Australian Government

STATE PARTY REPORT

ON THE STATE OF CONSERVATION

OF THE

TASMANIAN WILDERNESS WORLD HERITAGE AREA (AUSTRALIA)

PROPERTY ID 181bis

IN RESPONSE TO DECISION OF THE WORLD HERITAGE COMMITTEE WHC 31 COM 7B.43

FOR SUBMISSION BY
1 FEBRUARY 2008

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WHC DECISION 31 COM 7B.43

WORLD HERITAGE COMMITTEE
Thirty-first session
Christchurch, New Zealand
23 June-2 July 2007

43. Tasmanian Wilderness (Australia) (C/N 181)
Decision: 31 COM 7B.43

The World Heritage Committee,

1. Having examined Document **WHC-07/31.COM/7B**,

2. Recalling Decision **30 COM 7B.32**, adopted at its 30th session (Vilnius, 2006),

3. Notes with concern the issues raised by NGOs in relation to the impacts of logging adjacent to the World Heritage property and the commencement of the North Weld Road which compromises options for future extensions to the World Heritage property;

4. Urges the State Party to consider the extension of the World Heritage property to include critical old-growth forests to the east and north of the property, or at least to manage these forests in a manner which is consistent with a potential World Heritage value;

5. Expresses its concern about the risk from fire related to forest regeneration and natural events, and its possible adverse impact on the World Heritage property, and requests the State Party to prepare a Risk Management Plan and to consider distancing the logging operations from the boundary of the property;

6. Taking into account the clarification provided orally by the State Party at the 31st session, also requests the State Party to invite a joint World Heritage Centre /IUCN /ICOMOS mission to assess the state of conservation of the property, focusing on:
    a) appropriate management of areas of heritage value which are currently outside the property,
    b) an assessment of the degree of risk related to regeneration fires in areas adjacent to the World Heritage property as well as of the effectiveness of the fire management system in place,
    c) impacts of proposed forestry operations (including the construction of new roads) on the outstanding universal value of the property,

7. Requests the State Party to provide the World Heritage Centre with an updated report by **1 February 2008** on the state of conservation of the property and the above mentioned issues for examination by the Committee at its 32nd session in 2008.

EXECUTIVE SUMMARY

This Update Report on the State of Conservation of the Tasmanian Wilderness World Heritage Area (TWWHA, the property):

- responds to World Heritage Committee **Decision 31 COM 7B.43**; and
- provides an update to the **2007 State Party Report** prepared in response to World Heritage Committee **Decision 30 COM 7B.32**. The two documents should be read together.

Decision 31 COM 7B.43 relates to issues regarding the management of the TWWHA itself, external threats to the property and issues related to potential outstanding universal values outside the property. The Update Report separates discussion of issues relating to management of the TWWHA and issues relating to areas outside the property.

This Update Report demonstrates that the TWWHA is being effectively managed and that there is no substantive threat from forestry operations adjacent to the TWWHA. The Australian Government considers the management arrangements in proximity to the property boundary are appropriate to protect the property.

Management of the Tasmanian Wilderness World Heritage Area

The Tasmanian Wilderness World Heritage Area is a huge area covering over 20 per cent of the entire island of Tasmania.

Since the listing of the Tasmanian Wilderness World Heritage Area in 1982, Australia has invested well over AU$100 million in the management of the property. This funding has been jointly provided by the Australian and Tasmanian Governments. Due to this investment, the management of the property has received international acclaim, as outlined in the 2007 State Party Report.

A variety of potential threats to the natural and cultural World Heritage values of the property have been identified, including biosecurity, climate change and operations that pre-date the listing of the property. Management effort and research are focused on those issues that may directly impact on the property's World Heritage values. These are being addressed through national and state recovery programmes and the adaptive management arrangements for the property. As part of this adaptive management of the property, an interim review by the Tasmanian Parks and Wildlife Service of the 1999 Management Plan is nearing completion, with a full review due to commence in 2009-2010.

The area inscribed on the World Heritage List, including its diverse World Heritage values, has been shaped in many ways by fire. Anthropological evidence suggests that humans have occupied Tasmania for at least 35,000 years and possibly much longer. Aboriginal burning practices, and to a lesser extent lightning, have significantly influenced the development of plant and animal communities; some are adapted to fire, (e.g. buttongrass moorland), some are dependent on it for their survival, (e.g., eucalypt forest), and others are destroyed by it (e.g. native conifer stands and rainforest).

Prescribed or controlled burning is necessary in the management of natural and cultural values and assets inside the property. A substantial increase in the application of prescribed fire in buttongrass moorlands is required to protect the fire-sensitive ecological communities within the property. The Tasmanian Parks and Wildlife Service is in the process of developing an Integrated Fire Risk Management Plan for the land it manages across the State of Tasmania, including the TWWHA. This plan is due to be complete by the end of 2009.

Management of Areas Adjacent to the Property

The TWWHA is the largest World Heritage property in Australia as a proportion of the surrounding State's land mass. At 20 per cent of Tasmania's entire land area, the property represents a major contribution by Australia to the conservation of the world's natural and cultural heritage. Taken together with the TWWHA, protected areas cover almost 45 per cent of the entire land area of Tasmania. As a result, Australia is not contemplating an extension to the TWWHA.

Old growth forest values for the TWWHA include Pristine Tall Eucalypt Forests, Eucalyptus Tall Open Forest including Eucalyptus regnans and rainforest. These old growth communities are well protected within the TWWHA, formal or informal reserves or by specified forestry management practices outside of reserves. Approximately 80 per cent of old growth forest in Tasmania is protected in reserves. This level of protection for these old growth forest types is far in excess of the target established by the IUCN of 10 per cent and in excess of the national reserve target established for the Regional Forest Agreement 1997 (RFA) of 60 per cent.

The Regional Forest Agreement (RFA), together with the 2005 Tasmanian Community Forest Agreement, provides the framework for managing and protecting heritage values of forests outside the TWWHA.

The second independent five year review of the implementation of the RFA is nearing completion, and recommendations are expected to be available by the time the mission visits Tasmania in March 2008. The Australian government recognises that this review provides a timely opportunity to ensure that implementation of the RFA is delivering on a range of environmental objectives, including heritage protection, as envisaged. Australia will discuss with the mission any outcomes of the review relevant to the property and of World Heritage values.

Since the 1930s all of the large fires that have burnt between what is now the World Heritage property and State forest have started in the World Heritage property and moved into State forest and not vice-versa. Since the establishment of the TWWHA in 1982 Forestry Tasmania has conducted a total of 521 silvicultural regeneration burns covering a total of 10,748 hectares of State forest within five kilometres of the property boundary. As noted in the background report, none of these 521 regeneration burns have escaped into the property.

The Forest Practices Code mandates specific prescriptions to avoid impacts on karst values and systems, as well as cultural values. Operational staff are required to seek specialist advice from geoscientists and Aboriginal Heritage Officers on site specific

requirements to protect natural and cultural values in areas identified as likely to contain such values.

The risks to natural and cultural values from forestry operations in the vicinity of the property have been evaluated as low and manageable. Given the extent and representativeness of the protected area estate in Tasmania, the significant resources given to fire management and the adaptive risk management arrangements for the property and nearby forest areas, there is no need to distance forestry operations from the property boundary.

1. RESPONSE FROM THE STATE PARTY TO THE WORLD HERITAGE COMMITTEE'S DECISION

This document includes the updated report requested in **Paragraph 7** of the World Heritage Committee's Decision. The updated report is provided for examination by the Committee at its 32nd session in 2008. As requested by the World Heritage Centre, the updated report follows the format for State of Conservation reports agreed at the 31st session of the Committee in Christchurch, New Zealand.

Issues inside the World Heritage property are addressed distinctly from those relating to areas beyond the property.

1.1. Paragraph 3

Notes with concern the issues raised by NGOs in relation to the impacts of logging adjacent to the World Heritage property and the commencement of the North Weld Road which compromises options for future extensions to the World Heritage property;

The World Heritage property boundary extends to a distance approximately 1227km. Of this, 72 per cent abuts reserves, 12 per cent is production State forest, and less than 9 per cent of this long boundary is potentially exposed to clearfell and burning operations. Most of the remainder of the boundary abuts private land.

As envisaged in the 1989 nomination, and accepted in IUCN's technical evaluation of the 1989 extension of the property, forestry operations continue in areas adjacent to the property, and potential impacts on natural and cultural values are managed in accordance with the Forest Practices Code and other requirements.

Almost all streams outside the property flow away from the property and therefore the effects of forestry operations on water or stream biota inside the property are minimal.

While some minor road works / construction have occurred, these have been conducted in accordance with agreed practices and standards. The recently constructed North Weld Road is a small (1.4 km) extension of an existing road system in the lower Weld Valley, and is no closer to the World Heritage property than existing forest roads and intensive forestry operations.

Management of the Tasmanian Wilderness World Heritage property

No issues arise for management within the property, because no logging is conducted inside the property, and no forestry roads are built within the World Heritage property. The issue of future extensions to the TWWHA is addressed under 1.2 of this Update Report.

Management of Areas Adjacent to the Property

Forestry Operations

The State Party Report provided to the World Heritage Centre in February 2007 discussed at length management to prevent impacts from forestry operations on the outstanding universal values of the Tasmanian Wilderness World Heritage property.

Almost all streams outside the property flow away from the property and therefore the effects of forestry operations on water or stream biota inside the property are minimal. There are, however, a small number of streams that flow from State forest back into the property in karst. The Forest Practices Code mandates specific prescriptions to avoid impacts on karst values and systems, as well as cultural values. Operational staff are required to seek specialist advice from geoscientists and Aboriginal Heritage Officers on site-specific requirements to protect natural and cultural values in areas identified as likely to contain such values.

The management of risks associated with regeneration burns is discussed in Section 1.3 of this Update Report.

Roading

As an update to the 2007 report and in response to the specific issue raised regarding the construction of the North Weld Road, a case study on the Weld Valley is attached for information (**Attachment A**). The diagram in the case study illustrates the location of existing roads, previously logged areas by year, and planned logging areas. As shown, forest harvesting and regeneration has taken place in the Weld catchment since the early 1980s.

The recently constructed North Weld Road is a small (1.4 km) extension of an existing road system in the lower Weld Valley. Many forestry roads in the lower Weld Valley were built in the 1970s and 1980s, prior to the World Heritage listing, to provide access for harvesting of the forests in the area. Some of these roads are located within a short distance of the property boundary. The new North Weld Road has been constructed for minimal visual impact from the property and is no closer to the World Heritage property than existing forest roads and forestry operations.

All roading activities undertaken by Forestry Tasmania are regulated through the Forest Practices Code which includes the following general principles:

- Ascertain the presence of significant natural and cultural values before building roads; and
- Avoid road locations in areas where roading would substantially affect significant values.

The Code is available at http://www.fpa.tas.gov.au/index.php?id=81

In 2005, the Tasmanian Community Forest Agreement provided funding for Forestry Tasmania to construct new low-impact roading for the purpose of improving access for selective timber harvesting and to leatherwood apiary sites to maintain sustainable supplies of leatherwood honey. Most of these new roads are in north-west Tasmania, not

near the property boundary. The North Weld Road is part of this program, being constructed to provide improved access to the special timbers and leatherwood resources within the Weld Valley. Special Timber Management Units (STMUs) are shown in the map at **Attachment E**.

Further information on Forestry Tasmania's procedures to minimise impacts from road construction is contained at **Attachment F**.

Aesthetic Values

The World Heritage property boundary extends to a distance of approximately 1227km. Of this, 49 per cent abuts formal reserves, 23 per cent abuts informal reserves, 12 per cent is production State forest, and the remainder is private land and some land managed by Hydro Tasmania. When Special Timber Management Units are excluded from this State forest figure latter figure, less than 9 per cent of this long boundary is potentially exposed to clearfell and burning operations. When higher altitude forest types are excluded, which are not managed on clearfell regimes, this figure is much lower.

As forestry operations can be seen from parts of the property, particularly mountain peaks along the eastern boundary, forest operations on adjacent lands have the potential to impact on aesthetic viewfields. In many cases, the views from these same mountains also include cleared agricultural land, towns and other infrastructure. Forestry operations have been conducted in these areas since before the listing of the property, and were outlined in the 1989 nomination and IUCN evaluation.

Impacts on the aesthetic values of the TWWHA are managed through various policies:

- the Forest Practices Code, which outlines the requirements to manage landscape and visual amenity values when planning and conducting any forest operation.
- The Manual for Forest Landscape Management 2006 also provides forest managers with a range of visual principles, procedures and practices to guide the planning and management of forests. This manual is available at

  http://www.fpa.tas.gov.au/fileadmin/user_upload/PDFs/Landscape_CultHer/Landscape_Manual_background_and_contents_pages.pdf

- At a planning level, Forestry Tasmania implements a "forestry in the landscape" approach so that, in general, the most intensive forest activities are the greatest distance from the property and other wilderness areas. This approach was described in the 2007 State Party Report. An updated diagram at **Attachment B** illustrates the approach. It is an extract from *Stewards of the Forest*, a Forestry Tasmania publication available in full at www.forestrytas.com.au/uploads/File/pdf/stewards_of_the_forest_v5_screen.pdf
- Whilst there are some areas of forest close to the boundary that have been and will be logged, including clearfelling, most of these are regrown on rotations of between 80 and 200 years, which helps to minimise visual impacts.

- Visual management software is used to model the impact of harvesting operations from key points in the landscape, including from the World Heritage property. This approach provides a transition for activities adjacent to the property so that the natural and cultural values of the property are maintained.

Forestry Tasmania's draft Forest Management Plan 2008-2017 outlines this process at www.forestrytas.com.au/assets/0000/0300/draft_forest_management_plan_1.3_email.pdf

For several decades, it has been envisaged that forestry operations will be permitted to continue in some areas adjacent to the World Heritage property, with appropriate management through the Forest Practices Code. In its technical evaluation of the September 1989 nomination of the extension to the property, IUCN noted:

"Outside the boundaries of the site, extractive forestry operations will occur outside the eastern boundary with clear-cutting, road-building activity, the possibility of fire escape, and reduction in visual quality and wilderness values. These will hopefully be minimised through careful management and through application of the Forestry Commission's "Forestry Practices Code". However, the adjustments to the eastern boundary of the site made in the September 1989 revision to better follow natural features reduces the potential problem. Specific suggestions for adjustments of the eastern boundary reviewed during the IUCN field inspection have now been incorporated."

1.2. Paragraph 4

Urges the State Party to consider the extension of the World Heritage property to include critical old-growth forests to the east and north of the property, or at least to manage these forests in a manner which is consistent with a potential World Heritage value;

In 1989 the TWWHA was extended by 78 per cent from its previous boundaries to 20 per cent of the land mass of Tasmania. Australia is not contemplating further extensions to the Tasmanian Wilderness World Heritage property.

Old growth forest protection in Tasmania far exceeds the 10 per cent target set by IUCN and the 60 per cent national reserve criterion. Approximately 80 per cent of old growth forest in Tasmania is protected in reserves.

Areas outside the TWWHA are managed for a range of outcomes.

Management of the Tasmanian Wilderness World Heritage Area

As this Paragraph of the Decision refers to areas outside the TWWHA, this section does not discuss issues inside the TWWHA.

Management of Areas Adjacent to the Property

Consideration of extension to the TWWHA.

Australia is not contemplating an extension to the Tasmanian Wilderness World Heritage property. The TWWHA is the largest World Heritage site in Australia as a proportion of the surrounding State's land mass. At twenty per cent of Tasmania's entire land area, the property represents a major contribution by Australia to the conservation of the world's natural and cultural heritage.

Mapping of Tasmania's old growth forests was undertaken for the first time in 1996 as part of the process for identifying all forest values leading to the RFA between the Australian and Tasmanian Governments. A total area of 1,246,000 hectares of old forest was identified on public and private land, representing around 16 per cent of Tasmania's land area. As a result of the RFA and the Tasmanian Community Forest Agreement in 2005 (TCFA), almost one million of the 1.2 million hectares (or about 80 per cent) of old growth forest areas are now protected in identified reserves. Approximately 406,000 hectares of RFA-defined old growth forest are located within the TWWHA – about one third of the property's area.

All types of old growth forest represented in the TWWHA are therefore reserved on a statewide basis at levels that exceed the internationally recognised 'JANIS' reserve criterion that at least 60 per cent of each old growth RFA Forest Vegetation Community be reserved. The Forest Vegetation Communities of the areas of old growth forest to the north and east of the property are all communities that are well represented in the property. Old growth forest values are largely protected through the existing reserve system and management practices under the Forest Practices Code.

Australia's heritage assessment process

Australia has an agreed approach to heritage assessment at a national level and, under the RFA, for extensions to the reserve system and the TWWHA in Tasmania. This approach is consistent with the requirement under the World Heritage Convention to consider the environmental, social and economic aspects of World Heritage nominations[1]. Under the RFA, any World Heritage nominations of any part of the Forest Estate (i.e. State forest and private forest managed for production) will be from the Dedicated Reserve elements of the Comprehensive, Adequate and Representative (CAR) reserve system[2].

The Australian Government has in recent years revised the legislative arrangements for National and World Heritage listing. The 2003 amendments to the *Environment Protection and Biodiversity Conservation Act 1999* established the National Heritage List. The April 2004 National Heritage Protocol outlined arrangements for the coordination of Australian, State and Territory Governments systems for the protection of heritage. Under that protocol it was agreed that, as a general principle, future nominations for World Heritage listing would only be drawn from the National Heritage List.

Current National Heritage nominations in Tasmania include the Tarkine Wilderness and the Great Western Tiers. These public nominations are being assessed for values under the provisions of national legislation. Public nominations for the National Heritage List are accepted each year. No new nominations were received for natural sites in Tasmania in the latest round of nominations.

[1] Tasmanian Regional Forest Agreement 1997 - Clause 40.
[2] Tasmanian Regional Forest Agreement 1997 - Clause 41.

Management of old growth forests to east and north of property

Further to the discussion of old growth on page 6 of this Update Report, areas to the north and east of the TWWHA include a combination of old growth forest and other forest and non-forest vegetation types. They are also characterised by a mixture of different tenures with varying management objectives, and include significant areas that are already protected as formal and informal reserves (see 2007 State Party Report page 8 and Table 2).

The management framework outlined below demonstrates that protected areas and management practices covering 'old growth forests to the east and north of the property' provide protection for potential World Heritage values.

Areas to the north and east of the property include land zoned for management of old growth forest for protection of environmental values. These are areas designated as either Forest Reserves under the *Forestry Act 1920* or land designated by Forestry Tasmania as Informal Reserves. As noted in the 2007 State Party Report, timber harvesting is not permitted in either of these reserve categories and management of all reserves is conducted in accordance with the Tasmanian Reserve Management Code of Practice: http://www.parks.tas.gov.au/publications/tech/management_code/RMCODECO1.pdf

This management framework aims to protect the natural and cultural heritage values of the area and management for uses other than commercial forestry. Typical activities that might occur on these areas are nature conservation, fire management, research and recreation.

Many areas to the north and east of the property have also been managed for wood production on a sustainable basis for many years. In addition, many contain forestry roads and areas of harvested and regenerated forest, in some cases up to the boundary of the TWWHA. This was not only recognised in the 1989 nomination of the TWWHA, but was an important consideration in the establishment of boundaries at that time. As mentioned above, the IUCN accepted this in its technical evaluation of the 1989 renomination of the property.

On land managed for commercial wood production, all forest operations are conducted in accordance with the Forest Practices Code established under the *Forest Practices Act 1985*. Extensive planning is therefore required prior to commencing any forestry operations to identify and manage all environmental and heritage values.

Many State Forest areas to the north and east of the property include Special Timber Management Units or eucalypt management areas where old growth eucalypt forest will be managed for timber production using a range of systems. In particular, no regeneration burns are conducted in these Special Timber Management Units (refer **Attachment E**).

As indicated in 1.1 above, the Forest Practices Code stipulates practices to manage particular natural and cultural values, such as those often found in karst landscapes.

Key figures on old growth forest

Old growth forest values are well represented in the TWWHA and other reserves outside the TWWHA. Of the total area of 1.23 million hectares of old growth forest almost one million hectares (approximately 80 per cent) are currently protected in reserves. Old growth forest outside of these reserves is also managed such that much of it will not be logged.

Old growth forest values as referred to in the TWWHA values statement include Pristine Tall Eucalypt forests, Eucalyptus Tall Open Forest including Eucalyptus regnans, and rainforest. All are well protected within the TWWHA, formal or informal reserves or by specified forestry management practices outside of reserves. The level of protection for these old growth forests is far in excess of the target established by the IUCN of 10 per cent and in excess of the national reserve criteria established for the RFA of 60 per cent.

Of the 519,000 hectares of old growth temperate rainforest in Tasmania, 464,000 hectares (89 per cent) is fully protected in reserves, of which 199,000 hectares (38 per cent) is in the TWWHA.

Of the 249,000 hectares of tall wet eucalypt old growth forest in Tasmania, 179,000 hectares (72 per cent) is fully protected in reserves, of which 87,000 hectares (35 per cent) is in the TWWHA.

Approximately 80 per cent of old growth forest in Tasmania is protected in reserves. Management of these reserved forests is largely non-interventionist, letting natural processes run their courses.

Around 20 per cent of all identified old growth forest areas are not reserved. Much of this forest, however, is either on privately owned land, or in areas of State Forest not planned for future harvesting.

A small proportion of old growth forest in State Forest areas will be available for harvesting. In recognition of the environmental, cultural, economic and social value of old growth forests in Tasmania – and also acknowledging the economic and non-economic value of forestry operations to the State – the Australian and Tasmanian Governments have committed to a program to significantly reduce clearfelling of public old growth forest, through the TCFA in 2005. This commitment is on target to reduce clearfelling to less than 20 per cent of the annual harvest area of old growth forest on State Forest by 2010.

In areas of State Forest adjoining the TWWHA, old growth forests are managed for a variety of objectives. There are two broad classifications of management intent in these areas: management for wood production and management for protection of environmental values. The case study map at **Attachment A** shows the zones reflecting these management intents within the case study area.

1.3. Paragraph 5

Expresses its concern about the risk from fire related to forest regeneration and natural events, and its possible adverse impact on the World Heritage property, and requests the State Party to prepare a Risk Management Plan and to consider distancing the logging operations from the boundary of the property;

Since the 1930s all of the large fires that have burnt between what is now the World Heritage property and State forest have started in the World Heritage property and burnt into State forest. Not one has moved in the other direction.

Since the establishment of the TWWHA in 1982 Forestry Tasmania has conducted a total of 521 silvicultural regeneration burns covering a total of 10,748 hectares of State forest within five kilometres of the property boundary. None of these 521 regeneration burns have escaped into the property.

The risks to values from forestry operations in the vicinity of the property are low and manageable given the extent and representativeness of the protected area estate in Tasmania, the significant resources given to fire management and the adaptive risk management arrangements for the property and nearby forest areas. As a result, there is no evidence to suggest there is a need to distance logging from the boundary.

An Integrated Fire Risk Management Plan is being prepared for Tasmania.

The risk of fire to the TWWHA has been evaluated as part of a recent report on fire management in the TWWHA prepared by an independent expert from the University of Tasmania, *"Fire management in the Tasmanian Wilderness World Heritage Area: A Report to the Tasmanian Parks and Wildlife Service"*. It is provided at **Attachment D**.

The Tasmanian Parks and Wildlife Service is in the process of developing an Integrated Fire Risk Management Plan for all relevant Tasmanian Government agencies for the State of Tasmania, including the TWWHA. This plan is due to be complete by the end of 2009. Further information on the role of fire in the TWWHA and future directions for risk management planning for the property are at **Attachment C**.

A list of Tasmanian legislation, policies and operational plans, which together form the existing effective fire management framework, is attached to this update report (**Attachment C**), along with detailed information on how fire is managed in the World Heritage property.

The following information is drawn from the report by the University of Tasmania.

Management of Fire in the Tasmanian Wilderness World Heritage Area

Background to fire in the Tasmanian landscape

Fire has long been part of the natural and cultural environment of Australia as well as what is now the Tasmanian Wilderness World Heritage Area. Anthropological evidence suggests that humans have occupied Tasmania for at least 35,000 years and possibly much longer. Aboriginal burning practices, and to a lesser extent lightning, have significantly influenced the development of plant and animal communities; some are adapted to fire, (e.g., buttongrass moorland), some are dependent on it for their survival, (e.g., eucalypt forest), and others are destroyed by it (e.g., native conifer stands and rainforest).

The TWWHA, including its diverse World Heritage values, has been shaped in many ways by fire.

In Tasmania today, it is common for fire-adapted communities to adjoin fire-sensitive communities. Buttongrass moorland vegetation occurs within a mosaic of scrub and forest communities, with moorland occupying the most frequently burnt areas. Buttongrass moorlands are the first stage in the successional sequence of vegetation change towards rainforest.

All vegetation communities, including those more frequently burnt (e.g., buttongrass moorland) to the rarely burnt (e.g. rainforest), make an important contribution to the natural diversity of the TWWHA. Thus, it is just as important to actively promote fire in fire-adapted vegetation as it is to actively prevent and exclude fire in fire-sensitive vegetation.

Prescribed or controlled burning is necessary in the management of values and assets inside the property. In particular, fire research over the past 15 years has shown that a substantial increase in the application of prescribed fire in buttongrass moorlands is required to protect the fire-sensitive ecological communities within the property.

The University of Tasmania report **(Attachment D)** states whilst there have been no fires in the TWWHA that resulted from nearby forestry operations, there has been a significant increase in dry lightning storms over the past seven to ten years, with the potential for increased naturally-caused wildfire events. Relevant key papers are referenced in the report at **Attachment D**.

Management of Fire in Areas Adjacent to the Property

Since the establishment of the TWWHA in 1982 Forestry Tasmania has conducted a total of 521 silvicultural regeneration burns covering a total of 10,748 ha of State forest within five kilometres of the boundary of the TWWHA. As noted in the background report, none of these 521 regeneration burns have escaped into the property.

Whilst there may be a risk of adverse impact on the property from wildfire related to forest regeneration nearby, the risk is low. The report states that Forestry Tasmania has very stringent prescriptions for conducting regeneration burning which, when followed, result in regeneration burning being a low risk to the property. Risks are mitigated and managed with these management prescriptions, such as undertaking regeneration burns at the appropriate time of year and during conditions when surrounding forest is too wet to burn. The procedures used by Forestry Tasmania significantly reduce the risk to the property from wildfire, particularly since the refinement of its management prescriptions in 1989.

Some key elements of these procedures and practices are outlined below.

- Under Forestry Tasmania's ISO 14001 Environmental Management System, all procedures are scrutinised through external audits, which are conducted at six monthly intervals. Regeneration burns are lit under carefully monitored weather conditions in autumn (generally from March to April). Fuel moisture is monitored within the area to be burnt and in the surrounding vegetation. High intensity regeneration burns are only undertaken when there is a sufficient moisture differential between the fuels to be burnt and the surrounding vegetation to minimise the risk of significant fire escape. Resources are deployed to each burn to monitor the edges until the fire is extinguished and, if required, to control any fire that burns outside of the prescribed area.
- The method, intensity and time of burning are dependent on the forest community and silvicultural system employed. The risk of fire escaping into areas outside the prescribed burning area is also dependent on these factors. No fire is used in the regeneration of forest within special timber management units (STMUs). Many of these areas are adjacent to the property as shown in the map at **Attachment E.**

The decision (paragraph 5), in considering risk from fire related to forest regeneration and natural events, requests that Australia considers distancing logging operations from the boundary of the property.

Australia considered the issue of logging in proximity to the boundary in (i) preparing the nominations considered by the World Heritage Committee in 1989 and (ii) through the negotiation of the 1997 Tasmanian Regional Forest Agreement and 2005 Tasmanian Community Forest Agreement.

Australia notes that IUCN's 1989 technical evaluation recognised that logging operations would continue adjacent to the property and that any potential impact would be minimised through the application of management prescriptions such as the Forest Practices Code. These practices, including no burning in Special Timber Management Units, are described above and in the 2007 State Party Report. The Forest Practices Code is due to be reviewed in 2008 by the Forest Practices Authority.

Given the existence of appropriate and effective fire management prescriptions, the risk management plans (including Inter Agency Fire Management Protocols), the

development of an Integrated Fire Risk Management Plan for Tasmania, and the statistical evidence that the risk from fire regeneration is low, there is no evidence to suggest that there is any need to distance logging operations from the boundary of the property.

1.4. Paragraph 6

Taking into account the clarification provided orally by the State Party at the 31st session, also requests the State Party to invite a joint World Heritage Centre /IUCN /ICOMOS mission to assess the state of conservation of the property, focusing on:

a) appropriate management of areas of heritage value which are currently outside the property,

b) an assessment of the degree of risk related to regeneration fires in areas adjacent to the World Heritage property as well as of the effectiveness of the fire management system in place,

c) impacts of proposed forestry operations (including the construction of new roads) on the outstanding universal value of the property;

This Update Report and the 2007 State Party Report demonstrate that:

a) The level of protection given to old growth forests in Tasmania exceeds international and national targets, and any remaining areas of identified heritage value outside the property are managed appropriately;

b) The risk related to regeneration fires adjacent to the World Heritage property has been assessed as low;

c) The potential impact of proposed forestry operations on the outstanding universal value of the property is minimised and managed through the application of the Forest Practices Code and other measures.

Australia has invited a joint IUCN/ICOMOS mission to assess the state of conservation of the TWWHA, scheduled for March 2008.

1.5. Paragraph 7

Requests the State Party to provide the World Heritage Centre with an updated report by 1 February 2008 on the state of conservation of the property and the above mentioned issues for examination by the Committee at its 32nd session in 2008.

As mentioned above, this document is the updated report requested in **Paragraph 7** of the Committee's Decision. This updated report is provided for examination by the Committee at its 32nd session in 2008.

As requested by the World Heritage Centre, the updated report follows the format for State of Conservation reports agreed at the 31st session of the Committee in Christchurch, New Zealand. The following section provides an update on issues other than those mentioned above.

2. OTHER CURRENT CONSERVATION ISSUES IDENTIFIED BY THE STATE PARTY

A variety of potential threats to the natural and cultural World Heritage values of the property have been identified, including biosecurity, climate change and operations that pre-date the listing of the property. Management effort and research are focused on those issues that may directly impact on the property's World Heritage values.

These threats are being addressed through national and state recovery programmes and the adaptive management arrangements for the property. As part of this adaptive management of the property, an interim review of the 1999 Management Plan is nearing completion, with a full review due to commence in 2009-2010.

2.1. Interim review of Management Plan

During 2007 the *Tasmanian Wilderness World Heritage Area Management Plan 1999* was subject to an interim review. Public consultation was conducted over 6 weeks around October 2007. The Plan Update will be finalised shortly. A full review of the Plan is scheduled to commence in 2009-2010. More information on the interim review is available online at www.parks.tas.gov.au

2.2. Environmental Impact Assessment

From early 2007 the Tasmanian Parks and Wildlife Service has been upgrading its impact assessment process. The revised system is more thorough, has increased accountability, greater transparency and offers significantly improved assessment of environmental, social and economic impacts. The system has four levels of assessment, will be electronically distributed and will integrate with all other local and Federal assessment processes. It is currently being trialed and is schedule for full implementation in the second quarter of 2008.

2.3. Threat Management

Threats to World Heritage values of the TWWHA are taken extremely seriously by Australia. A number of potential threats to the TWWHA have been identified and are the focus of significant research and effort jointly by the Australian and Tasmanian Governments, and in many cases, in partnership with strategic partners such as universities etc.

The nature and management of these threats, discussed in further detail below, are central to Australia's management of the TWWHA under the World Heritage Convention and have been acknowledged in the interim review of the Management Plan and/or by the TWWHA Consultative Committee. The majority of management effort is dedicated to managing those issues which, through research and proper consultation processes, have

been identified as the most significant threats to the outstanding universal values in the TWWHA. Effort and resources to manage these issues and their impact on the world heritage values of the area have therefore been the focus for Australia, and are expected to remain the priority into the future.

2.4. Lake Fidler

Lake Fidler is one of three meromictic lakes located in the Gordon River system. As reported previously during the 1989 renomination process, the two other shallower lakes nearby had lost their meromixis. IUCN noted in its 1989 technical evaluation that, following the commissioning of the Middle Gordon Power Scheme, only one of three unique meromictic lakes beside the Gordon River retained the condition.

The underlying cause of the disturbance to the natural meromixis in these lakes related to the operation of the Middle Gordon Power Scheme which pre-dates the World Heritage listing of the property. Following the previous loss of meromixis in Lake Fidler in 2003, Hydro Tasmania had partial success in restoring the meromixis through a saline recharge in 2004, though at considerable expense. Since that recharge, unfortunately the meromictic state has continued to decline gradually.

At the November 2007 meeting of the Tasmanian Wilderness World Heritage Area Consultative Committee, Hydro Tasmania predicted the loss of meromixis of Lake Fidler in mid 2009 and proposed not to undertake a further saline recharge or further monitoring. The Consultative Committee requested that the State Party inform the World Heritage Committee of this situation and that management agencies explore options to maintain and monitor the meromixis. Hydro Tasmania and the Tasmanian Parks and Wildlife Service are currently evaluating various scenarios.

2.5. Basslink

A changed management regime for the Gordon River Power Station has resulted from the recent installation of the Basslink undersea power cable connecting Tasmania to mainland Australia. Prior to the commissioning of the cable, research during the assessment process indicated that the operation of Basslink could potentially cause changed conditions downstream along the Gordon River system in the south west of the World Heritage property.

Potential effects include: reduction in habitat availability for macroinvertebrate and fish communities; follow-on effects due to reduced food supplies for fish, platypus and native water rats; projected further erosion of alluvial sediment banks; and a projected acceleration of vegetation losses in riparian zone. Investigations found that all present and Basslink-projected impacts were greatest in the first 15km downstream of the power station, upstream of the Denison River, a major unregulated tributary.

In response to these research findings, Hydro Tasmania made two commitments to address Basslink impacts in the Gordon River. These commitments were to maintain a minimum environmental flow of 19 m^3/s in summer and 38 m^3/s in winter to maintain habitat area for macroinvertebrates and ensure adequate food supplies for fish and aquatic mammals; and to implement a rampdown rule to address the risks of increased river bank erosion. Results from post-Basslink monitoring will be compared to baseline information gathered in nearly five years of monitoring that occurred prior to Basslink coming on line in April 2006. Further information on this issue is available online at http://www.hydro.com.au/home/Our+Environment/Water/Basslink+Environmental+Studies/Gordon.htm

2.6. Biosecurity issues

In the last few years, a number of biosecurity issues have emerged in Tasmania, some of which may threaten listed World Heritage values. These emerging issues have been acknowledged in the interim review of the Management Plan for the property.

- **Devil Facial Tumour Disease**
  The Tasmanian devil (*Sarcophilus harrisii)* is considered a World Heritage value, and is one of the marsupial carnivores for which the TWWHA is a stronghold. The species is found across Tasmania. Since 1996 a devastating and hitherto unknown facial tumour disease has struck the species, with a very high mortality rate amongst those infected. It is believed to be spread from animal to animal, through direct contact. The disease was recently found at only a small number of locations at the edges of the property, such as Cradle Mountain and Strathgordon, but is believed to be spreading in a westerly direction across Tasmania. It is reported that devils in the more remote areas of the south west of Tasmania are so far free of the disease.

  The Tasmanian devil is listed as vulnerable[3]. Threatened fauna and flora may be listed in any one of the following categories as defined in Section 179 of the EPBC Act:

  - Extinct;
  - Extinct in the wild*;
  - Critically endangered*;
  - Endangered*;
  - Vulnerable*; and
  - Conservation dependent.

[3] S. 179 Under national legislation, a native species is eligible to be included in the ***vulnerable*** category of threatened species at a particular time if, at that time:
a) it is not critically endangered or endangered; and
b) it is facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria

* Only species in those categories marked with an asterix are matters of national environmental significance (protected matters) under the EPBC Act.

The Australian and Tasmanian Governments have invested significant effort and resources in a multi-faceted strategy for the recovery of the species, research into the disease and the prevention of its further spread. Further information on this issue is available online at www.dpiw.tas.gov.au/inter.nsf/WebPages/LBUN-5QF86G?open

- **Amphibian chytrid fungus**
  Chytridiomycosis is an infectious disease affecting amphibians worldwide. The disease has been recorded in other regions of mainland Australia and now Tasmania. Some species of endemic frogs are amongst the World Heritage values of the property. Chytridiomycosis is caused by the amphibian chytrid fungus, *Batrachochytrium dendrobatidis*. This is a highly virulent fungal pathogen of amphibians capable at the minimum of causing sporadic deaths in some populations, and 100 per cent mortality in other populations. Surviving individuals are believed to be carriers. A national Threat Abatement Plan has been prepared. In August 2007, researchers reported to the Consultative Committee for the TWWHA that the disease has been detected in frogs in many areas across the State, including the margins of the property.

  Research and management is now focused on developing effective biosecurity measures to contain both the amphibian chytrid fungus and root-rot *Phytophthora cinnamomi*, another pathogen found in the TWWHA and in other areas of Australia. *P. cinnamomi* can be spread in soil and water and affects plants.

  The measures being developed are expected to include wash-down disinfection procedures and caution when sourcing and transporting water for fire fighting. The Tasmanian Department of Primary Industries and Water is raising awareness and liaising with the Parks and Wildlife Service and Forestry Tasmania on this issue to review land management and visitor management practices in the light of new information on the distribution and spread of the chytrid fungus. More information on these issues is available at http://www.environment.gov.au/biodiversity/threatened/ktp/frog-fungus.html

  http://www.environment.gov.au/biodiversity/threatened/publications/tap/phytophthora/index.html

- **Platypus - fungal disease**
  Two of only three surviving species of monotremes – the most primitive group of mammals – are part of the suite of World Heritage values of the property. These are the platypus (*Ornithorhynchus anatinus*) and the shortbeaked echidna (*Tachyglossus aculeatus*). Although the platypus is currently common and widespread, there is concern about the potential impact of an infection caused by

an aquatic fungus, *Mucor amphiborum*. Affected animals develop ulcers on various parts of the body that can lead to death from secondary infection and inability to control body temperature. So far the disease appears confined to northern water catchments but there are anecdotal reports of the disease in southern and north-western river systems, which have indicated that the disease may be spreading to other areas. Further details on this issue are available at http://www.parks.tas.gov.au/wildlife/mammals/Platypus_Mucormycosis.pdf

- **Other Invasive Species**
  The **European fox** (*Vulpes vulpes*) has recently been introduced illegally into Tasmania. Although there have been very few reliable sightings of foxes, the potential impact of the fox on both livestock and native species has been demonstrated on mainland Australia. The Tasmanian Government is aiming to eradicate the fox before it can establish in Tasmania. Information on this issue is available online at http://www.dpiw.tas.gov.au/inter.nsf/ThemeNodes/LBUN-5K438G?open

- The **Superb lyrebird**, (*Menura novaehollandiae*) a native species to mainland Australia, but not to Tasmania, is becoming established in some areas around the edge of the TWWHA, particularly in the south east of Tasmania. Further work is needed to assess the impact that the introduced Superb Lyrebird (*Menura superba*) has on lizard species in forested areas.
  http://www.parks.tas.gov.au/wildlife/reptile/repindex.html#top

- Another emerging issue is the spread and establishment of highly invasive **weeds** such as sea spurge and marram grass, particularly around the south and west of the property. Specially trained teams are targeting weeds around the south and western coastline. Further information on this issue is available online at www.parks.tas.gov.au/factsheets/threats/CoastalWeeds.pdf

- **Orange-Bellied Parrot**

  The Orange-Bellied Parrot (*Neophema chrysogaster*) is a World Heritage value of the property and is listed as critically endangered under Australian and Tasmanian threatened species legislation. A captive breeding programme has been established as part of the Recovery Plan for the species. Some birds held in captivity outside of the property, as part of this programme, have contracted Psittacine circoviral disease. The disease is listed as a key threatening process under national legislation. The disease is not known within wild populations of the species.

2.7. Climate Change

At 20 per cent of the Tasmanian landmass, with extensive mountain ranges and incorporating large areas with very active coastline, the World Heritage property is at risk from climate change. However, the size of the area and the diversity of ecosystems contribute to the adaptive capacity of the area.

Potential impacts on the property include, but may not be limited to:

- rising sea levels and more intense or frequent storm events potentially damaging and submerging a range of World Heritage values along the coastline and waterways
- higher temperatures potentially resulting in changes of geographic distributions of ecosystems
- alterations in normal weather patterns potentially resulting in increases in dry lightning storms and changes to rainfall amounts and distribution
- potential 'knock-on' effect on ecosystems dependent on rainfall and moist conditions, fire-sensitive ecosystems and riverine systems.

Over the longer term these impacts will affect some World Heritage values, but on current information they will alter the nature and distribution of, rather than remove, the existence of a range of outstanding universal values in the property.

The impacts of climate change on a range of coastal values in the property are discussed and addressed in a proposed revision of Tasmania's State Coastal Policy, which is expected to be released in 2008. More information and a copy of the proposed Policy is at www.environment.tas.gov.au/cm_proposed_state_coastal_policy_2006.html

2.8. Ongoing Management of Cultural Sites

Most cultural heritage sites within the Tasmanian Wilderness World Heritage Area are in reserves managed by the Tasmanian Parks and Wildlife Service (PWS). Three of the major Pleistocene cave sites – Kuti Kina, Wargata Mina and Ballawinne – were handed back to the Tasmanian Aboriginal community by the Tasmanian Government in 1995. Freehold title was vested in the Aboriginal Land Council of Tasmania (ALCT), on behalf of the Tasmanian Aboriginal community, under the *Aboriginal Lands Act 1995* (Tas), which came into operation on 14 November 1995. These sites are managed on behalf of the Aboriginal community by the Tasmanian Aboriginal Land and Sea Council (TALSC).

The majority of the Pleistocene Aboriginal cave sites in the TWWHA are in Precambrian limestones and dolomites in the valley bottoms in remote areas, difficult to access, and their locations are not known to the general community. As a result they are generally not subject to disturbance. However, the Tasmanian Aboriginal Land and Sea Council (TALSC) has expressed concern about the impacts of human activity on some sites, in particular Kuti Kina and Wargata Mina. TALSC would also like to see acknowledgement of the entire TWWHA as an Aboriginal landscape; greater Aboriginal engagement in management; and a greater commitment of resources to cultural heritage

protection and management, including resources to TALSC to undertake appropriate management of Aboriginal held sites within the property. (2004 *State of the Tasmanian Wilderness World Heritage Area* report).

Systematic surveys of the coast within the property have shown that many of coastal Aboriginal sites, particularly those on Holocene dunes, are subject to, or at risk from, wind and/or wave erosion. The 2004 *State of the TWWHA* report notes that coastal erosion of Aboriginal heritage sites is one of the main threats causing impacts to the cultural values of the property. The report also notes the potential for erosion to be initiated or exacerbated by human impact. Coastal erosion remains a significant threat to coastal Aboriginal sites and this threat is likely to significantly increase as a result of climate change. Ongoing sheet erosion of the Central Plateau and visitor activities and infrastructure are also identified as threats to Aboriginal cultural sites.

A program of coastal site stabilisation and monitoring initiated by the Tasmanian Parks and Wildlife Service (PWS) and continued by the Tasmanian Aboriginal Heritage Office, in partnership with TALSC, has resulted in the stabilisation and revegetation of a number of important coastal sites.

Disturbances to Aboriginal heritage sites in some areas were reduced or eliminated through the closure or diversion of tracks and the restriction of damaging activities.

Losses of Aboriginal landscapes (identified through comparisons of current landscapes with descriptions by 19th century explorers) are recognised as having resulted at least in part from modern fire management regimes. This recognition has prompted the initiation of research into developing Aboriginal fire management techniques that may lead to the restoration of Aboriginal heritage landscapes (2004 *State of the TWWHA* report).

In the light of the view of cultural heritage staff within the PWS and TALSC that the "*current state of protection and conservation of Aboriginal heritage within the TWWHA was less than satisfactory*" (2004 *State of the TWWHA* report) the current review of the *Tasmanian Wilderness World Heritage Area Management Plan 1999* gives special attention to the management of Aboriginal heritage within the property, with a view to improving the conservation and protection of Aboriginal heritage.

2.9. Flood damage

The Tasmanian Parks and Wildlife Service has also reported on damage from recent floods and heavy rains in Tasmania in late 2007. This included:

- Serious damage to visitor infrastructure from flooding along the Gordon River and at Sarah Island, Macquarie Harbour.
- Substantial damage to the road surface and banks subsiding for the Crotty Rd, Mt McCall Road and Bird River track - including an extensive landslip in the Bird River Area.

The approximate cost to replace impacted infrastructure is estimated at $3 million. Values affected are mostly vegetation including Gondwanan linked species such as Huon pine along the rivers.

2.10. Wielangta Court Case – Eastern Tasmania

In the 2007 State Party Report, it was reported that a judgement had been delivered in December 2006 by the Australian Federal Court on a court case involving logging on the east coast of Tasmania, in the Wielangta State Forest (*Brown v Forestry Tasmania 2006*). The Wielangta State Forest is not located near the property.

The case related to whether forestry operations in Wielangta are likely to have a significant impact on the broad toothed stag beetle, the Tasmanian wedge-tailed eagle and the swift parrot, and whether the forestry operations had been undertaken in accordance with the RFA.

The December 2006 decision was successfully appealed by Forestry Tasmania to the full bench of the Federal Court during 2007. The 2007 appeal judgement is available online at: www.austlii.edu.au/au/cases/cth/FCAFC/2007/186.html . The other party has sought leave to lodge an appeal to the High Court of Australia.

2.11. Pulp Mill at Bell Bay, north east Tasmania

The World Heritage Centre wrote to the State Party during 2007 concerning media reports about the proposal to construct a pulp mill at Bell Bay, in the Tamar Valley, north east Tasmania. During 2007 the Tasmanian Parliament approved a comprehensive permit for the construction and operation of a pulp mill, comprising 44 schedules prepared by 19 independent authorities and regulators.

In August 2007, the then Australian Government Environment Minister approved the pulp mill subject to 48 conditions which must be met before construction commences. In summary, the key elements of the 48 conditions are:

- An integrated Environmental Impact Management Plan that will strictly prescribe all actions relating to matters under the *Environment Protection and Biodiversity Conservation Act*.
- An independent panel, drawn from national and international experts, to oversee the design, implementation and monitoring of the pulp mill.
- An independent inspector, appointed by the Australian Government, to monitor compliance, and
- Guarantee of tertiary treatment of effluent, in the unlikely event it becomes necessary.

The Wilderness Society raised concerns *inter alia* about the source of the wood for the mill, however an appeal by the Wilderness Society against the lawfulness of the assessment process was unsuccessful. There is a current legal challenge against the Minister's decision to approve the project. The proposed mill will not use wood from the TWWHA, as no logging is permitted inside the property. The proponent has stated that no old growth forest will be used in the mill.

More information on this issue is available at
http://www.environment.gov.au/epbc/notices/assessments/2007/3385/decision.html

3. POTENTIAL MAJOR RESTORATIONS, ALTERATIONS AND/OR NEW CONSTRUCTION(S) WITHIN THE PROTECTED AREA

The following provides a summarised update on potential and current redevelopments within the protected area covered by the Management Plan for the property. Full details on these activities can be made available to the mission if required.

The interim review of the 1999 Management Plan, once adopted, will formally update the procedures for impact assessment to be consistent with the World Heritage management principles in national legislation, namely the *Environment Protection and Biodiversity Conservation Regulations 2000.*

The TWWHA Consultative Committee has always had a formal place in these procedures, and provides advice to both the Tasmanian and Australian Governments on such matters. Members of the mission will have an opportunity to meet with members of the Consultative Committee.

Visitor Services Sites or Zones are the places where the majority of visitor facilities are provided and are the locations where the majority of visitors experience the World Heritage property. In one of the Visitor Services Zones (Lake St Clair) and at one of the Visitor Services Sites (Cockle Creek) new visitor facilities are undergoing assessment or are being built by commercial proponents.

3.1. Tourism redevelopment at Lake St Clair

Lake St Clair is a Visitor Services Zone provided for in the Management Plan for the TWWHA. It lies at the edge of the property, and is the source of the Derwent River. Since the 1930s there has been visitor accommodation at Lake St Clair. In recent years, various projects have been proposed, in accordance with the Management Plan for the property, at this location. The latest proposals are:

- Redevelopment of tourist facilities at Cynthia Bay, Lake St Clair
  The leaseholder of the Cynthia Bay facility is seeking a variation from an earlier approved proposal. The revised proposal is under consideration by the Tasmanian Parks and Wildlife Service.

- Adaptive re-use of Pumphouse Point for tourist facility
  Over recent years several proposals have been made for this site but have not proceeded. The current leaseholder has submitted a proposal for adaptive re-use of the existing buildings at Pumphouse Point and the construction of additional accommodation on the access road to the Point.

3.2. Tourism development at Cockle Creek

Cockle Creek is a Visitor Services Site provided for in the Management Plan for the TWWHA, but lies outside the World Heritage property itself. It marks the entrance / exit point for the South Coast Track, one of the main long-distance walking tracks in the property. These proposals lie within the area covered by the Management Plan for the property.

- Planter Beach, Cockle Creek East
  A development proposal for tourist accommodation was approved in previous years. The site lies outside the property.

- Freehold land at Cockle Creek East
  This proposal is essentially an amendment to the above development. It relocates the proposed main visitor lodge (reception, restaurant and visitor centre) from the approved location at Planter Beach to a block of freehold land outside the National Park and outside the TWWHA. The proposal has been approved and complementary broader site planning for the Cockle Creek environs is underway.

3.3. Mineral exploration in Adamsfield Conservation Area

In November 2007 the Tasmanian Parks and Wildlife Service reported to the Consultative Committee that mineral exploration on a lease within the Adamsfield Conservation Area was proposed. This is the only location within the World Heritage property where this activity is permitted under the Management Plan. The Adamsfield area was subject to mineral prospectivity prior to the 1989 extension of the property and was clearly mentioned in the nomination document.

The Tasmanian Parks and Wildlife Service has advised the proposal will need to follow the assessment procedures under the Management Plan to ensure there is no significant impact on World Heritage values from this activity if it proceeds. The Commonwealth Department of the Environment, Water, Heritage and the Arts may also need to assess the proposal.

3.4. Mineral exploration in the adjacent South West Conservation Area

In December 2007 Planet Minerals Pty Ltd applied for a exploration licence over a significant portion of the South West Conservation Area between Cox Bight and Melaleuca. This reserve is surrounded on three sides by the Tasmanian Wilderness World Heritage property. Mineral Resources Tasmania has sought Parks and Wildlife Service advice. The Parks and Wildlife Service is formulating its comment on the proposed licence application.

3.5. Cradle Valley Centralised Sewerage Scheme

During 2007 a detailed impact assessment was completed on a project to install a centralised sewerage scheme at Cradle Valley. The Cradle Valley village lies outside the property, with visitor services just inside the property. Pencil Pine Creek runs between these two areas. Cleaned water resulting from the scheme will enter Pencil Pine Creek under a road bridge, thence running downstream out of the property. Advice from the Consultative Committee informed a detailed examination of water quality, visitor experience and cultural heritage issues during construction and operation. It is expected that the treatment of sewerage under the new scheme will be far superior environmentally to the existing treatment using individual systems for each accommodation lodge.

4. ATTACHMENTS

A Case Study of the Weld Valley

B Forestry Tasmania's Updated *Forestry in the Landscape* approach

C Tasmania's Fire Management Framework & Role of Fire in the Tasmanian Wilderness World Heritage Area

D UTAS Innovation Ltd - Background report - November 2007

***Fire management in the Tasmanian Wilderness World Heritage Area: A report to the Tasmanian Parks and Wildlife Service*.**

E Map: Special Timber Management Units: no regeneration burns

F Additional information provided by Forestry Tasmania on Roading

ATTACHMENT A

Case Study of the Weld Valley

There have been concerns raised by NGOs about the recent construction of the North Weld Road in southern Tasmania. The North Weld Road is a small (1.4 km) extension of an existing road system in the lower Weld Valley. Most forest roads in this area were built in the 1970s, prior to the World Heritage listing. Some of these roads are located within a short distance of the property boundary. The new North Weld Road has been constructed for minimal visual impact from the property and is no closer to the TWWHA than existing forest roads and intensive forestry operations.

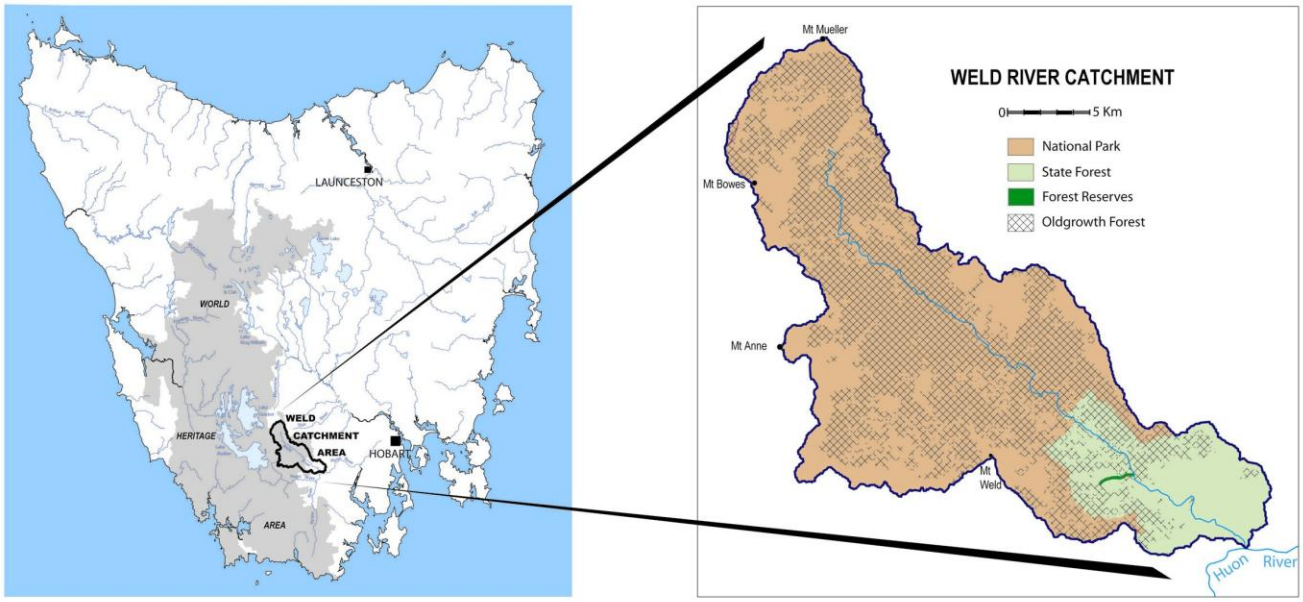
The following case study and map relates to the management of State forest within the Weld River catchment.

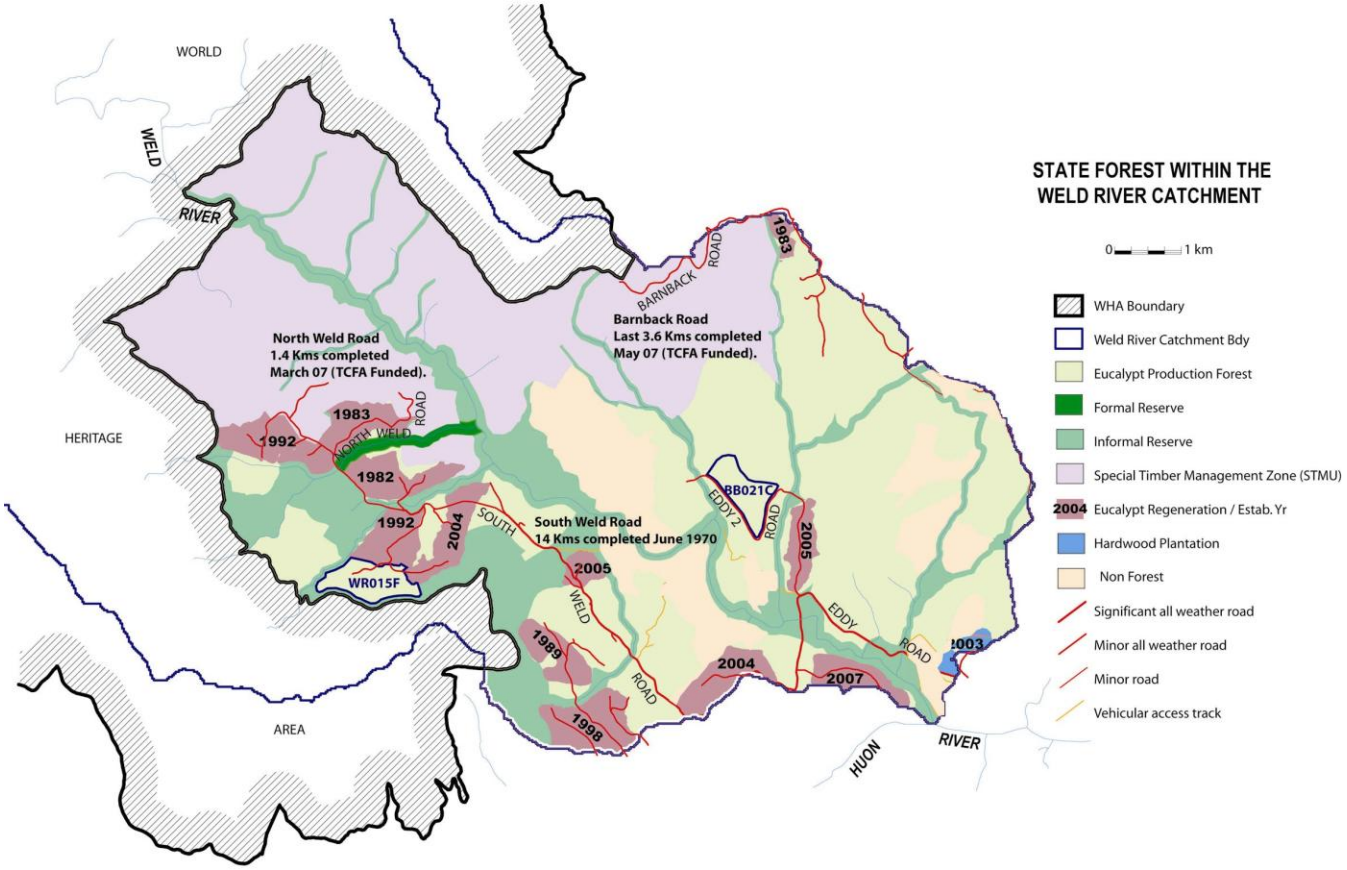
CASE STUDY: Management of State forest in the lower Weld Valley

The map overleaf shows the location of the Weld Valley in the Tasmanian context, from a catchment perspective, much of which is inside the Tasmanian Wilderness World Heritage property, and then details forestry operations that have already occurred or are planned outside the property.

Mineral prospectors constructed the first vehicular tracks in the lower Weld Valley. Roading for forestry purposes commenced in the late 1970s with the construction of the South Weld Road. Some 12 coupes have been logged and regenerated, using clearfell, burn and sow silviculture, since 1982. The 1989 nomination extended the property boundary eastwards so that it became almost adjacent to the South Weld Road. The extension resulted in 82 per cent of the Weld River catchment being reserved in the TWWHA.

In the mid 1990s, the State forest adjacent to the enlarged property was zoned for special timbers management, shown in purple as Special Timber Management Zones (STMUs) on the attached map. The purpose of STMUs is to contribute ongoing supplies of special timbers for the Tasmanian design and craft industry and leatherwood nectar for the beekeeping industry. The TCFA provided funds to build the North Weld Road and Barnback Road extension in 2006-2007 to access the lower Weld STMUs. These areas will be managed using selective logging techniques and rotations of around 200 years.


LAUNCESTON
WORLD
HERITAGE
AREA
WELD
CATCHMENT
AREA
HOBART
Mt Mueller
WELD RIVER CATCHMENT
0 5 Km
National Park
State Forest
Forest Reserves
Oldgrowth Forest
Mt Bowes
Mt Anne
Mt Weld
Huon River


WORLD
WELD
RIVER
HERITAGE
AREA
North Weld Road
1.4 Kms completed
March 07 (TCFA Funded).
Barnback Road
Last 3.6 Kms completed
May 07 (TCFA Funded).
South Weld Road
14 Kms completed June 1970
WR015F
BB021C
1983
1992
1982
2004
2005
1989
1998
2007
2003
NORTH WELD ROAD
SOUTH WELD ROAD
BARNBACK ROAD
EDDY 2 ROAD
EDDY ROAD
HUON RIVER
STATE FOREST WITHIN THE
WELD RIVER CATCHMENT
0 1 km
WHA Boundary
Weld River Catchment Bdy
Eucalypt Production Forest
Formal Reserve
Informal Reserve
Special Timber Management Zone (STMU)
2004 Eucalypt Regeneration / Estab. Yr
Hardwood Plantation
Non Forest
Significant all weather road
Minor all weather road
Minor road
Vehicular access track

ATTACHMENT B

Forestry Tasmania's Updated *Forestry in the Landscape* approach

Forestry Tasmania's Forestry in the Landscape approach was described and included in the 2007 State Party Report. This diagram is an updated version. It is an extract from *Stewards of the Forest*, a Forestry Tasmania publication available in full online at www.forestrytas.com.au/uploads/File/pdf/stewards_of_the_forest_v5_screen.pdf

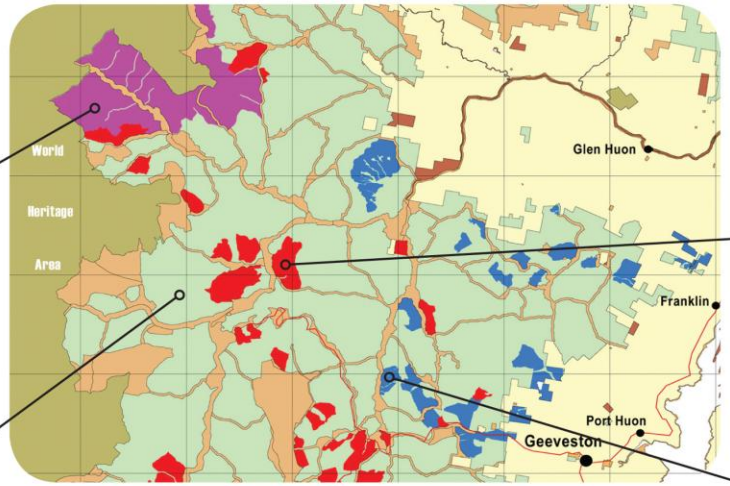
our APPROACH

Managing forests in the landscape

special timbers management

Special Species
(100–200-year management cycle)

- fine furniture
- boat building
- craftwood



thinned native forest

Thinned eucalypts and blackwood
(60-year management cycle)

- structural products
- framing and furniture
- pulpwood products

multiple use production forest

Eucalypts
(80–100-year management cycle)

- solid wood products
- furniture
- pulpwood products

The Parliament of Tasmania determines which areas of the State's public lands are set aside for wood production, and which areas should be in National Parks and Conservation Reserves.

Forestry Tasmania then broadly zones the lands we manage (State forests) for a range of wood production, protection and heritage values.

In areas bordering World Heritage Areas or National Parks, we generally plan longer management periods for special species timber production. Adjoining these areas, eucalypt forests are managed for multiple uses in 80-to-100-year management cycles, producing eucalypt logs that are used for solid wood production, furniture, pulp and paper.

Closer to the agricultural landscape, we thin the forests to produce a premium range of structural products – framing and furniture timbers. Adjoining the agricultural landscape, we set up our main plantation zones. These areas will produce products suitable for reconstituted wood, pulp and paper.

National Parks | special conservation zones | other public land | private property

eucalypt plantation

Planted and thinned eucalypt plantation
(25–40-year management cycle)

- structural products
- reconstituted wood
- pulpwood products

ATTACHMENT C

TASMANIA'S FIRE MANAGEMENT FRAMEWORK

Tasmania has an effective fire management framework. It consists of legislation, policies and operational plans within Tasmanian Government agencies. These give effect to and implement fire management programs within and surrounding the TWWHA.

List of Tasmanian legislation, policy and plans for fire management

Fire management programs cover prevention and mitigation (e.g., prescribed burning), preparedness (e.g., training), wildfire response (e.g., jointly managed through the Inter-agency Fire Management Protocol) and recovery (e.g, rehabilitation of machinery tracks created during wildfire suppression operations).

The key elements of Tasmania's fire management framework are listed below.

Legislation

Fire Service Act 1979
National Parks and Reserves Management Act 2002
Forestry Act 1920

Policies and Procedures

Inter-agency Fire Management Protocol 2007-2008
Forest Practices Code 2000

Parks and Wildlife Service

Tasmanian Reserve Management Code of Practice 2003
Policy Fire Management PWS P-050 2006
Procedure – Wildfire Response Procedures PWS PR- 048 2006

Forestry Tasmania

Policy: Fire Management (2007, under review)
(Interim) Policy: Bark Heap Management (2007, under review)
Standard Operating Procedure for Low Intensity Fuel Reduction Burning 2005
Prescribed Burning – High Intensity 2005 (Manual of Procedures)
Prescribed Burning – Low Intensity 2005 (Manual of Procedures)
Fire Management in Native Forests and Plantations: National Principles (undated)
Forest Industry Fire Suppression Protocol 1997/98
Procedure for auditing high intensity burns (undated)
Procedure: State Fire Duty Officer Tasks #1 Fire Season (2007)
Procedure: State Fire Duty Officer Tasks #2 Planned Burning Season (2007)
Forest Operational Plan For Burning Created or Modified Fuels (2006)
Forest Operational Plan For Burning Natural Fuels (2005)

Forest Industry Fire Management Committee

Procedure: Fire Prevention at Forest Operations (2008)

Statutory Plans

Tasmanian Wilderness World Heritage Area Management Plan 1999

Other Plans and Manuals

Parks and Wildlife Service:

Tasmanian Wilderness World Heritage Area Tactical Fire Management Plan (version 4) 2004/2005
Pencil Pine Development Zone Fire Protection Plan 1990
Orange-Bellied Parrot Recovery Plan: Prescriptions for Habitat Management Burns 1993
Lyell Highway Fire Management Plan 1996
Melaleuca – South West Cape Fire Management Plan 1997
Walls of Jerusalem National Park and Central Plateau Conservation Area Fire Management Plan 1997
Buttongrass Moorland Fire Behaviour Prediction and Management: A Field Guide for Operational Fire Management in Buttongrass Moorlands in Tasmania1999 (published in *Tasforests*)
Northern Region Fire Action Plan 2007 - 2008
Northwest Region Fire Action Plan 2007 - 2008
Southern Region Fire Action Plan 2007 - 2008
Hazard-Reduction and Habitat-Management Burning Form 1996

Forestry Tasmania:

Forestry Tasmania Strategic Fire Management Plan V1 (2007 - under ongoing development)
District Tactical Fire Management Plans (reviewed annually)

- Huon District Fire Action Plan 2007/2008
- Derwent District Fire Action Plan 2007/2008
- Murchison District Fire Action Plan 2007/2008
- Mersey District Fire Action Plan 2007/2008

THE ROLE OF FIRE IN THE TASMANIAN WILDERNESS WORLD HERITAGE AREA

Fire within the TWWHA – in the right place at the right time – can achieve important management objectives and thus can play a positive role. Unplanned fires, however, occur as a result of various causes and these can be environmentally damaging and economically costly when in the wrong place at the wrong time. Unplanned, unwanted fires are generally referred to as 'wildfires'.

The causes of wildfires within the TWWHA have changed considerably since the inscription of the TWWHA in 1982. Arson and accidental and escaped fires are becoming less common, and wildfires resulting from lightning strikes are becoming more common. Lightning accounted for only 2.8 per cent of the total area of the TWWHA burnt by wildfires in the 1980s, but since 2000, it has accounted for 83 per cent of the total area burnt.

More recently, in November 2007, lightning started at least three fires in the TWWHA, burning more than 4000 ha.

In contrast, arson has dropped from 46 per cent in the 1980s to zero per cent of the area burnt so far this decade, and management escapes have reduced from 31 per cent to 13 per cent during the same period (see **Attachment D**).

It was previously believed that lightning, as a cause of fire, was a relatively minor component of the fire regime that has fashioned the intricate mosaic of vegetation communities in western Tasmania. Since around the turn of the century, however, the incidence and impact of lightning fires appear to have increased significantly in western Tasmania. There is insufficient conclusive data available to state that this is related to climate change.

While lightning fires are 'natural', they not treated as 'healthy' – they have the potential to damage World Heritage values and are thus a category of wildfire.

The increase in lightning as a primary cause of wildfire has highlighted the outcomes of fire research over the past 15 years – that a substantial increase in the application of prescribed fire in buttongrass moorlands is required to protect the fire-sensitive communities within the TWWHA.

A project funded by the Australian National University and the Tasmanian Parks and Wildlife Service involving a computer simulation model evaluated various prescribed burning options that could be engaged to mitigate the risk posed by wildfire to natural values within the south-west part of the TWWHA. The model was based on real landscape (including the neighbouring State forest), vegetation, fire behaviour, ignition source and weather inputs. It tested various 'treatment' levels of prescribed burning of buttongrass moorland.

The study forecasts the level of buttongrass moorland burning that is optimal for meeting multiple management objectives in south-west Tasmania. These include the general objectives of reducing fire size, incidence, and areas burnt, and the specific ecological objectives of reducing the fire risk to fire-sensitive vegetation and orange-bellied parrot habitat, and maintaining biodiversity.

A more recent study undertaken by Dr Jon Marsden-Smedley of the University of Tasmania, has quantified the risk of significant wildfires occurring in the TWWHA in

terms of the frequency of days with weather conditions capable of sustaining large, landscape scale fires. The risk is significant, and in the absence of increased prescribed burning of buttongrass moorlands, very large wildfires are likely.

Findings from this research are incorporated into operational fire management systems and are regularly reviewed to ensure that a 'continuous improvement' and 'adaptive management' approach is taken.

These research studies demonstrate the Tasmanian Government's ongoing commitment to managing fire in the TWWHA and in the broader Tasmanian context.

Prescribed Burning

Prescribed burning is used by the Tasmanian Parks and Wildlife Service in areas with a low sensitivity to fire (i.e., primarily buttongrass moorland) to protect areas where there is a threat of fire to fire-sensitive assets within or adjacent to the TWWHA, and where prescribed burning will increase the ability of the Tasmanian Parks and Wildlife Service to protect those assets from fire.

Fire-sensitive assets include natural values such as coniferous forest and alpine vegetation, cultural and heritage assets such as Aboriginal heritage sites, and economic assets such as visitor infrastructure and neighbouring State forests.

Habitat management burning is used in the TWWHA to conserve the habitat of rare or endangered flora and fauna species, maintain the biodiversity of the TWWHA or maintain successional processes. For example, it is used to prevent the vegetation changing to a stage or condition where it will not provide suitable habitat for the targeted rare or endangered species, such as the orange-bellied parrot. Habitat management burns are specified in fire management plans that take account of the effects of such burning on other values, for example, organic soils.

Since the proclamation of the TWWHA in 1982, prescribed burning within the TWWHA has been mostly limited to relatively small areas of buttongrass moorland in areas where illegal human fire lighting has been occurring (e.g., the Lyell Highway between Bronte Park and Queenstown) and to promote habitat for the endangered orange-bellied parrot (e.g., Birchs Inlet and Melaleuca).

Several prescribed burns conducted by the Tasmanian Parks and Wildlife Service in the TWWHA have burnt significantly larger areas of buttongrass than intended. The most notable of these burns was the Birchs Inlet fire in 1985 (36,700 ha), the Ummarrah Creek fire in 2000 (5,000 ha) and the Melaleuca fire the same year (4,700 ha). None of these burns, however, burnt any fire sensitive vegetation or caused any long-term damage to ecological values. Indeed, all of these burns were part of either planned habitat management for the endangered orange-bellied parrot or for research. Learnings from these events underpin an adaptive management approach.

Research burning has been undertaken by the Tasmanian Parks and Wildlife Service in buttongrass moorlands to improve the science and techniques for applying prescribed fire. This research has identified the appropriate weather and soil dryness conditions for conducting prescribed burning in buttongrass moorlands, as well as the spatial pattern and frequency of burning. This research has been published in peer-reviewed journals (cited in the Fire Management Report at **Attachment D**).

The Tasmanian Parks and Wildlife Service is now developing a fire management plan for an expanded prescribed burning program for the TWWHA. This follows an

extensive program of research into the effects of fire on flora, fauna and soils, along with research into the dynamics of buttongrass moorland fuels and fire behaviour.

The plan will include a map that divides the entire TWWHA into fire management zones with clearly defined objectives. For example, the maintenance of low fuel levels will be the primary objective in some buttongrass moorland areas to protect neighbouring fire sensitive vegetation, while the maintenance of a fire regime that protects special ecological and geoheritage values will be the priority in other areas.

Fire Suppression

Fire suppression is about extinguishing wildfires. An effective and coordinated approach to wildfire suppression and fire protection planning requires close liaison and working arrangements with other emergency and support services. The Tasmanian Parks and Wildlife Service, Forestry Tasmania and the Tasmania Fire Service have a very close working relationship, underpinned by the Inter-agency Fire Management Protocol.

All wildfires within and near the TWWHA are actively suppressed in operations that are jointly managed are often assisted by private companies (e.g., aircraft contractors, forest industry companies) and other Tasmanian Government agencies (e.g., Tasmania Police and the State Emergency Service).

The arrangements for the detection of wildfires are tailored to the level of risk. Detection services are undertaken with close cooperation between the above-named Government agencies.

TWWHA Boundary Risk Management

Based on the statistics detailed in the Fire Management Report at Attachment D, there is no evidence to indicate that distancing forest harvesting operations on State forest further away from the TWWHA would reduce the threat of fire to the natural values of the TWWHA. This is because the forest harvesting operations, including regeneration burning, are managed by systems and practices that minimise the risk of escapes. Forest regeneration burns on State forest have never escaped into the TWWHA since its declaration.

Current practices now take into account the proximity of the TWWHA and implements the necessary measures and resources to protect its values. Significantly, extensive areas adjacent to the TWWHA are either not available for logging, not suitable for forestry, or set aside from harvesting by Forestry Tasmania through the forest planning process.

The prevailing wind direction associated with what is referred to commonly as ‘fire weather’ (i.e., when wildfires are most likely to spread quickly, which is summer/autumn in Tasmania), is from the north and north-west. Forest harvesting operations occur predominantly downwind of the TWWHA. Thus, there is a greater risk of wildfires spreading to State forest from the TWWHA than vice versa.

A wildfire under ’fire weather’ conditions will spread quickly in buttongrass moorland. For example, a wildfire in February 2007 that was started by lightning in the TWWHA spread 36 kilometres in one day.

Future directions for the Tasmanian Fire Management Framework and risk management planning for the TWWHA

The Tasmanian Government is strongly committed to continuous improvement of its systems and practices relating to the TWWHA. Several internal reviews of fire management have been commissioned by the Tasmanian Parks and Wildlife Service in recent years. These reviews have recommended changes to the fire management system covering reserved land and the TWWHA. These changes are now being implemented. Examples of work in progress by the Tasmanian Parks and Wildlife Service are:

- amendments to legislation, particularly the *National Parks and Reserves Management Act 2002*, to give a clear mandate for fire management responsibility by the Tasmanian Parks and Wildlife Service;
- development of a Code of Practice for fire management, empowered by legislation, including a clearly defined fire management framework for planning and policy;
- further revision and development of policies and procedures for fire management;
- strategic fire management planning and risk assessment; and
- increase in the amount of prescribed burning to mitigate wildfire risk based on research.

The Tasmanian Parks and Wildlife Service is developing an integrated and strategic fire management plan for its three regions, each of which includes a part of the TWWHA. Using GIS, the risk assessment identifies the assets at risk of wildfire (e.g., fire-sensitive vegetation and threatened species), the factors that contribute to that risk (e.g., ignition sources, fire history, vegetation fuels) and risk mitigation treatments (e.g., prescribed burning). This project aims to be completed by the end of 2009.

The outputs from the plans are as follows:

- GIS tools and computer models to conduct a wildfire risk assessment across the landscape on all land tenures, including the TWWHA, State forest and private lands;
- An AS/NZS 4360:2004 compliant landscape scale wildfire risk assessment of the Tasmanian reserve system;
- A strategic fire management zoning system for reserved land, along with a map of fire management zones;
- Wildfire prevention, preparedness, suppression and recovery strategies;
- Community and other stakeholder ownership of the plan and planning process;
- Delivery to and uptake of the plan at the regional level by relevant stakeholders.

These strategic fire management plans will identify priorities for fire management strategies and guide the development of operational plans for prescribed burning and other works.

Fire management in the Tasmanian Wilderness World Heritage Area: A report to the Tasmanian Parks and Wildlife Service

Report scope
This report provides fire related background information for the Update Report on the State of Conservation of the Tasmanian Wilderness being prepared in response to World Heritage Committee Decision **WHC 31 COM 7B.43**. The decision addresses concerns raised by Non Government Organisations relating to forestry operations in the vicinity of the Tasmanian Wilderness World Heritage Area (TWWHA) and in Tasmania generally, along with concerns about the integrity of the TWWHA.

Part 1: The role of fire in the Tasmanian Wilderness World Heritage Area
Fire has been an important aspect of the ecology of western and southwestern Tasmania (and hence the area that is now the TWWHA) for at least the last 10 000 years (Fletcher and Thomas 2007a) and for the last 70 000 years (Jackson 1999). In addition, recent palaeo-pollen work suggests that the region's vegetation type has been effectively stable in its distribution throughout the Holocene, probably as a result of continuous and active fire management by Indigenous people (eg see Fletcher and Thomas 2007a, 2007b).

However, in the approximately 200 years since European settlement there have been marked changes in the region's fire regime. These changes have resulted in the spread of fire into fire-sensitive temperate rainforest and alpine vegetation (Kirkpatrick and Dickinson 1984; Bowman and Brown 1986; Brown 1988; Cullen and Kirkpatrick 1988; Peterson 1990; Robertson and Duncan 1991). Conversely, a trend is also evident towards a reduction in the fire frequency in many of the region's buttongrass moorlands; which are dependent on shorter fire frequencies to maintain plant and animal diversity (see Brown and Wilson 1984; Marsden-Smedley 1993a, 1993b, 1998a, 1998b; Arkell 1995; Greenslade 1997; Driessen 1999; Driessen and Mallick 2007). Both changes have the potential to reduce the region's biological diversity, with the possibility of major alterations to ecological processes and biological patterning (Kirkpatrick 1994).

Fire history
Prior to human settlement, fires were infrequent in what is now the TWWHA (Fletcher 2007). The time period over which humans have occupied this region is currently the subject of some conjecture. Anthropological evidence suggests a minimum occupation age of about 35 000 years (see Kee et al. 1993) but in a review based on palaeoecological data, Jackson (1999) proposed that a occupation age of 70 000 years is possible.

Prior to European settlement in Tasmania there is strong evidence to support the concept that Indigenous people were actively living in and managing most of what is now the TWWHA and that they were using fire as their primary management tool. There are frequent references in the historical literature to Indigenous burning (eg see Kelly 1816; Goodwin 1828; Robinson 1829-1834; Calder 1847; Sharland 1861). In addition, descriptions of the country and the speed at which the early European explorers travelled suggest that many buttongrass moorlands were very open (eg Robinson 1829-1834; Burn 1842; Calder 1847, 1849, 1860a, 1860b, 1860c, Sharland 1861: reviewed in Marsden-Smedley 1998a; Johnson and Marsden-Smedley 2001).

From this information, the most likely fire regime utilised by Indigenous people in what is now the TWWHA was one of frequent (eg on average less than about 20 years between fires) and probably relatively low intensity fires in buttongrass moorlands, and with the exception of burning for access tracks, few fires in other vegetation types. These fires would have been mostly lit when scrub, eucalypt forest, rainforest and alpine areas were too wet to burn (Marsden-Smedley 1998a, 1998b). This regime would have been analogous to the firestick farming regime proposed by Jones (1969) and is similar to the fire regime utilised in parts of northern Australia's Top End by Indigenous people (Jones 1995; Andersen 1996). Under such a fire regime, the primary aim of the majority of burning would probably have been to create a large number of small recently burnt areas surrounded by thicker vegetation.

Following the removal of Indigenous people from what is now the TWWHA the fire regime changed to a regime of periods of few fires followed by a very large fire. Between the 1830s and early 1850s it is probable that few fires occurred in western and southwestern Tasmania. In the early 1850s at least a third of the region burned. Following on from the early 1850s fires it appears that although some fires occurred, most of the region would have remained unburnt until the summer of 1897/98. The fires in the summer of 1897/98 were the largest in Tasmania's recorded history and burnt about a third of the state. These fires also burnt over half of the area what is now the TWWHA. This pattern of few fires followed by a massive fire then repeated itself, with few fires occurring between 1897/98 and the summer of 1933/34 when about 414 915 ha or about a third of what is now the TWWHA burned. During the 1930s there were also very extensive fires elsewhere in western and southwestern Tasmania which burnt a greater area than the fires inside what is now the TWWHA (Marsden-Smedley 1998a; Johnson and Marsden-Smedley 2001).

These large fires burned very extensive areas of all vegetation types, taking several weeks to months to do so. These cycles of few fires followed by a very large fire were a reflection of periods where the region was more or less deserted followed by attempts to utilise it, followed by the next period when the region was abandoned again.

The primary cause of these very large fires was the deliberate and targeted activities of the early European explorers who used fire to open up the country, expose potential mineral deposits, improve access and/or to make the vegetation more economically productive. In their exploration reports, diaries and letters, they make very frequent reference to the fires they lit, for example:

> We burned the ground well filling the atmosphere with smoke ... Fired a vast tract of country. Never saw such a conflagration... JE Calder 1837.
>
> Whenever we could get a fine day we burned what we could, and the benefit to us was incalculable, rendering the travelling comparatively easy. D Jones 1881.
>
> ... sent James out on the previous day ... to put a match into the country, which is clothed with button grass and tea tree ... We found the fire had done excellent work and was still blazing ahead ... The fires burnt for a week, and cleared the hated button grass and bauera splendidly, in all directions for miles... TB Moore 1887.
>
> [moorland, scrub and forest can] ... be burned off in broad belts [and] … money spent in burning the country in this way is well spent… W Twelvetrees 1908.

As a result of these very large fires, there was massive structural and floristic change. These changes included the burning and transformation of the majority of the rainforest in the TWWHA into regrowth forms along with the destruction of extensive areas of King Billy pine rainforest, Huon pine rainforest, Deciduous beech, coniferous alpine heath and significant areas of other fire-sensitive vegetation types. For example, a minimum of 32% (Brown 1988) and probably greater than 50% (Marsden-Smedley unpublished data) of the area of King-billy pine, 8% of the area of Huon pine (Peterson 1990) and significant areas of Deciduous beech (Robertson and Duncan 1991) have been lost since Europeans arrived in Tasmania. Most of this loss has been within the TWWHA.

Since the 1930s, there has been no decade that has rivalled the area burnt in earlier periods. During this time, the fire management strategy changed to one of fire prevention and suppression in association with very limited area hazard-reduction and ecological-management burning.

Between 1940 and 2006/07 in what is now the TWWHA a total of about 424 375 ha was burnt. These fires included a total of 32 fires sized between 1 000 and 10 000 ha, six fires between 10 000 to 25 000 ha and five fires between 25 000 and 60 000 ha (Marsden-Smedley 1998a; Johnson and Marsden-Smedley 2001; PWS unpublished fire history records). With the exception of the 1960/61 Central Plateau fires all of these fires predominately burned buttongrass moorland, with much smaller areas of wet eucalypt forest, rainforest, alpine and subalpine vegetation being burnt. There is strong evidence from both anecdotal and government records (eg minutes of the Central Highlands Special Fire Area Committee) that the 1960/61 Central Plateau fires were deliberately lit by highland graziers in order to clean out thick vegetation and promote green-pick for sheep and cattle grazing.

As a result, although the majority of the TWWHA has been burnt in the past about 150 years, most of it has not been burnt since the fires of the 1930s or 1890s (Marsden-Smedley 1998a; Johnson and Marsden-Smedley 2001). This change is probably the result of a reduction in human initiated fires, as a result of declining social and legal acceptability of unplanned ignition of bush. The fire history data also indicates that since the 1930s within what is now the TWWHA 58% of fire seasons account for only 1% of the area burnt while 1% of fire seasons are responsible for over 40% of the area burnt. However, it is important to note that there has been a major increase in the incidence of lightning fires in the past seven to ten years indicating that ignition sources are now common in the TWWHA and therefore there is a high wildfire risk.

The area of the TWWHA burnt since the 1930s is summarised in Table 1. Nearly half of the area of the TWWHA that has been subjected to fire since the 1930s was burnt in two fire seasons: 1933/34 and 1938/39 (Marsden-Smedley 1998a; Johnson and Marsden-Smedley 2001) with that decade accounting for 3.7 times the average for subsequent time periods (Table 1).

Table 1 Area of the Tasmanian Wilderness World Heritage Area burnt since the 1930s

Decade	Area burnt	%	Average per year	ratio
1930s	414 913.4	47.8	41 491.3	3.7
1940s	2 664.4	0.3	266.4	0.0
1950s	112 774.9	13.0	11 277.5	1.0
1960s	113 415.0	13.1	11 341.5	1.0
1970s	84 042.6	9.7	8 404.3	0.8
1980s	68 250.1	7.9	6 825.0	0.6
1990s	5 068.5	0.6	506.9	0.0
2006/07	66 188.0	7.6	9 455.4	0.8
total	867 317.0		11 196.0	

Vegetation adaptations to fire

The major fire-attributes vegetation groups in the TWWHA are alpine heath and grassland, buttongrass moorland, wet eucalypt forest, rainforest and wet scrub (see below). These vegetation types characteristically occur in close juxtaposition, with their distributions being related to site productivity and its influence on the probability of fire (Jackson 1968; Bowman and Jackson 1981). A common lowland sequence from less productive and/or more flammable to more productive and/or less flammable sites is: buttongrass moorland – wet scrub – wet eucalypt forest – rainforest (Jackson 1968).

Below the alpine zone there are few places that could not support any of rainforest, wet scrub or buttongrass moorland, all of which can occur in the full range of sites from highly waterlogged to well-drained as well as on the full range of the region's geological types. Wet eucalypt forest tends not to occur in the most poorly-drained sites. This implies that, given the capacity for rainforest to expand and exclude other vegetation groups with increasing time since fire, in the prolonged absence of fire, or other major exogenous disturbance, almost all of the non-alpine parts of the TWWHA could conceivably be covered with rainforest, and a large proportion of the alpine vegetation of the region could be dominated by native gymnosperms and Deciduous beech.

Most rainforest and alpine shrub and tree species will regenerate after fire, with several fires with less than about 80 to 120 years between them being necessary for their local elimination. In contrast, the reestablishment of Deciduous beech and native gymnosperms in burned areas is normally an extremely slow process because they are killed by fire, have no persistent seed bank, and have very limited dispersal ranges (Kirkpatrick and Dickinson 1984). Conversely, under prolonged absence of fire in lowland sites, *Eucalyptus* can be eliminated from an area if the interval between fires exceeds their lifespans of about 350 to 500 years. This is due to *Eucalyptus* having no persistent seed bank, poor dispersal mechanisms and its requirement for open regeneration niches which tend not to occur in the absence of fire. The seed bank and dispersal characteristics of most buttongrass moorland taxa are also poorly known. However, canopy closure by overstorey tree and heath species will probably result in the elimination of many species. There seems little doubt that the extensive areas of eucalypt forest, tea-tree scrub and buttongrass moorland in southwest Tasmania are a product of a fire regime frequent enough to prevent the successional process that

terminates in rainforest. With a reduction in fire frequency in these areas, buttongrass moorland has been shown to maintain its species richness for at least 50 years without fire (eg see Brown and Podger 1982; Jarman et al. 1988a, 1988b; Marsden-Smedley 1990) but are transformed, at least structurally, into a tall closed wet scrub community by the time they are about 150 years old (Marsden-Smedley unpublished data). More frequent fires are therefore needed to maintain buttongrass moorland and its suite of animal species (see below).

The most critical ignitions are those that occur when any or all of tea-tree scrub (particularly its fibrous duff and peat layer), wet eucalypt forest, alpine and rainforest areas are dry enough to burn under the prevailing weather conditions. During most of the year, however, fuel moistures in southwest Tasmania are such that only buttongrass moorlands are dry enough to burn, and fires are therefore limited in their duration by the size of the buttongrass patch in which ignition took place. The probability of fire transgressing the boundary between buttongrass moorland and wet scrub increases with increasing buttongrass moorland fuel loads. Fires in old buttongrass moorlands burn with high rates of spread and intensities, tend to burn throughout the diurnal cycle and frequently burn into scrub vegetation types where there is a high potential for peat fires (see Marsden-Smedley 1993a, 1998b; Marsden-Smedley and Catchpole 1995a, 1995b, 2001; Marsden-Smedley *et al*. 1998, 1999, 2001). Thus, frequent fire in buttongrass moorlands in conditions in which other vegetation types will not burn seems likely to lower the probability of the other vegetation types burning at other times.

Conversely, an absence of fire from buttongrass moorland for a period sufficient to allow wet scrub to develop should also result in a lowering of the probability of fire in forest and alpine vegetation. The literature (eg Brown and Podger 1982; Jarman *et al.* 1988a, 1988b; Marsden-Smedley 1990, 1998b; Brown et al. 2002) suggests that this period could vary from less than 50 to more than 150 years, the lower limit relating to buttongrass moorland on fertile soils and the latter to steep, high altitude and/or sites underlain by quartzitic rocks. However, the fire history and weather data (see below) very strongly indicates that the probability of extensive areas of buttongrass moorland remaining unburnt for longer than about 75 to 100 years is extremely low.

Fire regimes appropriate to flora and fauna and the effect of variation in fire interval

Flora

The floristic values of the TWWHA have been reviewed by Balmer et al. (2004).

The vegetation of the TWWHA has been mapped by the TasVeg mapping program (Harris and Kitchener 2005) at a nominal scale of 1:25 000. A total of 158 mapping units have been identified by the TasVeg mapping program, 127 of which occur in the TWWHA. However, a major issue with the TasVeg mapping program relates to its complex classification of vegetation type along with its low accuracy in the identification of vegetation type and location. As an example, significant areas (~30 000 ha) of dry eucalypt forest have been mapped in the TWWHA despite the entire region having too high rainfall levels for this vegetation assemblage. In addition, damp eucalypt forest, wet sclerophyll forest and mixed forest have not been reliably differentiated, nor have implicate, thamnic or callidendrous rainforest

resulting in these assemblages needing to be combined respectively into wet forest and rainforest.

In order to reduce some of the problems associated with the TasVeg data was simplified and summarised into 22 fire-attributes vegetation types by Pyrke and Marsden-Smedley (2005), 20 of which occur in the TWWHA (Table 2; Appendix 1). The fire characteristics of the fire-attributes vegetation types in the TWWHA are summarised in Table 3. This table and the following descriptions on the fire requirements and sensitivities of the fire-attributes vegetation types have been summarised from the TWWHA Tactical Fire Management Plan (PWS 2004).

Table 2 Fire-attributes vegetation types in the Tasmanian Wilderness World Heritage Area

Group	Fire-attributes vegetation assemblages	
Alpine and subalpine heath and grass	Ac	Alpine/subalpine coniferous and/or fagus heath
	As	Alpine/subalpine heath (without native pines and/or fagus)
	Ag	Alpine/subalpine grassland
	Sp	Sphagnum
Wet forest, damp forest and woodland	Mf	Mixed forest
	Wf	Wet eucalypt forest
	Wd	Wet eucalypt woodland
	Dp	Damp eucalypt forest
	Df	Dry eucalypt forest
Rainforest	Rc	Coniferous rainforest
	Rf	Rainforest
Buttongrass moorland	Bs	Buttongrass moorland
	Wl	Swamp/wetland
Wet scrub and heath	Ws	Wet scrub
	Ds	Dry scrub
	Hh	Heathland
Miscellaneous vegetation types	Gr	Lowland native grassland
	Sr	Silvicultural regeneration, plantation
	We	Weeds (mostly gorse and blackberry)
	Zz	Non-vegetated

Table 3 Fire requirements and sensitivities of vegetation in the Tasmanian Wilderness World Heritage Area

Fire-attributes vegetation formations	Fire dependant	Fire-sensitivity rating	Fire-sensitivity freq (yrs)	Flammability rating	Flammability SDI
Ac alpine/subalpine coniferous heath	no	E	>500	L-M	>15
As alpine/subalpine heath	no	M-VH	>250	L-M	>15
Ag alpine/subalpine grassland	var	M	>25	H	>15
Sp sphagnum	no	H	>250	L	>15
Rc coniferous rainforest	no	E	>1000	L	>50
Rf rainforest	no	VH	>80	L	>50
Mf mixed forest	yes	VH	80-350	L-M	>25
Wf wet eucalypt forest	yes	H	25-350	L-H	>25
Wd wet eucalypt woodland	yes	H	25-350	M	>20
Bs buttongrass moorland	yes	L	5-100	VH	N/A
Ws wet scrub	yes	L-H	15-150	M-H	>15
Wl swamp, wetland	yes	L	5-100	L	N/A
Gr lowland native grassland	yes	L	1-25	H	>10
Dp damp eucalypt forest	yes	M	25-100	M-H	>15
Df dry eucalypt forest	yes	L-E	10-20	M-H	>15
Ds dry scrub	yes	L-M	10-50	H-VH	>5
Hh heathland	yes	L-VH	10-30	H-VH	>5
Zz non-vegetated	N/A	N	N/A	N	N/A

Note: fire dependence indicates whether fire is required for regeneration; fire sensitivity frequency indicates the formation's normal frequency between fires; flammability indicates the approximate soil dryness index above which the formation will burn.

Alpine and subalpine heath normally consists of a diverse range of species between 0.5 to 2 m in height with the dominant species including *Richea scoparia, Orites acicularis, Orites revoluta,* tea-trees *(Leptospermum* spp.), paper-bark (*Melaleuca* spp.), *Epacris* spp., *Cyathodes* spp. and *Nothofagus cunninghamii* (dwarf form). This assemblage is not fire-dependent and many of its species are highly fire-sensitive. Where this formation includes coniferous species and/or fagus it becomes extremely fire-sensitive and may take 500 to 1000 years to recover from the effects of a single fire. The dominant highly fire-sensitive species include King-billy pine (*Athrotaxis selaginoides*), Pencil pine (*Athrotaxis cupressoides*), dwarf conifers (*M. tetragona, M. niphophilus, P. lawrencei, D. archeri*) and fagus (*Nothofagus gunnii*). Alpine and subalpine grassland consists of grass dominated vegetation mostly on medium to high fertility substrates. It often forms extensive plains below inverted tree-lines in frost prone areas, and in areas with high levels of climatic exposure which have been subjected in the past to moderate fire frequencies. Many of these native grasslands have a sparse to moderate cover of eucalypts and in some sites, especially at higher altitudes and/or in more climatically exposed areas may contain fire-sensitive species such as Pencil pines. In the TWWHA significant areas of Sphagnum only occur in moderate to high altitude areas which also have high fertility substrates (especially dolerite) and poor drainage. Although the Sphagnum is fire-sensitive, the fire dynamics in these formations is highly dependent on how dry the soil is when the fire occurs. If fires occur when soils are wet (eg when the Soil Dryness Index (SDI, Mount 1970) is below 10) only the most elevated fuels may burn resulting in minor impacts. In contrast, if fires occur when soils are dry (eg when the SDI is greater than 25) extensive peat fires may occur resulting in long term deleterious impacts.

In the TWWHA, rainforest assemblages are normally dominated by myrtle (*N. cunninghamii*), sassafras (*Atherosperma moschatum*), leatherwood (*Eucryphia lucida*) and/or horizontal (*Anodopetalum biglandulosum*). While rainforests are fire sensitive and do not require fire for the maintenance of species diversity, if they are burnt either by single fire or at low frequency (eg greater than 120 years between fires) there are normally minimal impacts to their species diversity. In contrast, where rainforests contain highly fire senstive species such as King-billy pine (*Athrotaxis selaginoides*), Huon pine (*Lagarostrobos franklinii*), Pencil pine (*Athrotaxis cupressoides*) or fagus (*Nothofagus gunnii*) even a single fire will cause long term (ie greater than 500 to 1000 years) adverse impacts to species diversity.

Extensive areas of wet forest occur in the TWWHA. These forests range from damp eucalypt forests dominated by *Eucalyptus viminalis – E. ovata, E. pauciflora, E. dalrympleana, E. rodwayi, E. ovata, Notelaea ligustrina* (native olive) and/or *Pomaderris apetala* (dogwood) and a highly variable understorey through to wet sclerophyll and mixed forests dominated by *Eucalyptus regnans, Eucalyptus nitida, Eucalyptus obliqua, Eucalyptus delegatensis, Eucalyptus dalrympleana, Eucalyptus johnstonii, Eucalyptus coccifera* and/or *Eucalyptus subcrenulata*. The understorey in highland wet sclerophyll forests is typically dominated by *Hakea* spp., tea-trees, banksia (*Banksia marginata*), bauera (*Bauera rubioides*) and cutting grass (*Gahnia grandis*) while in lowland areas it is typically dense and dominated by blanket bush (*Bedfordia salicina*), *Phebalium squameum*, stinkwood (*Zieria arborescens*), tea-tree, paper-bark, banksia, bauera and cutting grass. Extensive areas of mixed forest occur in the TWWHA and normally consist of a rainforest assemblage (as above) with a overstorey of eucalypts. As noted above, significant areas of dry eucalypt forest have

been mapped by the TasVeg program in the TWWHA (see Appendix 1), but these types are considered to be a miss-typing and have been included in the wet forest category. Wet forests are fire dependent and their normal fire frequency are normally about 25 to 80 years for wet sclerophyll and damp eucalypt forests and between 80 and 350 years for mixed forests.

Buttongrass moorlands are the most extensive vegetation type in the TWWHA (Appendix 1). These moorlands are highly flammable, fire dependent and typically consist of a lower sedge dominated stratum up to about half a metre tall overtopped by a heath dominated stratum up to about one to two metres tall. The dominant species in this assemblage include buttongrass (*Gymnoschenous sphaerocephalus*), tea-tree, paper-bark, sprengelia (*Sprengelia incarnata*), banksia and mallee form western pepermint (*Eucalyptus nitida*). Swamp and wetland assemblages in the TWWHA have a relatively restricted distribution and are normally dominated by sedges, paper-bark and tea-tree. Swamp and wetland assemblages may be highly flammable when dry.

In the TWWHA, wet scrub, heathland and dry scrub associations normally consist of a closed, dense vegetation typically two to ten metres tall typically dominated by western peppermint, tea-tree, paper-bark, banksia, *Acacia* spp., bauera and cutting grass. This assemblage is fire dependent and typically carries fires at 15 to 500 year intervals.

Fauna

To date, in the TWWHA and its associated areas there has only been very limited research into fire - fauna interactions with the majority of the research performed being in buttongrass moorlands. Driessen and Mallick (2007) reviewed the research performed to date and their review has been summarised below with additional information from the 2007 Buttongrass Moorland Management Workshop (see below).

Observational evidence suggests that the optimal feeding habitat for Orange-bellied parrots are buttongrass moorlands between three to 12 years of age and that habitat greater than 20 years of age is unsuitable (Brown and Wilson 1984) although quantitative evidence to support these age ranges is not available. In order to manage for Orange-bellied parrots in the Melaleuca area the Melaleuca-South West Cape Fire Management Plan (PWS 1997a) recommends small scale patch burning on a ten to 12 year rotation.

Bryant (1991) investigated the relationship between Ground Parrot density and fire. Peak densities occur at four to seven years following fire with moderate to high bird densities persisting in buttongrass moorlands up to at least 75 years post-fire (Marsden-Smedley unpublished data).

Gellie (1980) noted that Southern Emu Wrens and Striated Field Wrens require dense vegetation for cover and nest materials, and both species may take from five to seven years to recolonise an area after a fire, unless suitable pockets of unburnt vegetation are left. This is supported by the work of Chaudry et al. (2007) who found these species utilised riparian habitats to a much higher extent than open buttongrass

moorlands possibly due to a higher abundance of arthropod prey along with other resources such as cover, perches and nesting sites. Site productivity in buttongrass moorlands also appears to be important. In medium productivity buttongrass moorlands the availability of prey resources was higher in medium aged sites (five to 16 years post-fire), while prey resources appear to be severely limited in recently burnt sites (one year post-fire) and may also be less available in old sites (greater than 30 years post-fire). These patterns were largely driven by Hemiptera, Diptera, and Araneae which together comprised the majority of total energy content of potential arthropod prey. In contrast, in low productivity buttongrass moorlands site age appeared to not have significant influences on bird numbers (Chaudry et al. 2007).

As regards small mammals in low productivity buttongrass moorlands, Gellie (1980), Arkell (1995) and Driessen (2007) suggest Swamp Rats, Broad-toothed Mice and Swamp Antechinus prefer buttongrass moorlands with moderate to dense covers, and that all three species may require ten to 15 years for the vegetation to recover sufficiently for species to regain their pre-fire species diversity and numbers. In contrast, in medium productivity sites Broad-toothed mice, Swamp rats and Swamp Antechinus recovered their pre-fire species diversity and numbers within four to six years following fire (Driessen 2007).

Greenslade and Driessen (1999) investigated the relationship between the age of buttongrass moorland and the abundance and diversity of invertebrates and found that both abundance and morphospecies richness was highest in intermediate aged sites (11 to 19 years post-fire) compared to younger sites (one to five years post-fire). They found that mites, spiders, springtails, beetles, flies and moths were the taxa most influenced by site age. Furthermore, there was some evidence to suggest that abundance and morphospecies richness declined in sites older than 20 years. In contrast, Green (2007) suggests that mite diversity and abundance increased significantly in buttongrass moorlands that had been left unburnt for about 30 years.

No research has been published to date on the effects of fire on reptiles, amphibians or fish in the TWWHA.

A major finding of the fauna and flora research reported on above relates to the importance of having a diversity of fire regimes within an area. This diversity includes having a range in fire sizes, frequencies, intensities and burning seasons.

Current age classes of buttongrass moorland, wet forest and wet scrub

Due to issues with the resolution of the available vegetation mapping (see above), the area in different fire ages classes were only assessed for the three main fire-dependent vegetation groups: buttongrass moorland, wet forest (combination of damp eucalypt forest, wet eucalypt forest and mixed forest) and wet scrub. These age class areas were then compared against the area that would be ecologically desirable.

Currently, within the Tasmanian scientific community discussions as to what the target proportion in different ages classes should be have only been made for buttongrass moorlands and even in this case, broad consensus is not available or been subject to peer review. As a result, when comparing the age distributions of

buttongrass moorland, wet forest and wet scrub against what would be desirable the age ranges outlined in Table 4 were used.

Table 4 Time period last burnt for fire dependent vegetation group age classes in the Tasmanian Wilderness World Heritage Area

	Age class		
Vegetation group	regrowth	mature	old-growth
buttongrass moorland, low productivity	1990s and 2000s	1970s and 1980s	pre-1970s
buttongrass moorland, medium productivity	1990s, 2000s	1980s	pre-1980s
wet forest	1980s to 2000s	1930s to 1970s	pre-1930s
wet scrub	1990s and 2000s	1930s to 1980s	pre-1930s

Due to there also being a lack of consensus in the scientific community as to what are the optimal age classes for ecological management, this assessment was done assuming that equal proportions in each age class was the desired target. This age class assessment is summarised in Table 5 which shows the area, percentage of the total and ratio of target of regrowth, mature and old-growth buttongrass moorland, wet scrub and wet eucalypt forest by tenure type, and for the entire TWWHA. The majority of the area of these vegetation types are in Cradle mountain - Lake St Clair, Franklin - Gordon and Southwest National Parks.

Assuming that the desired age range target is as described above, the area of regrowth buttongrass moorland, wet scrub and wet eucalypt forest is about a third of the target while the area of mature and old-growth is over represented (Table 5). This over representation of mature and old-growth is a reflection of the very extensive fires in the 1930s and 1890s followed by a marked reduction in burning since the 1930s.

Table 5 Area of buttongrass moorland, wet forest and wet scrub in different age classes and their corresponding proportions of the target in the Tasmanian Wilderness World Heritage Area

Cradle Mountain - Lake St Clair National Park									
Age class	Buttongrass moorland	%	ratio of target	Wet eucalypt forest	%	ratio of target	Wet scrub	%	ratio of target
regrowth	50.3	0.4	0.0	444.4	0.6	0.0	20.9	0.2	0.0
mature	22.9	0.2	0.0	27944.9	35.0	1.1	7522.0	57.5	1.7
old-growth	12808.6	99.4	3.0	51379.3	64.4	1.9	5547.0	42.4	1.3
total	12881.8			79768.6			13089.9		
Walls of Jerusalem National Park									
Age class	Buttongrass moorland	%	ratio of target	Wet eucalypt forest	%	ratio of target	Wet scrub	%	ratio of target
regrowth	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
mature	0.0	0.0	0.0	13853.6	61.3	1.8	36.8	28.9	0.9
old-growth	134.5	100.0	3.0	8728.8	38.7	1.2	90.6	71.1	2.1
total	134.5			22582.4			127.4		
Central Plateau Protected Area									
Age class	Buttongrass moorland	%	ratio of target	Wet eucalypt forest	%	ratio of target	Wet scrub	%	ratio of target
regrowth	0.9	2.1	0.1	1177.4	4.0	0.1	1.6	0.6	0.0
mature	0.0	0.0	0.0	21907.1	74.3	2.2	202.6	80.1	2.4
old-growth	42.2	97.9	2.9	6396.4	21.7	0.7	48.8	19.3	0.6
total	43.1			29480.9			253.0		
Franklin - Gordon National Park									
Age class	Buttongrass moorland	%	ratio of target	Wet eucalypt forest	%	ratio of target	Wet scrub	%	ratio of target
regrowth	9154.3	8.3	0.2	11072.0	8.4	0.3	1707.5	3.4	0.1
mature	31384.7	28.3	0.9	53838.6	40.6	1.2	31636.1	62.6	1.9
old-growth	70165.7	63.4	1.9	67688.2	51.0	1.5	17191.6	34.0	1.0
total	110704.7			132598.8			50535.2		

Table 5 Area of buttongrass moorland, wet forest and wet scrub in different age classes and their corresponding proportions of the target in the Tasmanian Wilderness World Heritage Area, continued

Macquarie Harbour Historic Site / Farm Cove Game Reserve									
Age class	Buttongrass moorland	%	ratio of target	Wet eucalypt forest	%	ratio of target	Wet scrub	%	ratio of target
regrowth	434.0	13.6	0.4	111.2	4.5	0.1	38.3	6.8	0.2
mature	1874.0	58.7	1.8	709.7	28.9	0.9	228.0	40.6	1.2
old-growth	885.2	27.7	0.8	1635.0	66.6	2.0	295.4	52.6	1.6
total	3193.2			2455.9			561.7		
Southwest National Park									
Age class	Buttongrass moorland	%	ratio of target	Wet eucalypt forest	%	ratio of target	Wet scrub	%	ratio of target
regrowth	30289.8	14.1	0.4	9306.2	7.8	0.2	6498.5	7.0	0.2
mature	46425.1	21.5	0.6	38138.6	32.1	1.0	47806.1	51.4	1.5
old-growth	138795.7	64.4	1.9	71241.6	60.0	1.8	38696.4	41.6	1.2
total	215510.6			118686.4			93001.0		
Hartz Mountains National Park									
Age class	Buttongrass moorland	%	ratio of target	Wet eucalypt forest	%	ratio of target	Wet scrub	%	ratio of target
regrowth	0.0	0.0	0.0	148.6	3.9	0.1	0.0	0.0	0.0
mature	0.0	0.0	0.0	793.3	20.6	0.6	363.4	58.1	1.7
old-growth	45.4	100.0	3.0	2903.1	75.5	2.3	262.3	41.9	1.3
total	45.4			3845.0			625.7		
Total Tasmanian Wilderness World Heritage Area									
Age class	Buttongrass moorland	%	ratio of target	Wet eucalypt forest	%	ratio of target	Wet scrub	%	ratio of target
regrowth	39929.3	11.7	0.3	22259.8	5.7	0.2	8266.8	5.2	0.2
mature	80087.7	23.4	0.7	157185.8	40.4	1.2	87795.0	55.5	1.7
old-growth	222496.3	65.0	1.9	209972.4	53.9	1.6	62132.1	39.3	1.2
total	342513.3			389418.0			158193.9		

Impact of fire on geoheritage values

Over the past 20 years the impact of fire on geoheritage values and specifically, buttongrass moorland organosols, has been subject to considerable debate. The majority of this debate however, has not been published in either papers or reports.

Probably the most important research question regarding geoheritage values relates to the impacts of fire on buttongrass moorland organosols. Pemberton (1998, 1989) speculated that extensive areas of buttongrass moorland organosol has been eroded by fire in the TWWHA and its adjacent areas but provided no information as to whether these sites ever had more extensive organosols, the time frame over which these soils had been lost, nor a mechanism by which they had been destroyed. However, there is considerable evidence that many of these areas were very open prior to European arrival in western Tasmania in the early 1830s (eg Robinson 1829-1834; Burn 1842; Calder 1847, 1849, 1860a, 1860b, 1860c, Sharland 1861; see also Marsden-Smedley 1998a; Johnson and Marsden-Smedley 2001). Marsden-Smedley (1993a) performed some preliminary research into the ignition thresholds of buttongrass moorland soils. This research found that the buttongrass moorland soils would not sustain combustion unless they were extremely dry (ie at moisture contents that would only be expected to occur during major droughts) and had a high percentage of organic matter (ie above about 75%). This threshold in organic content is higher than occurs in the vast majority of buttongrass moorland soils (di-Folco 2007) and probably is the major explanation as to why peat fires in buttongrass moorlands are extremely rare. For example, Marsden-Smedley (unpublished data) has recorded a total of two peat fires in buttongrass moorlands in the last 20 years despite making detailed observations on

the effects of over 1000 fires with both of these peat fires occurring when the Soil Dryness Index exceeded 50. In contrast, in all other vegetation types than buttongrass moorland, if the vegetation is dry enough to burn it is normal to get duff and peat fires (Marsden-Smedley et al. 1991).

Bridle et al. (2003) examined the effect of fire in buttongrass moorland soils which were too low in their organic content to be classified as peat (di-Folco 2007). Some of these issues are being researched at Gelignite Creek (Jerie and Household 2007), abet again in a site with low organic content soils (di-Folco 2007). As a result, neither the Bridle et al. (2003) or Jerie and Household (2007) studies will be able to address the major organosol research requirement, that being the impact of fire on buttongrass moorland peat soils.

2. Current fire ecology research

Between 4 and 6 July 2007 a workshop was held at the University of Tasmania investigating management issues in buttongrass moorlands. This workshop was jointly sponsored by the PWS, Department of Primary Industries and Water, Department of Environment and Water Resources, and Ecological Society of Australia. At the workshop a series of papers relating to fire were presented, as summarised below.

Examination of pollen cores from western Tasmania indicates that these cores have the potential to provide a good indication of the vegetation type in the surrounding area when the core was deposited (Fletcher 2007). This information can then be used to examine past fire regimes which suggest that during the last inter-glacial fires in this region were relatively uncommon and switched to a much higher frequency in the current inter-glacial, probably as a result of occupation of the region by Indigenous people. Following the end of the last glacial period this change in fire regime probably allowed for the expansion of buttongrass moorland whilst preventing the widespread expansion of rainforest (Fletcher 2007).

The effects of a range of factors, including low intensity prescribed fire, are being examined in two small catchments located near the Scotts Peak Road (Jerie and Household 2007). The buttongrass moorland in the catchment is underlain by a organosol with a low organic content (di-Folco 2007). This study aims to examine how the morphological and hydrological characteristics of the catchment affect water flow and stream sediment before and after burning but as discussed above, this study will be unable to address the major fire management issue of the effects of fire on organosols due to the site's low organic content soils.

Although organosols contain a large proportion of the stored carbon in the TWWHA, little research has been conducted on their characteristics. Di-Folco and Russell (2007) and di-Folco (2007) examined how variation in vegetation type, slope, temperature and distance from coast influenced soil organic carbon content and developed a model for predicting soil organic carbon for Tasmania in terms of the dominant soil forming factors.

A review of fire weather and area burnt between 1892/93 and 2006/07 was presented by Marsden-Smedley (2007). This review found that the risk of large scale fires in the

TWWHA was very high, both in terms of suitable weather conditions and ignition sources. The review is discussed further in the section below on the climatic potential for wildfires.

Storey and Balmer (2007) presented data pre and post-burn comparisons of vegetation structure and floristics in two buttongrass moorlands. These sites were a moderately fertile highland site and a low fertility lowland site. At the high fertility site there was a increase in herb and graminoid diversity following fire but little change occurred in the low fertility site. Seed regenerating woody species at both sites were slow in their recovery, suggesting that frequent fires have the potential to adversely affect these species. These results suggest that buttongrass moorland vegetation will respond to fire in markedly different ways depending of the characteristics of the site and of the pre-burn vegetation.

Balmer and Storey (2007) presented data from a series of long term monitoring sites located at Forest Lag (20 years of data, see Brown et al. 2002) and Birches Inlet (10 years of data) in order to examine the effects of fire interval and frequency. The overall conclusion from these studies is that moorland floristics and structure are most strongly determined by environmental factors such as site fertility, climate, soil depth and drainage with fire having a significant but smaller effects. Frequent and recent fire promotes a number of herbaceous species which become less observable in the vegetation as time since fire increases. In the immediate post-fire recovery phase shrubs are significantly diminished in importance and in low fertility areas are slow to recover their former cover and height. In the short to medium term it appears that *Phytophthora cinnamomi* (root dieback fungus) has a greater effect on species dynamics than does variation in fire regime (see also Rudman 2007). In low fertility sites, the fire regime which has the lowest risk to moorland floristics is relatively long fire free intervals (greater than 20 and probably greater than 30 years). In higher fertility sites higher fire frequencies pose significantly lower risks to species diversity and may reduce the risk of some species being excluded from older aged moorlands.

3. Fire management of the TWWHA and neighbouring areas

A major issue with fire management is that fires do not recognise tenure boundaries. This means that fire management has to be performed in a multi-tenure integrated manner in order to be effective. This fire management needs to include comprehensive fire planning covering the assets at risk and the values being managed for, information on wildfire suppression potential, prescribed burning, well resourced wildfire suppression operations and adaptive research to ensure that the strategies utilised meet management goals.

Role of prescribed fire as a management tool in the TWWHA

Within the TWWHA prescribed burning is conducted for three purposes:

- hazard-reduction;
- ecosystem-management, and;
- research burning intended to provide information for improved fire management practices.

The primary objective of the hazard-reduction burning is to broaden the conditions within which effective fire management can be performed. Hazard-reduction burning does this, in order of decreasing importance, by reducing the:

- ratio of dead to live fuel;
- fuel continuity, and;
- total fuel load.

The low fuel loads that result from hazard-reduction burning could be used to physically stop fires under low to moderate levels of fire danger, anchor fire suppression operations and/or temporally slow wildfires during periods of high, very high or extreme fire danger. In addition, although these low fuel strips may fail to stop high intensity fires during the middle of the day, they may reduce the level of fire behaviour such that fires fail to sustain at night and/or their level of fire behaviour is such that fire suppression operations are feasible. This may then allow for effective fire suppression operations to be performed. In hazard-reduction burning is normally conducted at five to eight year intervals. The prescriptions for performing buttongrass moorland prescribed burning are in Marsden-Smedley et al. (1999). The prescriptions for performing dry eucalypt forest prescribed burning are in FT (2007b).

The primary objective of ecological-management burning is to create a small scale patchy mosaic with the aim of promoting species diversity (both flora and fauna) and is normally performed at eight to 30 year intervals. Ecological-management burning also has the secondary objective of breaking up the sites into a series of smaller areas which should in turn reduce the probability of large scale wildfires. Ecological-management burning prescriptions have been developed which are shown in Appendix 4.

The objective of the research burning is to provide information as to appropriate methodologies for performing prescribed burning by examining interactions between meteorological conditions, fire frequencies, fire intensities, seasons, lighting patterns, site parameters (eg slope or aspect), species diversity and community structure.

Fire management plans for the TWWHA

Over the past 20 years a series of fire management plans (FMP) have been produced for the TWWHA. The some of these plans are no longer current due to their planned replacement dates having been exceeded and/or due to changes in fire management priorities. These fire management plans are shown in Table 6.

Table 6 Fire management plans for the WHA and its adjacent areas

Superseded fire management plans	*Reference*
Cradle Mountain – Lake St Clair National Park FMP	LPW 1987
Franklin – Lower Gordon Wild Rivers National Park FMP	LPW 1988a
South – West National Park FMP	LPW 1988b
World Heritage Area Boundary FMP	FC 1989
World Heritage Area Tactical FMP versions 1 to 3	PWS 2000, 2001, 2003
Current fire management plans	*Reference*
Pencil Pine Development Zone Fire Protection Plan	PWH 1990
Orange-bellied parrot recovery plan: prescriptions for habitat management burns	Marsden-Smedley 1993b
Lyell Highway FMP	PWS 1996
Melaleuca – South West Cape FMP	PWS 1997a
Walls of Jerusalem National Park and Central Plateau Conservation Area FMP	PWS 1997b
World Heritage Area Tactical FMP version 4	PWS 2004

The Fire Management Section of the PWS is currently coordinating the development of a integrated Tasmanian fire risk plan which will include the TWWHA. This plan aims to identify the assets at risk of wildfire (eg fire sensitive vegetation, threatened species), the factors that contribute to that risk (eg ignition sources, fire history, vegetation fuels) and identify risk mitigation treatments (eg prescribed burning). The plan should be completed by the end of 2009.

The Inter-agency Fire Management Protocol is a Tasmania-wide protocol between the three main fire management agencies, the Tasmania Fire Service, Parks and Wildlife Service and Forestry Tasmania, which aims to ensure safe, efficient and effective fire management. The protocol is revised and updated annually and has as its underlying principle the concept that the most able and available resources will respond to wildfires regardless of land tenure or assets at risk. A critical aspect of the protocol is its inclusion of the multi-agency coordination group which aims to maintain a state-wide perspective on wildfire suppression priorities.

Fire risk management strategies in the TWWHA

The development of a integrated Tasmanian fire risk plan (see above) will form a critical aspect of managing fire risk in the TWWHA. Other important risk management strategies include integrated fire management planning detailing asset locations and prescribed burning, maintenance of annual fire action plans detailing the resources and suppliers available for wildfire suppression operations, along with wildfire detection strategies such as fire towers and fire spotter flights.

In addition, fire management strategies must be integrated with targeted, outcomes driven research which aims to provide management specific information on the values being managed for. The Buttongrass Management Workshop provides an example of how this integration of research into management could be performed.

Procedures for managing the risk of prescribed burn escapes

Prescribed burning is an inherently risky practice. It is not possible to totally eliminate the risk of adverse outcomes due to uncertainties in fuel conditions, weather, probability of equipment failure and human activities. However, with effective and comprehensive planning performed to high standards, adequate levels of resources during the burn and comprehensive post-burn follow-up these risks can be minimised. In addition, when prescribed burns are being planned and performed the prescribed burn risk must be explicitly balanced off against the risk of not doing the burn. In this area, this includes the risk of wildfires and/or the risk to values from ecological succession.

The training and accreditation system employed by the PWS in its low intensity burning training (see FT 2007b) along with the clear allocation of responsibility for performing all aspects of the burn has the potential to minimise adverse risks. This means that the District Manager will have overall responsibility for the burn and ensuring that the Fire Boss is appropriately trained, experienced and resourced. The Fire Boss is responsible for ensuring procedures are followed and that all fireground personnel have appropriate training, experience and equipment. Individual fireground personnel are personally responsible for their own actions and equipment.

Fire regime modelling in the TWWHA

A process-based fire regime and vegetation dynamics model, FIRESCAPE-SWTAS, has been developed over about the past five years for the southern two thirds of the TWWHA and its surrounding areas. This computer simulation model aims to examine the trade-offs between prescribed burning versus wildfires and their impacts on management values by investigating the effects of different prescribed burning strategies. The strategies examined included variation in the amount of prescribed burning, prescribed burn block size and the geographic location of burning blocks. Simulations identified that as prescribed burn treatment level increased and prescribed burn block size decreased the mean number and area burnt by wildfires decreased. The study also indicated that the strategic location of prescribed burn blocks had the potential to enhance the protection in the fire sensitive areas whilst minimising the area treated by prescribed burning (King et al. 2006, 2007a, 2007b).

5. Risks to assets within and neighbouring the TWWHA

Fire is a major risk to both economic and natural assets in the TWWHA. The risks to natural values have been summarised above. This risk is being managed through the development of a Integrated Tasmanian Fire Risk Management Plan (see below).

Area burnt and number of wildfires in the TWWHA

Major changes have occurred in the area of the TWWHA burnt by fires with different ignition causes since the 1980s (Table 7; Appendix 3). During this period there have been large changes in the number, size and area burnt by fires of different ignition cause, with arson fires decreasing and lightning fires greatly increasing. This increase in lightning fires probably occurred between about 1998 and 2000. The reason for this large increase in lightning is not known but it is consistent with the pattern that would be expected from climatic change (eg see below; Goldammer and Price 1998).

Table 7 Mean number of fires of different ignition cause in the Tasmanian Wilderness World Heritage Area since the 1980/81 fire season

	1980s				1990s			
	count	%	area	%	count	%	area	%
Accident	0.4	7.0	1022.8	17.0	0.0	0.0	0.0	0.0
Arson	2.1	36.8	2773.5	46.1	1.3	46.4	99.3	47.2
Campfire	0.3	5.3	13.8	0.2	0.2	7.1	34.0	16.1
Escape management	0.5	8.8	1861.4	31.0	0.2	7.1	41.2	19.6
Lightning	1.0	17.5	169.9	2.8	0.7	25.0	19.9	9.4
Misc	0.1	1.8	5.7	0.1	0.3	10.7	16.2	7.7
Unknown	1.3	22.8	166.7	2.8	0.1	3.6	0.0	0.0
Total	5.7		6013.7		2.8		210.6	

	2000s				Entire TWWHA			
	count	%	area	%	count	%	area	%
Accident	0.4	7.3	341.6	3.9	0.3	5.6	485.0	10.5
Arson	0.9	14.6	3.2	0.0	1.5	31.7	1064.8	23.1
Campfire	0.0	0.0	0.0	0.0	0.2	4.0	17.7	0.4
Escape management	0.4	7.3	1129.3	12.8	0.4	7.9	997.4	21.7
Lightning	3.9	65.9	7323.6	83.2	1.6	34.9	1969.0	42.8
Misc	0.0	0.0	0.0	0.0	0.1	3.2	8.1	0.2
Unknown	0.3	4.9	3.3	0.0	0.6	12.7	62.6	1.4
Total	5.9		8801.0		4.7		4587.0	

In the fire history data since 1980/81 in addition to the increase in lightning caused fires and the decrease in arson fires there has been a decrease in fires of unknown cause. This decrease in the number of fires with unknown causes is a reflection of improved fire detection and investigation resulting in the cause of most fires now being determined. In addition, due to almost all of the 1980s fires with unknown causes starting on roads, 4wd tracks and the coast (PWS unpublished fire data) it is highly probable that most of these unknown cause fires would have been the result of arson and a very small proportion of the area burned would have been the result of lightning (Marsden-Smedley unpublished data). For example, between 1980/81 and 2006/07 only one fire larger than ten hectares of probable lightning cause was discovered when it was more than a few weeks after the date the fire happened. This fire was the 1987/88 Hardwood fire which was found in 1992/93 (D Heatley personnel communication).

Risk of fire escapes from silvicultural burning and forest harvesting activities
Forestry Tasmania has very stringent prescriptions for conducting silvicultural regeneration burning (FT 2007a) which, when followed, result in regeneration burning being a low risk to the TWWHA. These prescriptions rely on moisture differentials such that the coupe being burnt is highly flammable while the surrounding forest is too wet to burn.

In addition, in areas adjacent to the TWWHA regeneration burning is conducted at the end of the fire season between late February and early April. At this time of year the day length is rapidly decreasing and correspondingly, the potential for surrounding forest to dry sufficiently to carry a uncontrollable wildfire is also decreasing.

In the past ten years in Forestry Tasmania has conducted a total of 521 silvicultural regeneration burns covering a total of 10 748 ha on State Forest within five kilometres of the TWWHA boundary (Forestry Tasmania unpublished fire history data). None of these fires burnt into the TWWHA (PWS unpublished fire history data).

A good example of the robustness of the high intensity silvicultural regeneration burning prescriptions occurred in March 1998 when Forestry Tasmania used these prescriptions to light about 12 silvicultural regeneration burns. About a week later the worst March fire danger conditions in for 55 years occurred, and a total of about 62.5 ha was burnt outside the planned coupe boundaries, with all of these escapes being confined to State Forest (FT 1998; Forestry Tasmania unpublished fire history data).

The fire history records held by the Fire Management Section of PWS indicate that only one silvicultural regeneration fire has burnt into the area covered by the TWWHA (at the time this area had not been declared to be world heritage). This fire, the 1989 Clear Hill fire burnt across the Clear Hill Plain and spotted over to the northern bank of the Gordon Gorge in what is now the Franklin - Gordon National Park. However, since 1989 the prescriptions for conducting high intensity regeneration burning have been refined and the currently published high intensity burning prescriptions (FT 2007a) would not have allowed this fire to be lit.

No information on escapes from forest harvesting operations was provided by Forestry Tasmania. From the information that is available (PWS unpublished fire

history data), only two forest harvesting caused wildfires are known, both of which occurred in the Picton River valley in summer within three kilometres of the TWWHA boundary.

The risk to the TWWHA from forest harvesting operations would have to be considered to be moderate due to their potential to cause wildfires at the height of the fire season. The procedures utilised by Forestry Tasmania have the potential to reduce but not eliminate this wildfire risk. These procedures specify the conditions for initiating suspension of hazardous activities due to severe weather along with the fire weather monitoring and fire fighting equipment required. These procedures include the weather and forest fire danger conditions at which harvesting operations will cease work, the methodology and schedule for monitoring the weather and the fire fighting resources that must be onsite at a harvesting operation.

Another important factor is the relative locations of the TWWHA and major logging areas with the majority of the State Forest logging areas being to the east and southeast of the TWWHA. This means that during high fire danger events that the majority of the TWWHA is upwind of State Forest. Where State Forest is located upwind during high fire danger events of the TWWHA (ie along the Great Western Tiers), the normal situation is that due to the rapid increase in elevation over the tiers, the relative humidity is also greatly increased resulting in decreased levels of fire danger. This is reflected in the fire history data since the 1930s where all of the large fires that have burnt between what is now TWWHA and State Forest have gone from the area covered by the TWWHA into State Forest and not vice-versa.

Climatic potential for wildfires

Variation in western and southwestern Tasmanian fire weather between 1892/93 and 2006/07 was examined by Marsden-Smedley (2007, unpublished data). This analysis used a modified Soil Dryness Index (SDI), whereby the temperature based evaporation function in the published version of the SDI (Mount 1970) was replaced with a function based on the day of the year and the Bureau of Meteorology predicted actual evaporation. This was done due to temperature data not being available for most sites prior to about 1970. The system was developed using the last 20 years of daily summer (December to March) rainfall and Bureau of Meteorology predicted SDI for Strahan, Zeehan, Mt Reid, Lake St Clair, Melaleuca and Maatsuyker Island. There was a high correlation ($r^2 = 0.78$) between the Bureau of Meteorology predicted SDI and the estimated SDI using the day of the year and predicted actual evaporation. The estimated SDI figures were then averaged across the region and compared to the flammabilities of the different vegetation types in the TWWHA using the system detailed in Marsden-Smedley et al. (1999). The fire season ratings, SDI categories, time periods, vegetation types at risk of burning and the corresponding number of fire seasons in each category are shown in Figure 1 and Table 8.

This analysis of estimated SDI indicated that over the past 114 years suitable conditions for landscape-scale fire seasons, and major fire seasons have occurred at about 10 to 15 year intervals and at about five year intervals respectively. A landscape-scale fire seasons and major fire season are defined to be where fires burn for at least a month, burn all vegetation types with landscape-scale fires consuming at least 500 000 ha and major fire seasons consuming between 50 000 and 500 000 ha.

The region's fire history data shows that landscape-scale fires have actually occurred twice during the time period 1892/93 to 2006/03 (ie in 1897/98 and 1933/34) and that major fire seasons have occurred four times (ie 1914/15, 1938/39, 1950/51 and 1960/61). In contrast, about two thirds of fire seasons are unlikely to burn anything other than buttongrass moorland and wet scrub (Figure 1, Table 8).

Table 8 Fire season ratings, SDI categories, time periods, vegetation types at risk of burning and the number of fire seasons in each category in western and southwestern Tasmania between 1892/93 and 2006/07

Rating	Fire potential	SDI	Time period	Vegetation at risk of burning	Percentage of seasons
1 - very low		<15	entire fire season	buttongrass moorland	52.6
2 - low		<25	entire fire season	buttongrass moorland, wet scrub	11.4
3 - moderate	major	25-50	>1 month	buttongrass moorland, wet scrub, eucalypt forest	19.3
4 - high	landscape-scale	>50	1 to 2 months	all vegetation types	6.1
5 - very high	landscape-scale	>50	>2 months	all vegetation types	7.9
6 - extreme	landscape-scale	>75	>2 months	all vegetation types	2.6

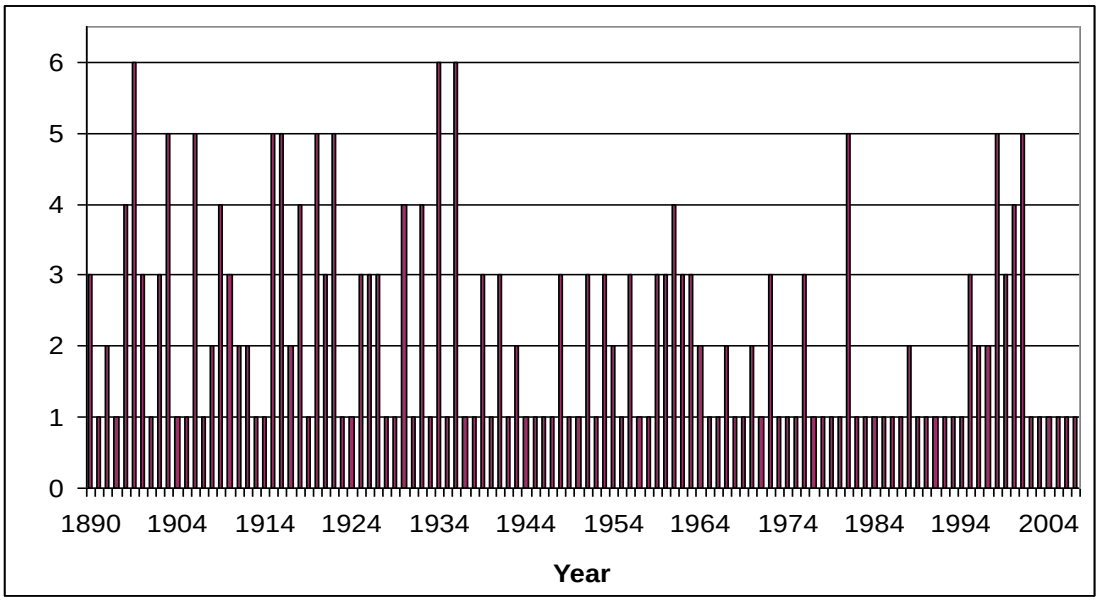


Figure 1 Fire season ratings in western and southwestern Tasmania between 1892/93 and 2006/07

A critical finding of this assessment of the climatic potential for wildfires is that in the TWWHA the risk of large scale fires that threaten human safety and ecological values is very high with the weather conditions and ignition sources for large scale fires occurring on a frequent basis.

The variation in Forest Fire Danger Rating (McArthur 1973) on a monthly basis in western and southwestern Tasmania has been calculated by the Severe Weather Section of the Bureau of Meteorology, Hobart, Tasmania (Figure 2; Appendix 5). This analysis indicates that over the past 20 years moderate to high fire danger weather occurs on a regular basis with very high and extreme fire danger being much less frequent. The highest levels of fire danger normally occur in January followed by February, December, March and November.

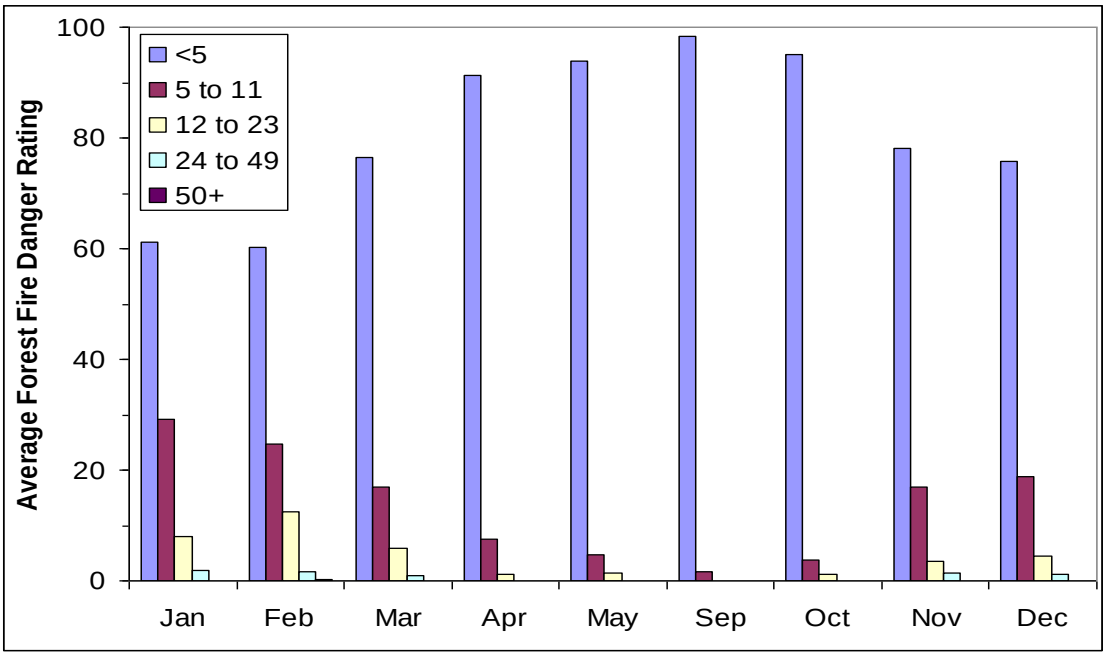


Figure 2 Percentage of days in different Forest Fire Danger Rating classes, averaged across western and southwestern Tasmania
Data source: Severe Weather Section, Bureau of Meteorology, Hobart, Tasmania; Appendix 5

In the TWWHA the issue of climate change versus the level of wildfire risk is highly uncertain. On the southeast Mainland of Australia and in the northeast of Tasmania large to very large increases in the incidence of severe fire danger weather are predicted to occur by 2050. In contrast, only small increases in the level of fire danger are predicted for western and southwestern Tasmania by this time (Lucas et al. 2007).

However, in the past seven to ten years in the TWWHA there appears to have been a major increase in dry lightning storms (PWS unpublished fire data). Whilst at the current time it is not possible to attribute this increase in dry lightning storms to climate change, it is consistent with the trend that would be expected under published climatic change scenarios (Goldammer and Price 1998; Lucas et al. 2007). This increase in dry lightning has been reflected in the large increase in the number and area burnt in lightning initiated fires (see above; PWS unpublished fire data).

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ATTACHMENT F

ADDITIONAL INFORMATION FROM FORESTRY TASMANIA ON ROADING

The Forest Practices Code outlines the minimum standards required for roads and tracks for forestry purposes, including construction and maintenance prescriptions to minimise impacts on natural and cultural heritage.

Forestry Tasmania's operations are independently certified under the Australian Forestry Standard (AFS), which sets stringent environmental, social and economic criteria for forest management and production tracking. This Standard is endorsed by the international programme responsible for such endorsements – the Programme for the Endorsement of Forest Certification schemes (PEFC). The Standard can be found at http://www.forestrystandard.org.au/

Forestry Tasmania also operates under an environmental management system certified to ISO 14001. Forestry Tasmania's environmental management system includes management of legal compliance, risk management, policies, procedures and guidelines, corrective and preventative action, operational monitoring and internal and external auditing.

Forestry Tasmania provides road access to State forest in a manner so as not to compromise other forest values or public safety. Roads, tracks and fire trails provide access for a range of forest management and other activities, primarily for extraction of harvested timber, but also for fire management, recreation, beekeeping and tourism. Some roads provide access to adjacent private freehold land and walking tracks that provide access to the adjacent TWWHA and other reserves.

Forestry Tasmania generally permits the public to have right of access to all roads on State forest. However, forest management activities result in certain roads and tracks being closed either on a temporary (e.g. during periods of extreme fire danger) or permanent basis.

As a result of about 50 years of road building activity, most areas of State forest have primary road access networks already constructed. Most new roading is upgrading of old logging tracks or construction of short secondary or spur roads from the main road network. Some of these are in State forest adjacent to the property.