

**Recovery Plan for the Mountain Pygmy-
possum *Burramys parvus* on Mount Buller,
Victoria**

2020 to 2024



Version date: June 2020

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Abbreviations

ARMB	Mount Buller and Mount Stirling Alpine Resort Management Board
BSL	Buller Ski Lifts
CMA	Catchment Management Authority
DAWE	Department of Agriculture, Water and the Environment (Commonwealth)
DoE	Department of the Environment (Commonwealth, now DAWE)
DoEE	Department of the Environment and Energy (Commonwealth, formerly DoE, DEH, DSEWPaC, now DAWE)
DEH	Department of the Environment and Heritage (Commonwealth, now DAWE)
DELWP	Department of Environment, Land, Water and Planning (Vic, formerly DEPI, DSE)
DEPI	Department of Environment and Primary Industries (Vic, formerly DSE, now DELWP)
DSE	Department of Sustainability and Environment (Vic, now DELWP)
DSEWPaC	Department of Sustainability, Environment, Water, Population and Communities (Commonwealth, formerly DEH, now DAWE)
EPBC	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
FFG	<i>Flora and Fauna Guarantee Act 1988</i>
NRE	Department of Natural Resources & Environment (Vic, formerly DSE, DEPI, now DELWP)
VMP	Vegetation Management Plan

1.0 PURPOSES OF THIS RECOVERY PLAN

This third Recovery Plan for Mountain Pygmy-possum *Burramys parvus* has been prepared to guide management actions to be undertaken on Mount Buller for the next five years. It briefly reviews achievements of the first and second Mount Buller Recovery Plans (ARMB 2005a; 2013) for the species and identifies limiting constraints that have become apparent during implementation of the first and second Recovery Plans. This third Recovery Plan aims to use existing knowledge to identify achievable actions for the next five years and nominates the parties responsible for each action, with a view to ensuring the long term persistence of the Mountain Pygmy-possum at Mount Buller.

Several management strategies and plans have been developed previously for the species and these have been reviewed to assist with the preparation of the actions presented in this Recovery Plan.

This Plan is primarily focused on management actions on and for the Mount Buller Alpine Resort. Historical management actions such as the captive management program at Healesville Sanctuary (which has now been reduced) are not discussed here in detail. The translocation strategy which commenced in 2010 – 2011 has become a main focus of this Plan and is integral to ensuring long term conservation of the population of Mountain Pygmy-possums at Mount Buller.

1.1 Recovery Plan Process

There is a wealth of knowledge and understanding relevant to the recovery of the Mountain Pygmy-possum on Mount Buller. This has been compiled from intensive scientific research and seasonal monitoring that has been conducted on the species and its habitat at Mount Buller and other populations. Specifically for Mount Buller there are a number of environmental plans and scientific papers that are relevant to the conservation of this species. Relevant documentation has been reviewed, and is briefly summarised where relevant, but the focus of this Recovery Plan is on the actions that need to be carried out to ensure that the Mountain Pygmy-possum population survives on Mount Buller.

The process of developing this Recovery Plan has actively involved the individuals – researchers, managers, agency staff and consultants – with knowledge of the Mountain Pygmy-possum on Mount Buller, through consultation (see Acknowledgments).

1.2 Plan Implementation

The primary responsibility for the implementation of this Recovery Plan lies with the Mount Buller Mount Stirling Alpine Resort Management Board (ARMB), but it also requires inputs and support from Buller Ski Lifts (BSL) and the Department of Environment, Land, Water and Planning (DELWP). Updates in relation to the implementation of this Recovery Plan and progress against objectives will be presented to the Victorian Mountain Pygmy-possum Recovery Team. This team provides advice to the Executive Director of the Biodiversity Division of DELWP and Regional Director of Hume DELWP.

The Victorian MPP Recovery Team is made up of representatives from:

- Parks Victoria

- Zoos Victoria
- Mount Buller Mount Stirling ARMB
- Mount Hotham ARMB
- Falls Creek ARMB
- Goulburn Broken Catchment Management Authority (GBCMA)
- North East Catchment Management Authority (NECMA). Wildlife biologist (Heinze)
- Conservation geneticist (Weeks).

A DELWP Natural Environments Program (NEP) Hume representative Chairs the Recovery Team.

ACKNOWLEDGEMENTS

The preparation of this Recovery Plan has been coordinated by Georgina Zacks and Matt Looby of Biosis Pty Ltd, on behalf of the Mount Buller Mount Stirling ARMB. The following individuals made significant inputs to the review and updated planning process (in alphabetical order of surname):

Jerry Alexander (DELWP)
 Aaron Harvey (Biosis Pty Ltd)
 Dean Heinze (Ecology Links)
 Louise Perrin (ARMB)
 Nick Reeves (BSL)
 Andrew Weeks (cesar)

The Plan's preparation was also supported by a range of ARMB staff and by the ARMB Board. Buller Ski Lifts was also highly supportive of the planning process. Inputs to this plan over the last few years have also been provided by Ian Smales and Clare McCutcheon of Biosis Pty Ltd.

Mapping was updated by Jason Prasad (Biosis Pty Ltd) and digital base data was supplied by the Mount Buller Mount Stirling ARMB.

Cover photo: Vincent Antony, ARMB.

2.0 INTRODUCTION

This document has been prepared to assist Mount Buller and Mount Stirling Alpine Resort Management Board (ARMB) to prepare for and manage the recovery of Mountain Pygmy-possum at Mount Buller.

This document is the third Mount Buller Recovery Plan for the Mountain Pygmy-possum. This Recovery Plan provides a brief overview of the species, its conservation status and threats across its current range, and then focuses on the Mount Buller population. This updated version discusses the successful actions, outcomes and identifies limiting constraints made apparent while undertaking the actions set out in the first and second Recovery Plans. The main focus of this Recovery Plan is to use and build on the existing knowledge of the conservation requirements of the Mountain Pygmy-possum, to identify achievable actions, and the parties responsible for each action. The overall aim of the Recovery Plan is to develop and implement strategies to increase the size of the population while protecting, enhancing and maintaining habitat to ensure the long-term persistence of the Mountain Pygmy-possum at Mount Buller.

This Plan has a five-year timeframe, 2020-2024, after which an updated Plan will be required. The progress of the Plan will be reviewed annually, with an evaluation of progress against set goals and indicators, and an analysis of the actions undertaken and any improvements needed to adapt to new knowledge and experience.

The Mount Buller Mount Stirling ARMB manages the Crown land reserve that includes the Mount Buller and Mount Stirling Alpine Resorts and provides the infrastructure services to the Resorts. There are two areas within the Victorian Alps in which the Mountain Pygmy-possum occurs, the Mount Bogong-Mount Higginbotham area, and the Mount Buller area. The entire known Mountain Pygmy-possum habitat on Mount Buller is contained within the Resort.

This Recovery Plan is the document that will guide the Mount Buller Mount Stirling ARMB and other stakeholders, including the ski-field lessee and operator, BSL, and DELWP, towards the long term survival of the Mountain Pygmy-possum on Mount Buller.

The Mountain Pygmy-possum *Burramys parvus* is the largest of the five pygmy-possums (Family Burramyidae) and is the only extant member of its genus. It is entirely restricted to alpine and sub-alpine environments, dependant on winter snow and is Australia's only marsupial that undergoes hibernation under a cover of snow (Heinze *et al.* 2004; Mansergh and Broome 1994). It is an iconic species of the Australia Alps. The Mountain Pygmy-possum is listed as Endangered under the *Environment Protection and Biodiversity Conservation Act 1999* and Threatened under the *Victorian Flora and Fauna Guarantee Act 1989*.

The most significant threats to the Mountain Pygmy-possum include habitat loss and fragmentation, predation and climate change. Since the mid-1990s population declines have been documented at Mount Buller and Mount Kosciusko. The Mount Buller decline in the early 2000's was particularly dramatic and the population almost bottomed out in the mid 2000's. Consequently, there was grave concern for the conservation and persistence of this population (Menkhorst *et al.* 2010). The Mount Hotham population was also in decline in the mid-late 2000's and has remained relatively low since

then. The implementation of the first and second Recovery Plans for this species at Mount Buller has successfully reversed this decline, with the population now at levels above those recorded upon its discovery at Mount Buller in 1996.

3.0 LEGISLATIVE AND POLICY CONTEXT

3.1 State Legislation and Policy

3.1.1 Alpine Resorts Planning Scheme

The Victorian Alpine Resorts are Crown land reserves. The sector is managed by four statutory authorities, including Mount Buller and Mount Stirling Alpine Resort Management Board. Each ARMB undertakes some administrative planning tasks on behalf of DELWP and are recommending referral authorities under the *Planning and Environment Act 1987*. DELWP is the responsible authority for providing alpine policy advice, considers proposals to use or develop land and ensures that land is not used or developed in conflict with the requirements of the Act or the Alpine Resorts Planning Scheme.

The Mount Buller Mount Stirling ARMB acts as the Crown's representative for leasing and other land management functions and also provides services such as water, sewerage, waste management and other municipal services. The ARMB is notified of all applications for planning permits and is given the opportunity to formally comment as the Land Manager.

3.1.2 Alpine Resorts Strategic Plan 2012 and 2019 (draft)

The *Alpine Resorts (Management) Act 1997* requires the Alpine Resorts Coordinating Council (ARCC) to prepare an Alpine Resorts Strategic Plan every five years. The Alpine Resorts Strategic Plan 2012 was endorsed by the Victorian Government and released in December 2012 (ARCC 2012). The Alpine Resorts Strategic Plan 2020 - 2025 is in draft form (as at March 2020), and once completed will replace the 2012 Plan. The 2020 Plan will, for the first time, incorporate climate change adaptation principles, in line with the requirement for all Victorian Government decision-making bodies to have regard to the impacts of climate change, as enshrined in the *Climate Change Act 2017*.

The draft vision of the 2020 Plan is that *The Victorian alpine resorts achieve their potential as thriving and sustainable destinations for mountain activities and nature-based tourism.*

The 2020 Plan sets out four draft strategic objectives as pathways for Victoria's Alpine Resorts to meet a sustainable alpine future. These include:

- Enable investment that drives sustainable businesses within a prosperous regional economy.
- Protect and enhance the mountain environment.
- Enhance our visitors' experience.
- Implement practical policy and regulatory reform.

These objectives are supported by a financial and governance implementation framework and a set of actions.

3.1.3 Flora and Fauna Guarantee Act 1988

The primary State legislation dealing with biodiversity conservation and sustainable use of native flora and fauna is the *Flora and Fauna Guarantee Act 1988* (FFG Act). An amendment was passed in 2019

(*Flora and Fauna Guarantee Amendment Act 2019*) to provide for a modern and strengthened framework for the protection of Victoria's biodiversity. The Act is administered by DELWP. The Mountain Pygmy-possum is listed under the FFG Act. Critical Habitat can be declared under the Act for a species, but there have been no areas of Critical Habitat declared for the Mountain Pygmy-possum in Victoria.

A permit under the FFG Act is required to 'take' (kill, injure, disturb or collect) listed flora species, flora species that are members of listed communities or protected flora from public land. A permit is not required to 'take' listed fauna or members of a listed fauna community under the FFG Act. Controls in relation to protection of fauna are provided under the *Wildlife Act 1975* and the *Wildlife Regulations 2002*.

A FFG Act Action Statement for the Mountain Pygmy-possum has been prepared (DSE 1991). The Action Statement was written prior to the discovery of the Mountain Pygmy-possum on Mount Buller and thus provided no measures related to its protection there. An updated Action Statement for the Mountain Pygmy-possum has been drafted but is not yet released (DELWP 2019a). Action Statements are statements of DELWP policy (not legally binding).

3.1.4 Advisory List of Threatened Vertebrate Fauna in Victoria

The Advisory List is prepared and revised at intervals by the DELWP. The List provides the conservation status of threatened vertebrate fauna in Victoria. The most recent List was published in March 2013.

The Mountain Pygmy-possum is listed on the Advisory List as "critically endangered" in Victoria (DSE 2013).

3.1.5 Guidelines for the removal, destruction or lopping of native vegetation

Guidelines for the removal, destruction or lopping of native vegetation (the Guidelines) outline how native vegetation removal is assessed and offset (DELWP 2017). The Guidelines are an incorporated document in all Victorian planning schemes. The policy is implemented through the *Planning and Environment Act 1987*, under Amendment VC138 to the Victoria Planning Provisions.

The State Planning Policy Framework (SPPF) outlines Victoria's policy objectives and strategies relating to the protection and management of native vegetation. Clause 12.01 *Biodiversity* provides specific direction regarding the protection and management of biodiversity and native vegetation in Victoria. A key strategy identified in Clause 12.01 is to ensure that there is no net loss to biodiversity as a result of the removal, destruction or lopping of native vegetation. This is achieved through a three-step approach, involving 1) avoidance, 2) minimisation, and 3) offset of native vegetation removal.

The methods and approaches outlined in the Guidelines are used to inform strategic planning processes and the application of appropriate planning controls to ensure Victoria's native vegetation is well managed and protected (DELWP 2017).

3.2 Commonwealth Legislation

3.2.1 Environment Protection and Biodiversity Conservation Act

Under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), actions, unless exempt, require approval from the Australian Government Minister for the Environment if they are likely to significantly impact on a ‘matter of national environmental significance’. There are currently nine matters of national environmental significance defined for the purposes of the Act. The relevant matter in relation to the Mountain Pygmy-possum is “nationally listed threatened species and ecological communities”. The Mountain Pygmy-possum is listed under the Act as “endangered”.

Any person proposing to take an action that may, or will, have a significant impact on a matter of national environmental significance must refer the action to the Australian Government Minister for Environment for determination as to whether the action is a ‘controlled action’. If this is the case, the Minister will determine the type of environmental assessment and reporting that is required and make a decision on whether or not to approve the taking of the action.

Under the Commonwealth’s assessment guidelines:

An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:

- *lead to a long-term decrease in the size of a population*
- *reduce the area of occupancy of the species*
- *fragment an existing population into two or more populations*
- *adversely affect habitat critical to the survival of a species*
- *disrupt the breeding cycle of a population*
- *modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline*
- *result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species’ habitat*
- *introduce disease that may cause the species to decline, or*
- *interfere with the recovery of the species.*

Under these guidelines, any action that has the potential to directly or indirectly cause impact on the Mountain Pygmy-possum habitat at Mount Buller, will be referable to the Minister under the Act.

The EPBC Act contains several compliance and enforcement mechanisms, including court injunctions, required environmental audits, strict civil and criminal penalties, remediation of environmental damage, liability of executive officers and publicising of contraventions.

3.2.2 National Recovery Plan

The 2016 National Recovery Plan (NRP) for the Mountain Pygmy-possum is the first national recovery plan prepared for this species, and details its distribution, habitat, threats and recovery objectives, as well as actions necessary to ensure its long-term survival (DoE 2016).

The NRP includes six specific objectives and details management actions associated with each objective. The six objectives of the NRP are:

- *To maintain or increase the number of Mountain Pygmy-possums in wild sub-populations that have declined and at least maintain current population levels at remaining sites.*
- *To maintain Victorian captive population and establish NSW captive breeding populations of Mountain Pygmy-possum.*
- *To restore and prevent damage to habitat.*
- *To investigate key aspects of the biology and ecology of the Mountain Pygmy-possum.*
- *To assess the capacity of the Mountain Pygmy-possum to adapt to climate change and investigate alternate strategies to assist their long-term survival.*
- *To increase community awareness of and support for the conservation of the Mountain Pygmy-possum.*

The NRP also includes specific performance criteria around which the plan will be considered successful if completed within its five year lifetime.

4.0 THE MOUNTAIN PYGMY-POSSUM

4.1 Conservation Status

The Mountain Pygmy-possum is listed as endangered under the EPBC Act, endangered under the New South Wales *Biodiversity Conservation Act* 2016, threatened under the Victorian FFG Act and critically endangered under the Advisory List of Threatened Vertebrate Fauna in Victoria (DSE 2013). The species is also listed as Critically Endangered on the 2008 IUCN Red List of Threatened Species.

4.2 Distribution

The Mountain Pygmy-possum occurs as three geographically distinct regions (Figure 1). The three regions are located in alpine areas above the winter snow line (>1300 metres above sea level) that are separated by valleys in south-eastern Australia (DELWP 2019a). The three regions are located at:

- Mount Kosciuszko in New South Wales (Northern region)
- Mount Bogong-Mount Higginbotham in Victoria (Central region)
- Mount Buller in Victoria (Southern region).

Multiple populations of Mountain Pygmy-possums occur within the Northern and Central regions. A single population occurs within the Southern region at Mount Buller, which is entirely within the confines of the Resort.

Each population is further limited and fragmented by the patchiness of their preferred boulderfield and alpine heathland (Type I) habitat (Heinze *et al.* 2004). It is estimated that there is less than 7 km² of Type I habitat in total across the three populations; less than 4 km² in Kosciuszko National Park, less than 4 km² in the Mount Bogong-Mount Higginbotham area, and less than 1 km² at Mount Buller (Heinze *et al.* 2004).

Each population has been shown to be genetically unique from the others at a level sufficient for the three populations to be identified as unique Evolutionarily Significant Units (ESU) (Osborne *et al.* 2000; Mitrovski *et al.* 2007).

4.3 Abundance

Because of the cryptic nature of the species, it is extremely difficult to determine how many Mountain Pygmy-possums are present in each population. Monitoring has occurred at survey sites within known and potential habitat located within the three geographically isolated regions. Detailed long-term surveys have occurred at selected survey sites (including Mount Buller, Falls Creek and Mount Hotham) to monitor fluctuations within the three populations, and the data from these surveys are now being used to inform management of the species more broadly. Additional detailed ecological and biological studies have been undertaken within many of the larger sub-populations.

These assessments have provided a good understanding of the current distribution, relative abundance, biology and ecology of the Mountain Pygmy-possum. The most recent (2017 and 2018) population

estimates of Mountain Pygmy-possum across the three regions is 2,180 adult individuals (1,605 females and 575 males). This includes 950 in the Mount Kosciuszko region, 1,030 in the Mount Bogong to Mount Higginbotham region and 200 at Mount Buller (DELWP 2019a). Additionally, small numbers of animals are held at Healesville Sanctuary, primarily for research purposes (DoE 2016), and in other captive institutions as display animals.

The surveys have also provided an understanding of home range, winter/summer nesting behaviour, diet and habitat use.

4.4 Habitat

Mountain Pygmy-possums are limited in distribution by their preference for deep boulderfields at high elevations above the winter snow line (>1300 metres above sea level). These boulderfield habitats have been formed by a cycle of freezing and thawing which, over time, has broken up the underlying rock into boulders. The spaces between the boulders provide protection from extremes of temperature. These spaces also provide summer habitat for the migratory Bogong Moth *Agrotis infusa*, which often occur in large numbers and are a major component of the Mountain Pygmy-possum dietary requirements. The vegetation is also an important component of the habitat requirements of the Mountain Pygmy-possum. Alpine heathland, typically dominated by Mountain Plum-pine *Podocarpus lawrencei* and other shrubs, provides cover, nesting material, seeds and fruit which are key components of the Mountain Pygmy-possum diet. Heinze (2002) classified the Mountain Pygmy-possum preferred habitat into two distinct groups, Type I and Type II habitat. The characteristics of these are explained below and mapped in Figure 3.

Habitat Type I is the habitat type where Mountain Pygmy-possums occur at the highest densities and generally breed (Heinze and Harvey 2006). It is composed of boulderfields and rocky outcrops that are dominated by Mountain Plum-pine and other alpine Heathland Communities. This habitat type occurs at higher elevations with high densities of the Mountain Plum-pine and deeper boulderfields. These areas support greater numbers of Bogong Moths. On Mount Buller the total area of Type I habitat comprises of 32.39 ha (Heinze and Harvey 2006).

Habitat Type II is habitat where Mountain Pygmy-possums occur at relatively lower densities and is less preferred as breeding sites (Heinze and Harvey 2006). It is more varied than Habitat Type I and is composed of boulderfields, rocky outcrops, isolated patches of Mountain Plum-pine Heathland, buried boulderfields, dense Snow Gum canopy cover and a range of heathland communities. Type II habitat occurs on more exposed aspects, lower elevations and generally has poor snow holding capacity. Although less optimal than Type I habitat, this habitat type is extremely important for breeding, migrating and providing cover for dispersing individuals. On Mount Buller, the total area of Type II habitat comprises of 192.13 ha (Heinze and Harvey 2006).

Management Areas (Heinze 2002) encompass Type I and Type II habitat of populations, as well as key dispersal and movement areas that provide links between isolated patches of Type I and Type II habitats. Recent research has highlighted the importance of this dispersal habitat in facilitating and maintaining the genetic diversity of populations at Mount Buller with evidence of gene flow between isolated patches of Type I and II habitat (A. Weeks 2019, pers. comm.). Here, these structurally diverse areas include small exposed outcrops, occasional rock jumbles and some naturally buried shallow

boulderfield. They are carpeted by tall closed heathland dominated by Alpine Shaggy-pea (*Podolobium alpestre*), and provide sufficient protective cover for potentially dispersing or migrating Mountain Pygmy-possum individuals (Ecology Links 2019).

The National Recovery Plan states that Type I, Type II and key dispersal habitat (defined Management Areas) are all considered habitat critical to the survival of the Mountain Pygmy-possum (DoE 2016).

4.5 Life History and Social Organisation

The Mountain Pygmy-possum has a unique life history. It is one of the longest-lived small terrestrial mammals in Australia, with some females known to live up to 12 years of age. Males generally live to five years of age. It is Australia's only small mammal known to hibernate beneath the winter snow. In Victoria, there is a naturally skewed and variable gender ratio, with fewer males than females (typically ranging from 1:3 to 1:6, with instances of 1:22 recorded in the Mount Buller population). In the 2019/20 survey period, the male to female ratio at Mt Buller was 1:2.8 (Heinze *pers. comm.* 2020).

After mating has occurred, males and females segregate and mostly use different habitat areas. The males generally move to lower elevation areas that are less resource-rich, while the lactating females and young remain in resource-rich higher elevations. The ability for males and females to move between elevations and habitat patches is critical for the normal social functioning of the species. In addition, corridors linking habitat patches provide juvenile possums with increased opportunities to disperse from their maternal nest sites. The protection and/or re-connection of links between habitats at lower and higher elevations are extremely important to the persistence of the Mountain Pygmy-possum.

4.6 Pouch young litter loss

Recent years of monitoring have identified an emerging threat with the capacity to severely threaten the sustainability of Mountain Pygmy-possum populations. This threat, known as pouch young litter loss (PYLL), has coincided with the occurrence of extremely low numbers of Bogong Moths in the alpine area, which normally constitute a key food resource for the Mountain Pygmy-possum during the breeding season (October-January). PYLL has occurred at the Mount Buller population as well as most local populations from the Mount Bogong-Mount Higginbotham region, with the observed level of PYLL at some sites above 50% and one being greater than 95% (Table 7; DELWP 2019b).

4.7 Mount Buller population of the Mountain Pygmy-possum

The Mountain Pygmy-possum was first discovered on Mount Buller in 1996 (Heinze and Williams 1998). Development for skiing, particularly during the 1980s and 1990s, prior to the species discovery, led to significant habitat loss, modification and fragmentation of once connected habitats. The most optimal Mountain Pygmy-possum habitat lies on the southern slopes of the mountain from Federation across Wombat Bowl and into the Fanny's Finish/West Ridge area. There is habitat on the northern slopes of the Summit which is largely outside ski run areas, with the exception of Grimus – a small isolated boulderfield north-east of the summit.

In 1996, the population of the Mountain Pygmy-possum at Mount Buller was estimated at 300 adult individuals (270 females and 30 males). Numbers declined significantly, with an estimated population size of 40 (30 females and 10 males) in 2010 (DoE 2016). In the last 5 years female numbers have been substantially higher in the Federation area than they were in 1996. Elsewhere, numbers are still less than in 1996 when the population was estimated at 300. Currently the population is probably less than 200. As previously mentioned, the major factors contributing to the decline included habitat loss and fragmentation, bushfire, predation and climate change.

Since then surveys have shown a steady increase in the number of individuals and therefore expected population size. The implementation of successive site-specific recovery plans for the species, primarily mitigating threats and implementing a novel genetic rescue program (Weeks *et al.* 2017), has led to the recovery of the species to levels above those in 1996. It is evident that the population has responded positively to ongoing on-ground management actions.

4.8 Previous Recovery Actions 2005 - 2019

A broad range of actions have been undertaken over the past 15 years in order to assist with the recovery of Mountain Pygmy-possum at Mount Buller. Actions have been undertaken within the following categories:

- Research and annual monitoring
- Habitat mapping and rehabilitation projects
- Road & track management
- Sediment control
- Fire protection
- Predator control
- Over-snow activities
- Bogong Moth investigations and campaigns
- Public interpretation activities
- Genetic rescue program.

An important discovery to come from the research and population monitoring undertaken in 2017-18 and 2018-19 was identification of the phenomenon of PYLL at a number of sites in Victoria (DELWP 2019). Stemming from this discovery, and following a number of workshops as well as input from the Victorian Mountain Pygmy-possum Recovery Team, the Mountain Pygmy-possum Operational Contingency Plan (OCP) was produced. The OCP outlines actions, timing and responsibilities for activities that are scheduled to occur between August 2019 and May 2020, and beyond.

The outcomes from each action category are summarised in Table 1.

Table 1 Summary of previous recovery action outcomes 2005 - 2019

OBJECTIVES	OUTCOMES TO DATE
5.1 Research and annual monitoring	<ul style="list-style-type: none"> • Resort Management has funded research and annual monitoring has occurred since 1996. • Nine sites within Type I habitats have been surveyed annually using live capture-mark-recapture (CMR) techniques (Figure 2 and Figure 3). • These sites are shown numbered within Type I habitats in Figure 2. • Discovery of PYLL phenomenon.
5.2 Habitat mapping and rehabilitation projects	<p>Several successful projects have been implemented to recreate, restore and extend habitats required by Mount Buller Mountain Pygmy-possums including:</p> <ul style="list-style-type: none"> • All Type I and II habitat mapped and detailed in a report (Heinze and Harvey 2006). Identification of an additional 3.58 ha of MPP habitat, including an additional 27 % Type I habitat and 1% reduction in Type II habitat. • Important linking habitat identified between Zwier’s Zig Zag Ski Run and Howqua Creek (Ecology Links, 2019). • The development and partial implementation of the first <i>Revegetation and Habitat Restoration Plan for Mountain Pygmy-possums Burraymys parvus at Mount Buller</i> (MacPhee and Harvey 2007). • The development and partial implementation of the <i>Boulderfield Habitat Feasibility Study</i> (SMEC Australia 2007). • Reduction of habitat isolation and fragmentation through installation of six boulderfield tunnels to link previously fragmented habitat areas (Figure 4). • Habitat recreation through boulderfield construction totalling 0.5 ha new habitat (Figure 4). This includes habitat connecting Federation Bowl to Wombat Valley by creating 2000 m² of Type I and 1950 m² of Type II Habitat and restoration of previously cleared boulderfield habitat to connect Bull Run Bowl with the Funnel by creating 2510 m² of Type I and 3380 m² of Type II. Revegetation within these areas of habitat has occurred involving the establishment of over 50,000 plants.
5.3 Road and track management	<p>It is important to limit sediment movement into Mountain Pygmy-possum habitat and reduce its fragmentation. Development and implementation of the <i>Vehicular Roads and Tracks Management Strategy</i> (2007) is ongoing. Standard Operating Procedures now incorporate considerations of MPP to ensure:</p> <ul style="list-style-type: none"> • Reduction in habitat fragmentation by roads and tracks (i.e. through decommissioning old tracks, no creation of new tracks that would have a negative impact on the species). • Reduce fragmentation of habitat by roads and tracks (e.g. create corridors beneath roads and tracks to reconnect previously isolated habitat patches • Minimisation of sediment inputs, weeds and litter from roads and tracks in to habitat • Reduction in predator access to Type I and II habitat.
5.4 Sediment control	<p>Sediment, occurring primarily due to run-off from roads and tracks, has potential to reduce or degrade habitat for Mountain Pygmy-possums if it infiltrates boulder scree. The interstitial spaces between rocks are micro-habitat of great importance to the species and</p>

OBJECTIVES	OUTCOMES TO DATE
	<p>these spaces can become filled with sediment where boulder scree downslope of sediment sources acts as a sediment trap. BSL undertook trials of different designs of traps to collect sediment at roadsides and has settled on a ‘best practice’ design that performs well to reduce environmental impact:</p> <ul style="list-style-type: none"> • Installation of 182 ‘best practice’ sediment traps • Collection of approximately 5 m³ of sedimentary material per annum collected by sediment traps
5.5 Fire protection	<p>The following actions have been undertaken during the past ten year period with a view to protection of Mountain Pygmy-possums and their habitat from deleterious impacts of fire:</p> <ul style="list-style-type: none"> • <i>Habitat and Fire Severity Mapping Project</i> (Harvey 2008) completed post 2006-2007 fires. • <i>A Mount Buller and Mount Stirling Mountains Fire Management Plan</i> has been produced (ARMB 2018) and incorporates the mapping information provided in Heinze and Harvey (2006). This report strongly recommends that all Type I and Type II habitats are to be protected from fire and as a result this habitat has been included in the Resort’s asset listings. • Review of the <i>DELWP Regional Fire Management Plan</i> to ensure that it fully takes into account the identification and protection of Mountain Pygmy-possum habitat on Mount Buller. This Plan provides that no planned burning is to be undertaken in Mountain Pygmy-possum habitat or in areas where fire may escape and threaten habitat.
5.6 Predator control	<p>The development and implementation of the ongoing Integrated Pest Animal Control Program (ARMB 2005b). which is focussed on the following pest animal management activities:</p> <ul style="list-style-type: none"> • Feral cat control via trapping and shooting. • Fox control using baiting and shooting. • Rabbit control. • Monitoring, Evaluation, Review and Improvement.
5.7 Over-snow and snow making activities	<p>Action has been taken to assist with reduction of potential negative effects associated with use of snowmobiles and snow-grooming activities and production of artificial snow, including:</p> <ul style="list-style-type: none"> • Introduction of information about appropriate use of snowmobiles by staff in <i>Snowmobile Manual Insert</i> (2006), which now includes exam questions relating to Mountain Pygmy-possum. • The establishment of specific snow mobile routes to avoid Mountain Pygmy-possum habitat. • Cessation of snow-grooming in Type 1 habitat areas. • Investigation and production of a report on the potential negatives of snow-making including potential for source water to include higher than natural levels of nutrients and other pollutants that may deleteriously affect vegetation within Mountain Pygmy-possum habitat (Feehan Consulting 2009).
5.8 Bogong Moth investigations and campaigns	<p>The following actions have been undertaken with regard to Bogong Moth:</p>

OBJECTIVES	OUTCOMES TO DATE
	<ul style="list-style-type: none"> • An investigation into survey techniques to monitor Bogong Moths resulted in the Trap Design and Surveys of Bogong Moths (<i>Agrotis infusa</i>) at Mount Buller (Mitrovski 2009). That report identified bucket traps filled with boulders (diameter >20 cm) provided an optimal method to survey moths. The report also showed that Bogong Moth abundance was considerably greater in the Mount Buller Village than in natural boulderfields. • For two years, solar powered lights were installed by Buller Ski Lifts within Federation boulderfields with the aim of attracting moths to these sites. • An external investigation into arsenic residues in Bogong Moths has been completed by Pettina Love, of La Trobe University (Love, PhD thesis). • In September 2019, Zoos Victoria launched the Moth Tracker online tool that allows the public to photograph and log any potential sighting of migrating Bogong Moths. • Also in 2019, a ‘Lights off for Moths’ campaign was run by Zoos Victoria with the aim of reducing moths being trapped and diverted in bright cities over the spring migration. • GBCMA/NLP 2 funding for Bogong Moth monitoring 2018-2023 including support for a La Trobe University honours project in 2019/20 • DELWP funding for a Bogong Moth population genetic study in 2019/20, encompassing spatial and temporal sampling at Mount Buller, as well as across other regions in Victoria and NSW.
5.9 Public interpretation activities	<p>The following actions have been undertaken to increase awareness of the Mountain Pygmy-possum:</p> <ul style="list-style-type: none"> • Construction of two miniature habitat areas with interpretive panels in the Village Centre and at the Ski School for adults and children. • Dedicated page on the Mount Buller website for Mountain Pygmy-possums including links and downloadable documents. • Mountain pygmy-possum information flyer available at Resort Management offices • Creation of ‘Barry the Burramys’ children’s mascot for Mount Buller (BSL initiative). • Delivery of Mountain pygmy-possum information to hundreds of school students each year by Resort Management Environmental Staff
5.10 Genetic rescue program	<p>Implementation of an innovative genetic rescue program involving the translocation of six males in 2011 and six males in 2014 from Mount Higginbotham (2011) and Timms Spur (2014) to the Mount Buller population (Weeks <i>et al.</i> 2017).</p> <ul style="list-style-type: none"> • Genetic diversity and population size have increased as a result of the introduction of new males. Initial hybrid fitness was more than two-fold higher than non-hybrids; hybrid animals were larger in body size, and female hybrids were longer-lived and produced more pouch young (Weeks <i>et al.</i> 2017). • Genetic diversity is now approaching levels found in populations in the central region, greatly improving the adaptive potential of the population; however ongoing success will rely upon the continued increase in population size at Mount Buller (see below). • Success of the genetic rescue program relied on the implementation of actions above aimed at improving and connecting habitat on Mount Buller, as well as the implementation of an invasive predator control program.

5.0 RECOVERY OBJECTIVES

5.1 Long term recovery aims

The current Plan has been prepared for the period 2020 – 2024. This timeframe is considered to be practical for the purposes of planned management. Longer-term aims have also been developed. The long-term aim is:

To achieve a self-sustaining population (including approximately 375 adult females) of Mountain Pygmy-possums at Mount Buller.

5.2 Evaluation of previous goals

An assessment of two previous Plan’s goals is provided below. The previous goals are considered to have been successful if it is demonstrated that the following has been achieved:

GOAL: Monitoring of Mountain Pygmy-possums shows a population with increased reproductive fitness improved over 2010 levels and including greater than 75% of females having full pouch compliments, no second litters, and a male to female ratio of between 1:2 and 1:6.

- 2019/20 sex ratio was 1M:2.8F, no second litters, >75% had full pouch litters in November (this doesn’t account for litter loss that appears to have occurred in December).

GOAL: Monitoring of key sub-populations demonstrates that they are inhabited by at least the following numbers of Mountain Pygmy-possums (Table 2).

Table 2 Sub-population monitoring results

SITE	GOAL NUMBER OF MOUNTAIN PYGMY-POSSUMS	2019 MONITORING RESULTS
Grimus (1 monitoring site)	>1 breeding females	3 females recorded
Buller South (1 monitoring site)	>12 breeding females	5 females recorded
Wombat Valley (2 monitoring sites)	>1 breeding females	6 females recorded
Federation (4 monitoring sites) <ul style="list-style-type: none"> • Site 324 • Site 350 • Site 329 • Site 334 	>32 breeding females <ul style="list-style-type: none"> • >3 breeding females • >23 breeding females • >3 breeding females • >3 breeding females 	113 females recorded* <ul style="list-style-type: none"> • 33 females recorded • 86 females recorded • 5 females recorded • 6 females recorded
Chamois (1 monitoring site)	>1 breeding females	Not surveyed

SITE	GOAL NUMBER OF MOUNTAIN PYGMY-POSSUMS	2019 MONITORING RESULTS
Additional <ul style="list-style-type: none"> • A350 • B350 • A329 		45 females recorded <ul style="list-style-type: none"> • 26 females recorded • 11 females recorded • 8 females recorded

* some individuals were recorded at multiple sites

GOAL: All Type I and Type II habitats and key dispersal areas have been protected and, where required, have been enhanced.

- No developments/disturbance in Type I and Type II habitats has occurred; revegetation using 5000/9000 food plants (1000 plants per year for the past 5 years – or 9000 over the past 9) in Type I and Type II habitat areas completed.
- A planning application that may disturb dispersal habitat has been lodged with DELWP (Howqua to Zwier’s Zig Zag ski-way).

GOAL: Less than 1% of introduced predator scats sampled and analysed contain remains of Mountain Pygmy-possum.

- 9 out of 913 scats tested were found to contain remains of MPP (0.98%).

GOAL: Knowledge of the species’ distribution and habitat use on Mount Buller has been improved over 2010 levels of understanding.

The annual monitoring at various sites led to trapping of animals at Fanny’s Finish and Grimus in recent years where they had been absent for some years. Similarly, trapping has indicated that the population at Buller North persists, albeit in low numbers and completely disconnected from other sites.

5.3 Five year Recovery Goals

This Recovery Plan has a five year life (2020-2024). Section 6.0 below, outlines actions to be taken during the life of this Plan. All actions are intended to contribute to the continued recovery and maintenance of the Mountain Pygmy-possum population on Mount Buller, and have been aligned with the objectives of the National Recovery Plan. The effect on Mountain Pygmy-possums of most of those actions of themselves and individually, will not be directly measurable. However, in combination they are designed to assist substantially with improvement of the species’ prospects. The following section sets out goals which can be measured at the end of the life of this Plan (or at any point during the next five years). The goals outlined here are direct measures of the improved status of the Mountain Pygmy-possum population on Mount Buller. Goals for particular actions are indicated in Section 6.0, as applicable.

5.3.1 Key goals for this Plan

Actions outlined in this Plan will be considered to have been successful if it can be demonstrated that the following goals have been achieved by 2024:

- Population: Increase in number of Mountain Pygmy-possums at Mount Buller (within each site).
- Genetic diversity: no significant loss in the genetic diversity of the Mount Buller population from 2019 levels.
- Habitat: Establish a Rehabilitation Plan with a focus improving habitat in upper Federation Bowl, Howqua to Zwier's Zig Zag and improving Type I habitat between Wombat and Fanny's, Bull Run/Funnel.
- Research: Intra-site translocations to establish hybrid possums in all sub-populations at Mount Buller has been undertaken. Knowledge and understanding of Mountain Pygmy-possum diet has been improved over 2019 levels of understanding. Bogong Moth monitoring has continued. Knowledge and understanding of predator diet has been improved over 2019 levels of understanding.
- Community awareness: Information available on websites, social media and other platforms (e.g. stakeholder notifications, newsletters and collateral). Maintenance of interpretive sites and presentations upon request.

6.0 RECOVERY ACTIONS FOR THIS PLAN

This section provides an overview of actions required to be undertaken during the life of the Plan. The actions set out here have been grouped according to the recovery objectives of the National Recovery Plan. Some entail continuation of existing actions and some are new. For each action the party or parties responsible for its implementation is identified in bold. All actions have been identified for the contribution they are expected to make to improve the status of the Mountain Pygmy-possum at Mount Buller. Some actions may not have an effect that is measurable during the life of the Plan, but all are expected to contribute to improving the species conservation status in the long-term.

6.1 Maintain numbers of Mountain Pygmy-possums at Mount Buller

Monitoring of key sub-populations demonstrates that they are inhabited by at least the following numbers of Mountain Pygmy-possums (Table 3):

Table 3 Goal numbers of Mountain Pygmy-possums at trapping locations at Mount Buller

SITE	GOAL NUMBER OF MOUNTAIN PYGMY-POSSUMS
Grimus (1 monitoring site)	>1 breeding females (>3)
Buller South (1 monitoring site)	>12 breeding females (>15)
Wombat Valley (2 monitoring sites)	>1 breeding females (>5)
Federation (4 monitoring sites) <ul style="list-style-type: none"> • Site 324 • Site 350 • Site 329 • Site 334 	>32 breeding females (>95) <ul style="list-style-type: none"> • >3 breeding females (>15) • >23 breeding females (>50) • >3 breeding females (>15) • >3 breeding females (>15)

6.1.1 Improved understanding of Mountain Pygmy-possums on Mount Buller

Although there is a good understanding of the biology and ecology of the Mountain Pygmy-possum, knowledge gaps still exist. The following actions are intended to address currently identified gaps in knowledge or understanding. If further gaps in knowledge are identified during the life of this plan that might affect achievement of its goals, an adaptive approach should be adopted with a view to filling them.

ACTIONS

- I. Review existing Mountain Pygmy-possum demographic and genetic monitoring program and modify if potential improvements are identified. **[ARMB & qualified ecologist]**
- II. Fully understand the distribution, dispersal patterns, habitat use (both natural and created) and ecology of the Mountain Pygmy-possum on Mount Buller. Explore understanding of

dispersal patterns through use of genetic techniques. Allow for modifications to the spatial and temporal structure of the demographic and genetic monitoring program to acquire more information on PYLL. **[ARMB, DELWP & as above]**

- III. Explore the efficacy of various technologies for the purposes of survey and monitoring for Mountain Pygmy-possums and for predators (e.g. use of remotely operated movement or infra-red-sensor cameras and/or hair tubes). Employ the most effective method(s). **[ARMB & DELWP]**
- IV. Develop and enhance techniques to maintain improved the genetic diversity, adaptability and survival of Mountain Pygmy-possums through increasing the population size and ensuring all sub-populations contain outbred individuals as per approved translocation plans. **[ARMB, cesar with support from DELWP]**
- V. As appropriate, results of the investigations outlined above should be reviewed and provided to agencies of jurisdictions responsible for the conservation and recovery of the species as they come to hand, in order to permit new knowledge to be shared. **[Relevant parties]**
- VI. Increase understanding of key food source seasonality. Review and incorporate (as appropriate) new knowledge acquired through dietary analysis investigations. **[ARMB & DELWP]**

6.2 Restore and prevent damage to habitat

Appropriate management of habitat is a key to the survival of the Mountain Pygmy-possum on Mount Buller.

Large areas of Type I and Type II habitat for the Mountain Pygmy-possum have been lost or degraded particularly during the 1970s, 1980s and 1990s. The prevention of any further loss, fragmentation or degradation of habitat is a critical component of this and the previous Recovery Plans. The retention and management of all existing habitat, maintaining and enhancing connections between habitat areas, and the rehabilitation of degraded habitat areas are high priority actions required for the continued recovery of the Mountain Pygmy-possum population on Mount Buller.

The following sections indicate actions that should be undertaken to retain and improve habitat connectivity. They are addressed under sections for development of connections between existing habitat patches; revegetation and boulderfield management.

6.2.1 Structural habitat connectivity

The habitat for the Mountain Pygmy-possum on Mount Buller occurs in discrete and often isolated patches. It is important for the normal social functions of Mountain Pygmy-possums that they have the ability to move safely throughout and between all habitat patches. This section focuses on artificially created and restored boulderfields, rock-filled tunnels and/or surface rock corridors which provide localised habitat connections. Revegetation of these areas to provide additional cover, nesting material and food resources is also critical (see below). These artificial links provide Mountain Pygmy-possums with increased capacity to move across areas that are currently lower value habitat for the

species. They are important for maintaining the genetic and adaptive potential of the Mount Buller population by increasing total population size through migration.

Feasible strategies set out in the *Revegetation and Habitat Restoration Plan* (MacPhee & Harvey 2007) and *Boulderfield Habitat Feasibility Study* (SMEC Australia 2007) have largely been implemented via the completion of actions described in previous Plans. Those documents encouraged the identification, design, feasibility assessments and construction of habitat connections aimed at facilitating the movement of Mountain Pygmy-possums. There are limited additional opportunities to reconstruct boulderfield habitat at Mt Buller beyond that habitat which has already been recreated. Additional revegetation remains a critical component to improve habitat areas for enhanced connectivity, cover and food resources.

ACTIONS

- I. Undertake a structural assessment (i.e. rating) of each habitat patch to help focus habitat restoration and revegetation efforts in priority areas. **[ARMB]**
- II. Prevent developments impacting on habitat and key dispersal and movement areas. **[DELWP & ARMB]**
- III. Review trapping and genetic data to identify and prioritise revegetation/restoration efforts aimed at connecting sub-populations. **[ARMB]**

6.2.2 Boulderfield management

The first Mount Buller Recovery Plan (ARMB 2005a) recommended that a number of lost habitat areas should be restored. Creation of boulderfields as two pilot projects in areas where there were few constraints have been accomplished and provided practical experience for the potential establishment of boulderfields on a larger scale.

The viability of further habitat re-creation in areas of more difficult terrain on Mount Buller was fully investigated during a detailed *Boulderfield Habitat Feasibility Study* (SMEC Australia 2007). The study identified many physical, financial and Occupational, Health and Safety issues that presented considerable practical difficulties, which also had significant cost implications. As a consequence future large habitat re-creation projects may not be feasible or safe to install, but feasibility of doing so should continue to be explored, especially if new methods come to light.

Key actions of this Recovery Plan focus on maintaining high quality natural and recreated boulderfield habitat by stopping further fragmentation and reducing impacts to habitat caused by inappropriate development.

ACTIONS

- I. Maintain the quality of boulderfield habitat. **[ARMB]**

- II. Where appropriate, seek to include a condition of permits for future construction or works on Mount Buller to salvage rock from construction areas for use in Mountain Pygmy-possum habitat management works. **[DELWP & ARMB]**

6.2.3 Road & track management

The extensive network of roads and tracks on the southern slopes of Mount Buller contribute to the fragmentation of a number of Type I and Type II habitat patches and are a source of sediment, weeds and litter that potentially impact upon the quality of the habitat areas. They are also likely to facilitate the access of introduced predators and consequential impacts on Mountain Pygmy-possum populations.

ACTIONS

- I. No further roads or tracks are to be developed in:
 - a. Type I or Type II habitat or within a 30 m buffer of those habitats; or
 - b. Key dispersal and movement areas (Management Area), unless for the specific purpose of restoration of habitat and with the approval of DELWP. **[ARMB, BSL & DELWP]**
- II. Plan vehicle use to minimise unnecessary trips (e.g. ensure all required equipment is in vehicle at commencement of trip, etc). **[ARMB & BSL]**
- III. The current low mountain bike and walking use in areas of Mountain Pygmy-possum habitat or buffers will be maintained. Summer recreational use of these areas will be kept to a minimum; events using the tracks and trails in these areas are discouraged. Promotion of these activities generally on Mount Buller must be tailored to ensure that they do not increase in these particular and identified locations. **[ARMB]**
- IV. Maintenance of existing roads is permitted using low impact construction and maintenance techniques designed to ensure long-term sustainable improvements are achieved. **[ARMB & BSL]**
- V. Attempt to re-align west ridge walking track to avoid MPP Type I habitat **[ARMB]**

6.2.4 Drainage & sedimentation

Much of the Mountain Pygmy-possum habitat on Mount Buller occurs naturally in drainage lines. The natural flow of water through these areas is likely to be important for the maintenance Mountain Pygmy-possums, their habitat and vegetation (Australian Geographic Issue #131). It also means that habitat areas are sensitive to altered flows or increased sedimentation caused by actions in their catchments. On some of the older ski slopes that occur within Mountain Pygmy-possum habitat (especially in the Federation Bowl), sediment from past ski area development (in the form of blasted rock and decaying woody debris from the removal of Snow Gums to facilitate the ski run) has partially filled in boulderfield habitat in several areas.

Management of drainage and sediment flows into Mountain Pygmy-possum habitat is an important component of this Recovery Plan. The two primary sources of sediment in the Resort are roads and tracks and poorly vegetated sections of ski field areas. Construction activities areas can create short-term and localised but significant sources of sediment. The major aim is to minimise sediment entering and impacting upon Mountain Pygmy-possum habitat.

ACTIONS

- I. Review and map all drainage and sediment sources in the catchments for Type I and Type II habitat areas, including roads and tracks, un-vegetated or poorly vegetated areas and cross-drains on ski areas. **[BSL]**
- II. Revisit and document the results of the trials undertaken by BSL of different designs of sediment traps. **[BSL]**
- III. Install where necessary, maintain and monitor preferred sediment traps on all roads and tracks draining to Type I and II habitats. **[BSL]**
- IV. Ensure that sediment traps are regularly cleared and maintained; all trapped sediment is to be documented and removed to an appropriate designated disposal site. Sediment is to be re-used/recycled as appropriate. **[BSL]**
- V. Stabilise and revegetate eroding or poorly vegetated areas. **[ARMB, GBCMA & BSL]**
- VI. Continue to investigate and improve the use of suitable construction techniques and materials for track repair to minimise erosion and consequent sedimentation. **[ARMB & BSL]**

6.2.5 Habitat management, restoration and rehabilitation

Management, restoration and rehabilitation, including revegetation, of Type I and II Mountain Pygmy-possum habitat and Management Areas (buffer and connecting vegetation) is important to the viability and continuation of the Mount Buller population.

The revegetation and restoration of degraded habitats are complex management processes. Specific key actions, logistics and resources required to enhance the quality of vegetation on and surrounding Mountain Pygmy-possum habitat at Mount Buller are now incorporated in this Recovery Plan (Appendix 2). Outstanding tasks from the *Revegetation and Habitat Restoration Plan* (MacPhee & Harvey 2007) are outlined below along with new tasks which have been identified since the restoration plan was written. The following general principles apply to revegetation works. All planting will be with the suite of species that comprise the natural floristic composition of Mountain Pygmy-possum habitats. Plants of local Mount Buller provenance may be used and plants of alternate provenances may be considered for climate change mitigation purposes.

Enhancement of Type I or Type II habitats are the priority, as required, through planting to restore full cover of indigenous vegetation. This will be achieved through natural regeneration combined with supplementary plantings where required. It may include infill plantings of particular species whose densities have decreased due to past management practices.

If buffer or connecting habitat is the focus, then the aim will be to encourage cover of low indigenous shrubs. This will be achieved through the promotion of natural regeneration combined with supplementary plantings. Rehabilitated and revegetated areas within ski fields must be managed to ensure habitat values are maintained whilst retaining their suitability as ski field areas.

ACTIONS

- I. Use monitoring (demographic / genetic) and other (e.g. intra-site translocation radio-tracking) data to improve understanding of the spatial and temporal use of rehabilitated habitats and help inform future works **[ARMB]**
- II. Define revegetation improvements needed at each key habitat site including Upper Federation Bowl, Women's Downhill and Little Buller / Wombat – Upper Tunnel and fire affected area, Fanny's Finish accessway and the Funnel. This should include specifications on food, cover and plants suitable for the ski area. **[ARMB]**
- III. Ensure the availability of suitable planting stock with genetic provenance specific to Mount Buller (or other provenance if required to mitigate for the impacts of climate change) is available through a sustainable plant nursery. **[ARMB]**
- IV. Undertake infill revegetation in the areas identified in Figure 4. **[ARMB & BSL]**
- V. Ensure all rehabilitated and revegetated areas are clearly identified and, as appropriate, protected from ski field management works. No summer grooming to occur in areas revegetated within the last 5 years. Where established (i.e. >5 years) revegetated areas may require summer slope grooming in the future, this should be subject to prior approval by ARMB and DELWP as identified in the BSL VMP. **[BSL & ARMB & DELWP]**

6.2.6 Waste and litter

Waste management issues can contribute to habitat degradation (e.g. litter trapped in boulders) and to death of Mountain Pygmy-possums (e.g. animals entangled, trapped or drowned in discarded material and containers that are inappropriately designed or unsecured waste bins (NSW National Parks and Wildlife Service 2002)). The aim is to minimise litter input to Mountain Pygmy-possum habitat.

ACTIONS

- I. Waste management planning and facilities on Mount Buller will take into account the potential for, and reduction of impacts on the Mountain Pygmy-possum. **[ARMB & BSL]**
- II. There will be an emphasis on minimising litter in and around Mountain Pygmy-possum habitat areas through the appropriate provision of bins (including at the top and bottom of lifts). **[BSL]**
- III. Educate staff and visitors as to the impacts of litter on the Mountain Pygmy-possum. **[ARMB & BSL]**

- IV. Undertake annual collection days within habitat areas during the summer months. **[BSL]**

6.2.7 Fire management

Vegetation within Mountain Pygmy-possum habitat is highly sensitive to fire and is very slow to regenerate after being burnt or scorched. It is critical that no Mountain Pygmy-possum habitat is burnt on Mount Buller. In the event of a bushfire, habitat areas will be regarded as a prime environmental asset on the mountain and given the same level of fire protection that is provided to key physical assets. The main aim is to exclude and protect the mapped Type I and Type II Mountain Pygmy-possum habitat from planned burns and from bushfire.

ACTIONS

- I. Exclude all Type I and Type II Mountain Pygmy-possum habitat and the encompassing Management Area from planned burns and bushfires. **[DELWP with support from ARMB and BSL]**
- II. Any reviews of relevant fire plans prepared during the life of this plan should specifically require the exclusion of fire from Type I and Type II Mountain Pygmy-possum habitat and provide maps that clearly delineating these habitat assets. **[ARMB, BSL & DELWP]**

6.2.8 Ski-field management

6.2.8.1 Snow grooming and over-snow vehicles

The winter hibernation period is a critical phase of the annual cycle of the Mountain Pygmy-possum. The noise and activity associated with over-snow vehicles (e.g. snowmobiles and snow groomers) may disturb the animals during hibernation and the compaction of snow by these vehicles may reduce or otherwise alter the insulating properties of the snow and or the sub-snow microenvironment. While there is some information to support these hypotheses, further research is required to confirm them. Due to the critical importance of hibernation and the fact that changes to over-snow vehicle use can be rapidly implemented, this Recovery Plan takes a precautionary approach and continues to recommend the on-going limitations to the use of over-snow vehicles in key winter habitat areas on Mount Buller.

ACTIONS

- I. Access trails identified in maps to be developed will only be groomed for essential operational procedures and only when the minimum snow depth is greater than 60 cm. Snow grooming activities in Type I and Type II habitat and associated 30 m buffer will be confined to essential operations (e.g. search and rescue) only. **[BSL]**
- II. The use of over-snow vehicles for search and rescue and medical evacuation will be allowed in all areas. **[BSL]**
- III. Develop readily accessible information/maps to clearly identify both appropriate over-snow access areas and no go areas where Mountain Pygmy-possum habitat is present. **[BSL].**

- IV. Type I or Type II preferred habitat may expand over time as new habitat is re-created. The snow grooming strategy/plan must be maintained current to any changes that occur. [BSL]
- V. Grooming on runs on the Southern Slopes that do not support Type I or Type II habitat will continue but will be undertaken in a manner that minimises damage to vegetation and soil, especially during low snow conditions. [BSL]
- VI. Where there are Mountain Pygmy-possum corridors constructed across runs that otherwise do not have Mountain Pygmy-possum habitat, the location of the corridors will be made clear to machine operators and grooming activities must be managed to ensure that the corridors are not damaged or unnecessarily disturbed. [BSL]
- VII. Where revegetation is being undertaken on ski runs that otherwise do not have Mountain Pygmy-possum habitat, the location of revegetation areas will be made clear to machine operators and grooming activities must be managed to ensure that revegetation areas are not damaged, especially in low snow conditions. [BSL]
- VIII. Snow farming activities are subject to the same restrictions as grooming activities. [BSL]

6.2.8.2 Ski lift rationalisation

It is understood that BSL has a long-term aim to rationalise the number and location of ski lifts on Mount Buller. This may provide opportunities to mitigate some existing impacts on Mountain Pygmy-possum habitat. Minimisation of impacts and, where practicable, enhancement of Mountain Pygmy-possum habitat should be key aims of lift system rationalisation. Creation of negative impacts to Mountain Pygmy-possum habitat as a result of the lift rationalisation process will not be supported.

ACTIONS

- I. Ensure any review of ski lifts includes a full consideration of potential impacts on the Mountain Pygmy-possum, including the potential to reduce impacts associated with some existing lifts and associated access and infrastructure (e.g. Southside). [BSL]
- II. Where any lift is permanently removed the site will be rehabilitated to replicate the habitat type that existed there prior to development. This will include re-establishment of boulderfield components and linkages wherever practicable [BSL]

6.2.8.3 Snow-making

Artificial snow-making may have positive and negative, direct and indirect effects on Mountain Pygmy-possums although these effects have not been fully explored. There are likely to be potential benefits of snow-making in some sites, for example through providing more consistent/appropriate snow cover to better support hibernation and normal functioning, and improved protection from bushfires.

ACTIONS

- I. Use measures to avoid and minimise direct impacts to Mountain Pygmy-possums and their habitat caused by snow-making activities (e.g. due to trenching). [ARMB & BSL]

6.3 Investigate key aspects of biology and ecology

6.3.1 Translocation Strategy

Genetic diversity within a population is important for many reasons. Reductions in genetic diversity can lead to inbreeding depression, reductions in fitness, fecundity and survival rates and an increased likelihood of a population becoming extinct. To boost the genetic diversity of the Mount Buller Mountain Pygmy-possum population a translocation strategy has been implemented. The *Translocation Strategy for the Mt Buller Population of the Mountain Pygmy-possum* (Weeks and Corrigan 2011) guides this aspect of management for the species.

The aims outlined in the *Translocation Strategy for the Mt Buller Population of the Mountain Pygmy-possum* (Weeks and Corrigan 2011) have now been largely realised through the genetic rescue undertaken in 2011 and the follow-up translocation undertaken in 2014 (Weeks *et al.* 2017). The current population in 2019 has ~300% more genetic diversity than the population pre-2011. Weeks *et al.* (2017) also established that individuals are more fit, which has led to an increase in adult population size of ~400% from 2010 levels. Research needs now should focus on methods that aim to maintain current levels of genetic diversity by increasing population size and ensuring that all sub-populations at Mount Buller contain similar levels of genetic diversity.

Therefore, the next steps within this process are intra-site translocations. These aim to help the species make better use of habitat areas with no or low numbers of Mountain Pygmy-possums. Intra-site translocation sites include Fanny's Finish, Grimus, Wombat, Buller North and Bull Run/Funnel.

Post-release surveys genetic and demographic must continue as they have since 2010. These surveys should continue to collect information regarding short term and long term survival, gender ratios, population trends, recruitment, distribution and habitat use, recapture rates, longevity and synchrony of breeding, as well as provide accurate information on genetic diversity and genetic contribution of translocated individuals. Understanding these processes will provide an indication of the success of translocation and the genetic augmentation program.

Where resources allow, work with relevant organisations around other aspects of genetic programs and research should be explored as opportunities arise.

6.3.2 Bogong Moths

Declines and variation in food resources, disturbance and predation will directly impact on the Mountain Pygmy-possum. Actions to mitigate these are proposed below.

Bogong Moths are a major component of the Mountain Pygmy-possum diet. The Bogong Moth breeds in the plains of the Murray-Darling Basin and migrates to the Alps for the summer. It has been suggested that Bogong Moths bring arsenic residues, and possibly pesticide residues, from the plains into Mountain Pygmy-possum habitat (Green *et al.* 2001). This suggestion has been largely disproved by the work of Love (2010), whose findings suggested the source of arsenic in Bogong Moths is not

anthropogenic and there is no evidence that the concentration of arsenic present in the moths pose a risk to Mountain Pygmy-possums.

Little is known about the status or any possible threats to the Bogong Moth in its breeding areas, and off-site management actions in these areas are not within the scope of this Recovery Plan. It should be noted that the National Recovery Plan identifies off-site management of Bogong Moth habitat as an action for state governments to pursue.

ACTIONS

- I. Use methods outlined in *Trap Design and surveys of Bogong Moths (Agrotis infusa) at Mount Buller* (Mitrovski 2009) to implement a Bogong Moth abundance monitoring program. **[ARMB]**
- II. Develop techniques to analyse Bogong Moth abundance and other relevant data with a view to assessing whether this is a limiting factor for the Mountain Pygmy-possum on Mount Buller. **[ARMB with support from GBCMA/Taungurung Land and Water Council (TLWC)]**
- III. Analyse Bogong Moth abundance data for seasonal trends. **[ARMB with support from GBCMA/TLWC]**

6.3.3 Natural predators and competitors

The impact of owl predation became evident during radio-tracking surveys of translocated individuals in 2009. Predation by snakes, smaller native predators and rodents may also occur, although predation by smaller native predators may be on nestlings not adults. The effects of such native predators on capacity for the Mount Buller Mountain Pygmy-possum population to recover is considered to be minimal.

Declines in food resources and available habitat may increase the likelihood of inter-species competition occurring. Bush Rats *Rattus fuscipes* and Dusky Antechinus *Antechinus swainsonii* commonly occur within Mountain Pygmy-possum habitats and may compete for food and nesting resources. The effects of such native competitors on recovery of the Mount Buller Mountain Pygmy-possum population is also unknown.

ACTIONS

- I. Where resources allow, assess the potential impact of native predators on Mountain Pygmy-possums. The aim of such investigations should be to ascertain whether effects of natural predators are having impacts that might significantly hamper recovery of the species. **[DELWP & ARMB].**
- II. Where resources allow, assess competition for key resources by other native species. Investigations should be aimed at identifying whether competition for key resource requirements between such species and Mountain Pygmy-possums are having impacts that might significantly hamper recovery of the species. **[DELWP & ARMB].**

6.3.4 Feral predator control

Red foxes, feral cats and wild dogs are introduced pest predators that are direct threats to the survival of Mountain Pygmy-possums on Mount Buller. Control of feral predators is considered a key management action to ensure the long-term survival of Mountain Pygmy-possums. The *Integrated Pest Animal Control Program* (ARMB 2005b) addresses the management of feral cats, foxes, wild dogs, rabbits and deer. It involves the use of various methods of control (trapping, shooting and baiting), monitoring (spotlight counts, remote camera monitoring, scat collection and stomach/gut samples) and analyses (scats and stomach/gut). The following actions are proposed/on-going from previous years.

ACTIONS

- I. Enhance existing predator monitoring and control techniques defined in the *Integrated Pest Animal Control Program* (2005). Continue to implement and review new technologies, bait types and effective and selective delivery systems that minimize hazards to non-target species. [ARMB]
- II. Review methods and success of new techniques to control foxes, cats and wild dogs. New bait types, delivery systems and methods to avoid non-target species should be explored and implemented where applicable. [ARMB]
- III. Increase use of remote cameras for monitoring activities of predatory mammals. [ARMB]

6.4 Respond to climate change and develop alternate strategies to long term survival

6.4.1 Climate change

Climate change is recognised as a key threat biodiversity and both state and federal governments have developed strategies and action plans to support biodiversity outcomes in the face of a changing climate (DELWP 2017; CoA 2017). A warming of the environment on Mount Buller due to global warming or natural climate change has the potential to significantly alter the habitat, population dynamics and survival of the Mountain Pygmy-possum. Mountain Pygmy-possums have been identified as one of the key species expected to be affected by climate change, not only due to climatic shifts but also through indirect impacts such as changes in food availability (Gibson et al., 2017). Increased temperatures, increased occurrence of ‘extreme’ events, lower rainfall, altered patterns of rainfall and other effects of climate change are expected to affect the operation of the Resort and the Mountain Pygmy-possum population at Mount Buller by reducing the extent, annual period and, possibly depth, of snow cover. Emergency management planning (in accordance with the *Emergency Management Act 2013*) is well established within the resort and identifies Mountain Pygmy-possum habitat as a key environmental asset.

ACTIONS

- I. Ensure good emergency management and fire plans are in place. [BSL & ARMB]

- II. Continue revegetation actions as per Appendix 2 to ensure availability of food resources to mitigate indirect impacts from climate change (eg reduced numbers of Bogong Moths). **[BSL & ARMB]**
- III. Ensure MEMP and IFMP are regularly reviewed and updated in accordance with EM Act. Incorporate adequate planning and recovery activities for Mountain Pygmy-possum habitat and other environmental assets. **[ARMB]**
- IV. Planning for any increased snow making facilities will need to take full account of potential impacts on the Mountain Pygmy-possum and its habitat; new facilities in Type I or Type II habitat or buffers will generally not be supported and if agreed under exceptional circumstances will need EPBC Act referral by the proponent. **[BSL]**
- V. Ensure water storage dams are kept full for firefighting and protection of Mountain Pygmy-possum habitat if at risk of harm from fire. **[BSL]**
- VI. Monitor and compare variances in weather data collected from weather stations at Mount Stirling and Mount Buller. **[ARMB]**

6.5 Increase awareness and support for conservation of Mountain Pygmy-possum

Over the past 20 years improvements in clarity, understanding and implementation of environmental and management requirements by both the ARMB and BSL have led to a contemporary and sometimes leading space in terms of innovations and positive outcomes. More focused arrangements for environmental management have the potential to improve the implementation of this Recovery Plan to ensure that the ARMB can fulfil its land management responsibilities and that BSL operates and manages leased sites according to lease conditions.

It will be important to ensure that the responsibility for environmental management within both the ARMB and BSL is clear, and each organisation will make sure there are strong and transparent responsibilities and lines of communication.

6.5.1 Education and environmental awareness of mountain staff

It is important that all mountain staff (and others) are aware of this Recovery Plan and its requirements, of the location of Mountain Pygmy-possum habitat and of their legal requirements, particularly under provisions of both State and Federal legislation, in particular the EPBC Act.

There has been a considerable increase in environmental awareness within the ARMB and BSL in recent decades, and the Mountain Pygmy-possum has been a major factor in raising this awareness. Environmental issues now form part of staff induction and key staff participate in the Alpine Ecology or Alpine Rehabilitation courses regularly. The actions set out in this plan provide an opportunity to build on this, and a program will be put in place to continue to expand the environmental awareness of mountain staff through education and training.

The range of management actions proposed in this Recovery Plan, combined with the presence of high quality educational facilities at Mount Buller, provide learning opportunities which should be built upon over the life of this plan. These must include ensuring that all staff working on the mountain are aware of the Recovery Plan, potential impacts on Mountain Pygmy-possums and their obligations, including legal requirements, in relation to the species.

ACTIONS

- I. Continue to include environmental issues in staff induction. **[BSL & ARMB]**
- II. Continue to send key staff to the Alpine Ecology or Alpine Rehabilitation Courses. **[BSL & ARMB]**
- III. Continue to involve BSL and ARMB staff in annual Mountain Pygmy-possum monitoring activities. **[ARMB & BSL]**

6.5.2 Education and environmental awareness of visitors

The recovery program for the Mountain Pygmy-possum has an effect on both winter and summer management, and visitor awareness and support will be important for the continued acceptance and success of such changes.

ACTIONS

- I. To create a supportive visitor community by ensuring visitors are aware of the significance of the Mountain Pygmy-possum on Mount Buller and are informed about the recovery actions that may affect them. **[ARMB & BSL]**
- II. Maintain existing interpretive displays in the village and ski school and update when appropriate. **[ARMB]**
- III. Provide regular Mountain Pygmy-possum recovery updates on Mount Buller web page, newsletters and interpretive videos. **[ARMB & BSL]**
- IV. Establish a public interpretation facility in Village Square Plaza or other prominent location that is easily located and viewed. **[ARMB & BSL]**
- V. Provide updates to Chamber and Ratepayers, undertake letter box drops to Buller PO boxes with newsletters including updates on Mountain Pygmy-possum related activities, distribution of flyers to lodges, inclusion of information in showbags for the annual Lodge Managers night, and make fact sheets and flora and fauna guides available at Reception. **[ARMB]**

7.0 SUMMARY OF ACTIONS FOR THIS RECOVERY PLAN

Table 4 below provides a summary of all actions across recovery objectives for Mountain Pygmy-possum at Mount Buller over the next five years.

Table 4 Summary of recovery actions for 2020 to 2024 at Mount Buller

ACTION	RESPONSIBILITY
6.1 Maintain numbers of Mountain Pygmy-possums at Mount Buller	
6.1.1 Improved understanding of Mountain Pygmy-possum on Mount Buller	
I. Review existing Mountain Pygmy-possum monitoring program (demographic and genetic) and modify if potential improvements are identified	ARMB & qualified ecologist
II. Fully understand the distribution, dispersal patterns, habitat use (both natural and created) and ecology of the Mountain Pygmy-possum on Mount Buller. Explore understanding of dispersal patterns through use of genetic techniques. Allow for modifications to the spatial and temporal structure of the demographic and genetic monitoring program to acquire more information on PYLL.	ARMB, DELWP & as above
III. Explore the efficacy of various technologies for the purposes of survey and monitoring for Mountain Pygmy-possums and for predators (e.g. use of remotely operated movement or infra-red-sensor cameras and/or hair tubes). Employ the most effective method(s).	ARMB & DELWP
IV. Develop and enhance techniques to maintain improved the genetic diversity, adaptability and survival of Mountain Pygmy-possums through increasing the population size and ensuring all sub-populations contain outbred individuals as per approved translocation plans.	ARMB, cesar with support from DELWP
V. As appropriate, results of the investigations outlined above should be reviewed and provided to agencies of jurisdictions responsible for the conservation and recovery of the species as they come to hand, in order to permit new knowledge to be shared.	Relevant parties
VI. Increase understanding of key food source seasonality. Review and incorporate (as appropriate) new knowledge acquired through dietary analysis investigations.	ARMB & DELWP
6.2 Restore and prevent damage to habitat	
6.2.1 Structural habitat connectivity	
I. Undertake a structural assessment (i.e. rating) of each habitat patch to help focus habitat restoration and revegetation efforts in priority areas.	ARMB
II. Prevent developments impacting on habitat and key dispersal and movement areas	DELWP & ARMB
III. Review trapping and genetic data to identify and prioritise revegetation/restoration efforts aimed at connecting sub-populations.	ARMB
6.2.2 Boulderfield management	
I. Maintain the quality of boulderfield habitat.	ARMB

ACTION	RESPONSIBILITY
II. Where appropriate, seek to include a condition of permits for future construction or works on Mount Buller to salvage rock from construction areas for use in Mountain Pygmy-possum habitat management works.	ARMB & DELWP
6.2.3 Road & track management	
I. No further roads or tracks are to be developed in: a. Type I or Type II habitat or within a 30 m buffer of those habitats; or b. Key dispersal and movement areas (Management Area), unless for the specific purpose of restoration of habitat and with the approval of DELWP.	ARMB, BSL & DELWP
II. Plan vehicle use to minimise unnecessary trips (e.g. ensure all required equipment is in vehicle at commencement of trip, etc).	ARMB & BSL
III. The current low mountain bike and walking use in areas of Mountain Pygmy-possum habitat or buffers will be maintained. Summer recreational use of these areas will be kept to a minimum; events using the tracks and trails in these areas are discouraged. Promotion of these activities generally on Mount Buller must be tailored to ensure that they do not increase in these particular and identified locations.	ARMB
IV. Maintenance of existing roads is permitted using low impact construction and maintenance techniques designed to ensure long-term sustainable improvements are achieved.	ARMB & BSL
V. Attempt to re-align west ridge walking track to avoid MPP Type I habitat	ARMB
6.2.4 Drainage & sedimentation	
I. Review and map all drainage and sediment sources in the catchments for Type I and Type II habitat areas, including roads and tracks, un-vegetated or poorly vegetated areas and cross-drains on ski areas.	BSL
II. Revisit and document the results of the trials undertaken by BSL of different designs of sediment traps.	BSL
III. Install where necessary, maintain and monitor preferred sediment traps on all roads and tracks draining to Type I and II habitats.	BSL
IV. Ensure that sediment traps are regularly cleared and maintained; all trapped sediment is to be documented and removed to an appropriate designated disposal site. Sediment is to be re-used/recycled as appropriate.	BSL
V. Stabilise and revegetate eroding or poorly vegetated areas.	ARMB, GBCMA & BSL
VI. Continue to investigate and improve the use of suitable construction techniques and materials for track repair to minimise erosion and consequent sedimentation.	ARMB & BSL
6.2.5 Habitat management, restoration and rehabilitation	
I. Use monitoring (demographic/genetic) and other (e.g. intra-site translocation radio-tracking) data to improve understanding of the spatial and temporal use of rehabilitated habitats and help inform future works.	ARMB
II. Define revegetation improvements needed at each key habitat site including Upper Federation Bowl, Women's Downhill and Little Buller / Wombat – Upper Tunnel and fire affected area, Fanny's Finish accessway and the Funnel. This should include specifications on food, cover and plants suitable for the ski area.	ARMB
III. Ensure the availability of suitable planting stock with genetic provenance specific to Mount Buller (or other provenance if required to mitigate for the impacts of climate change) is available through a sustainable plant nursery.	ARMB
IV. Undertake infill revegetation in the areas identified in Figure 4.	ARMB & BSL
V. Ensure all rehabilitated and revegetated areas are clearly identified and, as appropriate, protected from ski field management works. No summer grooming to occur in areas revegetated within the last 5 years. Where established (i.e. >5 years) revegetated areas may require summer slope grooming in the future, this should be subject to prior approval by ARMB and DELWP as identified in the BSL VMP	BSL & ARMB & DELWP

ACTION	RESPONSIBILITY
6.2.6 Waste and litter	
I. Waste management planning and facilities on Mount Buller will take into account the potential for, and reduction of impacts on the Mountain Pygmy-possum.	ARMB & BSL
II. There will be an emphasis on minimising litter in and around Mountain Pygmy-possum habitat areas through the appropriate provision of bins (including at the top and bottom of lifts).	BSL
III. Educate staff and visitors as to the impacts of litter on the Mountain Pygmy-possum.	ARMB & BSL
IV. Undertake annual collection days within habitat areas during the summer months.	BSL
6.2.7 Fire management	
I. Exclude all Type I and Type II Mountain Pygmy-possum habitat and encompassing Management Area from planned burns and bushfires.	DELWP with support from ARMB and BSL
II. Any reviews of relevant fire plans prepared during the life of this plan should specifically require the exclusion of fire from Type I and Type II Mountain Pygmy-possum habitat and provide maps that clearly delineating these habitat assets.	ARMB, BSL & DELWP
6.2.8 Ski-field management	
6.2.8.1 Snow grooming and over-snow vehicles	
I. Access trails identified in maps to be developed will only be groomed for essential operational procedures and only when the minimum snow depth is greater than 60 cm. Snow grooming activities in Type I and Type II habitat and associated 30 m buffer will be confined to essential operations (e.g. search and rescue) only.	BSL
II. The use of over-snow vehicles for search and rescue and medical evacuation will be allowed in all areas.	BSL
III. Develop readily accessible information/maps to clearly identify both appropriate over-snow access areas and no go areas where Mountain Pygmy-possum habitat is present.	BSL
IV. Type I or Type II preferred habitat may expand over time as new habitat is re-created. The snow grooming strategy/plan must be maintained current to any changes that occur.	BSL
V. Grooming on runs on the Southern Slopes that do not support Type I or Type II habitat will continue but will be undertaken in a manner that minimises damage to vegetation and soil, especially during low snow conditions	BSL
VI. Where there are Mountain Pygmy-possum corridors constructed across runs that otherwise do not have Mountain Pygmy-possum habitat, the location of the corridors will be made clear to machine operators and grooming activities must be managed to ensure that the corridors are not damaged or unnecessarily disturbed.	BSL
VII. Where revegetation is being undertaken on ski runs that otherwise do not have Mountain Pygmy-possum habitat, the location of revegetation areas will be made clear to machine operators and grooming activities must be managed to ensure that revegetation areas are not damaged, especially in low snow conditions.	BSL
VIII. Snow farming activities are subject to the same restrictions as grooming activities	BSL
6.2.8.2 Ski lift rationalisation	
I. Ensure any review of ski lifts includes a full consideration of potential impacts on the Mountain Pygmy-possum, including the potential to reduce impacts associated with some existing lifts and associated access and infrastructure (e.g. Southside).	BSL
II. Where any lift is permanently removed the site will be rehabilitated to replicate the habitat type that existed there prior to development. This will include re-establishment of boulderfield components and linkages wherever practicable	BSL
6.2.8.3 Snow-making	
I. Monitor and report any potential and realised impacts from the use of snow-making water in habitat areas.	ARMB & BSL

ACTION	RESPONSIBILITY
II. Use measures to avoid and minimise direct impacts to Mountain Pygmy-possums and their habitat caused by snow-making activities (e.g. due to trenching).	ARMB & BSL
6.3 Investigate key aspects of biology and ecology	
6.3.1 Translocation Strategy	
I. Undertake intra-site translocations to assist species in maintaining current levels of genetic diversity and encouraging use of habitat areas with no or low numbers of Mountain Pygmy-possums.	ARMB
II. Continue post-release genetic and demographic surveys.	ARMB
6.3.2 Bogong Moths	
I. Use methods outlined in <i>Trap Design and surveys of Bogong Moths (Agrotis infusa) at Mount Buller</i> (Mitrovski 2009) to implement a Bogong Moth abundance monitoring program.	ARMB
II. Develop techniques to analyse Bogong Moth abundance and other relevant data with a view to assessing whether this is a limiting factor for the Mountain Pygmy-possum on Mount Buller.	ARMB with support from GBCMA/Taungurung Land and Water Council (TLWC)
III. Analyse Bogong Moth abundance data for seasonal trends.	ARMB with support from GBCMA/TLWC
6.3.3 Natural predators & competitors	
I. Where resources allow, assess the potential impact of native predators on Mountain Pygmy-possums. The aim of such investigations should be to ascertain whether effects of natural predators are having impacts that might significantly hamper recovery of the species.	DELWP & ARMB
II. Where resources allow, assess competition for key resources by other native species. Investigations should be aimed at identifying whether competition for key resource requirements between such species and Mountain Pygmy-possums are having impacts that might significantly hamper recovery of the species.	DELWP & ARMB
6.3.4 Feral predator control	
I. Enhance existing predator monitoring and control techniques defined in the Integrated Pest Animal Control Program (2005). Continue to implement and review new technologies, bait types and effective and selective delivery systems that minimize hazards to non-target species. Investigate genetic monitoring techniques to increase understanding of fox populations.	ARMB
II. Review methods and success of new techniques to control foxes, cats and wild dogs. New bait types, delivery systems and methods to avoid non-target species should be explored and implemented where applicable.	ARMB
III. Increase use of remote cameras for monitoring activities of predatory mammals	ARMB
6.4 Respond to climate change and develop alternate strategies to long term survival	
6.4.1 Climate change	
I. Ensure good emergency management and fire plans are in place	BSL & ARMB
II. Continue revegetation actions as per Appendix 2 to ensure availability of food resources to mitigate indirect impacts from climate change (eg reduced numbers of Bogong Moths).	BSL & ARMB

ACTION	RESPONSIBILITY
III. Ensure MEMP and IFMP are regularly reviewed and updated in accordance with EM Act. Incorporate adequate planning and recovery activities for Mountain Pygmy-possum habitat and other environmental assets.	ARMB
IV. Planning for any increased snow making facilities will need to take full account of potential impacts on the Mountain Pygmy-possum and its habitat; new facilities in Type I or Type II habitat or buffers will generally not be supported and if agreed under exceptional circumstances will need EPBC Act referral by the proponent.	BSL
V. Ensure water storage dams are kept full for firefighting and protection of Mountain Pygmy-possum habitat if at risk of harm from fire.	BSL
VI. Monitor and compare variances in weather data collected from weather stations at Mount Stirling and Mount Buller.	ARMB
6.5 Increase awareness and support for conservation of Mountain Pygmy-possum	
6.5.1 Education and environmental awareness of mountain staff	
I. Continue to include environmental issues in staff induction.	ARMB & BSL
II. Continue to send key staff to the Alpine Ecology or Alpine Rehabilitation Courses.	ARMB & BSL
III. Continue to involve BSL and ARMB staff in annual Mountain Pygmy-possum monitoring activities.	ARMB & BSL
6.5.2 Education and environmental awareness of visitors	
I. To create a supportive visitor community by ensuring visitors are aware of the significance of the Mountain Pygmy-possum on Mount Buller and are informed about the recovery actions that may affect them	ARMB & BSL
II. Maintain existing interpretive displays in the village and ski school and update when appropriate	ARMB
III. Provide regular Mountain Pygmy-possum recovery updates on Mount Buller web page, newsletters and interpretive videos	ARMB & BSL
IV. Establish a public interpretation facility in Village Square Plaza or other prominent location that is easily located and viewed	ARMB & BSL
V. Provide updates to Chamber and Ratepayers, undertake letter box drops to Buller PO boxes with newsletters including updates on Mountain Pygmy-possum related activities, distribution of flyers to lodges, inclusion of information in show bags for the annual Lodge Managers night, and make fact sheets and flora and fauna guides available at Reception.	ARMB & BSL

8.0 ADMINISTRATION OF THE RECOVERY PLAN AND REVIEW PROCESS

The Mount Buller Pygmy-possum Recovery Team is to continue to set annual goals, incorporate new knowledge into adaptive management and report progress to relevant stakeholders annually. Updates on the implementation of this Recovery Plan will be provided to the Recovery Team annually

8.1 Knowledge management and base data

There is considerable knowledge about the Mountain Pygmy-possum on Mount Buller and about on-ground management issues. While much of this is documented, much is not and could be lost with changes in personnel which may occur over time. It is important that this knowledge is captured and stored at one secure repository on Mount Buller and, for security, at an additional location off the mountain to capture, curate and make available key knowledge about the Mountain Pygmy-possum and about on-ground management.

ACTIONS

- I. Establish and maintain a library of material and references on the Mountain Pygmy-possum at the ARMB offices and at another location off the mountain. [ARMB]
- II. All existing works undertaken for Mountain Pygmy-possum management (e.g. tunnels, revegetation) will also be accurately mapped and this will be continuously updated as new works are completed. [ARMB & BSL]

8.2 Mountain Pygmy-possum Recovery Team

A Taskforce group was established in 2005 to oversee the implementation of the first Recovery Plan for the Mountain Pygmy-possum on Mount Buller. Following the successful implementation of the first and second plans and with most actions becoming business as usual (and of an ongoing nature) in Resort operations for both the RMB and BSL, a specific Taskforce to drive and check implementation is considered no longer necessary. Ongoing Recovery Plan updates and implementation reports are now provided directly to and via the Recovery Team meeting convened by DELWP annually and the Taskforce has now been replaced with a Recovery Team. The Recovery Team involves representatives from the ARMB and DELWP who meet at least two to three times a year to discuss progress and projects. Other specialist invitees attend as required. This collaborative group has been instrumental in ensuring actions are completed on time and to budget.

ACTIONS

- I. Updates to this Plan and the implementation of actions contained within it will be provided by the ARMB to the Recovery Team at their annual meeting. The ARMB will chair the Recovery Team. [ARMB]

Table 5 Summary of administrative actions for 2020 to 2024 at Mount Buller

8.0 Review Process - Administration of Recovery Plan	
8.1. Knowledge management and base data	
I. Establish and maintain a library of material and references on the Mountain Pygmy-possum at the ARMB offices and at another location off the mountain.	ARMB
II. All existing works undertaken for Mountain Pygmy-possum management (e.g. tunnels, revegetation) will also be accurately mapped and this will be continuously updated as new works are done.	ARMB & BSL
8.2 Mountain Pygmy-possum Recovery Team	
I. Updates to this Plan and the implementation of actions contained within it will be provided by the ARMB to the Recovery Team at their annual meeting. The ARMB will chair the Recovery Team.	ARMB

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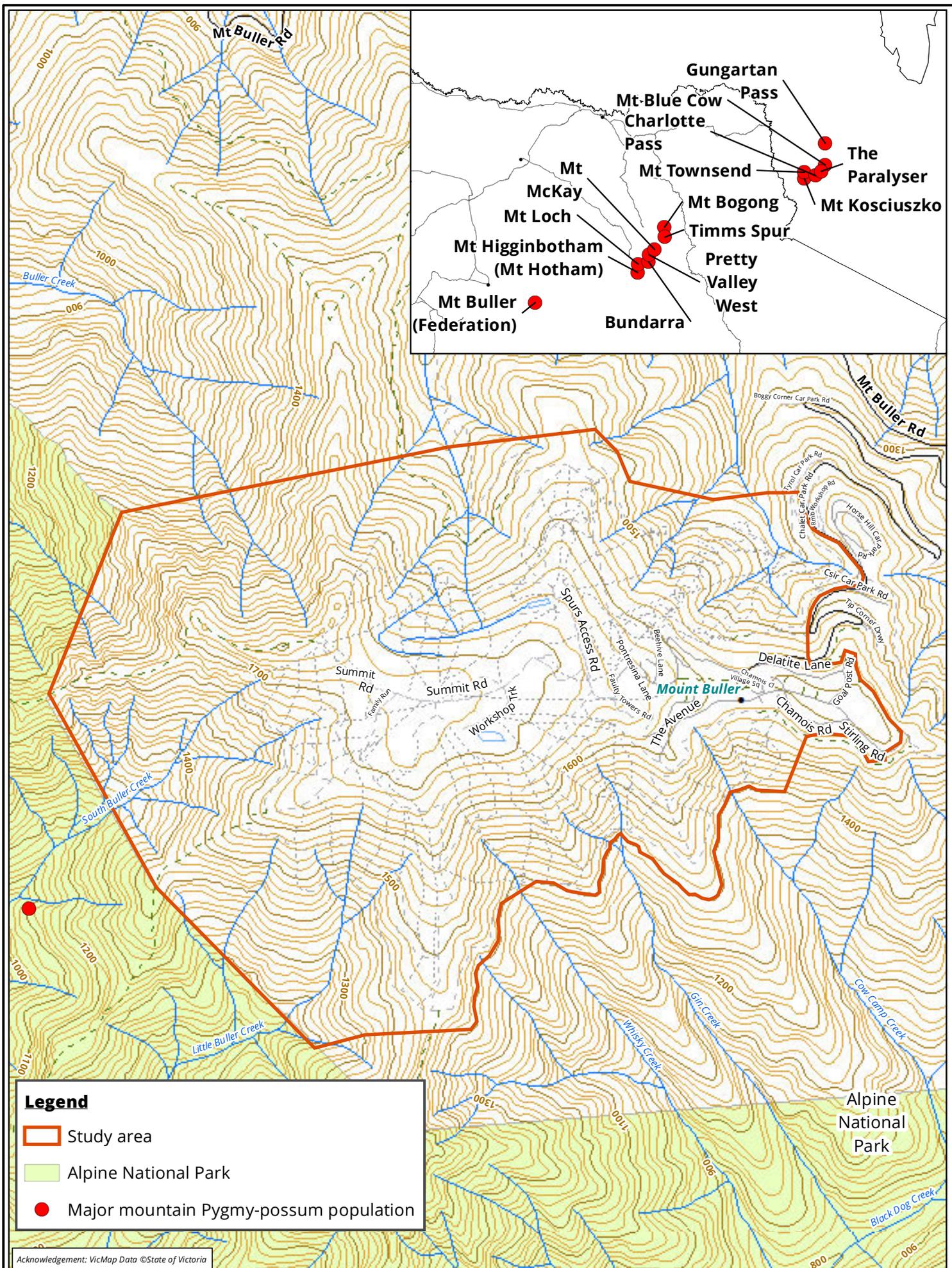
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Appendix 1: Figures and Tables



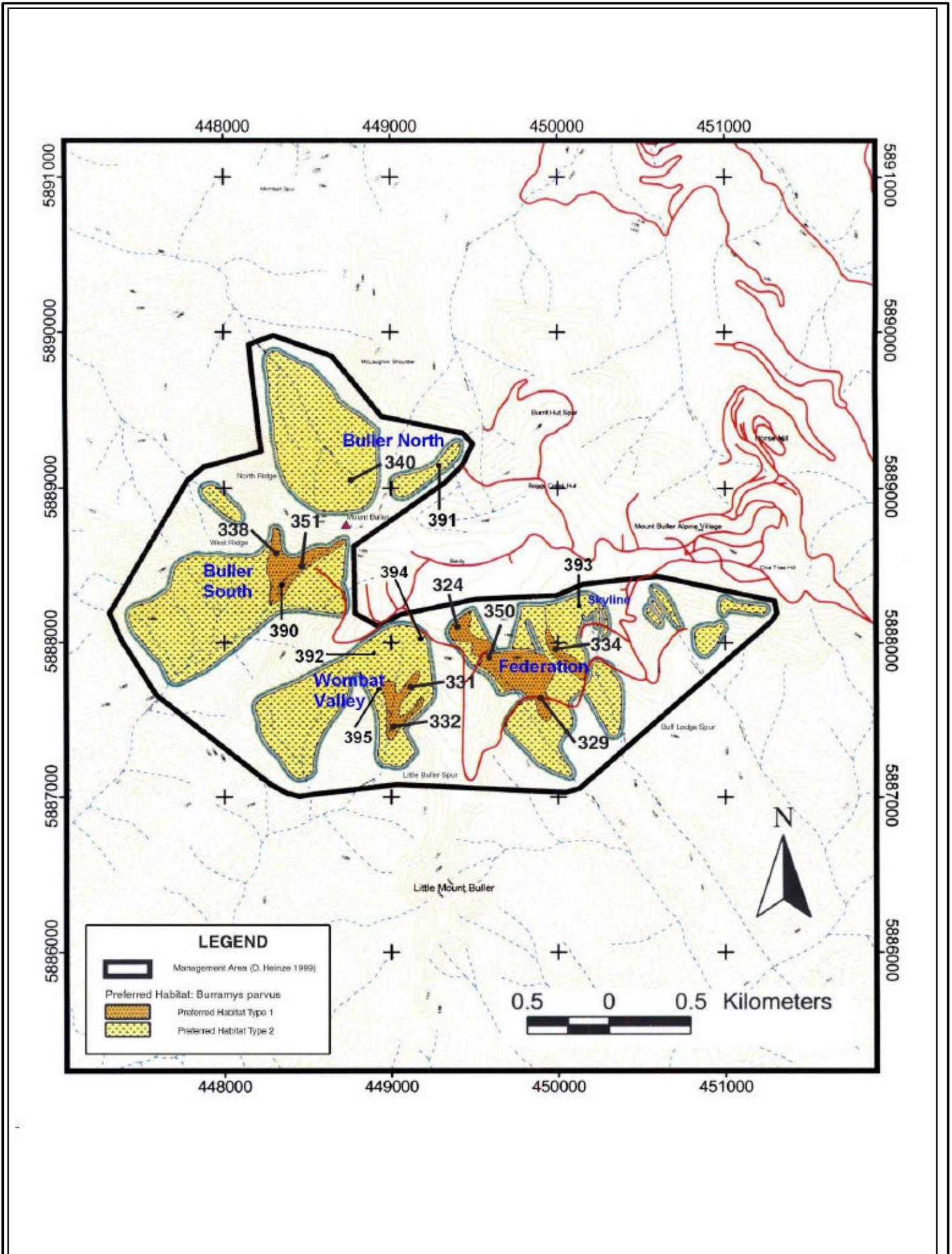
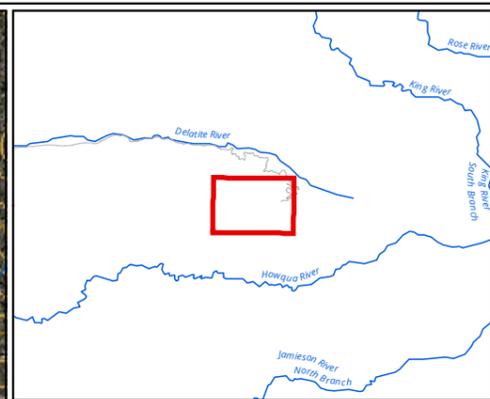
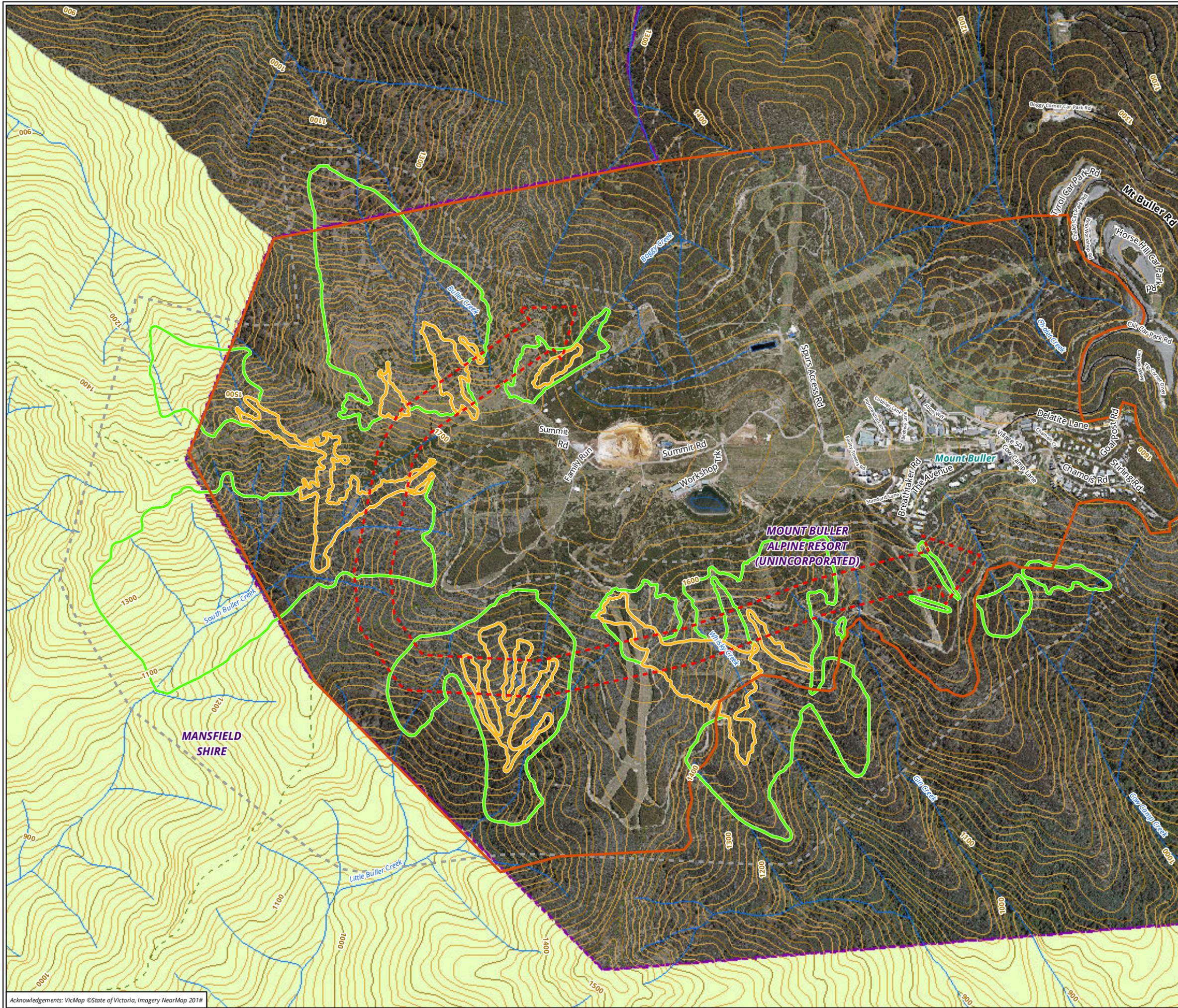


Figure 2: Trap sites and preferred habitat of the Mountain Pygmy-possum at Mount Buller, including the Wombat Valley.



- Legend**
- Study area
 - Key dispersal areas
 - Revised management area
 - Alpine National Park
- Preferred habitat**
- Type I
 - Type II

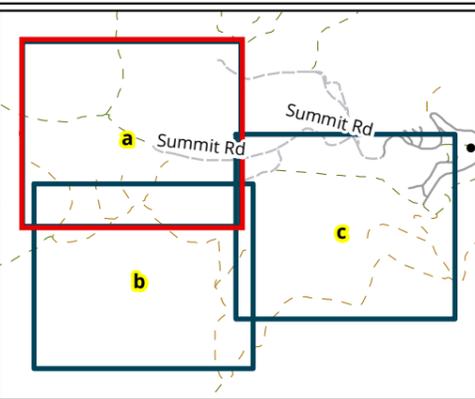
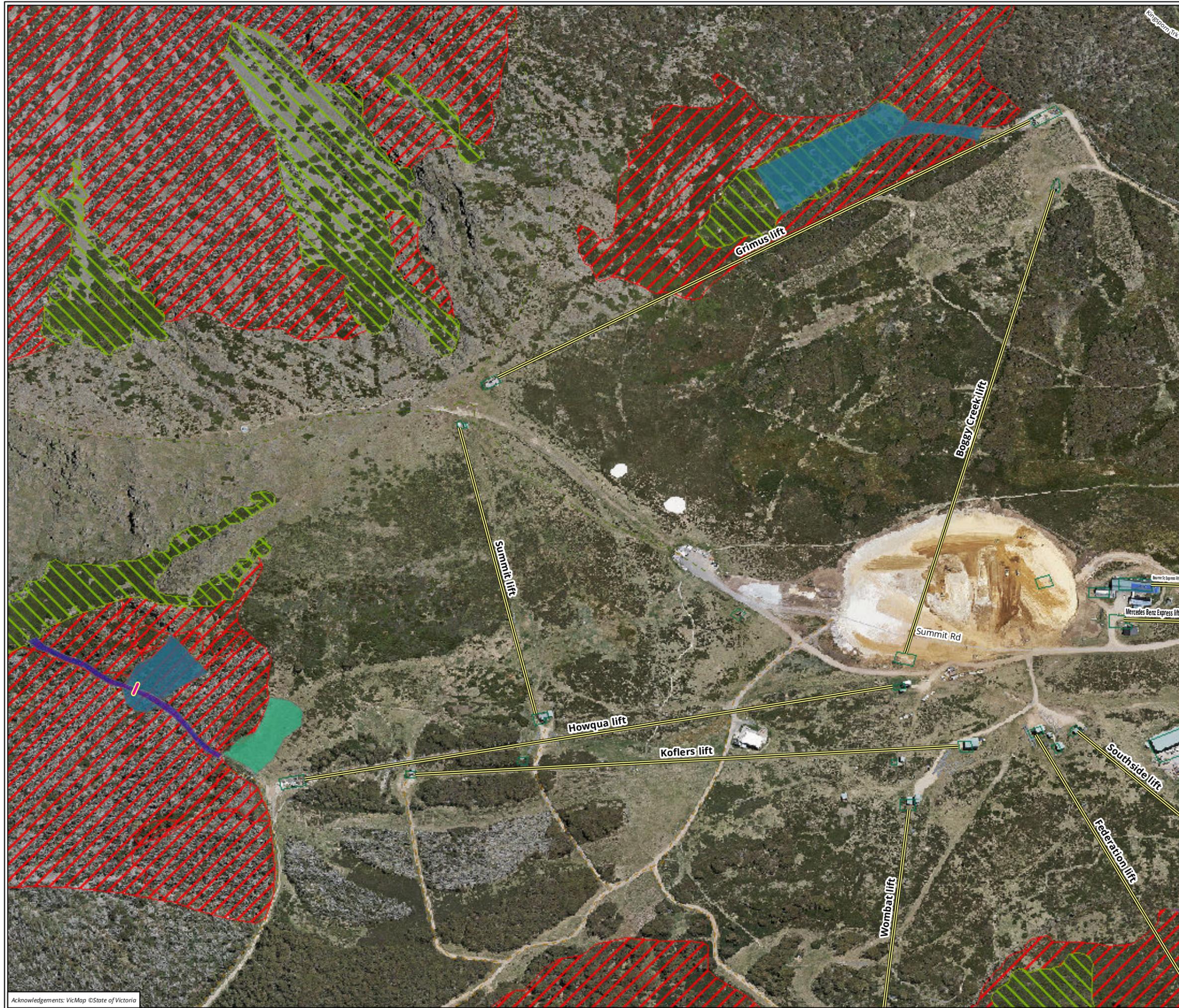
Figure 3 Distribution of Type I and Type II Mountain Pygmy-possum habitat, Mung Buller (from Heinze and Harvey March 2020)



Scale: 1:13,629 @ A3
 Coordinate System: GDA 1994 MGA Zone 55

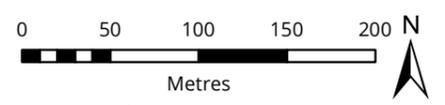


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 Checked by: GZ, Drawn by: JSP, Last edited by: jprasad
 Location: \\bio-data-



- Legend**
- Ski Lifts
 - Proposed additional habitat links**
 - Sub-surface, Medium priority
 - Created Boulder Fields
 - Future vegetation management**
 - Medium priority
 - Vegetation restoration areas**
(Condition and priority for follow-up)
 - Follow-up works: infill plant/ manage slashing, High
 - Follow-up works: infill plant/ manage slashing, Medium
 - Follow-up works required: replant, Medium
 - Follow-up works required: replant, Low
 - Future revegetation area, Low
 - Successful revegetation/ natural regeneration, Low
 - No immediate follow-up works required, Low
 - Habitat - Type 1
 - Habitat - Type 2

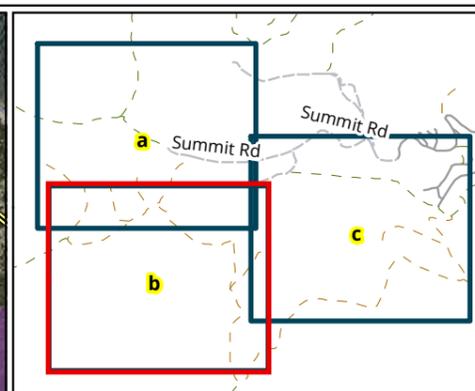
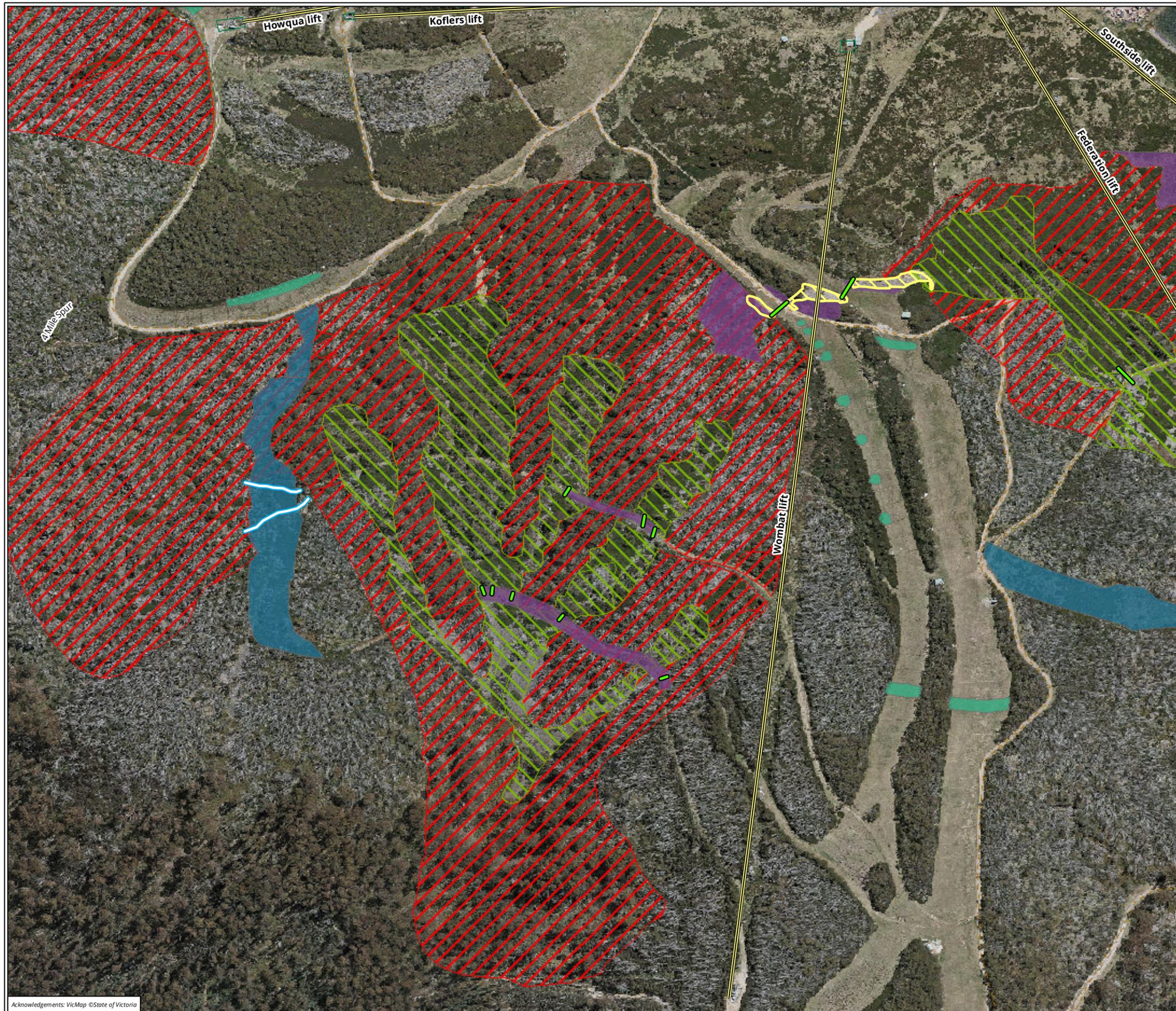
Figure 4: (map a) - Mount Buller Mountain Pygmy-possum habitat re-creation and restoration works (mapped in October 2013)



Scale: 1:4,000 @ A3
Coordinate System: GCS GDA 1994

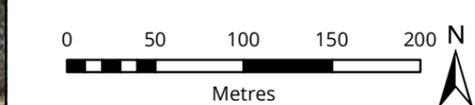


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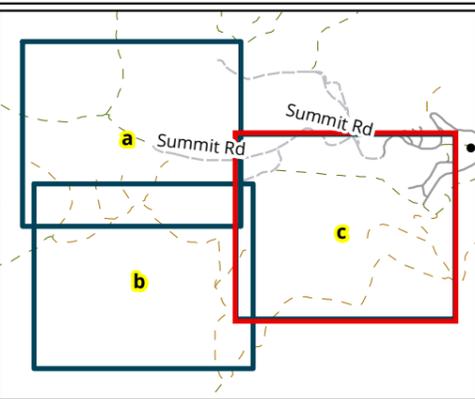
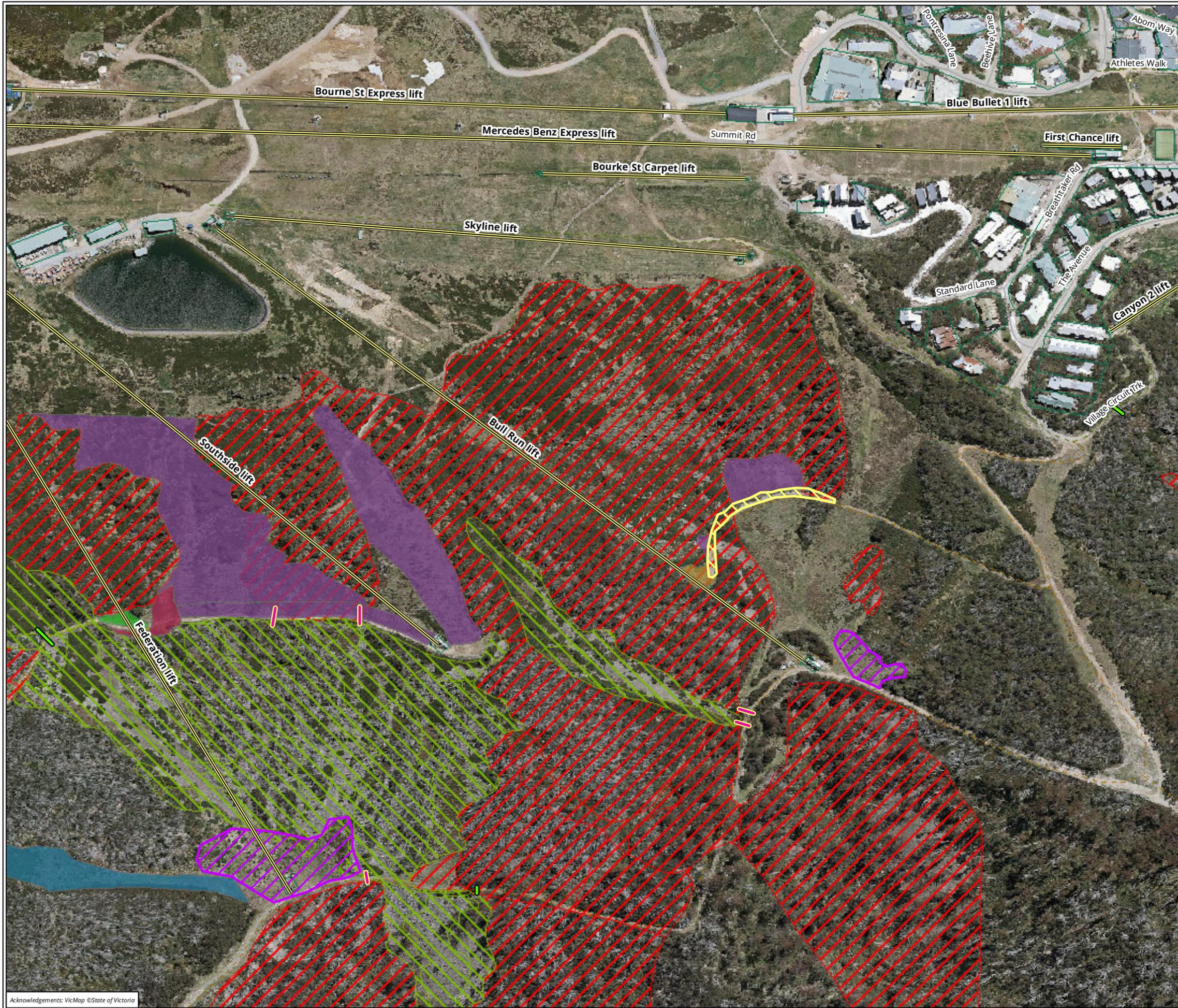


- Legend**
- Ski Lifts
 - Proposed additional habitat links**
 - Sub-surface, Medium priority
 - Created Boulder Fields
 - Future vegetation management**
 - Medium priority
 - Vegetation restoration areas**
(Condition and priority for follow-up)
 - Follow-up works: infill plant/ manage slashing, High
 - Follow-up works: infill plant/ manage slashing, Medium
 - Follow-up works required: replant, Medium
 - Follow-up works required: replant, Low
 - Future revegetation area, Low
 - Successful revegetation/ natural regeneration, Low
 - No immediate follow-up works required, Low
 - Habitat - Type 1
 - Habitat - Type 2

Figure 4: (map b) - Mount Buller Mountain Pygmy-possum habitat re-creation and restoration works (mapped in October 2013)

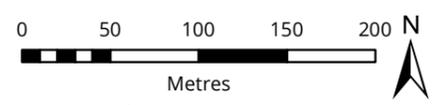


Scale: 1:4,000 @ A3
 Coordinate System: GCS GDA 1994



- Legend**
- Ski Lifts
 - Proposed additional habitat links**
 - Sub-surface, Medium priority
 - Created Boulder Fields
 - Future vegetation management**
 - Medium priority
 - Vegetation restoration areas**
(Condition and priority for follow-up)
 - Follow-up works: infill plant/ manage slashing, High
 - Follow-up works: infill plant/ manage slashing, Medium
 - Follow-up works required: replant, Medium
 - Follow-up works required: replant, Low
 - Future revegetation area, Low
 - Successful revegetation/ natural regeneration, Low
 - No immediate follow-up works required, Low
 - Habitat - Type 1
 - Habitat - Type 2

Figure 4: (map c) - Mount Buller Mountain Pygmy-possum habitat re-creation and restoration works (mapped in October 2013)



Scale: 1:4,000 @ A3
Coordinate System: GCS GDA 1994



Matter: 16654,
Date: 12 March 2020,
Checked by: MJAL, Drawn by: PMA, Last edited by: jprasad
Location: \\bio-data-

Table 6 Trapping results from the Mount Buller Mountain Pygmy-possum annual spring monitoring program, 2005-2019

AREA	SITE	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Buller North - Grimus	391	1:0	1:0	1:0	1:0	0:0	0:0	0:0	0:1	0:0	0:0	0:0	0:0	1:0	0:0	3:0
Buller South – Fanny’s Finish	351	2:0	2:0	3:0	0:0	0:0	0:1	0:0	0:0	0:1	0:1	0:0	0:0	1:0	6:0	5:0
Wombat Valley	331	0:0	0:0	1:0	0:0	2:0	1:0	1:1	1:0	1:1	1:1	1:0	0:0	2:0	0:0	0:0
	332	0:0	1:0	1:0	1:0	3:1	1:0	2:1	1:1	1:3	2:1	3:2	2:0	3:1	3:0	6:5
Federation	324	0:0	1:0	0:0	0:0	0:1	1:0	1:1	1:0	2:3	4:1	9:0	13:6	17:3	16:3	33:10
	329	0:0	1:0	0:0	0:1	0:2	1:3	5:5	2:7	3:4	2:2	3:8	1:0	3:5	5:3	5:8
	334	0:0	2:1	1:0	2:1	2:1	0:5	2:5	2:2	1:3	1:1	4:4	2:1	3:2	6:2	6:7
	350	3:0	5:0	4:0	1:2	6:4	9:10	18:9	18:8	31:9	43:14	70:7	76:9	67:8	54:14	86:24
Additional	A350	-	-	-	-	-	2:0	5:1	5:3	16:3	18:3	23:1	28:3	19:3	32:5	26:8
	B350	-	-	-	-	-	-	-	-	-	12:2	16:5	9:0	11:1	13:6	11:3
	A329	-	-	-	-	-	-	-	-	-	4:3	11:3	9:2	5:3	4:0	8:7
TOTAL		6:0	12:1	11:0	6:4	12:7	15:15	30:18	29:18	48:21	78:24	114:24	111:17	114:21	109:26	124:42
Total number of Burramys females and males trapped*		6 F	12 F 1 M	11 F	6 F 4 M	12 F 7 M	15 F 15 M	30 F 18 M	29 F 18 M	48 F 21 M	78 F 24 M	114 F 24 M	111 F 17 M	114 F 21 M	109 F 26 M	124 F 42 M

*individuals were trapped at multiple sites and this was taken into account when calculating total numbers for each year

Table 7 Percentage PYLL detected in key MPP populations since 2016 (DELWP 2019b)

POPULATION	2016/17	2017/18	2018/19
Mount Higginbotham	-	13% (29.11.2017)	19% (4/12/2018)
Mount Little Higginbotham	-	11% (26/11/2017)	63% (4/12/2018)
Mount Loch East	-	12% (5/12/2017) 75% (17/12/2017)	60% (6/12/2018) 95% (31/12/2018)
Mount Loch North	-	-	4% (1/12/2018) 50% (31/12/2018)
Mount Buller	-	-	18% (16/11/2018) 54% (18/12/2018)
Timms Spur	50 % (12/12/2016)	33% (15/12/2017)	8% (15/12/2018) 60% (2/1/2019)

Appendix 2: Revegetation Plan

Background

Biosis has previously prepared a Revegetation and Habitat Restoration Plan for the Mountain Pygmy-possum at Mount Buller (Biosis 2007). Goulburn Broken Catchment Management Authority has been allocated funding for National Landscape Projects with the objective of providing habitat outcomes for threatened species. Some funding has been made available to the ARMB for use in rehabilitation and restoration of habitat for the Mountain Pygmy-possum at Mount Buller. This Appendix section summarises the site preparation, species selection and planting densities for revegetation and habitat rehabilitation works to occur at Mount Buller commencing in 2020.

Objectives

The two main objectives for revegetation and habitat rehabilitation works at Mount Buller include:

- Extend and enhance habitat in areas where natural vegetation has been completely lost; and
- Rehabilitation of habitat in areas where natural vegetation has been modified/degraded.

Actions

Actions which must be completed for restoration and rehabilitation works include:

- Identification of priority areas of revegetation;
- Site preparation requirements;
- Follow-up maintenance and monitoring;
- Selection of appropriate species for planting; and
- An approximate calculation of resourcing needs at each revegetation area.

Priority Areas of Rehabilitation

Revegetation and rehabilitation works are to be implemented on the southern slopes of the Mount Buller Alpine Resort Ski Field. The southern slopes contain a large component of the best ski terrain within the Resort and this coincides with large areas of suitable habitat for the Mountain Pygmy-possum, especially within the Federation and Wombat Bowls.

A number of areas have been identified as high priorities for revegetation and habitat restoration works, as shown in Figure 4. These include, in order of priority:

- Top of Federation/Men's Downhill
- Family Run Batter and Little Buller and Wombat tunnel exit
- Fanny's access road and Fast One
- Funnel.

Site preparation and planting

To ensure planted tube stock has the best chance of survival, the following measures should be undertaken:

- Weed control prior to planting.
- Addition of a nutritional planting additive to aid initial establishment and promote growth of newly planted seedlings.
- Watering-in of tube stock on the same day they are planted.
- Cover all bare ground with an organic material. Wherever possible, local *Poa* straw is recommended. ‘Soil saver’ and/or individual weed mats could be used on steeper slopes.
- Installation of signage to indicate where revegetation works have occurred and no-go zones.

Follow-up maintenance and monitoring

The following measures should be undertaken in the weeks and months following planting:

- Follow-up watering if conditions are dry.
- Weed control post-planting.
- Monitoring of herbivorous grazing pressure. Where this is thought to threaten seedling survival, use of temporary guards may be implemented.

Species selection

Species selection for revegetation and habitat rehabilitation works will focus on use of known Mountain Pygmy-possum food plants. An additional requirement, particularly for plants to be used in previously cleared areas, will be use of species which will help to impede access of predators. Shrubby and heathy species including Mountain Plum Pine *Podocarpus lawrencei*, *Podopobium alpestre*, will be most effective at reducing predator access into areas of Mountain Pygmy-possum habitat. In some areas, species selection must also take into consideration operation of the ski field. Species complimentary to safe ski field management will predominantly focus on low-growing non-woody species such as Mother Shield-fern *Polystichum proliferum*.

It is recommended that all species be grown from seed or cuttings indigenous to the area and thus collected in the vicinity of revegetation and rehabilitation sites and preferably on the southern side of the Resort. A list of suitable species is provided in Table 8.

Table 8: Recommended species for Mountain Pygmy-possum habitat revegetation and rehabilitation works

SPECIES	COMMON NAME
Shrubs	
<i>Baeckea gunniana</i>	Alpine Baeckea
<i>Hovea montana</i>	Alpine Rusty-pods
<i>Grevillea australis</i>	Alpine Grevillea
<i>Grevillea victoriae</i>	Royal Grevillea

SPECIES	COMMON NAME
<i>Leucopogon</i> spp.	Beard Heath
<i>Olearia phlogopappa</i> subsp. <i>flavescens</i>	Dusty Daisy-bush
<i>Orites lancifolia</i>	Alpine Orites
<i>Ozothamnus cupressoides</i>	Kerosene Bush
<i>Pimelea ligustrina</i> subsp. <i>ciliata</i>	Tall Rice-flower
<i>Podocarpus lawrencei</i>	Mountain Plum-pine
<i>Podolobium alpestre</i>	Alpine Podolobium
<i>Prostanthera cuneata</i>	Alpine Mint-bush
<i>Rubus parvifolius</i>	Small-leaf Bramble
<i>Tasmannia xerophila</i> subsp. <i>xerophila</i>	Alpine Pepper
Herbs	
<i>Derwentia derwentiana</i> subsp. <i>maideniana</i>	Derwent Speedwell
<i>Coronidium montanum</i> & <i>C. scorpioides</i>	Everlasting
<i>Microseris lanceolata</i>	Alpine Yam-daisy
<i>Senecio gunnii</i>	Mountain Fireweed
<i>Stellaria pungens</i>	Prickly Starwort
Graminoids	
<i>Carex appressa</i>	Tall Sedge
Grasses	
<i>Poa fawcettiae</i>	Horny Snow-grass S
<i>Poa hothamensis</i> var. <i>hothamensis</i>	Ledge Grass
<i>Poa hiemata</i>	Soft Snow-grass

Approximate numbers of species to be planted in each priority rehabilitation area are outlined below in Table 9.

Table 9: Approximate numbers of plants to be plants in each priority revegetation and rehabilitation area

SITE	PLANT	NUMBERS
Funnel	Shrubs	1000
	Herbs	750
	Grasses	750
Top of Federation/Men's Downhill	Shrubs	1500
	Herbs	500
	Grasses	500
Family Run Batter/Little Buller and Wombat Tunnel exit	Shrubs	1000
	Herbs	750
	Grasses	750
Fanny's access road/Fast One	Shrubs	1500
	Herbs	500
	Grasses	500