

# Ecological Assessment of Mount Dobson Ski Area, South Canterbury



**Prepared for**

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**Plate B:** Proposed **Easement** is along Ski Field Road between ✨ and Licence Area (red line)

## Table of Contents

1.	Introduction .....	5
2.	Mount Dobson Ski Area Development .....	5
3.	Ecological Character of Mt Dobson Ski Area.....	5
4.	Ecological Context.....	6
5.	Ecology of Mount Dobson Ski Area.....	6
5.1.	Plant Communities.....	8
5.1.1.	Licence Area (Ski Field).....	8
5.1.2.	Lease Area (Base Area).....	11
5.1.3.	Easement (Ski Field Access Road) .....	11
5.2.	Animal Fauna .....	14
5.2.1.	Bird Fauna .....	14
5.2.2.	Invertebrate Fauna.....	14
5.2.3.	Lizard Fauna .....	14
5.3.	Threatened and At Risk Species.....	15
5.4.	General Ecological Condition .....	15
5.4.1.	Licence area (Ski Field) .....	15
5.4.2.	Easement (Ski Field Access Road) .....	15
6.	Significance of Ecological Values.....	16
7.	Assessment of past effects of ski field establishment on indigenous biological diversity .....	20
7.1.	Lease area (Base Area).....	20
7.2.	Licence area (Ski Field).....	20
7.2.1.	Activities.....	20
7.2.2.	Native vegetation regeneration .....	20
7.3.	Ski field access road - Easement .....	21
7.3.1.	Weed Ingress.....	21
7.3.2.	Erosion Control Plantings .....	21
8.	Effect of on-going management on biodiversity .....	21
8.1.	License Area (Ski Field) .....	21
8.1.1.	Snow Grooming.....	21
8.1.2.	Snow making .....	22
8.1.3.	Vegetation Removal for Pipe Laying .....	23
8.2.	Ski field road management - Easement .....	23
9.	Potential effects of proposed developments .....	23
10.	Discussion .....	25
11.	Recommendations.....	26
11.1.	Expert advice on Lizard values and Habitat .....	26
11.2.	Verify resource consents held .....	26

11.3.	Ecological Weed Control.....	26
11.3.1.	Californian Thistle .....	26
11.3.2.	Wilding Pines .....	27
11.3.3.	Catchment Board plantings .....	27
11.3.4.	Gorse.....	27
11.4.	Animal Control.....	27
11.5.	No disturbance to Seepages and Streams .....	28
11.6.	Vegetation Restoration.....	28
11.7.	Easement Provisions for gravel processing and storage of ski lift equipment .....	28
11.8.	Update Standard practices for MDSAL site works to mitigate adverse ecological effects .....	28
12.	References .....	29

**APPENDICES**

**Appendix 1:** Description of Priority Natural Area: Two Thumb Range *Priority Natural Area 59-5-03:* Mount Dobson

**Appendix 2:** Trail Map – Operational Boundary of Mount Dobson Ski Area

**Appendix 3:** Plant Species List

**Appendix 4:** Photographs

## 1. Introduction

Mount Dobson Ski Area Limited (MDSAL) is applying for a Department of Conservation Concession to utilise approximately 350 ha at Mt Dobson in South Canterbury (Cover photo). It is located in Mount Dobson Conservation Area, which is now part of Te Kahui Kaupeka Conservation Park. The Department of Conservation is currently undergoing a process of requiring all ski fields that operate on public conservation land to apply for a concession. MDSA has previously held licences under the Crown Pastoral Lands Act.

This ecological assessment was requested by MDSAL to form part of their Concession Application. The survey focussed on the botanical values, although casual observations and desktop research provide some information on invertebrate, bird and lizard fauna values. The survey was undertaken on January 24<sup>th</sup> 2021. This report describes the vegetation communities present at Mount Dobson Ski Area, and assesses the ecological impact of past, present and future ski field management. Recommendations are provided.

## 2. Mount Dobson Ski Area Development

Skiing has taken place at Mount Dobson since 1979, when the first rope tows were installed. The facilities have gradually been developed through time. Rope tows were replaced by a platter and T bar, while a triple chair lift was installed in 2001 which opened up West Valley for skiing. Terrain modification took place in the 1980s with a summer program of rock picking to improve the surface of ski trails located on boulderfields, and the formation of tracks to provide access for skiers in the winter, and ski field management throughout the year. Snow fences have been erected to improve snow cover in high use or exposed part of the ski field. MDSAL is currently trialling snow making in the beginners/intermediate area beside the Bunny Platter lift, and have plans to construct a reservoir to supply water for snow making in the next five years.

## 3. Ecological Character of Mt Dobson Ski Area

Mt Dobson Ski Area is located on the southern end of the Two Thumb Range in South Canterbury. The Licence area is located in an alpine basin to the south of Dobson Peak, and has an altitudinal range of ~1500 m to 2000 m asl.. The ski lifts currently service an altitudinal range from 1716 m at the chairlift base, to 2018 m asl. at the T bar top station below Dobson Peak.

The environment is alpine, experiencing cold temperatures, a short growing season, and frosts at any time of the year. The area lies within the rain shadow of the Main Divide, with predominantly north westerly winds in the spring and autumn. Easterly and southerly winds are also common bringing significant amounts of snow to the ski field area.

High alpine ecosystems are characterised by a having mostly bare ground cover. They support a mosaic of plant communities that reflects changes in physiographic gradients such as snow accumulation and duration, frost heave erosion, soil and moisture gradients, and exposure. Soil development is limited. These fellfields are sparsely vegetated, characterised by more or less stable boulderfield, and less stable scree where surface stones are loose and sometimes mobile.

Below about 1800 m asl., soil accumulation has resulted in a wider range of low alpine vegetation types to establish including tussockland, cushionfield, herbfield and wetlands.

## 4. Ecological Context

In pre human times, the alpine plant communities of the range summits in the Two Thumb Ecological District are likely to have been similar to those present today i.e. sparsely vegetated alpine boulderfield and stonefield communities, with cushionfield, herbfield and tall tussock grasslands (*Chionochloa* species) present where soil accumulation has taken place (Leathwick *et al* 2003).

The ski field road passes through an altitudinal range of 990 m to 1700m asl. The original (pre-human) vegetation on the hill slopes of the Two Thumb Range comprised a complex mosaic of low mountain totara-hardwood forest, scrub and/ or *Chionochloa* snow tussock grassland depending on the site and frequency of natural fires (McEwen, 1987; McGlone 2001; Harrington *et al* 1986; Leathwick *et al* 2003).

Human arrival about 850 years ago (Wilmhurst *et al* 2008), and associated burning caused widespread loss of woody vegetation, which was replaced by high diversity 'seral' tussocklands and scrub below 1000m asl. (McGlone 2001). Subsequent European arrival and the introduction of large herbivores, weeds and pests, have exacerbated ecosystem depletion (Walker *et al* 2006). In the 1970s such depletion led to the retirement from grazing of the land that has subsequently become Mount Dobson Conservation Area.

The Protected Natural Areas Programme (PNAP) survey of the Heron Ecological Region (Harrington *et al* 1986) identified the following Recommended Area for Protection (RAP), in which the entire Mt Dobson Ski Area Licence is part:

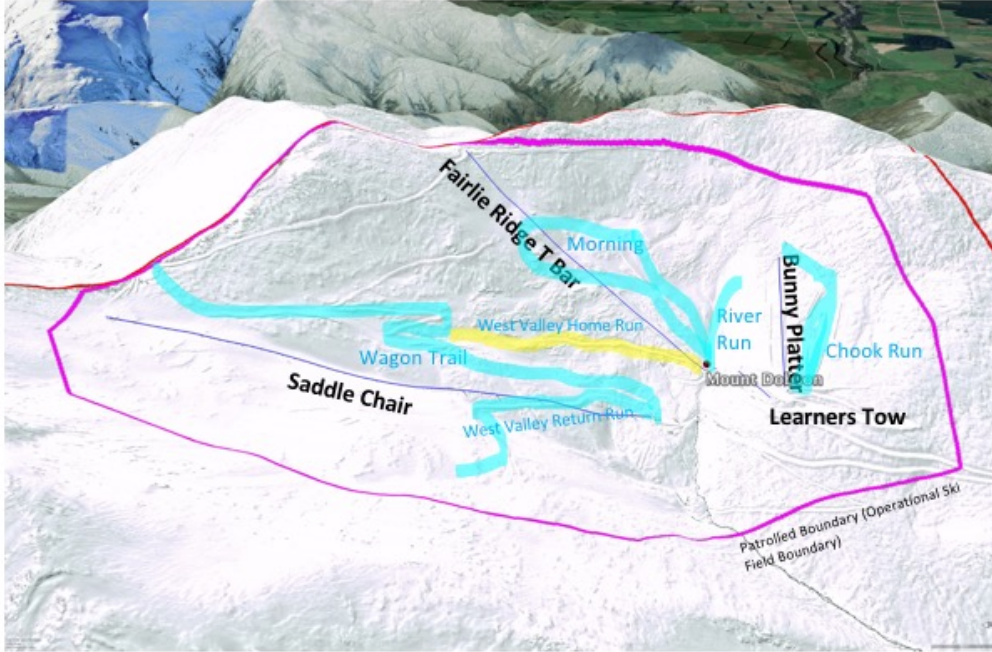
**Priority Natural Area 59-5-03:** Mount Dobson: Centred on Firewood Stream, this RAP includes alpine boulderfield, scree and bluff, cushionfield and tussockland communities, as well as shrubland and *Hoheria lyallii* shrubland on hillslopes at lower altitude. It includes good examples of high altitude east facing cirque basins (see Appendix 1).

These values are still present.

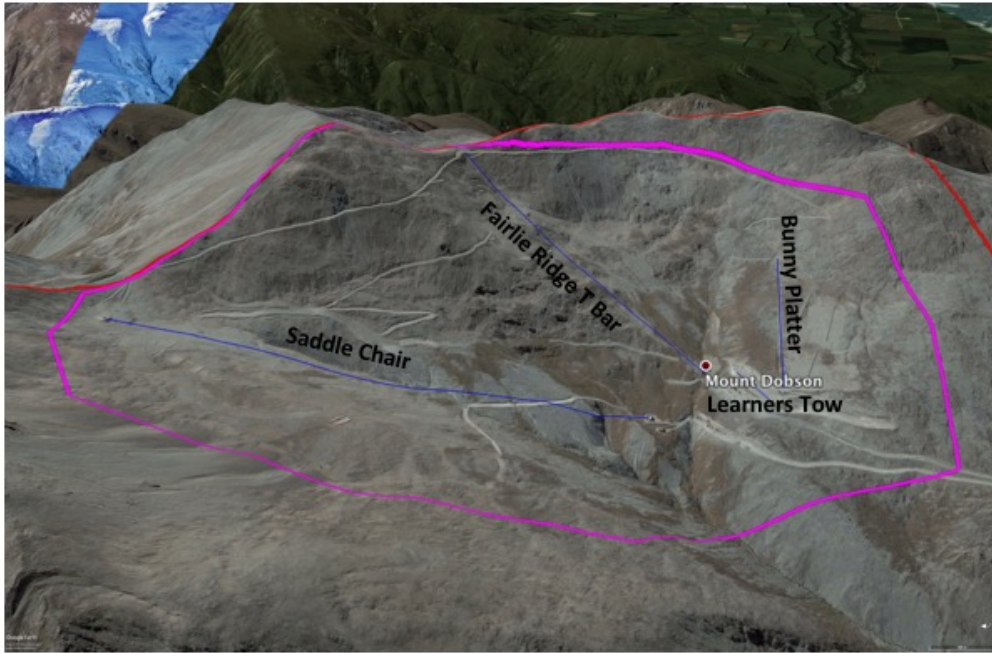
## 5. Ecology of Mount Dobson Ski Area

Approximately 50% of the Licence Area lies beyond the current operational boundary and is in a natural state. Survey effort concentrated on those areas of the Licence Area that are within the operational ski field boundary.

The location of the Licence Area and Easement for the access road are shown in Plates A and B on the front cover. The location of ski trails and cat tracks referred to in the text, and within the operational ski field boundary, are shown on the Trail Map (Appendix 2) and in Plate C.



**Plate C:** Location of ski lifts, ski trails and cat tracks referred to in the report. Winter (above) and Summer (below)



## 5.1. Plant Communities

Plant community names follow the structural class protocols of Atkinson (1985). A full species list is provided in Appendix 3. Exotic species are denoted with an \*. The photographic Figures are grouped together in Appendix 4.

### 5.1.1. Licence Area (Ski Field)

Within the current operational ski field boundary, areas with vegetation cover are generally below 1800 m asl. and occupy the west facing slopes within the south-eastern quartile of the Licence area. Low alpine plant communities occupying the fellfields here include tall tussockland, cushionfield, herbfield and wetland communities. There are areas that appear to be induced boulderfield including parts of Chook Run.

However, much of the Licence Area comprises high alpine fellfield with boulderfield and scree habitats, that naturally support very little vegetation cover.

#### **(i) High Alpine *Veronica* Boulderfield**

Upper parts of the Licence Area i.e. below Dobson Peak and the adjoining ridges that enclose the head of the catchment, and most of the terrain outside the current Operational Ski Field Boundary, are characterised by thick colluvium and mass movement fellfield deposits, with rocky bluffs at 2000 m asl. (Figures 1 & 2). These boulderfields are virtually unvegetated (Figure 3) but provide habitat for occasional small cushions of speargrass (*Aciphylla dobsonii*, *A. monroi*), hebes (*Veronica pinguifolia*, *V. epacridea*, *V. haastii*), vegetable sheep (*Raoulia exima*), South Island edelweiss (*Leucogenes grandiceps*), scree willowherb (*Epilobium porphyrium*, *E. pycnostachum*) and white mats of *Raoulia youngii*. *Haastia sinclairii* can be found on coarse scree and partly stable rock debris.

Little hard fern (*Blechnum penna-marina*) and low growing porcupine shrub (*Melicactus alpinus*) grow at the edge of stable boulderfields.

Within the current Operational Ski Field Boundary, Trails crossing boulderfield have been smoothed out by summer rock picking i.e. where the larger rocks have been removed leaving the small more consolidated rocks in situ. *Aciphylla dobsonii*, bristle tussock (*Rytidosperma setifolium*) and *Veronica epacridea* grow on these Trails (Figure 4).

#### **(ii) High Alpine *Epilobium* Stonefield**

Where dry screes are comprised of small sized rubble, including on the groomed West Valley Return Run returns skiers to the chair lift base, vegetation cover is sparse, but includes herbs - scree button daisy (*Leptinella atrata*), scree willowherbs (*Epilobium porphyrium*, *E. pycnostachyum*) and occasional tufts of mountain daisy *Celmisia angustifolia*; grasses - blue tussock (*Poa colensoi*), *Rytidosperma pumilum*, *Koeleria cheesemaniae*; sedge *Luzula pumila*, hebe (*Veronica epacridea* and *V. pinguifolia*) (Figure 5). Penwiper (*Notothlaspi rosulatum*) is uncommon.

#### **(iii) Low Alpine *Chionochloa* Tall Tussockland**

There is limited tall tussockland in the current Operational Ski Field Boundary and is largely confined to 1680 m to 1800 m asl. (Figure 6).



Slim-leaved snow tussockland (*Chionochloa macra*) is present on the gentler slopes between the T bar and Platter lift lines (Figure 7). Tussock cover is greatest on the lower slopes here between the snow fence to the north of the T bar line and the stream, where slim-leaved tussocks have 60% cover, with bare or rock and rubble occupying to 25%. Other species present include blue tussock (5% cover), narrow-leaved snow tussock (*C. rigida* 2%), trailing neinei (*Dracophyllum pronum* 1% cover) and *Celmisia viscosa* (5%), with occasional *Epilobium alsinoides*, false spaniard (*Celmisia lyallii*), *Rytidosperma pumilum*, and \*king devil hawkweed (*Pilosella prealta*).

Further upslope, where slim-leaved tussock cover is more open, species diversity increases with additional species comprised of cushion plants such as *Veronica pulvinaris*, *Raoulia hectori* var. *hectori*, *Raoulia grandiflora* and *Phyllachne colensoi*, *Luzula pumila*, pin cushion, moss and lichen.

Localised depressions and shallow gullies where snow accumulates, support snow bank vegetation, comprised of *Chionochloa flavescens* (40% cover), *Celmisia haastii* (20% cover), blue tussock, moss *Polygonum juniperum*, trailing neinei, *Phyllachne colensoi*, *Carex* sp. and *Anisotome flexuosa*.

The most extensive area of tall tussockland within the Licence Area is located beyond the Operational Ski Field Boundary, on the north-east facing slopes (1600-1480m asl.) in Firewood Stream.

#### **(iv) Low Alpine Cushionfield/*Celmisia* herbfield**

Within the Operational Ski Field Boundary cushionfield/*Celmisia* herbfield community is largely confined to the northern basin, serviced by the T bar and platter lifts. There are also small patches in West Valley, surrounded by boulderfield (Figure 8). At high altitude, cushionfield occupies relict cirque basins and is generally in good condition. Dominant species include trailing neinei, *Phyllachne colensoi*, cushion hebe (*Veronica pulvinaris*), blue tussock, and mountain daisy (*Celmisia viscosa*). Less common species include *Celmisia sessiliflora*, *Brachyscome longiscapa*, *Luzula pumila*, Lindsay's poa, and lichen species.

At about 1750-1800m asl., cushionfield also occupies the drier faces (Figures 9 & 10). The most common mat daisy present is *Raoulia hectorii*, var. *hectorii* which forms grey-green mats, while *R. grandiflora* can form open silvery grey mats. Grey-green cushions of *Veronica pulvinaris* are common. Other species that may be present include *Luzula pumila*, small pin cushions (*Colobanthus strictus*), *Anisotome flexuosa*, the diminutive needle-leaved mountain daisy (*Celmisia laricifolia*) and grass *Rytidosperma pumilum*. Trailing neinei with localised areas of *D. prostratum*, native daphne (*Pimelea oreophila* subsp. *lepta*), bright green cushions of *Phyllachne colensoi*, patches of *Celmisia angustifolia* and small speargrass (*Aciphylla monroi*) are present. Scattered tussocks grow amongst the cushion plants including slim-leaved snow tussock (5% cover) and blue tussock. Naturalness and species diversity is high. \*Mouse eared hawkweed (*Pilosella officinarum*) can be present, especially closer to the base area, and where ski field activities have disturbed the vegetation.

Moist cushionfields occupy the broad face above the chair lift base station, where alpine seepages are present. Cushion hebe (*Veronica pulvinaris*) is common, as is \*tussock hawkweed and *Kelleria dieffenbachii*. Additional species present indicative of moister habitats include *Schoenus pauciflorus*, *Ourisia caespitosa*, *Caltha obtusa* and comb sedge (*Oreobolus pectinatus*).

Snow groomer machinery has locally damaged the cushionfield vegetation in places including the upper slopes of the ski racing and Chook Run area. Here the stems of *Dracophyllum pronum* have been broken resulting in increased bare ground. Adjacent vegetation is healthy and more diverse.

### **(v) Induced Low Alpine Stonefield**

Vegetation cover of the bottom Chook Run is sparse. The stonefield present appears to be a community induced from tussockland/cushionfield through historic vegetation removal (either through development of the learner/intermediate area or through over-grazing) as there are some areas that still support soil and vegetation (Figure 11). Vegetation cover is greater at the top of the Platter Lift. However, this is a high traffic zone, as evidenced by scalped and/or dead tussocks of *Rytidosperma pumilum*, snow tussock, and trailing neinei, and bare ground showing (Figure 12).

The area closest to the Bunny Platter Base comprises rock and rubble cover, with sporadic wood rush, tufts of *Rytidosperma pumilum*, \*browntop, hebe (*Veronica epacridea*) and Lindsay's poa. In places blue tussock is recolonising the stonefield (Figure 13), together with occasional slim leaved tussock, creeping neinei, mats of *Raoulia hectori* and mountain daisy mats (*Celmisia viscosa*, *C. angustifolia*).

### **(vi) Low Alpine Herbfields – seepage**

A small narrow stream, fed by numerous seepages, runs east-west across the centre of the Licence Area, in the vicinity of the T bar base station. This community is very natural, and species diversity is particularly high (Figure 14).

The moist stream sides support a low growing herbfield comprised of moss with intermingling diminutive herbs and sedges including buttercup (*Ranunculus maculatus*), liverwort, creeping willowherb (*Epilobium brunnescens*), native cress (*Cardamine* sp.), viola (*Viola cunninghamii*), kopoti (*Anisotome aromatica*), *Azorella* sp, *Isolepis aucklandica*, sedge *Carex pyrenaica* var. *cephalotes*, pin cushion *Colobanthus affinis*, and occasional forget-me-not (*Myosotis drucei*). More extensive patches of montia (*Montia sessiliflora*), blinks (*Montia fontana* subsp. *fontana*) large white snow marguerite *Dolichoglottis scorzoneroideis*, *Poa dispacea*, willowherb *Epilobium macropus* and mountain daisy *Celmisia haastii* occupy the splash zone.

Other species growing close to the stream include alpine rush (*Marsippospermum gracile*), purple bidibid (*Acaena fissistipula*), mountain daisies (*Celmisia viscosa*, *C. sessiliflora* and *C. angustifolia*), native dandelion (*Taraxacum magellanicum*), sedge (*Carex lachanalii*), pin cushion (*Colobanthus strictus*), and *Geranium brevicaulis*. The uncommon sedge *C. allanii* has previously been recorded here (Harrington et al 1986). Bladder fern (*Cystopteris tasmanica*) grows beside the boulders where the water first emerges from the boulderfield. Numerous seepages that feed into the stream support a similar range of species.

A small tarn is perched above the chairlift base station at the foot of boulderfield and is the source of seepages that flow down towards the station (Figure 15). The low stature herbfield turf comprises white caltha, willowherbs (*E. brunnescens* and *E. komarovianum*), cudweed (*Argyrotegium mackayi*) kapoti, *Celmisia angustifolia*, button daisy (*Leptinella pusilla*), *Acaena fissistipula*, *Isolepis aucklandica*, rush (*Juncus pusillus*); and cushions comprise mountain daisy *C. sessiliflorum*, *Phyllachne colensoi*, and comb sedge (*Oreobolus strictus*).

The larger Firewood Stream flows in a north-east to south-west direction in West Valley. The Saddle Chairlift and an access track cross it midway within the Licence Area. Species diversity is lower than for the smaller stream described above. Key species include *Montia sessiliflora*, moss, *Ranunculus maculatus*, *Epilobium macropus*, white caltha, and bidibid (*Acaena fissistipula*). Boulderfield extends right down to the stream margin along the majority of its length (Figure 16). A water outtake pipe is present where the West Valley Return Run cat track crosses the stream.

### 5.1.2. Lease Area (Base Area)

The Lease Area comprises approximately 10 ha at the base area (see Plate D). Vegetation cover has been reduced or removed in much of the Lease Area. Earthworks were required during ski field establishment and over the years to construct roads, carparks, beginners rope tow area, T bar and Chair life base stations resulting in loss of vegetation within the construction footprint.



**Plate D:** Location of Lease Area

The Lease Area includes the bottom of groomed ski runs that take skiers to the T bar and chairlift base stations. These high use areas are groomed, and being at lower altitude, tend to lose their protective snow cover earlier than elsewhere within the Licence Area.

The vegetation communities present have been described in Section 5.1.1. The most natural community within the Lease Area is the alpine herbfield associated with seepages and streams.

The bottom section of the Wagon Trail comprises a mosaic of slim tussockland and *Celmisia* herbfield. A steep section of an old track located here blew out about 15+ years ago, but there is still a significant area of gully erosion present (Figure 17). Bare rock and soil is apparent (35%), with cover of \*mouse-eared hawkweed reaching 30% in places. Scattered slim snow tussock, mats of mountain daisy (*Celmisia viscosa* and *C. angustifolia*) and blue tussock are present.

Vegetation cover and condition is also modified in the high use areas at the base of the T bar, with more rock and less snow tussock present.

### 5.1.3. Easement (Ski Field Access Road)

It is proposed that the ski field road has an easement concession encompassing 20 m each side of the road formation. The easement will commence at the lower boundary of the Te Kahui Kaupeka Conservation Park (880 m asl.) and continue the length of the road to the Lease Area (~1700 m asl.).

The road crosses several vegetation communities within this altitudinal range, most of which have a high level of naturalness.

### **(i) Montane Exotic Grassland**

At the Mt Dobson lower boundary, the road initially passes through oversown and dressed pasture (Figure 18) dominated by exotic species (80% cover) that include \*sweet vernal, \*Yorkshire fog, \*mouse-eared hawkweed. The cover of native species quickly increases going up the road. Native species are regenerating and include narrow-leaved snow tussock, inaka (*Dracophyllum longifolium*), porcupine shrub, mountain daisy (*Celmisia semicordata*), feathery tutu (*Coriaria plumosa*), hard tussock (*Festuca novae-zealandiae*), blue tussock, willowherbs (*Epilobium glabellum*, *E. melanacaulon*), viola (*Viola cunninghamii*), *Anisotome flexuosa*, and occasional mountain flax (*Phormium cookianum*), and *Coprosma dumosa*. There are scattered wilding trees of the highly invasive \*lodgepole pine (*Pinus contorta*) present.

### **(ii) Montane -Subalpine Dracophyllum Shrubland**

*Dracophyllum* shrubland is the dominant community in the montane zone, comprising *Dracophyllum rosmarinifolium*, with some inaka and *D. acerosum* present (Figure 19). Other species present include mountain flax, giant speargrass (*Aciphylla scott-thompsoni*), mountain daisies (*Celmisia semicordata*, *C. angustifolia* and *C. spectabilis* var. *magnifica*); smaller herbs such as creeping mountain foxglove (*Ourisia caespitosa*), parahebe (*Veronica decora*), hells bells (*Anaphalioides bellidioides*), creeping willowherb (*Epilobium brunnescens*) and avens (*Geum leiospermum*); shrubs include hebes (*Veronica odora* and *V. pinguifolia*), *Gaultheria crassa*, mingimingi (*Coprosma dumosa*, *C. propinqua* and *C. rugosa*), prickly shield fern (*Polystichum vestitum*); lichen and moss. Occasional \*lodgepole pine (*Pinus contorta*), \*gorse (*Ulex europeaus*), \*grey willow, \*alder and \*tussock hawkweed are present.

On a west-facing slope *Dracophyllum* shrubland extends to ~1400 m asl. where it merges with tall tussockland and has a diversity of native herb species (Figure 20). Snow clearing on the road has resulted in localised areas of gravelfield to form below the road in the vicinity of the tussockland. This provides habitat for native species adapted to unstable gravel including willow herbs (*Epilobium pycnostachyum* and *E. atriplicifolium*) and *Trisetum* sp.

### **(iii) Montane \*Willow Woodland**

There are areas of \*grey willow (*Salix cinerea*), \*alder (*Alnus glutinosa*) and occasional \*bitter willow (*Salix elaeagnos*) that were originally planted below the road to control scree movement on the recommendation of the Canterbury Catchment Board (Figure 21). Sporadic native ribbonwood (*Hoheria lyallii*) are present amongst the exotic plantings (Figure 22). These plantings have spread into adjoining areas, including occupying ribbonwood habitat down the stream gullies.

An area of planted \*lodgepole pine beside the road has been felled, although a few live trees persist at its edges, with many wilding seedlings present above the road (Figure 23).

### **(iv) Subalpine Wetland**

At 1180m asl. wetland herbfield occupies the steam sides of a creek that flows under the road via a culvert. Large hummocks of yellow flowered \*musk (*Mimulus moschatus*) occupy the creek bed, while bog rush (*Schoenus pauciflorus*) and curly tipped sedge (*Carex petriei*) form swards and tufts at the stream side (Figure 24). Amongst the moss, willowherb (*Epilobium macropus*) and club rush (*Isolepis*

*aucklandica*) are present. \*Mouse eared chickweed (*Cerastium fontanum*), hellsbells and \*Chewings fescue (*Festuca rubra* subsp. *commutata*) are also present.

#### **(v) Subalpine *Hoheria lyallii* woodland**

Mountain ribbonwood (*Hoheria lyallii*) occupies gullies below the ski field road between 920m and 1130m asl. but only forms a woodland within the ski field road easement at 1130m asl. Mountain ribbonwood is the dominant species. Some road fill has spilled over the side of the road close to the ribbonwood woodland community, but native species including giant speargrass, hebe (*Veronica odora*), *Celmisia semicordata*, and occasional narrow leaved snow tussock and *Coprosma dumosa* have established in, and stabilized, the loose gravel material (Figure 25).

#### **(vi) Montane-Subalpine Stable Boulderfield**

There are stable boulderfield tongues present within the ski field road easement some of which have been cut through by the road formation (Figure 26). Boulders are about 40 cm across, with sparse vegetation cover that has established between the rocks. Species include occasional tufts of blue tussock, mountain shield fern (*Polystichum cystostegium*), mingimingi, lichen and moss.

#### **(vii) Subalpine *Chionochloa* Tall Tussockland**

Above about 1100 m asl., slim leaved snow tussockland becomes the dominant plant community (Figure 27). On a south east facing slope, slim leaved snow tussocks have 60% cover, and *Dracophyllum rosmarinifolium* (20% cover) being the dominant species. Additional species include narrow-leaved snow tussock, trailing neinei (*D. pronum*) blue tussock, mountain daisies (*Celmisia semicordata* and *C. angustifolia*), *Coprosma dumosa* (5%), hebe (*Veronica odora*), giant speargrass, pimelea, and occasional creeping matipo (*Myrsine nummularia*).

At about 1400 m asl., intertussock species diversity is greater, with many low growing species present including *Brachyglottis lagopus*, glaucous bidibid *Acaena caesiiglauca*, dwarf mingimingi (*Leucopogon fraseri*), *Acrothamnus colensoi*, snowberry (*Gaultheria depressa*), mat daisy (*Raoulia subsericea*), grassland daisy (*Celmisia gracilentia*), kopoti, and little hard fern. Exotic species are not extensive but include \*king devil and mouse-eared hawkweeds, and occasional wilding \*contorta pine.

#### **(viii) Alpine Boulderfields**

Above about 1450 m asl., blocky unstable boulderfield dominates with very sparse vegetation present. Species recorded include *Luzula pumila*, scree buttercup (*Ranunculus crithmifolius*), willowherbs (*Epilobium porphyrium* and *E. tasmanicum*), and Lindsay's poa where fine substrates have accumulated.

#### **(xi) Alpine Cushionfield**

Cushionfield is locally present where some soil formation has taken place amongst the surrounding alpine boulderfields (Figure 29). Trailing neinei dominates (80% cover), with scattered slim-leaved tussock, small mats or cushions of *Kellieria dieffenbachii*, cushion hebe (*Veronica pulvinaris*), pin cushion (*Colobanthus strictus*), *Phyllachne colensoi* and mat daisy (*Raoulia hectori*); mountain daisy (*Celmisia angustifolia*), gentian (*Gentiana corymbosa*), blue tussock, clubmosses (*Lycopodium fastigiatum* and *Huperzia australiana*) and lichen.

## 5.2. Animal Fauna

No specific animal fauna survey was undertaken as this is beyond my specialist knowledge. However, surveys have been conducted on neighbouring Mt Hay Pastoral Lease for their tenure review inspection, and findings from this were added to the casual observations made during the botanical survey. These modest findings were discussed with an entomologist and herpetologist.

### 5.2.1. Bird Fauna

During the botanical survey, a pair of New Zealand pipit (*Anthus novaeseelandiae novaeseelandiae*) were observed on open fellfield and boulderfield.

Although kea used to be recorded some 25 years ago (Peter Foote pers comm.), they have not been observed since then.

### 5.2.2. Invertebrate Fauna

In lieu of a comprehensive invertebrate survey taking place, casual observations were made, including photos, that were subsequently identified by the Department of Conservation entomologist Warren Chinn.

Alpine grasshopper *Brachaspis nivalis* are present on rocky boulderfeld, while grasshopper *Sigaus australis* was recorded in tussockland and on cushionfield.

Black mountain ringlet butterfly *Percnodaimon merula* was also observed on boulderfield and cushionfield (Figure 30), especially on slopes near the platter lift, and within the Access Road corridor at 1560m asl..

Drone fly *Eristalis tenax* was recorded feeding on nectar and pollen in a gentian flower growing beside an alpine tarn (Figure 31).

These species are all representative of the alpine environment of the Two Thumb Range.

### 5.2.3. Lizard Fauna

No lizards were observed during the botanical survey. However, several species have been recorded in scree habitat on neighbouring Mt Hay Pastoral Lease as part of its tenure review assessment (DOC). There, the following endemic skink species scree skink *Oligosoma waimatense*, long-toed skink *Oligosoma longipes*, and spotted skink *Oligosoma lineocellatum* were recorded in screes and/or boulderfield, while MacCann's skink (*Oligosoma maccannii*) and common skink (*O. nigraplantare polychroma*) were recorded in stony habitats. One species of endemic gecko was recorded in stony habitats and rock outcrops on Mt Hays - the common gecko (*Hoplodactylus maculatus*).

The alpine boulderfield and screefields at Mt Dobson Ski Area are likely to be excellent habitat for a number of alpine lizard species (James Reardon pers. comm.). Reardon notes that this site is well within the range of scree skink and the southern long-toed skink (now known as *O. aff. longipes* "southern" or Roamatimati skink), and that *Woodworthia* "Southern Alps" gecko are also likely to be there. Black eyed gecko (*Hoplodactylus kahutarae*), that are more commonly found further south, may also be present in the alpine scree habitats at Mount Dobson Ski Area.

### 5.3. Threatened and At Risk Species

Herb *Brachyscome longiscapa*, found in cushionfield, has a threat status of At Risk – Naturally Uncommon (Hitchmough et al. 2015). Sedge *Carex allanii* and herb *Helichrysum plumeum* have previously been recorded (Harrington et al. 1986), and are also ranked At Risk - Naturally Uncommon. Suitable habitat is present.

The boulderfields and cushionfields provide habitat for the recorded At Risk - Declining New Zealand pipit (*Anthus novaeseelandiae novaeseelandiae*). While no lizard survey was undertaken, an expert herpetologist expects the alpine boulderfields and screes to provide habitat to a suite of lizard species including scree skink (*Oligosoma waimatense*) ranked Nationally Vulnerable and spotted skink (*Oligosoma lineocellatum*) ranked At Risk – Relict. A formal survey would be required to confirm this.

### 5.4. General Ecological Condition

#### 5.4.1. Licence area (Ski Field)

While there has been permanent loss of vegetation cover within the construction footprint; and modification to vegetation cover and terrain on tracks, where summer rock picking has taken place, and on runs with high skier traffic, the vegetation of the remainder of the Licence Area is highly natural and intact. The seepage-fed stream that flows past the T bar station is highly natural, but vulnerable to ski field activities. Future developments, and current management in the vicinity of the stream must take place without adversely effecting this significant community.

Very few exotic species are present. The vegetation communities support native fauna, including invertebrates and birds, and is highly likely to be habitat for a diverse range of alpine lizards.

Wallaby and thar (both observed) and hare pose the greatest ecological pressure, as they browse palatable native species including speargrass, some mountain daisy and snow grass. A small suite of introduced plant species were recorded in the Licence Area and comprise \*mouse-eared hawkweed (*Pilosella officinale*), \*king devil hawkweed (*Pilosella prealta*), \*tussock hawkweed (*Hieracium lepidulum*), \*browntop (*Agrostis capillaris*) and \*Californian thistle (*Cirsium arvense*). \*Hawkweeds are present at very low levels and are more likely to grow in areas close to the base area and where skier traffic is higher such as ski runs just above the T bar and Chairlift base stations.

There is one small infestation of \*Californian thistle present along a section of the West Valley Home Run cat track that has revegetated with native species. \*Thistles are starting to spread into the adjacent highly natural cushionfield-herbfield community below the track. This is the only weed infestation that poses immediate threat to the natural values on the Ski Area, and should be eradicated while it is still of very limited distribution.

#### 5.4.2. Easement (Ski Field Access Road)

There is greater diversity of introduced plant species present along the access road Easement, most of which were confined to below 1200m asl. Species recorded include grasses \*Yorkshire fog, \*sweet vernal and \*Chewings fescue; herbs \*mouse-eared chickweed, \*hawkweeds, \*musk, \*Californian thistle and \*yarrow, shrub \*gorse; and trees \*lodgepole pine, \*grey willow, \*bitter willow and \*alder.

The invasive weed species of concern are lodgepole pine, gorse, grey willow, alder and bitter willow. Wilding lodgepole pine are particularly invasive. They are present 882 m – 1500 m asl. within the Te Kahui Kaupeka Conservation Park. Most are spreading from the felled Catchment Board stand beside the road at 1060 m asl. (Figure 23) into a nearby road cutting, native shrubland and tussockland communities.

On recommendation from the Canterbury Catchment Board, grey willow, bitter willow and alder were planted to stabilise scree present on the lower section of the Easement, but have spread downstream to occupy the streambed and sides, which is habitat for mountain ribbonwood (*Hoheria lyallii*).

One gorse bush was recorded in montane *Dracophyllum* shrubland, and warrants control before it spreads further.

Californian thistle near the gravel stock pile is the likely source for the on-field infestation.

## 6. Significance of Ecological Values

The Lease Area, Licence Area and Easement are entirely located within the Two Thumb Priority Natural Area 3: Mount Dobson. This PNA was identified approximately seven years after the initial ski field development and included the Licence Area and Access Road despite some level of modification.

The alpine plant species found within the Licence Area are representative of the original vegetation present in this environment of the Two Thumb Ecological District.

The significance of the ecological values found at Mount Dobson Ski Area was assessed using the Department of Conservation guidelines (Davis et al. 2016) and are presented in Table 1.



**Table 1:** Assessment of Ecological Significance

***Representativeness***

The Licence Area:

- Includes the range of alpine vegetation communities and landforms that are representative of the alpine zone in the Two Thumb ED.
- A range of aspects, altitudes, landforms, levels of soil development and vegetation communities are represented.
- A diverse range of lizard species is expected to be present in the alpine boulderfield/scree/open ground habitats; expected species would be representative of the Two Thumb ED.

Rating: High

***Diversity & Pattern***

The Licence Area:

- Includes a range of altitudes, aspects and landforms that provide sufficient environmental variation to support a diverse range of vegetation communities
- Plant species diversity and species richness are particularly high for wetland and flush communities; and high for cushionfields
- Plant species diversity is lower for boulderfield and scree communities, but that is to be expected for these alpine rocky habitats
- The predicted diversity of lizard species is high; this requires expert confirmation

Rating: High

***Rarity & Special Features***

The Licence Area:

- Includes wetlands and seepages that are a national priority for protection as they have become uncommon.
- Provides potential habitat for a number of lizard species that have been recorded on adjoining land in similar habitat, including the Nationally Vulnerable scree skink (*Oligosoma waimatense*) and At Risk - Relict spotted skink (*Oligosoma lineocellatum*)
- Provides habitat for the recorded At Risk - Declining New Zealand pipit (*Anthus novaeseelandiae novaeseelandiae*)
- *Brachyscome longiscapa* grows in cushionfield and is an At Risk – Naturally Uncommon plant species
- Historic records of *Helichrysum plumeum* and *Carex allanii* classified as At Risk – Naturally Uncommon not confirmed, but habitat is present
- This is the Type Locality for *Aciphylla dobsonii*, which is also a locally endemic species
- Several species reach their distributional limit here:
  - *Veronica buchananii* – near its eastern distributional limit
  - *Veronica pinguefolia* – near its western distributional limit

Rating: Medium/High. (Medium for Special Features; High for rarity if expert assessment finds threatened lizard species to be present.)

## ***Naturalness***

### The Licence Area:

- Much of the Licence Area has not been developed and remains highly natural
- Historical ski field development has required, and been consented for, the removal of vegetation and/or substrate to form carparks, building platforms, cat tracks, lift lines, and a beginner's area. Decades ago, areas of scree and boulderfield have had summer 'rock picking' done to create a smoother surface for winter snow grooming on ski runs. More recently snow fences have been erected, which have also required some vegetation clearance and rock picking to create a smooth surface. All these activities have impacted on the naturalness of those areas but is at a level that is expected at ski fields. Naturalness Rating: Low/Medium
- On-going effects of ski field activities e.g. use of tracked machinery for snow grooming and/or summer use of diggers has created tracks in cushionfield and seepages, with evidence of broken stems and reduced species richness at localised spots. Rating Medium/High
- Skier traffic in areas of low snow e.g. towards the bases of T bar and Triple Chair lifts has possibly contributed to a shift from taller tussockland to low growing cushionfield/tussockland with a higher occurrence of \*hawkweed. Rating High/Medium
- Very few exotic plants present. Hawkweeds are present, but a small infestation of Californian thistle above the Chair lift is just starting to spread further into natural vegetation cover and requires control.
- Some localised browsing of alpine plants by wallaby and/or thar.
- Disturbance by e.g. rock picking and formation of cat tracks across boulderfields, while is a visual scar, and locally modified the boulderfield habitat, it has also created new habitats for other native scree plants adapted to growing in finer scree material. Rating High/Medium

### Access Road:

- Overspilling of gravel from snow clearing and road grading does not appear to be increasing its footprint. Native plant species are colonising these areas, especially in subalpine zone
- Weed ingress is minimal. Of concern are gorse (1), wilding lodgepole (scattered), alder and willow (plantings and spread from these beyond the road corridor).

Overall ranking: Medium. When compared with other undeveloped alpine areas in Two Thumb ED, naturalness has been reduced due to historic and ongoing ski field activity. However, the level of vegetation removal and terrain modification is on a par with Lake Ohau Ski Area, and much less than larger commercial ski fields such as Mt Hutt Ski Area. Some wild animal (wallaby and thar observed) browsing. Weed ingress is minimal.

Rating: High/Medium

## ***Ecological Context***

### The Licence Area:

- The Licence Area is compact and well buffered by the surrounding expansive alpine environment with associated boulderfield and scree habitats. These are located elsewhere in the Te Kahui Kaupeka Conservation Park and adjoining pastoral lease land.
- Boulderfields and screes are likely to provide important feeding, and breeding habitat for a number of lizard species, and provide an important linkage to other habitats within the Conservation Park.
- Ski field activities, including the ski field road, have facilitated the introduction of weed species, albeit at very low levels. Within the Licence Area, hawkweed species are the main exotic species, which are impractical to control.
- Low levels of browsing by wallaby and thar is evident. Wild pest control is necessary.

### Access Road:

- Overspilling of gravel from snow clearing and road grading does not appear to be increasing its footprint. Native plant species are colonising these areas, especially in subalpine zone
- Weed ingress is minimal. Of concern are wilding lodgepole pine (scattered), gorse, alder and willow (plantings and spread from these beyond the road corridor to habitat below the road and its Easement). Remove and replace with native shrub species.

When compared with other undeveloped alpine areas in Two Thumb ED, naturalness has been reduced due to historic and ongoing ski field activity. However, the level of vegetation removal and terrain modification is on a par with Lake Ohau Ski Area and much less than larger commercial ski fields such as Mt Hutt Ski Area. Some wild animal (wallaby and thar observed) browsing. Weed ingress is minimal.

Rating: High/Medium

## 7. Assessment of past effects of ski field establishment on indigenous biological diversity

### 7.1. Lease area (Base Area)

The Base Area has experienced the greatest loss of vegetation and natural character, although the main impact took place in the 1980s during the initial ski field establishment. The Lease Area comprises 16 small buildings including the ticket office/café, ski school, ski club headquarters, workshop, toilets, generator shed, ski hire rental and storage, Ski patrol, ski storage, administration office, staff accommodation huts, pump shed, T bar and chair drive stations. The impact is largely confined to the footprint of these Lease Area buildings but extends to the surrounding area where there are carparks, a learner platter area (including Bunnies Run, and a bridge over the stream that flows past the T bar base station).

### 7.2. Licence area (Ski Field)

Historic terrain modification within the Licence Area took place mainly in the 1980's, resulting in habitat modification, and/or total localised removal of vegetation cover. Activities included vehicle track and lift line establishment, summer 'rock grooming', and creation of a beginner/intermediate ski area.

#### 7.2.1. Activities

##### (i) Tracks & Lift Lines

On the ski field, there are a number of vehicle tracks that were established to service the top stations of the Bunny Platter lift, Fairlie Ridge T Bar and Saddle Chair. These not only provide summer vehicle access for management purposes, but during the winter, act as cat tracks to give skiers an easy way back down the mountain. The vegetation and some rocks along the alignments of the T bar and Platter Lifts have been cleared to facilitate easy snow management (Figure 33).

##### (ii) Summer Rock grooming

Summer rock picking was carried out at locations where ski trails cross blocky boulderfield. This practice entails removing rocks that jut out, so as to create a smoother surface that is possible to snow groom and reduces the risk of skiers hitting protruding rocks. The ecological impact is the resulting change from blocky boulderfield to more consolidated boulderfield with finer substrate between the rocks. (See Figure 2).

##### (iii) Historic Vegetation Restoration

Approximately 35 years ago, Mt Dobson Ski Area was required to replant snow tussocks in a small area where loss of vegetation cover was sustained during ski field development (Peter Foote. *pers comm.*). This replanting effort has been successful.

#### 7.2.2. Native vegetation regeneration

While all these practices have resulted in a reduction in natural vegetation cover, there is evidence that alternative native species are colonising these modified areas, rather than exotic weed species coming in. For example, the fine gravels created by the vehicle track under the Saddle Chair are

colonised by scree plants including *Leptinella atrata* and willowherbs, whereas the surrounding block boulderfield is more sparsely vegetated by hebe species (see Figure 3).

Natural regeneration is also evident along a section of West Valley Home Run above the Saddle Chair line that is now well vegetated with native plant species including bidibid, *Celmisia angustifolia*, bristle tussock, *Anisotome flexuosa* and *Rytidoserma pumilum* (Figure 35). The only exotic species present are \*mouse-eared hawkweed, (to 5% cover) and a localised infestation of \*Californian thistle.

The bottom of Chook Run comprises boulderfield that is being recolonised by blue tussock, occasionally leaved tussock, tufts of *Luzula pumila* and other native species (See Figure 11).

### 7.3. Ski field access road - Easement

The original road formation resulted in the outright loss of vegetation and landscape character within its footprint, which includes some overspill of material in places down the side of the road. Comparison of current aerial photos with historic ones (1980s) indicates that the extent of overspill does not appear to have increased through time.

#### 7.3.1. Weed Ingress

The road can act as a conduit for weed species, as seed can be transported in heavy machinery, and the cuttings and overspill provide open habitat for establishment by weedy coloniser species. While the lowest section of road corridor does have exotic species present, these are mainly pasture grasses and herbs, and pose little threat to conservation values. Ecological weeds observed include occasional \*gorse, mainly seedling \*lodgepole pine, \*grey willow, \*alder and \*mouse-eared hawkweed.

#### 7.3.2. Erosion Control Plantings

In the 1980s there was concern that the ski field road might exacerbate erosion where it cuts across scree gullies in the lower sections within the Conservation Area. The Catchment Board at that time recommended that exotic tree species be planted to stabilise these gullies below the road.

“The practice involved planting a range of seedling trees on mountain faces or gullies subject to erosion. The trees were most likely planted as poles or stakes to control slips, gullies, debris avalanches and to a lesser extent for frost heave, sheet wash, wind and creep erosion”. MfE (2001)

Lodgepole pine, grey willow, alder and bitter willow were planted in the gullies and gully-sides. The invasive potential of these species into areas of indigenous vegetation has subsequently become better understood.

## 8. Effect of on-going management on biodiversity

### 8.1. License Area (Ski Field)

#### 8.1.1. Snow Grooming

Snow grooming takes place over many of the ski runs at Mount Dobson Ski Area. A snow groomer, which is a tracked vehicle with a blade in front, and a cutter behind, is used to push snow ahead of it

whilst smoothing out surface unevenness. While the majority of the ski field is at minimal risk of damage arising from snow grooming because boulderfields are the dominant feature, several localised areas of damage were observed.

On the upper slopes of the Chook Run, tracked snow groomer machinery has damaged cushionfield vegetation on a steep pitch of track, as evidenced by broken stems of *Dracophyllum pronum*, reduced plant diversity, and an increase in cover of bare ground (Figure 35). Adjacent vegetation is healthy and more diverse. At Treble Cone Ski Area, direct damage by groomer blades and tracks to cushion plants substantially reduced vegetation cover and cover of live cushion plants (Wardle & Fahey 2002), but changes in species diversity of cushionfield between ungroomed and groomed trails were not significantly different (Wardle et al 1005).

In the mid-section of Bottom Wagon Trail, moist cushionfield associated with seepages upslope has been damaged by a tracked vehicle /snow groomer (Figure 36). The section is short (about 15 m long) and comprises squashed vegetation including a turf of club rush with grass *Deschampsia pusilla*, and mats of *Celmisia angustifolia*. The turf has been cut by the tracks, but vegetation cover and composition is similar to the adjacent area; damage is minimal.

A change in species composition was apparent on the groomed slope above the Chair base station. Tussock cover was reduced, with low growing cushionfield vegetation being more prevalent than on the same slope further away from the base station. This may be a result of grooming and/or heavy skier traffic.

#### 8.1.2. Snow making

Minimal snow making has taken place to date, with only one mobile snowgun being used in areas of high skier traffic i.e. close to the base of the T bar, towards the base of Bunny Platter and at the Chair Base (Plate E). MDSAL is currently taking 15 litres/second of water from the small stream that flows past the T bar base station, and from the larger stream to the west in West Valley to supply the mobile snow making unit. Several outtakes are present, with pipes taking water down to a pump shed below. Residual water flow is maintained, except at the highest outtake observed (GR E1412744 N5131753), where that section of the seepage had no surface water left in it (Figure 37).

While there is no obvious sign of negative impact resulting from removing all the flow from the upper section of the seepage/stream in terms of changes in species composition, species diversity, or ingress by weed species, water flow within all the feeder seepages and the main stream should be maintained at their natural flow when there is no demand for snow making i.e. from October until June. This would be easily achieved through removal of the feeder pipe from the outtakes once the ski area has closed.

Snow making, especially when used in conjunction with snow fencing, can have a positive environmental impact because it enables a deeper snow pack to be maintained that better protects the vegetation from damage resulting from skier and/or groomer traffic.

A perusal of the Environment Canterbury Consent Website suggests that MDSAL does not hold a consent to take water for the purposes of snow making; MDSAL will need to sort this out prior to submitting the application for a Licence with the Department of Conservation.

### 8.1.3. Vegetation Removal for Pipe Laying

Race training takes place on the south side of the Bunny Platter lift. To create a suitably hard icy surface for racing, it is desirable to spray water onto the snow. A short (30 m) shallow trench has recently been dug across tall tussockland in which a pipe that will supply water to the race training area is carried (Figure 38). It will be necessary to cover over the pipe with soil and restore the vegetation cover along the trench alignment with slim-leaved tussock and intertussock species.

## 8.2. Ski field road management - Easement

Ski field road management requires grading and snow clearance. Some fine material gets pushed over the side of the road within the easement corridor. However, native plant species are colonising areas of overspill. For example, at 1400m asl., snow clearing on the road has resulted in localised areas of gravelfield to form below the road in the vicinity of a tussockland. This gravelfield now provides habitat for native scree plant species adapted to unstable gravel including willow herbs (*Epilobium pycnostachyum* and *E. atriplicifolium*). At 1460m asl., the coarse boulderfield supports almost no vegetation, but the material beside the road has been colonised by scree plants that prefer finer material, including scree buttercup (*Ranunculus crithmifolius*), willowherb (*Epilobium poryphyrum* and *E. tasmanicum*) and *Rytidosperma pumilum*.

At 1130m asl., a mountain ribbonwood woodland community is located within the ski road easement area. Some road fill has spilled over here, but native species including giant speargrass, hebe, mountain daisy, and occasional narrow leaved snow tussock and mingimingi have established in, and are stabilizing, the loose gravel material. (See Figure 23).

## 9. Potential effects of proposed developments

There are no definite plans for development at Mt Dobson Ski Area in the next 12 months. However, the five year plan is to improve the ski area's snow making capability at high use areas including Chook Run, the lower Morning Run at the T Bar base, and at the Chair Base (see Plate E). MDSAL plan to construct a reservoir to the south of Chook Run at approximately 1800m asl., into which water from the streams would be pumped.

As with any future developments a full ecological and environmental assessment would need to be assessed at that time. However, the main potential negative impacts on biodiversity and vegetation cover relate to the construction phase i.e.

- Loss of vegetation cover at the reservoir footprint
- Disturbance to flush areas, streams and their margins
- Vegetation disturbance along the trenches that are required to convey water pipes between water outtakes and the reservoir
- Disturbance of At Risk plant species
- Disturbance to boulderfield and potential lizard habitat
- Increased soil erosion
- Weed ingress

On-going impacts include:

- Impacts on aquatic ecology where it is desired to take a significant proportion of a stream's total flow to fill the reservoir.

- There can also be on-going effects of snowmaking that would have to be considered at the time of an application to extend snow making capability. A deeper snow pack will protect the native vegetation from the scraping action of groomer machinery and skis/boards, thereby assisting with improved vegetation cover, reduced risk of soil erosion, but likely result in a change in species composition as plants respond to changes in soil moisture levels. As the climate warms, it will become increasingly difficult to make snow using only water. Overseas, chemical (e.g. Drift) or bacterial (e.g. SnowMax) additives have been used as a cost-effective method for improving the quality and quantity of artificial snow. Over the last few decades there have been increasing concerns regarding their effect on human health, water quality and hydrology. More recently there is a growing focus on the impact of activities on climate change. If fossil fuels are used to make snow, this is further contributing to energy-related carbon emissions.



**Legend:**

- Current snowmaking trial areas
- Future snowmaking areas
- Approximate location of proposed reservoir
- Operational Boundary
- Licence Area

**Plate E:** Location of areas being trialled for snowmaking, and areas that would have snow making if the reservoir proposal goes ahead in the future



## 10. Discussion

Mount Dobson Ski Area exhibits a gradation in the extent of vegetation loss and modification. The most pristine areas within the Licence Area of Mount Dobson Ski Area are found beyond the operational ski field boundary. At the other end of the spectrum, vegetation loss is confined to those areas that are part of the construction footprint (i.e. buildings, car parks, learner ski area, ski field access road and lift infrastructure), which are concentrated in, but not limited to, the Lease Area.

However, what is of most interest to the Department of Conservation is the condition of vegetation within the operational ski field boundary that is available to skiers/riders for snowsports activities. Areas which exhibit highly natural unmodified vegetation cover are present on those parts of the Ski field that are not groomed (rock picked and/or snow groomed), which is a significant proportion of the operational area. These areas predominantly support boulderfield vegetation communities, but also include a mosaic of cushionfield and tussockland.

The boulderfields naturally support very sparse vegetation cover. Even where terrain modification (i.e. through cat track building and rock picking of groomed trails) of boulderfields has taken place, plant species present are native. In fact, native regeneration of these Trails is taking place, albeit with a suite of scree species that prefer more fine material that accumulates between the smaller rocks. The ecological impact of boulderfield terrain modification on lizard habitat requires investigation.

The areas that show the highest level and most widespread occurrence of vegetation modification are those that are most heavily used by skiers/riders, are frequently groomed, and especially at lower altitude where the snowpack can be shallow. Key areas include the beginners/intermediate zone serviced by the Bunny Platter Lift; Chook Run, and the lower slopes of Trails taking skiers/riders to lift base stations.

Historical and current licence conditions at Mount Dobson Ski Area are probably not as ecologically strict as those experienced by other commercial ski fields that have a longer history of being located on Conservation land. This has likely resulted in a more relaxed attitude to conducting e.g. pipe trenching activities without planning for vegetation restoration follow-up work; not doing remedial work where gully erosion has occurred.; or possibly taking of water out of a highly natural seepage/stream for snow making without a water consent for this purpose to ensure that rules around how water flow is to be maintained can be followed. Tussock replanting of a disturbed area took place 35 years ago, and has been successful, however this is the last time that such vegetation restoration work has been done. Compare this with larger ski areas (albeit with much higher visitor numbers than at Dobson Ski Area), which have an annual ecological restoration programme that aims to remediate areas that experience on-going damage e.g. on ski trails.

Mount Dobson Ski Area can be credited with their management that has largely not introduced exotic plant species onto the ski field.

The ski field road will always have some material falling down the side during maintenance and snow clearing. This does not appear to be increasing in extent, and native plants present are regenerating into these areas. Control of ecological weeds planted beside the road, and spreading beyond, are the main issue within the road easement. MDSAL have already felled the lodgepole pine planting, and need to follow through with the weed control measures outlined.

## 11.Recommendations

Additional information is required to support the Concession Application i.e.

- Obtain expert advice on lizard habitats and values
- Verify that correct water consents are held

To protect the integrity of the ecological values present within the Licence Area and access road Easement, the following actions are recommended:

- Conduct ecological weed control
- Conduct wild animal control
- No disturbance to seepages and streams
- Conduct vegetation restoration
- Consider provision for gravel processing and storage of ski lift equipment in Easement
- Update Standard practices for MDSAL site works to mitigate adverse ecological effects

These are discussed below.

### 11.1. Expert advice on Lizard values and Habitat

Preliminary feedback from a herpetologist is that the boulderfields and screes at Mount Dobson Ski Area are highly likely to provide excellent habitat to a suite of lizards, some of which are at risk or threatened with extinction. A lizard survey may be necessary. A herpetologist will need to provide guidance as to the impact of ski field activities (e.g. modification of boulderfields through rock picking) on lizard habitats, and what habitat rehabilitation would be appropriate.

### 11.2. Verify resource consents held

The only water consent held on Environment Canterbury's Consent webpage<sup>1</sup> is CRC992806, which is to take water from Firewood Stream and 'shall only be used for toilet and day use facilities'. There appears to be no consent for taking water for snow making purposes. MDSAL need to verify the status of their resource consents with Environment Canterbury.

### 11.3. Ecological Weed Control

#### 11.3.1. Californian Thistle

Californian thistle is the only exotic species observed that is considered necessary and practical to control within the Licence Area. This small (~5m<sup>2</sup>) infestation is located on a track that has regenerating native plants, but is starting to spread into the adjacent moist *Celmisia angustifolia* herbfield that is otherwise very natural. This infestation most likely originates from seed brought in on machinery, as it is also growing in the general locality of the gravel stock pile at the lower end of the Easement (Figure 40).

Control of Californian thistle requires persistence. It spreads primarily by its rhizomatous root system, rather than by seed, so the focus has to be on destroying the root system. The use of glyphosphate

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<sup>1</sup><https://www.ecan.govt.nz/data/consentsearch/consentdetails/CRC992806/Mount%20Dobson%20Ski%20Area>

herbicide on the infestation on the Ski Area would require care given that the surrounding native vegetation is natural and could also be killed. It would be preferable to control the thistle by physical means (i.e. by clippers to ground level, three times per growing season, ideally when it is raining, as damp conditions facilitate a fungal infection that further weakens the plants) but this is probably not going to be practical for the ski area.

Thistles in the vicinity of the gravel stockpile in the Easement, should also be spot sprayed using glyphosphate.

### 11.3.2. Wilding Pines

Lodgepole pine is one of the most invasive pine species, establishing into, and overtopping tussockland and shrubland communities. The stand of lodgepole pine has been felled, but young wilding lodgepole were observed along the road corridor and within open *Dracophyllum* shrubland and tussockland, both in close proximity to the original planting (Figure 41), and to 1400 m asl. in subalpine shrubland. They are highly likely to have spread further afield into the Te Kahui Kaupeka Conservation Park. None were found within the Licence Area.

These require immediate control. Young seedlings can be hand pulled. Larger sapling and trees can be cut at ground level, ensuring that no needles remain, and Vigilant paste applied to the stumps. If they are ever found within the Licence Area, they must be removed.

### 11.3.3. Catchment Board plantings

Alder, grey and bitter willow have successfully stabilised scree, but have also spread to areas both above the road, and downstream to occupy significant sections of the streambeds well below the road corridor. They occupy the native *Hoheria lyallii* habitat, and while a few individual mountain ribbonwood were observed growing amongst some of the stands, it is likely that the exotic species are preventing it from colonising the gullies.

Expert advice should be sought prior to control, but given that it will be desirable to continue to stabilise the scree slopes below the road for safety reasons, one option would be to spray/drill them and to leave them standing (rather than chopping them down), and to interplant with native species including *Hoheria lyallii* and broadleaf, which would eventually take over the scree stabilising role.

### 11.3.4. Gorse

Occasional gorse shrubs are located close to the road in the vicinity of the entrance to the Te Kahui Kaupeka Conservation Park. These pose a threat (especially in a warming climate) to native tussockland and shrubland communities and should be controlled,.

## 11.4. Animal Control

Thar and wallaby were observed during the survey, however the Department of Conservation notes that fallow deer, red deer and chamois are also known to be present on this Conservation land. These wild animal, including hare, browse on native plants. The benefits of wild animal control to MDSAL will widen as it conducts more vegetation restoration work in the future. Recreational hunting within the Mt Dobson Licence Area part of Te Kahui Kaupeka Conservation Park is prohibited by the Department. Responsibility for wild animal control lies with the Department and/or Mt Dobson Ski Area.

### 11.5. No disturbance to Seepages and Streams

The herbfield community associated with the seepages and streams are highly natural, and of high ecological value. Ski field activities must not disturb these areas, and adequate flow must be maintained so that seepages are not run dry.

### 11.6. Vegetation Restoration

There are virtually no exotic plant species present on the Ski Area, and the regeneration of native species is naturally taking place at some low use or resilient disturbed sites.

However, there are also areas of recent and ongoing vegetation loss and modification at Mount Dobson Ski Area, especially at lower altitude. Examples of recent vegetation loss/damage include where vegetation removal has recently taken place in the process of installing a water pipe across tussockland, and where snow groomer tracks have damaged cushionfield and herbfield vegetation. Elsewhere the initial modification to vegetation took place years ago, but on-going disturbance has prevented natural regeneration from occurring. Examples include gully erosion from a track blowing out above the Chair base station, and high use Trails where skier traffic and grooming, combined with lower snow pack, has resulted in scalping or death of vegetation.

Vegetation restoration effort should initially be focussed on areas where vegetation loss or modification has taken place recently. Replanting of tussocks and associated native species must take place as soon as possible where trenching has taken place. Standard practices for restoration works developed at other ski areas have proved ecologically successful and could be employed at Mount Dobson Ski Area (see Section 9).

It would be of benefit to also undertake additional rehabilitation planting of appropriate native plant species in areas of historical damage. At Mt Dobson Ski Area, priority areas include the gully erosion above the Chair Lift Base station; Chook Run, and where snow groomers have damaged vegetation. To speed up the regeneration of induced boulderfield associated with the Bunny Platter Trails, seeds from blue tussock, *Rytidosperma pumilum*, bidibid and *Luzula pumila* could be collected from other sites, and broadcast amongst the rocks.

### 11.7. Easement Provisions for gravel processing and storage of ski lift equipment

Roading material is currently processed towards the bottom of the Easement, while ski lift equipment is stored just below, and out of view of, the access road at 1120m asl. (Figure 43). If MDSAL wishes to continue to conduct these activities within the Easement, the Concession application needs to include provision for them. A condition should include the requirement that all roading material brought into the Ski Area be weed-free.

### 11.8. Update Standard practices for MDSAL site works to mitigate adverse ecological effects

At many of the large commercial ski areas on Conservation land, there is recognition that site works have the potential to result in adverse ecological effects and construction methodology has evolved over the years to mitigate potential adverse effects. Standard practices for site works include:

- Minimising the footprint of disturbance
- Avoiding areas of high ecological value (such as flush areas) and avoiding streams and their margins

- Removing native vegetation cover and soil from the footprint of a development. These plants are used for replanting where possible *in situ*, or elsewhere on the ski field where restoration is desirable (tussocks and cushionfield vegetation has successfully been replanted), with a requirement that the plants are replanted within 4 weeks, or cared for off-site to ensure their survival;
- Removing At Risk/Threatened species if these cannot be avoided. Removal is by hand, and immediately planted in similar habitat outside the Lease within the Conservation Area and monitored
- Replanted areas to be photo-monitored, and ongoing replacement of native species carried out
- Erosion and sediment control practices during works;
- Steam cleaning equipment prior to entry to avoid the introduction of invasive weeds;
- Use of specialised machinery (such as tracked diggers);
- Identifying machinery routes to work sites in conjunction with DOC staff prior to works commencing;
- Limiting the area of disturbance and taping off the area of disturbance;
- Over-snow transport of equipment and materials where possible

Conditions need to be set in the Concession document to address these issues.

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**APPENDIX 1:** Description of Priority Natural Area: Two Thumb Range *Priority Natural Area 59-5-03:* Mount Dobson (from Harrington, W.M.A., Cooper, P.J.; Davis C.M.; Higham, T.D.; and Mason C.R. 1986. Heron Ecological Region : Arrowsmith, Hakatere, and Two Thumb Ecological Districts : survey report for the Protected Natural Areas Programme .Wellington, N.Z. : Dept. of Lands and Survey, 1986 (New Zealand Protected Natural Areas Programme (Series); no. 4) ISSN 0112-9252. 214pp.)

TWO THUMB PRIORITY NATURAL AREA 3

59/05/PNA03 MOUNT DOBSON

590 260040

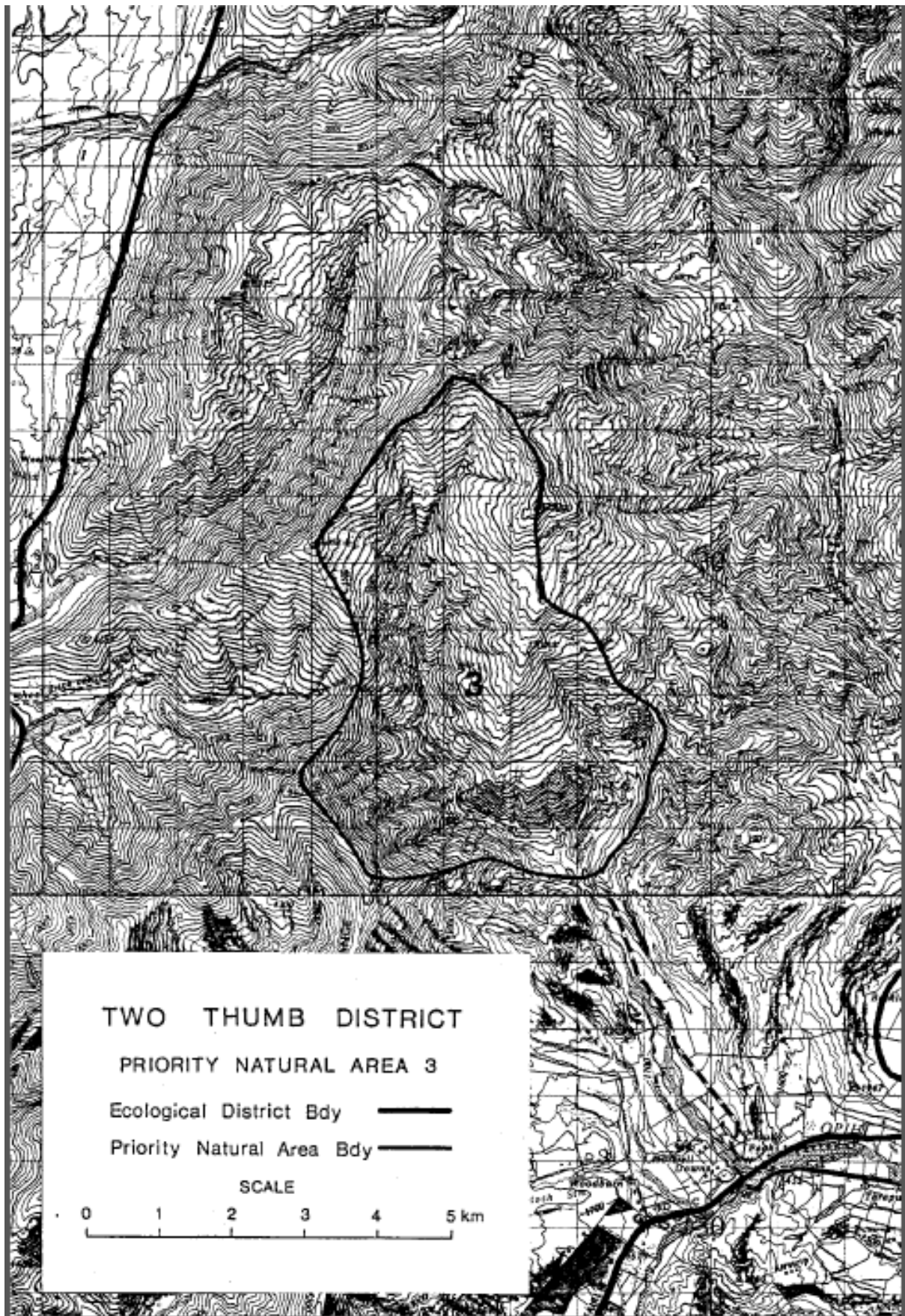
TA	DRAUNI-CELANG-POACOL bluff and Rockland	on Mountain
TA	DRAUNI-CELANG-POACOL bluff and Rockland	on Hill
TF	CHIRIG Tussockland	on Hill
TI	DRASPP-CHIRIG-CHIMAC tussock Shrubland	on Hill
TJ	DISTOU-BOSRUB/FESNOV tussock Shrubland	on Hill
TX	DISTOU-CRILIT Shrubland	on Hill
TK	DISTOU-CRILIT Shrubland	on Valley tce
TL	HOHLYA-ARIFRU-COPspp. Shrubland	on Hill
	Scree and bluff communities	

VEGETATION:

Mt. Dobson contains a wide range of community types. In the head of the valley are numerous small relict cirque basins containing a variety of fellfield species such as Phyllachne colensoi, Raoulia grandiflora, Celmisia viscosa and Chionochebe pulvinaris. In small seepage areas and stream margins species such as Caltha obtusa, Euphrasia revoluta and Poa dipsacea are found. Carex allanii, previously unrecorded in this area, has been found in some of these seepage areas. Areas of scree and bluffs provide habitats for plants such as Hebe pinguifolia, Aciphylla monroi, South Island edelweiss (Leucogenes grandiceps), Aciphylla dobsonii and Hebe haastii. Cushionfields dominated by Celmisia sessiliflora are common. On upper hill sideslopes, the vegetation is predominantly Chionochoa macra snow tussock- Celmisia species- fescue (Festuca novae-zelandiae) associations grading into C. rigida snow tussock associations on lower hillslopes. On damper wetter faces, Dracophyllum acerosum and D.longifolium become more common along with Aciphylla colensoi var. maxima and Celmisia semicordata. Small patches of Coprosma spp.- mountain ribbonwood (Hoheria lyallii)- Chionochoa conspicua- Dracophyllum spp. shrublands are found in stream cuttings and gullies. Mixed shrublands become more important in the lower Firewood Stream area with a significant stand of mountain totara (Podocarpus hallii)- Pseudopanax crassifolius- broadleaf (Griselinia littoralis) forest.

LANDFORMS:

This valley has good vegetation cover to moderate altitudes, and is representative of the valleys at the southern end of the Two Thumb Range that are influenced by the easterly weather fronts which can often bank up along the ridges. The dominant lithology here is a weakly schistose, non-foliated greywacke (Haast Schist Group, Chlorite subzone II)(1). Rock bluffs are prominent near the head of the catchment, and are also in the steeper, south-west corner of the area. Thick colluvium and mass movement deposits are extensive elsewhere, exposed in the mid to high altitude areas, where the vegetation is scarce. While the upper valley has many features indicative of recent glaciation, the cirque topography is somewhat more subdued than that





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in more northern parts of the district.

Soils of the Kaikoura set cover the majority of this area, with some Hurunui set soils in the lower valley, and Alpine set along the ridge tops and on the summits.

FAUNA:

Forest bird species are associated with the scrub and forest remnants above firewood stream.

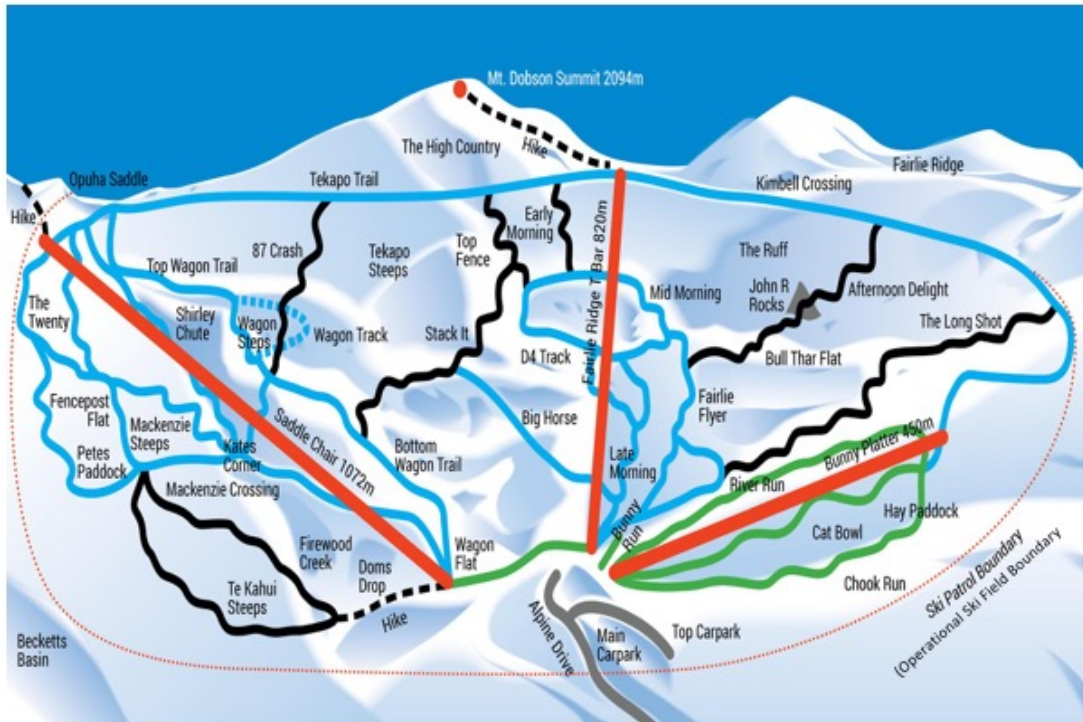
CRITERIA:

This area includes a range of vegetation communities and landforms representative of the southeastern end of the Two Thumb Range. A good range of altitudes, aspects, landforms and vegetation communities are represented. This area contains the best stands of remnant mountain totara/hardwood forest in the district, as well as good examples of high altitude, east facing cirque basins. Mt Dobson is the type locality for Aciphylla dobsonii and Helichrysum plumbeum. The uncommon Carex allanii is recorded from here. Catchment boundaries provide the best natural buffer zones, but the impact of the Mt Dobson skifield within this priority natural area must be considered.

PHYSIOGRAPHY:

Area (ha) : 2117  
Altitude range (m) : 600 - 2100  
Type/Aspect : Catchment: South  
Tenure : Crown Land  
Sample sites : 1101/1103/1102/1105,1106,1111/1107,  
1108/1110/(1109)/1104  
References : (1) Ackroyd,(1983)

**APPENDIX 2: Trail Map – Operational Boundary of Mount Dobson Ski Area**



**APPENDIX 3: Plant Species at Mt Dobson Ski Area [\* denotes an exotic species]**

<b>Scientific Name</b>	<b>Common Name</b>
<b>Monocots including Grasses</b>	
<i>*Agrostis capillaris</i>	Brown top
<i>*Anthoxanthum odoratum</i>	Sweet vernal
<i>*Festuca rubra subsp. Commutata</i>	Chewings fescue
<i>*Holcus lanatus</i>	Yorkshire fog
<i>Agrostis subulata</i>	grass
<i>Carex allanii</i>	sedge
<i>Carex lachanalii</i>	sedge
<i>Carex petriei</i>	sedge
<i>Carex pyrenaica var. cephalotes</i>	sedge
<i>Chionochloa flavescens</i>	Broad-leaved snow tussock
<i>Chionochloa macra</i>	Slim-leaved snow tussock
<i>Chionochloa rigida</i>	Narrow-leaved snow tussock
<i>Deschampsia pusilla</i>	grass
<i>Festuca novae-zealandiae</i>	Hard tussock
<i>Hierochloe novae zelandiae</i>	Grass
<i>*Holcus lanatus</i>	Yorkshire fog
<i>Juncus novae zelandiae</i>	Rush
<i>Koeleria cheesemanii</i>	Grass
<i>Luzula pumila</i>	Woodrush
<i>Luzula rufa</i>	Woodrush
<i>Marsippospermum gracile</i>	Rush
<i>Phormium cookianum</i>	Mountain flax
<i>Poa colensoi</i>	Blue tussock
<i>Poa dispacea</i>	Grass
<i>Poa lindsayi</i>	Lindsay's poa
<i>Rytidosperma pumilum</i>	Grass
<i>Rytidosperma setifolium</i>	Bristle tussock
<i>Schoenus pauciflorus</i>	Sedge
<b>Herbs</b>	
<i>Acaena caesii-glauca</i>	bidibid
<i>Acaena fissistipula</i>	bidibid
<i>Aciphylla dobsoni</i>	Dobson's speargrass
<i>Aciphylla monroi</i>	Speargrass
<i>Aciphylla scott-thompsonii</i>	Giant speargrass

<i>Anaphalioides bellidioides</i>	Hells bells
<i>Anisotome aromatica</i>	kopoti
<i>Anisotome flexuosa</i>	
<i>Argyotegium mackayi</i>	
<i>Brachyglottis lagopus</i>	
<i>Brachyscome longiscapa</i>	
<i>Brachyscome radicata</i>	
<i>Caltha obtusa</i>	White caltha
<i>Cardamine sp.</i>	Native cress
<i>Celmisia angustifolia</i>	Mountain daisy
<i>Celmisia gracilenta</i>	Mountain daisy
<i>Celmisia haastii</i>	Mountain daisy
<i>Celmisia laricifolia</i>	Mountain daisy
<i>Celmisia lyalli</i>	Mountain daisy
<i>Celmisia semicordata</i>	Mountain daisy
<i>Celmisia sessiliflora</i>	Mountain daisy
<i>Celmisia spectabilis var. magnifica</i>	Mountain daisy
<i>Celmisia viscosa</i>	Mountain daisy
* <i>Cerastium fontanum</i>	Mouse-eared chickweed
<i>Colobanthus apetalus</i>	Pin cushion
<i>Colobanthus strictus</i>	Pin cushion
<i>Coriaria plumosa</i>	Feathery tutu
<i>Dolichoglottis scorzoneroides</i>	White snow marguerite
<i>Epilobium alsinoides</i>	Willowherb
<i>Epilobium brunnescens</i>	Willowherb
<i>Epilobium glabellum</i>	Willowherb
<i>Epilobium komarovianum</i>	Willowherb
<i>Epilobium macropus</i>	Willowherb
<i>Epilobium melanocaulon</i>	Willowherb
<i>Epilobium porphyrium</i>	Willowherb
<i>Epilobium pycnostachum</i>	Willowherb
<i>Epilobium tasmanicum</i>	Willowherb
<i>Euphrasia revoluta</i>	
<i>Gentiana corymbosa</i>	Gentian
<i>Geranium brevicaulis</i>	Geranium
<i>Geum leiospermum</i>	Avens

<i>Haastia sinclairii</i>	
<i>Helichrysum filicaule</i>	
* <i>Hieracium lepidulum</i>	Tussock hawkweed
* <i>Hypochaeris radicata</i>	Catsear
<i>Kelleria dieffenbachii</i>	
<i>Leptinella atrata</i>	Scree button daisy
<i>Leptinella pusilla</i>	
<i>Leucogenes grandiceps</i>	South Island edelweis
<i>Lobelia angulata</i>	Lobelia
* <i>Mimulus muschatus</i>	Musk
<i>Montana fontana subsp. fontana</i>	
<i>Montia sessiliflora</i>	
<i>Myosotis drucei</i>	For-get-me not
<i>Notothlaspi rosulatum</i>	Penwiper
<i>Ourisia caespitosa</i>	
* <i>Pilosella praealta</i>	King devil hawkweed
* <i>Pilosella officinarum</i>	Mouse-eared hawkweed
<i>Ranunculus crithmifolius</i>	Scree buttercup
<i>Ranunculus maculatus</i>	Buttercup
<i>Raoulia grandiflora</i>	
<i>Taraxacum magellanicum</i>	Native dandelion
* <i>Trifolium repens</i>	White clover
<i>Veronica decora</i>	parahebe
<i>Viola cunninghamii</i>	Viola
<i>Wahlenbergia albomarginata</i>	Native harebell
<b>Cushion forming plants</b>	
<i>Oreobolus pectinatus</i>	comb sedge
<i>Phyllachne colensoi</i>	
<i>Raoulia eximina</i>	vegetatable sheep
<i>Raoulia hectori subsp. hectori</i>	mat daisy
<i>Raoulia subsericea</i>	mat daisy
<i>Raoulia youngii</i>	mat daisy
<i>Veronica pulvinaris</i>	cushion hebe
<b>Shrubs</b>	
<i>Coprosma dumosa</i>	Mingimingi
<i>Coprosma propinqua</i>	Mingimingi

<i>Coprosma rugosa</i>	Mingimingi
<i>Dracophyllum acerosum</i>	
<i>Dracophyllum longifolium</i> var. <i>longifolium</i>	Inaka
<i>Dracophyllum pronum</i>	Trailing neinei
<i>Dracophyllum prostratum</i>	
<i>Dracophyllum rosmarinifolium</i>	
<i>Gaultheria crassa</i>	Snowberry
<i>Gaultheria depressa</i>	Snowberry
<i>Acrothamnus colensoi</i>	
<i>Leucopogon fraseri</i>	Dward mingimingi
<i>Melicytus alpinus</i>	Porcupine shrub
<i>Myrsine nummularia</i>	Creeping matipo
<i>Ozothamnus leptophyllus</i>	Tauhinu
<i>Pimelea oreophila</i> subsp. <i>Lepta</i>	Pimelea
* <i>Ulex europeaus</i>	Gorse
<i>Veronica buchananii</i>	Hebe
<i>Veronica epacridea</i>	Hebe
<i>Veronica haastii</i>	Hebe
<i>Veronica odora</i>	Hebe
<i>Veronica pinguifolia</i>	Hebe
<b>Trees</b>	
* <i>Alnus glutinous</i>	Alder
<i>Griselinia litoralis</i>	Broadleaf
<i>Hoheria lyallii</i>	Mountain ribbonwood
* <i>Pinus contorta</i>	Lodgepole pine
<b>Ferns &amp; Fern Allies</b>	
<i>Blechnum penna-marina</i>	Little hard fern
<i>Cyopteris tasmanica</i>	fern
<i>Huperzia australianum</i>	club moss
<i>Lycopodium fastigiatum</i>	club moss
<i>Polystichum cytostegis</i>	Bladder fern
<i>Polystichum vestitum</i>	Prickly shield fern
Lichen species	
Moss species	