tasmanian weather and climate data.

In constructing this investment program, an audit of existing weather and climate sensors in the region should be conducted and protocols developed for incorporating these data into real-time forecasts of fire weather.

## Response

### Current operational practice

The main means of identifying fire-sensitive natural and cultural values, and relevant priorities and response in the TWWHA is through the Natural Values Atlas, the Bushfire Risk Assessment Model (BRAM), and specialist staff from the Department of Primary Industries, Parks, Water and Environment.

The basic principle for determining response strategies and priorities is that the highest rated values from BRAM will be protected in preference to lower rated values.

Human life is afforded the highest priority in BRAM, and areas where visitors to the TWWHA are likely to be present are given the highest ranking. Typically, the highest ranking for natural values is assigned to areas that are fire-sensitive because there would be permanent and significant losses if burnt.

Responding to fires in the TWWHA requires consideration of broader strategic fire suppression priorities after consideration of the values, operational limitations and available resources. In reality, not all values can be protected at all times, and therefore a triage process is involved in strategic decision-making. The suppression objectives, strategies and allocation of resources are ultimately based on what can realistically be achieved to protect identified and agreed priorities.

Bushfire risk assessment is a dynamic process that recognises and adjusts to circumstances as they change. It relies on information from a range of sources and the application of appropriate fire models.

During a large bushfire event, where there are a number of fires that require suppression response, assessment can occur at both the State and regional level, using a risk assessment approach consistent with the National Emergency Risk Assessment Guidelines (NERAG) to:

- enable the timely and relevant issuing of community warnings;
- prioritise operational activities on the fireground; and
- undertake options analyses in determining suppression and control strategies.

Fire risk to visitors is mitigated by developing emergency response plans or actions within the Fire Action Plan to enhance visitor safety. The Tasmania Parks and Wildlife Service has a draft emergency response plan for the Mt Field National Park, which includes responding to fire with appropriate trigger points.

During the 2016 bushfires, the Tasmania Parks and Wildlife Service set up a Visitor Management Team to coordinate warnings to walkers, detection and relocation of visitors at risk (those in the path of fires), closure of campgrounds, walking tracks and reserves, communication with the public, and liaison with incident management teams and the State Fire Duty Officer.

## Report findings and recommendations

### ***Recommendation 9 – Mapping of values***

*DPIPWE and the Tasmania Parks and Wildlife Service should continue to improve mapping, and incorporate the most up-to-date and available vegetation, soil and other natural and cultural values mapping into TASVEG and the Bushfire Risk Assessment Model (BRAM).*

The availability of high-resolution aerial imagery has increased significantly in the past decade. Higher resolution mapping of natural values will significantly improve the inputs to the BRAM and enhance the fire risk assessments BRAM produces.

There is a role for the broader research community in providing both input to, and review of, natural and cultural values mapping for the TWWHA.

### **Recommendation 10 – Operational capability**

*The Tasmania Parks and Wildlife Service should review its immediate, medium and long-term fire suppression capabilities, including staffing.*

*This review should be done in consultation with other fire agencies in Tasmania as skills, demographic factors, and agency capabilities are expected to change significantly across all agencies.*

*This review should also take into account the spatial context of bushfire risk; emerging technological development; future fire suppression capabilities such as new fixed- and rotary-wing aircraft; and the future requirements for skilled, remote-area firefighting teams.*

*A review of resources and staffing arrangements should be undertaken to facilitate flexibility and responsiveness in capability to match annual variation in fire seasons (ie that impact workload).*

The aim of this review is to understand what resources are required by the Tasmania Parks and Wildlife Service to manage current and future bushfire risk, and what actions need to be taken now to ensure that adequate levels of skill, staffing, equipment and decision-support tools are available for fire management in the future.

### **Recommendation 11 – Use of volunteers**

*The Tasmania Parks and Wildlife Service, in conjunction with other Tasmanian fire agencies, should review the future potential for the use of volunteers in supporting fire management activities, including the potential to use trained remote area volunteer fire crews.*

*This review should be conducted in conjunction with the review of the Tasmania Parks and Wildlife Service's fire suppression capabilities.*

### **Recommendation 12 – Fire suppression techniques and methods**

*The Tasmanian fire agencies should regularly review operational practices, fire suppression technologies and techniques used in other jurisdictions and determine their efficacy for Tasmania, including in the TWWHA.*

*In the TWWHA, particular attention should be paid to:*

- *early intervention techniques and technologies such as early detection and rapid attack; and*
- *continuing to investigate methods and equipment for extinguishing ground (organic soil) fires (eg spike and pump combinations).*

### **Recommendation 13 – Aerial fire suppression**

*The Tasmania Parks and Wildlife Service and the Tasmania Fire Service should review future capabilities in fixed- and rotary-wing aircraft for fire suppression in the TWWHA, and for the safe insertion of remote area firefighting teams, including where landing or hover exit is not possible.*

This review of aircraft support should be carried out in conjunction with the review of staffing capabilities.

### **Recommendation 14 – Research on fire suppression chemicals**

*The current research on the efficacy and environmental impacts of the use of fire suppression chemicals in the TWWHA should be continued in the short term.*

This research should inform the development of guidelines for future use of fire suppression chemicals in the TWWHA.

### **Recommendation 15 – Use of fire suppression chemicals**

*The Tasmania Fire Service and Parks and Wildlife Service should review the future use of fire suppression chemicals in the TWWHA following the conclusion of the research project currently being undertaken.*

*Research, monitoring and adaptive management should continue on the use of fire suppression chemicals from the perspective of both impacts on TWWHA values, and guidelines on the effective and efficient operational strategies and tactics of the various fire chemical classes.*

*If the research determines that the use of fire suppression chemicals is appropriate in the TWWHA, suitable procedures will need to be established, as well as training and equipment, to manage the use of these products in a safe and responsible manner.*

*Protocols for future decisions to use fire suppression chemicals in the TWWHA should be incorporated into the TWWHA Fire Management Plan and associated operational fire guidelines.*

*As an interim measure, the use of fire suppression chemicals should be undertaken using a precautionary approach, where application is assessed and approved on a case-by-case basis.*

The use of fire suppression chemicals for firefighting in the TWWHA should balance potential environmental impacts (if any) with the protection of the natural and cultural heritage values of the TWWHA.

## **Recommendation 16 – Improved public information and communications**

*The Tasmania Parks and Wildlife Service should develop a specific communications plan on bushfires and fire management. This plan should include:*

- *public information on the restrictions on lighting fires in the TWWHA and the impacts of bushfire on sensitive natural and cultural assets;*
- *the dissemination of public information on fire danger during the fire season;*
- *the dissemination of public information during fire events including bushfires and management fires, including suppression activities; and*
- *the dissemination to the public of information on the extent and impacts of bushfire in the TWWHA.*

*The communications plan should also cover the provision of public information during extreme bushfire events, such as those that occurred during 2016.*

Good quality public information can play an important role in building community support for fire management in the TWWHA, and for the efforts of fire agencies during extreme events.

## **Recovery**

### **Current operational practice**

Building on the Victorian approach, in 2011 New South Wales and the Australian Capital Territory developed Burned Area Assessment Teams and also invited the Tasmania Parks and Wildlife Service to participate in a cooperative arrangement across jurisdictions.

These teams draw together expertise in a range of scientific disciplines and conduct a rapid risk assessment immediately following an emergency event. These assessments are used to assist managers in identifying and minimising future impacts – both immediate and longer-term – caused by the emergency event. The goal is to reduce further threat to life, property, infrastructure and the environment. The outputs of the process, which include a written report, support the transition from emergency response to recovery.

The Department of Primary Industries, Parks, Water and Environment (DPIPWE)'s Natural and Cultural Heritage Division and the Tasmania Parks and Wildlife Service have supported this multi-jurisdiction approach, providing some input to the development of the process, and may provide personnel for teams in the future. This assessment approach has been used in Tasmania by the Parks and Wildlife Service, Forestry Tasmania and the Tasmania Fire Service in 2013 and 2016, drawing on the assistance of expertise from other states and territories.

Assessment of the impacts on natural values following major fire events is a function performed by DPIPWE's Natural and Cultural Heritage Division, where resources and time permit. The tasks are assigned to a small team of specialists, typically botanists, zoologists, geomorphologists, soil scientists and spatial data analysts. Brief reports are prepared that highlight:

- the area of different vegetation types burnt within the fire perimeter, based on TASVEG vegetation mapping;

- natural values that may have been affected, such as threatened species, threatened vegetation communities and fire-sensitive species or soils; and
- the context of the impacts within the broader management of fire regimes for species or ecosystems of concern.

When considered appropriate, longer-term monitoring and studies are established for targeted species or values.

## Report findings and recommendations

### **Recommendation 17 – Role of Bushfire Rapid Risk Assessment**

*The Tasmania Parks and Wildlife Service and other fire agencies should establish protocols for ‘rapid assessment’ of the impacts of major bushfires in the TWWHA and resourcing of immediate priorities for recovery action.*

Rapid assessment techniques are used in many jurisdictions in Australia and overseas to provide an initial assessment of fire impacts and priorities for recovery and rehabilitation. While these ‘rapid assessments’ cannot replace long-term investigation and monitoring of fire impacts, they can be useful in prioritising recovery efforts and rationalising commitment of resources to recovery.

The efficacy and usefulness of rapid assessment techniques should subsequently be evaluated, and their implementation modified if required.

### **Recommendation 18 – Ecosystem rehabilitation and restoration trials**

*The Tasmania Parks and Wildlife Service and DPIPW should undertake trials of post-bushfire rehabilitation techniques (eg erosion control, tree planting, seed germination and seed banks), especially for vulnerable species, communities and other significant values in the TWWHA.*

This work should be integrated into a broader research strategy for the TWWHA, and incorporated into the Adaptive Management framework contained in the TWWHA Management Plan.

Protecting the natural and cultural heritage values of the TWWHA will be challenged by the increased likelihood of bushfires under projected climate change. Some of these challenges are already apparent as increased soil dryness and increased occurrence of ignition from lightning strikes. Given the national and international significance of the TWWHA and its importance to the Tasmanian economy and Tasmania’s image, it is imperative that steps be taken now to prepare and plan for these future challenges.

Tasmania has well-developed fire management arrangements and procedures for the TWWHA across the areas of bushfire prevention, preparedness, response and recovery. Tasmania also has

well-developed interagency cooperation mechanisms that underpin responses to large and complex bushfire events. It is likely that the capacity of all Tasmanian fire agencies will be under great pressure at times in the future. Tasmania's ability to call in additional resources from other jurisdictions may also be challenged by extreme climate events elsewhere.

This Report sets out recommendations that can be employed by Tasmania to prepare for, and respond to, future bushfire threat in the TWWHA. While some recommendations focus on the responsibilities of particular agencies, responding to and implementing these recommendations will require consideration across all areas of government so that the benefits that accrue are available and shared across the Tasmanian economy.