

Proposed Year 1-5 Mt Cass Conservation Area Management Plan

Draft 2.3 (31 October 2008)

1. Introduction

As part of the biodiversity offset for the establishment of a wind farm at Mt Cass, MainPower Ltd. has committed to undertaking a comprehensive programme of conservation, protection and restoration that within 30 years will result in a substantial increase in the overall biodiversity values of the Mt Cass Conservation Area (Figure 1). In particular, the management actions outlined in this plan will result in the protection and enhancement of *ca.* 120 ha¹ of limestone forest, shrubland and escarpment/boulderfield, vegetation types that are regarded as regionally rare and underrepresented within the current protected area network in Canterbury. This plan describes the vision and outcomes proposed for the management of this site, and the methods that will be used to achieve them.

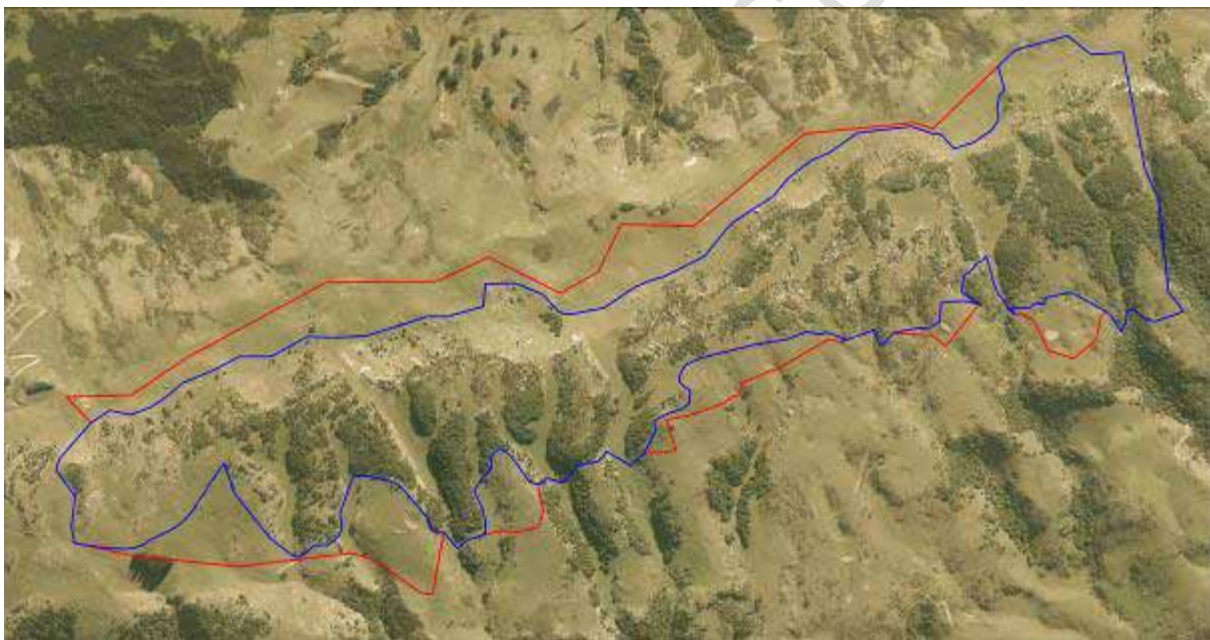


Figure 1. Mt Cass Conservation Area (blue line) and MainPower Ltd. Mt Cass property (red line).

Management of the Mt Cass Conservation Area will involve several components including control of domestic stock and feral animals, active restoration of native plants, natural regeneration resulting from stock removal and animal pest control, and monitoring of the outcomes of this management programme. This plan outlines the general approach that will be taken to implementing this management.

¹ Subject to survey

This plan is the guiding document for management of the site. It provides the overview of the approach that will be taken, but is not prescriptive as it is not always possible to predict in advance changing circumstances that might occur as management proceeds; annual work plans will provide the detail on the specific actions that will be taken to implement this plan. This management plan will be implemented on a five-yearly cycle and will be reviewed every five years to ensure that the outcomes envisaged are being achieved. The present Management Plan therefore deals with the first five years of the project, with longer-term outcomes extending beyond the bounds of this plan.

Ensuring the implementation of this management plan and in particular determining the detail of the annual work plans that will result from it is essential to the success of this project and will be the responsibility of the Mt Cass Advisory Group (Section 11). This group, which will have representatives from Hurunui District Council and various stakeholders (e.g., Department of Conservation, Environment Canterbury, Royal Forest and Bird Protection Society, IWI) will be charged with endorsing and recommending the annual work plan to Hurunui District Council for approval. The annual work plans will provide the detail on how the Mt Cass Conservation Area will be managed on a day-to-day basis.

This Mt Cass Conservation Area Management Plan is structured as follows:

- Introduces the project and the context within which this plan was written including the resource consent conditions that are relevant to the projects development. A brief description of the Mt Cass Conservation Area, including an overview of the physical and ecological aspects of the site, is also included.
- Outlines the vision and goals for the Mt Cass Conservation Area.
- Outlines both the opportunities and constraints presented by the Mt Cass site that will affect the ability to achieve the visions and goals, and discusses the management responses to these constraints.
- Outlines the management units proposed for the Mt Cass Conservation Area.
- Sets out the management methods for the Mt Cass Conservation Area, including plant and animal pest control, restoration planting, and threatened species management.
- Sets out the monitoring that will be undertaken to ensure that the project is achieving the desired goals.
- Describes the manner in which this Management Plan will be implemented.

2. Management Plan Context

Legal requirements for restoration

The legal requirement for the Mt Cass Conservation Area is outlined in the resource consent associated with the Mt Cass wind farm. Specifically the resource consent requires:

NEED TO INSERT DETAILS HERE FROM RESOURCE CONSENT CONDITIONS.

Ecological context

The Mt Cass ridge, which rises to 557 m, is notable for its limestone geomorphology. The limestone pavement and escarpment topography present today has formed from limestone rocks laid down during the Oligocene (37-24 mya) and subsequently uplifted, tilted, and exposed from the late Pleistocene (*ca.* 250,000 before present) onwards. While two limestone types are present, Weka Pass and Amuri, it is the weathering of the Weka Pass Limestone that

has produced the eroded limestone landforms (e.g., grikes, clints) evident today along the broad undulating ridgeline.

While there is no climate data from the site, data from adjacent sites provides some indication of conditions at Mt Cass. Annual rainfall at Kate Valley to the southeast is 921 mm (1986-2000 average) while at Waipara to the west it is 613 mm (1991-2005 average), although rainfall along the Mt Cass ridge line is likely to be higher because of its elevated location and occurrence of cloudy conditions. However, as with the rest of Canterbury, there is considerable variation both within years and especially between years. The Mt Cass ridge line is exposed to strong and persistent winds, especially from the northwest. The area typically experiences warm dry summers and cool wet winters. Mean annual temperature is likely to be about 9.5 °C along the ridge line, with a mean January maximum of 19.4 °C and a mean July minimum of 1.3 °C (Norton 1985). Snow occasionally lies on the ridge line in winter, and frost can occur in sheltered valleys.

In pre-human times the ridgeline, excluding the escarpment itself and other areas of outcropping limestone, would have most likely comprised mixed conifer-broadleaved forest similar in composition to present forest remnants (Molloy 1994), while shrubland would have occurred on the most exposed sites or sites with very thin soils. Fossil charcoals from adjacent lowland areas, believed to have dated from early Maori or natural fires, support the presence of this forest type (Moar 1971). More recently, fire and subsequent grazing and associated management has converted much of the native woody communities to pasture, although there has been some shrubland expansion since the 1950s, primarily on areas of limestone pavement (Golder Associates 2008), possibly reflecting changes in grazing patterns.

The vegetation of the Mt Cass ridgeline comprises a complex mosaic of variously-sized and moderately interconnected mixed broadleaved-podocarp forest remnants, regenerating divaricating (grey) shrubland communities, and mixed pasture grasslands. The unusual geomorphology, micro-environment variability, biogeography, and local environmental conditions of the ridgeline have also resulted in a relatively unique floristic assemblage. The flora comprises both wide-ranging indigenous species, as well as some species restricted to limestone and other base rich substrates (so-called basicoles *sensu* Molloy 1994). Nine of the species present on the Mt Cass ridgeline are ranked as national threatened or uncommon (*Aciphylla subflabellata*, *Australopyrum calcis* subsp. *optatum*, *Carmichaelia kirkii*, *Heliohebe raoulii* subsp. *maccaskillii*, *Pseudopanax ferox*, *Raoulia monroi*, *Senecio glaucophyllus* subsp. *basinudus*, *Tupeia antarctica* and *Vittadinia australis*; de Lange et al. 2004), of which two (*Heliohebe raoulii* subsp. *maccaskillii* and *Australopyrum calcis* subsp. *optatum*) are Canterbury endemics.

The mosaic of vegetation types along the Mt Cass ridge provides diverse habitat for native fauna, with data available for birds, reptiles and invertebrates (Golder Associates 2008). Fifteen bird species (10 native, five naturalised/migrant) have been recorded along the Mt Cass ridgeline including two species listed as Nationally Threatened (New Zealand falcon, *Falco novaeseelandiae* “eastern”, and Kereru, *Hemiphaga novaeseelandiae*). Two reptile species (Canterbury gecko, *Hoplodactylus* aff. *maculatus* ‘Canterbury’, and common skink, *Oligosoma nigriplantare polychroma*) have also been recorded and other reptile species may be present. A number of common invertebrate species have also been recorded from the site.

3. Vision and Goals

Introduction

Successful conservation management is dependent on having clearly defined goals. Such goals are important as they enable the success of a project to be quantified and enable the project manager to critically evaluate the effectiveness of the methods that are being used. It is useful to set goals within a broader vision of what the site might be like at some stage in the future. However, it is not possible to use such a vision to assess the success of management because of the long time-frames involved and because of the uncertainties over future conditions (e.g., as a result of climate change). For the Mt Cass Conservation Area, an overall vision of what the site might be like in 300-years time has been developed to guide the project, with specific 5-year goals identified to assess management success against.

Vision

This vision sees the Mt Cass Conservation Area in 300 years time restored to a diverse mixture of vegetation types appropriate to their location (dense podocarp forest, mixed podocarp-broadleaved forest, broadleaved forests and shrublands, and open escarpment communities) that are resilient to external perturbations, and where currently threatened and uncommon plant and animal species are flourishing.

In order to achieve this vision, four outcomes have been identified that need to be achieved over the next 30 years:

1. Vigorous regeneration is occurring within the existing areas of forest and shrubland sufficient to ensure that these ecosystems will be resilient in the face of any future perturbation such as a wind storm.
2. Restoration plantings and seedings are facilitating the establishment of later successional species in sites that are currently pasture dominated.
3. Existing populations of threatened plant and animal species at the site are secure with appropriate recruitment occurring.
4. Appropriate access is available for recreation, education, scientific and traditional cultural use.

Five-year goals

In order to meet the vision and 30-year outcomes for the Mt Cass Conservation Area, a series of five-year management goals have been developed. These goals can be regarded as “stepping-stones” towards achieving the 30-year outcomes. Each five-year management goal has a performance indicator that can be used to measure the success of conservation management in achieving the goal. Five-years has been chosen as the time-period for these goals because it is short enough to be realistically achievable, but long-enough to see real progress made towards the longer-term outcomes.

At the end of the first five-year term of this management plan, the success of the project in meeting these outcomes needs to be carefully assessed. In developing the management plan for the subsequent five-years, the reasons why these outcomes might not have been achieved needs to be evaluated and measures put in place to address these.

Goal 1: The long-term protection of the Mt Cass Conservation Area has been secured through an appropriate covenant.

Explanation: While MainPower Ltd. are fully committed to the conservation management of the Mt Cass Conservation Area, it is not possible to predict future economic and social

environments. Covenants, such as through the QEII National Trust, can be registered against the title of a property in perpetuity and as such provide a much longer-term guarantee of the tenure and management focus of the site than either a Resource Consent or owner can.

Performance indicator: An appropriate covenant has been registered against the title of the property comprising the Mt Cass Conservation Area.

Goal 2: The ecological integrity of both the existing remnants of native woody vegetation and the restoration plantings has been secured.

Explanation: At present the area is heavily grazed by cattle and to a lesser extent by sheep which are having a significant adverse impact on ecosystem condition, especially through hindering regeneration of existing forest areas. Domestic stock would also have a significant adverse impact on restoration areas. However, not all domestic grazing is necessarily 'bad' as stock, especially sheep may also be reducing grass competition with some threatened and uncommon plant species (e.g., *Australopyrum calcis* subsp. *optatum*). Removal of cattle and controlled grazing of sheep is therefore a high management priority for this site.

Performance indicator: (a) Cattle have been removed from the entire Mt Cass Conservation Area, and if they do enter the area, they have been quickly and efficiently removed and the reasons for their ingress (e.g., damaged fence) has been remedied. (b) A "Research by Management" approach has been adopted to assess the interaction between sheep grazing, forest regeneration and the survival of *Australopyrum calcis* subsp. *optatum*.

Goal 3: High priority animal pests are controlled to levels that do not threaten native biodiversity values of the Mt Cass Conservation Area.

Explanation: Animal pests are the single biggest threat to the success of conservation management programmes in New Zealand. Herbivores can significantly affect the growth of restoration efforts and natural regeneration while predators have devastating impacts on native fauna.

Performance indicator: High priority animal pests identified in this management plan have been controlled to a level that is considered not to have an adverse effect on native biodiversity in the Mt Cass Conservation Area.

Goal 4: Plant pests are controlled to levels that do not threaten native biodiversity values of the Mt Cass Conservation Area.

Explanation: Plant pests threaten the viability of existing forest, shrubland and open communities, and restoration plantings, especially through competition. The Mt Cass site is currently largely free of plant pests apart from pasture species.

Performance indicator: Key plant pests identified in this plan are controlled to a level that does not threaten native biodiversity values of the Mt Cass Conservation Area.

Goal 5: Restoration of native plants covering an area of at least 6 ha are growing vigorously.

Explanation: The primary objective of restoration in the Mt Cass Conservation Area is to enhance connectivity between existing native forest and shrubland remnants and to enhance locally uncommon species. This goal sees the area restored amounting to at least 2 ha per year, with the 6 ha goal allowing for a 2-year lag for seed collection and plant propagation.

Performance indicator: The annual restored area (allowing for an initial lag for bringing plants into propagation) is 2 ha with planting survival >60%².

² The 60% value is based on the success of initial restoration planting at the adjacent Tiromoana Bush.

Goal 6: Successful restoration of *Australopyrum calcis* subsp. *optatum* has been undertaken to compensate for the plants destroyed through road construction.

Explanation: Wind farm construction will have an unavoidable residual impact on a small number of *Australopyrum calcis* subsp. *optatum* plants, a Nationally Vulnerable plant species. Current (2008) estimates suggest this may amount to *ca.* 20 plants within the Mt Cass Conservation Area (out of a total estimated population of 700 plants/clumps in the greater Mt Cass area).

Performance indicator: Material from all plants/clumps of *Australopyrum calcis* subsp. *optatum* that have been disturbed by wind farm construction have been propagated, and together with an equivalent number of plants established from seed germination, have been established into areas of suitable habitat and at least 60% of these plantings have survived.

Goal 7: Although not known from the Mt Cass Conservation Area, the potential of introducing the snail *Wainuia edwardi* has been evaluated, and if deemed suitable, an application for doing this has been lodged through appropriate channels.

Explanation: An outlying population of *Wainuia edwardi* occurs amongst boulders at the edge of an unfenced bush remnant surrounded by pasture and grazed by stock on Mt Cass Road to the west of the Mt Cass Conservation Area. The very small extent of this population (<1 ha) and the known vulnerability of these snails to rat predation, suggests that this small population is at best precarious. Although not recorded from the Mt Cass ridge, suitable habitat may well be present for this species and this site offers the potential to secure this southern outlier population.

Performance indicator: An evaluation of habitat suitability for *Wainuia edwardi* has been undertaken and if deemed suitable, an application for introducing the snail to the Mt Cass Conservation Area has been lodged.

Goal 8: A biodiversity monitoring programme has been established that enables the success of the management programme to be quantified.

Explanation: Monitoring is an integral part of conservation management as it allows the success of the methods used to be assessed, and modified as appropriate, and it provides a means to report on this success to the various groups with an interest in the project. Monitoring, however, needs to be carefully targeted to ensure that it can supply meaningful information that informs management without being an unreasonable cost.

Performance indicator: A monitoring programme has been established and all base-line monitoring completed and re-measurements undertaken as appropriate.

4. Opportunities and Constraints

Introduction

This section outlines both the opportunities that the Mt Cass site presents for conservation management, and the factors that are likely to limit the success in achieving the management goals, and ultimately the long-term vision for the site. A clear recognition of both the opportunities and constraints is essential to ensure that management is appropriately focused for the conditions that occur at this site.

Opportunities

The first set of opportunities for conservation management provided by Mt Cass relate to the physical environment.

- The location of Mt Cass on a high ridge close to the east coast ensures that it receives higher rainfall (due to moist SE-NE airflows) than adjacent sites in the Waipara Basin, while its relatively high elevation (300-500 m) ensures that evapotranspiration demands are not as great as at lower altitude sites.
- The relatively remote location of the site, especially from public roads, means that the probability of deliberate fire is low. Fire is a major threat to native vegetation in dry eastern areas of New Zealand.
- The presence of extensive remnants of native forest along the Mt Cass ridge line means that the probability of forest species colonising restoration sites is high.

The second set of opportunities relate to the socio-economic environment in which Mt Cass is located.

- The establishment of the wind farm provides the economic certainty (an ongoing income stream) for native biodiversity conservation at a site where this is unlikely to otherwise occur.
- Mt Cass's location close to Christchurch (approximately one hours drive) means that it is possible to implement an effective conservation management programme with the opportunity for input from individual experts from a range of institutions (universities, Crown Research Institutes, local and central government).
- The presence of the wind farm will enable easy access through the site, thus facilitating conservation management work in what would otherwise be a difficult site to access.
- The inclusion of conservation management within the resource consent for the Mt Cass wind farm provides a guarantee that the management work outlined in this plan will be implemented.
- The presence of wind farm infrastructure enables the development of public access, facilitating the public's appreciation of the site and the conservation management work being undertaken.

Constraints

Constraint 1: Climate is likely to limit natural regeneration and restoration through low soil moisture availability, frost and high wind speeds. Soil moisture deficits are common during summer in North Canterbury and in some years can lead to marked dieback in native vegetation. Restoration plantings and natural regeneration into grassland are particularly vulnerable to soil moisture deficits, especially during the initial stages of establishment. Soil moisture levels are strongly affected by the present vegetation. In particular, soils under grass swards are very dry because the dense grass root mat quickly takes up any water that reaches the ground. This constraint may well be exacerbated by an increased incidence of droughts as predicted by climate change models for eastern New Zealand. However, the higher altitude location of this site coupled with the common occurrence of a cloud cap with associated "fog drip" is likely to reduce the impacts of summer soil moisture deficits. Strong winds and winter frost may also limit the success of both restoration plantings and natural regeneration.

Response: While mortality of natural regeneration can occur during particularly dry summers, the increasing cover of both native shrubland across the Mt Cass Conservation Area since the 1950s aerial photo suggests that this is not a major limitation, at least under current conditions. The primary response to dealing with soil moisture deficits, strong winds and frost in the restoration plantings is to use plant species adapted to local conditions in plantings and direct seeding, including sourcing all plant material locally. However, future changes as a result of global climate change will need to be dealt with when they arise.

Constraint 2: Because adjacent land uses include pastoral farming and forestry, weed spraying in adjacent areas has the potential to damage natural regeneration and restoration plantings if drift occurs. A major population of the Nationally Endangered *Heliohebe raoulii* subsp. *maccaskillii* near Weka Pass, a species that is also present at Mt Cass, was inadvertently killed during a routine weed control operation.

Response: *Liaising with adjacent landowners and Environment Canterbury about the threat of spray-drift to existing forest and shrubland remnants and restoration areas.*

Constraint 3: Grazing by domestic stock (sheep and cattle) is presently a major limitation to natural regeneration, with most areas of remnant forest and shrubland having severely grazed understorey's. In addition, domestic stock can quickly destroy young restoration plantings if they gain access to these. However, some sheep grazing might be required to sustain the Nationally Vulnerable *Australopyrum calcis* subsp. *optatum* in order to reduce competition from exotic pasture grasses.

Response: *Cattle will be removed from the Mt Cass Conservation Area at the start of the project and fences will be regularly inspected to ensure that they do not gain entry in the future. Should domestic stock be found in the restoration area, they will be quickly removed. A controlled sheep grazing experiment will be established to assess their impact on both forest/shrubland regeneration and the viability of the Australopyrum calcis subsp. optatum population.*

Constraint 4: One of the major factors likely to limit conservation management in New Zealand ecosystems is browsing and predation by introduced animals, especially possums, ungulates (deer and goats), lagomorphs (rabbits and hares), mustelids (stoats, ferrets and weasels) and rodents (rats and mice). Browsing reduces viability and growth rates of plants, especially young ones, while the impact of predation on invertebrate, reptile and bird species influences restoration success as these species play key roles in ecosystem processes such as pollination, seed dispersal and nutrient cycling. The escarpment community while largely unaffected by domestic stock is particularly vulnerable to goats.

Response: *A sustained ongoing animal pest control programme will be undertaken within the Mt Cass Conservation Area.*

Constraint 5: Introduced plant species also have the potential to limit the success of conservation management. Invasive woody species already present, or present in adjacent areas (e.g., hawthorn, cherry plum, European broom, wilding conifers and old man's beard), have the potential to invade substantial areas of the Mt Cass Conservation Area.

Response: *Regular surveys and control operations will be undertaken for identified problem woody weeds with the aim of eradicating those species identified as a management priority.*

Constraint 6: Several studies have commented on the importance of using planting stock of local genetic origin in restoration projects because of concerns about local adaptation and maintenance of genetic integrity of existing plant populations. Planting of non-local material may result in loss of local adaptations (e.g., to particular environmental conditions) and eventually could lead to a loss of overall genetic variation within particular species. It is therefore prudent to use plant material of local origin as local plants will be better adapted to

local conditions than non-local plants (e.g., resistance to cold temperatures) and as a safeguard for maintaining genetic diversity.

Response: To ensure that plants are adapted to local environmental conditions and to minimise the loss of genetic variability only locally sourced planting material will be used for the restoration plantings (preferably from within the Mt Cass Conservation Area itself or, when not available, from elsewhere within the southern part of the Motunau Ecological District).

Constraint 7: The success of the Mt Cass Conservation Area project will not be realised for many years and there is therefore potential uncertainty over the long-term security of the site beyond the time-frame of this management plan.

Response: The Mt Cass Conservation Area will be covenanted (e.g., through the QEII National Trust) to ensure that the tenure of the site as a conservation area is secured in perpetuity, while a bond will be established to guarantee long-term funding of conservation management work.

Constraint 8: As a high profile site because of the presence of the wind farm, it is likely that the wider public will have a strong interest in the management of the Mt Cass Conservation Area. This interest can be positive through people supporting the management values outlined in this plan, but can also be a constraint when people desire different outcomes for the site.

Response: MainPower Ltd. will be proactive in how it lets the public know about the management work that is being undertaken on the property and in involving the local community in this management. In addition appropriate public access will be provided.

5. Management Units

THIS SECTION HAS NOT BEEN COMPLETED, BUT THE FOLLOWING TEXT PROVIDES AN INDICATION OF THE LIKELY COVERAGE.

Introduction

The Mt Cass Conservation Area, although dominated by the underlying limestone geology, includes a diverse range of habitat types ranging from dense podocarp forests to exposed limestone outcrops. This section provides both a division of the conservation area into management units (Figure 2) and the identification of management objectives for each unit. These management objectives outline the key approaches to the management of the unit and reflect both the existing underlying environmental conditions and the potential for future management interventions. The definition of management units is based on a combination of landforms and existing habitat types, plus management areas. This section briefly describes the features of each unit and outlines the types of management that will occur within them over the next five years. The management actions are expanded on in the following sections of this plan. Table 1 provides a summary of some of this information.

Management unit 1

Description: This unit comprises remnant areas of forest and shrubland that extend from just south of the ridge crest to the lowest parts of the Mt Cass Conservation Area. Most of this unit

has an existing canopy of native shrub and tree species, but the understory has been severely degraded by many years of grazing by domestic livestock, especially cattle

Goal: Re-establishing the understory vegetation.

Management actions: Removal of cattle grazing and limited access of sheep, plus control of wild herbivores and carnivores including possums, goats, rodents and mustelids as required.

Management unit 2
etc

Table 1. Summary of restoration actions by management unit

Management unit							
South facing forest and shrubland vegetation							
South facing pasture vegetation							
Wind farm construction areas							
Ridge crest woody vegetation							
Ridge crest pasture vegetation							
Exposed pavements							
Escarpment & associated boulderfields							
North-facing slopes below escarpment							

6. Land tenure

Introduction

Ensuring the long-term security of the Mt Cass Conservation Area is essential to the success of this project. Without a guarantee of long-term site security there is no assurance to stakeholders that the management actions proposed in this plan will contribute to regional conservation objectives; a change in site ownership could quickly lead to a reversal of the positive management actions implemented here. While tenure provides no guarantee that appropriate management will occur, ensuring that the Mt Cass Conservation Area does enjoy an appropriate protective tenure in perpetuity is an important component of its long-term management. This section briefly outlines the proposed future tenure of this site.

Covenant

It is proposed to establish an appropriate covenant (such as with the QEII National Trust) over all of the area described here as the Mt Cass Conservation Area (Figure 1) and currently owned by MainPower New Zealand Ltd. This management plan will form an annex to the covenant document, and the goals for the covenant will be the same as the goals outlined in this plan.

To ensure that the management actions described here are successful the area under the covenant will also be fenced from the remainder of the MainPower property. Fencing will involve upgrading existing fences and installation of new fencing where required. All fences will be established or maintained to a standard to ensure that stock, especially cattle, are not able to readily re-enter the area and all gates not required for management purposes will be removed to prevent accidental entry by stock. Those gates that are required for management purposes will be locked to ensure that they are not left open accidentally, or where the wind farm access road enters/leaves the covenant area, appropriate cattle stops will be installed to prevent stock access.

Management actions Years 1-5

1. Establish an appropriate covenant (e.g., through the QEII National Trust) over the Mt Cass Conservation Area.
2. Install and/or upgrade boundary fences to ensure that all of the Mt Cass Conservation Area is securely fenced from the balance of the land on the MainPower property and from other adjacent properties.

7. Plant and Animal Pest Management

Introduction

Invasive plant and animal species are widely regarded as the single biggest threat to New Zealand's indigenous biodiversity. These invasive species directly threaten conservation management projects such as that at the Mt Cass Conservation Area. Because of the importance of invasive species, this section provides a detailed overview of how they will be managed at Mt Cass.

Domestic stock management

Cattle will be removed from the Mt Cass Conservation Area at the outset of the project, once boundary fencing has been completed.

The management of sheep is more complex as it may well be that judicious sheep grazing could be important for reducing competition between aggressive invasive pasture grasses and the Nationally Vulnerable plant *Australopyrum calcis* subsp. *optatum*. In order to maximise the conservation of this plant, a 'Research by Management' experiment will be established at the western end of the Mt Cass Ecological Area (utilising existing internal fences) to assess the impact of sheep grazing on both populations of *Australopyrum calcis* subsp. *optatum* and the understorey of remnant forest and shrubland areas.

Any incursions of stock into areas where they are being excluded will be quickly dealt with by removing the animals and repairing fencing as required. Annual inspections of all boundary fences will be undertaken to minimise the likelihood of such excursions and those involved in the management of adjacent areas will be informed of the desire to keep the Mt Cass Conservation Area free of domestic stock.

Management actions Years 1-5

3. Remove all cattle from the Mt Cass Conservation area.
4. Implement a 5-year trial to assess the interaction between sheep grazing and (a) competition between exotic pasture grasses and *Australopyrum calcis* subsp. *optatum* and (b) forest regeneration.
5. Ensure any incursions of domestic stock are promptly dealt with the reasons for the incursion (e.g., broken fence) fixed.

Animal pest management

A number of introduced animal pests including brushtail possums, stoats, ferrets, rats, mice, red and fallow deer, goats, rabbits, hares, pigs and hedgehogs are likely to be present or border upon the Mt Cass Conservation Area. Domestic and feral dogs and cats may also come onto the site. The presence of both wild and domestic animals within the conservation area

will impact upon the management work proposed at this site. This section outlines the objectives for animal pest management and the programme that will be used to achieve these objectives. The objectives for animal pest management are (i) to reduce the impact of herbivores on the regenerating of the existing remnant forest and shrubland areas as well as on restoration areas, (ii) to reduce the impact of predators on recruitment of native fauna, and (iii) to ensure that any new threats, especially goats, are quickly and appropriately dealt with.

The approach to animal pest management recognises that different animal pests pose differing threats to indigenous biodiversity. A prioritisation system will therefore be used for management work based on likely threats of individual pest species. The priority ranking and objectives for control of each pest will be reviewed annually to allow for adaptive pest management.

The specific management approach used (trap/bait station type, trap/bait station density, frequency of servicing etc) will be developed in consultation with the contractor being used to undertake this work but will follow accepted best practice standards (e.g., as defined by ECan and DOC) and the methods used will be kept under regular review through an adaptive management approach (see monitoring section). All animal pest control work will meet the legislative conditions and requirements set by the relevant Acts and Regulations of Parliament. All pest control operators will be required to have appropriate pesticide licences.

Introduced pests targeted for control are split into two management groups: High priority (possums, rabbits, hares, feral deer, feral goats, stoats, ferrets, weasels, rats, feral cats); Low priority (feral dogs, feral pigs, hedgehogs, mice, wasps). The priority ranking for each pest animal will be reviewed every five years, or more frequently if needs dictate this.

Brushtail possums: Brushtail possums are present throughout the Mt Cass Conservation Area. They are a direct threat to general biodiversity values and to plant restoration. They also constitute a threat to neighbouring land holders in terms of production (damage to young pine trees and spread of bovine Tb) and biodiversity values on their land. Because of previous records of bovine Tb in cattle in the Mt Cass area, possum control has been undertaken in this area for some years and as a result possum numbers are low. It is intended to continue possum control for the foreseeable future. This control will involve a mixture of poisoning and trapping as circumstances dictate based on a comprehensive system of bait stations and traps located across the area. The effectiveness of possum control will be monitored through assessing biodiversity response (Section 10). Should monitoring indicate that the level of possum control is insufficient to sustain biodiversity values then the possum control operation will be reviewed.

Hares and rabbits: Hares and rabbits constitute a direct threat to natural regeneration, restoration plantings and direct seeding. Active hare and rabbit control will be undertaken at all sites with restoration plantings or direct seeding and will include shooting, poisoning and the use of appropriate retardant pastes on restoration plantings as circumstances dictate. If impacts are considerable unacceptable, the use of hare proof fencing will be considered for restoration of areas with particularly vulnerable species. Hare and rabbit impacts will be directly monitored as a part of restoration monitoring (Section 10).

Feral deer and goats: Feral deer (red and fallow) and goats are likely to be present within the general area, and to pass through the Mt Cass Conservation Area from time to time. These species can cause severe damage to biodiversity values, and pose a threat to restoration

success. They are also known to be reservoirs for bovine Tb. Goats in particular could quickly eliminate key plant species from the escarpment areas if left uncontrolled. Control will be opportunistic in nature, and will involve intensive hunting when animals are known or thought to be present. The benefits of any control will be based on assessment of the number of animals killed versus the number seen, as well as through monitoring of biodiversity values (Section 10).

Mustelids and rats: Mustelids and rats are likely to be present in the Mt Cass Conservation Area and to be having adverse impacts on native fauna and in the case of rats, on seed germination as well. An intensive control programme involving trapping and poisoning will be undertaken, which will need to be sustained indefinitely. Control will be based on a systematic layout of bait stations and/or traps across the site at a density appropriate for the control of these pests. The effectiveness of mustelid and rat control will be monitored through assessing biodiversity response (Section 10). Should monitoring indicate that the level of control is insufficient to sustain biodiversity values then the mustelid and rat control operation will be reviewed

Other animal pests: A number of other animal pests are either known to be present in the Mt Cass Conservation Area but are not considered a priority for conservation management at this stage. Should feral pigs be recorded in the area all efforts will be made to eliminate them.

Management actions Years 1-5

6. Continue and enhance the current possum control operation.
7. Implement active rabbit and hare control when the restoration plantings and/or direct seeding is established (Section 8).
8. Remove any feral deer or goats that are present within the conservation area.
9. Implement active control of mustelids and rodents.
10. Review priority animal pest species as the situation dictates and at the end of the life of this present management plan.
11. Liaise with adjacent landowners and ECan over animal pest control.

Plant pest management

Plant pest (weed) species are plants that are growing in places where they are not wanted and can out-compete and displace native species resulting in loss of biodiversity values. However, not all weeds pose the same level of threat while the practicality of controlling weeds also differs between species. The objective of plant pest management is therefore to maintain the Mt Cass Conservation Area free of those weed species that pose the highest threats and are amenable to eradication, while managing other weed species to levels that are acceptable in terms of the management plan goals. Two groups of weed species potentially threaten the success of this project; (i) woody weeds that establish into and out-compete native vegetation and (ii) pasture grasses which compete with restoration plantings and seedings.

All plant pest control will meet regional and national legislative requirements, especially any obligations imposed through the Environment Canterbury Regional Pest Management Strategy. Contractors will be required to have appropriate certification for handling any chemicals involved. The following notes summarise the broad approach that will be taken to the management of these species. Details of the specific methods to be used for plant pest control will be developed with the contractors undertaking the work and will be based on current best practice guidelines.

Woody weeds: These are weed species that are known to cause problems in similar environments and therefore pose a threat to biodiversity values, including restoration plantings, at this site. Woody weed species known to be present in the Mt Cass Ecological Area (October 2008) and considered a potential threat to native biodiversity values include wilding conifers, European broom, hawthorn and elderberry. In addition a number of species are present in adjacent areas and could potentially establish in the Mt Cass Conservation Area and threaten biodiversity values including cherry plum and old-man's beard. These species constitute priority woody weeds. Wind farm development and ongoing management represents a real risk for weed spread as seeds are readily dispersed on the vehicles entering the site

Woody weed control will involve the:

- Removal of all priority woody weeds from the Mt Cass Conservation Area prior to the commencement of wind farm development.
- Ongoing surveillance to locate and remove any priority woody weeds that might establish (especially adjacent to the wind farm infrastructure).

Pasture grasses and herbs: Pasture grasses and herbs are efficient competitors for water, as well as nutrients and light, and can restrict the growth of new plantings (including seeding). Control of these species will focus on removing them prior to the establishment of restoration plantings and seeding (through spraying) and restricting their re-establishment and growth after planting/seeding until plantings are tall enough to suppress them.

Management actions Years 1-5

12. Remove all priority woody weeds from the site prior to wind farm development.
13. Undertake annual surveillance of woody weeds to identify and eliminate any new individuals that establish.
14. Undertake pasture grass and herb control as part of restoration plantings and seeding.

8. Active restoration

Introduction

Active restoration in the Mt Cass Conservation Area will involve restoration plantings and direct seeding aimed at enhancing the area of native woody habitat present and increasing connectivity between the remnant patches. The active restoration programme will be undertaken over a 15-year period, with this section describing both the general approach and the work that will be undertaken in the first 5-year period. Issues covered in this section include the approach to collection and propagation of planting material, site preparation, planting and seeding, and post-planting maintenance.

Planting approach

The Mt Cass Conservation Area has been divided into three zones for restoration (Figure 3) – eastern and central forest zones and a western rock pavement zone. There will be four major uses of restoration plantings:

- As a general tool to increase the area of native woody vegetation, especially enhancing connectivity between existing remnants, through planting a range of relatively fast growing early successional forest species (e.g., kohuhu, lemonwood, kaikamoko, lowland ribbonwood, narrow-leaved ribbonwood, mahoe, kowhai, kanuka, ngaio, five finger, broadleaf etc depending on local site conditions).

- To reintroduce currently locally uncommon species including but not restricted to *Carmichaelia kirkii*, fierce lancewood, *Aciphylla subflabellata*, kahikatea, totara, matai and titoki.
- To re-establish the escarpment shrubland communities in areas where they have been lost involving planting of a range of shrub and small tree species including *Hebe*, *Coprosma*, *Raukaua*, *Corokia*, *Brachyglottis*, *Olearia* etc.
- Establishing ecologically appropriate plantings around wind farm infrastructure appropriate to site locations (e.g., shrubland on road batters and silver tussock grassland around wind turbine towers).

The general approach to planting encompasses five steps:

- Plant/seed ecologically appropriate species adapted to site conditions.
- Plant/seed in late winter/early spring to avoid winter frosts but provide the longest possible time for root systems to develop before summer droughts occur.
- Before planting or seeding, use herbicide (and possibly ground disturbance for direct seeding) to kill grass to lessen the competition for water while the seedling establishes.
- At the time of planting/seeding, and for the first year undertake intensive rabbit and hare control to ensure that these animals do not limit plant establishment and growth.
- Release weeding where required to clear encroaching grass/herbs after planting. In order to avoid plant losses it is important to restrict the numbers planted to those that can be properly maintained. Once root systems have developed (over the first two growing seasons) plants should readily survive grass competition.

Planting will be staged to occur over approximately 15 years, with the goal being to establish approximately 2 ha per year, but recognising that the first 2-3 years will involve propagation of planting stock. It is proposed to proceed in an east-west direction with planting, utilising existing fencing where possible to enable exclusion of sheep from restoration sites.

Because of the high cost of restoration plantings it is proposed to also use direct seeding as an additional tool for restoration (Dodd & Power 2007, Ledgard et al. 2008). Direct seeding involves sowing native plant seeds across areas of pasture that have been appropriately disturbed prior to seeding. Direct seeding is a more cost-effective method of establishing native woody plants than active planting but is more limited in the species that can be used. Therefore a mixture of these two approaches is likely to be the most successful in terms of cost-benefit.

Collection and propagation of planting material

Selection of species for restoration will be based on the current ecological patterns in the forest and shrubland remnants in the Mt Cass Conservation Area, together with experience from the adjacent Tiromoana Bush restoration project. Species choice will focus on those species that are adapted to local conditions and that will grow rapidly and provide suitable conditions for subsequent indigenous regeneration. Table 2 provides an initial list of species for planting. It is proposed to utilise the initial plantings to try a range of species in a range of different planting microsites to evaluate species performance as a basis for making more informed decisions about later plantings.

Table 2. DRAFT list of species for use in restoration plantings and possible abundances in plantings.

Species	Southern slopes	Exposed ridge crest	Infrastructure	Northern slopes
Aciphylla sp. aff colensoi			low	
Brachyglottis monroi		low	low	
Broadleaf	low			low
Coprosma crassifolia		high	moderate	low
Coprosma propinqua		high	low	low
Coprosma virescens	low		moderate	low
Corokia cotoneaster		low	low	
Fierce lancewood		low		low
Five-finger	low			
Grassland spaniard			moderate	
Kaikamako	moderate			
Kanuka	moderate			
Karamu	moderate			
Kohuhu	moderate			moderate
Korimiko	low	low		
Kowhai	moderate			moderate
Lemonwood	moderate			moderate
Lowland ribbonwood	moderate			moderate
Mahoe	moderate			low
Narrow-leaved ribbonwood	moderate			
Ngaio	moderate			
Olearia avicenniifolia	low	low		low
Phormium cookianum		low		
Prostrate kowhai		low		low
Raukaua anomalus		moderate	low	
Silver tussock			high	

Overall species choice represents a balance between those species that will grow best under the prevailing environmental conditions, are likely to contribute most to meeting the management goals, and be most attractive to seed dispersing birds. At a local site level, species choice needs to consider the main limitations to plant growth (moisture, frost, exposure, infertility and competition) associated with particular microsites. This can be guided by the success of restoration plantings as they are established as well as the general ecology of species in remnant forest in the Mt Cass Conservation Area. However, species choice needs to be regularly reviewed based on the performance of plantings, especially during dry years, and the availability of propagated material.

Sources of plant stock for propagation to be grown in the Mt Cass Conservation Area are seeds and cuttings from wild plants growing in the same area. Where seed supplies are inadequate or where seed germination is poor, cuttings may be used for propagation so long as sufficient material is available from the collection site. In some cases plant material may be

sourced from other sites in the general area (e.g., Tiromoana Bush or on Dovedale Station). The contracted plant propagator will collect all material for propagation.

This project will require a substantial number of plants propagated. This work will be undertaken by an experienced plant propagation contractor. Decisions on appropriate methods for plant collection and propagation will be based on discussions between MainPower advisors and the contracted plant propagator.

Management actions Years 1-5

15. Identify and map on GIS the areas that will be used for restoration plantings over the life of this management plan.
16. Let contract to undertake plant propagation.
17. Ensure that all plant material used for restoration is sourced from within the Mt Cass Conservation Area, or from nearby sites if insufficient material is available on site.
18. Ensure that initial plantings represent a diverse range of species and sites as a basis for determining the best performing species.
19. Establish infrastructure plantings once wind farm development has been completed.

Site preparation and planting

Plantings: The majority of planting sites are covered with pasture grasses. The main species are perennial grasses with a mat of underground rhizomes (browntop, red fescue, field poa, cocksfoot). These grasses compete vigorously for the limited available water resources and they can smother young plantings, while their presence makes planting physically difficult. Primary site preparation involves removing these grasses permanently from the planting sites by herbicide spray prior to planting. Mulches may also be used, with one option being to mulch all plant material removed during wind farm construction. While this might be useful for restoration of sites disturbed directly by wind farm construction, it will be of less value for the broader restoration plantings because of the time-delay between mulching and restoration plantings, unsuitability at some sites, and difficulties to spreading it across sites distant from the access road. Notwithstanding this, the use of mulching will be considered if herbicide spraying is not successful.

Planting methods will follow the standard restoration approach in Canterbury which involves plantings spaced at 1.5 m intervals, with fertiliser and water-retention crystals (or similar) added prior to planting. Plants will also be either sprayed with a hare/rabbit retardant paste prior to planting or covered with a browse-resistant netting cover.

Recent experience with direct seeding in Canterbury suggests that ground disturbance as well as herbicide application will be beneficial for seed germination and plant establishment. Because soil disturbance requires cultivation, direct seeding will most likely be restricted to sites where machinery can be used. The approach to direct seeding will be based on the results of recent direct seeding trials being undertaken at Tiromoana Bush (Nick Ledgard *pers. comm.*) and will be adapted to the Mt Cass situation based on these.

The underlying approach to restoration taken here is through appropriate site preparation and use of good quality plants, post planting management should be kept to a minimum except for follow-up weed control during the first 1-2 years after planting. The intention is that once established, the restored areas should require minimal direct human intervention unless something unexpected occurs (e.g., an extreme weather event).

The timing of restoration activities during the year is largely dictated by climatic conditions and the plant growth patterns. The annual work cycle is focussed on late-winter/spring planting with the aim of gaining full benefit from the period when soil moisture is likely to be at a peak. However, plants must also be suitably hardened off prior to planting in order to withstand conditions at the time of planting. Sites protected from severe frost may be planted in late July, but in more frost-sensitive sites planting should be delayed until August or September. The following is a summary of the main restoration activities and their timing.

Autumn - site preparation, planning for next years requirements.

Winter – hardening off, transport of plants to site, planting/seeding (late-winter).

Spring – finish planting, post planting maintenance.

Summer – seed collection, general maintenance.

Animal and plant pest control is undertaken throughout the year depending on the specific control method and the activity of the species involved (see Section 6).

Management actions Years 1-5

20. All sites will be appropriately prepared prior to planting/seeding.

21. At least 2 ha of planting/seeding will be undertaken each year once sufficient material is available (will possibly require a 2-3 year lead-in time from project commencement for material to be ready for planting/seeding).

22. Appropriate management of restoration plantings will be implemented (including rabbit and hare control, and post-planting weed control) once plants are in the ground.

9. Threatened Species Management

Introduction

While a number of threatened and naturally uncommon species are present in the Mt Cass Conservation Area, it is proposed to focus on only three of these in the five-year life of this management plan: *Heliohebe raoulii* subsp. *maccaskillii* (Nationally Endangered), *Australopyrum calcis* subsp. *optatum* (Nationally Vulnerable), and Canterbury gecko (Gradual Decline). In addition, the native snail *Wainuia edwardi* (Gradual Decline) will also be targeted in threatened species management. This section describes the management work that will be undertaken with these species during the five-year life of this management plan.

Heliohebe raoulii* subsp. *maccaskillii

This spreading, semi-divaricating shrub 50-300 mm tall is common at nine locations along the limestone escarpment where it occurs on ledges and in crevices on the limestone bluffs, and less often in open mixed herb-shrub communities in limestone boulder field adjacent to the escarpment. The total population is estimated as *ca.* 600 plants. The Mt Cass site is possibly the largest remaining population of this species and is also the only site where this species is known to be sympatric with *Heliohebe raoulii* subsp. *raoulii*.

The populations of *Heliohebe raoulii* subsp. *maccaskillii* are not directly threatened by the wind farm development as they are on sites that are not part of the development. Nonetheless it is proposed to establish a comprehensive monitoring programme for at least three *Heliohebe raoulii* subsp. *maccaskillii* subpopulations as a basis for assessing long-term trends in population structure and abundance as a basis for any future management interventions.

Management actions Years 1-5

23. A monitoring programme for at least three subpopulations of *Heliohebe raoulii* subsp. *maccaskillii* will be established and remeasured at least biannually.

Australopyrum calcis* subsp. *optatum

This small slender, creeping, perennial grass up to 60 cm tall is found sparsely under rock overhangs on the south-facing dip slope. Records based on 2002-2004 DOC surveys indicate that most plants occur at the western end of the Mt Cass ridge (Figure 2), although this may reflect survey bias (especially at the eastern end of the Mt Cass ridge). *Australopyrum calcis* subsp. *optatum* has been recorded from over 100 sites, with ca. 700 plants/clumps recorded. However, it is difficult to be certain of the precise number present as plants occur in clumps and it is not possible to always identify distinct individuals. Furthermore, the adjacent Dovedale property has not been surveyed for this species. The Mt Cass site is the second largest population known for this species (after the Flock Hill area), and further survey work may show the population to be even larger

Both access road and turbine construction associated with wind farm development may result in the loss of some *Australopyrum calcis* subsp. *optatum* plants, although the majority of sites where this species has been recorded will not be affected by wind farm development. It is proposed that once the road and other construction areas have been surveyed on the ground that detailed surveys will be undertaken and any affected plants of *Australopyrum calcis* subsp. *optatum* will be transplanted to sites not affected by the wind farm. It is further proposed that an equivalent number of additional plants will be propagated from seeds collected on site and planted into the wild. Monitoring will be undertaken of both undisturbed wild populations and of planted populations of this species.

As a basis for undertaking these plantings a detailed survey of the microsites where *Australopyrum calcis* subsp. *optatum* occurs will be undertaken, focusing particularly on light levels, substrate and associated species. The results from this survey will be used to inform the decision on planting sites.

In addition, a management experiment will be undertaken to assess the influence of sheep grazing on the persistence of this species and on forest regeneration, and hence to determine if any ongoing grazing is required for conservation purposes. *Australopyrum calcis* subsp. *optatum* plants and forest regeneration in sites with and without sheep grazing (and with and without hare/rabbit grazing) will be monitored to determine the effect of grazing. Grazing will be excluded using localised fencing.

Management actions Years 1-5

24. A survey of existing *Australopyrum calcis* subsp. *optatum* sites will be undertaken to better determine planting sites.

25. All *Australopyrum calcis* subsp. *optatum* plants affected by the windfarm will be transplanted and an additional number of new plants propagated and planted out.

26. A monitoring programme for at least three subpopulations of *Australopyrum calcis* subsp. *optatum* will be established and remeasured at least biannually.

27. A research trial to assess the influence of sheep grazing on *Australopyrum calcis* subsp. *optatum* plants will be undertaken, with the results of the trial be reviewed at the end of the life of this management plan (2014).

Canterbury gecko

This unnamed gecko is from the 'common' gecko complex in the South Island and has not been formally described as a separate species from the broader common gecko *Hoplodactylus maculatus* complex covering New Zealand). The Canterbury gecko is widely distributed throughout Canterbury and is primarily a terrestrial dweller. Canterbury gecko is most often encountered in edge environments where shrubland meets grassland and where rock cracks, crevices, piles or fallen logs and standing hollow trees offer daytime refuges. Over 50 individuals of Canterbury gecko have been found at Mt Cass where they occur in crevices in boulders and limestone outcrops, and in piles of stones or boulders.

Both access road and turbine construction associated with wind farm development may result in the loss of some individuals of Canterbury gecko, although it appears that the main sites for this species will not be affected by wind farm development. It is proposed that once the road and other construction areas have been surveyed on the ground that detailed surveys will be undertaken and individuals of Canterbury gecko found within the construction zone will be translocated to suitable sites not affected by the wind farm.

In addition, a monitoring programme will be instigated as a basis for assessing long-term trends in population structure and abundance as a basis for any future management interventions. It is likely that the predator control programme will have a marked effect on the abundance of geckos, as predation is likely to be the main limiting factor for this species.

Management actions Years 1-5

28. Canterbury gecko individuals found within the wind farm construction zone will be translocated to suitable sites away from the wind farm.

Wainuia edwardi

The *Wainuia edwardi* population near Mt Cass is at the current southern limit for this species and is considered to be an outlying population, as the main distributional range is centred on Kaikoura. It appears that this population adjacent to Mt Cass Road has an uncertain future and that the Mt Cass Conservation Area offers considerable potential for establishing a much larger populations, especially when stock removal and predator control is implemented, although this snail has never been recorded from the Mt Cass Conservation Area or elsewhere along the Mt Cass ridge line.

As a basis for undertaking such a translocation it is proposed that during the five-year life of this management plan that a detailed study of the current sites where *Wainuia edwardi* occurs will be undertaken and based on these results a search made for suitable restoration sites in the Mt Cass Conservation Area. Should the outcome of these studies suggest that it may well be possible to translocate individuals of *Wainuia edwardi* to the Mt Cass Conservation Area, then applications for permission to do this will be made. However, it is not proposed to undertake the actual translocation during the life of this management plan.

Management actions Years 1-5

29. Undertake a habitat suitability evaluation of Mt Cass for *Wainuia edwardi*.

30. If the outcome of this action suggests translocation is possible, then apply for permission to undertake a translocation

10. Monitoring

Introduction

A comprehensive monitoring programme will be established to assess the success of the management work described in this plan. Monitoring will focus on the recovery of forest and shrubland remnants, on the success of the restoration plantings (e.g. plant survival), and on the population dynamics of threatened plant and animal species. It is not proposed to undertake specific animal pest monitoring; rather the success of animal pest control will be assessed by the response of indigenous biodiversity to this control. However, regular surveys of the area will be undertaken to locate any plant pests that require control. This section provides an overview of the approach that will be taken to monitoring.

Photopoints

Permanent photopoints will be located throughout the Mt Cass Conservation Area as a means to document the change that occurs as a result of management work. Landscape photopoints will be established in locations that provide a panoramic view of the area (including possibly from the turbine towers). Photopoints will be also established at each permanent monitoring plot location (see below). In order for successive photos to be taken at the same location, all photopoints will be permanently marked with stakes and located using GPS.

Forest and shrubland recovery

For a representative selection of forest and shrubland areas, permanent 10 x 10 m plots will be established. Because permanent plots are time-consuming to establish and to re-measure, it is proposed that while all plots will be established in the first year, re-measurement will be on a five-year cycle with five plots remeasured each year. Thus the total number of permanent plots will be 25. The number of plots in each vegetation type will be in proportion to the area of the vegetation type. Plot establishment will follow standard forest permanent plot methodology including tagging and diameter measurement of canopy trees, and seedling and sapling counts based on permanently marked individuals.

Restoration monitoring

Permanent 10 x 10 m plots will be established within the restored areas to monitor their overall success. These plots will be used to assess both the survivorship and growth of the plantings and the establishment of ecosystem processes within the plantings. The information from the initial restoration plantings will be particularly important for informing decision making with regard to subsequent restoration plantings. Permanent plots take time to measure and it is important that the number of plots established is sufficient to allow assessment of planting success but not too many as to become logistically difficult to manage. Permanent plots should be measured annually, at least during the first five years after planting. It is proposed that at least two plots are established in the area planted in each year. In addition, species specific monitoring of plantings of threatened and uncommon plant species will be undertaken as these are established.

Threatened species monitoring

A monitoring programme will be established for at least three representative subpopulations of *Heliohebe raoulii* subsp. *maccaskillii* and *Australopyrum calcis* subsp. *optatum*. The monitored areas will be searched carefully and all plants present will be tagged and their dimensions recorded. Monitoring will be repeated on a regular basis (at least every two years) as a basis for monitoring long-term trends in population structure and abundance. Lower-level monitoring (most likely using photopoints) will be undertaken for other threatened and

uncommon plant species, including species located on the escarpment, to assess the effects of changing conditions associated with the management proposed here (e.g., effect of grazing reduction or removal on invasive grasses). In addition, permanent monitoring of Canterbury gecko will also be undertaken, most likely based on the use of artificial covers.

Management actions Years 1-5

31. Establish photopoints across the Mt Cass Conservation Area at the outset of the project.
32. Establish permanent vegetation sampling points in the first year, and re-measure on a five-year cycle.
33. Establish permanent vegetation sampling points associated with restoration sites and re-measure annually for the first five years.
34. Establish permanent monitoring of *Heliohebe raoulii* subsp. *maccaskillii*, *Australopyrum calcis* subsp. *optatum* and Canterbury gecko.

11. Project Management

Introduction

Having a clear plan for project management is essential if this project is to be successful. Furthermore, a clearly outlined approach to project management is essential for providing certainty to stakeholders with an interest in the outcomes of the management work. This section outlines the manner in which the Mt Cass Conservation area will be managed and the way in which its success will be assessed.

Project management

The Mt Cass Advisory Group will be established to oversee the management of the Mt Cass Conservation Area. It is proposed that this group has representatives from Hurunui District Council and various stakeholders (e.g., Department of Conservation, Environment Canterbury, Royal Forest and Bird Protection Society, iwi), as well as from MainPower. The specific terms of reference of this group are:

- To review and recommend this management plan to Hurunui District Council for final approval.
- To review the work undertaken in implementing the Mt Cass Conservation Area management plan over the preceding year.
- To review and recommend the work plan for the Mt Cass Conservation Area for the following year to Hurunui District Council.
- To provide advice to the managers of the Mt Cass Conservation Area as deemed necessary by the Advisory Group or as requested by management staff.

The Mt Cass Advisory Group will meet at least twice each year, once during summer and to include a site visit, and once in June to review the previous years work and approve the following years work plan.

Annual work plan

This management plan is the guiding document for the management of the Mt Cass Conservation Area. It provides the overview of the approach that will be taken in management but is not a prescriptive document as it is difficult to predict in advance changing circumstances that might result as management proceeds or changing biotic and abiotic factors that might influence the site. Annual work plans will provide these prescriptive details. This management plan provides the general overview of the project while the annual work plans will provide the detail on the specific actions that will be taken to implement the

management plan. The annual work plan must be reviewed by the Mt Cass Advisory Committee prior to being approved by Hurunui District Council.

Bond

MainPower Ltd. will establish a bond to ensure that there is sufficient capital available to guarantee the long-term management of the Mt Cass Conservation Area.

Public relations

MainPower Ltd. are committed to making this conservation management project and the results that arise from it widely known. This is important for several reasons; because it enables ownership of the project by local communities, it permits transparency in terms of project management, and it allows sharing of the results that arise from the project with other similar projects. It is proposed that information about the project will be disseminated through a range of tools include information signs along any public walking tracks located through the area, newsletters and/or brochures, and via the web. A web page will be established that provides regularly updated information on the project including copies of all plans and reports relating to the project.

Management actions Years 1-5

35. Establish the Mt Cass Advisory Group.
36. Prepare an annual work plan that describes the management actions for each year.
37. Establish a bond to guarantee the long-term funding of the Mt Cass conservation management work.

INDICATIVE TIME LINE FOR YEARS ONE TO FIVE

The following timeline indicates the activities that will be undertaken during the first five years of management of the Mt Cass Conservation Area (and the year preceding the formal start of wind power generation). Full details will be included in the annual work plans.

Year 0

These management actions will need to be implemented prior to the wind farm becoming operational, but some may not occur until after the construction phase has been completed (e.g., fencing).

Project management

Establish covenant for Mt Cass Conservation Area
Erect new fences and ensure existing boundary fences are of an adequate standard
Remove cattle from Mt Cass Conservation Area
Prepare Year 1 work plan

Plant and animal pest control

Undertake control of priority weeds

Plant propagation and planting

Let contract for plant propagation and direct seeding
Collect seed and cuttings as appropriate

Threatened species

Identify and bring into propagation *Australopyrum calcis* subsp. *optatum* plants affected by construction

Propagate additional *Australopyrum calcis* subsp. *optatum* plants

Identify and translocate Canterbury gecko individuals affected by construction

Monitoring

Establish photopoints

Year 1

Project management

Establish web page

Prepare Year 2 work plan

Plant and animal pest control

Undertake control of priority weeds

Implement possum, mustelid and rat control

Plant propagation and planting

Collect seed and cuttings as appropriate

Threatened species

Propagate and if appropriate plant out *Australopyrum calcis* subsp. *optatum* plants

Establish sheep grazing trial

Monitoring

Remeasure photopoints

Establish permanent forest regeneration plots

Establish threatened plant and animal monitoring

Year 2

Project management

Maintain web page

Prepare Year 3 work plan

Plant and animal pest control

Undertake weed surveillance and control as required

Continue possum, mustelid and rat control

Plant propagation and planting

Undertake initial restoration planting/seeding if plants large enough

Undertake restoration plantings around infrastructure once development work has been completed.

Threatened species

Monitor translocated and planted *Australopyrum calcis* subsp. *optatum* plants

Monitor sheep grazing trial

Undertake assessment of *Wainuia edwardi* along the Mt Cass Road.

Monitoring

Remeasure photopoints

Remeasure permanent forest regeneration plots (5 per year)
Establish restoration planting monitoring plots
Undertake threatened species monitoring

Year 3

Project management

Maintain web page
Prepare Year 4 work plan

Plant and animal pest control

Undertake weed surveillance and control as required
Continue possum, mustelid and rat control

Plant propagation and planting

Undertake restoration plantings/seedings

Threatened species

Monitor translocated and planted *Australopyrum calcis* subsp. *optatum* plants
Monitor sheep grazing trial
Undertake assessment of possible translocation sites for *Wainuia edwardi* in the Mt Cass Conservation Area.

Monitoring

Remeasure photopoints
Remeasure permanent forest regeneration plots (5 per year)
Establish restoration planting monitoring plots
Undertake threatened species monitoring

Year 4

Project management

Maintain web page
Prepare Year 5 work plan

Plant and animal pest control

Undertake weed surveillance and control as required
Continue possum, mustelid and rat control

Plant propagation and planting

Undertake restoration planting/seeding

Threatened species

Monitor translocated and planted *Australopyrum calcis* subsp. *optatum* plants
Monitor sheep grazing trial
Submit application for permission to translocate *Wainuia edwardi* to Mt Cass

Monitoring

Remeasure photopoints
Remeasure permanent forest regeneration plots (5 per year)
Establish restoration planting monitoring plots
Undertake threatened species monitoring

Year 5

Project management

Maintain web page
Undertake full review of initial 5-years work
Prepare new 5-year management plan
Prepare Year 6 work plan

Plant and animal pest control

Undertake weed surveillance and ongoing control
Continue possum, mustelid and rat control

Plant propagation and planting

Undertake restoration planting

Threatened species

Monitor translocated and planted *Australopyrum calcis* subsp. *optatum* plants
Review results from sheep grazing trial

Monitoring

Remeasure photopoints
Remeasure permanent forest regeneration plots (5 per year)
Establish restoration planting monitoring plots
Undertake threatened species monitoring

Literature cited

- Dodd MB, Power IL 2007. Direct seeding of indigenous tree and shrub species into New Zealand hill country pasture. *Ecological Management and Restoration* 8:49-55.
- Golder Associates 2008. Ecological Assessment Mount Cass Wind Farm. Report MAIPO-CAN-006, June 2008.
- Ledgard N, Charru M, Davey H 2008. Establishing native species from seed within exotic grasslands. *New Zealand Journal of Forestry* 53(1):23-32.
- Moar NT 1971. Contributions to the Quaternary history of the New Zealand flora 6. Aranuiian pollen diagrams from Canterbury, Nelson, and North Westland, South Island. *New Zealand Journal of Botany* 9:80-145.
- Molloy BPJ 1994. Observations on the ecology and conservation of *Australopyrum calcis* (Triticeae: Gramineae) in New Zealand. *New Zealand Journal of Botany* 32:37-51.
- Norton DA 1984. A multivariate technique for estimating New Zealand temperature normals. *Weather and Climate* 5:64-74.