3

Tasmanian Midlands and Central Plateau

3.1 Tasmania has been isolated from the Australian mainland for at least 10 000 years. It is characterised by geographic and environmental variation, and high ecological and species biodiversity.[1] The state is home to the Tasmanian Wilderness World Heritage Area, an area recognised by the United Nations Educational, Scientific and Cultural Organization (UNESCO) in part for its unusually high proportion of endemic species.[2] Tasmania also contains one of Australia's few alpine regions, and one of 15 nationally-recognised biodiversity hotspots.[3]

3.2 Average temperatures have been rising in Tasmania since the 1950s, but not as rapidly as the Australian or global averages.[4] And while no significant change to *total* annual rainfall is projected in Tasmania under climate change scenarios, extensive changes are expected to regional and seasonal distributions of rainfall. This is likely to have significant implications for Tasmania's biodiversity.

3.3 The Committee visited several sites around Tasmania on 30 January 2012. Site inspections focussed on climate change impacts on terrestrial biodiversity, while evidence gathered at a public hearing the following day centred on marine ecosystems. This chapter outlines some of the

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1 Department of Primary Industries, Parks, Water and Environment (2010) *Vulnerability of Tasmania's Natural Environment to Climate Change: An Overview*, Department of Primary Industries, Parks, Water and Environment, Hobart.

2 UNESCO, 'Tasmanian Wilderness', <http://whc.unesco.org/en/list/181> viewed 11 April 2012.

3 Department of Sustainability, Environment, Water, Population and Communities, 'Australia's 15 National Biodiversity Hotspots', <http://www.environment.gov.au/biodiversity/hotspots/national-hotspots.html> viewed 11 April 2012.

4 Antarctic Climate and Ecosystems Cooperative Research Centre (2010) *Climate Futures for Tasmania general climate impacts: the summary*, Hobart.

issues the Committee investigated during its site inspections in the Tasmanian Midlands and on the Central Plateau.

Committee activities

3.4 The Committee visited three distinct sites in the Tasmanian Midlands and on the Central Plateau. The inspections provided an insight into the diversity of Tasmania's landscapes, and the challenges both common and unique to each region. The following officers from the Tasmanian Department of Primary Industries, Parks, Water and Environment (DPIPWE) joined the Committee for the duration of the site inspections:

- Mr Michael Comfort, Geodiversity Section Leader;
- Ms Louise Gilfedder, Senior Conservation Scientist;
- Dr Wendy Potts, Senior Botanist (Threatened Flora); and
- Mr Peter Voller, Branch Manager, Land Conservation Branch.

3.5 DPIPWE officers provided briefings at each of the sites, and also briefed the Committee on related matters throughout the day, including: the Tasmanian Wilderness World Heritage Area, including threats to biodiversity such as phytophthora dieback; initiatives to promote citizen science; the Wealth for Water program; and weather monitoring and data-gathering.

3.6 During the inspections, the Committee received the following documents from DPIPWE officers:

- *Vulnerability of Tasmania's Natural Environment to Climate Change: An Overview*, DPIPWE, 2010.
- *Potential Climate Change Impacts on Geodiversity in the Tasmanian Wilderness World Heritage Area – Overview*, C. Sharples, 2011.
- *Implications of Climate Change for Australia's National Reserve System: A Preliminary Assessment*, M. Dunlop and P. R. Brown, 2008.

Revegetation in the Tasmanian Midlands

3.7 The Tasmanian Midlands bioregion is one of 15 national biodiversity hotspots, and is home to endemic plant species, endemic freshwater mollusc species, and invertebrates. The area contains 32 nationally-recognised threatened species and more than 180 species listed as

threatened under state legislation. It also contains several wetlands of national and regional significance.[5]

3.8 Of the threats to biodiversity in the Midlands, of significance is the high degree of landscape fragmentation resulting from its land use history, which includes extensive clearing for agriculture and plantation forestry. Native vegetation remnants in the Midlands are small and scattered, and protected areas constitute less than two per cent of the bioregion.[6]

3.9 Members of the Committee had the opportunity to see firsthand the highly fragmented landscape when they visited visited Grassy Hut, a biodiverse carbon restoration research site near Bothwell in the Midlands. The Grassy Hut site is being used to identify priority areas for tree planting, and determine key plant species and optimal species relationships that will be best suited to being grown in the predicted hotter and drier conditions expected to result from climate change.

3.10 At the Grassy Hut site, the Committee received briefings from the following organisations:

- Greening Australia, represented by:
  - ⇒ Mr Jamie Bayly-Stark, President; and
  - ⇒ Dr Neil Davidson, Landscape Ecologist (and Senior Lecturer at the University of Tasmania School of Plant Science); and
- the Tasmanian Land Conservancy, represented by:
  - ⇒ Mr Stuart Cowell, Conservation Programs Manager; and
  - ⇒ Ms Jane Hutchinson, Chief Executive Officer.

3.11 The briefings at the Grassy Hut site covered a range of issues, including: threats to biodiversity in the region and the role of revegetation in mitigating these threats; methods of community engagement in biodiversity conservation initiatives, particularly working with landowners in the Midlands; the importance of rigorous research to better inform revegetation initiatives; and the necessity of cooperation between government, conservation groups and research institutions to ensure good biodiversity outcomes.

5 Department of Sustainability, Environment, Water, Population and Communities, 'Australia's 15 National Biodiversity Hotspots', <http://www.environment.gov.au/biodiversity/hotspots/national-hotspots.html> viewed 11 April 2012.

6 Department of Sustainability, Environment, Water, Population and Communities, 'Australia's 15 National Biodiversity Hotspots', <http://www.environment.gov.au/biodiversity/hotspots/national-hotspots.html> viewed 11 April 2012.

3.12 During the inspection, the Committee received the following documents:

- *Biodiverse Carbon Permanent Research Sites*, copy of slides, Greening Australia.
- *Year in Review*, Greening Australia Tasmania, 2011.
- Grassy Hut research site, map of experimental plots.

Threatened plant species on the Central Plateau

3.13 The Central Plateau is a large alpine and subalpine area in central Tasmania. The higher parts of the Plateau in the west and north are largely either national park or conservation areas, and are included in the Tasmanian Wilderness World Heritage Area.[7] The Plateau suffers from widespread degradation of vegetation and soils as a result of historical land management practices, including inappropriate grazing by domestic and feral animals, burning from wildfires and fires deliberately lit to create pastures for grazing, road construction, and manipulation of lake levels.[8]

3.14 Representing one of Australia's few alpine regions, the Central Plateau is considered to be highly vulnerable to the effects of climate change. Projected temperature rises are likely to increase threats from pests and disease. Increased shrub and tree invasion could lead to significantly transformed alpine ecosystems. It is anticipated that the changing role of fire will present considerable challenges.

3.15 Unlike many other terrestrial ecosystems in Australia, Tasmanian alpine ecosystems have evolved largely in the absence of fire. More frequent fires due to climate change are therefore expected to have significant impacts on the alpine ecosystems of the Central Plateau.

3.16 The Committee visited two distinct sites on the Central Plateau and received various briefings on the biodiversity of the area. Of particular relevance to the inquiry were the cases of two threatened plant species: the pencil pine; and the miena cider gum.

7 Storey, K. and Comfort, M. (2007) *A progress report on the development of rehabilitation priorities for broad scale erosion within the World Heritage Area on the Central Plateau of Tasmania 2005-06*, Department of Primary Industries and Water, Hobart, p. 1.

8 Storey, K. and Comfort, M. (2007) *A progress report on the development of rehabilitation priorities for broad scale erosion within the World Heritage Area on the Central Plateau of Tasmania 2005-06*, Department of Primary Industries and Water, Hobart, p. 1.

Pencil pines

3.17 The pencil pine (*Athrotaxis cupressoides*) is a conifer endemic to Tasmania, and its habitat is generally restricted to sub-alpine areas above an elevation of 800 metres. A close relative of the iconic King Billy pine and Huon pine, the pencil pine can reach ages of over 1200 years. The most extensive pencil pine montane forests and woodlands are located on the Central Plateau, with the vast majority in the Tasmanian Wilderness World Heritage Area. The pencil pine is a threatened species,[9] and is expected to become more vulnerable as a result of the climate change-induced transformation of its habitat.

3.18 The Committee inspected some pencil pines near the Pine Lake boardwalk, and received briefings from DPIPWE officers on threats to the species. The key stressors relate to pests and disease, and changes in fire regimes, as discussed below.

Miena cider gums

3.19 The miena cider gum (*Eucalyptus gunnii* subsp. *divaricata*) is an iconic, small to medium woodland tree endemic to the Central Plateau, where it tends to grow on the edges of frost hollows. It is one of the most frost-tolerant of Tasmania's eucalypts, with a recorded range of 865 to 1150 metres above sea level.[10] However, it is sensitive to the effects of drought, which has led to the death of mature trees in relatively large patches since the mid 1990s. The species is listed as endangered under state and federal legislation.[11]

3.20 The miena cider gum is considered a 'keystone species', with many other species in the ecosystem relying on it for their continued survival. A number of shrub, herb and grass species are associated with the miena cider gum, as are two threatened orchid species. The grassland associated with the miena cider gum is habitat for the vulnerable ptunarra brown butterfly.[12]

9 IUCN, *IUCN Red List of Threatened Species. Version 2011.2*, <http://www.iucnredlist.org/apps/redlist/details/32054/0> viewed 13 April 2012.

10 Threatened Species Section (2010) *Listing Statement for* Eucalyptus gunnii *subsp.* divaricata *(miena cider gum)*, Department of Primary Industries, Parks, Water and Environment, Hobart, p. 3.

11 Department of Sustainability, Environment, Water, Populations and Communities, *EPBC Act List of Threatened Flora*, < http://www.environment.gov.au/cgi-bin/sprat/public/publicthreatenedlist.pl?wanted=flora> viewed 18 April 2012; Threatened Species Section (2010) *Listing Statement for* Eucalyptus gunnii *subsp.* divaricata *(miena cider gum)*, Department of Primary Industries, Parks, Water and Environment, Hobart.

12 Threatened Species Section (2010) *Listing Statement for* Eucalyptus gunnii *subsp.* divaricata *(miena cider gum)*, DPIPWE, Hobart, p. 3.

3.21 The Committee inspected a stand of miena cider gums in the Great Lake area on the Central Plateau. The dramatic tree decline was immediately apparent, even from some distance away. Briefings were provided by DPIPWE officers on threats to the miena cider gum, including: browsing by possums and insects; a low rate of seedling establishment due to grazing and browsing by sheep, wild deer, possums, and rabbits; intolerance of mature trees to drought; and fire regimes.

3.22 As a result of these pressures, most stands of miena cider gum consist mainly of over-mature trees that are more susceptible to stressors and, as a result, are often in poor condition. Climate change is likely to exacerbate some of these threats, particularly those relating to the activities of pests, and changes in rainfall patterns and fire regimes.

3.23 During the inspection, the Committee received the following document:

- *Listing Statement for* Eucalyptus gunnii *subsp.* divaracta *(miena cider gum)*, Threatened Species Section, DPIPWE, 2010.

Figure 3.1 Committee members and DPIPWE officers inspect miena cider gums

Photograph courtesy of committee secretariat

Issues explored in Tasmania

3.24 Through its Tasmanian site inspection program, the Committee gathered evidence on how changes to rainfall patterns, fire regimes, and threats from pests and disease are anticipated to change due to climate changes. Other key issues explored by the Committee relate to flexibility and cooperation in biodiversity conservation approaches, and the role of research in ensuring efficient and effective outcomes.

Changes in rainfall patterns

3.25 According to DPIPWE, drought in Australia has become more severe, with increased temperatures and increased evaporation.[13] There have been significant decreases in average annual rainfalls in Tasmania over the last 40 years. There has also been a change in the timing of rainfall episodes, with a reduction in autumn rains.[14] Changes in the timing and geographical distribution of rain are likely to persist as a result of climate change, and this is expected to adversely affect the ecosystems of the Midlands and the Central Plateau.[15]

3.26 The alarming decline of the miena cider gum—a species highly sensitive to drought—has been attributed to observed changes in rainfall patterns. The increasing frequency and intensity of droughts over recent decades has caused a significant decline across the species' geographical range. Coupled with increased temperatures, it is thought that most miena cider gums are now highly stressed by the end of each summer and in need of substantial rain in autumn in order to recover. Given that these autumn rains are now delayed and diminished, the trees are more stressed and more susceptible to other threats, such as pests and disease. In conjunction with inappropriate fire regimes and browsing pressures, observed rainfall pattern changes have created ecosystem disturbances that have resulted in the spiralling decline of the miena cider gum.[16]

13 DPIPWE (2010) *Vulnerability of Tasmania's Natural Environment to Climate Change: An Overview*, p. 7.

14 DPIPWE (2010) *Vulnerability of Tasmania's Natural Environment to Climate Change: An Overview*, pp. 7–8.

15 Antarctic Climate and Ecosystems Cooperative Research Centre (2010) *Climate Futures for Tasmania general climate impacts: the summary*.

16 DPIPWE (2010) *Vulnerability of Tasmania's Natural Environment to Climate Change: An Overview*, pp. 5–7.

Committee comment

3.27 The Committee notes the contribution of changing rainfall patterns to the observed, dramatic decline of the miena cider gum. There is an interrelationship between rainfall patterns and other threats to the species. The Committee is concerned that these threats are expected to be exacerbated by climate change.

3.28 The Committee is aware that the miena cider gum is usually one of the first eucalypt species to show signs of drought stress. As rainfall patterns change under climate change scenarios, other species may reach their tipping points and experience similar declines in years to come. While the loss of individual species clearly has implications for biodiversity at species level, the loss of keystone species in particular is likely to be detrimental to the continued health of functional ecosystems.

3.29 With regional rainfall patterns projected to change, including a decrease in rainfall in the highly fragmented Tasmanian Midlands biodiversity hotspot, it will be important to ensure that revegetation projects in the region are robust and appropriately targeted to withstand new climatic conditions. Research, such as that being carried out at the Grassy Hut site (discussed below), is likely to make important contributions to conservation programs in years to come.

Figure 3.2 Miena cider gums, near Pine Lake, Central Plateau

Photograph courtesy of committee secretariat

Fire regimes in alpine ecosystems

3.30 The Committee was informed that the greatest threat to alpine plants is fire. As noted above, the alpine ecosystems of the Central Plateau have evolved largely in the absence of fire. Since European settlement, however, fires have been lit relatively frequently, to facilitate the growth of pastures for grazing.[17]

3.31 It was suggested to the Committee that inappropriate fire regimes have contributed to the decline of the miena cider gum. As a result of more frequent fires, fewer individual plants have been able to reach maturity or recover sufficiently to set enough seed before the next fire.[18] Frequent fires kill seedlings and young saplings. They also deplete the shrubby understorey that protects surviving plants from grazing animals. Combined with the impacts of browsing and grazing, which make it very difficult for communities to recover from disturbances, inappropriate fire regimes have had a significant impact on the miena cider gum.

3.32 As with all of Tasmania's endemic conifers—including the King Billy pine, celery-top pine, and Huon pine—the pencil pine is a particularly fire-sensitive species.[19] Some of the largest pure stands of pencil pine have been lost due to escaped campfires. Recovery is unlikely for some communities, due to the species' very slow growth and poor seed dispersal abilities. In fact, some species may take between several hundred and several thousand years to recover from fire.[20]

Committee comment

3.33 With higher temperatures and more frequent severe weather events (such as storms and lightning strikes) predicted under climate change scenarios, wildfires are likely to play an ever-increasing role in shaping the biodiversity of Tasmania's Central Plateau. Although alpine ecosystems occupy only a small proportion of Tasmania's total area, they contain considerable biodiversity values. More frequent fires due to climate change are therefore a significant threat to biodiversity.

17 DPIPWE (2010) *Vulnerability of Tasmania's Natural Environment to Climate Change: An Overview*, p. 6.

18 DPIPWE (2010) *Vulnerability of Tasmania's Natural Environment to Climate Change: An Overview*, p. 6.

19 Parks and Wildlife Service Tasmania, 'Native Conifers of Tasmania', <http://www.parks.tas.gov.au/index.aspx?base=3240> viewed 18 April 2012.

20 Parks and Wildlife Service Tasmania, 'Alpine and Subalpine Plants of Tasmania: Introduction', < http://www.parks.tas.gov.au/index.aspx?base=3216> viewed 18 April 2012.

3.34 Fire management is a complex issue, particularly in Australia, where many species and ecosystems have evolved to require a certain amount of fire in order to survive. At the same time, ecological needs must be balanced against public safety considerations. The Committee sees evolving fire management practices as a key emerging issue for biodiversity in a changing climate.

Threats from pests and disease

3.35 The Committee's visit to the Central Plateau highlighted the threats to biodiversity posed by pests and disease. Pest activity and disease in this location have increased due to climate changes in recent decades. The Committee heard that the discovery in Tasmania of around 15 new diseases, and increases in the incidence of known diseases, are thought to be at least partly due to climate change.

3.36 Pests and disease are likely to become even greater threats to biodiversity as the climate continues to change. Projected reductions in the frequency of frosts and the increase in the incidence of so-called 'tropical nights' are likely to further increase the damage caused by disease and pest species on the Central Plateau.

3.37 In the case of the miena cider gum, the Committee heard that the species' tender shoots and regrowth following fire or damage are highly palatable to insects and animals, including sheep; brushtail possums; wallabies; deer; rabbits; and leaf eating and sap-sucking insects, including the introduced European wasp.[21] Climate change has already increased browsing pressure on the miena cider gum, with milder winters having led to increases in insect populations. These trends are expected to persist.

3.38 *Phytophthora cinnamomi*, a soil-borne water mould discussed in Chapter 2, produces an infection which causes root rot or dieback in plants. Many Australian plants are particularly susceptible to it. Parts of the Tasmanian Wilderness World Heritage Area are affected by phytophthora dieback. The Committee heard that dieback is not an issue in the Tasmanian Midlands, but that it may become more relevant as temperatures increase due to climate change, with warmer soils being more susceptible to phytophthora.

3.39 The Committee heard that the stand of pencil pines it inspected near Pine Lake exhibited some dieback several years ago. Investigations did not reveal a pathogen responsible for the dieback, but one hypothesis was that

21 Threatened Species Section (2010) *Listing Statement for* Eucalyptus gunnii *subsp.* divaracta *(miena cider gum)*, DPIPWE, Hobart, p. 6.

nearby roadworks may have inadvertently brought in gravel from a phytophthora affected area. This coincided with a period of unusually high temperatures in the region, which may have allowed the phytophthora water mould to survive in and travel through the warmer soils, possibly infecting the pencil pines. Although this sequence of events was not proven, the theory highlights the possibility of new pests and diseases emerging in new areas as the climate changes.

Committee comment

3.40 It appears that the issue of pest and disease threats to biodiversity will become more significant as the climate changes. Active and adaptive management strategies are likely to become more important. As was noted during the Committee's inspections, the complexity of ecosystems presents a challenge to predictions about the biodiversity of species and ecosystems under climate change scenarios.

Research and cooperation

3.41 The Committee's inspection of the Grassy Hut site highlighted the importance of research and cooperation in ensuring good biodiversity outcomes in a changing climate.

3.42 Research conducted at the site is a cooperative venture between a research body, government, and non-government organisations, and seeks to inform decisions about the design of revegetation programs. It will be used to identify species and, importantly, combinations of species that are likely to grow well under various conditions. It will also explore whether seeds from local species or from hotter, drier areas are likely to be best suited to the Midlands under predicted climate changes.

3.43 In addition to cooperation between organisations, the Committee heard that individuals can also assist policy-makers and land managers by helping to gather data. The Committee was informed that DPIPWE encourages recreational users of Tasmanian parks to monitor the health of important plant species, by printing species field guides that describe and illustrate the characteristics of healthy and unhealthy specimens.

Committee comment

3.44 The Committee acknowledges the value of the research work being carried out at the Grassy Hut site, which seeks to better inform decisions about revegetation initiatives. In a changing climate and with limited resources, the Committee sees rigorous research as an important part of

the biodiversity management response to climate change. Research can ensure that scarce resources are appropriately prioritised and utilised in a way that delivers the best ecological outcomes.

3.45 The Committee is pleased to note the level of cooperation between the Tasmanian Government, the Commonwealth Government, non-government environmental organisations such as the Tasmanian Land Conservancy and Greening Australia, and research bodies such as the University of Tasmania. This cooperative approach is consistent with the Committee's observations based on other site inspections.

3.46 The Committee acknowledges that monitoring and data-gathering can be resource-intensive activities. They are, however, essential to ensuring effective policies and plans for managing biodiversity. Citizen science initiatives may therefore assist in this regard. As the move to adaptive management continues under changing climate conditions, and the need for field information increases, citizen science programs are likely to become more important. Such programs also deliver an important community engagement outcome, making members of the public more aware of biodiversity issues.

3.47 The Committee considers that cooperative ventures provide benefits in terms of allowing organisations and individuals (such as landowners and volunteers) to share their areas of expertise, contributing to better ecological outcomes. In a changing climate, where policy-makers and land managers are facing a variety of challenges and uncertainty, cooperation, information-sharing and effective coordination can only become more important in conserving Australia's biodiversity.

3.48 There is a need to ensure that government policies and administrative practices facilitate—or, at the very least, do not unnecessarily impede—groups of passionate, dedicated, innovative and knowledgeable people working together to deliver positive biodiversity outcomes.

Maintaining flexibility

3.49 Discussions with Greening Australia and the Tasmanian Land Conservancy highlighted the importance of community engagement and retaining the flexibility to use the appropriate conservation tool according to the circumstances. For instance, the Tasmanian Land Conservancy uses a range of tools, including covenants, stewardship agreements, and acquisitions, depending on the needs of each particular conservation site and stakeholder needs.

Committee comment

3.50 The Committees considers that non-government environmental organisations are uniquely placed to engage landholders and members of the public in a way that is often difficult for government agencies, given the constraints they face. The Committee appreciates that organisations such as the Tasmanian Land Conservancy are able to maintain flexibility in their arrangements with landholders, tailoring solutions to each particular situation. There is a need to ensure that government policies and administrative practices do not unnecessarily hamper this flexible approach.

Concluding remarks

3.51 The Tasmanian site inspections illustrated that climate change is a threat to biodiversity that adds to and interacts with the range of existing stressors. Ecosystems involve multiple and complex interactions and feedback loops, and trying to disentangle these is challenging. What is clear is that existing stressors need to be managed as carefully as possible to minimise the interaction effects from climate change.

3.52 The Committee was interested to visit the alpine ecosystems of the Central Plateau, one of the few alpine areas in Australia. As evidence to the inquiry has noted, alpine ecosystems are some of the most vulnerable to climate change impacts, and the Committee found its visit to the Central Plateau very informative.

3.53 The dramatic decline of the miena cider gums was a fascinating case study of a keystone species declining due to a number of interrelated factors, which are expected to be exacerbated under climate change. It highlights the likelihood of ecosystem transformations under climate change—for better or for worse—and the importance of monitoring and management practices for devising effective interventions where possible.

3.54 The fragmentation of the Tasmanian Midlands landscape was an appropriate backdrop to discussions on community engagement in conservation activities, including revegetation programs on private land. Given the projected changes to temperature and rainfall in the Midlands, this was also an appropriate place to discuss the importance of research in optimising the biodiversity outcomes of ecological restoration programs in a changing climate.

3.55 The Committee was heartened to see first-hand some of the excellent biodiversity conservation work being done in Tasmania, under some challenging circumstances. The Committee wishes to record its thanks to the experts with whom it met and from whom briefings were received. In particular, the Committee is grateful to the Tasmanian Department of Primary Industries, Parks, Water and Environment for facilitating the visit and for making their officers available to travel with the Committee.