Land Information New Zealand
Toitū te whenua

Crown Pastoral Land Tenure Review

Lease name : SAWDON

Lease number : PT 013

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.

Nov 11

SAWDON
PASTORAL LEASE

CONSERVATION RESOURCES REPORT

March 2003

PART 1 INTRODUCTION

This report describes the significant inherent values present on Sawdon Pastoral Lease. The information presented in this report is derived from field surveys undertaken during November and December 2002, and data collated between November 2002 and January 2003. Field survey reports upon which this report is based are listed below. The methodologies used for the field surveys are described in those reports, and are not outlined again in this report. This report forms part of the Sawdon Pastoral Lease tenure review process.

Sawdon Pastoral Lease covers an area of approximately 7628 hectares in the northeast Mackenzie Basin in South Canterbury. The property lies between Sawdon Stream and Tekapo River, southeast of Lake Tekapo. It adjoins five other pastoral leases: Balmoral and The Wolds across Tekapo River to the west; Mt Hay to the north; Holbrook to the east; and, Grays Hills to the south. The DOC-administered Tekapo Scientific Reserve lies between the property and the town of Lake Tekapo to the north. The property is bisected by State Highway 8 (the Fairlie Tekapo Road).

Sawdon Pastoral Lease covers a broad glacial outwash surface below Lake Tekapo and adjoining ridges of the southern Two Thumb Range. It lies between approximately 600 and 1400 metres altitude, with the majority of the property below 800 metres. The property is drained by Edward Stream, Dead Mans Creek and Sawdon Stream.

The property lies on the boundary of the Mackenzie and Heron ecological regions: the western part is within Pukaki Ecological District; the eastern part is within Tekapo Ecological District; and, the northeast part of the property is within Two Thumb Ecological District. Mackenzie Ecological Region was surveyed as part of the Protected Natural Areas Programme in the early 1980s. Two areas identified as priority natural areas (PNA) for protection during that survey (Espie *et al*, 1984) lie wholly on Sawdon Pastoral Lease (Pukaki PNA 16 Tekapo River Terrace and Pukaki PNA 17 Edward Stream) and small parts of two other priority natural areas lie within the property (Pukaki PNA 15 Tekapo River and Tekapo PNA 29 Tekapo Tarns).

Field survey reports upon which this report is based:

- Sawdon Pastoral Lease Landscape Assessment, Alan Petric, December 2002. 12p+maps+photographs.
- Botanical Assessment for Tenure Review: Sawdon Pastoral Lease, Geoff Walls, Taramoa Ltd, November 2002, 20p+map.
- Assessment of the Fauna Values of Sawdon Pastoral Lease, Jane Sedgeley, DOC, December 2002, 14p+map+photographs.
- Sawdon Pastoral Lease Invertebrate Assessment, Simon Morris, December 2002, 8p+maps.
- Sawdon Pastoral Lease, Report on Aquatic Fauna Surveys, Scott Bowie, December 2002, 13p+map+photographs.

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

2.1 LANDSCAPE

Sawdon Pastoral Lease is a part of a cluster of leases that form the gateway to the Mackenzie Basin via Burkes Pass. From this natural saddle State Highway 8 gradually descends towards Lake Tekapo between the valleys and ridges that extend out from the Two Thumb Range and the expansive outwash plains. From along this section of the highway a sequence of views and visual expressions unfold:

- Expansive views which are generally panoramic and uncluttered by intervening vegetation or "built" elements.
- A landform defined by outwash plains, frequently bounded by intermediate hills and with a backdrop of angulated mountains.
- Little visual enclosure, except around homesteads where there are established exotic plantings.
- Uniformity and localized subtleties in the ground cover dominated by grasslands.

Sawdon Pastoral Lease contains both high landscape and visual values attributable to the variation of landforms that are characteristic of both glaciation and natural weathering processes. The most recognizable landscape type is the outwash gravel plain. It is significant due to its sense of vastness, boundless qualities, lack of vertical height, and the uniformity in ground cover.

The property contains several significant discrete natural features, particularly the basin and kettle lakes (Landscape Unit 3) and the impounded lake (Landscape Unit 4) as well as playing a key role in the introduction of the Mackenzie Basin for visitors traveling from the north. Similarly when approaching Lake Tekapo from the south the main ridgelines leading off Mt Edward form a part of the scenic backdrop to the lake.

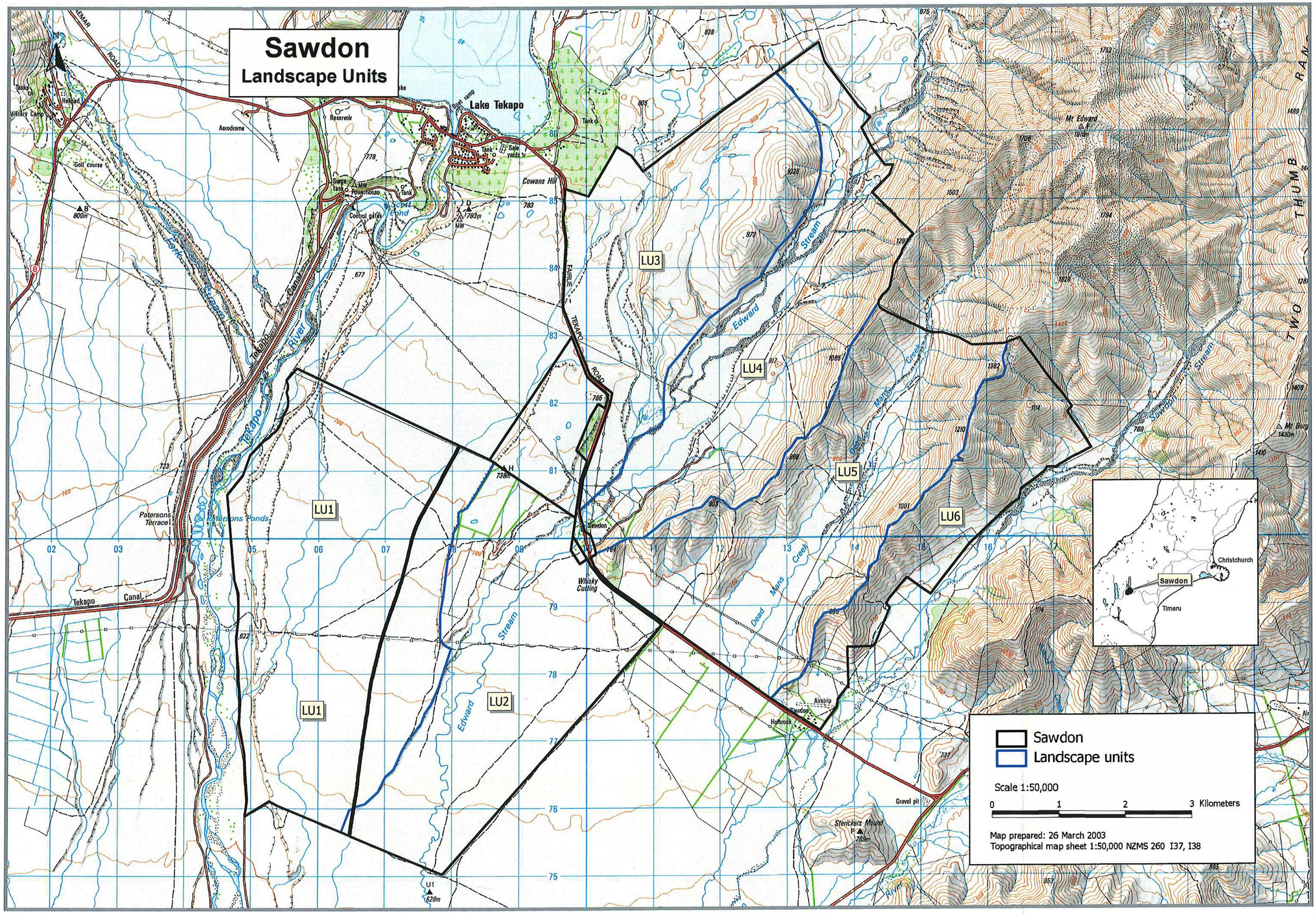
For this assessment of significant inherent values Sawdon Pastoral Lease is divided into six landscape units which are shown on the map on following page and are described below.

Landscape Unit 1

This unit encompasses a large proportion of the expansive outwash gravel plain that extends from the hummocky country south of the township of Lake Tekapo. The unit's eastern boundary follows the base of the moraine terrace west of State Highway 8 and its western boundary is the base of the terrace that encloses the residual Tekapo River. The northern portion of the outwash gravel plain is protected within Tekapo Scientific Reserve.

A distinctive feature of this landscape unit is the uniformity of the ground surface. Only micro topographic changes occur in the form of low scrolling ridgelines that appear to have been created by the deposition of fine silt along the edges of the former river channels. The deep silt of these ridgelines has in places been heavily modified by rabbit warrens. Flat expanses of sorted cobbles lie between the ridges.

Sawdon
Landscape Units



The vegetation covering this subdued topography appears unchanging. Low ridges are clad in depleted fescue grasslands supplemented by introduced plants such as sheep's sorrel[1], sweet vernal and Yorkshire fog. The flat depressions between the ridgelines have a spasmodic covering of *Raoulia* cushionfields and mats of hawkweed. Although the topographical map indicates several watercourses superimposed over the outwash, after inspection these would appear to be all ephemeral channels.

The primary land use over the outwash is light grazing, and the location of pylons for electricity transmission. A point of interest is the rabbit-proof fencing that was erected around the perimeter of the property by the former Ministry of Works and Development to help prevent animals damaging exotic trees planted along the margins of the Tekapo River.

Landscape Values

This unit contains significant landscape values as the formative processes that created the outwash plains are clearly legible. Even though the topography is not as dramatic as other landforms associated with glaciation, it represents an integral component of the Mackenzie basin because of: the uniformity in the topography (ridges are scarcely one metre high); the absence of grasslands; the strong horizontal lines created by the outwash especially where it abuts the escarpment; and, the simplicity of the landform.

Visual Values

This unit has moderately-high visual resource values that should not be assessed in isolation, but as part of the wider Tekapo outwash plain. The imposing scale of the outwash plain helps to provide the sense of spaciousness and uncluttered views characteristic of the Mackenzie Basin.

Potential Vulnerability to Change

This unit is highly sensitive to change. Threats include:

- Any further subdivision that would compromise the uniformity and simplicity of this expansive landform.
- Tree planting, especially geometric blocks of trees.
- Wilding tree spread.
- Gradual "greening" of the distinctive mousy-grey outwash gravel surface.
- Introduction of any vertical "built" elements.
- Earth disturbance, especially on the low ridges.

Landscape Unit 2

This unit is a combination of the elevated moraine terrace west of State Highway 8, the outwash gravel plain south of that terrace, and the more recent alluvial deposits along Edward Stream. The surface of the terrace slopes slightly to the south and its perimeter forms a well defined escarpment. The outwash surface is both similar in scale and character to that described for Landscape Unit 1.

A large proportion of the terrace has been developed as farmland, and is surrounded by well-maintained pine shelterbelts. The balance of the terrace supports modified fescue tussockland. Areas between the terrace scarp and Edward Stream have been developed and cultivated. It appears that there is potential for the cultivation of further areas along

[1] Scientific names of species are listed in Section 4.4.1

Edward Stream. The vegetative cover over the outwash gravel is unvarying and similar to that which has been described for Landscape Unit 1.

Landscape Values

The outwash gravel formation has high landscape values and complements the qualities already described for Landscape Unit 1. Continued development of the flats along Edward Stream could compromise the overall integrity of the outwash by bisecting the area. The landscape values of the terrace have been compromised by conversion to pasture.

Visual Values

The visual resource values within this unit are moderately high, forming the middle ground of the distant views of the foothills and mountains.

Potential Vulnerability to Change

This unit is highly sensitive to change. Threats include:

- Tree planting.
- Wilding tree spread.
- Earth disturbance, especially to the fragile low ridges.
- Any further subdivision of the outwash gravel plain.
- Introduction of any vertical "built" elements.

Landscape Unit 3

This unit covers a large triangular block of land at the northern corner of the property. The western boundary follows State Highway 8, the northern boundary is Mt Hay Pastoral Lease, and the southeast boundary is the rounded crest of a large glacial hillock that is separated from the main rangelands by Edward Valley.

The hillock contains two prominent rounded domes, at 1026m and 973m altitude. To the west of these domes, the even-graded colluvial slopes descend to an enclosed basin containing a string of small lakes which drain to Edward Stream via a natural swale. West of the hillock is a gentler rolling terrain that merges with the outwash formation already described within landscape units 1 and 2.

The vegetative cover is dominated by modified fescue tussockland. Drier northwest-facing slopes support depleted short tussockland, matagouri, golden spaniard, and areas of bare ground. The margins of the lakes and the interconnecting swale contain modified turf communities. The primary land use is light grazing. The unit is subdivided into several large grazing blocks.

Landscape Values

The unit has moderately-high landscape values, attributable to the unit's homogenous landform and the unvarying character of the fescue tussock cover, even though these tussocklands are modified. The simple landform and uniform ground cover combine to form a coherent montane landscape. The basin between the hillocks is a distinctive natural feature.

Visual Values
The hillock and surrounding undulating terrain have high visual resource values as they form the immediate foreground view for travelers on State Highway 8 south of Lake Tekapo.

Potential Vulnerability to Change
This unit is moderately sensitive to change. Threats include:
- Further fragmentation of the uniform ground cover through subdivision and land-use change.
- Unsympathetic track construction that would permanently scar the rounded landforms.
- Tree planting, including shelter planting.
- Enrichment of the lakes by stock grazing.

Landscape Unit 4

This unit comprises the part of Edward Valley that lies northeast of State Highway 8. The eastern boundary to the unit is the long ridgeline that descends from Mt Edward (outside the property). The even side slopes on this ridge feature indented watercourses, areas of rotational slumping, strips of wind erosion and occasional patches of stable scree.

Opposite the eastern ridgeline are the eastern faces of the glacial hillocks that have already been described for Landscape Unit 3. The edges of the wide valley that contains Edward Stream are defined by a series of thin alluvial terraces, many of which have been undercut by the stream. The floor of the valley increasingly widens after departing the enclosed hills to merge with the outwash plain of the Tekapo River.

A relatively recent natural feature is a lake created by the impoundment of water behind alluvial gravel from Edward Stream. The eastern margin of this lake consists of a craggy spur, much of which has been buried by the accumulation of gravel. To the north of the lake the topography becomes smoother owing to a mantle of colluvium. A series of kettle-hole lakes are located close to the northern corner of the property.

Much of the gentler front country within this unit has been cultivated and turned into semi-intensive farmland. Drier northwest facing slopes are covered in depleted short tussockland with occasional patches of matagouri shrubland. Mouse-ear hawkweed is also abundant over these semi-arid slopes. Along the base of the slopes *Coprosma*/matagouri/*Olearia* shrublands and occasional sweet brier occupy many of the narrow gullies.

Landscape Values
The landscape values of the slopes are moderately-high owing to the overall natural appearance of the short tussockland. Most of the lower slopes and valley floor have been converted into either improved pasture or cultivated and subdivided into smaller paddocks. A distinctive feature is the small lake adjacent to the bed of Edward Stream: the presence of a large mass of water within a semi-arid environment and the presence of a variety of water fowl provides a strong sense of place and discovery.

Visual Values
The upper and mid sections of the northwest facing slopes have high visual resource values, as they form the front line of the rangelands when viewed from State Highway 8.

The balance of the unit has moderate visual values, except for the localized views of the lake.

Potential Vulnerability to Change

This unit is moderately sensitive to change. Threats include:

- Any subdivision or major change in land-use on the visually-prominent slopes that lead down from Mt Edward.
- Tree planting on the outwash gravels and terraces.
- Spread of wilding trees.

Landscape Unit 5

This unit covers the mid section of Dead Mans Creek. The upper boundary is Holbrook Pastoral Lease, and the east and west boundaries are the long southern ridges of Mt Edward. Undulating crests with the occasional rocky outcrop typify these ridgelines. The side slopes have a straight constant grade that eases near the base. These side slopes are intermittently indented by shallow depressions that contain ephemeral watercourses. Dead Mans Creek flows over a substantial outwash gravel plain that fans out towards State Highway 8.

The vegetative cover is strongly influenced by aspect: the darker face on the western ridgeline is covered in a mixture of modified short grasslands and occasional patches of *Coprosma/Olearia/*matagouri shrubland, with good populations of native broom. On the drier faces the tussock cover becomes sparser and some areas are affected by wind erosion. In the deeper folds and along the base of the slopes native shrubland is present. Modified short grasslands dominate the ground cover on the valley floor with matagouri colonizing the abandoned water channels. A distinctive feature of this unit is the fact that no shelter planting has been established.

Landscape Values

This unit has high landscape values due to the coherence and uniformity created by the harmonious merging of natural and exotic cover. The valley is a good example of the natural fusing of the expansive Mackenzie Basin and the encircling rangelands: a fundamental component of a valuable high country landscape.

Visual Values

This unit contains high visual resource values due to the prominence of the ridges that help form the southern end of the Two Thumb Range, and which are prominent from State Highway 8. A distinctive visual feature is the localized subtleties and coherent qualities of the expansive grasslands.

Potential Vulnerability to Change

This unit is moderately sensitive to change. Threats include:

- Unsympathetic track construction that would scar the colluvial slopes.
- Further depletion of natural ground cover.
- Fragmentation of the existing uniform ground cover through subdivision or abrupt changes in land use.
- Spread of wilding trees.

Landscape Unit 6

This unit comprises the southeast flanks of the long southern ridge of Mt Maude (1793m). The northern boundary is Holbrook Pastoral Lease: the southeast boundary follows the edge of the river terrace and outwash flats of the Sawdon Stream; and, the southern boundary is State Highway 8. Similar to the adjacent catchments, the side slopes are moderate with intermittent deep indentations that form small side spurs. At the base of the ridgelines the slopes change to undulating terrain that grades to the valley floor of the Sawdon Stream (outside the property).

Above the 900 metre contour the vegetation on these darker slopes is dominated by healthy narrow-leaved snow-tussock and golden spaniard. At the base of the slopes the snow tussock is replaced by short tussockland with a scattered *Coprosma*/matagouri shrubland. The southern toe-slopes are also covered in modified short tussock with the occasional thicket of matagouri, while the gentler low country has been cultivated.

Landscape Values

These southeast-facing slopes have high landscape values, forming the junction and natural fusing point between the rangelands and outwash plain. A special feature is the intactness and extent of the snow tussock, which transmits a distinctive golden sheen and contrasts with the muted grey of the drier faces.

Visual Values

This unit has a high visual resource value due to its prominence from State Highway 8.

Potential Vulnerability to Change

This unit is moderately sensitive to change. Threats include:

- Fragmentation of the existing cover of snow tussock.
- Spread of wilding pines.
- Unsympathetic fencing and track construction that would compromise the existing coherent qualities of the prominent side slopes.

2.2 LANDFORMS AND GEOLOGY

Three distinct and contrasting landforms dominate Sawdon Pastoral Lease: the broad flat plain between State Highway 8 and the Tekapo River; the low rounded moraine hills on both sides of the highway; and, the long southern ridges and valleys of the Two Thumb Range. The broad plain comprises glacial outwash gravel deposited during the Otira Glaciation (Mt John Formation). The moraine hills also originate from the last glaciation and comprise tills of the Balmoral and Wolds formations. The ridges of the Two Thumb Range comprise greywacke and argillite of the Torlesse Group rocks, and weakly schistose greywacke and argillite of the Haast Schist Group (Gair, 1967; Suggate, 1978).

The effects of recent glaciation and subsequent fluvial erosion are clearly illustrated by the landforms on the property. The topography is subdued, except for the narrow ridges of the Two Thumb Range, though even these landforms are of relatively gentle relief. Most parts of the property lie below 800m altitude and much of that area is almost flat. The highest point on Sawdon Pastoral Lease (approximately 1400m above sea level) is at the boundary of Holbrook Pastoral Lease on the ridge between Dead Mans Creek and Sawdon Stream.

The property is mostly drained by Edwards Stream and Dead Mans Creek, with eastern and western parts of the property draining to Sawdon Stream and the Tekapo River respectively. Small tarns are present on the moraine hill in the northern part of the property, and there is a small impounded lake just east of this hill in the bed of Edwards Stream.

Soils on the property are predominantly high country yellow brown earths, with Kaikoura yellow brown earths on upper slopes. The shallow stony flats support Mackenzie soils, with Pukaki soils on the terraces and fans, and Tekapo soils on the rolling hills. Soil fertility is moderate to low and all soils are highly susceptible to wind erosion.

2.3 CLIMATE

Sawdon 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. Easterly and southerly winds are also common: the latter can deposit snow on all parts of the property during winter months. The climate of the property is sub-humid with cold winters and hot summers. Annual rainfall averages 600mm at Lake Tekapo.

2.4 VEGETATION

2.4.1 Original Vegetation

McEwen (1987) described the former (pre-European) vegetation of the Tekapo and Pukaki ecological districts as extensive red tussock with areas of wetland and turf vegetation at kettle-holes and tarns, and snow tussock at higher altitudes. The Two Thumb Ecological District is described as supporting tussockland and alpine plant communities, with mountain totara-hardwood forest on lower and mid slopes. Espie *et al* (1984) described the original vegetation of the Mackenzie Basin as scrub and tussocklands (fescue, red and snow tussock), with some forest in the west.

In a recent review of the origin of indigenous grasslands, McGlone (2001) proposes that the original (pre-human) vegetation of South Canterbury was dominated by grassland and scrub in the intermontane basins, with low-stature forest on the range slopes. Basin grasslands, he suggests, were dominated by species of *Poa*, *Festuca*, *Elymus* and *Rytidosperma*; scrub by species of *Coprosma* and *Myrsine*; and, forest by mountain totara. McGlone proposes that tall tussock (*Chionochloa* species) were generally confined to higher-altitude sites.

It appears likely that most low-altitude (below 900m) parts of Sawdon Pastoral Lease formerly supported short tussock grassland (dominated by *Festuca* and *Poa* species) and scrub, with areas of red tussock and turf vegetation in damper moraine hollows, and shrubland and scrub along stream sides. Areas of bare ground (stones and loess) were probably present. The lower slopes of the Two Thumb Range are likely to have supported mountain totara forest, scrub and/or tall tussock grassland, depending on the site and the frequency of natural fires.

2.4.2 Indigenous Plant Communities

The present-day vegetation of Sawdon Pastoral Lease is described below for each of the five distinctive parts of the property: uplands; lowland valleys; northern block; low hills; and, the outwash plain.

Uplands

Uplands on the property comprise the upper portions (above about 800m altitude) of the two major ridges that run each side of Dead Mans Creek. Most of the land is steep and rocky. Native vegetation has been somewhat depleted by sheep grazing.

On lower hill-slopes with a sunny northwest aspect, most of the original tussockland and shrubland has been replaced with fairly sparse exotic pasture dominated by sweet vernal and browntop. Fescue tussock is common, silver tussock and narrow-leaved snow-tussock are present, mouse-ear hawkweed is abundant, mat daisies are frequent and golden spaniard is scattered. Some rocky faces have patches of shrubland containing matagouri, mingimingi, porcupine shrub and *Olearia odorata*. Prostrate kowhai is present in the sunniest places, as high as 1000m.

On upper hill-slopes and those with a shaded southeast aspect, snow tussockland is the predominant vegetative cover. As a rule this forms a denser cover on the shadier sides of the ridges. Below 1200m altitude tussocklands are dominated by narrow-leaved snow-tussock, but also have sweet vernal, browntop, fescue tussock, mouse-ear hawkweed and golden spaniard throughout. Shrubs, mainly matagouri, are common in places. Woody weeds are few, but include exotic conifers and sweet brier. In seepages *Carex coriacea,* tussock sedge and bog-rush are dominant. Above 1200m slim snow-tussock becomes dominant on most slopes. This tussockland often includes inaka scrub, other shrubs, subalpine herbs and golden spaniard.

Rock outcrops are common and support populations of *Helichrysum plumeum*, a locally-endemic yellow-flowered compact shrub daisy. The population on the southern ridge is particularly strong. Also present are mountain daisies (*C. gracilenta* and *Brachyglottis haastii*), coral broom, dwarf broom, cushion broom, snowberry, *Gaultheria crassa*, *Myrsine nummularia*, the small speargrass *Aciphylla monroi*, native daphnes (*Pimelea oreophila* and *P. traversii*), dwarf heath and small hebes (*Hebe haastii* and *H. tetrasticha*). Lichens are diverse and common.

At the highest point of the lease on the southern ridge is a small snow-fed cushion bog featuring tiny sedges and herbs, including the buttercup *Ranunculus gracilipes*. On the ridge crest are various cushion plants among the tussocks, including *Chionohebe pulvinaris*, *Phyllachne colensoi* and woolly moss. There are mini heathlands of *Dracophyllum pronum* in places. There are only a few upland screes, mostly bare of vegetation.

The threatened plant, *Ischnocarpus novae-zelandiae*, has been recorded on Sawdon Pastoral Lease from the "ridge on Mt Edwards".

Lowland Valleys

There are three main valleys: Edward Stream, Dead Mans Creek and Sawdon Stream. Edward Stream is the largest and most complex. It has extensive flats and fans and various wetlands. In the flood-prone channels of gravels and boulders are scattered grasses (sweet vernal, browntop, fescue tussock and silver tussock), willow herb (*Epilobium melanocaulon*), creeping pohuehue and mat daisies. In places not prone to flooding diverse braided boulderfields of various ages and soil fertility are present. Where there is substantial soil development the main vegetation is degraded short tussockland or pasture containing fescue tussock, sweet vernal, browntop and much mouse-ear hawkweed. On the older boulderfields are complex carpets composed of native plants specialised for that habitat, including mat daisies (at least four species), creeping pohuehue, *Coprosma petriei*, patotara, *Colobanthus brevisepalus*, *Scleranthus uniflorus* and a wealth of lichens and mosses. Low bushes of matagouri, scattered fescue tussock and mouse-ear hawkweed are also present. Patches of shrubs (matagouri, porcupine shrub, *Olearia odorata* and mingimingi) occur at the feet of adjacent slopes and terrace risers.

The wetlands of Edward Stream are many and varied. Near the north boundary of the lease is a substantial tarn, at the head of which is damp turf containing small sedges and grasses kept low by grazing, emergent rushes (mainly soft rush) and various native herbs including *Leptinella serrulata*, *Oxalis exilis* and *Ranunculus maculatus*. Wetlands just to the east are dominated by bog-rush, tussock sedge and *Carex coriacea*. The nationally-rare sedge *Carex tenuiculmis* occurs at one location. The extensive spring-fed wetland complex where Edward Stream emerges onto the plain has similar vegetation, including damp-turf plants. It also has willows (*Salix* sp.), shrublands (of matagouri, porcupine shrub, *Olearia bullata*, *O. odorata* and sweet brier), some *Carex buchananii* and a good population of *Carex tenuiculmis*.

Dead Mans Creek is in a somewhat smaller valley. The lower portion has a broad dry flat, clad in short tussock grassland and pasture with matagouri shrublands alongside the water channels. Upstream is a more complex valley-floor mosaic of dynamic flood channels, stable flats, terraces, fans and wet zones where water follows old meanders. The dry flats have degraded short tussock grassland dominated by mouse-ear hawkweed and fescue tussock but also containing many small native boulderfield plants. The active flood channels have little vegetation except willow herb (*Epilobium melanocaulon*), creeping pohuehue and mat daisies. Swamps and seeps are dominated by bog-rush, *Carex coriacea*, silver tussock and spike-sedge. Alongside the flowing streams and damp channels is a diverse mature shrubland dominated by matagouri, but also containing much *Olearia bullata*, *O. odorata*, tauhinu, mingimingi and porcupine shrub, with lesser amounts of *Coprosma. intertexta* and native brooms (*Carmichaelia australis* and *C. crassicaule*). In these shrublands is a surprising amount of narrow-leaved snow-tussock, golden spaniard and *Aciphylla subflabellata*.

Sawdon Stream is a large stream, but only a small portion of its lower flats and fans are within the pastoral lease. On the broad fans and toe-slopes is vegetation of narrow-leaved snow-tussock, golden spaniard and matagouri, with grasses (including much fescue tussock) and mouse-ear hawkweed in between. On the flats is mostly matagouri shrubland and sparse pasture. All this vegetation is grazed, as in the other valleys.

Northern Block

This area is a rough triangle between Edward Stream and State Highway 8. The dry valley with its flight of terraces in the west of the area is bouldery and has a degraded vegetation of mouse-ear hawkweed, exotic grasses, fescue tussock, lichens, mosses and specialist native boulderfield plants including *Pimelea pulvinaris*, *Coprosma petriei* and mat daisies. In the valley bottom where it is permanently damp is a sedgeland of bog-rush, *Carex coriacea*, tussock sedge, *Carex buchananii* and *Carex virgata*. There are very small patches of shrubland dominated by matagouri on toe-slopes.

To the east of the dry valley is a high terrace or plateau. It is mostly covered in short-tussock grassland with exotic pasture grasses (browntop and sweet vernal in particular). Mouse-ear hawkweed is abundant and lichens, mosses and specialist native boulderfield plants are common. There are several dry tarns (ephemeral wetlands) containing low turfs dominated by small sedges and grasses and *Galium perpusillum*. In a basin where two drainage channels coalesce is an area of narrow-leaved snow-tussock. At a slightly higher altitude is a series of tarns with standing water that rarely dries completely, linked by a tiny creek. These tarns have the naturalised glaucous sweetgrass (*Glyceria declinata*) growing in the water and have damp turfs of small rushes and sedges such as *Isolepis basilaris* and *Carex berggrenii,* and tiny herbs including *Galium perpusillum*, *Plantago triandra* and *Gnaphalium mackayi*. Of note is the presence of the tiny native spring-annual forget-me-not *Myosotis pygmaea* var. *minutiflora*. This plant is nationally uncommon, being found in only a handful of sites in Canterbury and Otago, and is otherwise known in the Mackenzie Basin only from kettle-hole turf in Tekapo Scientific Reserve. It has two colour morphs, bronze and green; the green morph was found at the high tarns.

East of the high tarns is a double hill. It mostly supports a degraded vegetation of mouse-ear hawkweed, exotic grasses, fescue tussock, lichens, mosses and scattered native boulderfield plants. On the summit is a sheep camp dominated by horehound and sheep's sorrel, with mounds of cushion broom.

Low Hills

The low hills at the southern ends of the two main upland ridges are heavily grazed and mostly support fairly sparse pasture of exotic grasses, fescue tussock, mouse-ear hawkweed, sheep's sorrel and various native mat plants. Areas of matagouri shrubland occur on some toe-slopes. The northwest-facing rocky slopes provide a distinctive habitat. They have shrublands of varying density, dominated by prostrate kowhai (*Sophora prostrata*), porcupine shrub and matagouri. Also present are *Olearia odorata*, common broom (*Carmichaelia petriei*), scrub pohuehue, mingimingi, *Coprosma virescens*, fescue tussock and blue tussock. Rock ferns (*Cheilanthes distans* and *Pellaea calidirupium*) and sun orchids (*Thelymitra* sp.) are common. Of particular note is the occurrence of the rare native broom *Carmichaelia curta*. It is growing among the rocks at a number of sites but is browsed by sheep.

Outwash Plain

North-east of State Highway 8, where Dead Mans Creek and Sawdon Stream emerge onto the lowland plain is a gently-sloping broad fan. It is clad in pasture of sweet vernal and browntop, with much fescue tussock. Southwest of the highway is similar vegetation on a triangular continuation of the same surface.

West of the highway, on the true right (northwest side) of Edward Stream, is an elongated triangular remnant of a high terrace. It has a series of kettle-holes, occasionally containing water, in which there are low turfs of native and exotic grasses, sedges, rushes and herbs. This turf is much modified by grazing, trampling, over-sowing and fertiliser use; and this community appears to be better represented within the adjacent Tekapo Scientific Reserve (Johnson, 1991). Most of the high terrace is in improved pasture, grazed by sheep, and has shelterbelts of exotic pines. The lower terraces flanking Edward Stream and the floodplain of the stream itself appear to be more fertile still and are either developed for improved pasture and fodder cropping or support relatively lush exotic pasture.

The majority of the area though is a broad arid plain of stones and loess soils with much more sparse vegetation cover, each side of Edward Stream. Plants make up about half the ground cover, and are small and low-growing. Fescue tussock and small bushes of matagouri are scattered along the crests of mounds. Otherwise, the vegetation is composed mainly of small grasses (predominantly browntop, blue tussock and *Poa maniototo*), mouse-ear hawkweed, mat daisies (*Raoulia australis, R. subsericea, R. parkii* and *R. hookeri*), creeping pohuehue, patotara, sheep's sorrel, native wood-rushes (*Luzula* spp.), mosses, lichens (including tumble lichen *Chondropsis semiviridis*), *Coprosma petriei* and *Scleranthus uniflorus*. Less common are cushion broom, *Pimelea pulvinaris*, *Pimelea oreophila*, *Pimelea prostrata*, the daisy *Celmisia gracilenta* and *Hebe pimelioides*. In places, especially on the tops of the terrace risers, is a scattering of the rare native cress *Lepidium sisymbrioides* subsp. *sisymbrioides*, the tiny rare bachelor's button *Leptinella* 'Clutha' and dwarf broom (*Carmichaelia vexillata*). A small native convolvulus, *Convolvulus verecundus*, which appears in spring before dying away in summer, is also present. This habitat has virtual desert conditions and the vegetation is distinctive.

On the low terrace flanking the Tekapo River, on the western boundary of the pastoral lease, there is a greater vegetative cover, possibly because it is less affected by wind erosion and frost heave. Exotic grasses are common, there are a few willows in damp places and shrubs (matagouri, porcupine shrub and sweet brier) are prevalent. In gravelly places, the distinctive cryptic mat daisy *Raoulia monroi* is common. Also found there during the survey were *Convolvulus verecundus* and a single population of *Muehlenbeckia ephedroides*.

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 Sawdon Pastoral Lease.

Plant Species	Known Distribution on Property
Nationally Critical	
Leptinella "Clutha River"	Tekapo outwash plain
Nationally Endangered	
Carmichaelia curta	Edward Stream valley; slopes behind woolshed and homestead
Nationally Vulnerable	
Myosotis pygmaea var. *minutiflora*	tarn margins, northern moraine hill
Serious Decline	
Isolepis basilaris	tarn margins, northern moraine hill
Gradual Decline	
Carmichaelia crassicaule	upland tussockland and rockland
Carmichaelia vexillata	Tekapo outwash plain; Mt Edward ridge
Ischnocarpus novae-zelandiae	Mt Edward ridge
Lepidium sisymbrioides ssp. *sisymbrioides*	Edward Stream valley (likely) Edward and Tekapo outwash plains (several plants) -
Raoulia monroi	Tekapo outwash plain
Raoulia parkii	Tekapo and Edward outwash plains
Sparse	
Aciphylla subflabellata	Dead Mans Creek (shrubland)
Carex tenuiculmis	wetland west of Edward Stream (15 plants) upper Edward Stream (one plant)
Coprosma intertexta	lowland valleys (shrubland)
Muehlenbeckia ephedroides	Tekapo outwash plain
Olearia bullata	lowland valleys (shrubland)
Convolvulus verecundus	Edward Stream valley Tekapo outwash plain
Range Restricted	
Helichrysum plumeum	upland ridges (rock outcrops)
Data Deficient	
Myosotis uniflora	Edward Stream valley (terrace)
Vittadinia australis	upland rockland

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*)
Crack willow is present at several locations on the property, notably as planted stands alongside the major streams close to State Highway 8. Scattered crack willow trees are also present in the small tributary of Edward Stream at the northern end of the property. Removal of these scattered trees would be relatively easy and would help protect the habitat values of Edward Stream and maintain the natural character of this part of the property.

Gorse (*Ulex europaeus*) and broom (*Cytisus scoparius*)
Both gorse and broom are present in the Tekapo River valley adjacent to the western boundary of the property. Containment (or removal) of these infestations may be required to prevent spread onto the property.

Wilding pines (conifer species)
Scattered wilding pines were observed on upper slopes in Dead Mans Creek. The presence of substantial conifer plantings northwest of the property at Lake Tekapo suggests that ongoing monitoring and control of wilding trees will be required, especially in areas no longer grazed by domestic stock.

Russell lupin (*Lupinus polyphyllus*)
Russell lupins are common on the gravel verge and adjoining grasslands beside State Highway 73. This species does not appear to be spreading onto the property at present. However, open or disturbed sites on the property, such as riverbeds or sparsely-vegetated gravel and stonefield, are vulnerable to the invasion of Russell lupin. Removal of grazing from areas near the highway may also encourage the establishment of this species. Control of Russell lupin may be required at some sites.

Sweet brier (*Rosa rubiginosa*)
Sweet brier was observed at scattered locations throughout the property. No large or dense infestations were observed, and it does not appear to pose a significant threat to natural values on the property.

Stonecrop (*Sedum acre*)
This hardy species is well established on dry gravelfield and stonefield in the Tekapo River valley adjacent to the western boundary of the property. Its rapid spread in other parts of the high country suggests that it poses a significant threat to low-stature plant communities on the property, especially those at dry stony sites. However, containment or control of infestations of this species is likely to be difficult.

2.5 FAUNA

2.5.1 Birds and Reptiles

A total of 44 bird species: 28 indigenous (15 endemic and 13 native) of which 11 are considered threatened (Hitchmough, 2002), and 16 introduced species, have been recorded from the property (Tables 2 & 3). Six endemic lizard species have been recorded from the property, three of which are threatened – spotted skink, scree skink and long-toed skink (Table 4). The area appears to be an important stronghold for scree skink and long-toed skink.

The main bird and lizard habitats on the property are: the Edward Stream complex; the series of high tarns; native shrublands; rocky hillsides; and, the arid plains to the south-west of State Highway 8. These areas are described below.

Edward Stream and Wetland Complex

Edward Stream is a small gravel-bed river with fluctuating flows. It runs through the length of the property. There is a lake at its upper end, and a spring-fed wetland system midway along its length. It has rich habitat complexity, including riverine, palustrine and lacustrine wetlands and dry riverbed terraces. This complexity is enhanced by the connectivity between these habitat types, the proximity of the habitats to one another, and the high diversity of foraging and breeding micro-habitats.

Birds

A total of 26 indigenous bird species have been recorded in this habitat. These species include 14 endemic and 12 native species, of which 10 are classified as threatened (Table 5). Virtually all bird species representative of high country braided rivers, small lakes, ponds and swamps have been recorded. Relatively high numbers of wetland birds were recorded in the seven kilometre section between the lake and the highway bridge. Comparatively lower numbers were recorded in the section between the highway bridge and the point where pylon cables cross the stream. Numbers of banded dotterel were the second highest (14.2 per km) of those recorded on 21 surveys of braided rivers in Canterbury (O'Donnell & Moore, 1983; Robertson *et al.*, 1983). A small nesting colony (approximately 10 pairs) of black-fronted tern was found in the upper reaches.

Lizards

Areas of the dry stream bed provided good habitat for several lizard species. A scree skink was found 20 metres from a stream channel during this survey. Main habitat components are bare rocky ground with scattered short tussock, sweet brier, mat daisies, and creeping pohuehue. Common skink, McCann's skink and common gecko "southern alps" have been recorded here previously.

High Tarns

This area covers a linked series of small tarns on a high terrace in the northeast of the property. Several species of wader and waterfowl use the tarns, including paradise shelduck, grey duck, banded dotterel and pied stilt. Black stilt and Australasian bittern have been previously recorded at this site. New Zealand pipit and mallard were recorded during this survey.

Other Wetlands

Two other wetlands with permanent water were observed on the property. The first is a relatively small wetland at the foot of a steep rocky hillside just northeast of the woolshed. It has permanent open water, willow trees, areas of sedge including *Carex secta* and *C. coriacea*, and a fringe of native shrubs (matagouri and *Olearia bullata*). Grey teal and grey warbler were recorded there during this survey. It also provides habitat for marsh crake. The second wetland is located on the true right of Edward Stream in the south part of the property close to where the pylon cables cross the stream. It has permanent water but is shaded by willow trees. Grey teal were present during this survey.

Shrublands

The best examples of native shrubland on the property were found alongside Edward Stream in the vicinity of the lake, on the rocky face near the woolshed, and along the upper section of Dead Mans Creek (the most mature and complex of the shrublands on the property). Grey warbler and silvereye were recorded in all these locations during this survey. The habitat is also suitable for fantail.

The complex of shrubland and rocky ground provides habitat suitable for both ground-dwelling and arboreal lizard species, such as jewelled gecko (*Naultinus gemmeus*) which has been recorded on the western side of the Tekapo River. A McCann's skink was recorded, and lizard sign was common, amongst the rocks and shrublands close to the woolshed.

Lower Hill-slopes with Rocky Outcrops and Talus

Three hillsides that had relatively extensive rock outcrops were examined: the east- to north-facing slope west of the lake in Edwards Stream valley; the steep rocky face near the woolshed; and, the steep dry rocky hillside immediately east of the homestead. These slopes supported short tussock, matagouri shrubland, rock and talus.

Lizards

Common skink and common gecko "southern alps" (adult and juvenile) were observed on the western side of the lake under boulders between the track and the lake edge. Lizards appeared more numerous further around the lake as the hillside turned away from the lake and became north-facing. Common gecko, common skink and spotted skink were recorded, and lizard sign was very prevalent (skink and gecko droppings, and gecko skins). Lizard sign (droppings and skin) was numerous on the rock face near the woolshed. The long-toed skink has been previously recorded just to the northeast of the area searched during this survey. In the third area by the homestead one juvenile common gecko and numerous droppings were found.

Southern Arid Flats

In the southern portion of the property (south of State Highway 8) there is an extensive arid plain system each side of lower Edward Stream. It is a wide fluvial-glacial surface descending towards the Tekapo River in a series of terraces. Also present is a dry gully (probably an old stream channel) which contains numerous boulders, and low shrublands of porcupine shrub, matagouri, sweet brier and mingimingi.

Birds

South Island pied oystercatcher, numerous New Zealand pipit and banded dotterel were recorded during the survey. The area provides important breeding habitat for banded dotterel.

Lizards

The isolated dry gully appeared to have the highest density of lizards encountered during this survey. Five common geckos and five common/McCann's skinks were found over a very short period of time.

Table 2 Indigenous bird species recorded from Sawdon Pastoral Lease.

Bird species		**Known Distribution on Property**
Common name	Scientific name	
black shag*	*Phalacrocorax carbo novaehollandiae*	Edward Stm
little shag*	*P. melanoleucos*	Edward Stm
white-faced heron*	*Ardea novaehollandiae*	Edward Stm
Australasian bittern*	*Botaurus poiciloptilis*	Edward Stm wetland, high tarns
black swan[2]	*Cygnus atratus*	Edward Stm lake
paradise shelduck	*Tadorna variegata*	Edward Stm, Edward Stm lake
grey duck*	*Anus superciliosa*	Edward Stm, Edward Stm wetland
grey teal	*A. gibberifrons*	Edward Stm wetland, woolshed wetland
NZ shoveler*	*A. rhynchotis*	Edward Stm wetland
NZ scaup*	*Aythya australis*	Edward Stm
harrier hawk	*Circus approximans*	throughout
eastern falcon	*Falco novaeseelandiae "eastern"*	upper reaches of Edward Stm
marsh crake*	*Porzana affinis*	Edward Stm wetland
SI pied oystercatcher	*Haematopus ostralegus finschi*	Edward Stm
spur-winged plover	*Vanellus miles*	throughout
pied stilt	*Himantopus himantopus*	Edward Stm, Edward Stm lake
black stilt*	*H. novaeseelandiae*	Edward Stm, high tarns
banded dotterel	*Charadrius bicinctus*	Edward Stm, throughout
wrybill*	*Anarhynchus frontalis*	Edward Stm
black-backed gull	*Larus dominicanus*	Edward Stm(colony), throughout
black-billed gull*	*L. bulleri*	Edward Stm
black-fronted tern	*Sterna albostriata*	Edward Stm, boundary (colony)
Caspian tern*	*S. caspia*	Edward Stm
welcome swallow*	*Hirundo tahitica*	Edward Stm, highway bridge
silver eye	*Zosterops lateralis*	around homestead
grey warbler	*Gerygone igata*	shrubland, shelter belts, willows
fantail	*Rhipidura fulignosa*	around homestead
NZ pipit	*Anthus novaeseelandiae*	throughout

*Recorded previously (Bull *et al.* 1985; S. Elkington, *unpublished data 1987-2002*; Jarman 1987) but not recorded during the field survey (4th to 8th November 2002).

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

Bird species	
Common name	Scientific name
Canada goose	*Branta canadensis*
mallard	*Anas platyrhynchos*
chukor	*Alectoris chukar*
rock dove	*Columbia livia*
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 Sawdon Pastoral Lease.

Lizard species		**Known Distribution on Property**
Common name	Scientific name	
common gecko	*Hoplodactylus* aff. *maculatus* "southern alps"	several locations under rocks & among talus
spotted skink	*Oligosoma lineoocellatum*	rocky outcrops talus & outcrops, north facing hill-slope western side of low tarn[5]
McCann's skink	*O. maccanni*	rocky outcrop and shrubs near woolshed, gully arid plains
common skink	*O. nigriplantare polychroma*	hill-slope below track on western side of tarn
scree skink	*O. waimatense*	Edward Stream bed
long-toed skink*	*O. longipes*	rocky outcrops on hill-slopes near woolshed

*Recorded previously, but not recorded during the field survey (4th to 8th November 2002).

2.5.2 Freshwater Fauna

Freshwater fauna communities were surveyed at 25 sites on Sawdon Pastoral Lease, spread between Edward Stream, Dead Mans Creek and a series of ponds, tarns, springs and wetlands associated with these streams. Six different fish species (including five native species), one introduced frog and a wide range of aquatic macro-invertebrates were found throughout the different habitat types on the property.

Seven different aquatic habitat types are described. These are classified by water source, resistance to drying and surrounding landform structure. Of these, four were flowing-water habitats and three were still-water habitats. Native fish were found in most habitat types,

except for the high tarns. The three springs were found to contain the recently-described bignose galaxias (*Galaxias* sp. "Waitaki alpine") that is currently listed as "data deficient" (Hitchmough, 2002), with only three populations known prior to this survey. Also found in one of these springs was the upland longjaw galaxies (*Galaxias prognathus*), listed as "sparse" (*ibid*).

The high tarns were the most distinctive macro-invertebrate habitat on Sawdon Pastoral Lease. They contained many species not present in any of the other aquatic habitats surveyed, including tadpole shrimp (*Lepidurus viridus*) (listed as "sparse"), *Daphnia* species and a large Coleoptera species. The other habitats were less distinctive, although each held some individually important qualities.

Of the streams around Sawdon Pastoral Lease, Edward Stream and Sawdon Stream have been surveyed in the past. The New Zealand Freshwater Fish Database contains records of koaro (*Galaxias brevipinnis*), Canterbury galaxias (*G. vulgaris*), alpine galaxias (*G. paucispondylus*), upland longjaw galaxias (*G. prognathus*), common bully (*Gobiomorphus cotidianus)*, upland bully (*G. breviceps*) and rainbow trout (*Oncorhynchus mykiss*), of which common bully were found only in Sawdon Stream and upland longjaw galaxias and rainbow trout were found only in Edward Stream. Of these, only upland longjaw galaxias is considered threatened (Hitchmough, 2002).

The seven types of habitats associated with freshwater communities on Sawdon Pastoral Lease are described below.

High Tarns (also known as Tekapo Tarns)

These tarns occupy a small area near the northern boundary of the property. There are four main tarns with water in them, though all were in varying stages of drying-up at the time of the field survey. All provide some natural habitat, though are affected by pasture grasses and domestic stock.

The high tarns were trapped using gee-minnow traps, but no fish were caught. However, not all tarns were fished, and bullies may be present in the permanently-wet tarns. Populations of macro-invertebrates not found anywhere else on the property were recorded in the tarns: large water beetles (*Homeodytes hookeri*); water bugs (*Diaprepocoris zealandiae*); and Crustacea (*Daphnia* and *Notostracans* species). A tadpole of the whistling frog (*Litoria ewingii*) was also caught.

Lowland Kettle-holes

There are only three of these, all located on the downstream, western side of the road. All were affected by pastoral use, either as stock watering holes, over-sown in pasture or cultivated. Lack of water precluded survey of these kettle-holes.

Lakes

Only one lake is present, in Edward Stream on the north part of the property. Upland bullies were observed in this lake.

Braided Stream Systems

Braided stream-beds are present in Edward Stream and Dead Mans Creek. Both valleys have sections of wet braided stream (with water still flowing in one or more channels) and dry braided stream (presently without water flowing in the channels). Wet braided stream habitat was present in Edward Stream from the upstream property boundary to approximately 1 km upstream of the power lines crossing the stream; and, in Dead Mans Creek for approximately one kilometre from the upstream property boundary.

Four species of fish were observed in the braided section of Edward Stream: alpine galaxias and upland bully were found in the upper reaches; and, Canterbury galaxias and rainbow trout were found in the lower reaches. No adult fish were observed in the middle section of Edward Stream (between the lake and just above the highway), although numerous galaxiid fry were present. Alpine galaxias were observed in the braided section of Dead Mans Creek.

Macro-invertebrate populations observed in the wet braided sections of Edward Stream and Dead Mans Creek, included two *Deleatidium* groups (*D. lilli*-group and *D. myzobranchi*-group), black fly larvae of *Austrosimulium tillyardianum*, members of the free-living caddisfly (*Hydrobiosis* species) and Chironomidae (*Tanypodinae* and *Diamesinae* species).

Springs

There are several springs on the property, three of which are particularly important: the first originates beside the woolshed (Spring 1), flowing through an area of willow trees and into a water race; the second (Spring 2) feeds the wetland area on the opposite (west) side of Edward Stream; and, the third (Spring 3) is on the opposite (southwest) side of the road. Spring 1 has a farm intake sump near the source of the spring, and Spring 3 has water extracted for irrigation 200m below the source. All springs are accessible to domestic stock, though Spring 1 is fenced 100m below its source.

Bignose galaxias were observed in each of the three springs: an important find as each spring can be considered a separate population, thereby doubling the number of recorded populations for this newly-described species. Upland longjaw galaxias were observed in Spring 2: also an important record as this species is classified as "sparse" (Hitchmough, 2002). Larval galaxiids were quite plentiful in all three springs.

Only one spring (Spring 2) was surveyed for macro-invertebrates, though it is probably representative of other springs on the property. Cased caddisfly species (*Conuxia gunni*, *Olinga feredayi*, *Pycnocentria evecta* and *Pycnocentrodes aeris*) and water snails (*Potamopyrgus* sp.) were common. Fingernail clams (*Sphaeriid* sp.) were also present.

Stable Waterways (spring-derived)

Two spring-derived stable waterways are present on the property. One rises from Spring 1, runs past the house and joins Edward Stream 30m below the road. This waterway has gravel substrate with a continuous water flow, although it fluctuates seasonally. It was constructed as a farm water race and pond so there is little native vegetation around it, yet it still provides high-quality stream habitat.

This stream showed similar attributes to its source: cased caddisfly (*Philorheithrus lacustris*, *Conuxia gunni*, *Olinga feredayi*, *Pycnocentria evecta* and *Pycnocentrodes aeris*) and snails were again common. Canterbury galaxias were also observed.

The other stable waterway is in Dead Mans Creek valley, although it does not join Dead Mans Creek inside the property boundary. It begins from a series of rain and spring derived channels and runs along the true left of the valley, against the edge of the hills, flowing through an area of dense shrubland and tussock before emerging into cultivated farmland. The channel runs in a deep gut, surrounded by tussocks and pasture, but dries up approximately 2 km above the highway.

Canterbury galaxias and upland bully were observed in the stable stream in Dead Mans Creek valley. Macro-invertebrates recorded included stonefly (*Stenoperla prasina* and *Zelandobius furcillatus*) and mayfly (*Austroclima sepia* and *Nesameletus* species).

General Wetland Area

There is an area of wetland between Spring 2, Edward Stream and the metal pit beside the highway. There is little water flow though the ground is wet, with some large pools. The area is accessible to stock, and silting has destroyed some of the qualities of this wetland.

2.5.3 Invertebrates

Invertebrate communities were sampled from six main habitats on Sawdon Pastoral Lease: small streams, open tussock grassland, shrubland, kettle-holes, older fluvial terraces and sub-alpine slopes. 66 species of invertebrates were collected and identified, including six Orthoptera (cricket, grasshopper and weta) species, 22 Trichoptera (caddisfly) species and 26 Lepidoptera (moth and butterfly) species. The identity of some of the species collected awaits formal confirmation. Two invertebrate species classified as "nationally-endangered" (Hitchmough, 2002) were collected: a grasshopper *Brachaspis robustus*; and, a moth *Orocrambus sophistes*. A moth *Siguas minutus* classified as "gradual decline" was collected. Two invertebrate species classified as "sparse" were collected: a moth *Dasyuris enysii*; and, a weevil *Lyperobius carinatus*. Approximately 90% of the invertebrates observed on the property are endemic to New Zealand.

Invertebrate communities observed on Sawdon Pastoral Lease are described below for each of the main habitats sampled.

Alpine and Sub-alpine Habitats

Only a small part of the property lies within the sub-alpine zone, and windy weather precluded effective survey of that area. However, alpine habitats of the southern Two Thumb Range were surveyed recently by Eric Edwards (DOC, Southland). Several rare and endangered invertebrates were collected during that survey, including the giant speargrass weevil (*Lyperobius carinatus*), the moth *Dasyuris enysii* and the ground beetle *Megadromus fultoni*. It is likely that these species are also present on the higher-altitude parts of Sawdon Pastoral Lease.

Shrubland

Small areas of shrubland (including associated gravelfield and rock outcrop) are found throughout the property. The best example is in Dead Mans Creek Valley where a healthy shrubland community adjoins areas of open grassland, rock and bluff, and provides a range of invertebrate habitats. Ground cover within the shrubland is in good condition, and supports species of spider (Araneae), false scorpion (Pseudoscorpionida), centipede (Chilopoda) and millipede (Diplopoda). Invertebrates observed on shrubland foliage include species of spider (Arachnida) and ichneumon wasp (Ichneumonidae). Fly (Diptera) and butterfly (Lycaenidae) species were observed flying over the shrubland.

Rock outcrop and fellfield in Sawdon Stream and Dead Mans Creek support a diverse range of invertebrates, including species of spider wasp (Pompilidae), grasshopper (Acrididae) and diurnal moth.

Moraine

Kettle-holes on the moraines within Sawdon Pastoral Lease support a diverse invertebrate community. Species of ant, fly, copper butterfly (*Lycaena boldenarum*), ground beetle, wasp and bee were all observed in and around the kettle-holes. Many of these species reside in the turfs at the kettle-hole margins. In addition to the species collected during this survey, Brian Patrick (Otago Museum, Dunedin) collected 14 species of moth on the Sawdon flats between October 1988 and August 1989 and Eric Edwards collected two endangered moths, *Orocrambus sophistes* and *Orocrambus* "Mackenzie Basin" during a recent survey of an adjoining area. It is very likely that both these species are also present on Sawdon Pastoral Lease.

Glacial outwash surfaces on the property also support a diverse invertebrate fauna, notably grasshoppers. Four species of grasshopper, all of which are threatened, were observed in this habitat, including New Zealand's most endangered grasshopper, *Brachaspis robustus*. Other grasshoppers recorded were *Sigaus minutus,* which is only found in the Mackenzie Basin, and two un-described species of grasshopper: *Sigaus* 'buttis' and *Sigaus* 'Tekapo' (Morris, 2002).

Aquatic (lakes, streams, creeks, tarns, flushes and cushion-bogs)

Spring-fed creeks on the property are in good condition and provide a variety of habitats (runs and riffles) and substrates (sand and stones), though creek margins and wetland complexes are disturbed by livestock. Despite this, a rich aquatic invertebrate community is present, and species of stonefly, caddisfly, mayfly, dobsonfly and beetle were observed. 22 species of caddisfly have been recorded from the property, five of which are endemic to the South Island (*Hydrobiosis chalcodes*, *Neurochorema forsteri*, *Polyplectropus puerilis*, *Psilochorema bidens* and *Psilochorema tautoru*).

Riverbeds (including alluvial fans, mossfield, lichenfield and rockland)

The invertebrate fauna on the braided bed of Edward Stream is extremely rich and diverse. High numbers and a diverse range of diurnal moth species were observed in this habitat. A good population of *Sigaus minutus* was observed on Edward Stream riverbed, making it a key site for this rare grasshopper. The robber fly (*Neoitamus smithii*) is likely to be found in this area. *Mecodema lucdum* (Coleoptera:Carabide) a rare but widespread species from the

Otago area was collected from the riverbeds on this property. Many other invertebrates, including species of wasp, beetle, fly and ant, were observed on the riverbeds.

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 Sawdon Pastoral Lease.

Animal Species Common name	Scientific name	**Known Distribution on Property**
Nationally Critical		
black stilt	*Himantopus novaeseelandiae*	Edward Stream; high tarns
Nationally Endangered		
Australasian bittern	*Botaurus poiciloptilis*	Edward Stream wetland; high tarns
robust grasshopper	*Brachaspis robustus*	Outwash plain
Moth	*Orocrambus sophistes*	Kettle-holes
Nationally Vulnerable		
Wrybill	*Anarhynchus frontalis*	Edward Stream
Caspian tern	*Sterna caspia*	Edward Stream
Serious Decline		
grey duck	*Anus superciliosa*	Edward Stream; Edward Stream wetland
black-billed gull	*Larus bulleri*	Edward Stream
black-fronted tern	*Sterna albostriata*	Edward Stream; and colony close to property boundary
Gradual Decline		
banded dotterel	*Charadrius bicinctus*	throughout (esp. Edward Stream)
eastern falcon	*Falco nocaeseelandiae "eastern"*	Edward Stream (upper reaches)
scree skink	*Oligosoma waimatense*	Edward Stream bed
spotted skink	*Oligosoma lineoocellatum*	hill-slope west of lake
alpine grasshopper	*Sigaus minutus*	outwash plain; Edward Stream
Sparse		
marsh crake	*Porzana affinis*	Edward Stream wetland
long-toed skink	*Oligosoma longipes*	hill-slope near woolshed
upland longjaw galaxias	*Galaxias prognathus*	Edward Stream; springs
tadpole shrimp	*Lepiduris viridus*	high northern tarns
Moth	*Dasyuris enysii*	upland areas
speargrass weevil	*Lyperobius carinatus*	upland areas
Data Deficient		
bignose galaxias	*Galaxias* sp. "Waitaki alpine" (not formally described)	springs

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 and possums were observed on the property. Of these species, the former pose the greatest threat. While rabbits were not observed in high numbers, the property is

clearly vulnerable to rabbit infestations. Rabbit control within areas set aside as public conservation land may be required to protection important natural values.

Large mammals, such as Himalayan tahr and wallaby may also be present on upland parts of the property. None were observed during the field survey, but both species are present on the Two Thumb Range. Control of these species may also be required.

2.6 HISTORIC RESOURCES

Run 252, Sawdon was first taken up on 1 May 1858 by G.W. Hall and E.G. Stericker. G.W Hall was the older brother of John Nall, who became Prime Minister of New Zealand. The run was originally 20,000 acres and stretched from Burkes Pass to the Tekapo River and the first homestead was on Sawdon Stream above the existing homestead. In 1863 the property was sold to the Parkerson brothers who had a pretty rough time with floods and heavy snow. Later owners included George Russell, Lachlan Macdonald, William Sibbald (who had Lilybank for some time), and Donald Burnett, eldest son of Andrew Burnett, of Mt Cook Station.

In 1911 the Run was subdivided and the 14,000 acres that retained the name of Sawdon was taken up by Colin McKenzie. In 1924 the property was taken over by Walter Don and, when the Tekapo station was surrendered, 5,600 acres out of it was added to Sawdon. Walter Don's daughter and son-in-law Robert Allan became involved in the property in 1966 and are the present-day lessees.

The old homestead sites are of some historic significance but otherwise there are no known historic sites or artefacts.

2.7 PUBLIC RECREATION

2.7.1 Physical Characteristics

The two recreational settings on Sawdon are the hills and ridges leading up to Mt Edward (on the Mt Hay lease) and the flats in Dead Mans Creek, Edward Stream and adjacent to the Tekapo River. The low hills and ridges can be readily traversed on foot. All areas receive snow at times which can impede access. The streams and rivers are usually able to be crossed. The lease is all classified as "pastoral" in the Recreation Strategy for Canterbury (Department of Conservation 1994) and as "open space" in the Departments Recreation Opportunity Spectrum. As "open space" land is generally accessible by off-road vehicles, foot tracks and horse trails with low to moderate use and little facility development.

2.7.2 Legal Access

Legal access is provided to the lease via State Highway 8, the Fairlie to Tekapo Road. There is also a legal road following the Tekapo River which touches into the western boundary of the property. An old legal road line down the Sawdon Flats has been closed and added to the lease.

2.7.3 Activities

Walking access is occasionally given by the lessee for parties climbing on to and traversing Mt Edward. There is some scope for walking access to the high tarns area in conjunction with the existing walkway on Cowans Hill and in conjunction with access through Mt Hay lease. There is also scope for mountainbike riding, horseriding and 4wd trips on the lease.

PART 3 OTHER RELEVANT MATTERS AND PLANS

3.1 CONSULTATION

Meetings were held on the 10th of September 2002 in Timaru and the 11th December 2002 in Christchurch, to discuss a number of pastoral leases, including Sawdon. Representatives of the following organisations were present at these meetings: NZ Four Wheel Drive Association, Canterbury Four Wheel Drive Association, Canterbury University Tramping Club, Canterbury Botanical Society, Peninsula Tramping Club, NZ Deer Stalkers Association, Federated Farmers High Country Committee, Public Access NZ, South Canterbury Tramping Club, Temuka Tramping Club, and Federated Mountain Clubs of NZ.

Issues raised by representatives included: the need for marginal strips along Dead Mans Creek and Edward Stream; four-wheel-drive-vehicle access up Edward Stream as a route onto Mount Hay; the need to investigate invertebrate populations on the property; and, the fact that Sawdon Pastoral Lease was included in the Pastoral Lands Assessment Study by the Clayton Committee.

3.2 DISTRICT PLANS

Sawdon Pastoral Lease lies within the Mackenzie District. The Proposed Mackenzie District Plan, as amended by Council decisions, was notified in September 1999. In this plan the property is zoned Rural. The schedule of Sites of Natural Significance in the Proposed Plan lists three sites located on the property:

- Site 52 (Tekapo Terrace) (Pukaki PNA 16) located on the western side of the property and is recognised for the presence of the rare grasshopper *Sigaus minutus* (Orthoptera, Acrididae).
- Site 53 (Edward Stream) (Pukaki PNA 17) is recognised for the grasshopper *Sigaus minutus* and other terrestrial insects within this habitat.
- Site 54 (High tarns/Tekapo tarns) (Tekapo PNA 29) is recognised for the tarn edge vegetation and fescue tussock community.

The Proposed Mackenzie District Plan contains a number of rules relating to land use activities within sites of natural significance, riparian areas, and in the high-altitude areas (i.e. areas above 900m).

- No clearance of indigenous vegetation (in the case of riparian areas - no vegetation) to exceed 100m² per hectare in any continuous period of 5 years, except for declared weed pests or for the purpose of track maintenance or habitat enhancement.
- No earthworks to exceed 20m³ (volume) or 50m² (area) per hectare in any continuous period of 5 years, except for the purpose of track maintenance (applies to earthworks in sites of natural significance, riparian areas and over 900m).
- No pastoral intensification to exceed 5% of any site of natural significance, except where that activity is provided for under a consent under the Crown Pastoral Land Act, or other management plan or covenant ratified by the district council.

- No tree planting in sites of natural significance or above 900m, but forestry up to a maximum of 2 hectares per Certificate of Title is a controlled activity within wetland and riparian areas.

3.3 CONSERVATION MANAGEMENT STRATEGIES AND PLANS

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

- To identify, maintain and seek to enhance the natural landscape values of the unit through appropriate methods such as tenure review and district plans.
- To identify the significant native vegetation and threatened species of the unit and to use a range of effective methods to protect a representative range of indigenous biodiversity of the unit as well as protecting and enhancing the viability of priority threatened species populations and their habitats in the unit.
- To provide new recreational facilities and opportunities by the Department and other organisations and concessionaires where natural and historic resources and cultural values are not compromised, and to liaise with adjacent landholders to resolve conflicts over access for recreation to land managed by the Department.
- To reduce and maintain rabbit and tahr densities to levels that ensure their adverse effects on natural values are minimised.

Other conservancy-wide priorities identified in the CMS that are relevant to tenure review on these properties are to undertake necessary actions to secure the conservation of category A and B species, including predator control, fencing and habitat protection. The species listed as priority include *Carmichaelia curta,* the robust grasshopper, scree skink, long-toed skink, black-fronted tern and banded dotterel.

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*
broom* ..... *Cytisus scoparius*
browntop* ..... *Agrostis tenuis*
coral broom ..... *Carmichaelia crassicaule*
crack willow ..... *Salix fragilis*
creeping pohuehue ..... *Muehlenbeckia axillaris*
cushion broom ..... *Carmichaelia nana*
dwarf broom ..... *Carmichaelia vexillata*
dwarf heath ..... *Pentachondra pumila*
fescue tussock ..... *Festuca* sp.
golden spaniard ..... *Aciphylla aurea*
gorse ..... *Ulex europaeus*
horehound* ..... *Marrubium vulgare*
inaka ..... *Dracophyllum uniflorum*
mat daisies ..... *Raoulia* spp.
matagouri ..... *Discaria toumatou*
mingimingi ..... *Coprosma propinqua*
mountain totara ..... *Podocarpus hallii*
mouse-ear hawkweed* ..... *Hieracium pilosella*
narrow-leaved snow-tussock ..... *Chionochloa rigida*
native broom ..... *Carmichaelia* sp.
patotara ..... *Leucopogon fraseri*
porcupine shrub ..... *Melicytus alpinus*
prostrate kowhai ..... *Sophora prostrata*
raupo ..... *Typha orientalis*
red tussock ..... *Chionochloa rubra*
scrub pohuehue ..... *Muehlenbeckia complexa*
sheep's sorrel* ..... *Rumex acetosella*
silver tussock ..... *Poa cita*
slim snow-tussock ..... *Chionochloa macra*
snowberry ..... *Gaultheria depressa* var. *novae-zelandiae*
soft rush ..... *Juncus effusus*
spike sedge ..... *Eleocharis acuta*
stonecrop ..... *Sedum acre*
sweet brier* ..... *Rosa rubiginosa*
sweet vernal* ..... *Anthoxanthum odoratum*

tauhinu..... *Ozothamnus leptophyllus*
tussock sedge..... *Carex secta*
woolly moss..... *Racomitrium* sp.
Yorkshire fog..... *Holcus lanatus*

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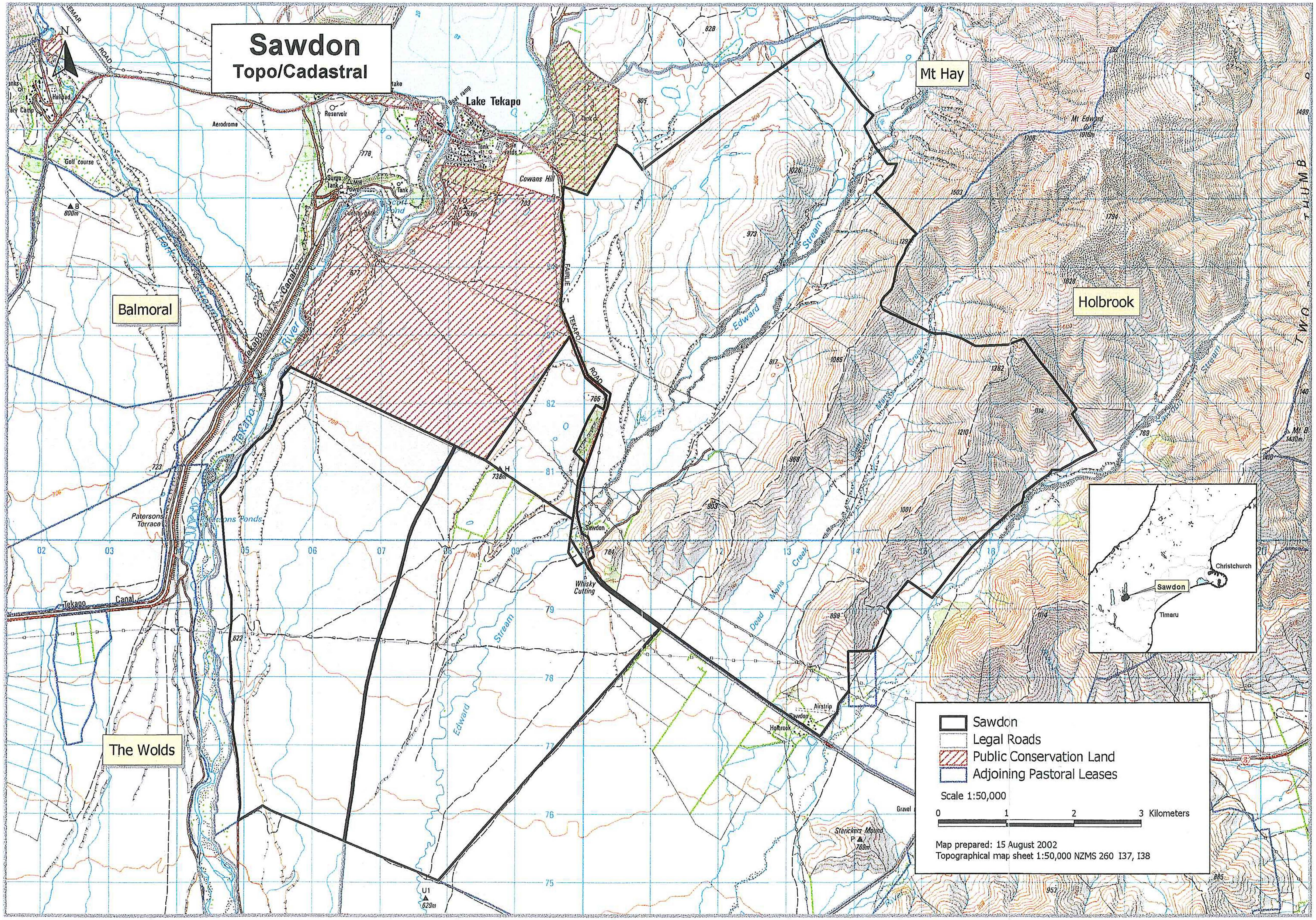
4.2 ILLUSTRATIVE MAPS

4.2.1 Topographic/Cadastral
4.2.2 Values


Sawdon
Topo/Cadastral
Lake Tekapo
Mt Hay
Balmoral
Holbrook
The Wolds
Sawdon
Legal Roads
Public Conservation Land
Adjoining Pastoral Leases
Scale 1:50,000
0 1 2 3 Kilometers
Map prepared: 15 August 2002
Topographical map sheet 1:50,000 NZMS 260 I37, I38
Christchurch
Sawdon
Timaru

Sawdon
Values