Toitu te whenua
Land Information
New Zealand

Crown Pastoral Land Tenure Review

Lease name : THE WOLDS

Lease number : PT 008

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.

They are released under the Official information Act 1982.

June 04

THE WOLDS PASTORAL LEASE

CONSERVATION RESOURCES REPORT

Department of Conservation
June 2004

CONTENTS

PART 1 INTRODUCTION

This report describes the inherent conservation values present on The Wolds Pastoral Lease. The Wolds Pastoral Lease covers an area of approximately 8110 hectares in the Mackenzie Basin, South Canterbury. In addition, a triangular section of Unoccupied Crown Land adjoining the northeast corner of the lease is also assessed in this report. The Wolds Pastoral Lease spans an area of glacial outwash terraces and hills between Lake Pukaki and the Tekapo River, mid-way between Twizel and Lake Tekapo. It covers relatively gentle country lying between c. 520 m at Lake Pukaki (and c. 600 m at the Tekapo River) and 995 m on the Mary Range at Mount Mary. The property is drained by sections of the Mary Burn, Irishman Creek and small tributaries of the Tekapo River and Lake Pukaki.

The Wolds Pastoral Lease adjoins Irishman Creek Pastoral Lease to the north, Maryburn Pastoral Lease to the south, Sawdon Pastoral Lease across the Tekapo River to the east and Lake Pukaki to the west. There are no areas of public conservation land adjoining or near to the property.

Northwest parts of the property lie in the Tekapo Ecological District (ED), and southeast parts of the property lie in the within the Pukaki ED, within the Mackenzie Ecological Region (McEwen, 1987). Mackenzie Ecological Region was surveyed as part of the Protected Natural Areas Programme (PNAP) in the early 1980s (Espie *et al*, 1984). Three areas on the property were recommended for protection as a result of that survey: Tekapo RAP 7 Reservoir Wolds Station (26 ha, west of the Mary Range), Tekapo RAP 8 Mount Mary Eastside (68 ha of the Mary Burn Wetland) and Pukaki RAP 13 Northeast Face Mount Mary (160 ha of scrub on the Mary Range). One other area adjoining the property was also recommended for protection: Pukaki RAP 15 Tekapo River.

Three areas on or adjoining the property are listed as Sites of Natural Significance (SONS) in the Proposed Mackenzie District Plan: SONS 38 Wolds Stream (Mary Burn wetland), SONS 39 Mount Mary (northeast slopes of the Mary Range) and SONS 45 Tekapo/Pukaki Rivers (Tekapo River). Some of the areas proposed for protection as RAPs or SONSs have previously been proposed for protection as Sites of Significant Wildlife Interest.

This report has been compiled from the following field survey reports:

- The Wolds Pastoral Lease Landscape Assessment. Alan Petrie, November 2003, 9p + photographs + map.
- Botanical Assessment for Tenure Review: The Wolds Pastoral Lease. Geoff Walls, Taramoa Ltd., January 2004, 23p + map.
- Assessment of the Faunal Values (Birds and Lizards) of The Wolds Pastoral Lease, Canterbury. Jane Sedgeley, Department of Conservation, Christchurch, February 2004, 14p + appendices + map.
- The Wolds Pastoral Lease, a report on the Aquatic Fauna Surveys. Scott Bowie, Department of Conservation, Christchurch, February 2004, 11p + photographs + map.
- The Wolds Pastoral Lease Tenure Review, Entomological Survey. Rowan Emberson and Pauline Syrett, January 2004, 10p + appendices + photographs + map.

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

2.1 LANDSCAPE

2.1.1 Landscape Context

The Wolds Pastoral Lease forms an integral part of the Mackenzie Basin, which is a highly recognizable landscape of national significance. The flanks of distant mountain ranges and chains of moraine hills characteristically define this expansive landscape.

A landscape study of the Mackenzie and Waitaki basins in 1992 placed The Wolds Pastoral Lease within three separate landscape compartments (Boffa Miskell, 1992). Each of these landscape compartments contains subtle differences in landform and landscape values:

- Lake Pukaki Landscape Compartment (incorporating all of the moraines on the property between the Mary Range and Lake Pukaki). The attributes that typify this landscape compartment include the impressive raw, dramatic landscape qualities where the formative natural processes are strongly evident.
- Tekapo Downs Landscape Compartment (incorporating the Mary Range and terraces east to State Highway 8). This compartment contains extensive moraine with a surface dissected by streams and creeks flowing from north to south, creating "corrugated" and in places rolling terrain.
- Mackenzie Landscape Compartment (incorporating all of the terraces between State Highway 8 and the Tekapo River). This compartment is broadly rectangular in shape and comprises expansive and imposing flat terrain. The absence of vertical elements affords extensive views throughout the basin.

Another landscape study undertaken in 1993 concluded that the Mackenzie Basin is a regionally outstanding natural feature and landscape (Boffa Miskell and Lucas Associates, 1993). The study determined that the Mackenzie Basin is one of the most investigated, painted, written about, visited, eulogized and argued over landscapes in New Zealand. Its key attributes include:

- The many ways by which the formation of the land is expressed: moraines, outwash plains, terraces, fans etc.
- The openness and naturalness of the area.
- The coherence of the land cover and underlying landform.

In essence, the various landscapes of the Mackenzie Basin are typified by uninterrupted views, their apparent (if not actual) naturalness, their extent and uniformity, and the subtleties of colour, texture and vegetative pattern.

2.1.2 Landscape Description

For the purposes of this landscape assessment The Wolds Pastoral Lease is divided into five landscape units and one sub-unit (see Landscape Units map on the following page), reflecting changes in landform, ground cover and land use. The criteria used to assess and evaluate the landscape of each unit are based on the following attributes:

1. Naturalness: an expression of the indigenous content of the vegetative cover and the extent of human intervention.
2. Legibility: an expression of the clarity of the formative processes and how striking these processes are.
3. Aesthetic value: the memorability and naturalness of the area, including factors which can make a landscape vivid, such as simplicity in landform, muted colours and fine-textured ground cover.

Finally, visual values, which are a sub-set of landscape values and relate to the visibility of a particular landscape or natural feature as seen from key viewing points, are also assessed.

Landscape Unit 1

This landscape unit comprises the flight of terraces that step down towards the Tekapo River at the eastern boundary of the property. These terraces are characterized by their gentle relief with the only noticeable variation in ground surface being the terrace risers and the low deposits of sediment that are scrolled across the terrace surfaces. This subdued landform is tilted slightly towards the south though contains no obvious permanent watercourses.

In the north this unit extends to take in a section of the Tekapo Canal (following the eastern toe of Patersons Terrace). This enclave includes Patersons Ponds, which are a string of inter-connected ponds developed by the former Ministry of Works and Development as a wetland/waterfowl habitat area during construction of the Upper Waitaki Power Development Project. A mixture of exotic tree species that include alder, birch, oak and willow encloses the ponds. Raupo reedland has established around the shallow margins of the ponds.

Vegetation on the terraces is predominantly depleted fescue tussock on the linear deposits, with a mixture of native prostrate species, hawkweed, and tufted patches of browntop and sweet vernal on the intervening lower spaces. Infrequently, patches of low matagouri shrubland cover the terrace risers. A large percentage of the surface comprises assorted cobbles and fine windblown soils (glacial till).

Landscape Values

This unit contains high landscape values attributable to the overall naturalness in appearance of the vegetative cover over a simple landform. The low-stature vegetation that struggles to survive in such a harsh environment reinforces the simplicity of this nearly two-dimensional landscape. These alluvial terraces provide the continuity and linkage with other geomorphic features, such as the outwash plains, that make the Mackenzie Basin so distinctive, and help provide the district with an impression of spaciousness.

Visual Values

This unit has only moderate visual resource values due to the fact that, unlike most of the Mackenzie Basin, the Tekapo River terraces are obscured from view with only glimpses visible from the Tekapo Canal Road.

Potential Vulnerability to Change

Land uses and activities that have the potential to adversely affect this unit include:

- Further subdivision and intensification of land use that would be detrimental to the existing uniformity and openness of the terraces.
- The introduction of linear shelter planting that would introduce a sense of visual enclosure.
- Further "greening" of the terraces through irrigation.
- Extraction of gravel.

Landscape Unit 2

This landscape unit incorporates all of the outwash terraces and hummocky moraine across the centre of the property. The unit is bounded in the east by the upper edge of the Tekapo River terraces (Landscape Unit 1) and State Highway 8, in the north by the Tekapo Canal and its accompanying earthworks (which bisect the original outwash plain), in the northwest by the Mary Burn wetland, and in the west by the base of the Mary Range.

The unit contains subtle variations in physical relief with the eastern side containing a series of hummocky mounds that gradually transform to outwash plains further the west. The drainage pattern is consistent, with all permanent and ephemeral watercourses flowing in a north to south direction. The largest of these watercourses is the Mary Burn which meanders over a narrow flood plain at the base of the Mary Range. A distinctive low hummocky moraine ridge follows State Highway 8 along the eastern edge of the unit (sub-unit 2A). This feature is formed from dumped glacial material and is studded with large ice-transported rocks (erratics).

The majority of the unit is clad in modified fescue tussock. Commonly, these depleted grasslands have a presence of introduced grasses and pastoral weeds. Among the grasslands there are occasional patches of low matagouri and sweet brier shrubland. Lucerne paddocks have been developed close to the base of the Mary Range and around the homestead. Within this landscape unit are two parcels of freehold land, the largest containing The Wolds homestead, farm buildings and stockyards. These facilities are enclosed by an assortment of willow, Lombardy poplar and pine trees.

Landscape Values

Specific parts of this unit contain high landscape values principally due to the overall impression of naturalness and spaciousness, with distant views terminated by the high hills that surround the Mackenzie Basin. Similar to Landscape Unit 1, the landform is dominant over both land cover and land use, which are key features of the Mackenzie Basin. In an aesthetic context, which commonly refers to describing the landscape in more descriptive terms, this unit conveys an overall sense of cohesion due to the extensive grazing regime, muted colour range and fine textural patterns. This sense of uniformity has been lost where semi-intensive development has occurred on the property, especially along its northern margins.

Sub Unit 2A conveys a clear expression of the formative processes that have helped fashion the Mackenzie Basin's distinctive landscape.

Visual Values

Landscape Unit 2 and Sub Unit 2A both have high visual resource values principally due to the expansive views of this unit from State Highway 8. A key to this unit's high visual accessibility is the lack of foreground and middle ground features, again reflecting the landscape's formative processes.

Potential Vulnerability to Change
Land uses and activities that have the potential to adversely affect this unit include:
- Further shelter planting, especially close or parallel to roads, which will block out vistas and cause an unnatural sense of enclosure.
- Introduction of further pylons and any other vertical structures.
- Further subdivision and intensification of land use that will create unnatural geometric patterns within a landscape which has a strong sense of homogeneity.
- Further spread of wilding pines.
- Unsympathetic design and siting of buildings.

Landscape Unit 3

This landscape unit includes all of the low-lying Mary Burn basin and wetland on the property. The eastern and southern edges of the unit are defined by hummocky topography, the western edge is the base of the Mary Range, and the northern edge is a straight survey-line that separates the property from Irishman Creek Pastoral Lease. The drainage pattern of the Mary Burn is intricate with numerous small channels meandering across the basin then connecting with the main stream before it flows through a rocky gorge. Grazing of cattle in the basin has resulted in extensive modification to the wetland plant communities and pugging of watercourse margins and natural hollows.

Landscape Values
This unit has moderate landscape values attributable to the extent of human intervention through subdivision fencing and intensive grazing.

Visual Values
This unit has only moderate visual resource values due to the low-lying topography, with only glimpses of the unit visible from the Tekapo Canal road.

Potential Vulnerability to Change
Land uses and activities that have the potential to adversely affect this unit include:
- Further trampling and pugging of watercourse margins.
- Further fragmentation and modification of the remaining wetland plant communities.
- Planting of trees and willow spread.

Landscape Unit 4

This landscape unit incorporates the part of the Mary Range covered by the property. This low range is characterized by its narrow elongated profile and strong north-south axis. The eastern boundary to the unit follows the toe of the range at about 650 m altitude, adjoining Landscape Unit 2. On the corresponding western side the unit's boundary merges with the moraine in Landscape Unit 5. In the north and south the unit is defined by the property boundaries. Along the narrow crest of the range there are numerous low peaks, the highest of which is Mount Mary (995 m). The northern and southern ridges of the range descend to the floor of the outwash plain. The upper flanks of the Mary Range have ice scoured depressions while the mid and lower slopes have a more rounded appearance.

Vegetative cover on the western flanks is predominantly modified short tussock, widely over-sown and top-dressed. The eastern flanks are clad in modified grassland, mixed shrubland and a scattering of exotic trees. At the northern end of the eastern flank scrub is still widespread and proposed for protection as Pukaki RAP 13. At the base of the eastern slope there are mixed plantings of pines and ornamental trees, indicating the site of an early homestead.

Landscape Values
This unit has high landscape and scenic values due to the Mary Range being such a prominent landmark within the Mackenzie Basin. This range is one of the few landforms that protrude above the surface of the outwash plains and terraces, making it a significant natural feature within the wider context of the basin.

Visual Values
This unit has high visual resource values that are intertwined with its scenic value due to the Mary Range being visible from near Lake Tekapo township to the edges of Lake Pukaki where it forms the visual backdrop from several viewing points along State Highway 8. Furthermore, the 1992 landscape study placed great importance on the Mary Range, describing it as a natural divider separating the expansive Mackenzie Landscape Compartment from the ice-scoured Lake Pukaki Landscape Compartment.

Potential Vulnerability to Change
Land uses and activities that have the potential to adversely affect this unit include:
- Decline in the ecological health of the remnant grey shrublands.
- Establishment of geometric blocks of forest.
- Further zigzag tracking across highly visible side slopes.
- Extending the area of utilities around the summit of Mt Mary; co-siting of utilities should be promoted.

Landscape Unit 5

Landscape Unit 5 comprises the moraine surface located between the base of the Mary Range and Lake Pukaki. The low scarp that overlooks Lake Pukaki represents a former lake shore along which Hayman Road has been formed. The northern and southern boundaries of the unit follow the arbitrary straight-line property boundaries across the moraine. Typically the moraine is characterized by hummocky topography, shaped by the dumping of glacial debris in rounded mounds. Separating these mounds is a series of shallow depressions and troughs which generally have a north-south alignment.

Vegetation comprises depleted fescue tussock supplemented by prostrate native species, hawkweed and pasture grasses. Frequently the ground cover is dominated by assorted cobbles. The margins of Hayman Road have been planted with pine, larch and poplar trees, with many of these species spreading onto the low scarp and lake margins.

Landscape Values
Generally this unit has high landscape values due to its overall appearance of naturalness and the repetitive nature of the hummocky topography. It is a natural landscape where landform is dominant over land cover and land use. This slice of moraine must be considered in its wider context as a part of the distinctive glacial landforms that surround the entire southeast corner of Lake Pukaki. Along the margins of the lake the landscape values have been compromised by the introduction of exotic trees into a landscape that is inherently void of high-stature vegetation. In aesthetic terms, the vivid turquoise colour of the lake makes a stark contrast with the mixed vegetation surrounding the lake.

Visual Values
The foreground of this unit has high visual resource values as it provides the visual setting to Lake Pukaki, which can be seen from many viewing points along State Highway 8, Hayman Road and State Highway 80. Although much of the moraine surface is obscured from view, its low relief helps to provide the spatial qualities that are such an important element within the Mackenzie Basin.

Potential Vulnerability to Change

Land uses and activities that have the potential to adversely affect this unit include:

- Introduction of "built" elements that would compromise the natural character of the moraine and the uncluttered qualities of the margins of Lake Pukaki.
- Further spread of wilding trees.
- Introduction of single, high impact land uses such as plantation forestry.

SUMMARY

The Wolds Pastoral Lease forms an integral part of the highly-recognizable Mackenzie Basin landscape, characterized by its distinctive glacial landforms, homogeneity in ground cover and the lack of intensive development. Collectively all the landscape units on the property are interconnected to form a coherent and striking high country landscape. The property includes a diversity of landforms associated with glacial processes, including moraines, glacially-carved hills, outwash plains and terraces.

In aesthetic terms The Wolds Pastoral Lease exemplifies the qualities that are closely associated with the Mackenzie Basin including:

- The uniformity and simplicity of landform with horizontal sweeps.
- Subtle interlocking landforms that provide an overall sense of space and freedom.
- Fine textural qualities of the extensive grasslands.
- Muted tonal range of the vegetation normally contained within a narrow spectrum of brown, gold and grey.

The high visual qualities of the property are reinforced by the abrupt change in physical relief between the Mary Range and the surrounding moraines and outwash terraces. The juxtaposition between such a prominent landmark and landforms that comprise a horizontal plane is both striking and memorable. Patersons Ponds also have a strong identity, even oasis qualities, which for some people may translate to high scenic qualities.

The Wolds Pastoral Lease makes a major contribution to the distinctive traits of the Mackenzie Basin, one of Canterbury's quintessential high country landscapes. Significant parts of the property merit protection for their landscape value. Most of the property's boundaries follow straight survey-lines that often bisect landscapes and natural features. Accordingly, the areas recommended to be protected should be considered alongside similar landscapes and features on adjoining properties.

2.2 LANDFORMS AND GEOLOGY

The Wolds Pastoral Lease covers moraine and outwash gravels on either side of the Mary Range in the central Mackenzie Basin. The Mary Range is a moderately-steep range of bedrock shaped into a north to south-trending ridge by former advances of glaciers from the Pukaki and Tekapo valleys. It comprises moderately-indurated Torlesse Group sandstone (greywacke) and mudstone (argillite) of Triassic age (Gair, 1967).

Landforms surrounding the Mary Range are extensive terraces and fans comprising glacial till (moraine) and outwash gravels. Surfaces west of the Mary Range are predominantly till of the Tekapo, Mt John and Balmoral formations, whereas surfaces east of the range are predominantly till and outwash gravels of the Balmoral Formation. Older outwash gravels and till of the Wolds Formations are present further east, between Irishman Creek and the Tekapo River. Terraces adjacent to the Tekapo River, at the eastern edge of the property, are recent outwash gravels of the Tekapo Formation (Gair, 1967).

Topography of The Wolds Pastoral Lease is, with the exception of the Mary Range, relatively gentle. The bulk of the property lies between altitudes of c. 520 m at Lake Pukaki (and c. 600 m at the Tekapo River) and just over 600 m at the base of the Mary Range. The Mary Range rises above these broad terraces and fans to an altitude of 995 m at Mount Mary. The property is drained by sections of the Mary Burn, Irishman Creek and small tributaries of the Tekapo River and Lake Pukaki. The large Mary Burn Wetland occupies a broad basin northeast of the Mary Range, where tributaries of the Mary Burn meander across outwash gravels impounded by low moraine hills.

Soils of the property are predominantly Meyer Hills soils on the Mary Range, Bendrose bouldery soils on younger flood plains, Fork stony soils and Mackenzie soils on intermediate terraces and fans, Pukaki and Wolds soils on older terraces and fans, and Tekapo and Mary hill soils on moraines. Soil fertility is moderate and drainage good on the Mary Range and soil fertility is moderate to high and drainage good on terraces and fans, except for the area occupied by the Mary Burn Wetland (Leathwick *et al*, 2003).

2.3 CLIMATE

The Wolds Pastoral Lease has a relatively cool climate with wide seasonal temperature variation. Predominant winds are from the northwest and are frequently strong. Annual rainfall ranges between 800 and 1200 mm (Tomlinson, 1976). Snow falls are common in winter and snow may lie on the property for several weeks. The property lies in an area that has high annual solar radiation and low average water deficits, but high spring vapour deficits (Leathwick *et al*, 2003).

2.4 VEGETATION

2.4.1 Ecological Context

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. Espie *et al* (1984) described the original vegetation of the Mackenzie Basin as scrub and tussocklands (fescue tussock, red tussock 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.

These vegetation descriptions are broadly similar to those proposed by Leathwick *et al* (2003) in their analysis of the Level II Land Environments on the property. Land Environment K2, covering the recent terraces adjacent to the Tekapo River (c. 2% of the property) is described as originally supporting matagouri over turf and cushion vegetation. Land Environment N6, covering older terraces near the Tekapo River (c. 7% of the property), is described as originally supporting short tussockland. Land Environment E4, covering most terraces and fans (c. 72% of the property), is described as originally supporting low forest of mountain totara, toatoa and bog pine. Land Environment E1, covering the Mary Range (c. 12% of the property), is also described as originally supporting low forest dominated by mountain totara and toatoa. Land Environment J2, covering areas alongside Irishman Creek and the Mary Burn (c. 2% of the property), is described as originally supporting shrubland. And, Land Environment K4, covering poorly-drained

hollows (c. 5% of the property), is described as originally supporting *Carex* sedgeland (Leathwick *et al*, 2003).

From the above information it appears likely that most parts of The Wolds Pastoral Lease formerly supported shrubland or scrub dominated by species such as matagouri, small-leaved *Olearia*, *Carmichaelia*, *Coprosma* and *Hebe* species, bog pine, tauhinu and porcupine shrub. Areas of short tussockland (dominated by *Festuca* and *Poa* species) and red tussockland were probably present, and also areas of wetland dominated by sedges and shrubs. Low forest dominated by mountain totara and/or toatoa were probably present at sheltered sites and on the slopes of the Mary Range. Only the high parts of the Mary Range, fresh erosion surfaces and active floodplains would have supported low open vegetation. There, grasses (including tussocks), speargrass, herbs and cushion plants, adapted to tolerate the harsh conditions characterised by intense winter cold and summer drought, would have dominated. The relative extent of all these plant communities would have been influenced by the frequency and severity of the natural fires that almost certainly affected the area.

Analysis of the extent to which the Land Environments of the property are represented within existing protected natural areas in New Zealand indicates that approximately 2% of Land Environment K2, 6% of Land Environment Q2, 1% of Land Environment N6, 10% of Land Environment E4, 16% of Land Environment E1, 2% of Land Environment J2, and 1% of Land Environment K4 are protected (Department of Conservation, *unpublished data*, November 2003). However these data should be interpreted with caution, as the predicted extent and suggested vegetation types for each Land Environment have been extrapolated from limited field data.

As a result of the Protected Natural Areas Programme (PNAP) survey (Espie *et al*, 1984) and subsequent reassessment for purposes of the Mackenzie District Plan (Lee, 1996), three areas on the property have been previously recommended for protection (see attached map):

- The Mary Burn wetland (RAP Tekapo 8)
- Northeast Mary Range dry shrublands (RAP Pukaki 13)
- The Wolds reservoir (RAP Tekapo 7)

The Mary Burn wetland, the Wolds reservoir and the adjacent braided bed of the Tekapo River have been identified as Sites of Special Wildlife Interest (SSWIs) by the NZ Wildlife Service and the Department of Conservation. The wetland was also the subject of a detailed botanical investigation (Partridge and Molloy, 1986) that recommended its full protection.

2.4.2 Plant Communities

Predominant vegetation of the property is now short tussockland, low shrubland and scrub, with localised areas of sedgeland, cushionfield and tall tussockland. These plant communities are described for each part of the property below.

Western Moraine Land

This is the area of the property between the shore of Lake Pukaki and the Mary Range. The shore fringe and the slope behind (up to about 600 m) are clothed in vegetation dominated by exotic plants, mainly pine, larch and sweet brier. This vegetation is thickening up fast and native plants such as matagouri and fescue tussock are being rapidly overwhelmed. The flatter land to the east is largely covered in extensive short tussockland with shrubs. The short tussockland (mainly fescue tussock) is grazed and rather depleted in condition. It contains exotic pasture grasses and herbs and a range of indigenous species including cushion plants, small daisies and ground orchids. The shrubs are predominantly matagouri and sweet brier, but also present are tauhinu, common broom, coral broom and small-leaved

Coprosma shrubs. There are scattered wilding conifers. A few small kettleholes with boulderfield and turf contain ephemeral exotic and indigenous plants. At the foot of the range on gentle colluvial slopes is extensive scrub of matagouri and sweet brier.

In the shallow valley system to the south of an airstrip is a reservoir identified as RAP Tekapo 7 (SONS 40). The artificial dam that created the wetland upon which the identification was based has been breached. Water still ponds during rainy periods but only a damp turf persists. This is subject to artificial fertiliser runoff and stock use and is dominated by exotic herbs and grasses. Some indigenous plants remain, such as the tiny turf plants *Leptinella maniototo* and *Galium perpusillum*, but they form minor component of the vegetation.

A rockland in the central part of the area of moraine retains considerable indigenous vegetation and is of great botanical importance. The rocks are set in a moraine landform of hollows, mounds and small ridges.

Associated with the rocks is indigenous shrubland, composed of matagouri, small-leaved *Coprosma* species (*C. propinqua*, *C. rigida*, *C.* aff. *parviflora* and *C. intertexta*), mountain wineberry, porcupine shrub, *Olearia odorata* and common broom. There are climbers interwoven through the shrubs, including *Parsonsia capsularis* (with both pink and white flowers), *Muehlenbeckia complexa*, *Clematis marata* and *Rubus schmidelioides*. In rock crevices are various indigenous ferns (*Cheilanthes humilis*, *Asplenium richardii*, *A. trichomanes*, *A. flabellifolium*, *Blechnum penna-marina* and *Cystostegia tasmanica*) and herbs (*Wahlenbergia albomarginata*, *Brachyglottis haastii* and *Acaena caesiiglauca*). Lichens are numerous and contribute a distinctive component to the plant community. Also present among the rocks are golden speargrass, blue tussock (healthy ungrazed plants), silver tussock and occasional sweet brier. Of great note are at least six individuals of the nationally-vulnerable *Hebe cupressoides* and a thriving population of dwarf mistletoe *Korthalsella clavata* on at least five species of shrub.

There are some small kettleholes within the rockland. They contain their own boulderfields and ephemeral turfs that include a plant (not collected) that looks very like the nationally-endangered *Oreomyrrhis colensoi* var. *delicatula*. The land between and surrounding the rocks and kettleholes is tussock-shrubland in which the dominant plants are fescue tussock, matagouri, browntop and mouse-ear hawkweed. Also present are indigenous orchids (at least two species), mat daisies (*Raoulia* spp.), herbs, grasses and small shrubs. Weeds include scattered sweet brier and wilding conifers.

Mary Range

The flanks of the Mary Range are moderately steep, the upper slopes gentler and there are various rock outcrops and small drainage channels. The upper slopes are mostly in rough pasture dominated by fescue tussock, browntop and mouse-ear hawkweed. There is a scattering of ubiquitous indigenous plants including mat daisies (three species), *Coprosma petriei*, small herbs, lichens, mosses and grasses. Of note is the threatened dwarf broom *Carmichaelia vexillata*. Associated with rock outcrops are porcupine shrub, matagouri, common broom and *Coprosma propinqua*.

The flanks of the range are mostly clad in pasture dominated by exotic grasses, mouse-ear hawkweed, fescue tussock and scattered matagouri. However, in gullies and on some lower slopes there are extensive shrublands of matagouri and sweet brier, and occasional clumps of narrow-leaved snow tussock. There is one small rocky gully on the western side that has a running stream and shrubland containing matagouri, *Olearia odorata*, *O. bullata*, *Coprosma intertexta* and prostrate kowhai.

Of more importance though is a dry shrubland associated with massive rock outcrops, scree and boulderfield on the north-eastern face of the range previously identified as RAP Pukaki 13. On these dry rocky northeast-facing slopes, indigenous shrubs are dominant, including prostrate kowhai, matagouri, porcupine shrub, *Olearia odorata*, *Coprosma propinqua*, *C. virescens*, common broom, coral broom (very little) and *Muehlenbeckia complexa*. Other indigenous plants include golden speargrass, silver tussock, blue tussock, grasses, mat daisies, lichens, orchids and *Rubus schmidelioides*. In rock crevices are various indigenous ferns (*Cheilanthes humilis*, *Asplenium richardii*, *A. flabellifolium* and *Pellaea calidirupium*) and herbs (*Wahlenbergia albomarginata*, *Brachyglottis haastii* and white fuzzweed). The rare fern *Pleurosorus rutifolius*, recorded from the northern end of this system on the neighbouring lease, was searched for but not found. Weeds include mouse-ear hawkweed, sweet brier and occasional wilding pines. The botanical values of this dry shrubland are sufficient to support the original RAP and subsequent SONS identifications.

Central Moraine Land

This is the area between the Mary Range and State Highway 8. It is traversed and largely drained by the Mary Burn and a smaller tributary to the east. Irishman Creek flows through the northeast corner. The land is mostly gently undulating, with mounds, low ridges, flats, hollows and erratic rocks. However, the Mary Burn and Irishman Creek have cut braided channels and formed terraces and broad deposits of fluvial material. At the northern end of the area is the large Mary Burn Wetland fed by springs and the Mary Burn itself.

Most of the area is clad in short tussockland with exotic pasture and low shrubland. It has the superficial appearance of naturalness because of the abundant emergent fescue tussock and matagouri, but exotic grasses and herbs (browntop, sweet vernal, mouse-ear hawkweed, clover, etc.) occupy more than 50% of the ground cover in most places. Indigenous plants are more dominant in the vicinity of the rocks, and include matagouri, porcupine shrub, *Coprosma propinqua*, *C. petriei*, common broom, *Muehlenbeckia complexa*, *M. axillaris*, golden speargrass, *Leucopogon fraseri*, silver tussock, blue tussock, grasses, mat daisies, lichens, mosses and orchids.

The wetland still remains largely as described by Partridge and Molloy (1986). It has a series of ponds and channels, some of which dry up at times. The northern portion is somewhat wetter and therefore less modified by grazing. It has a combination of dense *Schoenus pauciflorus* tussockland and lower spongy *Carex diandra* sedgeland. *Carex secta* is common in places. The exotic sedge *Carex ovalis* is common around the edges and may be a fairly recent arrival as it is not mentioned by Partridge and Molloy. The ponds and channels provide a wide spectrum of micro-habitats for wetland plants. *Potamogeton cheesemanii* and *Myriophyllum triphyllum* are common in standing and flowing water. Margins and ephemeral turfs include plants such as *Glossostigma elatinoides*, *Limosella lineata*, *Ranunculus trichophyllus*, *Utricularia monanthos*, *Carex gaudichaudiana* and the threatened *Ranunculus limosella*. There is a fenced area at the extreme north end that shows that exclusion of cattle allows the indigenous vegetation to remain in better condition than where stock have unimpeded access. There are a few young willow trees present.

The narrower central portion of the wetland has similar vegetation patterns to those in the northern portion. The southern portion is more modified by stock and has drier slightly-raised areas. Most of the area is made up of damp terraces and flats with a *Schoenus pauciflorus* tussockland and silver tussock, fescue tussock, rushes and small sedges, with a large component of exotic grasses. *Carex coriacea* is common in places and *Carex secta* occurs locally. There are peaty areas in which *Carex diandra* is dominant, but the cattle and sheep keep it to a turf. Ponds and flowing channels have plants found in similar sites elsewhere in the wetland. Boulderfields of water-rounded boulders occur in places and

presumably represent former braided channels and upwellings. They add a distinctive element to this part of the wetland. The boulders are clothed in a splendid array of lichens that could include rare species such as those found on similar boulderfields on Balmoral Pastoral Lease to the north. Fringing the boulderfields near the Mary Burn is scrub of matagouri, with much *Coprosma intertexta* and some porcupine shrub.

The wetland system drains southwards and the channels coalesce to form the Mary Burn and become a sinuous gorged stream with rapids, narrow terraces, swampy banks and rock outcrops. A feature of this system is mature continuous riparian scrub of matagouri, *Coprosma propinqua* and porcupine shrub, with a scattering of sweet brier. This extends at least two kilometres southwards. There are dense aggregations of *Coprosma intertexta* and on the stream banks are *Hebe odora*, *Olearia bullata*, common broom, toetoe, golden speargrass, swamp speargrass and tauhinu. Swampy places are dominated by sedges, including *Carex secta*, *C. coriacea*, *C. diandra* and *Schoenus pauciflorus*. Damp turfs of small exotic and indigenous plants, and occasional willow and wilding conifer trees are present.

On the low ridge system flanking the wetland to the northeast are diverse scrub and shrubland that complement the aquatic ecosystem and protect the springs that feed it. The northern area of scrub, in a series of small gullies, is dominated by matagouri and has a lot of *Coprosma propinqua*, *C. intertexta*, porcupine shrub and *Olearia odorata*, with sweet brier throughout. The eastern area of scrub and shrubland, around Trig T, is more diverse and is composed of matagouri, common broom, *Coprosma propinqua*, *C. intertexta*, porcupine shrub and *Olearia odorata*. Sweet brier is sparse. Intermingled with the scrub and shrubland is fescue tussockland and exotic pasture containing various indigenous plants including unexpected patches of *Carex comans*.

The southern part of the wetland was proposed as RAP 8 by Espie *et al* (1984) and the northern and central section was proposed as SONS 38 by Lee (1996). It was also identified as an SSWI by the NZ Wildlife Service and Department of Conservation. Partridge and Molloy (1986) concluded that the wetland was the largest and best moraine-dammed swamp in the Mackenzie Ecological Region and recommended that it be protected in its entirety, with cessation of artificial drainage, control of grazing and formulation of a management plan. This report supports that recommendation and backs the designations of RAP, SONS and SSWI status.

Eastern Moraine and Flats

This area lies between State Highway 8 and the Tekapo River, and is bounded to the north by the Tekapo Canal. It is mostly composed of outwash terraces, with some hummocky moraine, and is drained by tributaries of Irishman Creek. Most of the area is developed farmland with little remaining indigenous vegetation. Northern parts that remain undeveloped have short fescue tussockland and rough exotic pasture with scattered low matagouri and various ubiquitous indigenous plants characteristic of open sites in the area.

In the east of the area is a flight of alluvial terraces associated with the Tekapo River. The upper terrace has a cover of short fescue tussockland with scattered low matagouri and rather sparse turf of mouse-ear hawkweed, exotic grasses and small indigenous plants including *Coprosma petriei*, *Leucopogon fraseri*, *Pimelea* spp., *Poa* spp., mat daisies, *Muehlenbeckia axillaris* and *Celmisia gracilenta*. The distinctive tumbleweed lichen *Chondropsis semiviridis* is also present. There are shallow hollows like those on the upper terraces on Maryburn Pastoral Lease just to the south. Although searched for, none of the tiny rare indigenous plants unique to such sites were found, but they are likely to have been present earlier in the spring. The mid terraces have similar but sparser vegetation. The risers between these terraces, especially where exposed to wind erosion, have open stony

ground where the threatened inland cress *Lepidium sisymbrioides* subsp. *sisymbrioides* and threatened *Convolvulus verecundus* are present. These plants were also found occasionally on the terraces. Other notable plants include the dwarf broom *Carmichaelia nana* and cushion daphne.

The riser between the middle and lowest terraces is very stony and actively eroding. It has scrub of matagouri, sweet brier and porcupine shrub. At the top are plants of *Carmichaelia vexillata*. The lowest terrace, best preserved in the extreme southeast of the area, is highly distinctive. It is very stony and virtually lacking in soil. The sparse vegetation cover is dominated by lichens and the woolly moss *Racomitrium pruinosum*. It also contains *Muehlenbeckia axillaris*, mat daisies (including *Raoulia monroi*), *Convolvulus verecundus*, mouse-ear hawkweed, small grasses and a large population of the leafless *Muehlenbeckia ephedroides*. Stonecrop is present in small amounts.

At the northwest corner of the area, where State Highway 8 and the Tekapo Canal intersect, is an artificial pond and associated wetland that are traversed by a small meandering stream. The pond and upper part of the wetland are fenced from stock. Around the pond is a narrow fringe of sedges and rushes, with some willow trees. The wetland has a mosaic of indigenous shrubland with matagouri, *Coprosma intertexta* and *Olearia bullata* and sedgeland with *Carex coriacea*, *C. ovalis*, *C. secta* and *Schoenus pauciflorus*. Within the fenced wetland, golden speargrass and swamp speargrass are common, and one plant of *Carex tenuiculmis* was found. Russell lupin and willow are present, and in the stream channel is monkey musk, *Potamogeton cheesemanii* and *Myriophyllum triphyllum*. The adjacent terrace riser has typical sparse dryland vegetation of indigenous and exotic plants.

Patersons Ponds, at the northeast corner of the area, are artificial. Their margins are planted with willow, poplar and other exotic trees that are now well established and multiplying. The ponds are important botanically for the communities of raupo (unusual in the Mackenzie Basin) and indigenous sedges (particularly *Carex secta*) around the margins. However, these communities are at risk of being overwhelmed by the exotic trees.

Northeast Triangle

The triangle of land north of the Tekapo Canal has been fenced from rabbits and stock for about 30 years, but the fences are derelict in places. The land is part of a high terrace system. It has been scraped in places as part of the canal construction, and two artificial ponds have been created. There is a broad natural pond on the northwest boundary, which was dry at the time of the survey.

Most of the area is vegetated in fescue tussockland with patches and scattered low matagouri. The fescue tussock is in relatively good condition and there is a smaller component of exotic pasture plants than elsewhere. The matagouri is dense in places and is accompanied by other shrubs (tauhinu, *Coprosma propinqua* and porcupine shrub), golden speargrass, healthy large blue tussocks and the suite of ubiquitous indigenous ground cover plants characteristic of the area. Protected from stock, rabbits and hares, the indigenous vegetation is likely to grow in both density and stature. A major threat is posed by exotic conifers, mainly pines but also cypress and alder, but control of these plants would be quite easy at present.

In the northwest ephemeral pond is an interesting turf zonation. The main turf plants are indigenous, including *Callitriche petriei*, *Leptinella maniototo*, *Poa maniototo*, *Galium perpusillum*, *Epilobium angustum* and tiny sedges.

SUMMARY

The Wolds Pastoral Lease supports plant communities that are characteristic of the Tekapo and Pukaki ecological districts. Despite extensive modification, there are areas on the property that support vegetation that is moderately or highly representative of the vegetation originally present in the area. There are also healthy populations of a number of rare and threatened plant species on the property, including populations of species listed by Hitchmough (2002) as nationally-endangered and nationally-vulnerable. Many of these plant communities and threatened plant populations are in relatively good condition, have moderate to high naturalness values, and are viable in the long term.

2.4.3 Notable Flora

Notable plant species recorded from the property are listed in Table 1 below. Threat categories are those proposed by Hitchmough (2002)

Table 1 Threatened plant species recorded from The Wolds Pastoral Lease, December 2003.

Plant Species	Known Distribution on Property
Nationally Endangered	
Oreomyrrhis colensoi var. *delicatula*	May be present (not positively identified) in kettleholes on moraine west of the Mary Range
Nationally Vulnerable	
Hebe cupressoides	Six plants on moraine west of the Mary Range
Gradual Decline	
Carmichaelia crassicaule	Occasionally present on northeast side of the Mary Range
Carmichaelia vexillata	Common in tussockland on the Mary Range and on terraces near Tekapo River
Lepidium sisymbrioides ssp. *sisymbrioides*	On terrace risers near the Tekapo River
Ranunculus limosella	Mary Burn Wetland
Raoulia monroi	On the lower terrace near the Tekapo River
Sparse	
Aciphylla subflabellata	Occasionally present alongside the Mary Burn and in the wetland near the Tekapo Canal and State Highway 8
Carex tenuiculmis	One plant in the wetland near the Tekapo Canal and State Highway 8
Clematis marata	In shrublands on the Mary Range
Convolvulus verecundus	On terrace risers near the Tekapo River
Coprosma intertexta	Common on the Mary Range and in shrublands on moraines and beside streams throughout the property
Muehlenbeckia ephedroides	On the lower terrace near the Tekapo River
Olearia bullata	Relatively common in shrublands throughout the property
Data Deficient	
Vittadinia australis	Occasionally present on northeast side of the Mary Range

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.

Wilding trees
Several exotic tree species are naturalised on the property, notably wilding conifers. The areas worst affected are the western parts of the property adjacent to Lake Pukaki, the lower slopes of the Mary Range, and the northeast corner of the property near Patersons Ponds. Wilding trees pose a significant threat to low-stature plant communities throughout the property and to populations of threatened species, notably the *Hebe cupressoides* population on the western moraine. Removal of wilding trees, and continued control of wilding tree spread will be required to protect conservation (including natural landscape) values on the property.

Sweet brier
Sweet brier is present throughout the property, mostly within shrublands and scrub and occasionally as scattered plants in tussockland. The only place that it forms dense stands is on the lower slopes of the Mary Range, possibly as a result of the application of fertiliser. Control of this ubiquitous species may be necessary to protect conservation values at specific sites, such as Pukaki RAP 13 on the northeast slopes of the Mary Range.

Willow
Species of willow, especially crack willow, are present in and around wetlands and beside streams on the property. No large dense stands exist, except around the artificial Patersons Ponds. Control of willow infestations will be required to protect conservation values at some sites, notably the Mary Burn Wetland.

Stonecrop
Stonecrop is present, though not common, on the alluvial terrace near the Tekapo River. Control of this species may be necessary to protect conservation values at specific sites (such as populations of threatened species), though control of stonecrop is difficult.

Russell lupin
This species is present along Irishman Creek near the northern boundary of the property. Russell lupin threatens open and disturbed surfaces and may pose a threat to conservation values on the property. Ideally, this infestation should be removed, though such control would be difficult and may not be sustainable.

Broom
This species is present along Irishman Creek near the northern boundary of the property, and may be present elsewhere. Broom poses a major threat to low-stature plant communities. This infestation should be eradicated or at least contained, to prevent this species affecting conservation values on the property.

2.5 FAUNA

2.5.1 Birds

The bird fauna of the Mackenzie Basin is characterised by open country and wetland species, reflecting the paucity of native forest in the region (Bull *et al*, 1985, Jarman, 1987). The Tekapo and Pukaki ecological districts contain numerous lakes, ponds, tarns, wetlands, braided riverbeds and tributary streams that are important habitats for a large number of waterfowl and wading birds, including several threatened species (Espie *et al*, 1984; Jarman, 1987). These include Australasian crested grebe, black stilt, Australasian bittern, wrybill, black-fronted tern, black-billed gull, banded dotterel and marsh crake. Open grasslands provide habitat for species such as New Zealand pipit, Australasian harrier and New Zealand falcon.

Nine threatened bird species have previously been recorded on The Wolds Pastoral Lease: New Zealand falcon (gradual decline), black-billed gull (serious decline), grey duck (serious decline), black shag (sparse), black stilt (nationally critical), Australasian bittern (nationally endangered), black-fronted tern (serious decline), banded dotterel (gradual decline) and marsh crake (sparse) (S. Elkington, *pers. comm.*; Jarman, 1987).

Of the RAP areas identified, two are especially important for birds: the Mary Burn Wetland, which supports several species of wetland birds and is rated as a Site of Special Wildlife Interest (SSWI) of high wildlife value (Jarman, 1987), and the Tekapo River (including Patersons Ponds).

Birds observed on The Wolds Pastoral Lease are described below for the two main habitats surveyed and listed in Table 2 (indigenous species) and Table 3 (introduced species).

Rockland and Shrubland

Three areas were inspected on the western part of the property, and one on the eastern part. Grey warbler and silvereye were recorded in all areas of shrubland. The remains of an old Australasian harrier nest were as found amongst a small boulderfield in shrubland within RAP Pukaki 13. Black-fronted tern and banded dotterel were recorded along the Tekapo River terraces. Banded dotterel almost certainly nest on these terraces. Numerous introduced passerines were present throughout.

Wetlands

Four main wetland areas were inspected: Mary Burn Wetland, Patersons Ponds, an artificial pond near the intersection of State Highway 8 and the Tekapo Canal, and Tekapo RAP 7 (an artificial dam, now breached and drained, between the Mary Range and Lake Pukaki).

The Mary Burn Wetland and Patersons Ponds provided habitat for numerous species of native birds. Grey duck, banded dotterel, marsh crake, Australasian bittern, black shag, black-fronted tern, grey teal, paradise shelduck, South Island pied oystercatcher, New Zealand scaup, spur-winged plover, Australasian pied stilt, welcome swallow, Australasian harrier and southern black-backed gull were recorded during the survey. Additionally, black stilt, black-billed gull, New Zealand falcon, New Zealand shoveler, white-faced heron and little shag have been recorded on previous surveys between 1982 and 2003 (S. Elkington, *pers. comm.*; Department of Conservation databases). Introduced mallard, Canada goose and a range of passerines were also recorded. New Zealand scaup were observed on the artificial pond near the intersection of State Highway 8 and the Tekapo Canal.

Table 2 Indigenous bird species recorded from The Wolds Pastoral Lease.

Bird species Common name	Scientific name	**Known Distribution on Property**
Australasian bittern	*Botaurus poiciloptilis*	Patersons Ponds, Mary Burn Wetland#
Australasian harrier /kahu	*Circus approximans*	throughout
Australasian pied stilt /poaka	*Himantopus himantopus*	Mary Burn Wetland
banded dotterel	*Charadrius bicinctus*	Tekapo River terraces, Mary Burn Wetland
black shag/koau	*Phalacrocorax carbo*	Patersons Ponds
black stilt/kaki*	*Himantopus novaezelandiae*	Mary Burn Wetland
black-billed gull*	*Larus bulleri*	Mary Burn Wetland
black-fronted tern	*Sterna albostriata*	Tekapo River terraces, Patersons Ponds, Mary Burn Wetland#
grey duck/parera	*Anas superciliosa*	Patersons Ponds, Mary Burn Wetland
grey teal/tete	*Anas gracilis*	Patersons Ponds, Mary Burn Wetland
grey warbler/rironiro	*Gerygone igata*	shrublands throughout
little shag*	*Phalocrocorax melanoleucos*	
marsh crake	*Porzana pusilla*	Patersons Ponds, Mary Burn Wetland#
New Zealand falcon/karearea*	*Falco novaezelandiae "eastern"*	Mary Burn Wetland
New Zealand pipit /pihoihoi	*Anthus novaezelandiae*	Mount Mary
New Zealand scaup	*Aythya novaezeelandiae*	Patersons Ponds
New Zealand shoveler /kuruwhengu*	*Anas rhynchotis*	
paradise shelduck /putakitaki	*Tadorna variegata*	Mary Burn Wetland
silvereye	*Zosterops lateralis*	shrublands throughout
South Island fantail /piwakawaka*	*Rhipidura fuliginosa*	
South Island pied oystercatcher	*Haematopus ostralegus finschi*	Mary Burn Wetland
southern black-backed gull/karoro	*Larus dominicanus*	throughout
spur-winged plover	*Vanellus miles novaehollandiae*	Mary Burn Wetland
welcome swallow	*Hirundo tahitica*	Patersons Ponds
white-faced heron*	*Ardea novaehollandiae novaehollandiae*	

* Not observed on survey, but recorded by Simon Elkington between 1982 and 2003
# Not observed in this habitat during survey, but recorded by Simon Elkington between 1982 and 2003

Table 3 Introduced bird species recorded from The Wolds Pastoral Lease.

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

SUMMARY

A total of 33 bird species were recorded on the property during this survey: 18 indigenous species (seven endemic species or sub-species, and 11 native) and 15 introduced species. A further seven indigenous species have been recorded by Simon Elkington between 1983 and 2003. A total of nine threatened bird species have been recorded on the property (Table 6).

2.5.2 Lizards

Common skink, McCann's skink and Southern Alps gecko are widespread and abundant in the region. Scree skink, spotted skink, green skink and long-toed skink have been recorded on braided river beds, eroded river terraces and high altitude scree in the area. Jewelled gecko has occasionally been recorded in shrubland in the area (Espie *et al*, 1984; Whitaker, 1998; DOC Herpetofauna database). Four threatened species of lizard have been previously recorded on or near The Wolds Pastoral Lease: spotted skink (gradual decline), green skink (gradual decline), long-toed skink (sparse) and jewelled gecko (gradual decline). Scree skink (gradual decline) has been recorded on the neighbouring Sawdon Station (DOC Herpetofauna database).

Four areas of rockland and shrubland were inspected on the property: an area of large boulders and shrubland between the Mary Range and Lake Pukaki (proposed for rock extraction by Meridian Energy), dry shrubland at the northern end of the Mary Range (including Pukaki RAP 13), the central moraines alongside State Highway 8, and shrubland and boulderfield along the lower terraces near the Tekapo River.

Southern Alps gecko was found at all rockland sites, and was most numerous in the Mount Mary shrublands. One gecko was found beneath an artificial cover object, but the highest concentration (more than 20 individuals) was found in a large rock stack on the north-eastern side of Mt Mary. Large quantities of gecko droppings were present amongst the boulders between the Mary Range and Lake Pukaki, but only one Southern Alps gecko was found. A botanist noted an "unusual" looking skink among the boulders here, possibly a

long-toed skink. Two McCann's skinks and one common skink were found on the Tekapo River terraces.

No other lizard species were found during this survey, but four threatened species (spotted skink, green skink, long-toed skink and jewelled gecko) were recorded on the Tekapo River terraces in the 1980s (DOC Herpetofauna Database; R. Maloney, *pers. comm.*). The lack of records from recent surveys may be due to the very hot weather experienced during the December inspection, during which lizards may have burrowed deep beneath the rocks.

SUMMARY

Three lizard species were recorded during this survey and a further four have been recorded on the property during surveys in the 1980s (Table 4). The lack of skink and jewelled gecko records from the current survey may be due to the weather experienced during the survey and the time required to adequately survey for these species.

Table 4 Lizard species recorded from The Wolds Pastoral Lease.

Lizard species		**Known Distribution on Property**
Common name	Scientific name	
common skink	*Oligosoma nigriplantare polychroma*	Tekapo River terraces, Mary Range shrublands, Mary Burn Wetland
green skink*	*Oligosoma chloronoton*	Tekapo River terraces
jewelled gecko*	*Naultinus gemmeus*	shrublands on Tekapo River terraces
long-toed skink*	*Oligosoma longipes*	Tekapo River terraces
McCann's skink	*Oligosoma maccanni*	Tekapo River terraces
Southern Alps gecko	*Hoplodactylus* aff. *macculatus* "Southern Alps"	rock and boulder areas throughout
spotted skink*	*Oligosoma lineoocellatum*	Tekapo River terraces
unidentified skink	*Oligosoma sp.*	large boulders and shrublands, Lake Pukaki side of Mary Range

* DOC Herpetofauna Database records

2.5.3 Fish

The Wolds Pastoral Lease lies in the upper Waitaki River catchment, between the Tekapo River and Lake Pukaki. The property covers parts of two small tributaries of the Tekapo River, the Mary Burn and Irishman Creek. It also covers a large wetland in the Mary Burn catchment, known as The Wolds Wetland or Mary Burn Wetland.

One of the distinguishing features of the Waitaki Catchment is the presence of hydroelectric dams. This has two major effects on fish communities. The first is that fish communities upstream from the dams are generally composed of only non-diadromous species (those species without a marine phase in their lifecycle), although some exceptions do occur (e.g. longfin eel may still be present and common bully and koaro have become non-diadromous substituting lakes for the sea). The second effect is that fish communities are separated into discrete populations preventing re-colonization of previously dewatered streams.

The New Zealand Freshwater Fish Database has 632 records (at 5th February 2004) from the Waitaki catchment (McDowall and Richardson, 1983). Species recorded from rivers near The Wolds Pastoral Lease include Canterbury galaxias, koaro, alpine galaxias, longfin eel, upland bully, common bully, brown trout and rainbow trout. Also present in the area are populations of the recently-described bignose galaxies (McDowall and Waters, 2003). Two

of these species are listed as threatened by Hitchmough (2002): bignose galaxias (data deficient) and longfin eel (gradual decline).

Six different freshwater habitats were surveyed on the property. These are classified by water source and surrounding vegetation type. These habitats and the fish species observed are described below. Fish species observed are also listed in Table 5.

Ephemeral Tarns

This habitat type is represented by small tarns on the Mary Range, a breached farm pond west of the Mary Range (Tekapo RAP 7), tarns on moraine between the Mary Range and Lake Pukaki, and two tarns on the triangular block north of the Tekapo Canal. Of these tarns, only the two north of the Tekapo Canal held water at the time of the survey. These tarns were less than 70 m^2 in area and 400 mm deep at the time of the survey. They are surrounded by pasture with scattered tussocks, willow and wilding pine trees. The area is fenced from stock though still affected by straying sheep. No fish were recorded. Whistling tree frogs were present in both tarns.

Artificial Lakes

This habitat type is present on the property at Patersons Ponds and at a small lake near the intersection of State Highway 8 and the Tekapo Canal. Surrounding vegetation at Patersons Ponds is dominated by exotic trees with areas of raupo reedland and *Carex* sedgeland. The small lake lies within modified pasture but with a fringe of sedges and rushes at its margin. Stock are excluded from both areas, though Patersons Ponds are a popular recreation site and are readily accessible to people. The lakes vary in size but all are more than 200 m^2 in area and deeper than one and a half metres, with average depths of approximately 800 mm. Brown trout were very common in all the ponds searched, and upland bully found in some of the small streams flowing into the ponds.

Large Streams

Large streams on the property are the Mary Burn and Irishman Creek. These streams flow through pasture, shrubland, scrub, sedgeland and scattered willow trees. All parts of the streams are accessible to stock though stock access is restricted in places by vegetation. Both are crossed by vehicle tracks. These streams are up to seven metres wide and have an average depth of 500 mm. This habitat type was surveyed at five sites, with upland bully and brown trout present at all sites. Canterbury galaxias were found at one site and unidentified juvenile galaxias found at most sites.

Small Streams

This habitat type comprises the small tributaries of the Mary Burn and Irishman Creek. Most small streams have their source off the property, do not always join the large streams while on the property and are not associated with the Mary Burn Wetland. Surrounding vegetation is generally modified grassland with some areas of shrubland. All are accessible to stock and some are crossed by vehicle tracks. Small streams on the property are all less than one and a half metres wide and on average approximately 200 mm deep. Two sites were surveyed and upland bully found at both sites. Brown trout and an unidentified juvenile galaxias species (probably Canterbury galaxias) were found at one site.

Wetland

The Mary Burn Wetland is the most significant freshwater feature on the property. It is a large wetland comprising a mosaic of small interconnected freshwater environments including still water, ephemeral ponds and small clear-water streams. The wetland vegetation is also quite variable with patches of introduced grasses, large areas of *Schoenus* tussockland, *Carex* sedgeland and turf vegetation. It is surrounded by pasture, shrubland and scrub. The wetland is accessible to stock, though cattle access is partly restricted by a fence. The different freshwater environments range in width and depth from small swampy areas 200 mm deep and 30 m wide to streams 400 mm deep and half a metre wide.

Ten sites were surveyed for fish either by intensive searching or electro-fishing. Upland bully were recorded at five sites, unidentified juvenile galaxias at four sites, brown trout at one site and bignose galaxias at one site. No fish were observed at four sites.

Small Spring-fed Streams

Several streams flowing into the Mary Burn Wetland are sourced from springs. Surrounding vegetation is generally *Carex* sedgeland or pasture with rushes, tussocks, matagouri and occasional willow trees. All are accessible to stock. The streams range in width from one and a half to two metres and have an average depth of 70 to 120 mm. Six sites were surveyed for freshwater fish, and fish were recorded from all six sites. Bignose galaxias was found at four sites, unidentified juvenile galaxias at four sites and upland bully at one site.

SUMMARY

Freshwater fauna communities of six different habitats were surveyed at 27 sites on The Wolds Pastoral Lease. Four fish species were observed of which upland bully was the most common, occurring at 14 sites. Brown trout occurred at seven sites, bignose galaxias at five sites and Canterbury galaxias at one site. Unidentified juvenile species of galaxias were observed at ten sites, and the introduced whistling tree frog occurred at two sites. No fish were recorded at five sites.

There are two significant features of the fish fauna on the property: the occurrence of the recently-described bignose galaxias, populations of which warrant protection; and the limited distribution of brown trout, indicating that some freshwater habitats on the property are unaffected by this introduced species.

Table 5 Fish species recorded on The Wolds Pastoral Lease, December 2003.

Fish species Common name	Scientific name	**Known Distribution on Property**
bignose galaxias	*Galaxias macronasus*	spring-fed streams around Mary Burn Wetland
brown trout	*Salmo trutta*	Patersons Ponds, the artificial lake near the canal, Mary Burn, Irishman Creek and a small tributary of Irishman Creek
Canterbury galaxias	*Galaxias vulgaris*	Irishman Creek and Mary Burn
common bully*	*Gohomorphus cotidianus*	Patersons Ponds, artificial lake near the canal
Koaro*	*Galaxias brevipinnis*	Mary Burn near the wetland
longfin eel*	*Anguilla dieffenbachii*	Patersons Ponds, Mary Burn wetland
rainbow trout*	*Oncorhynchus mykiss*	Patersons Ponds, the artificial lake near the canal
unidentified galaxias	*Galaxias* sp.	throughout the property
upland bully	*Gobiomorphus breviceps*	all freshwater habitats except the ephemeral tarns

* New Zealand Freshwater Fish Database Records.

2.5.4 Invertebrates

Information about invertebrates in the vicinity of The Wolds Pastoral Lease is limited. Most useful is the report on the status of the protected robust grasshopper (*Brachaspis robustus*) in the Mackenzie Basin (White, 1994). That report recommended formal protection for two populations of the grasshopper, optimising the timing of hydro-electric river releases to protect grasshopper populations, and trial control of feral cats.

Invertebrate sampling for this report was concentrated on beetles (Coleoptera). This order comprises the largest and most diverse group of insects in New Zealand. Beetles occur in all terrestrial and freshwater habitats and have the widest range of feeding habits of any group of terrestrial invertebrates. They are relatively well known in New Zealand and have been extensively used in ecological surveys.

Survey locations were selected to provide good representation of the less modified areas of the property and locations where representative and unusual invertebrates might be present. Invertebrate populations are described below for each part of the property surveyed. Notable species are listed in Table 6. Scientific names of species cited by common name are listed in section 4.1.1.

West of Mary Range

One kettlehole surveyed supports a small ephemeral wetland, dry at the time of the survey, with short turf and embedded rocks surrounded by scattered shrubland. It provides habitat

for widespread and common native and naturalized species that would be expected to occur in this and similar areas.

Also present is an extensive rockland area of glacial erratic boulders and rock piles with mainly indigenous shrubs in a matrix of grassland that appears not to have been grazed for some years. A kettlehole occurs towards the eastern edge of this area, similar to the one described above. The rocky outcrops have protected the flora and fauna from burning and grazing, providing refugia for many species of invertebrates. The uncommon anobiid (*Australanobium inaequale*), the clerid (*Parmius longipes*) and the *Coprosma*-feeding weevil (*Praolepra* sp.) were found only at this site. The threatened grasshopper (*Sigaus* sp. A) and the lax beetle (*Selenopalpus aciphyllae*) were collected from the grassland between the rocks, together with the naturalized Australian grass stem anthribid (*Euciodes suturalis*). The native shrubland is diverse and the most natural and intact of any observed on the property. Collecting revealed the most diverse beetle fauna of any shrubland sampled, including the scrub on the northeast face of the Mary Range (Pukaki RAP 13), which has been identified as one of the best dryland scrub associations in the district. The presence of a threatened grasshopper species enhances the significant inherent value of this area, which is rated as high.

A former reservoir (Tekapo RAP 7) has been drained and was dry at the time of the survey. The basin above the dam has a short turf community supporting a diverse range of herbs and grasses. A number of species of butterflies and moths were observed here, including the southern blue butterfly, the boulder copper butterfly, grass moths (Crambidae), and a day-flying geometrid (*Arctesthes catapyrrha*). On the ground, the sun-loving ground beetle (*Scopodes* sp.) and several species of seed bugs (Lygaeidae) were collected. Emergence holes in hips of sweet brier caused by the naturalized seed-feeding torymid wasp (*Megastigmus aculeatus*) were observed in the area. In its drained state, this site has a reasonably diverse lepidopteran fauna, but no species of special note.

Mary Range

The summit of Mount Mary comprises heavily grazed grassland with mouse-ear hawkweed and scattered rock outcrops. Two notable species found here were a possibly un-described endemic ground beetle (*Holcaspis* n. sp.) which is similar to, if not the same as, a new species recently described by Johns (2003) from Black Forest Creek, and the localised darkling beetle (*Mimopeus impressifrons*) under loose rocks around the rock outcrops. The significant inherent value of this site is medium-high because, in spite of its degraded state, two notable species are present.

Species of robber fly (*Neoitamus* ?*varius*) and native bee (*Leioproctus fulvescens*) were collected from an un-vegetated sandy erosion scar further north on the Mary Range.

Scrub on the northeast face of the Mary Range (Pukaki RAP 13) was intensively sampled by beating. A range of insect species similar to the rockland site, but less diverse, was collected. There were several species of weevils, including *Peristoreus sudus* that feeds on the seeds of the native broom. A leaf beetle (*Adoxia* sp.) collected here was not found elsewhere. Numerous larvae of the kowhai moth (*Uresiphita polygonalis* ssp. *maorialis*) were beaten from prostrate kowhai bushes. The vegetation here is apparently less diverse than that at the rockland site, has been heavily modified by stock and is being invaded by sweet brier on the lower eastern margin. The beetle fauna sampled was also less diverse than at the rockland site although it included two species not found elsewhere. No species of special note were collected. The significant inherent value of this area is medium.

Mary Burn Wetland

The Mary Burn Wetland area includes a wide variety of distinct habitats for invertebrates, including spring-fed streams and pools, open ponds with muddy banks and edges, dried-up ponds, slow-moving streams, streamside shrubland and sedgeland, and boggy sedgeland. The open water habitats and their margins contained a representative range of wetland invertebrates. Species noted included three diving beetle species and their larvae (Dytiscidae), a species of water scavenger beetle (Hydrophilidae), backswimmers (Notonectidae), water boatmen (Corixidae), shore bugs (Saldidae), the veliid (*Microvelia macgregori*) and damselfly nymphs (*Xanthocnemis zealandica*). The small diving beetle (*Liodessus deflectus*) has been recorded only sparsely from the South Island (Ordish, 1964). In the dried-up ponds, there was a small community of hygrophilous beetles including the ground beetle (*Bembidion rotundicolle*), the naturalised rove beetle (*Gyrohypnus fracticornis*) and the dung beetle (*Aphodius granaries*). Fingernail clams (*Sphaeriid* sp.) were observed when the substrate of the wetland was disturbed. Sweeping of sedges yielded a representative range of insects including the redcoat damselfly (*Xanthocnemis zealandica*) and a stratiomyid fly (*Odontomyia chloris*). The geographically-limited ground beetle (*Megadromus alternus*) was collected under a fencepost on the edge of the wetland. The streamside shrubland appeared to support a reduced range of beetle species compared to other shrublands.

Flying insects from the sedgeland community at the northeast corner of the wetland were sampled in a Malaise trap. There were many species of flies (unidentified) and the redcoat damselfly, but only a small number of beetles. However, these included six species of marsh beetles (Scirtidae, *Cyphon* spp.), indicating a diverse fauna of a group representative of wetland habitats.

This area contains a wide diversity of wetland vegetation types and habitats for invertebrates, but these have been significantly modified and degraded by stock. A representative fauna of wetland insects was observed and collected, but only one notable species collected. Most species are relatively common and widespread in New Zealand wetland habitats. On entomological grounds, the wetlands can be rated medium-high for their significant inherent value. However, with adequate fencing there could be significant improvement in habitat quality, perhaps allowing recolonisation or recovery of specialist species not detected in this survey.

Irishman Creek

Irishman Creek is a fairly typical stream with gravel banks. Three small ground beetle species were found here, including *Bembidion parviceps*, which has not previously been recorded in the Mackenzie Region (Lindroth, 1976, Larochelle and Larivière, 2001). Many specimens of larvae and pupae of the dobsonfly (*Archichauliodes diversus*) were observed under stones on the stream banks.

Tekapo River Terraces

This flight of terraces on the west bank of the Tekapo River provides important habitat for several species of threatened grasshopper. On the upper terraces, grassland dominated by fescue tussock provides habitat for a range of species representative of short tussock grasslands including the tussock butterfly, southern blue butterfly, boulder copper butterfly and Fereday's tiger beetle (*Cicindela feredayi*). The threatened small grasshoppers, *Sigaus minutus* and *S. minutus* 'blue', were observed along the bare, stony edges of the upper terraces. The lowest terrace is very sparsely vegetated and provides habitat for the nationally-endangered robust grasshopper. Along the boundary of this terrace, at the foot of

the steeply sloping terrace riser, the localised darkling beetle (*Mimopeus impressifrons*) was found under rocks. In the same place, the introduced biological control agent, the small St John's wort beetle (*Chrysolina hyperici*) was defoliating its weedy host plant. A number of individuals of the robust grasshopper were observed on stony areas and along vehicle tracks adjacent to Patersons Ponds. Species of small ground beetle (*Demetrida dieffenbachii*), weevil (*Catoptes* sp.) and cydnid bug (*Choerocydnus nigrosignatus*) were collected from under dry rocks in the same area.

These terraces preserve several communities of sparse grassland and mat vegetation, which provide habitat for a distinctive insect fauna. The vegetation is relatively intact with minor invasion of mouse-ear hawkweed. The most significant insect species noted were the threatened grasshoppers *Brachaspis robustus*, *Sigaus minutus* and *S. minutus* 'blue'. The last two of these were apparently present in reasonable numbers. The localised darkling beetle (*Mimopeus impressifrons*) was also found here. The site has high significant inherent values and rates 'outstanding' as an SSWI.

Triangular Block North of Tekapo Canal

This area of high river terraces bounded by the Tekapo Canal is stony, sparsely vegetated and dominated by short grassland. It is relatively free of woody weeds except for occasional pine trees and sweet brier bushes. Disturbed sites, including a gravel roadway along the eastern boundary, provide prime habitat for the robust grasshopper. This track may support one of the largest known populations of this threatened grasshopper (S. Morris, *pers. comm.*). The small pond is subject to seasonal fluctuations in water level. The diversity of beetle species and the number of individuals under rocks and stones above the present water line was outstanding. There is good evidence that this is an aestivation site (facultative summer dormancy, preserving humid conditions in an otherwise arid environment) for many of the species found and that others are concentrated here by consistent high humidity. Such high numbers and diversity of insects under rocks at the water's edge is usually only seen alongside rivers flowing through deserts. For the conservation of insects in their natural environments preservation of habitat through all phases of the life cycle, including dormancy, is essential. Based on both the robust grasshopper population, and this unusual pond, the significant inherent value of the area is high.

Streams

The Mary Burn had good water quality, indicated by the presence of several sensitive species including cased caddisflies (*Olinga feredayi*, *Pycnocentria* spp and *Helicopsyche albescens*), uncased caddisflies (*Hydrobiosis harpidiosa* and *H. charadraea*) and mayflies (*Coloburiscus humeralis*, *Deleatidium lillii*- and *myzobranchia*-group). Also present were freshwater mussels (*Hyridella* sp.) whose threatened status is unknown as distributional information is lacking (it is possible that they are threatened in Canterbury streams). A small stream near the State Highway/Canal junction was sampled and had poor water quality, indicated by the presence of roundworms, segmented worms and flatworms (Nematoda, Oligochaeta, and Platyhelminthes-*Cura* spp), the snail (*Potamopyrgus* sp.) and amphipods.

SUMMARY

During the invertebrate survey of The Wolds Pastoral Lease, 94 insect species were collected or observed from 28 collection sites across the property. All were identified at least to sub-family, and nearly all to genus or species. Sixty-five species of beetle from 20 families were collected, nine of which are naturalised species. Twelve notable insect species were recorded, one is a rare, possibly un-described species, two are possibly new species,

four are threatened species, three are endemic to the area, five have limited distributions, one is a range extension, and two are rare in collections (status unknown).

Three areas on the property were identified as having high significant inherent values for invertebrate conservation. These are the rockland area west of the Mary Range, which supports the most diverse insect fauna of any shrubland sampled, the Tekapo River terraces, which provide habitat for three of the threatened grasshoppers found on the property, and an area of high river terrace on the north side of the Tekapo Canal that supports one of the largest known populations of the nationally-endangered robust grasshopper, and includes a small pond whose margins are unusually rich in insect species. Based on their insect fauna, two other areas were shown to have a medium to high level of significant inherent values. These are Mount Mary summit, where a rare un-described ground beetle was collected, and the Mary Burn Wetland area for its diverse and representative insect fauna.

2.5.5 Notable Fauna

Notable animal species recorded from the property are listed in Table 6 below. Threat categories are those proposed by Hitchmough (2002).

Table 6 Notable fauna recorded from The Wolds Pastoral Lease.

Animal Species Common name	Scientific name	**Known Distribution on Property**
Nationally Critical		
black stilt*	*Himantopus novaezelandiae*	Mary Burn Wetland
Nationally Endangered		
Australasian bittern	*Botaurus poiciloptilis*	Patersons Ponds, Mary Burn Wetland
robust grasshopper	*Brachaspis robustus*	lower Tekapo River terraces and terrace north of Tekapo Canal
Serious Decline		
black-billed gull*	*Larus bulleri*	Mary Burn Wetland
black-fronted tern	*Sterna albostriata*	Tekapo River terraces, Patersons Ponds, Mary Burn Wetland#
grey duck	*Anas superciliosa*	Patersons Ponds, Mary Burn Wetland
Gradual Decline		
banded dotterel	*Charadrius bicinctus*	Tekapo River terraces, Mary Burn Wetland#
grasshopper	*Sigaus minutus*	upper Tekapo River terrace
grasshopper	*Sigaus minutus* 'blue'	upper Tekapo River terrace
grasshopper	*Sigaus* sp. A	moraine west of the Mary Range and northeast flank of Mary Range
green skink*	*Oligosoma chloronoton*	Tekapo River terraces
jewelled gecko*	*Naultinus gemmeus*	shrublands on Tekapo River terraces
New Zealand falcon*	*Falco novaeseelandiae*	Mary Burn Wetland
spotted skink*	*Oligosoma lineoocellatum*	Tekapo River terraces
Sparse		
black shag	*Phalacrocorax carbo*	Patersons Ponds
long-toed skink*	*Oligosoma longipes*	Tekapo River terraces
marsh crake	*Porzana pusilla affinis*	Patersons Ponds, Mary Burn Wetland#
Data Deficient		
bignose galaxias	*Galaxias macronasus*	spring-fed streams around Mary Burn Wetland
freshwater mussels	*Hyridella* sp.	Mary Burn
Not listed as threatened		
Rare in collections		
anobiid	*Australanobium inaequale*	rockland site west of Mary Range
byrrhid	*Microchaetes* sp.	terrace north of Tekapo Canal
Un-described or new species		
ground beetle	*Holcaspis* n.sp.	Mount Mary
small manuka beetle	*Pyronota* nr. *festiva*	terrace north of Tekapo Canal
Limited distribution		
ground beetle	*Megadromus alternus*	northeast side of Mary Burn Wetland
	Metaglymma aberrans	alongside Mary Burn
darkling beetle	*Mimopeus impressifrons*	Mount Mary and lower Tekapo River terrace
Range extension		
ground beetle	*Bembidion parviceps*	beside Irishman Creek

* Not recorded during this survey.
# Not observed in this habitat during the survey.

2.5.6 Problem Animals

Introduced animals that may have a significant effect on indigenous plant or animal 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 rodents and mustelids), or domesticated animals that are grazed on the property, are not discussed here.

Rabbit
All parts of the property, and particularly the stony outwash terraces, are prone to rabbit infestations. Numbers appeared relatively low at the time of the field survey, though rabbits could quickly become a significant problem if the population were to increase. Control of rabbits is likely to be required to protect conservation values in any areas set aside as protected natural areas.

Hedgehog
The hedgehog population appeared high based on the large number of scats observed throughout the property. Hedgehogs are well known invertebrate predators. Control of hedgehogs may be required to protect important invertebrate populations.

Possum
Possum sign (droppings) was observed at numerous locations on the property, notably at rock outcrops and other areas of lizard habitat. The impact of possums on native plants or animals (especially invertebrates and lizards) on the property is unclear. However, control of possums may be required to protect conservation values.

Brown trout
Brown trout are present in all the larger streams and ponds on the property. It is likely that native fish populations are reduced at some locations because of the presence of brown trout. Maintaining some areas free of brown trout may assist with the protection of native fish populations.

2.6 HISTORIC

The Wolds (Run 275) was taken up by Thomas Williamson Hall in 1858. At that time it comprised 20,000 acres and was extended in 1859 to 30,000 acres (Pinney, 1971). The property was managed by William Ostler and apparently named by him after the Yorkshire wolds. In the late 1860s Hall sold the property to Alexander Smith and William Saunders. Smith sold his share to Saunders in 1872, and the property was held by Saunders for the next 30 years. Saunders also owned at various times parts of the Mistake, Mary Range and Irishman Creek runs. In 1902 Saunders sold The Wolds to William Grant, and in 1911 the property was divided into Maryburn, Mary Hill and The Wolds. The homestead block remained in the Grant family until 1957 when it was sold to Michael Murray (Pinney, 1971).

Three buildings on the property are of historic interest. Two are located on the lower eastern slopes of the Mary Range: an old fertiliser building and a woolshed. Both appear disused, though still in relatively good condition. This area appears to be the site of a former homestead, as there is a wide range of exotic trees planted in the vicinity. The third building is an old hut near the Mary Burn wetland.

The most significant historic resource noted on the property is a site on the southern side of a small pond in the triangle of land north of the Tekapo Canal. Moa bones and moa gizzard stones were found at this site.

2.7 PUBLIC RECREATION

2.7.1 Physical Characteristics

The Wolds Pastoral Lease lies within the 'pastoral' recreation opportunity class in the Recreation Strategy for Canterbury Conservancy (Department of Conservation, 1994). The property can be divided into three main recreation settings.

Lake Shore and River Edge

This recreation setting covers the parts of the property alongside Lake Pukaki and the Tekapo River, including Patersons Ponds. The section of the Tekapo River near Patersons Ponds and most parts of the lake shore are dominated by introduced woody species. Lake Pukaki and the Tekapo River are both affected by hydroelectricity generation. The lake level varies throughout the year, determining the extent of the beach exposed. The quantity of water flowing down the river also varies, affecting its suitability for recreation.

Moraines and Terraces

This recreation setting covers most of the property. It comprises all the flat or gently-sloping country between Lake Pukaki and the Tekapo River except for the Mary Range. Vegetation is predominantly modified tussockland, shrubland and scrub, with areas of pasture and wetland. Low moraines and terrace scarps are present, though the area is characterized by its low relief. Several vehicle tracks traverse the area.

Mary Range

This recreation setting covers the part of the Mary Range that is within the property. It comprises the moderately-steep slopes and gentler summit ridge of the range. Vegetation is predominantly modified tussockland with areas of shrubland and scrub, notably on the lower slopes. A well-formed vehicle track traverses the summit ridge, providing access to communication facilities on Mount Mary.

2.7.2 Legal Access

State Highway 8 provides legal access to the central part of the property. No other legal roads appear to provide access to the property, and no marginal strips appear to have been set aside along the rivers or lake shore. Practical access to parts of the property is readily available from Hayman Road, the Tekapo Canal road, a rough gravel road along the Tekapo River and from the road along the crest of the Mary Range. Several vehicle tracks traverse the property.

2.7.3 Activities

Scenery appreciation is probably the most important recreational use of the property, as a large part of the property is clearly visible from State Highway 8 and the Tekapo Canal road. Both roads are very important tourist routes, providing access between Canterbury, Mount Cook and the Southern Lakes. The property is part of the foreground of the spectacular views of the Southern Alps, including Mt Cook, gained from the main highway. It is also an integral part of the Mackenzie Basin, a regionally-outstanding natural feature and landscape

(Boffa Miskell and Lucas Associates, 1993). Other important recreational uses of the property are water-based activities associated with Lake Pukaki, Patersons Ponds and the Tekapo River, walking/tramping on the Mary Range, and bird-watching along the Tekapo River and at the Mary Burn Wetland. Some paragliding and mountain biking has been carried out on the Mary Range.

The property has the potential to provide further opportunities for scenery appreciation, photography, walking, mountain-biking, horse-riding, driving, fishing, picnicking, bird-watching and natural history study.

PART 3 OTHER RELEVANT MATTERS AND PLANS

3.1 CONSULTATION

Early-warning consultation meetings were held in Christchurch on 28th October 2003 and in Timaru on 29th October 2003. Issues raised at those meetings are listed below.

- There are important RAPs on the property, including an area near Lake Pukaki and shrublands on the eastern side of the Mary Range.
- Water quality is an issue, especially in the Mary Burn and Irishman Creek.
- The waterways are important for recreation and need to be buffered, especially the Tekapo River.
- There are important areas on the property for invertebrates and lizards, especially on the river terraces.
- Mount Mary provides great views, similar to the views gained from Mt John. Access to Mount Mary for recreation would be desirable.

3.2 DISTRICT PLANS

The Wolds 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 or adjacent to the property:

- Site 38 (Wolds Stream) (Tekapo RAP 8) covering the Mary Burn Wetland.
- Site 39 (Mount Mary) (Pukaki RAP 13) covering scrub on the northeast side of the Mary Range.
- Site 45 (Tekapo River) (Pukaki RAP 15) covering the Tekapo River bed.

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 a wetland and riparian areas.

3.3 CONSERVATION MANAGEMENT STRATEGIES AND PLANS

The Wolds 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. There is a Recovery Plan for non-migratory galaaxids which should also be referred to.

PART 4 ATTACHMENTS

4.1 ADDITIONAL INFORMATION

4.1.1 Scientific Names of Species

Plant Species

Species names follow the published volumes of New Zealand Flora (Allan, 1961; Moore and Edgar, 1976; Webb, Sykes and Garnock-Jones, 1988; and Edgar and Connor, 1999), Brownsey and Smith-Dodsworth (1989) for ferns, Allison and Child (1971) for mosses, the name changes listed in Connor and Edgar (1987) and recent names (for shrubs) listed in Wilson and Galloway (1993). Maori names are included for taonga species listed in Schedule 97 of the Ngai Tahu Claims Settlement Act 1998. Naturalised species are indicated by an asterisk (*).

Common name	Scientific name
alder*	*Alnus glutinosa*
birch*	*Betula* sp.
blue tussock	*Poa colensoi*
bog pine	*Halocarpus bidwillii*
broom*	*Cytisus scoparius*
browntop*	*Agrostis capillaris*
clover*	*Trifolium* spp.
common broom	*Carmichaelia petriei*
coral broom	*Carmichaelia crassicaule*
crack willow*	*Salix fragilis*
cushion daphne	*Pimelea pulvinaris*
cypress*	*Cupressus* sp.
fescue tussock	*Festuca novae-zelandiae*
golden speargrass/taramea	*Aciphylla aurea*
hawkweed*	*Hieracium* spp.
larch*	*Larix decidua*
Lombardy poplar*	*Populus nigra*
mat daisies	*Raoulia* spp.
matagouri	*Discaria toumatou*
monkey musk*	*Mimulus guttatus*
mountain totara	*Podocarpus hallii*
mountain wineberry	*Aristotelia fruticosa*
mouse-ear hawkweed*	*Hieracium pilosella*
narrow-leaved snow tussock	*Chionochloa rigida*
oak*	*Quercus* sp.
poplar*	*Populus* sp.
porcupine shrub	*Melicytus alpinus*
prostrate kowhai	*Sophora prostrata*
raupo	*Typha orientalis*
red tussock	*Chionochloa rubra* ssp. *cuprea*
Russell lupin*	*Lupinus polyphyllus*

silver tussock/wi ..... *Poa cita*
snow tussock ..... *Chionochloa* sp.
speargrass/taramea ..... *Aciphylla* sp.
St John's wort* ..... *Hypericum perforatum*
stonecrop* ..... *Sedum acre*
swamp speargrass ..... *Aciphylla subflabellata*
sweet brier* ..... *Rosa rubiginosa*
sweet vernal* ..... *Anthoxanthum odoratum*
tauhinu ..... *Ozothamnus leptophyllus*
toatoa ..... *Phyllocladus alpinus*
toetoe ..... *Cortaderia richardii*
tumbleweed lichen ..... *Chondropsis semiviridis*
white fuzzweed ..... *Vittadinia australis*
willow* ..... *Salix* sp.

Animal Species

Species names follow King (1990) for mammals, the June 2003 version of the New Zealand Recognized Bird Names list (compiled by C.J.R. Robertson and D.G. Medway for the Ornithological Society of New Zealand Inc.) for birds, Whitaker (1998) for lizards and McDowall (2000) for fish. Maori names are included for taonga species listed in Schedule 97 of the Ngai Tahu Claims Settlement Act 1998. Naturalised species are indicated by an asterisk (*).

Common name ..... Scientific name

alpine galaxias ..... *Galaxias paucispondylus*
Australasian bittern ..... *Botaurus poiciloptilis*
Australasian crested grebe/kamana ..... *Podiceps cristatus australis*
Australasian harrier/kahu ..... *Circus approximans*
Australasian pied stilt/poaka ..... *Himantopus himantopus leucocephalus*
banded dotterel ..... *Charadrius bicinctus bicinctus*
bignose galaxias ..... *Galaxias macronasus*
black shag/koau ..... *Phalacrocorax carbo novaehollandiae*
black stilt/kaki ..... *Himantopus novaeseelandiae*
black-billed gull ..... *Larus bulleri*
black-fronted tern ..... *Sterna albostriata*
boulder copper butterfly ..... *Lycaena boldenarum*
brown trout* ..... *Salmo trutta*
brushtail possum* ..... *Trichosurus vulpecula*
Canada goose* ..... *Branta Canadensis maxima*
Canterbury galaxias ..... *Galaxias vulgaris*
common bully ..... *Gobiomorphus cotidianus*
common skink ..... *Oligosoma nigriplantare polychroma*
European hedgehog* ..... *Erinaceus europaeus occidentalis*
European rabbit* ..... *Oryctolagus cuniculus cuniculus*
green skink ..... *Oligosoma chloronoton*
grey duck/parera ..... *Anas superciliosa superciliosa*
grey teal/tete ..... *Anas gracilis*
grey warbler/rironiro ..... *Gerygone igata*
hedgehog* ..... *see* European hedgehog
jewelled gecko ..... *Naultinus gemmeus*
koaro ..... *Galaxias brevipinnis*
little shag ..... *Phalocrocorax melanoleucos brevirostris*

long-toed skink.....*Oligosoma longipes*
longfin eel.....*Anguilla dieffenbachii*
McCann's skink .....*Oligosoma maccanni*
mallard*.....*Anas platyrhynchos platyrhynchos*
marsh crake .....*Porzana pusilla affinis*
New Zealand falcon/karearea.....*Falco novaeseelandiae*
New Zealand pipit/pihoihoi.....*Anthus novaeseelandiae novaeseelandiae*
New Zealand scaup .....*Aythya novaeseelandiae*
New Zealand shoveler/kuruwhengu....*Anas rhynchotis variegata*
paradise shelduck/putakitaki .....*Tadorna variegata*
possum*.....*see* brushtail possum
rabbit* .....*see* European rabbit
rainbow trout* .....*Oncorhynchus mykiss*
redcoat damselfly .....*Xanthocnemis zealandica*
robust grasshopper .....*Brachaspis robustus*
scree skink.....*Oligosoma waimatense*
silvereye .....*Zosterops lateralis lateralis*
South Island pied oystercatcher.....*Haematopus ostralegus finschi*
Southern Alps gecko .....*Hoplodactylus* aff. *maculatus* "Southern Alps"
southern black-backed gull/karoro .....*Larus dominicanus dominicanus*
southern blue butterfly .....*Zizina otis oxleyi*
spotted skink.....*Oligosoma lineoocellatum*
spur-winged plover.....*Vanellus miles novaehollandiae*
upland bully.....*Gobiomorphus breviceps*
welcome swallow .....*Hirundo tahitica neoxena*
whistling tree frog* .....*Litoria ewingi*
white-faced heron.....*Ardea novaehollandiae novaehollandiae*
wrybill .....*Anarhynchus frontalis*

4.1.2 References

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4.2 MAPS

4.2.1 Topographical and Cadastral

4.2.2 SSWI and RAP Values

4.2.3 Values – Botanical, Landscape and Recreation

4.2.4 Fauna Values