Toitu te whenua
Land Information
New Zealand

Crown Pastoral Land Tenure Review

Lease name : Mt Potts

Lease number : Pc 143

Conservation resources report

As part of the process of tenure review, advice on significant inherent values within the pastoral lease is provided by Department of Conservation officials in the form of a conservation resources report. This report is the result of outdoor survey and inspection. It is a key piece of information for the development of a preliminary consultation document.

The report attached is released under the Official Information Act 1982.

Copied June 2003

CONTENTS

PART 1 INTRODUCTION

This report describes the significant inherent values present on Mt Potts Pastoral Lease. Field survey reports upon which this report is based are listed below. This report forms part of the Mt Potts Pastoral Lease tenure review process.

Mt Potts Pastoral Lease covers an area of approximately 9692 hectares in the upper Rangitata Valley in Canterbury. The property lies between the Rangitata River, Potts River and Potts Range. It adjoins two other pastoral leases: Erewhon across the Potts Range to the west and Hakatere across the Potts River to southeast. DOC-administered conservation land lies across the Potts River to the northeast, and areas of UCL adjoin the property in the Rangitata River bed to the southwest.

Mt Potts Pastoral Lease covers the eastern flank of the Potts Range and small part of the Rangitata Valley floor. It lies between approximately 500 and 2180 metres altitude, with the majority of the property above 600 metres. The property is drained by tributaries of the Potts and Rangitata rivers.

The property lies across the boundary of the Arrowsmith and Hakatere ecological districts within Heron Ecological Region. Heron Ecological Region was surveyed as part of the Protected Natural Areas Programme in the mid 1980s. Three areas identified as priority natural areas (PNAs) for protection during that survey (Harrington *et al*, 1986) lie wholly or partly on Mt Potts Pastoral Lease: Arrowsmith PNA 4, Erewhon Beech Remnants; Hakatere PNA 20, Potts Gorge; and, Hakatere PNA 21, Rangitata River.

Field survey reports upon which this report is based:

- Mt Potts Pastoral Lease Landscape Assessment, Alan Petrie, November 2002. 15p+maps+ photographs.
- Tenure Review Report: Mt Potts Vegetation, Mark Davis, January 2003. 20p+appendices+ map + photographs.
- Assessment of the Fauna Values of Mt Potts Pastoral Lease, Jane Sedgeley, DOC, December 2002. 13p+map+photographs.
- Mt Potts Pastoral Lease Invertebrate Assessment, Simon Morris, December 2002. 6p+maps.
- Mt Potts Pastoral Lease, A Report on Aquatic Fauna Surveys, Scott Bowie, December 2002. 10p+map+photographs.

PART 2 INHERENT VALUES: DESCRIPTION OF CONSERVATION RESOURCES AND ASSESSMENT OF SIGNIFICANCE

2.1 LANDSCAPE

Mt Potts Pastoral Lease encompasses a large tract of high country on the northern side of the upper Rangitata River. The property is dominated by two major physical components: the southern extent of the Potts Range; and, the flood plain of the Rangitata River. In its wider context Mt Potts forms an integral part of the upper Rangitata Valley: a high country landscape that spans several properties.

Mt Potts Pastoral Lease contains a spectacular diversity of glacial and fluvio-glacial landforms, including: U-shaped alpine valleys, lateral moraines, hummock fields, truncated benches and spurs, incised side-streams, outwash plains, and roche moutonnées.

Access to the pastoral lease is via the Hakatere-Potts Road, which traverses the intermontane basin containing lakes Clearwater and Camp. The panoramic views from this road of both the surrounding mountains and river outwash plain capture much of the natural processes and elements that are an integral part of Canterbury's high country. The area is steeped in history, with Samuel Butler establishing the early pastoral run of Mesopotamia nearby in 1860 and then using the area as a setting for his novel: the New Zealand classic "Erewhon".

For this assessment of significant inherent values, Mt Potts Pastoral Lease is divided into eight landscape units. These units are illustrated on the Landscape Unit Map on the following page, and are described below.

Landscape Unit 1

This unit comprises a large block of glaciated mountain lands at the northern end of the pastoral lease. The unit's boundaries narrow towards the north where the upper catchment of the Potts River becomes steeper and more enclosed. The western boundary is defined by the serrated ridge crest of the Potts Range. The distinctive narrow ridge crest that separates the peaks of this range is a razorback forged by flanking glaciers. Descending from the narrow ridge crests are rectilinear slopes that terminate along the incised Potts River. Separating these straight slopes are large angulated valleys that are characterised by shallow cirques, rocky buttresses, and extensive scree faces with talus cones on the valley floor.

Overlooking the Potts River is a sequence of elevated moraine terraces, some of which have been cut into parallel steps due to the action of successive glacial retreats. Where watercourses have cut down through the terraces, these steps have become truncated in appearance. The Potts River is confined to a meandering channel. The area is dominated by long sheets of stable scree, snow tussockland, short tussockland and small patches of shrubland.

<u>Landscape Values</u>
This unit has outstanding inherent landscape values. A special feature is the legible imprint of the glacial processes mainly in the form of flights of terraces and truncated benches. These landforms have strong horizontal lines, which contrast vividly with the upper side slopes.

Visual Values
This unit has moderately-low visual resource values due to the unit's remoteness.

Potential Vulnerability to Change
This unit is highly sensitive to change. The main threats include:
- Construction of tracks that would be highly visible and intrusive.
- Fences that would detract from existing coherent qualities.
- Any decline in the ecological health of the snow tussock.
- Unsympathetic siting of any "built" elements, such as transmitters.
- Possible spread of wilding trees.
- Possible power projects

Landscape Unit 2

This unit encompasses all of the dissected slopes that descend towards the mid-section of the Potts River. The unit is sandwiched between the glaciated mountains in the north (Landscape Unit 1) and the expansive sloping moraine plateau to the south (Landscape Unit 3). It is characterised by a series of small, angulated gullies that stem out from the foot slopes of an unnamed peak to the west.

A notable feature of the unit is the narrow gorge through which the Potts River flows, with the constricted river channel forming a number of white-water pools. The sidewalls of the gorge are nearly vertical, and natural erosion has left pinnacles of bedrock protruding. Ground cover is dominated by short tussockland, with occasional snow tussockland on shaded faces and matagouri[1] shrubland extending up from the valley floor.

Landscape Values
This unit has high landscape value, and forms a transition between landscape units 1 and 3. It is dominated by the wild and scenic river gorge. The formative process that created the gorge, the down-cutting of water along a weak lineal rock seam, is highly legible. The gorge's austere natural traits contrast markedly with the adjoining rounded foot slopes.

Visual Values
This unit has moderately-low visual resource values due to its remoteness. However the gorge does convey special visual qualities in the form of a strong sense of containment, making the unit an ideal setting for backcountry recreation.

Potential Vulnerability to Change
This unit is highly vulnerable to change. The main threats include:
- Construction of tracks or subdivision fencing close to the gorge.
- Changes in the composition of the vegetation.
- Possible spread of wilding trees.
- Possible power projects

Landscape Unit 3

This unit consists of the sloping moraine terrace that extends out from the southern tip of the Potts Range. The terrace slopes evenly from 1100m to approximately 700m altitude at the edge of the trench that contains the Potts River. This distinctive landscape features low parallel moraine ridgelines, subdued topography and a young drainage pattern that is superimposed over the ground surface. Along the southern boundary of the unit frequent watercourses have made deep incisions into the surface of the terrace.

[1] Scientific names of species are listed in Section 4.1.1

The vegetation across the terrace is relatively homogenous, and dominated by low-stature snow tussockland. A feature of the ground cover is the occasional patch of silvery lichen on areas of exposed stonefield. The lower southwest end of the unit has been developed and subdivided into deer paddocks.

Landscape Values
This unit has high landscape values attributable to the lack of complexity in the terrain, unvarying tussock cover, and the unit's visual prominence. The formative processes that created the terrace are apparent, and the terrace has inherent qualities that are dissimilar to surrounding glacial landforms.

Visual Values
This unit has extremely high visual resource values. It is an integral component of the visually-accessible margins of the upper Rangitata River, and is the frontispiece of the view from Lake Clearwater and the Hakatere-Potts Road.

Potential Vulnerability to Change
This unit is highly sensitive to change. Threats include:
- Vegetation change, including "greening" through pasture development.
- Further subdivision or track construction.
- Spread of wilding trees.
- Inappropriate siting, design and exterior colour of buildings.
- Possible power projects

Landscape Unit 4

This unit comprises the deeply-entrenched valley that contains the Potts River. It extends from the rocky gorge in the north (Landscape Unit 2) to the start of the outwash flats of the lower Potts River. The unit has a distinctive box-shaped cross section that has an unvarying appearance until it joins the Rangitata Valley. The side slopes have a constant gradient formed by the gradual down-cutting of the river through the glacial gravels. In places the single- to multi-channeled river has left a series of thin alluvial terraces.

The vegetation is dictated by aspect and stability of the land. Most of the side slopes within the river trench support short tussockland or bare ground. Shrublands occupy the damper gullies, matagouri occupies the margins of the river, and small remnants of mountain beech are present at the gorge entrance.

Landscape Values
This unit has moderately-high landscape value. The strong lineal qualities of the river trench, which cuts a swathe through the surrounding moraine, give a clear indication of the dynamic processes that created this distinctive landscape.

Visual Values
This unit has moderate visual values. Its characteristics can best be appreciated from an aerial perspective.

Potential Vulnerability to Change
Although this unit has relatively robust inherent characteristics, it is vulnerable to certain threats, including:
- Vehicle tracks.
- Stock-grazing and trampling along riparian areas.
- Gravel extraction from river terraces or bed.
- Construction of groynes.

- Weed infestation, especially the river bed.
- Possible power projects

Landscape Unit 5

This unit incorporates a collection of glaciated landforms over a wide altitudinal range. Mt Potts and surrounding peaks dominate the northern section of the unit, comprising a shallow cirque basin, scree faces and rocky buttresses. Powerhouse Stream drains this basin, flowing out to the Rangitata River via a well-defined gully. The Pyramid, located in the centre of the unit, separates two U-shaped valleys and is a distinctive peak that is prominent from many viewing points in the upper Rangitata Valley.

The lower-altitude part of the unit covers a series of lateral moraine benches and hummocky mounds, with deep gullies fanning out before reaching the outwash plain of the Rangitata River. Rock and scree dominate upper slopes; tussockland occupies mid-slopes; and, developed pasture or scrub is present at the base of the slope.

Landscape Values

This unit has high landscape value. A number of distinctive glacial landforms (U-shaped valleys, lateral moraine benches and truncated ridgelines) are demonstrated within a relatively short distance. It is a high country landscape where landform completely dominates both vegetative cover and land use; even developed areas along the foot slopes do not compromise the surrounding natural landscape.

Visual Values

Similar to Landscape Unit 3, this unit forms an integral part of the "visual wall" of the upper Rangitata Valley when viewed from the Hakatere-Potts Road. These steep faces are also prominent from Mesopotamia and the Rangitata Gorge Road on the south side of the Rangitata Valley.

Potential Vulnerability to Change

This unit is moderately sensitive to change due to the complexity of the landform. The main threats include:

- Plantation forestry, which would disguise the distinctive glacial landforms.
- Further track construction.
- Subdivision fencing that disregards landform.
- Erection of structures on visually-sensitive skylines and ridgelines.
- Inappropriate siting, design and colour of buildings.
- Possible power projects

Landscape Unit 6

This unit incorporates two distinctive physical features: the alluvial floodplain of the Rangitata River; and, the prominent roche moutonnée, Mt Sunday. The old braided river channels are still prominent on the river floodplain, and contrast markedly with the hummocky appearance of Mt Sunday. Stable parts of the valley floor, at the confluence of the Potts and Rangitata rivers, have been developed into pasture with shelter belts and farm buildings. The homestead and its utility buildings are traditional in layout with some of the older buildings now utilized as a tourist lodge.

In addition to the main braided channels of the Rangitata River, the floodplain contains a number of shallow winding streams that have their sources in the adjoining slopes of the Potts Range. Most of the recent floodplain surrounding Mt Sunday is UCL, though parts of that area

are grazed by Mt Potts Station under a special grazing permit. The vegetation pattern across the flood plain is a mixture of stonefield, short tussockland and matagouri shrubland.

Mt Sunday is a conspicuous landmark that can be seen from many different viewpoints owing to the lack of physical relief over the floodplain. This glacial hillock comprises two basic components: the central rocky buttress of the roche moutonnée; and, the surrounding hummocky terrain of the moraine, both of which are partially buried by the outwash gravels that have built up around the hillock. A number of lakes occupy the depressions between the hummocks. Bordering Mt Sunday are several intact wetlands and swampy areas.

Landscape Values
Both the recent outwash flats and Mt Sunday have high landscape value. Both make important contributions to the upper Rangitata Valley landscape and are highly characteristic of the Canterbury high country landscape. Mt Sunday also has contemporary heritage value, as it provided the setting for the mythical village of Edoras during the filming of "Lord of the Rings".

Visual Values
This unit has extremely high visual resource values. It is visible over long distances and has two-dimensional qualities that help to set off the distant views of the surrounding mountain ranges. Mt Sunday forms an interesting focal point within the unit.

Potential Vulnerability to Change
This unit is sensitive to change. Threats include:
- Quarrying of gravel.
- Spread of riverbed weeds e.g. wilding pines, willow, and gorse.
- Damage to wetlands and streambeds by stock trampling and grazing.
- Construction of tracks or fences.
- Erection of structures.
- Uncontrolled vehicle access to the flood plain.
- Possible power projects.

Landscape Unit 7

This unit comprises the long alpine valley that contains Erewhon Park Ski Field. This valley penetrates into the Potts Range from the south and is defined in the north by a head basin that features high peaks and steep head-walls. Mid-valley slopes are covered in a mantle of stable scree, and the bottom section is confined in a narrow gorge cut into the faces that overlook the Rangitata Valley.

Rock and scree dominate the upper parts of the unit with snow tussockland and shrubland along the stream margins. The lower, incised part of the valley supports mountain beech forest, with patches of mountain totara on surrounding gorge-sides. This valley contains a number of "built" elements including a well-formed road and parts of an old ski tow.

Landscape Values
This unit contains high landscape values. Within this symmetrical valley the landform completely dominates the vegetation. The fine texture and blue-grey colorations of the scree create vivid patterns when adjacent to patches of snow tussock. This valley forms the impressive alpine backdrop to the ski area, and the present scale of this operation is subservient to the high inherent values contained within the valley.

Visual Values
This unit has moderate visual resource values. It is visually accessible from the ski field road, and the overall sense of enclosure becomes greater when ascending the valley.

Potential Vulnerability to Change
This unit is moderately sensitive to change. The main threats include:
- Spread of gorse and broom along the ski field access road.
- Upgrading of the ski field road on the steeper slopes.
- Damage to the tall tussock during "grooming" of the slopes.
- Further proliferation of discarded ski field equipment.
- Possible power projects.

Landscape Unit 8

This unit includes all of the slopes that overlook the Rangitata Valley in the western part of the property. These upper- and mid-sections of these southwest-facing slopes are a constant grade, while the foot slopes tend to become gentler. The ground surface is relatively smooth owing to the mantle of glacial soils that cover these slopes. At frequent intervals narrow "gutters" are cut into the ground surface, while in other areas there are long straight screes and stripes of wind erosion.

Rock and scree dominate the upper slopes; snow tussockland occupies most mid slopes; and, scrub and pasture are present lower down. Small remnants of mountain beech forest are present along Caroline Stream on the property boundary.

Landscape Values
This unit has moderately-high landscape values. This unit is still predominately natural in landscape character and forms an integral part of the distinctive upper Rangitata Valley landscape. The natural weathering processes on the western faces are a striking feature, with the finely-grained texture of the sheets of scree contrasting vividly with the improved grasslands lower down.

Visual Values
The slopes that overlook the Rangitata Valley have a high visual resource value as they form part of the overall "visual wall" that surrounds the river when viewed from the Hakatere-Potts Road. The more western faces form an impressive backdrop to the front country on the neighbouring Erewhon Pastoral Lease.

Potential Vulnerability to Change
This unit is only moderately sensitive to change. The main threats include:
- Further subdivision fencing.
- Further depletion of beech remnants.
- Siting of utilities on visually sensitive skylines and ridgelines.
- Further zigzag tracking that requires extensive earth works in the form of side-casting.
- Possible power projects.

2.2 LANDFORMS AND GEOLOGY

Three distinct and contrasting landforms dominate Mt Potts Pastoral Lease: the mountainous glaciated country of the southern Mt Potts Range, which makes up the bulk of the property; the broad outwash plain of the Rangitata and Potts rivers, of which only a small part is within the pastoral lease; and, the small but prominent roche moutonnée Mt Sunday. The mountainous country comprises greywacke and argillite of the Torlesse Group overlain in the upper Potts Valley and on the gentle slopes east of the homestead with glacial till of the St Bernard Formation. A small area of quartzose coal-measures is exposed in the Potts River gorge. The alluvial floodplain comprises recently-deposited outwash gravel (Warren, 1967; Gair, 1967).

The effects of recent glaciation and subsequent fluvial erosion are clearly illustrated by the landforms on the property. High summits and ridges of the Potts Range are ice-steepened arêtes, surrounded by frost-shattered rock buttresses and mantled with broken talus that forms extensive scree slopes. The valleys are U-shaped in their upper reaches, originating from small cirque basins, and narrow and incised in their lower reaches. The largest valley on the property, the Potts River, has high gravel terraces in its mid-reaches and an extensive outwash fan at its confluence with the Rangitata Valley.

The front-faces of the property are carved smooth by glaciers, and mantled with moraine where these glaciers carved north of the Harper Range into the large intermontane basin of the Ashburton Lakes. Mt Sunday stands out as a piece of resistant bed-rock smoothed by the glacier, partly mantled with moraine and subsequently all-but buried by gravel deposited by the Rangitata River.

Mt Potts Pastoral Lease is mostly mountainous, rising to 2184m altitude at Mt Potts, with a large proportion of the property lying above 1000m. Areas of gentle terrain are confined to a relatively small part of the property on the toe-slopes and flats of the Rangitata and lower Potts rivers, and the gently-sloping moraine-covered slopes above the lower Potts River at the southeast corner of the property.

Two geo-preservation sites are located on these mountains: FOS237 Rocky Gully; and, FOS167 Mt Potts Triassic Plant Beds. These sites contain rich Triassic macro-flora, and Torlesse macro-fauna of brachiopods, bivalves, nautiloids and vertebrates.

The property is drained by tributaries of the Rangitata and Potts rivers. All eastern and northern parts of the property are drained by the western tributaries of the Potts River. Western and southern parts of the property are drained by Powerhouse Stream, the ski field valley stream, and lower Caroline Stream, all of which drain to the Rangitata River.

Soils on the property are predominantly Kaikoura and Cass soils of the high country yellow-brown group. Low-altitude and wetland areas by the river comprise Mesopotamia high country yellow-brown earths and recent Tasman soils. Recent gley soils of the Dobson set are present on Mt Sunday.

2.3 CLIMATE

Mt Potts Pastoral Lease lies within the rain shadow of the main divide of the Southern Alps. Winds are predominantly from the northwest and are most frequent in spring and autumn. Summers are warm and dry with temperatures occasionally exceeding 30°C. Winters are cold with frequent snow and severe frosts. Snow can fall throughout the year and can lie for several months on higher-altitude parts of the property. Annual precipitation is 1500mm on the nearby Dogs Range and ranges between 1000 and 3500mm over the Arrowsmith Ecological District.

2.4 VEGETATION

2.4.1 Original Vegetation

The vegetation history of the main upland valleys in the Arrowsmith Ecological District has been deduced by Burrows *et al* (1993) from the analysis of pollen and macrofossils. It appears that until just prior to human settlement a low-stature mountain toatoa forest and associated scrub flora was widespread and dominant at montane sites. Areas of mountain totara and mixed hardwood forest may also have been present. Mountain beech forest and minor localised stands of silver beech forest were present at lower-altitude sites (Burrows and Russell, 1990).

In the Hakatere Ecological District, the extent of recent glaciation, cool climate and infrequent natural fires are likely to have restricted the extent of forest cover in the intermontane basins. It appears likely that low-stature mountain toatoa forest or scrub, short tussockland, narrow-leaved snow-tussockland, red tussockland, and sedgeland or reedland were present in the large intermontane basins (Burrows *et al*, 1993; Harrington *et al*, 1986). Mountain beech forest, small areas of mountain totara and mountain ribbonwood forest, matagouri-*Coprosma* shrubland, and relatively extensive open stonefield plant communities were probably present at montane sites in the Rangitata Valley.

It appears likely that montane slopes (below 900m) on Mt Potts Pastoral Lease formerly supported mountain beech forest, with areas of mountain totara forest on drier slopes and bluffs, and ribbons of mountain ribbonwood forest along streams and gullies. Valley floor sites are likely to have supported areas of short tussockland (dominated by *Festuca* and *Poa* species), matagouri scrub, relatively extensive areas of wetland vegetation, and open stonefield communities on the recent floodplain. Upland valleys probably supported mountain toatoa scrub, narrow-leaved snow-tussockland, and minor areas of mountain totara or mixed hardwood forest. Alpine parts of the property supported vegetation very similar to that present today: extensive rock and scree; narrow-leaved and slim snow tussockland; herbfield; and, fellfield.

2.4.2 Indigenous Plant Communities

The present-day vegetation of Mt Potts Pastoral Lease is described below for each plant community in the montane, subalpine and alpine zones.

Montane Zone (below 900m)

River floodplain and terrace communities

The main floodplain and terrace communities are associated with the Rangitata and Potts rivers, with a limited number associated with smaller streams. The Rangitata riverbed is the most extensive, and supports riverbed communities at different stages of development, reflecting different-aged surfaces.

Middle-aged surfaces are dominated by lichens, mosses, mat daisies (*Raoulia* spp.) and creeping pohuehue. Introduced grasses are locally abundant and there is a diverse range of other native herbs and woody plants, including matagouri, *Helichrysum depressum* and mat *Coprosma* species. Naturalness is moderate. The threatened plant *Luzula celata* (a dwarf woodrush) and notable plant *Myosotis uniflora* (a cushion forget-me-not) were recorded at several localities.

Older surfaces (higher terraces and islands) support a mosaic of taller matagouri (up to 4m tall), mouse-ear hawkweed, sweet vernal, browntop, tutu and scattered silver tussock or fescue tussock. Other shrubs, including porcupine shrub and species of *Coprosma* are sometimes present. Naturalness is again moderate.

The middle and lower Potts River floodplain supports smaller areas of these communities. Natural hydrological processes are intact, but sweet brier and broom dominate parts of the lower floodplain. Naturalness varies from low to moderate-high.

Short tussockland communities

These communities are relatively widespread at lower altitudes, though they typically occur in combination with matagouri shrubland and snow-tussockland. A number have been over-sown and top-dressed, especially on parts of the Rangitata floodplain and the toe slopes and fans adjacent to the Hakatere-Potts Road. In the latter area, introduced grasses and clovers are

prominent or dominant, together with matagouri, tutu, cotton daisy and scattered bracken. The short tussockland communities are typically of low-moderate naturalness.

The most modified communities are those closest to the homestead; some fans are cultivated or cleared of indigenous vegetation. The paddocks below the homestead have also been intensively developed, with some shelterbelt planting.

Tall tussockland communities

Tall tussockland is common above about 700m, mostly on colluvial slopes above the Hakatere-Potts Road, on the Potts lateral moraine terrace and to a limited extent in the Potts River gorge. At this altitude the communities are relatively open and modified by grazing, burning, and sometimes over-sowing and top-dressing. The most modified communities are in the deer paddocks east of the homestead, and below the upper fence-line (approximately 800m altitude) above the Hakatere-Potts Road.

Prominent plants include narrow-leaved snow-tussock, matagouri, fescue tussock, *Leucopogon colensoi*, cotton daisy, blue tussock, sweet vernal, browntop, mountain clubmoss, mouse-ear hawkweed, *Raoulia subsericea*, snowberry, *Pernettya nana*, catsear, golden spaniard, bog-rush and mosses. Hybrids between narrow-leaved and slim snow-tussock are present on south-facing slopes. Overall the cover of narrow-leaved snow-tussock is often 20-30%, though it varies from around 10% to 80%. Naturalness varies from low-moderate to moderate-high but is generally moderate.

Shrubland communities

Shrublands (including scrub) are widespread below 900m. They are common on lower mountain slopes above the Hakatere-Potts Road, the Rangitata and Potts river floodplains, and in the Potts River gorge. Some are primarily in the subalpine zone and are described in that section.

Matagouri shrublands are common on stream margins, terraces, lower hill slopes and floodplains. Often few additional shrub species are present, but sometimes their diversity is much higher, such as in dense shrubland in gullies, alongside streams and in the Potts River gorge. Characteristic species include porcupine shrub, species of *Coprosma* especially mingimingi, mountain wineberry, *Olearia bullata* (a threatened shrub-daisy), korokio, species of *Hebe* (especially koromiko), mountain ribbonwood, native broom (*Carmichaelia australis*), tauhinu and, less commonly, mountain totara. Scramblers associated with these shrublands include native jasmine, bush lawyer (*Rubus schmidelioides*) and scrub pohuehue.

The most diverse shrublands are found in the Potts River gorge: additional species include broadleaf, *Olearia avicenniifolia*, mountain beech, kanuka and manuka. The threatened scrambler, *Clematis marata*, was found in shrubland below the Hakatere-Potts Road. The naturalness of shrublands varies from low or low-moderate (at over-sown and top-dressed sites) to almost high where natural protection has been provided by gullies or gorges.

Forest communities

Mountain beech forest remnants are found in Caroline Stream, Erewhon Ski Field valley, Potts River gorge, Powerhouse Stream and several other gullies. Isolated patches and individual trees are scattered along the slopes of the Rangitata Valley. Several of these mountain beech remnants were recommended for protection following the PNAP survey of the Heron Ecological Region (Harrington *et al*, 1986).

Associated plants in mountain beech forests include *Coprosma linariifolia*, mingimingi, matagouri, *Cyathodes juniperina*, mountain wineberry, three-finger, bush lawyers (*Rubus* spp.), *Helichrysum aggregatum*, *Olearia arborescens*, broadleaf, *Gaultheria antipoda*, ferns and, less

commonly, mountain totara. Beech mistletoe (*Peraxilla tetrapetala*) was observed in the Erewhon Ski Field valley remnant.

Mountain totara forest or treeland is uncommon and sparse on the property. The largest and most dense examples are in the Potts River gorge, and the Erewhon Ski Field valley gorge. Small patches are scattered in gullies and bluffs in the Rangitata Valley.

Wetland communities

The main wetlands on the property are on the Rangitata River floodplain, around Mt Sunday and on the lateral moraine terrace. Smaller wetlands (flushes) occur on lower mountain slopes above the Rangitata River and on the Potts River floodplain.

Wetlands on the Rangitata River floodplain form a complex mosaic determined by substrate, water source (active channels, subsurface or springs) and the successional age of the surface. The main wetland types are characterised by bog-rush, red tussock or sedges (*Carex* spp.), and are associated with stable spring-fed channels and backwaters. The largest wetlands are found southeast of Mt Sunday adjacent to Deep Creek[2]. Prominent plants in these wetlands include red tussock, bog-rush, sphagnum, *Carex sinclairii*, *Carex coriacea*, matagouri, mingimingi, tussock sedge, *Carex virgata*, native violet, *Celmisia gracilenta*, clovers, lotus, sweet vernal, browntop, Yorkshire fog, ferns, and occasionally mouse-ear hawkweed. There is some stock damage in these wetlands, especially from cattle. The wetlands visited varied in naturalness from low-moderate to high.

There are several wetlands on the lower slopes of Mt Sunday. A small one on the southwest side is dominated by red tussock, bog-rush, *Carex sinclairii* and scattered soft rush. Water in the adjacent tarn appears very eutrophic, and cattle pugging is widespread. An adjacent degraded wetland of bog-rush and fescue tussock contained two plants of the threatened *Aciphylla subflabellata*. The main wetland immediately south of Mt Sunday is roughly one-third open water. It supports sedges, *Eleocharis acuta*, mingimingi, tussock sedge, bog-rush, *Potamogeton cheesemanii* and several patches of raupo. Stock damage is restricted to the margins, though nutrient enrichment is likely to be occurring through fertiliser run-off and stock waste. Naturalness here was close to high. No other wetlands of this type were seen on the property.

Southeast of Mt Sunday is another wetland covering approximately 300x200m. This wetland contains sedges, bog-rush, red tussock and a small area of open water. Other plants include fescue tussock, matagouri, mingimingi, native violet, *Celmisia gracilenta*, *Anisotome aromatica*, *Blechnum penna-marina*, *Ranunculus glabrifolius* and mosses. Sweet vernal, browntop and lotus are locally prominent. Cattle damage is largely confined to the margins. Naturalness is moderate-high.

In the main shrubby gully northwest of Powerhouse Stream, a substantial wetland occurs adjacent to shrubland at around 620m. It contains bog-rush, *Blechnum penna-marina*, *Blechnum* sp. "gracilis", *Olearia bullata*, sphagnum, tauhinu, matagouri, mingimingi, *Coprosma rugosa*, scrub pohuehue, mountain flax, *Astelia nervosa*, tutu, *Carex coriacea*, *Carex virgata*, narrow-leaved snow-tussock, native broom, native violet, Maori onion, soft rush, sweet vernal, white clover and several plants of broom. Naturalness varies from moderate to moderate-high.

Among tall tussockland on the lateral moraine, cushion bogs and flushes are numerous. They are dominated by comb sedge, sphagnum and bog-rush. The naturalness of these wetlands typically varies from moderate to high. Some have been damaged by sheep grazing and trampling and, in those situations, naturalness may be reduced to low-moderate. There are several small tarns, but none were visited.

[2] Deep Creek is the large stream channel that lies between Mt Sunday and the Hakatere-Potts Road.

Subalpine Zone (900-1300m)

River floodplain and terrace communities

These are largely restricted to the main upper Potts Valley, though very small examples are present in some side valleys. In the middle reaches of the Potts River, floodplain terraces and islands support matagouri, fescue tussock, mosses and lichens. The most recent terraces and islands support scabweed, *Raoulia tenuicaulis*, an unidentified *Raoulia* sp., *Scleranthus uniflorus*, *Stellaria gracilenta*, *Poa lindsayi*, *Poa maniototo*, creeping pohuehue, *Helichrysum depressum*, red woodrush, *Aira caryophyllea*, patotara, *Epilobium melanocaulon*, *Epilobium rostratum*, *Epilobium atriplicifolium*, mouse-ear hawkweed, sweet vernal, sheep's sorrel, mosses and lichens. Naturalness is generally high.

Short tussockland communities

These occur locally on the lateral moraines among tall tussockland, especially where burning and concentrated stock grazing has occurred. They are also found on some river terraces and lower slopes in the Potts Valley. Their species composition is similar to that of open narrow-leaved snow-tussock communities.

Tall tussockland communities

Tall tussock communities are very extensive on the property and most widespread in the subalpine zone. They are found across all mountain slopes, terraces and moraines. Narrow-leaved snow-tussockland is the main community, but slim snow-tussockland is also present, especially on shady slopes. Hybrids between the two species are common.

Narrow-leaved snow-tussock communities support plants such as snowberry, *Pentachondra pumila*, patotara, *Leucopogon colensoi*, mouse-ear hawkweed, blue tussock, *Anisotome flexuosa*, *Raoulia subsericea*, cotton daisy, sweet vernal, *Blechnum penna-marina*, fescue tussock, golden spaniard, matagouri, lichens and mosses. Slim snow-tussock communities contain similar plant assemblages, with additional species indicative of colder conditions such as *Dracophyllum pronum*, mountain clubmoss and *Celmisia lyallii*.

The naturalness of the tall tussockland communities varies from moderate to high. They are generally in good condition, despite the presence of exotic plants and the effects of grazing. Localised areas of tall tussockland on lateral moraine terraces below The Pyramid have been damaged by tahr.

Shrubland communities

Subalpine shrublands are quite common, though not very extensive. They are mostly associated with shady slopes, toe-slopes, fans, bluffs, stream-sides and gullies. Montane mixed shrublands extend into this zone with a similar species composition, such as in the upper Potts River gorge and the stream below The Pyramid. Mountain totara communities are also present in this zone, but are of very limited extent. Snow totara occurs on talus and stable scree, but is far more common at higher altitudes.

A typical streamside shrubland was visited in the Erewhon Ski Field valley at about 1150m. Species present included *Brachyglottis cassinioides*, *Olearia cymbifolia*, mountain toatoa, *Coprosma cheesemanii*, snow totara and *Aciphylla colensoi.* The most extensive subalpine shrublands observed are on the southern slopes of the main western tributary of the Potts River. Dominant species include *Olearia cymbifolia*, *Olearia nummulariifolia*, *Brachyglottis cassinioides*, inaka and snow totara. These communities extend to the alpine zone. Inaka scrub is locally abundant on shady slopes and at exposed sites. The main species are *Dracophyllum uniflorum* and the prostrate *D. pronum.*

Forest communities
Mountain beech forest remnants extend slightly into the subalpine zone in Caroline Stream and Erewhon Ski Field valley. There are also isolated smaller patches and scattered trees along the slopes facing the Rangitata River.

Wetland communities
The most substantial wetlands at this altitude are cushion bogs and flushes on the lateral moraine terraces, with small flushes on other mountain slopes. They are often interconnected and linked with numerous small creeks. Some cushion bogs have been trampled by sheep, and localised areas are quite badly damaged.

Alpine Zone

These communities occur from 1300-1850m. The tops of the higher peaks extend beyond this altitude but none were visited. They would support a narrow zone of sub-nival communities associated with bedrock and scree.

Tall tussockland communities
These communities are extensive throughout the property on steep mountain slopes, moraines, terraces and bluffs. Narrow-leaved snow-tussock typically extends to lower altitude, and slim snow-tussock can extend below 1300m on shady slopes. Both communities are in good condition, except for localised areas where grazing damage from sheep and wild animals (mostly tahr and hares) is evident.

Prominent species in these communities include narrow-leaved snow-tussock, slim snow-tussock, *Celmisia angustifolia*, blue tussock, *Celmisia lyallii*, *Blechnum penna-marina*, fescue tussock, cotton daisy and mosses. Sweet vernal and mouse-ear hawkweed may be locally abundant. Naturalness is moderate to high or high.

Shrubland communities
Subalpine shrublands sometimes extend into the alpine zone, but apart from those in upper tributaries of the Potts Valley, they are not very extensive. Prominent species include tauhinu, inaka, *Hebe odora, Celmisia lyallii*, narrow-leaved snow-tussock, blue tussock and cotton daisy. At higher altitudes a shrubland characterised by *Dracophyllum pronum*, slim snow-tussock and *Celmisia lyallii* is present. Snow totara is widespread on talus, stable scree and some rocky spurs, sometimes in association with mountain toatoa.

Fellfield, scree and bluff communities
Scattered vegetation is associated with fellfield and talus throughout the property. Typical plants include slim snow-tussock, *Dracophyllum pronum*, porcupine shrub, *Haastia sinclairii, Hebe epacridea, Hebe haastii, Myrsine nummularia,* blue tussock, *Blechnum penna-marina, Celmisia lyallii, Celmisia angustifolia, Anisotome flexuosa, Aciphylla montana, Colobanthus acicularis, Raoulia hookeri*, creeping pohuehue, *Hebe pinguifolia, Poa novae-zelandiae* and sometimes *Chionochloa crassiuscula* and *Poa cockayneana*. The naturalness of these communities is typically moderate to high or high.

Scree is very extensive and supports a range of specialised plants including penwiper, *Leptinella atrata, Lignocarpa carnosula, Ranunculus crithmifolius, Epilobium pycnostachyum, Senecio glaucophyllus, Lobelia roughii, Neopaxia australasica, Hebe haastii, Hebe epacridea* and *Poa buchananii*. The naturalness of these communities is typically high.

Plants associated with rock outcrops and bluffs overlap to some extent with those of fellfield and scree. Typical plants include *Raoulia eximia* (vegetable sheep), South Island edelweiss, bristle tussock, blue tussock, *Colobanthus acicularis*, porcupine shrub, *Poa novae-zelandiae,*

Hebe epacridea, *Hebe tetrasticha*, mosses and lichens. The naturalness of these communities is usually high.

Wetland communities
Wetlands are small and relatively uncommon in the alpine zone. They largely consist of flushes, though minor cushion and turf wetlands are present in vegetated areas in some alpine basins (seen by helicopter). None of these communities were visited.

2.4.3 Notable Flora

The following species classified as threatened by Hitchmough (2002) have been recorded from the property.

Table 1 Threatened plant species recorded from Mt Potts Pastoral Lease.

Plant Species	Known Distribution on Property
Serious Decline	
Luzula celata	Rangitata and Potts river floodplains; Potts River is the type locality for the species.
Gradual Decline	
Peraxilla tetrapetala	Erewhon Ski Field valley (beech forest)
Sparse	
Aciphylla subflabellata	southwest side of Mt Sunday
Clematis marata	shrubland below Hakatere-Potts Road
Coprosma intertexta	lateral moraines above Potts River
Olearia bullata	lateral moraines; Rangitata faces; Mt Sunday
Data Deficient	
Vittadinia australis	Erewhon Ski Field valley (on bluffs)
Myosotis uniflora	Rangitata River floodplain

Other notable plants include: the scree plant *Lignocarpa carnosula* (uncommon); *Pimelea sericeovillosa* (at its southern limit); manuka and kanuka (uncommon in the area); and, mountain totara and mountain toatoa (important components of the original vegetation, but now uncommon).

2.4.4 Problem Plants

Introduced plants that may have a significant effect on indigenous plant communities on the property, and that can be controlled or contained, are listed and discussed below. Other ubiquitous naturalised species for which containment or control are probably impractical, such as mouse-ear hawkweed and pasture grasses, are not discussed here but are listed in the vegetation descriptions.

Crack willow (*Salix fragilis*)
Large crack willow trees are present along streams and seepage channels on the Rangitata River floodplain, with the largest infestation in the wetlands below the homestead. Although most of the crack willow is on riverbed (UCL) lands, its presence threatens adjoining areas especially the open floodplain of the Rangitata River. These willows should be removed.

Willow (presumably grey willow) has been planted alongside the road to Erewhon Ski Field, where the road crosses small gullies on the front (Rangitata Valley) faces. Grey willow is an aggressive coloniser and poses a significant threat to surrounding areas. These planted willows should be removed, especially if they are grey willow.

Gorse (*Ulex europaeus*) and broom (*Cytisus scoparius*)
Scattered infestations of gorse and broom are present on the property and on adjoining riverbed lands on the Rangitata River floodplain. Major infestations of broom are present near the homestead in Powerhouse Stream and adjoining the property on the Potts River fan. Isolated infestations of broom were also observed beside the Hakatere-Potts Road and near the vehicle track on the lateral moraine terrace. Scattered infestations of gorse are present alongside the Erewhon Ski Field Road and in the lower Potts Valley. Both these species pose a significant threat to surrounding areas. All infestations should be removed or, at least, effectively contained.

Wilding pines (conifer species)
Isolated small wilding pines are present on the Rangitata and Potts river floodplains, mostly outside the property. Monitoring and control will be required to maintain the property free of wilding pines, as there are a number of significant seed sources in the area.

Sweet brier (*Rosa rubiginosa*)
Sweet brier is present at lower altitudes on the property. The only place that it appears to be having a significant impact is in the lower Potts River. Otherwise it does not appear to pose a significant threat to natural values on the property.

Male fern (*Dryoteris filix-mas*)
This fern was observed within beech forest remnants on the property. It is now widespread (though not common) in the high country. Attempts to control this species are probably futile.

2.5 FAUNA

2.5.1 Birds and Reptiles

A total of 40 bird species: 26 indigenous (15 endemic and 11 native), of which 11 are listed as threatened (Hitchmough, 2002), and 14 introduced were recorded on Mt. Potts Pastoral Lease (Tables 2 and 3). Four endemic lizard species were recorded from the property (Table 4), one of which one is listed as threatened. The wetlands and streams associated with the Rangitata River floodplain and Mt Sunday provide the most important bird habitats on the property. Higher altitude areas also provide important habitat for native birds. Lizards are numerous, and the property appears to support a good population of scree skink.

The main bird and lizard habitats on the property are: Mt Sunday; Deep Creek and the Mt Sunday wetlands; gullies on the front (Rangitata Valley) faces; the eroded escarpment above the lower Potts River; the lateral moraine terrace; and, the alpine zone. The bird and lizard species found in these areas are described below.

Mt Sunday

Mt Sunday lies within the Rangitata River floodplain and within the Rangitata Site of Special Wildlife Interest (SSWI). It is a small hill with rock outcrops forming steep bluffs on the north-eastern side. A small tarn is present on the hill.

New Zealand pipit, Australasian harrier, and grey warbler were recorded on the hill. The rocky bluffs and native shrubland provide good lizard habitat. Four common geckos “Southern Alps” were found after turning just two rocks.

Deep Creek and Mt Sunday wetlands

Mt Sunday is separated from the rest of the pastoral lease by the spring-fed Deep Creek, and is surrounded by small tarns and swamps. Wetlands extend downstream from Mt Sunday to where the Potts River fan joins Deep Creek and the Rangitata River. These wetlands are part of the Upper Rangitata SSWI, which is classed as being of "outstanding value to wildlife" (O'Donnell & Moore, 1983) and is listed in the Ashburton District Plan as an "Area of Significant Conservation Value". It also attained the highest ranking in an assessment of wetlands of regional significance for its wetland bird community (O'Donnell, 2000).

The area has rich habitat complexity, including: flowing river channels; swamp communities, including raupo, sedge and red tussock associations; and, tarns with open water. The habitat values are enhanced by the high level of connectivity between and proximity to the different habitat types. This complex of habitats is characterised by a high diversity of foraging and breeding micro-habitats, including all those representative of riverine wetland systems: riparian areas; major river channels; low river terraces; shingle bars and flats; and, shallow channels (O'Donnell, 2000).

Birds

Australasian harrier, South Island pied oystercatcher, banded dotterel, paradise shelduck, grey teal, white-faced heron, southern black-backed gull and black-fronted tern were observed during this survey. The black-fronted terns were exhibiting courtship behaviour, and the harriers appeared to be nesting in the wetlands. The wetland bird community of the upper Rangitata River is relatively well known. A total of 21 indigenous bird species have been recorded from the site, (10 native, 11 endemic). Of these nine are classed as threatened (Table 5). Virtually all bird species representative of high country braided rivers, small lakes, ponds and swamps have been recorded. The Rangitata River is thought to support the highest breeding numbers of the nationally-vulnerable wrybill in New Zealand (O'Donnell & Moore, 1983; O'Donnell, 2001).

Both Deep Creek and the main stream of the river were surveyed intensively from the confluence of the Clyde and Havelock rivers downstream to the Potts River delta in 1986 and again in 2001. Of particular note were the high numbers of wrybill and banded dotterel. The raupo and *Carex* swamps are good habitat for Australasian bittern and marsh crake. Both have been recorded in the swamps close to Mt Sunday (D. Geddes, *pers. comm*.) and are likely to be abundant throughout the wetland complex.

Gullies in south-west facing hill-slopes

Along the lower south-west facing hill-slopes between the Erewhon boundary and Powerhouse Stream are a series of stream gullies (some flowing and some dry). One gully adjacent to the ski field road has remnant mountain beech forest with some totara, and several contain matagouri-dominated shrubland.

Birds

It was not possible to conduct five-minute bird counts in the beech forest because the noise of the stream (which was in flood) made it to difficult to hear bird calls. However, two family groups of riflemen, numerous grey warbler and a bellbird were recorded. Fantails are also likely to be present in this habitat though none were recorded during this survey. Riflemen and grey warbler were recorded throughout the shrublands on the hill slopes.

Lizards

Two dry gullies east of the ski field road gully were searched intensively for lizards. One common/McCann's skink and one juvenile common gecko "Southern Alps" were recorded.

Eroded escarpment of the lateral moraine and lower Potts River

The first two kilometres upstream from the road bridge was surveyed for fish. Birds and lizard species were also noted. The Potts River is a braided river, with matagouri and sweet brier-dominated shrublands on the flats in the lower reaches.

Birds
Welcome swallow, black-fronted tern, South Island pied oystercatcher, New Zealand pipit and banded dotterel were recorded on the river bed, and grey warbler in the shrublands.

Lizards
A young scree skink was found just over two kilometres upstream from the road bridge. It was found at the foot of a dry gully on the true right of the river. Disturbance of the scree habitat by stock has been identified as one of the key threats to scree skinks (Whittaker *et al*, 2002).

Lateral moraine terrace

This area extends from Powerhouse Stream to the Potts River. Only a small portion in the northwest corner was examined by this surveyor. Vegetation is dominated by depleted tall tussockland with a few small tarns, occasional shrubs, and small rocky outcrops.

Birds
Australasian harrier, New Zealand pipit and southern black-backed gull were observed in this habitat.

Lizards
Numerous skinks were observed in the complex of rocky ground and tussocks. Both common and McCann's skink were present.

Birds recorded in other areas

Paradise shelduck, kea (2 adults) and New Zealand pipit were recorded in the upper ski field valley. Eastern falcon were seen in the vicinity of The Pyramid and in a tributary of the upper Potts River.

Table 2 Indigenous bird species recorded from Mt Potts Pastoral Lease.

Bird species		**Known Distribution on Property**
Common name	Scientific name	
black shag*	*Phalacrocorax carbo novaehollandiae*	Deep Creek
white-faced heron	*Ardea novaehollandiae*	Deep Creek; Mt Sunday wetlands
Australasian bittern*	*Botaurus poiciloptilis*	Mt Sunday wetlands
paradise shelduck	*Tadorna variegata*	Deep Creek; Mt Sunday wetlands; throughout
grey duck*	*Anas superciliosa superciliosa*	Deep Creek; Mt Sunday wetlands
NZ shoveler	*A. rhynchotis*	Deep Creek; Mt Sunday wetlands
NZ scaup	*Aythya australis*	Deep Creek; Mt Sunday wetlands
harrier hawk	*Circus approximans*	throughout
eastern falcon	*Falco novaeseelandiae "eastern"*	Pyramid; upper Potts Valley
marsh crake*	*Porzana pusilla affinis*	Mt Sunday wetlands

SI pied oystercatcher	*Haematopus ostralegus finschi*	Deep Creek; lower Potts River
spur-winged plover	*Vanellus miles*	throughout
pied stilt*	*Himantopus himantopus*	Deep Creek
banded dotterel	*Charadrius bicinctus*	Deep Creek; lower Potts River
wrybill*	*Anarhynchus frontalis*	Deep Creek
black-backed gull	*Larus dominicanus*	throughout
black-billed gull*	*L. bulleri*	Deep Creek
black-fronted tern	*Sterna albostriata*	Deep Creek; lower Potts River
Caspian tern*	*S. caspia*	Deep Creek
kea	*Nestor notabilis*	Ski field basin
Shining cuckoo	*Chrysococcyx lucides*	Roadside near Erewhon boundary
welcome swallow	*Hirundo tahitica*	Deep Creek; lower Potts River
rifleman	*Acanthisitta chloris chloris*	Beech forest; shrubland
NZ pipit	*Anthus novaeseelandiae novaeseelandiae*	throughout
grey warbler	*Gerygone igata*	throughout
bellbird	*Anthornis melanura melanura*	Beech forest; shrubland

* Recorded previously (October 2001)

Table 3 Introduced bird species recorded from Mt Potts Pastoral Lease, November 2002.

Bird species	
Common name	Scientific name
Canada goose	*Branta canadensis*
mallard	*Anas platyrhynchos*
skylark	*Alauda arvensis*
dunnock	*Prunella modularis*
song thrush	*Turdus philomelos*
blackbird	*T. merula*
starling	*Sturnus vulgaris*
house sparrow	*Passer domesticus*
chaffinch	*Fringilla coelebs*
redpoll	*Carduelis flammea*
goldfinch	*C. carduelis*
greenfinch	*C. chloris*
yellow hammer	*Emberiza cintrenella*
Australian magpie	*Gymnorhina tibicen*

Table 4 Endemic lizard species recorded from Mt Potts Pastoral Lease.

Lizard species		**Known Distribution on Property**
Common name	Scientific name	
common gecko	*Hoplodactylus* aff. *maculatus* "Southern Alps"	Mt Sunday; gullies on front (Rangitata Valley) faces
McCann's skink	*Oligosoma maccanni*	throughout
common skink	*O. nigriplantare polychroma*	throughout
scree skink	*O. waimatense*	Eroded moraine scarp, lower Potts River

2.5.2 Freshwater Fauna

Freshwater fauna communities were surveyed at 16 sites on Mt Potts Pastoral Lease along the front (Rangitata Valley) flats and at the large wetland opposite the homestead. Seven different fish species, including four native species, and a wide range of aquatic macro-invertebrates, including insect larvae, crustaceans, molluscs and worms, were found in the different habitat types on the Pastoral Lease.

Eight different aquatic habitats are described. These are classified by water source, resistance to drying and surrounding landform structure. Of these, five are flowing-water habitats and three are still-water habitats. Native fish were found in all habitat types except for farm ponds. The smaller streams had the greatest diversity of native fish; the large streams were devoid of native fish except in the calmer shallower stretches of water. No threatened species of fish were found in this survey..

The spring-fed streams around the wetland had the greatest diversity of macro-invertebrates. The rain- and snow-fed streams on the property also supported abundant macro-invertebrates, with distinct communities present in each stream. The other habitats were less distinctive, although each had some individually important qualities.

One of the distinguishing characteristics of the Rangitata River and its tributaries is the lack of dams. This has two effects on the fish communities within the river. The first is that diadromous fish species (those species with a sea phase in their lifecycle) are more likely to be present. This is particularly important for the Rangitata River and the wetland associated with Deep Creek, as that area is a major spawning ground for chinook salmon (*Oncorhynchus tshawytscha*). The second effect is that fish are able to migrate between streams allowing re-colonisation of previously de-watered streams.

The groyne at the mouth of the Clyde River, upstream from the property, is having two effects on the wetlands around Mt Sunday. It protects the wetlands from flood flows of the Rangitata River thereby maintaining good fish habitat, and it stabilizes the river braids which means the wetlands are more accessible to stock and associated silting. Stabilization of these braids also favours salmonid species (introduced trout and salmon) at the expense of native galaxiid species, though native bullies appear unaffected.

The only diadromous species previously recorded (in the New Zealand Freshwater Fish Database) in the vicinity of Mt Potts Pastoral Lease are chinook salmon and koaro (*Galaxias brevipinnis*). The non-diadromous species recorded are brown trout (*Salmo trutta*) and rainbow trout (*O. mykiss*), and four native fish species: upland bully (*Gobiomorphus breviceps*); alpine galaxias (*Galaxias paucispondylus*); Canterbury galaxias (*G. vulgaris*); and, upland longjaw galaxias (*G. prognathus*). Of these, only upland longjaw galaxias is considered threatened by Hitchmough (2002).

Habitat Types

The eight habitat types associated with freshwater communities on Mt Potts Pastoral Lease are described below.

Wetlands

Wetlands cover a relatively large area on the property and adjoining riverbed lands (UCL) in the vicinity of Mt Sunday. The water in the wetlands originates from springs or seepage flows through the bed of the Rangitata River. The groyne upstream at the confluence of the Clyde River has stabilized most of this area, enabling pasture development and improving stock access.

Swamp
One raupo swamp is present on the side of Mt Sunday. The swamp has one major pool in the centre (with steep 2m-deep sides) and a large area of standing water surrounding the pool. Stock can gain access to this area, though the silty nature of the swamp has limited their impact.

Ponds
Three large ponds are present around Mt Sunday. All have been modified for use as farm ponds and all retain permanent water. The ponds are considerably silted and surrounded by pasture and scattered shrubs.

Braided River
The braided Potts River runs along the eastern boundary of the property. Unlike some braided river systems, the Potts River appears to have a permanent surface flow although its meandering channel may move across the gravel bed. The river channel is generally pristine although parts of it are accessible to stock.

High-Altitude Originating Streams
High altitude streams on the property are those streams that develop in the alpine region and flow as torrents at lower altitudes. There are two main high-altitude originating streams on the Pastoral Lease: Powerhouse Stream, which flows off the slopes of Mt Potts; and, the stream flowing from the ski field basin. Both streams flow through narrow gorges containing stands of mountain beech forest before reaching the gentler lower slopes. Domestic stock can gain access to most parts of both of these streams.

Mid-Altitude Originating Streams
These streams originate at much lower altitudes to the high-altitude originating streams. They are much calmer, often flowing through pasture, matagouri and broom before reaching the valley-floor. Several of these streams are present on the front (Rangitata Valley) faces. Most parts of these streams are accessible to domestic stock.

Stable Streams
Stable streams are generally spring-fed. The main stream of this habitat type is Deep Creek, which flows through the wetlands. There are several smaller stable streams within the wetland system, all flowing into Deep Creek. Most parts of these streams are accessible to stock, and considerable silting has occurred as a result. Vegetation surrounding these streams is mostly pasture, with some tussockland and occasional willow trees.

Ephemeral Streams
Ephemeral streams are present along the Potts River. Most are flowing in the upper reaches, but become dry for a considerable distance before reaching the river. Most are accessible to stock. The streams in this area drain tussocklands on the moraine terrace, though they flow into gravel fans before reaching the Potts River.

Fish

Three species of native fish were recorded in the wetlands around Mt Sunday: upland bully; alpine galaxias; and, Canterbury galaxias. Salmonids are also present in the area: chinook salmon spawn there (McClintock, 1997) and the area is popular with trout anglers. Upland bullies were caught in very high numbers in the swamp on Mt Sunday; in contrast, no fish were caught in the ponds around Mt Sunday. Five species of fish were observed in the braided Potts River: brown trout; chinook salmon; upland bully; alpine galaxias; and, koaro.

Only one species, brook char (*Salvelinus frontinalis*), was observed in the upper reaches of the high-altitude originating streams. However, three species were observed in the lower, calmer

reaches of the ski field stream: brown trout; alpine galaxias; and, Canterbury galaxias. In the mid-altitude originating streams only native fish were found: upland bully; alpine galaxias; Canterbury galaxias; and, koaro. Three species were observed in the stable stream, Deep Creek: upland bully; alpine galaxias; and, salmonids. No fish species were caught in the ephemeral streams, though alpine galaxias and upland bully could be present in this habitat.

Aquatic macro-invertebrates

The wetlands around Mt Sunday contained mainly snails (*Potamopyrgus* spp.) and cased caddisflies (*Zelolessica meizon*, *Conuxia gunni*, *Olinga feredayi*, *Pycnocentria evecta*, *Pycnocentrodes aeris* and *Oxyethira albiceps*). The other group found was Diptera larvae (*Muscidae* spp. and *Aphrophila neozelandica*); an indication of the slightly degraded nature of this part of the wetland. The swamp was not surveyed, but its central pool is likely to support fewer caddisflies and more species of Diptera, Coleoptera, Hempitera (water bugs), worms and crustaceans (*Daphnia* spp.). The ponds were not surveyed, though species caught in the gee-minnow traps were retained. These species were mainly snails (*Physa* spp), but small numbers of stick caddisflies (*Triplectides obsoleta*) and large beetles (*Homeodytes hookeri*) were also present.

The main macro-invertebrate species observed in the Potts River were mayflies (*Deleatidium* spp.) and cased caddisflies (*Conuxia gunni* and *Olinga feredayi*). The fast flowing zone of high-altitude originating streams were found to support *Deleatidium* spp., net-wing midge larvae (*Neocurupira campbelli, Neocurupira hudsoni* and *Peritheates turrifer*), crane fly larvae (*Eriopterini* spp. and *Aphrophila neozelandica*), beetle larvae (*Elmidae* spp.) and free-living caddisfly larvae (*Hydrobiosis umpripennis, H. charadraea, H. clavigera* and *H. harpidiosa*). The lower sections of these streams were not so easily defined. They appeared to be most similar to the mid-altitude originating streams, but no particular macro-invertebrate species was common throughout. The cased caddisfly group (*Beraeoptera roria*, *Helicopsyche albescens*, *Olinga feredayi* and *Pycnocentrodes aeris*) was the only obvious group present.

The stable stream of Deep Creek had the best diversity of macro-invertebrates of any of the streams surveyed. One interesting species, *Megaleptoperla grandis*, was not collected anywhere else on the property. Also present were members of the major groups: cased caddisflies; mayflies; stoneflies; diptera; and, snails. The ephemeral stream system was not surveyed as the flow was not large enough for kick-net sampling, but mayflies, stoneflies and caddisflies are likely to be present in this habitat.

2.5.3 Invertebrates

Invertebrates were sampled from six main habitats on Mt Potts Pastoral Lease: alpine/sub alpine; shrubland; open tussock grassland; forest; riverbed; and, aquatic. 37 species of invertebrates were collected and identified, including: seven Orthoptera (cricket, grasshopper and weta) species; three Coleoptera (beetle and weevil) species; seven Trichoptera (caddisfly) species; and, seven Lepidoptera (moth and butterfly) species. A number of additional species await formal identification.

The invertebrate fauna of the property exhibits a very high level of endemism (c.95%). It includes a diverse grasshopper fauna: seven species were recorded, including two threatened species (*Brachaspis* "lowland" and *Brachaspis* "Hunter"). Four other notable species have been recorded in the area: the robber fly (*Neoitamus smithii*); the rare long-legged black weta (*Pharmacus montanus*); the rare millipede (*Icosidesmus setiventris*); and, two rare alpine Blattidae (cockroach) species (*Celatatoblatta montana* and *Celatatoblatta palliidicaude*).

Invertebrate communities of Mt Potts Pastoral Lease are described below for each of the main habitats sampled.

Alpine and Sub-alpine

Alpine areas on the property were snow-covered at time of the field survey. However, some low-alpine habitats were sampled, and the likely composition of invertebrate communities in the alpine zone can be deduced from earlier surveys of nearby areas. Three alpine grasshopper/kawhitiwhiti species were collected from the Potts Range: *Sigaus australis*; *Brachaspis* "Hunter"; and, *Paprides nitidus*. Each species occupies a distinct habitat: *Sigaus australis* is present in tall tussock, primarily between 1500 and 2000m; *Brachaspis* "Hunter" is present on scree and rockfield; and, *Paprides nitidus* is present in tall tussock, primarily between 1200 and 1500m. Other common alpine insects observed include the mountain weta (*Hemideina maori*) and the black mountain ringlet (*Percnodaimon pluto*).

Several rare alpine invertebrate are known to occur in the Arrowsmith Ecological District, including: the long-legged black weta (*Pharmacus montanus*) (Burrows, 2002); a millipede (*Icosidesmus setiventris*) and, two alpine cockroaches (*Celatatoblatta montana* and *Celatatoblatta palliidicaude*).

Shrubland

Shrubland (including gravelfield and rock outcrop) is present throughout the property, notably on the Potts River terraces, alongside the Hakatere-Potts Road, in the Potts River gorge, and in the upper Potts Valley. Nearly all areas of shrubland appear to provide good invertebrate habitat.

The shrubland on the Potts River terraces was considerably dryer and had a thinner leaf litter than other shrublands present on the pastoral lease. Only ground-dwelling invertebrates that are adapted to drier conditions were observed here: cockroaches (Blattidae); beetles and weevils (Coleoptera); centipedes (Chilopoda); and, millipedes (Diplopoda). Spiders (Araneae) and ichneumon wasps (Ichneumonidae) were observed on the shrubland foliage. Shrublands in the Potts River gorge were not sampled, but are likely to support a diverse invertebrate community.

Shrubland communities on the slopes above the Hakatere-Potts Road were mainly scattered and likely to provide inferior habitat for ground-dwelling invertebrates. Shrubland communities along the two un-named creek in this area are denser and provide very good habitat for ground-dwelling invertebrates. They are likely to support good populations of cockroaches, ground beetles (Carabidae), darkling beetles (Tenebrionidae), weevils (Curculionidae), springtails (Arthropleona), centipedes, millipedes and flatworms (Geoplanidae).

Shrubland communities in the upper Potts Valley (at c.1300m) are in very good condition, and provide excellent habitat for ground-dwelling invertebrates. They are likely to support cockroaches, ground beetles, darkling beetles, weevils, springtails, centipedes, millipedes and flatworms.

Rock-bluff habitats are present on Mount Sunday, in the alpine zone (between 1300 and 2000m), and in the lower Potts River (between 600 and 800m). All support diverse invertebrate populations, including species of cockroach, robber fly (Asilidae), blowfly (Calliphoridae), ant, diurnal moth and grasshopper.

Grassland

Two grasshopper/kawhitiwhiti species were collected in the grassland habitats: *Sigaus campestris* and *Paprides nitidus*. A diverse butterfly fauna is also present, including: the tussock ringlet butterfly (*Argyrophenga antipodum*); the boulder copper butterfly (*Lycaena boldenarum*); copper butterflies (*Lycaena* spp.); red admiral butterfly (*Bassaris gonerilla*); and, the southern blue butterfly (*Zizina otis oxleyi*). Diurnal moths (Lepidoptera) were abundant, especially in rocky areas and around bare ground. Several ground beetles were collected in the grassland. The flatworm (*Newzealandia agricola*) was recorded near the hut in the upper Potts Valley.

Forest

Of the small forest remnants on the property, only the one in the lower ski field valley was inspected. A large number of wood-boring invertebrates were observed, along with species of cockroach, beetle, springtail, centipede and millipede.

Aquatic

Spring-fed creeks, streams and rivers on the property are generally in good condition, and provide a variety of habitats (runs, riffles and pools) and substrates (medium/large stones, fine/coarse gravel and mud). Species from all the main aquatic insect orders were observed in these habitats: damselflies and dragonflies (Odonata); stoneflies (Plecoptera); caddisflies (Trichoptera); mayflies (Ephemeroptera); dobsonflies (Megaloptera); flies (Diptera); and, beetles (Coleoptera).

Small streams cascading through sub-alpine shrubland in the upper Potts Valley are likely to support a diverse aquatic invertebrate fauna including species of caddisfly, stonefly, mayfly, crane fly and dobsonfly.

Small isolated tarns are present throughout the moraine terrace above the lower Potts River. Invertebrates observed in these tarns include: shiny brown-black diving beetles (*Rhantus pulverosus*); waterboatman (*Sigara* sp.); and, red damselfly/kihitara (*Xanthocnemis zealandica*).

Small alpine flushes on the Potts Range north of the ski field are likely to support diverse invertebrate communities, and are vulnerable to browsing and trampling by introduced animals.

Riverbed Invertebrates

Old moss- and lichen-covered river channels support an extremely rich and diverse invertebrate fauna. Two rare insects were recorded from the Rangitata and Potts riverbeds: the robber fly *Neoitamus smithii* and the grasshopper *Brachaspis* "lowland". Large numbers of diurnal moths were also observed.

2.5.4 Notable Fauna

The following species classified as threatened by Hitchmough (2002) were observed on the property.

Table 5 Threatened fauna recorded from Mt Potts Pastoral Lease.

Animal Species Common name	Scientific name	**Known Distribution on Property**
Nationally Endangered		
Australasian bittern	*Botaurus poiciloptilis*	Mt Sunday wetlands
kea	*Nestor notabilis*	Ski field basin
grasshopper	*Brachaspis* "lowland"	lower Potts River
Nationally Vulnerable		
wrybill	*Anarhynchus frontalis*	Deep Creek
Caspian tern	*Sterna caspia*	Deep Creek
Serious Decline		
grey duck	*Anas superciliosa superciliosa*	Deep Creek, Mt Sunday wetlands
black-billed gull	*L. bulleri*	Deep Creek
black-fronted tern	*Sterna albostriata*	Deep Creek, lower Potts River
Gradual Decline		
eastern falcon	*Falco novaeseelandiae "eastern"*	The Pyramid; upper Potts Valley
banded dotterel	*Charadrius bicinctus*	Deep Creek; lower Potts River
scree skink	*O. waimatense*	lower Potts River
Sparse		
black shag	*Phalacrocorax carbo novaehollandiae*	Deep Creek
marsh crake	*Porzana pusilla affinis*	Mt Sunday wetlands
Range Restricted		
grasshopper	*Brachaspis* "Hunter"	alpine scree and rockfield

2.5.5 Problem Animals

Introduced animals that may have a significant effect on indigenous plant communities on the property, and for which control or containment is practical, are discussed below. Other ubiquitous naturalised species are not listed.

Rabbits, hares, possums, red deer and tahr were observed on Mt Potts Pastoral Lease. Of these species, rabbits and tahr pose the greatest threat: the former in drier habitats such as the open riverbeds; and the latter in high-altitude tussocklands. Rabbit control within areas set aside as public conservation land may be required to protect natural values.

Areas of vegetation damaged by tahr were observed at higher altitudes on the property. Tahr are presumably present throughout back-country parts of the property, and control of tahr within areas set aside as public conservation land will be essential to protect natural values. Mt Potts Pastoral Lease lies within the defined feral range of tahr, but most of the property lies outside the management units defined in the Himalayan Thar Control Plan (Department of Conservation, 1993). This plan proposes a maximum population density of 2 tahr per km² in Management Unit 1 (including the upper Potts Valley).

2.6 HISTORIC RESOURCES

Mt Potts was originally part of the Hakatere station, which originally took in the country between the Rangitata and Ashburton Rivers above Mt Possession. At one time it extended up the Rangitata as far as the Lawrence and to the head of the Ashburton.

Thomas Henry Potts, F.G.P.Leach and Henry Phillips first explored the Ashburton side of Hakatere in April 1857. Potts took up the land around Lake "Clear Water" and ran it as a cattle property until 1870. In 1894 the run was combined with Mt Possession. This continued until 1911 when the country was divided again into two leases and Mt Potts was formed on the western side of the Potts River. Later the run was run in conjunction with Erewhon station by the Urquhart family and it was at this time that the Erewhon ski field was established on what is now the Mt Potts lease. The lease is now run separately and the ski field is managed by the lessees with base facilities at the homestead.

The ski field facilities at the homestead have some historic interest along with the associated power scheme. It is believed that the auxiliary power supply for Mt Potts consisting of a pelton wheel and generator is from the Sawyer Stream powerhouse that supplied power to the Hermitage at Mt Cook from 1925 until about 1957.

Mt Sunday is of interest as a site for the filming of Lord of the Rings although there is no physical remnant from the filming. Otherwise there are no other known historic sites on the lease.

2.7 PUBLIC RECREATION

2.7.1 Physical Characteristics

Mt Potts Pastoral Lease lies within the "pastoral" recreation opportunity class in the Recreation Strategy for Canterbury Conservancy (Department of Conservation, 1994). Within the property, three main recreation settings can be described.

High Mountains

This recreation setting covers the high altitude country on the Potts Range and upper Potts Valley. The area is contiguous with the high mountain ranges of the Arrowsmith Range and, more distantly, the central Southern Alps. It comprises extensive areas of steep broken rock, with sparse vegetation on upper slopes and denser tussock and scrub on sub-alpine slopes. Range crests are snow-covered for at least part of the year and lower slopes snow-covered during the winter months. The area includes access routes to the southern Arrowsmith Range, though there are no popular climbing peaks in this area. One station hut is present in the upper Potts Valley.

Front Faces

This recreation setting covers the "front faces" of the Potts Range, overlooking the Rangitata Valley and including the high lateral moraine terrace west of the lower Potts River. The area mostly comprises moderately-steep mountain slopes and the broad and gently-sloping lateral moraine. It is well vegetated with a mosaic of slim snow-tussock grassland, stonefield and herbfield at higher altitudes; extensive narrow-leaved snow-tussock at mid-altitudes; and, degraded tussock, pasture and scrub at low-altitudes. Beech forest remnants are present in the incised stream gullies and as scattered trees across the upper-montane slopes in the west. The area is relatively accessible from the Hakatere-Potts Road and along a well-formed four-wheel-drive-vehicle track that leads to the Erewhon Ski Field basin.

Rangitata Valley

This recreation setting covers the lower-altitude parts of the property in the Rangitata Valley, and includes the river flats and Mt Sunday. It comprises very gentle country, flat on the river floodplain and relatively gentle on the Mt Sunday roche moutonnée and moraine. The area is also the most modified part of the property, with extensive areas of pasture and numerous cultivated paddocks and shelterbelts. It is, however, the most accessible part of the property, close to the Hakatere-Potts Road and traversed by several well-formed farm tracks. The main vehicle access route to the upper Rangitata Valley (the Hakatere-Potts Road) and important fishing access to the Rangitata River are within this area. The area also contains the well-known location (Mt Sunday) that was used for production of the film "Lord of the Rings".

2.7.2 Legal Access

The Hakatere-Potts Road bisects and provides legal access to lower-altitude parts of the property. Legal access to the Rangitata River floodplain and Mt Sunday is available via UCL areas along the Potts River and on the Rangitata riverbed. Legal, though not practical, foot access is available along the property boundary up the Potts River to Hakatere Conservation Area. Legal access to higher-altitude parts of the property is available from the adjoining Hakatere Conservation Area, though the most practical (but not legal) access is via the Erewhon Ski Field Road.

2.7.3 Activities

The most important recreational use of the property, in terms of visitor numbers, is probably scenery appreciation. Mt Potts Pastoral Lease is clearly visible from most parts of the upper Rangitata Valley. The Hakatere-Potts Road provides a popular drive for visitors to the area and, on the other side of the valley, the Rangitata Gorge Road to Mesopotamia Station is also popular with visitors. Both roads provide spectacular views of the mountain ranges and slopes of Mt Potts, including the prominent knoll of Mt Sunday.

Lower altitude parts of the property, in the Rangitata Valley, provide access for picnicking, bird-watching, sight-seeing and fishing. Vehicle routes for tramping, climbing and hunting in the Lawrence and Clyde valleys (and to lesser extent the Havelock Valley) pass through this part of the property.

There appears to be little other recreational use of other parts of the property apart from commercial use, and occasional public use, of the Erewhon Ski Field Basin. Difficult access appears to limit the popularity of the northern parts of the property on the Potts Range and upper Potts Valley, though there is likely to be occasional use of the latter area from the adjoining Hakatere Conservation Area. These areas provide good opportunities for tramping, hunting and winter climbing. The Potts River may have some potential for water-based recreation.

PART 3 OTHER RELEVANT MATTERS AND PLANS

3.1 CONSULTATION

Early-warning consultation meetings were held in Timaru on 10th September 2002 and in Christchurch on 11th September 2002. The following points were made by groups represented at those meetings:

- The high alpine lands should be retained by the Crown.
- There would be no difficulty with the current ski-field operation continuing, provided it was formalised by a concession agreement.
- There should be free public access along the ski field road.
- The Mt Sunday area has high landscape value, as do the lateral moraines.
- The Erewhon area is a recreational asset and an important recreation resource.
- Deep Stream and the Mt Sunday area should be investigated.
- Trout and salmon spawning areas are located in Deep Stream.
- The road up the valley should be a dedicated road, not an easement.
- There needs to be access from the road to Deep Stream and the Rangitata River.
- Four-wheel-drive-vehicle access up the Lawrence Valley is essential, so that people can drive up certain distance and then mountain-bike beyond.

3.2 DISTRICT PLANS

Mt Potts Pastoral Lease lies within the Ashburton District. The Ashburton District Plan was approved in September 2001. Under this plan the property is zoned Rural C, due to its location in the high country. The district plan also defines areas of important landscape value; both "outstanding" and "significant" landscapes are present on Mt Potts Pastoral Lease. The district plan also lists significant natural conservation sites; three such sites are located on the property:

- Site 37 (Erewhon Beech Remnants) RAP A4: identified for its mountain beech forest remnants.
- Site 38 (Potts Gorge) RAP H20: identified for the diversity of shrubs.
- Site 48 (Upper Rangitata River) RAP H21, SSWI, WERI: for the extensive area of braided riverbed, and range of habitats.

The schedule of Geo-preservation Sites lists two sites on Mount Potts Pastoral Lease:

- Site E (Rocky Gully, Mt Potts) FOS237: for its rich Triassic and Torlesse fossils.
- Site F (Mount Potts Triassic Plant Beds) FOS167: for its well preserved fossil beds.

The district plan contains a number of zone rules relating to land-use activities for significant natural conservation sites, alpine environments, and any land above 900m asl:

- No earthworks shall exceed 30m³ (volume) and/or 50m² (area) in any one hectare in any continuous period of 5 years, or be located on slopes with an angle of greater than 20°.
- No clearance of indigenous vegetation shall exceed 100m² in any one hectare in any continuous period of 5 years.
- No clearance of indigenous vegetation and no earthworks in or within 20m of a naturally-occurring wetland which exceeds 1000m².
- No exotic tree planting.
- No buildings erected.

- No dumping of rubbish
- All tree planting limited to shelterbelts located within the "shelterbelt areas" shown on planning maps.

3.3 CONSERVATION MANAGEMENT STRATEGIES AND PLANS

Mt Potts Pastoral Lease is within the Rangitata Unit of the Canterbury Conservation Management Strategy (CMS). Key priorities for this unit are listed as:

- To identify the significant indigenous vegetation and threatened plant and animal species.
- To use a range of effective methods to protect the indigenous biodiversity.
- To protect and enhance the viability of priority threatened species populations and their habitats.
- To promote appropriate land tenure, reserve status and RMA protection to protect natural character values and provide for appropriate recreation.
- To reduce the impact of wild animals, particularly thar, on indigenous plant communities by managing them at specific density levels.
- To investigate wilderness status and, if agreed to by the Minister of Conservation, gazette a Wilderness Area for the upper catchments of the Havelock, Lawrence, Clyde and Rakaia rivers to protect their wilderness values.
- To investigate conservation park status for land managed by the Conservancy in the Upper Rangitata and Rakaia and, if agreed to by the Minister, gazette as a Conservation Park.

PART 4 ATTACHMENTS

4.1 ADDITIONAL INFORMATION

4.1.1 Scientific Names of Plant Species Cited in the Text

Common name.....Scientific name
(* = naturalised species)

blue tussock ..... *Poa colensoi*
bog-rush ..... *Schoenus pauciflorus*
bracken..... *Pteridium esculentum*
bristle tussock ..... *Rytidosperma setifolium*
broadleaf ..... *Griselinia littoralis*
broom*..... *Cytisus scoparius*
browntop* ..... *Agrostis tenuis*
bush lawyer..... *Rubus schmidelioides*
catsear* ..... *Hypochoeris radicata*
clovers*..... *Trifolium* spp.
comb sedge ..... *Oreobolus pectinatus*
cotton daisy..... *Celmisia spectabilis*
creeping pohuehue..... *Muehlenbeckia axillaris*
fescue tussock ..... *Festuca* sp.
golden spaniard..... *Aciphylla aurea*
inaka..... *Dracophyllum uniflorum*
kanuka..... *Kunzea ericoides*
korokio..... *Corokia cotoneaster*
koromiko..... *Hebe salicifolia*
lotus* ..... *Lotus pedunculatus*
manuka..... *Leptospermum scoparium*
Maori onion ..... *Bulbinella angustifolia*
mat daisies ..... *Raoulia* spp.
matagouri ..... *Discaria toumatou*
mingimingi..... *Coprosma propinqua*
mountain beech..... *Nothofagus solandri* var. *cliffortioides*
mountain clubmoss ..... *Lycopodium fastigiatum*
mountain flax ..... *Phormium cookianum*
mountain ribbonwood..... *Hoheria lyallii*
mountain totara ..... *Podocarpus hallii*
mountain wineberry ..... *Aristotelia fruticosa*
mouse-ear hawkweed*..... *Hieracium pilosella*
narrow-leaved snow-tussock ..... *Chionochloa rigida*
native broom ..... *Carmichaelia australis*
native jasmine ..... *Parsonsia capsularis*
native violet ..... *Viola cunninghamii*
patotara ..... *Leucopogon fraseri*
penwiper ..... *Notothlaspi rosulatum*
porcupine shrub ..... *Melicytus alpinus*
raupo ..... *Typha orientalis*

Common name	Scientific name
red tussock	*Chionochloa rubra*
red woodrush	*Luzula rufa*
scabweed	*Raoulia australis*
scrub pohuehue	*Muehlenbeckia complexa*
sheep's sorrel*	*Rumex acetosella*
silver tussock	*Poa cita*
slim snow-tussock	*Chionochloa macra*
snowberry	*Gaultheria depressa* var. *novae-zelandiae*
snow totara	*Podocarpus nivalis*
snow tussock	*Chionochloa* spp.
soft rush*	*Juncus effusus*
South Island edelweiss	*Leucogenes grandiceps*
sphagnum	*Sphagnum cristatum*
sweet brier*	*Rosa rubiginosa*
sweet vernal*	*Anthoxanthum odoratum*
tauhinu	*Ozothamnus leptophyllus*
three-finger	*Pseudopanax colensoi*
tussock sedge	*Carex secta*
tutu	*Coriaria sarmentosa*
Yorkshire fog*	*Holcus lanatus*

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4.2 ILLUSTRATIVE MAPS

4.2.1 Topographic/Cadastral Map
4.2.2 Values Map