



Land Information
New Zealand
Toitū te whenua

Crown Pastoral Land Tenure Review

Lease name : MATAKANUI

Lease number : PO 324

Conservation Resources Report

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

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

MARCH

14

**DOC CONSERVATION RESOURCES REPORT ON
TENURE REVIEW OF**

MATAKANUI PASTORAL LEASE

PAP-13-04-324

**UNDER PART 2 OF THE CROWN PASTORAL LAND
ACT 1998**



TABLE OF CONTENTS

PART 1	2
INTRODUCTION	2
1.1 Introduction:.....	2
PART 2	3
INHERENT VALUES: DESCRIPTION OF CONSERVATION RESOURCES AND ASSESSMENT OF SIGNIFICANCE	3
2.1 LANDSCAPE	3
2.1.1 Significance of Landscape.....	8
2.2 LANDFORMS & GEOLOGY.....	9
2.3 LAND ENVIRONMENTS	10
2.3.1 Significance of Land Environments	11
2.4 Climate:.....	11
2.5 VEGETATION	11
2.5.1 Significance of Vegetation	14
2.5.2 Problem Plants.....	16
2.6 FAUNA.....	16
2.6.1 INVERTEBRATE FAUNA	16
2.6.2 Significance of Invertebrate Fauna	18
2.6.3 Herpetofauna:	18
2.6.4 Significance of Herpetofauna	19
2.6.5 Avifauna:	19
2.6.6 Significance of Avifauna	19
2.6.7 Aquatic Fauna:.....	19
2.6.8 Significance of Aquatic Fauna.....	21
2.6.9 Problem Animals	21
2.7 ECOSYSTEM SERVICES AND ECOLOGICAL SUSTAINABILITY.....	21
2.7.1 Ecosystem Services	21
2.7.2 Land Use Capability and Sustainability.....	25
2.7.3 Significance of Ecosystem Services and Sustainability.....	25
2.8 HISTORIC	26
2.8.1 Significance of Historic	31
2.9 PUBLIC RECREATION:	31
2.9.1 Physical Characteristics:.....	31
2.9.2 Legal Access.....	32
2.9.3 Activities	32
2.9.4 Significance of recreation on the PL	33
PART 3	34
OTHER RELEVANT MATTERS & PLANS.....	34
3.1 CONSULTATION.....	34
3.2 REGIONAL POLICY STATEMENTS & PLANS	34
3.3 DISTRICT PLAN	35
3.4 CONSERVATION MANAGEMENT STRATEGY & PLANS.....	35
3.5 NEW ZEALAND BIODIVERSITY STRATEGY	36
3.6 PROTECTING OUR PLACES.....	36
PART 4	38
ATTACHMENTS.....	38
4.1 Additional information.....	38
4.1.1 References	38
4.2 Maps.....	
4.3 Appendices.....	
4.4 PHOTOGRAPHS.....	

PART 1

INTRODUCTION

1.1 Introduction:

The Matakanui Pastoral Lease (PL) tenure review is being undertaken under the provisions of the Crown Pastoral Land Act 1998. As part of the tenure review process, a range of specialists have visited the property. Their reports identifying the significant inherent values on Matakanui PL have been incorporated within this Conservation Resources Report.

The lessees of the PL, Matakanui Station Ltd have applied to undertake tenure review. A survey of the property by 4WD vehicle was undertaken 13 and 14 December 2011.

The PL has an area of 3602ha and is farmed in association with freehold land. It lies in the Dunstan Mountains to the south of Thomsons Saddle. The property encompasses most of the catchment of upper Thomsons Creek and the catchments of a number of small creeks draining to Chatto Creek. These small creeks drain the SE faces of the range, and include the headwaters of Devonshire, Scotts, Coal, Buster, Neds and Laheys Creeks. The property dips to about 700 m altitude in the extreme south, but most of it lies above 1000 m. Its high point is just under 1600 m.

The property lies within the Dunstan Ecological District, which takes in the Dunstan Mountains down to surrounding toe-slopes. The Dunstan ED along with the neighbouring Linda and Pisa EDs were surveyed as part of the Protected Natural Areas Programme (PNAP) during the summer of 1984/85. The resulting report (Ward et al. 1994) identified 17 Recommended Areas for Protection (RAPs) in the Dunstan Ecological District. Neds Creek RAP (B9) and parts of both Bendigo Tops (A4) and Scotts Creek (A5) lie within Matakanui Pastoral Lease.

This is one of the driest ranges in Central Otago, with a sub-continental climate of hot summers and cold winters.

The PL adjoins and is continuous with the Matakanui Station freehold which extends from the valley floor on the flats of the Manuherikia Valley up onto the eastern face of the Dunstan Range. The homestead is situated on this freehold in the valley floor on the Moutere Disputed Spur Road.

PART 2

INHERENT VALUES: DESCRIPTION OF CONSERVATION RESOURCES AND ASSESSMENT OF SIGNIFICANCE

2.1 LANDSCAPE

Introduction

This report provides the landscape assessment of Matakanui Pastoral Lease which was inspected under fine and clear conditions.

Methodology

The process of landscape assessment includes the following steps:

1. Landscape units of the PL are defined. The landscape units reflect areas of similar landscape character. Landscape character is based on how the land looks and attributes such as visible geology/formative processes, waterbodies, vegetation type and pattern and any cultural use by humans. The PL has been divided into three landscape units.
2. A description of the landscape character of the landscape unit.
3. A description of the visual and scenic values of the property.
4. An assessment of landscape vulnerability.
5. Landscape values are then assessed using the 5 criteria outlined below.
6. From the above, a determination is made about significance.

The definition of the 5 criteria used to assess individual units are:

Naturalness refers to the condition of the natural vegetation, patterns and processes and the degree of modification present.

Legibility - refers to its expressiveness - how obviously the landscape demonstrates the formative processes leading to it.

Aesthetic Factors - include criteria such as distinctiveness - the quality that makes a particular landscape visually striking. Frequently this occurs when contrasting natural elements combine to form a distinctive and memorable visual pattern. A further criteria assessed under aesthetic factors is coherence. This is based on characteristics including intactness, unity, continuity, and compatibility. Intrusions, alterations, disruptions tend to detract from coherence.

Historic Values - refers to historically valued attributes in the context of a high country landscape

Visibility - refers to the visibility from public places such as highways, waterways or local vantage points.

Location and Landscape Context

The PL is located on the southern Dunstan Mountains.

The PL occupies an upland area south of Thomsons Gorge Road, from Thomsons Saddle and extending up onto the broad summit of the Dunstan Mountains and down the front face of the range. The PL is a rectangular shaped block of land (approximately 6.5 km long by 3 km wide).

Landscape Analysis and Evaluation

Three landscape units are defined on Matakanui PL. (refer section 4.2: Map 2)

These include the following:

- Landscape unit 1 (LU1) Thomsons Gorge
- Landscape unit 2 (LU2) Dunstan summit plateau
- Landscape unit 3 LU3) Dunstan scarp faces

Landscape unit 1: Thomsons Gorge

Character Description (refer Photos section 4.4: LU1)

This area includes the lower end of Thomsons Creek and side tributaries that descend from the summit of the Dunstan Range from an altitude of approximately 1100 m. The unit also includes the hills forming the north-west corner of the PL from Thomsons Creek to Thomsons Saddle.

Thomsons Gorge Road passes through the northern corner of the PL. Cattleyards and a stone hut mark the entrance to the PL next to Thomsons Gorge Road. The lower portion of Thomsons Creek within the PL is a narrow alluvial valley with the watercourse meandering across the valley floor. Scattered willows line the bank of the stream and the groundcover is mainly clover and hawkweed on the valley floor. A small area of tailings remain from early goldworkings, some of which appear to have been flattened in more recent times. The lower slopes above the valley are a briar/shrubland mix with scattered short tussock, exotic pasture and extensive hawkweed. Shrubland species observed include *Olearia*, matagouri, *Coprosma* and native broom.

The native shrubland component within the gullies is quite extensive and is the most significant feature on the lower slopes of the Thomsons Creek tributaries. They are also significant in terms of their role in maintaining soil and water values as the hillslopes have a degraded fragile appearance.

Upstream Thomsons Creek changes direction and narrows to a steep-sided, rocky lined gorge entrenched into the summit plateau with some slump topography. Vegetative cover is scattered depleted snow tussock, pasture grasses, and speargrass. The south face of the lower end of Thomsons Creek has extensive tussock hawkweed and again with significant shrubland on the lower faces and gullies. A lone wilding pine tree is located here.

Following the spur with the 4WD track to the top, the adjoining north facing hill slopes above Thomsons Gorge are similar with mainly short matagouri, tussock hawkweed with scattered snow tussock above a height of around 900 m. From about this elevation to approximately 1200 m is a band of blue tussock, hard tussock, speargrass and extensive tussock hawkweed with significant bare ground. These north faces of Thomsons Creek tributaries appear to be severely degraded.

Overall the whole of this unit has a low to medium level of naturalness. Landform characteristics are intact but vegetation patterns have been considerably modified.

The unit has a reasonably remote backcountry feel as it is in the centre of the range away from respective valley /basins on either side of the range.

Visual and scenic values

This area of the PL considered on its own is unremarkable in terms of visual and scenic values. It is not visually striking or distinctive. Visual coherence is reduced due to a degree of degradation. However viewed and considered in the context of Thomsons Gorge it is significant. The area forms part of the visual catchment of Thomsons Gorge Road which is an increasingly used easily accessible back country road. This part of the PL is similar in appearance to the landscape on both sides of the road corridor east of Thomsons Saddle. While from an ecological perspective the values are highly modified there are visual and scenic values associated with the landform characteristics especially rocky outcrops and bluffs, the views available from the road, and the shrubland and scattered tussock remaining.

Summary Evaluation of the Thomsons Gorge Unit

Table 1

Criteria	Value	Comment
Naturalness	Low to medium	Landform characteristics intact. Vegetation patterns considerably modified and degraded in places
Legibility	Medium	Weathering and water processes are expressed in the dissected and incised gully systems
Aesthetic Factors	Medium	Not distinctive or visually striking. Viewed in context of the Thomsons Gorge corridor is a reasonably coherent landscape apart from modified and degraded ecological values. This would only be apparent to a minority of the public.
Historic Factors	Medium	Some early gold workings in lower Thomsons Creek. Thomsons Gorge Road is an historic road built to connect the Bendigo and early goldfields east of the Dunstan Range.
Visibility	Medium	Part of the corridor visual catchment of Thomsons Gorge

Landscape Vulnerability

The unit is vulnerable to land use changes that would impact on the character of the historic Thomsons Gorge Road. Particularly those that masked the underlying landform patterns e.g. plantation forestry, damming of the gorge and activities that further diminished or fragmented shrublands.

Landscape Unit 2: Dunstan Summit Plateau

Character Description (refer Photos section 4.4: LU2)

This unit occupies the majority of the PL and includes all the upland summit area of the Dunstan Range. In landscape terms it forms a single unit though there are variations in character (mainly variation in vegetation patterns) across the plateau. It includes upper Thomsons Creek and tributaries that encroach onto the plateau surface as incised basins, and the upper shallow tributaries that drain east to the edge of the Dunstan Mountains fault scarp.

The northern end of the plateau loosely starts at about 1100 m upwards.

The whole of the plateau forms an undulating, rolling summit with broad, smooth ridges tilted either north-west into Thomsons Creek or south-east towards the eastern fault scarp.

The northern end is of lower altitude; gradually rising up to the southern end high point. Low rock outcrops occur usually on knobs or high points, but these are not extensive or dominant. Vegetation is tundra-like with scattered clumps of tall tussock within a dominant cover of extensive cushion-herbfield.

Bare ground in the form of gravel is significant and there are signs of peri-glacial features. Shallow ephemeral ponds occur around 1300 m. Also wet zones within gentle gully systems which stand out as bright green and contrast with the tawny tussock and muted greens and browns of the surrounding cushion field. Snow tussock is greater within the shelter of gentle gullies incised into the plateau. Snow tussock is also more prevalent within gully systems that descend towards the eastern edge of the fault scarp compared to the exposed undulating summit area. Here snow tussock is generally continuous and in good condition.

The south west end includes a domed summit area with 'well developed soil hummocks and stripes' (Ward et al. 1994). Extensive cushion-herbfield has conspicuous *Celmisia*, *Dracophyllum* and blue tussock. Peri-glacial features are more developed here compared to the northern end of the plateau. Also at this end, gentle gullies become gradually more entrenched towards the eastern edge of the plateau with bogs and wetlands and it is increasingly rock and tor studded. Small snow drifts were still present in snowbank hollows in a few places.

An important characteristic of the summit plateau is the openness and expansiveness of the plateau surface which extends beyond the boundaries of the PL and the feeling of being 'on top of the world'. Other characteristics include the bleakness and evident harshness of the climate and environment. Snow lies for winter months and contributes to this, as well as completely changing the appearance of the plateau into a white arctic like environment.

There is a high level of naturalness associated with the summit plateau. The only obvious signs of humans are the access tracks and a fenceline at the northern end.

Visual and scenic values

The summit plateau has high visual and scenic values derived from the inherent natural landform and vegetation characteristics, which imparts a visually striking and distinctive appearance to this upland landscape. The gently rolling plateau surface, extensive cushion field/short tussock, peri-glacial features and broad sweeps of snow tussock are visually impressive and distinctive of Central Otago's flat-topped, block mountain ranges.

Views out in all directions are spectacular. These include west to the Pisa Mountains, distant Mt Aspiring and the divide, and east, south and north to the ranges and basins of Central Otago.

Summary Evaluation of Dunstan Summit

Table 2

Criteria	Value	Comment
Naturalness	High	All natural processes and patterns intact apart from the lower northern end.
Legibility	High	The uplifted peneplain subjected to weathering and down cutting is very legible in the appearance of the landscape
Aesthetic Factors	High	Visually striking and distinctive. Overall is visually coherent apart from signs of early grazing and burning which has impacted on the vegetation patterns
Historic Factors	Low	No evidence of historic associations. Grazing will have occurred early on with arrival of run- holders.
Visibility	Low	Not visible from public places

Landscape Vulnerability

As with all high altitude uplands these lands are inherently fragile and vulnerable to human intervention. The gently undulating surface and low vegetation is visually sensitive to any alteration or addition which has the potential to adversely affect the character and quality of the landscape. The summit plateau is vulnerable to all forms of land use and extreme care is essential. Structures and earthworks have the greatest potential to impact on landscape values eg buildings, telecommunication facilities and earthworks of any kind.

Pastoralism, causing altered vegetation patterns has impacted to some extent on naturalness and therefore on landscape values.

Landscape Unit 3: Dunstan Fault Scarp Faces

Character Description (refer Photos section 4.4: LU 3)

The upper edge of this unit is not clearly defined and overlaps with the summit plateau. It includes the transition from the rolling summit down the upper fault scarp face of the southern Dunstan Mountains to the boundary with the Matakanui Station freehold. A number of tributaries incised into the upper slopes of the range are included.

The summit plateau rolls towards the front face of the escarpment with either gentle incised or more sharply defined gullies.

At the transition between the summit and fault scarp is an extremely diverse area of cushion and herb field alternating with wetlands and boggy zones and often gentle small streams forming the headwaters to the creeks below. Boulders and rocky rubble are often associated with the watercourse and wetlands creating an alpine rock garden effect. Rock stacks and outcrops some of huge proportions are also a feature of this transition zone on the edge of the escarpment. Within the dominant cushion/herbfield are also drifts of tall tussock though their stature is low in this harsh environment.

Streams become more incised downslope with the clearly defined ridges and derivative slopes. Tall tussock is dominant and in reasonably good condition though appears to decrease in quality nearer to the lower boundary and particularly on sunny faces. The dominant characteristic of this upper scarp face is extensive rock outcrops, slump topography and golden

coloured tall tussock. Although the tussock is fragmented in places, overall it is coherent and natural.

Visual and scenic values

The whole of the upper face also has inherently high visual and scenic values. The transitional zone of the summit and scarp face has particularly high visual values associated with the many and varied rock outcrops, wetlands and seepages and associated plant communities. These are visually distinctive and striking. The tall tussock covered upper slopes and their rock outcrops and bluffs are also visually impressive.

The whole of this unit forms part of southern Dunstan slopes of the range which is the eastern enclosing mountain range of the Manuherikia Valley. The distinctive fault scarp face dominates and is part of the highest landform feature over most of the valley. It is visible from all public places and roads including the Ida Valley Omakau Road (Blacks Hill) over the Raggedy Range.

Landscape Vulnerability

As with the summit the upper scarp face is visually sensitive and vulnerable to any form of alteration or modification. The skyline silhouette of the upper ridge of the range is especially vulnerable.

Summary Evaluation for Dunstan Scarp

Table 3

Criteria	Value	Comment
Naturalness	High	All natural patterns and processes intact
Legibility	High	The tectonic processes responsible for the fault block range, periglacial features, and subsequent weathering processes are highly expressive of the formative processes.
Aesthetic Factors	High	Distinctive and striking. Visually coherent. No discordant features.
Historic Factors	Low	
Visibility	High	Forms the skyline ridge and upper slope. It is visible over a wide area of the Manuherikia Valley.

2.1.1 Significance of Landscape

The summit plateau and the upper fault scarp faces of the southern Dunstan Mountains forms a large part of the southern Dunstan Mountains and has inherently high landscape values. In a broad context, the whole of the area is a dominant landform and landscape feature within the Manuherikia Valley. It is included within the Outstanding Natural Landscape (ONL) classification of the Central Otago District Plan.

The fault scarp face and summit plateau in a landscape sense are a single landscape entity (as is the whole of the range face including below the PL boundary). In addition to the areas' significance as an important landscape feature within the context of Central Otago, its values are derived from the many and varied inherent characteristics and features. These include the distinctive, undulating and rolling summit and especially the 'domed' summit and associated soil hummocks and peri-glacial features; the expansive views and desolate and remote

characteristics; the gentle and sharply incised tributaries extending down the front face and upper Thomsons Creek tributaries, the rock outcrops and tors; the diverse cushion-herbfield, snowbank and broad drifts of tall and short tussock; the alpine bogs and wet zones, fellfield and associated plant communities.

On the upper scarp face the extensive rock outcrops and bluffs and dominant tall tussock is continuous and intact forming a distinctive and iconic New Zealand landscape, despite some fragmentation in the lower reaches.

On the Thomsons Gorge faces vegetation patterns have in places been severely degraded by the legacy of pastoral use. However shrublands are a significant feature and will increase with appropriate management. The natural landform patterns including rock exposure remain intact. Being a part of the visual catchment and setting of Thomsons Gorge is significant. The landforms including rock outcrops and bluffs as well as shrublands and scattered tussock are part of the setting and character of the gorge landscape.

2.2 LANDFORMS & GEOLOGY

The Dunstan Mountains form one of several parallel fault-block mountain ranges that characterise the Central Otago region. The property is underlain by Rakaia Terrane rocks within the Haast Schist group. The north-western, generally higher altitude part of the property is underlain by variably schistose greywacke and argillite (sandstones and mudstones), while the south-eastern part is underlain by schist with occasional bands of greenschist and metachert (Turnbull, 2000). The rock is exposed as tors across the property, especially near its southeast edge, above the scarp which falls to the Manuherikia Valley below.

The most significant structural feature in the area is the Dunstan Fault along the southeast margin of the range, against which uplift of the range is ongoing. This is the reason for the steep scarp on the south-east side of the range. The north-western side of the range dips more gently. Within the property are traces of an anticline in the west and overturned formation on the broad ridge between upper Thomsons Creek and the unnamed tributary creek to its east.

The broad, smooth, gently sloping ridge crests which dominate the property are formed on an old exhumed peneplain surface which has undergone limited erosion. There is no evidence of the Dunstan Mountains having generated glaciers in the past (Ward et al. 1994). Much of the broad ridge crest areas of the property above approximately 1250-1300 m are covered in soil hummocks, a peri-glacial phenomenon whose origins are still debated. The work of Mark and Bliss (1970) suggests that the Dunstan Mountains may have the most extensive continuous soil hummock habitat in the Central Otago region. In places, particularly towards the east, sheet erosion has exposed stony 'barrens' with little plant growth. The northern third of the property is strongly dissected by streams dropping to 800 m altitude in Thomsons Gorge. Thomsons Creek itself, and an unnamed tributary to the east, extend further back into the property but are not exceptionally strongly incised in this area. The SE property boundary lies along the upper part of the scarp marking the edge of the range. In the southern corner, the upper part of Neds Creek is especially deeply incised into the property.

2.3 LAND ENVIRONMENTS

Description

The environmental distinctiveness of this area has been assessed through the Land Environments of New Zealand (LENZ). This is a classification of New Zealand landscapes using a comprehensive set of climate, landform and soil variables chosen for their roles in driving geographic variation in biological patterns (Leathwick et al. 2003). It is presented at four levels of detail containing 20, 100, 200 or 500 environments nationally. The data in this report is presented at Level IV which more adequately reflects the distribution of biodiversity, past clearance and current vulnerability across the landscape than higher levels of LENZ (e.g. level II). Threat classification at level IV results in substantially more effective and efficient identification of threatened remaining indigenous cover.

When the Level IV LENZ information is combined with information describing the area of unprotected indigenous cover in threatened land environments, as identified in the national land cover database (LCDB), the biodiversity most likely to be lost can be identified. Five categories identify those threatened environments containing indigenous biodiversity at most risk of loss. These categories which are derived from a combination of measures for the percentage of biodiversity legally protected and percentage of remaining indigenous vegetation cover, are described as follows:

Table 4: Land Environments of New Zealand Threat Classification Categories

Threat Classification	Description
Acutely threatened	<10% indigenous vegetation cover remaining
Chronically threatened	10-20% indigenous vegetation remaining
At risk	20-30% indigenous vegetation cover remaining
Critically underprotected	> 30% indigenous vegetation cover remaining and <10% protected
Underprotected	>30% indigenous vegetation cover remaining and 10-20% protected
No threat	>30% indigenous vegetation cover remaining and >20% protected

One LENZ environment (Q) (Leathwick et al. 2003) is present on the PL. At Level IV classification the PL comprises Q3.3b, Q1.1b, Q1.1a, Q1.2a, Q2.2a, Q1.1c, Q3.3a, and Q3.3c. Table 4 presents a full LENZ analysis for Matakanui Pastoral Lease.

Table 5: LENZ environments present on Matakanui Pastoral Lease

Threat Category	LENZ Level IV units	Area of LENZ unit on Matakanui PL (ha) (Approx. only)	Area of LENZ unit as a % of Matakanui PL	Area of LENZ unit as a % of LENZ level 4 category nationally
Critically Underprotected	Q1.1b	20	0.6	0.04
	Q2.2a	650	18	0.30
	Q3.3b	44	1	0.05
Underprotected	Q1.1c	1545	43	0.60
	Q3.3c	12	0.5	0.01
No threat category	Q1.1a	65	2	0.06
	Q1.2a	73	2	0.04
	Q3.3a	1214	34	1.64
Total		c.3623	c. 100	

2.3.1 Significance of Land Environments

National priority 1 in “Protecting our Places” (MfE 2007) is to protect indigenous vegetation associated with land environments (defined by Land Environments of New Zealand at Level IV) that have 20% or less remaining in indigenous cover. Of the Level IV land environments on Matakanui Pastoral Lease none has less than 20% indigenous vegetation remaining nationally and therefore the land environments do not rate as significant.

2.4 CLIMATE

No specific climate data is available. The PL experiences a typical Central Otago climate with hot dry summers and cold winters. Considerable variation in annual rainfall and seasonal temperatures occurs. Rainfall at the nearby Moutere Station is 350 to 600 mm per annum. Rainfall is generally heavier during the summer months. However, due to high evapotranspiration rates, a soil moisture deficit usually exists. Frosts can be recorded at any time during the year and winters are cold with moderate to heavy frosts. Snow falls to low levels and generally lies on the ground during winter.

2.5 VEGETATION

Ward et al. (1994) summarises the vegetation history of the Dunstan Ecological District along with the neighbouring Pisa and Lindis Districts. They suggest that successive modification (particularly that caused by fire) over several thousand years have transformed the mountainsides of the Central Otago Ranges from a forest dominated environment to one dominated by tussock grassland. Evidence from pollen preserved in peat bogs suggests that matai and celery pine were locally dominant species in addition to beech and Hall’s totara. It is thought Polynesians brought an increased incidence of fire which greatly accelerated the rate of vegetation change.

The small pockets of silver and mountain beech, Halls totara, celery pine, kowhai and broadleaf that still occur on these ranges are descendants of the former forests. Patchily distributed snow totara, bog pine, *Dracophyllum longifolium* and *Hebe subalpina* are derived from a subalpine shrubland formerly more continuous between forest and alpine tussockland. Replacing the former forests, narrow-leaved snow tussock grassland expanded its range down-slope to all but the driest low altitude faces and drone-prone alluvial terraces of the valley floor.

Subsequent pastoralism and goldmining has also transformed the vegetation, especially at lower altitudes. Fire eliminated much of the remaining woody vegetation and reduced narrow-leaved tussock from lower and dry mid-slopes, to be replaced by grazing and fire-tolerant species such as fescue and golden speargrass. Much of the higher altitude snow tussockland was also transformed, especially on the extensive plateau summits where fire and grazing-susceptible slim snow tussock were replaced by alpine blue tussockland and cushion herbfields.

These generalised patterns are reflected in the current state of the vegetation of Matakamui PL, noting that it spans an altitudinal range from montane – low alpine. Cushion-herbfields dominate the range crest and extensive snow tussocklands clothe the eastern faces of the range. Woody species, descendants of earlier forests and shrublands are present in small fire refuges. Areas at lowest altitude and with sunny aspect have been most affected by pastoralism and, apart from matagouri-dominated shrublands, retain little native vegetation cover.

Early run plan information (Otago Catchment Board 1973) suggests that the vegetation condition has improved since the PL ran wethers all year round. Those areas clear of snow over winter appear to be the same severely degraded hawkweed infested faces to the north of the property.

Survey Method

Much of the property was inspected by 4WD, but steep terrain, creek beds, and other areas remote from tracks were surveyed on foot. Descriptions were made of the composition of major plant communities. Threatened plants were searched for in potentially suitable habitats. Digital photographs were taken of particular species, communities and landscapes to aid in interpretation. Specimens were collected of noteworthy or uncertain taxa for herbarium accession and determination.

Vegetation Description

For the purposes of describing the vegetation the property has been divided into two units: Thomsons Creek catchment below 1000 m above sea level (asl), and the remainder of the PL.

Thomsons Creek catchment below 1000 m

The headwaters of Thomsons Creek rise in the southwestern corner of the PL before swinging east for two kilometres and exiting the property. Several small and unnamed tributaries enter the creek from the south. Below c. 1000 m in the catchment vegetation is comprised of degraded short tussockland, exotic pasture, shrubland, small riparian wetlands and valley floor rockland.

Near the historic stone hut, terrace rock tailings support low vegetation cover comprising creeping pohuehue (*Muehlenbeckia axillaris*), slender chickweed (*Stellaria gracilentia*), *Acaena inermis*, *Colobanthus strictus*, alpine hard fern (*Blechnum pennamarina*), *Raoulia australis* and porcupine shrub (*Melictyus* aff. *alpinus*).

Elsewhere on the better drained parts of the valley floor and riparian margins are communities characterised by hard tussock (*Festuca novae-zelandiae*) and exotic pasture species with scattered matagouri (*Discaria toumatou*) and sweet briar (*Rosa rubiginosa*).

Large willow (*Salix fragilis*) line the riparian margin of the lower valley. Small toe-slope flushes and seeps support a mixture of native and exotic wetland herbs. Common native species include cutty grass (*Carex coriacea*), bog rush (*Schoenus pauciflorus*), purei (*Carex secta*), *Ranunculus amphitricus* and blinks (*Montia fontana* subsp. *fontana*). Exotic species include musk (*Mimulus moschatus*), purging flax (*Linum catharticum*), leafless rush (*Juncus effusus*) and oval sedge (*Carex ovalis*).

Patches and ribbons of shrublands extend along both sides of the lower valley hill slopes. These are dominated by matagouri, in association with *Coprosma propinqua*, *Olearia odorata*, desert broom (*Carmichaelia petriei*) and sweet briar. Pohuehue (*Muehlenbeckia complexa*) and *Clematis marata* are also occasionally present.

Between the shrublands and extending above them to c. 1000 m are short tussock (*Festuca novae-zelandiae*) dominated grasslands and tussock hawkweed (*Hieracium lepidulum*) and sheep sorrel (*Rumex acetosella*) herbfields. Pasture grasses are strongest at lower altitude and on landforms where soil has accumulated, often in conjunction with low matagouri. Sites with thin soils and sunny aspects are often dominated by tussock hawkweed with considerable bare ground. Resilient native species in this community include scattered narrow-leaved snow tussock (*Chionochloa rigida*), golden speargrass, *Anisotome aromatica*, *Leucopogon fraseri*, *Acrothamnus colensoi*, *Celmisia gracilenta*, *Brachyglottis haastii*, *Raoulia subsericea* and *Pentachondra pumila*.

Remainder of PL

The remainder of the PL includes land above 1000 m in the Thomsons Creek catchment, the broad rolling crest of the Dunstan Mountains, and the steep headwaters of numerous small easterly-flowing tributaries of Chatto Creek. Vegetation communities include short and tall tussockland, alpine cushion-herbfields, vegetation associated with a range of wetland types (tarns, ephemeral depressions, fens, bogs, snowbanks, flushes and seeps), rock tors and subalpine shrublands.

Above c. 1000 m on the north-facing slopes above the Thomsons Creek catchment native tussocklands begin to dominate with a wider range of intertussock native species and less bare ground. Coral broom (*Carmichaelia crassicaulis* subsp. *crassicaulis*) occurs locally and is very heavily browsed. At c. 1200 m alpine hard tussock and golden speargrass dominates with a range of intertussock herbs and grasses including *Pimelea oreophila* subsp. *lepta*, *Rytidosperma pumilum*, *Kelleria villosa*, *Celmisia gracilenta*, *Celmisia sessiliflora*, *Scleranthus uniflorus*, *Raoulia subsericea*, *Leptinella pectinata* subsp. *villosa*, *Ranunculus multiscapus* and *Craspedia incana*.

Tall tussock cover is extensive on the flanks of the range and extends down to the boundary fence in many places, often in association with short tussock and pasture species. Its distribution on the range crest is much more variable and probably reflects fire boundaries. There are large areas where narrow-leaved tussock and, at highest altitude slim tussock (*Chionochloa macra*), are absent or represented by only individuals or small groups. Elsewhere they are more prevalent in damp gullies and on shady aspects.

The dominant vegetation over much of the range crest in the southwest is cushionfield on soil hummocks and solifluction lobes and terraces. The cushionfield is variously dominated

Celmisia sessiliflora, *C. lyallii*, *C. viscosa* and *Dracophyllum muscoides*. Common associated species include *Kelleria villosa*, *K. childii*, *Celmisia laricifolia*, *Chionohebe thomsonii*, *Hebe hectorii*, *H. lycopodioides*, *Raoulia hectorii*, *Leptinella goyenii*, *Phyllachne colensoi*, and *Gentianella bellidifolia*. Locally uncommon species include *Leptinella albida*, *Carex pterocarpa* and *Poa pygmaea*.

Gravelly ablation surfaces at exposed sites devoid of tussock have a sparse vegetation cover containing a range of mostly prostrate or cushion-forming species. These include *Celmisia sessiliflora*, *Anisotome imbricata*, *Kelleria villosa*, *Leptinella pectinata* subsp. *villosa*, *Abrotanella inconspicua*, *Hebejeebie densifolia*, *Lycopodium fastigiatum*, *Brachyscome sinclairii*, *Dracophyllum muscoides*, *Raoulia grandiflora*, *R. hectorii* and *Viola cunninghamii*.

A small range crest tarn at the head of Scotts Creek (c. 1350 m) is surrounded by cushion bog. Common species include *Phyllachne colensoi*, *Ranunculus gracilipes*, *R. brevis*, *Caltha obtusa*, *Kelleria paludosa*, comb sedge (*Oreobolus pectinatus*), *Plantago lanigera*, *Abrotanella caespitosa*, *Epilobium komarovianum*, *Coprosma atropurpurea*, *Carex gaudichaudiana* and *Euchiton lateralis*. The tarn itself has abundant water milfoil (*Myriophyllum triphyllum*) and the exotic floating sweet grass *Glyceria fluitans*. A nearby damp depression (ephemerally wet) has *Carex kirkii* var. *kirkii*, *Gaultheria depressa* and *Ranunculus foliosus*.

Several fens, dominated by comb sedge, are scattered through the shallowly incised heads of gullies. These are rich in wetland herbs and include *Hydrocotyle montana*, *Epilobium komarovianum*, *Chaerophyllum* "bog", *Euchiton lateralis*, *Lobelia angulata*, *Plantago triandra*, *Kelleria paludosa*, *Nertera baufouriana*, *Caltha obtusa* and *Celmisia* "rhizomatous".

Areas of snow accumulation exist in the narrow and shallow head of Thomsons Creek and snow was present at the time of inspection. A typical snowbank vegetation community occurs with distinctive species including *Gaultheria nubicola*, *Celmisia haastii* var. *haastii*, *Argyrotegium mackayi* and *Ranunculus maculatus*.

Rock tors on the steepening edge of the rolling range crest provide a range of habitats for both rupestral species and those for which the tors provide a refuge from grazing and past fires. Common shrubs include creeping matipo (*Myrsine nummularia*), *Coprosma dumosa*, *C. fowerakeri* and porcupine shrub. Common herbs include false speargrass (*Celmisia lyallii*), *C. angustifolia*, *C. densifolia*, *C. ramulosa*, *Colobanthus buechananii*, *Hectorella caespitosa*, everlasting daisy (*Anaphalioides bellidioides*), *Brachyglottis haastii*, *Acaena anserinifolia*, *Luzula traversii*, *Pachycladon novaezelandiae* and *Geum leiospermum*.

The lower reaches of Neds Creek in the southern corner of the PL have distinctive woody vegetation not encountered elsewhere on the PL. Outcrops on shady slopes have a range of woody species but of particular note are Hall's totara (*Podocarpus cunninghamii*), snow totara (*Podocarpus nivalis*) and inaka (*Dracophyllum longifolium*). Snow totara patches also extend over an area of stony deflated soils on sunny aspects.

2.5.1 Significance of Vegetation

The PL lies within the Dunstan Ecological District. It contains representation of the plants and plant communities in the montane, sub-alpine, and low alpine bioclimatic zones. Parts of two RAPs (A4 Bendigo Tops and A5 Scotts Creek) and one RAP in its entirety (B9 Neds Creek) lie within Matakanui Pastoral Lease. At least 143 native vascular plant species (see Appendix 2) have been recently recorded from the PL.

Threatened and At Risk species

Of the native vascular plant species present eight are listed as 'At Risk' in the most recent threat classification system listing (de Lange et al. 2009). A list of these species with their threat of extinction status and distribution within Matakanui Pastoral Lease is provided below in Table 6.

The New Zealand Threat Classification System provides a tool for assigning a threat status to candidate taxa. Species listed in the super category 'Threatened' are grouped into three categories: 'Nationally Critical', 'Nationally Endangered', and 'Nationally Vulnerable'. Taxa in these three categories are facing a very high risk of extinction in the wild.

The latest revision (Townsend et al. 2008) of the 2002 system includes the addition of the new categories 'Declining', 'Naturally Uncommon', 'Recovering' and 'Relict' within a super category 'At Risk'. Declining taxa do not qualify as 'Threatened' because they are buffered by a large total population size and/or slower decline rate. However, if the declining trends continue, these taxa may be listed as 'Threatened' in the future. The category 'Naturally Uncommon' is adopted to distinguish between biologically scarce and threatened taxa. 'Recovering' allows for threatened taxa whose status is improving through management action and 'Relict' is used to encompass taxa that have experienced very large historic range reductions and now exist as remnant populations that are not considered unduly threatened. Where information is so lacking that an assessment is not possible, the taxon is assigned to the 'Data Deficient' category. Collection of sufficient demographic data to allow evaluation is a high priority as such data may confirm whether these taxa are 'Threatened' or 'At Risk'.

Table 6: At Risk plant species found on Matakanui Pastoral Lease

Super Category	Threat Category	Species	Location on property
At Risk	Declining	<i>Carmichaelia crassicaulis</i> subsp. <i>crassicaulis</i>	Amongst shrublands in Thomsons Creek
		<i>Ranunculus brevis</i>	Bog around range crest tarn
	Naturally Uncommon	<i>Carex pterocarpa</i>	Cushionfield at western end of range crest
		<i>Festuca matthewsii</i> subsp. <i>pisamontis</i>	Range crest throughout
		<i>Leptinella albida</i>	Cushionfield at western end of range crest
		<i>Poa pygmaea</i>	Cushionfield at western end of range crest
		<i>Ranunculus maculatus</i>	Seeps on southeastern slopes
		<i>Urtica aspera</i>	Under shrubland in Thomsons Creek

In addition, one species that is uncommon in Otago (Regionally Significant) was found: see Table 7.

Table 7: Regionally significant plants found on Matakanui Pastoral Lease

Status	Species	Location on property
Regionally significant	<i>Podocarpus nivalis</i>	Neds Creek

Rare Ecosystems

Terrestrial ecosystems that were rare before human colonisation of New Zealand often have highly specialised and diverse flora and fauna characterised by endemic and nationally rare species. Rare ecosystems are defined as those having a total extent less than 0.5% (i.e. < 134 000 ha) of New Zealand's total area (268 680 km²). A framework has been developed (Williams et al. 2007) based on descriptors of physical environments that distinguish rare ecosystems from each other and from more common ecosystems. Using this framework 72 rare ecosystems have been defined using pertinent environmental descriptors selected from soil age, parent material, soil chemistry and particle size, landform, drainage regime, disturbance, and climate.

On Matakanui Pastoral Lease four rare ecosystems were identified (seepages and flushes; ephemeral wetlands; snowbanks; cushion bogs), all in the wetland category.

2.5.2 Problem Plants

At least 36 exotic species of plants are present on the PL but relatively few are of conservation concern. Introduced plants that may have an important 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 conifers, broom and gorse

Gorse and broom were not observed on the PL but may be present at very low density and only one wilding tree was seen. If present they would pose an ongoing threat of suppression to areas of low-stature vegetation on the PL. Regular checks for new infestations and the removal of any found, will be required to protect conservation values on the property.

Oval sedge (*Carex ovalis*) and floating sweetgrass (*Glyceria fluitans*)

Oval sedge and floating sweetgrass are present in some wetlands. They pose a threat to wetland values through their ability to compete with and suppress native wetland plants. Their control at priority sites will be required to maintain wetland values at those sites.

2.6 FAUNA

2.6.1 INVERTEBRATE FAUNA

Survey Method

There are limitations on invertebrate sampling in this type of survey, due to very restricted time-frames and at a single sample time of year. Many insect species have a very short and specific season of activity, and while these tend to be concentrated in late spring to mid

summer, for some species they can be at completely different times of year, including winter. Weather conditions during the survey were a mixture of cloudy and sunny days, but strong cold winds on the first day limited invertebrate activity. Therefore a survey of this nature will seldom reveal more than a few percent of the total invertebrate diversity of a property.

Invertebrate values were assessed primarily on the basis of habitats present. Time on the ground was spent assessing habitats and searching for species, including beating, sweep-netting and rolling rocks. A UV light-trap was set out one night amongst large tors near the head of Coal Creek. This captured only two noctuid moths, suggesting that the wind continued to be a factor during the night at this site.

Areas/habitats on the property

1. Broad, gently sloping ridge tops, predominantly covered in soil hummocks with a low, dense, alpine cushion-herbfield vegetation of native species. This area also includes a mosaic of occasional stony barrens; small, peaty wetlands where water comes to the surface in the heads of many of the creeks rising on the ridge, including a small tarn in the head of Scotts Creek; tors and rock outcrops with tussocks and occasional woody species; and small tussocklands or areas with tussock on better-drained steeper slopes, and around rock outcrops.
2. Modified to very modified grasslands with tussock and a variety of adventive species, on sloping ground below the ridge tops and in the floor of Thomsons Creek valley.
3. Scattered shrublands on valley sides at lower altitudes in the property, holding variable numbers of woody species, including *Olearia odorata* and *O. bullata*.

Species

Invertebrate species recorded from the property are listed in Appendix 1.

In the ridgetop habitat, invertebrate activity was high whenever the wind abated. Species included large numbers of a few species of diurnal moths, true flies (Diptera) from a range of families, and an assemblage of small bugs (Hemiptera) and beetles. The wetlands added extra diversity to this mix, especially to the numbers of fly species. Some of the diurnal moths in the wetlands also occurred through the soil hummocks along the ridges. Aquatic species were visible in the small tarn, including at least two species of water beetles.

The species present at altitude included a mix of Central Otago endemics, lower South Island endemics and more widespread alpine species.

Species present in the grasslands were generally more predictable, with a range of nocturnal crambids and other moth species present. The single fresh speargrass flowerhead seen on the property, near the boundary in upper Coal Creek, yielded a range of fly species and small weevils.

Upper Coal Creek hosted healthy populations of flatworms and amphipods, along with an assortment of aquatic insect species. The presence of healthy amphipod populations appears to be a feature of Otago alpine/subalpine streams.

There was little opportunity to inspect the shrublands in detail. The presence of small-leaved *Olearia* species means that a range of associated species, including some rare species, are likely to be present.

Invertebrate habitats

The property has a mix of moderately to heavily modified communities on the hillslopes and in the lower valleys and subalpine communities that appear to be largely intact on the peneplain surface at altitude. The latter represents a classic dry Otago periglacial landform and associated habitats. It may have the largest continuous extent of soil hummocks in Central Otago.

A rich diurnal invertebrate fauna was apparent across the turf-covered peri-glacial landscape on the broad ridges and spurs on the property when conditions were mild and sunny. Complexity of this fauna is increased by the mosaic effect of scattered small wetlands in the heads of streams and the streams themselves, the rocky outcrops and tors, the small tarn and scattered tussockland. This habitat holds a fully functional, overwhelmingly indigenous invertebrate community as indicated by a range of species at many trophic levels. The species present are characteristic of Central Otago uplands and include both local and regional endemics. The upland part of the property is considered to have high invertebrate conservation value on the basis of the quality and mosaic nature of its habitats

2.6.2 Significance of Invertebrate Fauna

All higher-altitude parts of the property had species and their associated habitats at the extremities of their range. *Megadromus* sp. is at its furthest known south-eastern extent and this also appears to be a range edge for *Prodontria capito*.

2.6.3 Herpetofauna:

Survey results:

The most common lizard species present was McCanns skinks (*Oligosoma maccanni*) which were present to at least 1400m. They appeared most frequently in the lower reaches of Thomsons Creek where tailings piles offer them abundant refuge sites. They were also common around the middle gully east of Thomsons Creek. This gully has a dense cover of *Chionochloa rigida* in the gully floor, but decreasing native cover up the slopes.

One common skink (*Oligosoma nigriplantare* subsp *polychroma* (Patterson and Daugherty, 1990)) was sighted near Thomsons Creek below the airstrip east of Mt Moka.

Geckos were common around rock tors in the headwaters of Coal Creek. They were also found on outcrops and under piles of broken rock at both of the sites noted for McCanns skinks above. These had a wide range of sizes but adults were measured at 60 mm SVL (male) and two at 73 and 75 mm SVL (male and female). Larger specimens were also observed, and a juvenile measured had an SVL of 65 mm. The sizes and appearance (particularly the eye colour (Jewell, 2008) of the geckos found suggests that two species are present; *Woodworthia* sp. 'Cromwell Gorge' and *Woodworthia* sp. 'Otago/Southland'.

2.6.4 Significance of Herpetofauna

The gecko, *Woodworthia* 'Otago/Southland' is classified as 'At Risk – Declining' by Hitchmough et al. (2010).

The major threats to the lizard species noted are likely to come from habitat loss (farming practices or other land use leading to clearance of tussock and other indigenous vegetation) and pressure from introduced predators (which increases with increasing rabbit populations, in turn typically driven by farming practices).

2.6.5 Avifauna:

Table 8: Birds noted on inspection. Exotic species are denoted by an asterisk.

Common Name	Species	Threat Status
Thrush	<i>Turdus philomelos</i> *	
Australasian harrier	<i>Circus approximans</i>	
Blackbird	<i>Turdus merula</i> *	
Southern black backed gull	<i>Larus dominicanus dominicanus</i>	
Grey warbler	<i>Gerygone igata</i>	
New Zealand pied oystercatcher	<i>Haematopus finschi</i>	Declining
Yellowhammer	<i>Emberiza citrinella</i> *	
New Zealand pipit	<i>Anthus novaeseelandiae</i>	Declining
Redpoll	<i>Carduelis flammea</i> *	
Banded dotterel	<i>Charadrius bicinctus bicinctus</i>	Nationally Vulnerable

2.6.6 Significance of Avifauna

Only one of these species, the banded dotterel is classified as being "Threatened - Nationally Vulnerable" (Miskelly, 2009). The pied oystercatcher and pipit are classified as "At Risk - Declining".

2.6.7 Aquatic Fauna:

Historical fish records from the New Zealand Freshwater fish database (NZFFD) within the Matakanui Pastoral Lease were sparse. Only a single record (NZFFD number 10620) of brown trout had been observed in the main stem of Thomsons Creek. The lower section of Thomsons Creek which occupies the Manuherikia Valley has a variety of native fish species present. The NZFFD has records for longfin eel (*Anguilla dieffenbachii*), upland bully (*Gobiomorphus breviceps*) and Central Otago roundhead galaxias (*Galaxias anomalus*). In the northwest, the neighbouring catchment of Shepherds Creek has a total absence of fish species.

Methods

Thomsons Creek is the combination of five tributaries. Survey work was undertaken at the top and bottom of the two largest creeks and the lower sections of the three smallest creeks. Additional survey sites were undertaken in the main stem at the confluence with each of the tributaries. Each site was surveyed, pursuant to the guidelines specified in "Non-migratory

galaxiid survey methods" (Department of Conservation 2007), using backpack electro-fishing methods. A total of 50 m² was fished at all sites to sample a variety of instream habitat types targeting riffle/run and pool habitats. Where possible the up-stream limits of fish species were determined by fishing either side of potential barriers. All fish species were identified in the field using morphological characters derived from "*The Reed Field Guide to New Zealand Freshwater Fishes*" (McDowall 2000) and measured to the nearest millimetre, then released. The presence of benthic invertebrate taxa was identified to a genus and where distinguishable in the field, to a species level using "*Guide to the Aquatic Insects of New Zealand*" (Winterbourn et al. 2006). Macroinvertebrate Community Index scores (Table 1) were used to assess water quality based on Winterbourn et al. (2006).

Results

Brown trout were common throughout the main stem of Thomsons Creek and the lower sections of all the unnamed tributaries and Violets Creek ($n = 34$, size range 20 – 230 mm, mean 103.5 ± 8.7 S.E.). Thomsons Creek occupies a flat valley that has been filled with flood depositions of cobbles and boulders and contains remnants of historical gold mining activities. The riparian vegetation is predominantly rough pasture, hard tussock (*Festuca novae-zelandiae*) with patches of matagouri (*Discaria toumatou*) and occasional willows (*Salix fragilis*) in the riparian area. The relative density of stream invertebrates was moderate to low in the main stem of Thomsons Creek. The most numerous taxa observed were mayfly species (*Coloburiscus humeralis*, *Deleatidium* spp. and *Nesameletus* spp.). Less frequently encountered taxa were caddisfly (*Aoteapsyche* spp.), stonefly (*Zelandoperla* spp.) and dobsonfly (*Archichauliodes diversus*). A waterfall barrier of about 2 metres was situated in the unnamed creek draining the area beneath Mt Moka. No fish species were observed in the upper reaches of the creek above the barrier.

Fish species were absent from the upper reaches of the two main catchments of Thomsons Creek. Both creeks were characterised by fast flowing sequences of rapids, riffles and occasional pools. The majority of instream substrate was boulder and cobble with occasional deposits of mobile course gravels. The riparian areas of the two catchments consisted of turf herb field at higher altitude 1300 – 1400 m and snow tussock (*Chionochloa rigida* and *C. macra*) at 1200 – 1300 m. Both streams had a number of mayfly species (*Nesameletus* spp. and *Deleatidium* spp.) and stonefly, (*Stenoperla prasina* and *Zelandoperla* spp.). No fish species were observed in Scotts Creek a tiny headwater tributary of Chatto Creek. The creek was a shallow, gravelly and overgrown with snow tussocks. Several stream invertebrate taxa (*Deleatidium* spp. and amphipods) were present here.

Discussion

The upper catchment of Thomsons Creek and unnamed tributaries of Chatto Creek contained no native freshwater fish species. There is a notable absence of galaxias species within the vicinity of Thomsons Creek in the neighbouring catchments of Lauder, Dry and Shepherds Creeks. Central Otago roundhead galaxias appear to be recent colonisers into the Manuherikia River system from the Ida Basin (Bennett et al. 2006) and only occupy lower altitudinal areas (NZFFD data). It would appear that no opportunities to colonise Thomsons Creek by either Clutha flathead galaxias (*Galaxias species 'd'*) from the Lindis River or Central Otago roundhead galaxias from the Manuherikia River have occurred. Further survey work is required in the northern catchment of Beggs Creek to assist with this issue.

2.6.8 Significance of Aquatic Fauna

No freshwater fish of significance were found on the PL.

2.6.9 Problem Animals

The PL has some signs of wild pigs which travel through this area from time to time. Deer may sometimes frequent the PL in very low numbers. Hares are present.

2.7 ECOSYSTEM SERVICES AND ECOLOGICAL SUSTAINABILITY

2.7.1 Ecosystem Services

The PL contributes a number of “ecosystem services” which are significant to Otago from social, infrastructural and economic perspectives. Constanza et al. (1997) define ecosystem services as flows of materials, energy, and information from natural capital stocks which combine with manufactured and human capital services to produce human welfare.” They identify 17 “services”. Matakanui PL clearly contributes to at least six of these services excluding those of a recreation and cultural nature which are described elsewhere.

(i) Climate Regulation:

Carbon storage in expanding shrublands, forest, tall tussock grasslands and consequential increased soil organic matter makes a modest contribution to ameliorating the current anthropogenic induced rise in atmospheric carbon dioxide levels. Much of the existing tussockland and shrubland has potential for further carbon sequestration. The full potential of lower altitude tussocklands to increase in density and stature and ultimately to succeed to indigenous woody cover, is currently retarded by stock grazing. The succession of montane shrublands to forest is also limited by stock grazing and very limited seed sources.

(ii) Water Supply and Water Regulation

The Manuherikia River is one of the driest catchments nationally (Otago Regional Council 2011) and the primary surface water supply allocation is considered over-allocated (Otago Regional Council 2006a, 2006b).

Matakanui PL makes up 35% of the Thomsons Creek catchment and 30% of the Chatto Creek catchment. Therefore any activities which increase in water yield within the PL would be significant for these catchments and the quality and quantity of water for the users lower down the catchment.

Water quality

In September 2004, Otago Regional Council began a surface water quality monitoring programme in tributaries of the Manuherikia including Chatto Creek and Thomsons Creek.

Flood irrigation is the main irrigation method used in the catchments monitored. This study clearly shows that water quality in all the tributaries monitored were degraded due to flood irrigation practices during the summer period. In the Manuherikia catchment, water quality in Thomsons Creek showed the worst deterioration.

As well as a deterioration in water quality, abstractions for irrigation may use all of the available flow. Thomsons Creek lost natural upstream flow to irrigation practice. The lower Thomsons Creek has been identified with several serious contamination issues including *Escherichia coli* and high nitrate levels from farming practices (Otago Regional Council 2011). Any development in the upper catchment may exacerbate detrimental effects downstream. The small unnamed tributaries of Chatto Creek draining the southern slopes of the PL boundary and Thomsons Creek are also a major source of water for stock water and irrigation usage (Otago Regional Council 2011).

The water quality on the PL itself is very good. The fish survey of the property revealed a small selection of pollution intolerant freshwater invertebrate taxa was present throughout the Thomsons Creek catchment. Water quality based on Macroinvertebrate Community Index score ($n = 8$, mean 7.75) for each taxon reflects a healthy stream community.

Hydrological Flows

To enable the best flow regime for the future that will assist with the above downstream water quality issues the following research provides some insights:

Waugh (2005) notes that;

- snow-tussock catchments have less variable flows than degraded tussock
- snow-tussock catchments have flows that are steadier on a monthly basis and are less variable in the summer- autumn period.
- To maximise water yield it is necessary to maintain tall, unmodified tussock vegetation over the headwater catchments. This is best achieved by completely destocking these areas, preventing fires of any kind and controlling wilding pine tree growth.

Mark and Rowley (1969) demonstrated that undisturbed snow tussocks produced a greater water yield than either a sward of blue tussock or snow tussocks which have been recently defoliated by clipping or burning. Retirement of grazed areas with the view to allowing natural regeneration of snow tussock grasslands provides the potential for increased water yield.

Fahey and Jackson (1991a) note “Evaporation from tussock grasslands has important implications for water-resource management. The strong physiological control of transpiration by tall tussock produces low rates of water use in summer and contributes to the well sustained stream flow”.

Fahey and Jackson [1991b] in the Landcare reports to DCC provide some indication of the influence of depleted tussock cover on summer water yield. They estimate that restoration of the tussock cover to nil depletion and vigorous growth in these areas [water producing headwaters] could lead to... “Yield would increase by 52% and 48% at the Deep Creek and Deep Stream water intakes for the three summer months in the driest year”.

Figure 1 Thomsons Creek ORC sampling points and takes. The arrow indicates the confluence of Thomsons Creek and a tributary dominated by flood irrigation practices

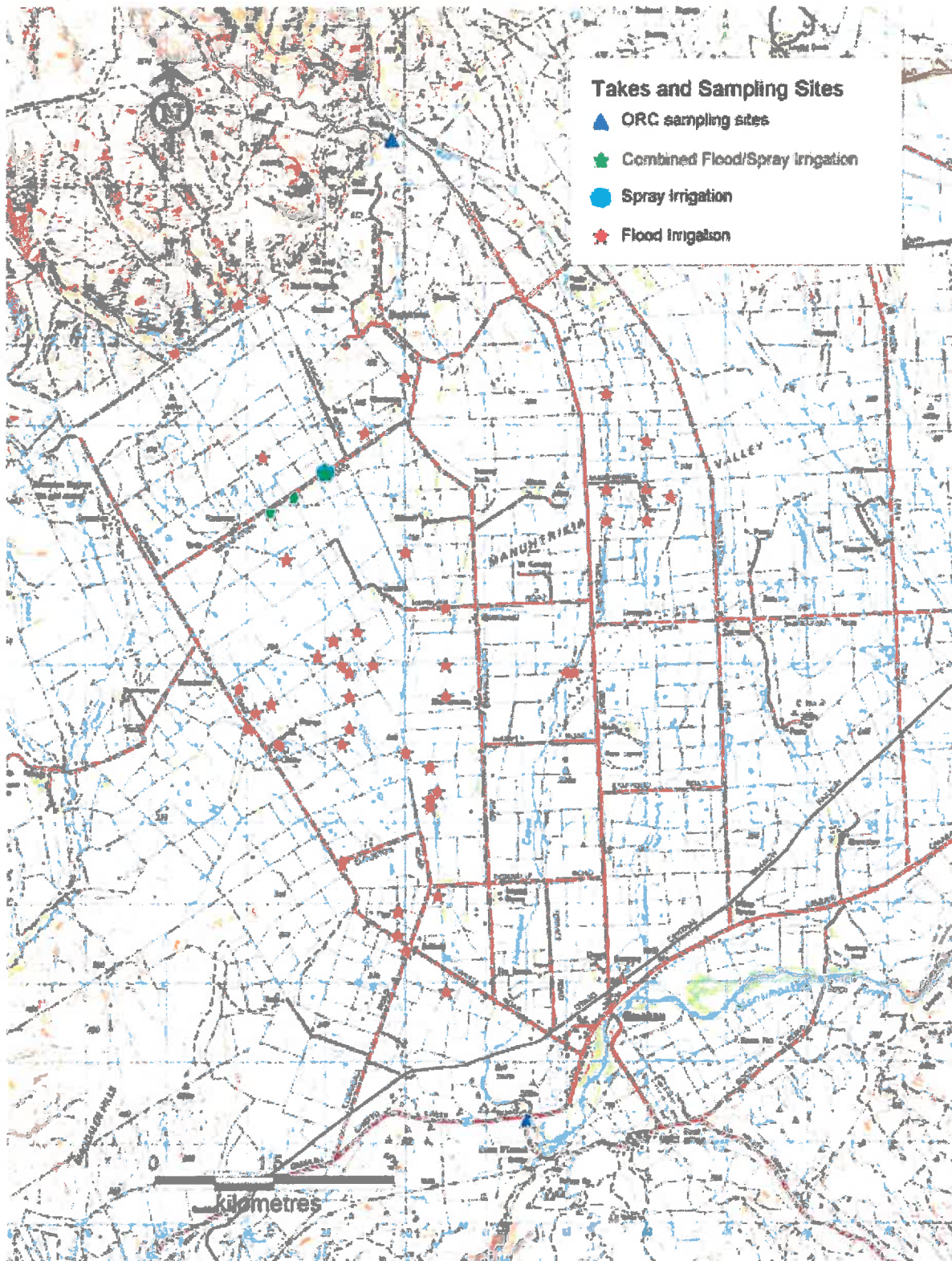
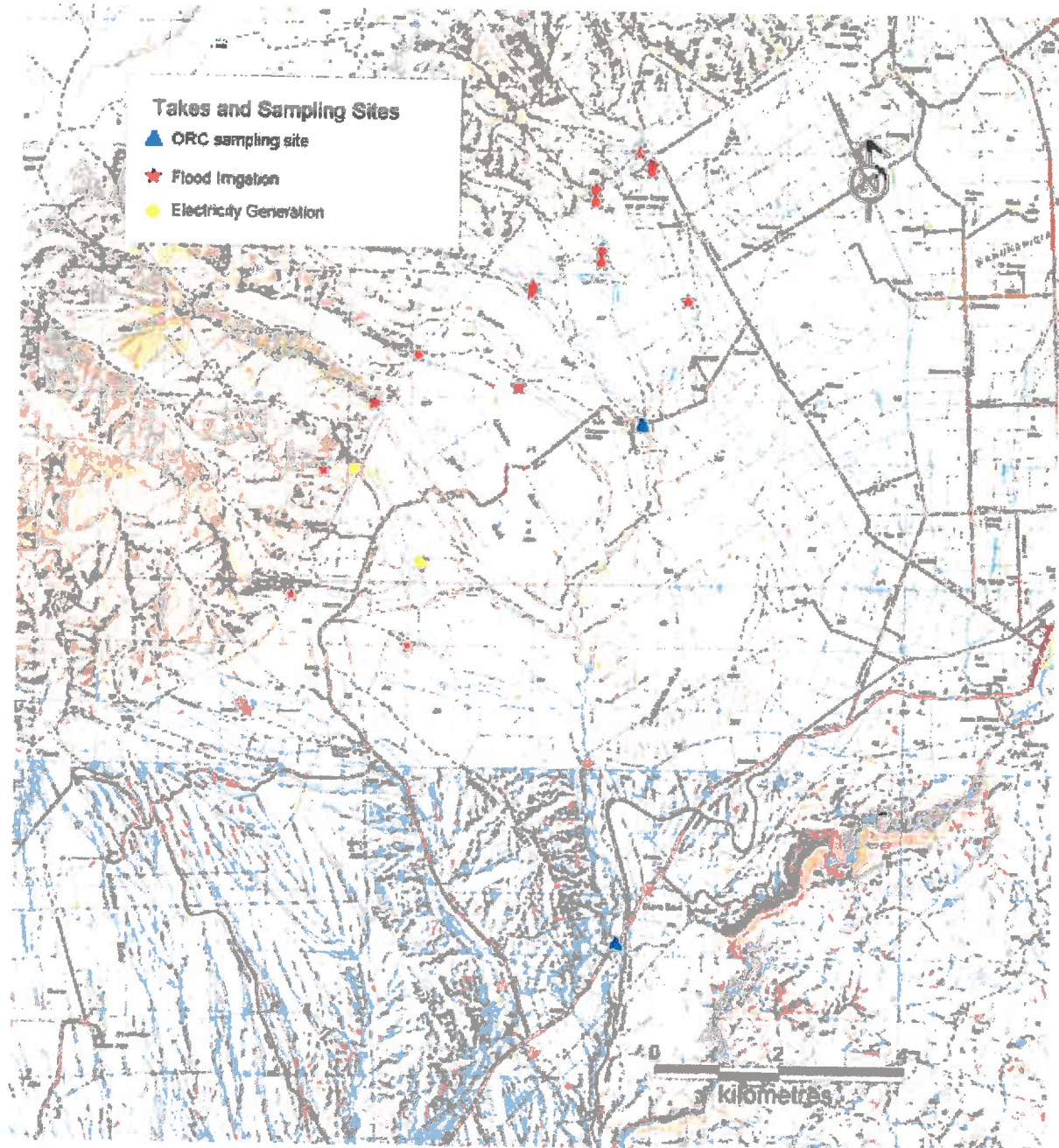


Figure 2 Chatto Creek. Water takes shown by red stars, ORC sampling sites shown by blue triangles.



(iii) Erosion control and sediment retention

Run plan number 140 (Otago Catchment Board 1973) identified that erosion on the PL was a problem. *“On the mountain top, the soils are very friable and in any areas where the vegetative cover has been depleted the extent of the wind erosion is severe. This problem is further accentuated by the action of frost lifting soil and breaking soil structure”.*

All the class VIIe and class VIII land was identified as suitable for watershed protection. Proposals to address the problems included the 5 year temporary retirement of the more depleted and eroded land on the Ten Mile block. Also identified was the possible future treatment of the Top Block in the same manner.

(iv) Food Production

The water yield from Matakanui contributes to the irrigation water for both Thomsons and Chatto Creeks. This water is used for the production of crops and livestock.

(v) Raw Materials

With its dry climate and low water availability, the Thomsons and Chatto Creek catchments are dominated by sheep and beef farming, with deer and crop farming also prominent.

2.7.2 Land Use Capability and Sustainability

The Land Use Capability (LUC) system is a nationally consistent land classification system based on physical sustainability that has been used in New Zealand to help achieve sustainable land development and management since 1952. The LUC system has two key components. Firstly, Land Resource Inventory (LRI) is compiled as an assessment of physical factors considered to be critical for long-term land use and management. Secondly, the inventory is used for LUC classification, whereby land is categorised into eight classes according to its long-term capability to sustain one or more productive uses (Lynn et al. 2009).

Analysis of LUC for Matakanui PL reveals that the land at highest altitude (above c. 1300 - 1400 m asl) fall into class VIII. Class VIII land has severe to extreme physical limitations or hazards which make it unsuitable for arable, pastoral, or commercial forestry use. Erosion control, water management and conservation of flora and fauna are the main uses of this land (Lynn et al. 2009). Land below this, down to approximately 1000 m asl is class VII. This land has severe physical limitations and consequently it is high risk land requiring active management to achieve sustainable production (Lynn et al. 2009). This class has a subclass 'e' which indicates that erodibility is the main kind of physical limitation or hazard to use that has been identified. The remainder of the PL is classified as class VI indicating low suitability for pastoral grazing or production forestry but with less severe limitations than class VII. This class also has a subclass 'e' indicating erosion limitations

2.7.3 Significance of Ecosystem Services and Sustainability

Given its relatively small size, the PL makes only a modest contribution to ecosystem services such as water yield in the Thomsons and Chatto Creek catchments and has an equally modest potential for carbon storage. However with the PL covering 30 to 35% of the land area of these catchments it is not insignificant. This property is one of many on the Dunstan Range and when combined with potential gains on the range as a whole, benefits could be significant.

Potential for increased water yield and in particular a reduction in the number of annual low flow days and improvement in water quality are possible with the destocking the PL and allowing for tall tussock to improve in quality.

This may also support the Regional Water Plan's aim to: '*Maintain the natural character and aquatic ecosystem*' (Otago Regional Council 2004).

Being mainly class VII and VIII land the PL has long been identified as being most suitable for (what was called in 1973) watershed protection. It has low suitability for ongoing pastoral use as it is not considered its highest and best use.

2.8 HISTORIC

Introduction

An historic desktop assessment was undertaken in June 2011 to review significant historic resources located on Matakanui Pastoral Lease, Run 238N. This report details the significance of the key historic sites.

Historic Records and Previous Archaeological Surveys

No previous historic surveys have been undertaken on the Matakanui Pastoral Lease and there are no recorded sites listed with NZAA (ArchSite).

Pre-contact Maori Sites

There are no recorded sites of Maori origin on the PL although Thomsons Creek was used as a Maori route over the Dunstan Mountains between Manuherikia and Upper Clutha basins (Angus 1977: 17, Roxburgh 1957: 17). Mata-ka-nui is the Maori name for the Dunstan Range meaning 'big burn on the face' (Roberts 1910: 8).

Pastoral Farming

The main water shed of the PL, Thomsons Creek, lies between two well known gold mining catchments, the Rise and Shine Valley of Bendigo to the west and the Manuherikia catchment of Matakanui, Tinkers, and Drybread to the east. The track through Thomsons Saddle allowed access to the Upper Clutha through to Lakes Wanaka and Hawea. James McKerrow and his assistants John Goldie and James Bryce crossed the saddle in 1862 on their return to Dunedin from Wanaka. Alfred Duncan used Thomsons Pass to drive the first mob of sheep to William Ree's newly acquired run in Queenstown (Roxburgh 1957: 38, 57).

Thomsons Saddle was used primarily as a stock route and a regular stopping place with holding paddocks for stock. Stock and horses were driven to the railway at Omakau. When the Otago Central Railway Line reached Ida Valley in the 1890's the route became more important and the Upper Clutha Farmers' Club sought to have a road built over it. Despite a survey and report by the Vincent County engineer, little was done (Angus 1977: 79, Roxburgh 1957: 136, 197 - 198).

Run 223 (totalled 80,000 acres and granted on short term licence in those days), which included the now Run 234N, was first granted to Richard Anthony Filleul on the 5th of September 1858 but within a month was transferred to Frederick Chamberlin. George Thomson acquired the run in 1861 and was the first long term holder of Matakanui Station along with his partner Webster. It was George Thomson who named Thomsons Creek, Thomsons Gorge, and Thomsons Saddle (Otago Goldfields Heritage Trust pamphlet 2007). James and Henry Glassford bought the Run in 1864 and also ran the Lauder Run.

James P. Davidson was manager of Matakanui until 1879 followed by John Stronach. Stronach represented Lindis Riding on the Vincent County for two terms, was a member of the Otago Club, and responsible for considerable agricultural development at Tarras using a sharecropping system that allowed many small farmers to become established.

The run was transferred to William Laidlaw and David Crawford in 1884 following the death of James Glassford. Laidlaw stood as Councillor for Matakanui Riding from 1899 to 1911.

Andrew Cowie Scoular took over Matakanui Station around 1914, stood as Councillor for Matakanui Riding for 25 years, and Chairman of Vincent County Council 1941 – 1944. Scoular was well thought of by other councillors and well known as a pastoralist and president of the Vincent Jockey Club. A.C. Scoular died in 1945 and his son, W.B. Scoular, took over Matakanui Station. W.B. Scoular became Councillor for Matakanui Riding, sat as Chairman of the Council in 1955, and he and his wife played a big part in the district and Otago affairs. In 1958 the Scoular Trust sold to James Scott Paterson (Angus 1977: 107 - 108, 119, 136 – 138, Pinney 1981: 132).

Gold mining

Thomsons Creek is primarily a water shed supplying water to various gold mining fields either side of the Dunstan Mountains. Upper Thomsons Creek was diverted west to the Rise and Shine Creek to supply water to the Rise and Shine Company and alluvial miners working in that catchment.

Survey Method

In order to provide value judgments on the historic heritage within the PL more data on the archaeological evidence remaining in the landscape was required. Historic records provided some information on the identification of areas of interest. One day was taken to conduct a survey of known historic resources on the PL. GPS coordinates taken to locate archaeological/historic features are depicted as red dots on map section 4.2: Map 3. A list of waypoint coordinates will be held in the Otago Conservancy’s historic database. Historic photos are shown in section 4.4.

Historic Heritage Description

The location of key significant sites within the bounds of Matakanui Pastoral Lease is provided in Table 9. The archaeological/historic sites include four hut or tent sites (one standing in good condition), 19th century fence lines, alluvial gold mining tailings (including herringbone pattern), water races, and a possible umu.

Table 9. Key historic resources on Matakanui PL;

GPS ID	Historic feature	New NZAA site record	Update to site record
056	Strainer and fence line	G41/638	
057	Rise and Shine upper water race		G41/584
069	Rise and Shine lower water race diversion		G41/584
074	Flat standard fence line	G41/638	
079	Hut and small pit	G41/631	
080	Stacked stone wall	G41/631	
081	Tailings and water race	G41/636	
084	Herringbone tailings	G41/636	

092	Hut site	G41/633	
093	Stacked feature unknown function	G41/633	
096	Large pit possible umu	G41/632	
097	Hut site	G41/634	
102	Hut site	G41/635	
104	Fence strainer and holding paddock	G41/638	
106	Rise and Shine upper water race diversion		G41/584
107	Trig R	G41/637	

Pre-contact Maori Sites

No confirmed sites of Maori origin were noted on the PL. A feature of possible Maori origin is a large oval shaped raised rim pit (G41/632) recorded on the terrace on the true right of Thomsons Creek (GPS 096).

Pastoral Farming

A standing hut (G41/631) and modern stock yards are located on the north-east boundary of the PL (GPS 079), true left Thomsons Creek. The hut was built in 1908 by the Vincent County Council to provide shelter for sheep drovers and travelers using Thomsons Gorge Road to access between Matakanui and Bendigo (shown on SO 1158 dated 1909: QuickMap, Otago Goldfields Heritage Trust pamphlet 2007). The hut is included in the Central Otago District Council Schedule of Heritage Buildings, Places, Sites & Objects and Notable Trees.

The hut measures 3.5 m x 3.1 m internally standing 1.63 m to the bottom of the top plate (externally). The hut is constructed from mud packed river boulders with some later cement render applied. The corrugated roofing iron appears to be original. The one window is four paned but no longer retains any glass.

A section of Thomsons Gorge Road runs through the north-eastern corner of the PL west of Nicolsons Creek from the current stock yards over Thomsons Saddle. The road alignment was mapped by W.T. Neill in December 1909 (SO 1158: QuickMap) along a slightly different alignment east of Nicolsons Creek.

The creek terrace on the true left bank south of the stock yards has been shored up with stacked rock (GPS 080). It is not known if the wall was constructed for gold mining purposes or to lessen erosion of the terrace where the earlier stock yards were located. A small stone lined raised rim pit, 1 m diameter, is 12 m south-west of the hut. This feature may represent a toilet that would be expected close by the shepherds hut (G41/631).

Stock yards and fences

Stock yards are noted by the hut in Thomsons Creek on SO 1158 (dated December 1909). The current stock yards were built by Matakanui Station in the 1980's (Otago Goldfields Heritage Trust pamphlet 2007).

Fabric of 19th century fence lines is present on the PL (G41/638). The north-west boundary fence line along the Dunstan Mountains crosses the upper Rise and Shine water race ca. GPS 056 and crosses the lower Rise and Shine water race at GPS 074. 19th century metal flat standards and two early strainers are incorporated in the boundary fence line at GPS 056 and alongside the current boundary fence on Thomsons Saddle at GPS 104. SO 1204 (dated 1909:

QuickMap) notes the fence as a post, metal standard and five wire fence. Maintenance alterations include some new standards with an extra top wire and netting in part.

Holding yards (G41/638) are located on Thomsons Saddle (GPS 104). The yards comprise flat metal standards, ca. 25 m length recorded at right angles to the road, demarcating part of a holding pen or tailings fence to direct stock. It is not known if the holding paddock on Thomsons Saddle pre-dates the hut and early stock yards.

Gold mining

J. Coates, Mining Surveyor, provides the first record of gold mining undertaken at Thomsons Diggings in 1863 (AtoJs Online 1865). The Otago Witness (Papers Past: August 1863A) reported 200 miners working at Thomsons and mining parties working in various gullies. The gold is noted as rather fine. A new rush was reported at Thomsons October 1863 (Papers Past: August 1863B). The reference to Thomsons could well be the area east of the PL presumably Tinkers, Matakanui and Drybread. Matakanui was known to the miners as Tinkers Gully (Beattie 1948: 116).

Rise and Shine Syndicate water races (NZAA G41/584)

Carpenter (2012) provides relevant information regarding water races on the PL feeding gold workings over Thomsons Saddle to the Rise and Shine watershed of the Bendigo Creek catchment. A party of alluvial miners working in the Rise and Shine Creek cut in a water race from the head of Thomsons Creek, known as Tipperary Creek (GPS 106) in mid 1864. Unfortunately the race was cut too high in altitude above the winter snow levels and water froze solid. The party abandoned the race and shifted the alignment three miles lower down Thomsons Creek (diversion at GPS 069). The higher Rise and Shine water race may never have held running water.

The lower water race, 1.2 m wide and 0.35 m deep, was used to supply water to the Rise and Shine claim and others working in the Rise and Shine Creek. Stacked revetment at GPS 069 marks the water diversion from Thomsons Creek. Sections of stacked revetment lie on the lower side of the race. A rock outcrop has been cut through to allow the race to pass around the topography on the correct alignment. The lower water race has been damaged by erosion below the diversion point in Thomsons Creek and by gravel removal beside Mt Moka Road where it crosses the race.

The Rise and Shine Syndicate were very well financed and able to hire a large work force to extend their water race in 1867 bringing twelve heads of water from Thomsons Creek and securing full rights to the only water in the area. This bought relief to the alluvial miners who suffered from a lack of water. The eleven mile long race took nearly a year to complete. The Rise and Shine claim paid almost immediately working two parts of their claim with sluicing guns. This was one of the largest sluicing claims in the Upper Clutha region and the longest gold sluicing enterprise in Otago goldfields history worked by the same men and their families for close on 30 years. John Ewing bought shares in the Rise and Shine Syndicate's water right from Thomsons Creek in 1888 so he could split the flow to work his claim at Tinkers. Ewing's race is located outside the PL (Carpenter 2012: 3, Parcell 1976: 127).

Numerous prospecting licences have been granted in more recent times over an area extending either side of Thomsons Saddle from the Rise and Shine catchment encompassing Thomsons Creek, but none are still current.

Thomsons Creek alluvial mining (NZAA G41/636)

Gold mining tailings are noted extending from below the stock yards beside Thomsons Gorge Road (at GPS 081) upstream in Thomsons Creek. At the eastern extent of the PL a water race, 1.4 x 0.4 m deep, skirts above the hummocky gold tailings at GPS 081. The race appears to have been destroyed in part by later mining activity as work continued upstream. A small set of herringbone tailings in a feather pattern reside within the gold sluicing field at GPS 084 (true right bank. The workings are fed by barely visible header races.

Thomsons Creek appears to have been diverted to work the bed for gold. It is not confirmed who undertook the alluvial mining activity in this part of Thomsons Creek.

Chinese miners

Parcell (1976: 150) notes an influx of 200 Chinese miners into Thomsons Gorge October 1871. James Ng (1993a: 43, 63, 126, 268) notes Lok Luk Jay working in Thomsons Creek along with six others (unnamed). Archives New Zealand holds two licenses for extended claims in Thomsons Creek, a two acre claim granted 11 May 1875 to Ah Sin and Ah Chun ca. 7 miles from Tinkers, and a three acre claim granted 17 September 1877 to Ah Sing, Ah Su, and Ah Hong. A license for a head race from Thomsons Creek was granted 2 October 1877 to Ah Sing, Ah Hung and Ah Chew carrying 3 heads. It is not confirmed whether these mining claims or head race correspond to features identified during the PL survey. Alexander Don noted nine Chinese miners working in Thomsons Gorge in 1891 including James Shum, Tse Lin Foo, Kong Tong, Kong Maan Chiu, and Laam Hau (Ng 1993a: 263, 342 and 1993b: 342).

James Shum (adult name Shum Yen Hoi) was a personal friend to Reverend Alexander Don and was the only Chinese person Don stayed with outside of his tours. Don first met Shum at Thomsons Gorge on his 1890 - 91 inland Otago tour. Shum was Don's first convert to Christianity (Ng 1993b: 330 - 336).

Hut sites (NZAA G41/633 – G41/635)

Three hut or tent sites are located on the true right of Thomsons Creek. A collapsed stacked schist hut (G41/634) resides on the terrace at GPS 097. The hut measures 4 x 2.6 m internally with the remaining chimney standing 1 m high. The stacked walls are 0.6 m thick. A small fruit tree (possibly apple) grows beside the hut with a section of metal fluming present. A raised earthen wall, ca. 50 m long, runs alongside the terrace edge ca. 30 m east of the hut. This feature may have functioned as a stock enclosure or garden. It is not known if this hut was a musterers hut or was occupied by a gold miner. A small water race skirts the south slope above the hut feeding workings lower down Thomsons Creek (to GPS 102).

A collapsed stacked schist hut (G41/635) with a large standing chimney, 1.2 m high, is built into the slope at GPS 102. The hut measures 6.5 x 2.7 m internally with walls up to 0.6m thick. The chimney measures 2.37 m externally and extends out from the hut wall 1.3 m. Two lengths of wire with remnant wood fragments tie down the large chimney lintel. Part of a broken rice bowl with an unidentified blue makers mark lies in the north wall of the chimney. A second base fragment of the rice bowl was found above the hut along with a partial neck of a broken aqua salad oil bottle. Gold mining tailings are noted in this gully worked by water supplied from a race diverting from Thomsons Creek.

A hut or tent site (G41/633) is cited in a tributary of Thomsons Creek (GPS 092). The hut is built up against a large boulder and cut into the bank which provides one of the side walls. The hut measures 3.7 x 2.3 m internally with a small stacked stone chimney standing 1 m high in the east wall. The northern wall is 0.6 m wide consisting of both side stacked and flat stacked rock. A wire tie sticks out of the chimney. A small stacked feature, 1 m wide and 0.6 m high, of unknown function lies 4 m south-east of the tent site on the steep slope of the gully. A

second stacked feature, 2.5 m square, of unknown function is built into a steep slope ca. 50 m west of the hut at GPS 093. Further details of features are shown on the relevant new NZAA site records (ArchSite).

Trig Stations

Two 19th century Trig stations were noted on the PL in the desktop assessment (Briden 2011) although only one, Trig R, was recorded during the survey. Trig R (B1BV) is located at GPS 107 in the upper reaches of Thomsons Creek noted on Survey Office Plan 1983 (dated April 1883: QuickMap). The trig contains a central metal flat standard wrapped with fine wire set in a circular lockspit (NZAA G41/637).

The second Trig, 13411 (A4X0) formerly Trig G (A4WV) established by F. Howden 1866 (SO 1982 not dated: QuickMap), was not searched for as the LINZ Geodetic database notes the following information, old peg replaced with 2 inch iron tube set in concrete. Buried mark is an iron spike in a circular lockspit.

2.8.1 Significance of Historic

The above review of the history and archaeological sites recorded during the Tenure Review field survey illustrate some of the history of this PL. Of most historic significance is Thomsons Gorge Road and the use of this route as an early Maori trail, the remaining fabric of sites related to early pastoral history of the run, and for use as an early gold mining field.

The archaeological and historic evidence present on the Matakanui station resides within a wider historic landscape rather than existing as individual or isolated sites. The historic pastoral landscape includes elements of regional infrastructure providing an early access route through the interior of Central Otago from Manuherikia to the Clutha. The gold mining field includes hut sites, water races, hard rock tailings (including herringbone pattern), and associated site artefacts. It is not confirmed who undertook the mining activity in this part of Thomsons Creek although there is a high likelihood the workings are related to Chinese miners.

The Rise and Shine Company water races have significance, particularly the lower race used to supply water to their quartz stamper and alluvial sluicing claim in the Rise and Shine catchment. The Rise and Shine Company sluicing claim was one of the largest in the Upper Clutha region and the longest gold sluicing enterprise in Otago goldfields history worked by the same men and their families for close on 30 years.

The 19th century Trig stations are important features related to land parcel subdivision for the early pastoral runs and for delineating gold mining claims. All other pre 1900 sites are protected by way of the NZ Historic Places Act (1993).

2.9 PUBLIC RECREATION

2.9.1 Physical Characteristics:

The PL includes Thomsons Saddle the lowest saddle in the Dunstan Range. The Thomsons Gorge Road which crosses this saddle, is a dry weather road and is used mainly by four wheel drives and less frequently by cyclists and walkers. Although not formally closed during winter, at times it becomes impassable.

The PL is bounded to the north largely by public conservation land; Bendigo Conservation Area to the south of Mt Moka; Ardour Conservation Area to the north of Thomsons Gorge Rd; freehold land with a covenant protecting landscape/biodiversity/historic values sits between the public conservation land. On all other sides the PL is bound by freehold land.

The PL lies within the 'backcountry' recreation opportunity setting in DOC's Otago Conservation Management Strategy (CMS 1998). The CMS defines the backcountry experience as being characterised by a "...feeling of relative remoteness from populated areas, yet has good recreational facilities. The highly natural setting is a valued part of the experience and may be associated with motivations of "escape from town", education, exercise and/or a sense of being close to nature".

Work being undertaken for the upcoming review of CMS would indicate that the PL lies within the "backcountry accessible" recreation zone where the land is a natural setting away from 2WD roads but accessible by 4WD or aircraft. Within the zone people of all ages and abilities enjoy an opportunity to explore the hinterland of larger protected areas by both motorised and non-motorised means.

The Recreation Strategy: Otago Conservancy (Springer 1993) referred to the need for "extended walking, mountain biking, cross country skiing, off road vehicle and horse riding opportunities" in Central Otago, while noting that the closure "of legal formed and unformed roads was a threat." Although this work is under revision its commentary on the area still holds true.

In 1988, Federated Mountain Clubs compiled an outdoor recreation plan (now somewhat out of date) for the Central Otago block mountains (Mason, 1988) which includes a section on the Dunstan mountains but makes limited comment on the area covered by the PL. It notes that while some cross country skiing occurs usually the range has limited snow in comparison to nearby ranges. The report also notes limited walking use of the area.

2.9.2 Legal Access

The formed Thomsons Gorge Road passes through the northern corner of the property. For about 1.5km the formation deviates from the legal alignment but the Central Otago District Council undertake regular but limited maintenance on the road.

Government funding was set aside for the building of a road through Thomsons Gorge as early as 1897 (Mason 1988) but it was not until 1975 that a dry weather route was completed (OGHT 2004) and although initially it had limited through use (Mason 1988) it is now a popular trip for cyclists and four wheel drives.

2.9.3 Activities

The CMS identifies the activities most often associated with the 'backcountry zone' as including hunting, tramping, camping, mountain biking, outdoor education and nature appreciation. Day trips are common. The area surrounding and including the PL is used largely by Central Otago residents but is reported widely on the internet as a tourist through route by New Zealand and international tourists. Some of the forms of recreation in the are not focused on particular tracks/localities but involve roving through the landscape.

Both motorised and non-motorised use of the area is largely restricted to either Thomsons Gorge Road or to the adjoining public conservation land. The recently completed Central Otago Outdoor Recreation Strategy (CODC 2011) did not identify demand for recreation opportunities which could be met within this PL.

Thomsons Gorge Road gets used both informally and for organised events for a variety of recreational activities including mountain biking (Southern Brevet), multisport (Goldrush), walking (Goldfields Cavalcade) and four wheel driving (various).

There is a recognised north/south traverse of the south Dunstan Mountains but the usual route is via Mt Moka and the Bendigo Conservation Area. This is undertaken by both motorised and non motorised means, including horses trekking and mountain bikes.

A round trip for walking, mountain biking and/or off road vehicle is feasible from Thomsons Gorge Road through the Bendigo Conservation Area and back through the existing 4wd track that runs the length of the property. Existing use patterns and recent public consultation (CODC 2011) does not indicate a high level of demand for additional as-of-right public access along the section of track within the PL. Access to the Bendigo Conservation Area via Thomsons Gorge Road is a limiting factor to any future growth for recreation in the area as it is usually only passable to 4wd vehicles, except during the dry summer months when the road is in good condition.

A full range of recreational activities are undertaken in the Bendigo and Ardgour Conservation Areas and are undertaken on the PL from time to time.

2.9.4 Significance of recreation on the PL

Opportunities for public recreation in the area encompassed by the Matakanui PL arise from the following:

- Presence of Thomsons Gorge Road through the north west corner of the property
- Outstanding views of the Clutha and Manuherikia Valleys along with stunning rock formations
- Access to mining features which form part of the important Bendigo goldfield
- Access to peri-glacial landscapes and associated flora

PART 3

OTHER RELEVANT MATTERS & PLANS

3.1 CONSULTATION

An NGO early warning meeting was held on 22 September 2011 where the NGO had an opportunity to express their views on the tenure review. Points made were as follows:

- Almost entirely LUC Class VIIe with some VIII – unlikely to be able to support sustainable land use.
- Probably should designate entire block for conservation.
- Need to secure 3 RAPs for protection.
- Need public access for bike, horse, cross country skiing and vehicle (with permission) along the crest of the Dunstan Mountains.
- Consider public access (escape route?) from Dunstan Mountains to Moutere Disputed Spur Road in the Manuherikia Valley, down farm track on true left of Neds Creek – but need to avoid the homestead – this goes through Freehold.
- It is important for water yield.
- Need public access to old stone hut.
- Track south from hut excellent for walking and biking.

At a follow up meeting of 18 April 2012 the following points were made:

- Suggested all should be CA.
- Considered land not suited to sustainable grazing
- Most class VII land
- All of RAP A5 should be protected, even the area in adjoining FH.

Since that meeting written submissions have been received from:

Dr David K Holdsworth
FMC
Forest and Bird, Dunedin Branch

A full copy of these reports is attached (Appendix 3).

3.2 REGIONAL POLICY STATEMENTS & PLANS

Regional Policy Statement

The Regional Policy Statement for Otago provides a policy framework for all of Otago's significant regional resource management issues. It does not contain rules. District Plans shall not be inconsistent with the Regional Policy Statement. In respect of natural values the Regional Policy Statement includes the following policy and method statement:

Policy: To maintain and where practicable enhance the diversity of Otago's significant vegetation and significant habitats of indigenous fauna, trout and salmon.

Method: Identify and protect Otago's significant indigenous vegetation and significant indigenous habitat of indigenous fauna, trout and salmon, in consultation with relevant agencies and with Otago's communities.

In respect of landscape and natural features it includes the following policy and method statement.

Policy: To recognise and provide for the protection of Otago's outstanding natural features and landscapes.

Method: Prepare in conjunction with relevant agencies and in consultation with the community and affected landowners, an inventory of outstanding features and landscapes that are regionally significant.

Regional Plans

The whole PL is subject to the *Otago Regional Plan Water* rule which requires resource consent for suction dredge mining.

3.3 DISTRICT PLAN

The PL is within the Central Otago District, is identified in the fully operative Central Otago District Plan (the Plan) as being within the Rural General Zone. The entire PL is zoned as Outstanding Natural Landscape (ONL).

Subdivisions which create lots which on average are less than 8 ha or any lot that individually is less than 2ha requires a resource consent as does the construction of buildings within 20 m of any waterbody; while a consent is required for any earthworks, deposition of sediment, earthworks greater than 20 m³ and the removal of vegetation within 10 m of any waterbody. Earthworks exceeding 2000 m² and/or 3000 m³ from any one site also require a consent.

The clearance of indigenous vegetation of specified areas and/or types and the establishment of exotic woodlots requires a consent, but note these provisions do not apply to land that is freeholded via tenure review.

Consent is required for earthworks that breach specified thresholds, activities including but not limited to cutting new roads etc, subdivision (except for the creation of legally protected areas) and the planting of exotic plantation species. Again note these provisions do not apply to land that is freeholded via tenure review.

Within the Otago Regional Council Regional Plan: Water for Otago, there are no significant wetlands identified on the PL, but note that consent is required to modify any wetlands above 800m asl.

Protection via the RMA is therefore limited to the controls set out above.

3.4 CONSERVATION MANAGEMENT STRATEGY & PLANS

The Otago Conservancy of DOC has prepared a Conservation Management Strategy (CMS) which was approved by the New Zealand Conservation Authority in August 1998. The CMS identifies 41 special places of conservation interest in Otago Conservancy.

The PL is incorporated in the South Dunstan Special Place. The CMS objectives for this Special Place relevant to the PL include:

To achieve protection of and public access to areas of high nature conservation, historic and recreational interest; on an extensive basis where possible.

The implementation method applicable to this review is:

Rationalisation of pastoral lease boundaries under tenure review will enable other areas of high natural and historic value to be protected, and public access secured.

3.5 NEW ZEALAND BIODIVERSITY STRATEGY

The New Zealand Government is a signatory to the Convention on Biological Diversity. In February 2000, Government released the New Zealand Biodiversity Strategy which is a blueprint for managing the country's diversity of species and habits and sets a number of goals to achieve this aim. Of particular relevance to tenure review, is goal three which states:

Maintain and restore a full range of remaining natural habitats and ecosystems to a healthy functioning state, enhance critically scarce habitats, and sustain the more modified ecosystems in production and urban environments, and do what is necessary to:-

Maintain and restore viable populations of all indigenous species across their natural range and maintain their genetic diversity.

The strategy outlines action plans to achieve this goal covering terrestrial and freshwater habitat and ecosystem protection, sympathetic management, pest management, terrestrial and freshwater habitat restoration, threatened terrestrial and freshwater species management, etc.

3.6 PROTECTING OUR PLACES

In April 2007 the Ministry for the Environment produced a new policy document titled 'Protecting Our Places' which was jointly launched by the Minister of Conservation and the Minister for the Environment. This publication introduces four national priorities for protecting rare and threatened native biodiversity on private land. The national priorities identify the types of ecosystems and habitats most in need of protection.

The policy statement supports the government's pledge to maintain and preserve New Zealand's natural heritage. This began in 1992 when New Zealand signed the United Nations Convention on Biodiversity; followed in 2000 with the release of the New Zealand Biodiversity Strategy.

The four national priorities for biodiversity protection are listed below. They are based on the most up to date scientific research available.

National Priority 1:

To protect indigenous vegetation associated with land environments, (defined by Land Environments of New Zealand at Level IV), that have 20 percent or less remaining in indigenous cover.

National Priority 2:

To protect indigenous vegetation associated with sand dunes and wetlands; ecosystem types that have become uncommon due to human activity.

National Priority 3:

To protect indigenous vegetation associated with 'originally rare' terrestrial ecosystem types not already covered by priorities 1 and 2.

National Priority 4:

To protect habitats of acutely and chronically threatened indigenous species.

PART 4

ATTACHMENTS

4.1 ADDITIONAL INFORMATION

4.1.1 References

Angus J H 1977. One Hundred Years of Vincent County: A Centennial History of the Vincent County Council 1877-1977. Dunedin: John McIndoe Limited.

Archives New Zealand. Te Rua Mahara o te Kāwanatanga. Archway. DADO 23179 D589 33b 6511 and DADO 23179 D589 33d 4400 and 6729. Dunedin office.

ArchSite. New Zealand Archaeological Association Site Recording Scheme.

AtoJs Online 1865. Appendix to the Journals of the House of Representative, Session I, C-04a Page 11

Beattie H 1948. Otago Place Names. Otago Daily Times and Witness Newspapers Co. Limited.

Bennett, E.R.; Youngson, J.H.; Jackson, J.A.; Norris, R.J.; Raisbeck, G.M. and Yiou F. 2006. Combining geomorphic observations with in situ cosmogenic isotope measurements to study anticline growth and fault propagation in Central Otago, New Zealand. *New Zealand Journal of Geology and Geophysics* 49: 217-231.

Carpenter L 2012. The Rise and Shine Water Race Bendigo, Central Otago.

Central Otago District Council (CODC) 2011: Central Otago Outdoor Recreation Strategy 2011 – 2021 (draft), *Central Otago District Council, Alexandra*

Central Otago District Council. Schedule of Heritage Buildings, Places, Sites & Objects and Notable Trees.

Constanza, R., R. d'Arge, R. de Groot, S. Farber, M. Grasso, B. Hannon, K. Limburg, S. Naeem, R. V. O'Neill, J. Paruelo, R. G. Raskin, P. Sutton, M. van den Belt. (1997): The value of the world's ecosystem and natural capital. *Nature*, 387 (6230): 255.

de Lange PJ, Norton DA, Courtney, SP, Heenan PB, Barkla JW, Cameron EK, Hitchmough R, Townsend A.J 2009. Threatened and uncommon plants of New Zealand (2008 revision). *New Zealand Journal of Botany* 47: 61-96.

Department of Conservation 1998: Otago Conservation Management Strategy: August 1998. *Otago Conservancy CMS Series No. 7.* Department of Conservation, Dunedin.

Department of Conservation 2007. Non-migratory galaxiid survey and monitoring guidelines. *Unpublished internal report.* Department of Conservation, Wellington, New Zealand.

Department of Lands and Survey 1968. Omakau Topographical Map S134. 1st Edition. Wellington: A.R. Shearer, Government Printer.

Duff G 1978. Sheep may safely graze: The story of Morven Hills Station & the Tarras District. Dunedin: John McIndoe Limited.

Fahey, B.D; Jackson, R.J. 1991a: Hydrologic Study of Deep Creek and Deep Stream Catchments.

Fahey, B.D; Jackson, R.J. 1991b: Water Yields and Land-use in Deep Creek and Deep Stream Catchments.

Hitchmough, RA., Hoare, JM., Jamieson, H., Newman, D., Tocher, MD., Anderson, PJ., Lettink, M. and Whitaker, AH. 2010 Conservation status of New Zealand reptiles, 2009, *New Zealand Journal of Zoology*, 37: 3, 203 – 224

Jewell, T. 2008 A photographic guide to reptiles and amphibians of New Zealand: photographs by Rod Morris. New Holland Publishers, Auckland.

Leathwick J, Wilson G, Rutledge D, Wardle P, Morgan F, Johnston K, McLeod M, Kirkpatrick R 2003. Land Environments of New Zealand. Ministry for the Environment.

LINZ (Landonline) 2009. Due Diligence Report for Matakanui Station PO 324. Crown Pastoral Land Tenure Review.

LINZ (Landonline) Geodetic database. Search for Geodetic marks. Land Information New Zealand.

Lynn IH, Manderson AK, Page MJ, Harmsworth GR, Eyles GO, Douglas GB, Mackay AD, Newsome PJF 2009. Land Use Capability Survey Handbook – a New Zealand handbook for the classification of land 3rd ed. Hamilton, AgResearch; Lincoln, Landcare Research; Lower Hutt, GNS Science. 163 p

Mark, AF & LC Bliss, 1970. The high-alpine vegetation of Central Otago, New Zealand. *New Zealand Journal of Botany* 8: 381-451.

Mark, A.F; and Rowley, J. 1976: Water yield of low alpine snow tussock grassland in Central Otago. *New Zealand Journal of Hydrology* 15, 2: 59-79.

Mason, B. 1988: Outdoor Recreation in Otago: A conservation plan. Vol 1 Central Otago's Block Mountains. Federated Mountain Clubs of New Zealand Inc. Wellington

McDowall, R.M. 2000. *The Reed Field Guide to New Zealand Freshwater Fishes.* Reed Publishing New Zealand Limited.

McGlone MS 2001. The origin of the indigenous grasslands of southeastern South Island in relation to pre-human woody ecosystems. *New Zealand Journal of Ecology* 25: 1-15.

Miles Lewis 2006. Corrugated iron gazetteer. Appendix A.

Ministry for the Environment 2007: Protecting our Places. Introducing the national priorities for protecting rare and threatened native biodiversity on private land. Ministry for the Environment, Wellington.

- Miskelly CM, Dowding JE, Elliot GP, Hitchmough RA, Powlesland RG, Robertson HA, Sagar PM, Scofield RP, Taylor GA 2008.** *Conservation status of New Zealand birds, 2008. Notornis 55: 117-135.*
- Ng J 1993a.** Windows on a Chinese Past. Don's 'Roll of Chinese'. Volume 3. Otago Heritage Books, Dunedin.
- Ng J 1993b.** Windows on a Chinese Past. Larrikinism and Violence: Immigration Issues 20th Century Assimilation: Biographies. Volume 4. Otago Heritage Books, Dunedin.
- Otago Catchment Board 1973:** Soil and Water Conservation Plan no 140. Matakanui Station
- Otago Goldfield Heritage Trust 2004** *Thomsons Gorge Road, Dunstan Mountains, Historic sites, 4WD viewing & walking or biking tour*
- Otago Goldfields Heritage Trust pamphlet 2007.** Thomsons Gorge Road, Dunstan Mountains.
- Otago Regional Council 2004.** *Region Plan: Water.* Otago Region Council, Dunedin.
- Otago Regional Council 2006:** The Effect of Irrigation Runoff on Water Quality
- Otago Regional Council 2006a.** *Management flows for aquatic ecosystems in the lower Manuherikia River.* Otago Regional Council, Dunedin.
- Otago Regional Council 2006b.** *State of the Environment Report Surface Water Quality in Otago.* Otago Regional Council, Dunedin
- Otago Regional Council 2011.** *Water quality and ecosystem health in the Manuherikia catchment.* Otago Regional Council, Dunedin.
- Patterson, G.B.; Daugherty, C.H. 1990:** Four new species and one new subspecies of skinks, genus *Leiolopisma* (Reptilia: Lacertilia: Scincidae) from New Zealand. *Journal of the Royal Society of New Zealand 20* : 65-84.
- Papers Past 1863A.** Otago Witness, Issue 613, 28 August, Page 8 The Dunstan
- Papers Past 1863B.** Otago Witness, Issue 618, 2 October, Page 8. The Dunstan.
- Parcell J C 1976.** Heart of the Desert: A History of the Cromwell and Bannockburn Districts of Central Otago.
- Pinney R 1981.** Early Northern Otago runs. Auckland: William Collins Publishers Ltd.
- QuickMap Survey Office Plans.** Land Information New Zealand.
- Roberts W H 1910.** Maori nomenclature: early history of Otago. 1st edition. The Otago Daily Times and Witness Newspapers Company Limited.
- Roxburgh I 1957.** Wanaka Story: A History of the Wanaka, Hawea, Tarras and surrounding districts. Reprint by Capper Press 1977, Christchurch.

Springer, K 1993: Otago Conservancy Recreation Strategy. *Otago Conservancy Miscellaneous Series No. 18*. Department of Conservation, Dunedin.

Thomson J 1998. Southern People: A Dictionary of Otago Southland Biography. Longacre Press in association with the Dunedin City Council.

Townsend AJ, de Lange PJ, Duffy CAJ, Miskelly CM, Molloy J, Norton DA 2008. New Zealand Threat Classification System manual. Science & Technical Publishing, Department of Conservation, Wellington.

Turnbull, I.M. 2000. Geology of the Wakatipu area. *Institute of Geological and Nuclear Sciences 1:250 000 geological map 18*. Lower Hut, New Zealand.

Walker S, Lee W G, Rogers, GM 2003. The woody vegetation of Central Otago, New Zealand: its present and past distribution and future restoration needs. Science for Conservation 226. 99 p.

Ward, C.M., Bruce, D.L, Rance, B.D, Roozen, D.A., Grove, P 1994: Lindis, Pisa and Dunstan Ecological Districts. A Survey Report for the Protected Natural Areas Programme. Department of Conservation, Dunedin.

Waugh J.R. 2005: Water Resources of Tussock Grasslands in the Upper Taieri Catchment. Report prepared for Department of Conservation by OPUS International Consultants Ltd.

Williams PA, Wiser S, Clarkson B, Stanley MC 2007. New Zealand's historically rare terrestrial ecosystems set in a physical and physiognomic framework. *New Zealand Journal of Ecology* 31(2): 119-128

Winterbourn, M.J.; Gregson, K.L.D.; Dolphin, C.H. 2006. *Guide to the Aquatic Insects of New Zealand*. Bulletin of the Entomological Society of New Zealand 14.

4.2 MAPS

4.2.1 Topographical and Cadastral Plan

4.2.2 Landscape Units Plan

4.2.3 Values Plan

4.2.4 Land Resource Inventory Plan

4.3 APPENDICES

Appendix 1 Invertebrate species identified from tenure review survey

Appendix 2 Vascular plant species recorded from Matakanui Pastoral Lease

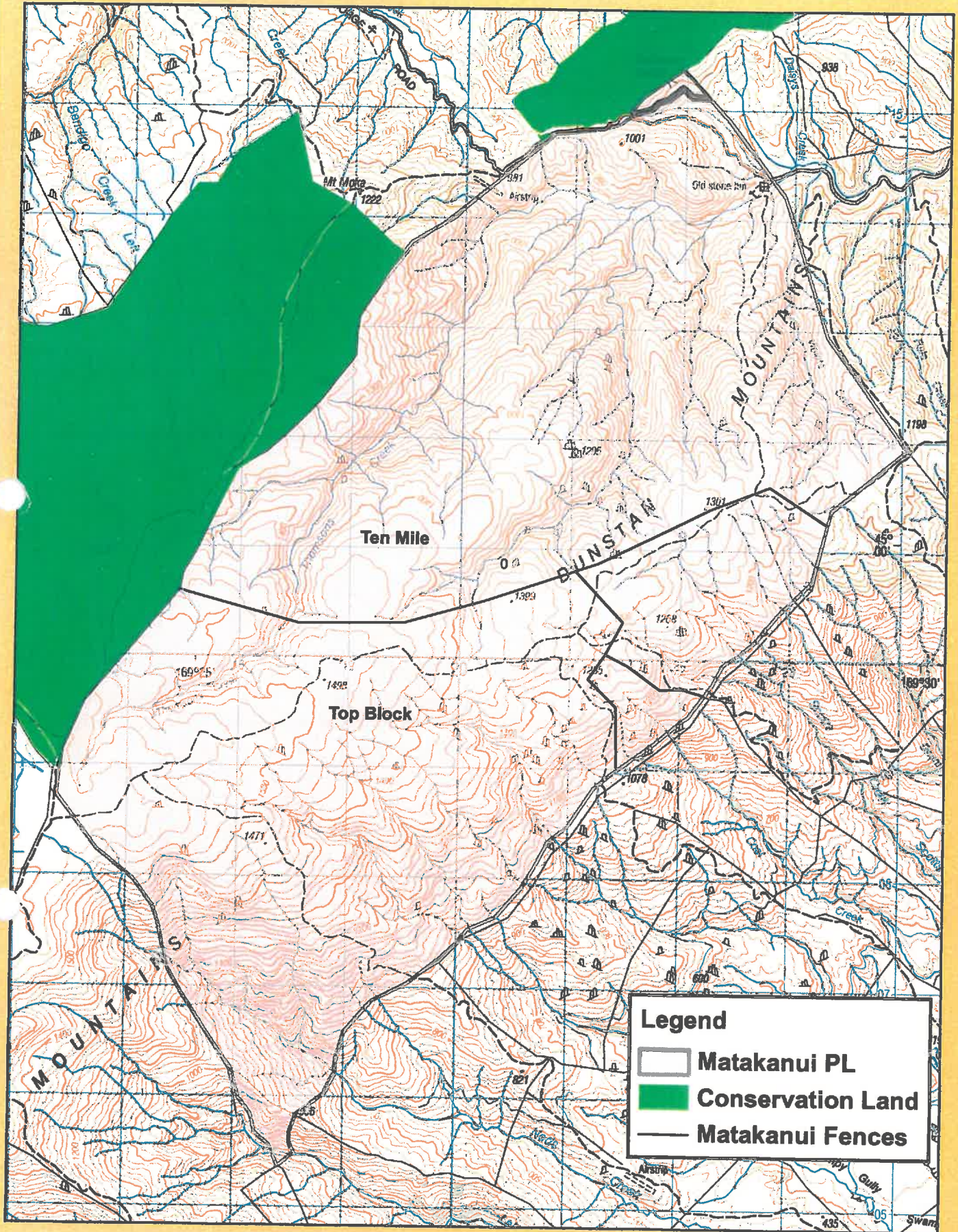
Appendix 3 Written submissions from consultation

4.4 PHOTOS


4.4.1 Landscape Photos

4.4.2 Historic Photos

4.2 MAPS



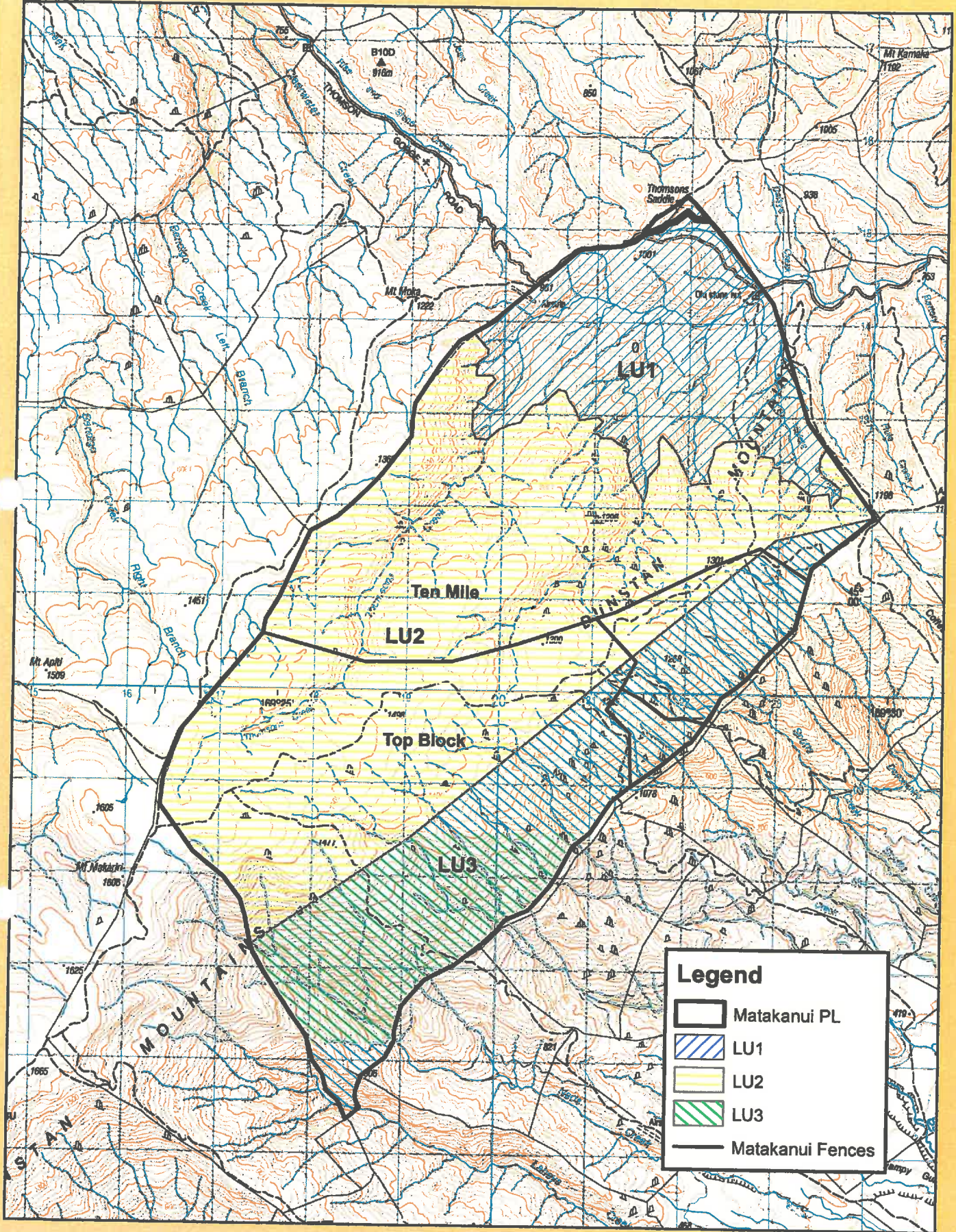
Matakanui Pastoral Lease TOPOGRAPHICAL AND CADASTRAL

 Department of Conservation
Te Papa Atawhai

 0.95 km

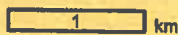


NZGD 2000 New Zealand Transverse Mercator
ArcGIS Lite
Internal DOC use only
Crown Copyright Reserved
User: TWHITTAKER



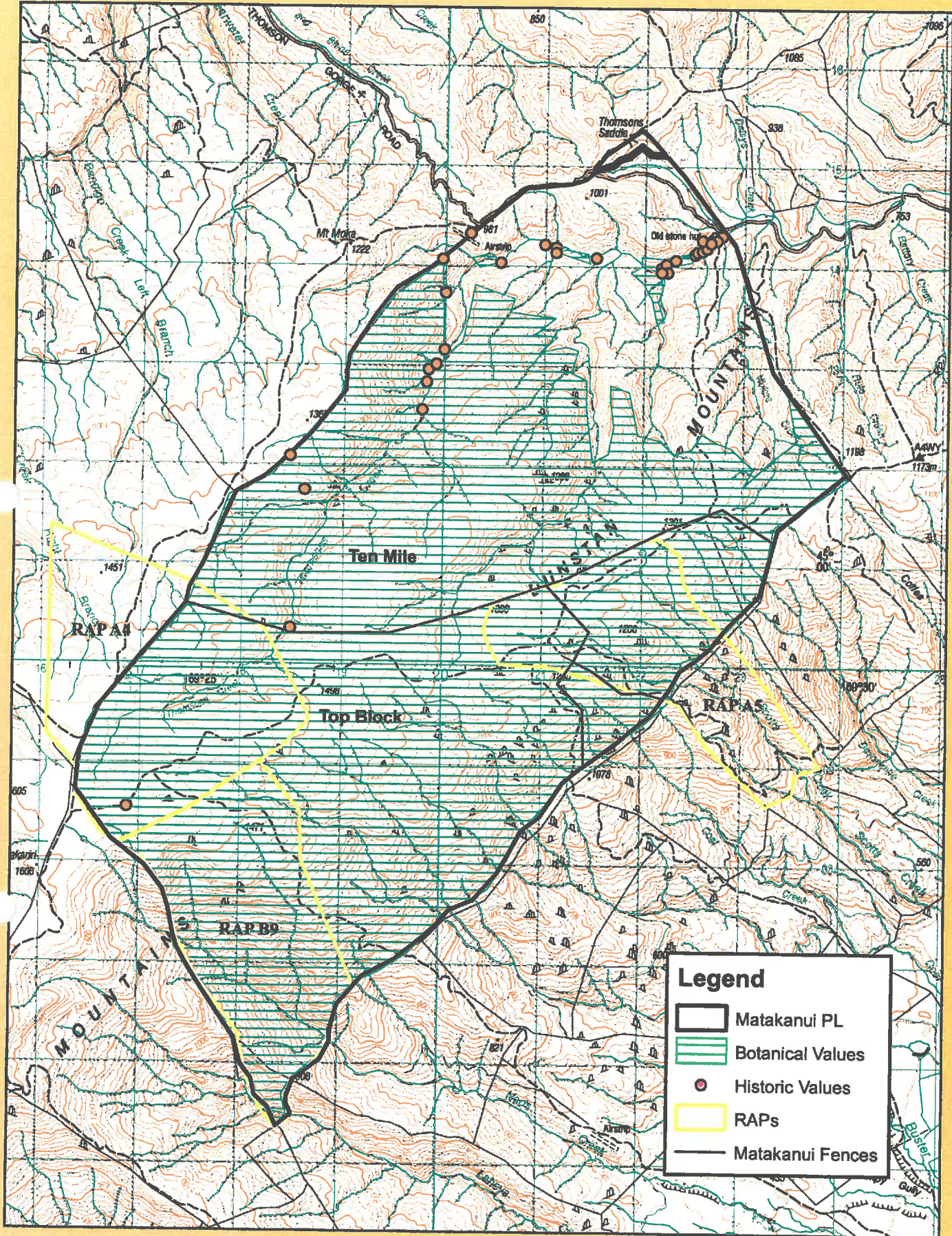
Matakanui Pastoral Lease LANDSCAPE UNITS

 Department of Conservation
Te Papa Atawhai

 1 km



NZGD 2000 New Zealand Transverse Mercator
ArcGIS Lite
Internal DOC use only
Crown Copyright Reserved
User: TWHITTAKER



Matakauui Pastoral Lease VALUES PLAN

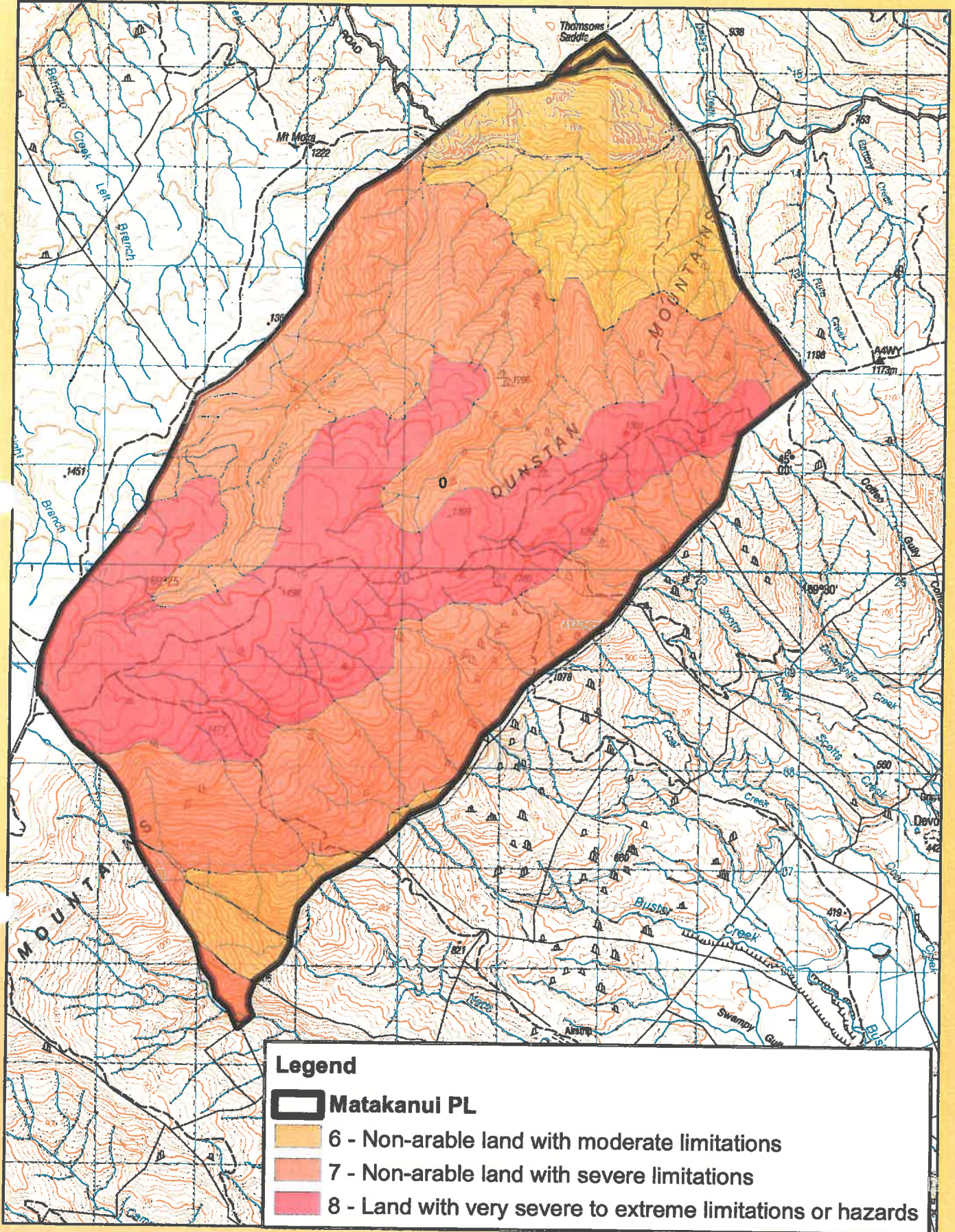
 Department of Conservation
Te Papa Atawhai

1 km







NZGD 2000 New Zealand Transverse Mercator
ArcGIS Lite
Internal DOC use only
Crown Copyright Reserved
User: TWHITTAKER

Path: M:\TENURE REVIEW\Tim\Matakauui GIS Plans\Matakauui Values Plan.mxd

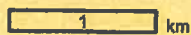


Legend

-  Matakanui PL
-  6 - Non-arable land with moderate limitations
-  7 - Non-arable land with severe limitations
-  8 - Land with very severe to extreme limitations or hazards

**Matakanui Pastoral Lease
LAND RESOURCE INVENTORY**

 Department of Conservation
Te Papa Atawhai

 1 km



NZGD 2000 New Zealand Transverse Mercator
ArcGIS Lite
Internal DOC use only
Crown Copyright Reserved
User: TWHITTAKER

4.3 APPENDICES

APPENDIX 1: Invertebrate species identified from tenure review survey

Playhelminthes: "Turbellaria" (free-living flatworms)

Small aquatic flatworms, presumed to be of a single species, were numerous in upper Coal Ck. Similar flatworms often occur in the high altitude streams of the Central Otago ranges.

Crustacea

Amphipoda - Paraleptamphopidae

The numerous amphipods found in some of the creeks appear to belong to the *Paraleptamphopus caeruleus* complex of species.

Orthoptera (grasshoppers, etc.)

Acrididae (short-horned grasshoppers)

Sigauss australis(?) Three specimens collected all appear to key out closer to this species, than to the similar but rarer *S. obelisci*. Widespread through the alpine zone from south-west Otago to mid-Canterbury, but shows considerable genetic variation through this range.

Hemiptera (bugs, etc.)

Small bugs were numerous on the property, with many small ones, representing several species, seen around the tarn wetland and other wetlands and through the soil hummocks habitat. Three species of Lygaeidae were taken from *Olearia bullata* above Thomsons Creek.

Lepidoptera (moths, butterflies) (IDs courtesy of John Dugdale)

Noctuidae (owlet moths)

Aletia cuneata Philpott, 1916, 1 example. Widely distributed subalpine/alpine species, North and South Is., hosts unknown.

Ichneutica ceraunias Meyrick, 1887, 2 examples. Widely distributed in montane to subalpine grasslands; absent from Fiordland (hosts: *Chionochloa*., *Festuca*, and *Poa* tussocks).

Geometridae (looper moths)

Notoreas paradelpa, 5 examples. (ID courtesy of Brian Patrick.) Host: *Kelleria* (Thymeleaceae); early season species; common and widespread 850-1500m. Occurred numerous and widely through the soil hummocks and wetlands of the summit plateau.

Notoreas hexaleuca, 2 examples. (ID courtesy of Brian Patrick.) Host: *Kelleria* (Thymeleaceae); early season species, widespread from Mackenzie Basin mountains southwards, 600-1400m. Occurred widely through the soil hummocks and wetlands of the summit plateau.

Crambidae (snout moths; grass moths)

Eudonia trivirgata (F&R, 1875), 1 ex. Widespread geographically and altitudinally in non-forest areas.

Eudonia xysmatias (Meyrick, 1907), 2 ex. A Central Otago endemic found in mossy seeps and wetlands of the Central Otago ranges, from Rock & Pillar/ Lammermoors west to The Remarkables, including Old Man Ra (type locality, 1700m), Umbrellas, Garvie Mtns. Locally common.

Eudonia spp, 2 ex, one from each of 2 species: too worn to identify.

Orocrambus machaeristes Meyrick, 1905, 1 example. A species of alpine grasslands from Canterbury to Otago, particularly blue tussock areas.

Orocrambus tritonellus Meyrick, 1885, 1 example. Alpine, widely distributed in South Island.

Orocrambus ramosellus (Doubleday, 1843), 1 example. Widespread.

Tauroscopa gorgopis Meyrick, 1888, 4m & 1f. Widespread, high alpine species, from NW Nelson to Otago. This species is capable of switching from active to comatose in mid-air, dropping to the ground seemingly dead, but awakening when the sun shines again.

Nymphalidae (ringlet butterflies)

Bassaris itea (yellow admiral butterfly) several admirals were noted around rock tors in the head of Neds Ck, near the south end of the property. These highly mobile butterflies are not uncommon in the Otago high country.

Lycaenidae (copper butterflies)

Boldenia boldenarum (White) boulder coppers were numerous in the valley floor of Thomsons Ck, near the old hut site; host: *Meuhlenbeckia axillaris*, which was all through the boulders of the old gold workings at this site.

Coleoptera (beetles)

Dytiscidae (water beetles)

Rhantus suturalis, the larger (c. 12mm long) of two water beetle species seen in the tarn; common in upland and lowland ponds, etc.

Liodessus plicatus, the smaller (c. 2.5mm long) of two species seen in the tarn; one of our commonest dytiscids, often seen in alpine tarns.

Carabidae (ground beetles)

Mecodema politanum, 1 specimen found by Craig high in the unnamed true right tributary of Thomsons Creek. This species is endemic to Central Otago and South Canterbury, but may yet prove to be part of a cline with *M. lucidum*, which occurs more widely in the southern South Island.

Megadromus sp. (undescribed species) 1 specimen from the sheet erosion area on the ridge summit, NE of the small tarn. Peter Johns has specimens of this species "from Trotters Gorge, Mt St Bathans and Lake Ohau, with some sites in between". There is also a specimen in the NZAC collection from each of the Dunstons and the Pisa Range. Peter states that this site is south of and higher than any of his records.

Scarabeidae (chafer beetles)

Prodontria sp., probably *P. capito* (ID courtesy of Dr Barbara Barratt) a single specimen found near the very head of Thomsons Creek by Dan; the specimen was a female and therefore difficult to ID with certainty. Elsewhere, *P. capito* occurs on the Old Man Range and the Remarkables; this record is likely to be near its northern extent.

Odontria sp. fragments of one individual of a small species with patterned elytra, collected by Craig

Melyridae

Specimens of 1 species were taken from an *Aciphylla* flower in upper Coal Creek

Coccinellidae (ladybirds)

Coccinella undecimpunctata The introduced 11-spot ladybird was present occasionally throughout the property. This species is frequently found at higher altitudes in NZ.

Tenebrionidae (darkling beetles and associated beetles)

Tribe Titaenini; probably *Artystona* sp. – specimen found at 1200m in Thomsons Ck catchment by Craig.

Chrysomelidae

Specimens from two small species were taken from an *Aciphylla* flower head in Coal Creek.

Curculionidae (weevils)

Specimens from three species were collected: 2 moderately large black weevils, possibly a small species of *Anagotus*, were found high on the ridge by John & Dan, along with a smaller patterned species found by John; 3 specimens of a small species were taken from an *Aciphylla* flower head in upper Coal Creek.

Mecoptera (scorpionflies)

Nannochorista philpotti 1 specimen of NZ's only endemic scorpionfly was taken in the soil hummock area on the range summit

Diptera (true flies)

Bibionidae (March flies)

Dilophus nigristigmata a female taken from tors above Coal Creek; the largest and most widespread species of NZ's small bibionid fauna

Chironomidae

Chironomids were common in the wetland areas

Empididae

Several species. Small predatory flies, numerous through the soil hummock habitat.

Syrphidae (hoverflies)

Specimens representing at least two species were taken; one off *Olearia bullata*; the other swept from the soil hummock habitat. These are dark species which don't key out in the available keys.

Sciomyzidae

Neolimnia ?irrorata 2 specimens, from an *Aciphylla* flower head in upper Coal Creek. The larvae of this family are predators or parasitoids of freshwater and terrestrial snails.

Muscidae

gen et sp indet, 1 example. Probably adult is predatory, as proboscis is stiff.

Limnohelina spp., several specimens, probably representing two species, from different sites in the soil hummock/wetland areas and from an *Aciphylla* flower head near a wetland at slightly lower altitude; species from this genus are associated with seepages and wetlands

Tachinidae

Protohystricia signata (Walker, 1849), 1 f. This is a parasite of soil-dwelling hepialid moth larvae (porina moth) and its presence indicates that at least one hepialid occurs there.

Hymenoptera (bees, wasps, ants)

Bumblebees were numerous at lower altitudes when the weather was sunny

APPENDIX 2: Vascular plant species recorded from Matakanui Pastoral Lease

Current name	Family (Tribe)	Threat ranking (2009)	Common name
<i>Abrotanella caespitosa</i>	Asteraceae	Not threatened	
<i>Abrotanella inconspicua</i>	Asteraceae	Not threatened	
<i>Acaena anserinifolia</i>	Rosaceae	Not threatened	bidibid
<i>Acaena caesiiglauca</i>	Rosaceae	Not threatened	bidibid
<i>Acaena inermis</i>	Rosaceae	Not threatened	bidibid
<i>Acaena saccaticupula</i>	Rosaceae	Not threatened	bidibid
<i>Achillea millefolium</i>	Asteraceae	Exotic	yarrow
<i>Aciphylla aurea</i>	Apiaceae	Not threatened	spaniard
<i>Aciphylla hectorii</i>	Apiaceae	Not threatened	dwarf spaniard
<i>Acrothamnus colensoi</i>	Ericaceae	Not threatened	
<i>Agrostis capillaris</i>	Poaceae	Exotic	browntop
<i>Agrostis muscosa</i>	Poaceae	Not threatened	pincushion grass
<i>Aira caryophyllea</i> subsp. <i>caryophyllea</i>	Poaceae	Exotic	silvery hair grass
<i>Anaphalioides bellidioides</i>	Asteraceae	Not threatened	
<i>Anisotome aromatica</i>	Apiaceae	Not threatened	
<i>Anisotome imbricata</i> var. <i>imbricata</i>	Apiaceae	Not threatened	
<i>Anthoxanthum odoratum</i>	Phalaridinae	Exotic	sweet vernal
<i>Arctium minus</i>	Asteraceae	Exotic	burdock
<i>Argyrotegium mackayi</i>	Asteraceae	Not threatened	
<i>Blechnum penna-marina</i> subsp. <i>alpina</i>	Blechnaceae	Not threatened	
<i>Brachyglottis haastii</i>	Asteraceae	Not threatened	
<i>Brachyscome sinclairii</i>	Asteraceae	Not threatened	
<i>Bromus tectorum</i>	Bromeae	Exotic	downy brome
<i>Bulbinella angustifolia</i>	Asphodelaceae	Not threatened	maori onion
<i>Caltha obtusa</i>	Ranunculaceae	Not threatened	white caltha
<i>Cardamine debilis</i> agg.	Brassicaceae	Not threatened	
<i>Carex coriacea</i>	Cyperaceae	Not threatened	
<i>Carex gaudichaudiana</i>	Cyperaceae	Not threatened	
<i>Carex ovalis</i>	Cyperaceae	Exotic	oval sedge
<i>Carex secta</i>	Cyperaceae	Not threatened	niggerhead
<i>Carmichaelia crassicaulis</i> subsp. <i>crassicaulis</i>	Fabaceae	Declining	coral broom
<i>Carmichaelia petriei</i>	Fabaceae	Not threatened	Desert broom
<i>Celmisia</i> (g) (CHR 274779; "rhizomatous")	Asteraceae	Not threatened	

<i>Celmisia angustifolia</i>	Asteraceae	Not threatened	
<i>Celmisia densiflora</i>	Asteraceae	Not threatened	
<i>Celmisia gracilentata</i> agg.	Asteraceae	Not threatened	
<i>Celmisia haastii</i> var. <i>haastii</i>	Asteraceae	Not threatened	
<i>Celmisia laricifolia</i>	Asteraceae	Not threatened	
<i>Celmisia lyallii</i>	Asteraceae	Not threatened	false spaniard
<i>Celmisia ramulosa</i> var. <i>ramulosa</i>	Asteraceae	Not threatened	
<i>Celmisia sessiliflora</i>	Asteraceae	Not threatened	
<i>Celmisia viscosa</i>	Asteraceae	Not threatened	
<i>Cerastium fontanum</i> subsp. <i>vulgare</i>	Caryophyllaceae	Exotic	mouse-ear chickweed
<i>Chaerophyllum</i> (c) (CHR 469467; "bog")	Apiaceae	Not threatened	
<i>Chaerophyllum ramosum</i>	Apiaceae	Not threatened	
<i>Chionochloa macra</i>	Gramineae (Danthonieae)	Not threatened	slim snow tussock
<i>Chionochloa rigida</i> subsp. <i>rigida</i>	Gramineae (Danthonieae)	Not threatened	narrow-leaved snow-tussock
<i>Chionohebe thomsonii</i>	Plantaginaceae	Not threatened	
<i>Cirsium vulgare</i>	Asteraceae	Exotic	Scotch thistle
<i>Clematis marata</i>	Ranunculaceae	Not threatened	
<i>Colobanthus apetalus</i>	Caryophyllaceae	Not threatened	
<i>Colobanthus buechananii</i>	Caryophyllaceae	Not threatened	
<i>Colobanthus strictus</i>	Caryophyllaceae	Not threatened	
<i>Conium maculatum</i>	Apiaceae	Exotic	hemlock
<i>Coprosma atropurpurea</i>	Rubiaceae	Not threatened	
<i>Coprosma dumosa</i>	Rubiaceae	Not threatened	
<i>Coprosma fowerakeri</i>	Rubiaceae	Not threatened	
<i>Coprosma perpusilla</i> subsp. <i>perpusilla</i>	Rubiaceae	Not threatened	creeping coprosma
<i>Coprosma propinqua</i> var. <i>propinqua</i>	Rubiaceae	Not threatened	
<i>Craspedia incana</i>	Asteraceae	Not threatened	
<i>Cystopteris tasmanica</i>	Dryopteridaceae	Not threatened	bladder fern
<i>Discaria toumatou</i>	Rhamnaceae	Not threatened	matagouri
<i>Dracophyllum longifolium</i>	Ericaceae	Not threatened	inaka
<i>Dracophyllum muscoides</i>	Ericaceae	Not threatened	prostrate inaka
<i>Dracophyllum pronum</i>	Ericaceae	Not threatened	
<i>Dracophyllum rosmarinifolium</i>	Ericaceae	Not threatened	turpentine scrub
<i>Echium vulgare</i>	Boraginaceae	Exotic	viper's bugloss
<i>Epilobium komarovianum</i>	Onagraceae	Not threatened	
<i>Epilobium</i>	Onagraceae	Not threatened	

<i>microphyllum</i>			
<i>Epilobium nerteroides</i>	Onagraceae	Not threatened	
<i>Euchiton lateralis</i>	Asteraceae	Not threatened	
<i>Festuca matthewsii</i> subsp. <i>pisamontis</i>	Gramineae (Poeae)	Naturally Uncommon	
<i>Festuca novae- zeelandiae</i>	Gramineae (Poeae)	Not threatened	hard tussock
<i>Festuca rubra</i> subsp. <i>commutata</i>	Poeae	Exotic	Chewings fescue
<i>Galium aparine</i>	Rubiaceae	Exotic	cleavers
<i>Gaultheria depressa</i>	Ericaceae	Not threatened	snowberry
<i>Gaultheria nubicola</i>	Ericaceae	Not threatened	
<i>Gaultheria parvula</i>	Ericaceae	Not threatened	
<i>Gentianella bellidifolia</i>	Gentianaceae	Not threatened	
<i>Geranium</i> (d) (aff. <i>G. microphyllum</i> ; "mainland")	Geraniaceae	Not threatened	
<i>Geranium brevicaule</i>	Geraniaceae	Not threatened	
<i>Geum leiospermum</i>	Rosaceae	Not threatened	
<i>Glyceria fluitans</i>	Meliceae	Exotic	floating sweet grass
<i>Hebe buchananii</i>	Plantaginaceae	Not threatened	
<i>Hebe hectorii</i>	Plantaginaceae	Not threatened	
<i>Hebe lycopodioides</i>	Plantaginaceae	Not threatened	
<i>Hebe rakaiensis</i>	Plantaginaceae	Not threatened	
<i>Hebejeebie densifolia</i>	Plantaginaceae	Not threatened	
<i>Hectorella caespitosa</i>	Montiaceae	Not threatened	
<i>Hieracium lepidulum</i>	Asteraceae	Exotic	tussock hawkweed
<i>Hieracium praealtum</i>	Asteraceae	Exotic	king devil
<i>Holcus lanatus</i>	Poaceae	Exotic	Yorkshire fog
<i>Hydrocotyle</i> (a) (<i>H. novae-zeelandiae</i> var. <i>montana</i>)	Araliaceae	Not threatened	
<i>Hypochoeris radicata</i>	Asteraceae	Exotic	catsear
<i>Hypolepis millefolium</i>	Dennstaedtiaceae	Not threatened	thousand- leaved fern
<i>Isolepis aucklandica</i>	Cyperaceae	Not threatened	
<i>Juncus articulatus</i>	Juncaceae	Exotic	jointed rush
<i>Juncus effusus</i>	Juncaceae	Exotic	soft rush
<i>Kelleria croizatii</i>	Thymelaeaceae	Not threatened	
<i>Kelleria dieffenbachii</i>	Thymelaeaceae	Not threatened	
<i>Kelleria paludosa</i>	Thymelaeaceae	Not threatened	
<i>Kelleria villosa</i> var. <i>villosa</i>	Thymelaeaceae	Not threatened	
<i>Lemna</i> (a) (; aff. <i>L. minor</i> ; New Zealand)	Lemnaceae	Not threatened	duckweed
<i>Leptinella</i> (f) (; "seep")	Asteraceae	Not threatened	
<i>Leptinella albida</i>	Asteraceae	Naturally Uncommon	

<i>Leptinella goyenii</i>	Asteraceae	Not threatened	
<i>Leptinella pectinata</i> subsp. <i>villosa</i>	Asteraceae	Not threatened	
<i>Leptospermum scoparium</i> agg.	Myrtaceae	Not threatened	manuka
<i>Leucopogon fraseri</i> complex (mountain ecotype)	Ericaceae	Not threatened	
<i>Linum catharticum</i>	Linaceae	Exotic	purging flax
<i>Lobelia angulata</i>	Lobeliaceae	Not threatened	
<i>Luzula pumila</i>	Juncaceae	Not threatened	woodrush
<i>Luzula traversii</i>	Juncaceae	Not threatened	
<i>Lycopodium fastigiatum</i>	Lycopodiaceae	Not threatened	mountain clubmoss
<i>Melicytus alpinus</i> agg.	Violaceae	Not threatened	porcupine shrub
<i>Mimulus moschatus</i>	Scrophulariaceae	Exotic	musk
<i>Montia fontana</i> subsp. <i>montana</i>	Montiaceae	Not threatened	blinks
<i>Montia sessiliflora</i>	Montiaceae	Not threatened	
<i>Muehlenbeckia axillaris</i>	Polygonaceae	Not threatened	
<i>Muehlenbeckia complexa</i> agg.	Polygonaceae	Not threatened	small-leaved pohuehue
<i>Mycelis muralis</i>	Asteraceae	Exotic	wall lettuce
<i>Myosotis arvensis</i>	Boraginaceae	Exotic	field forget- me-not
<i>Myosotis laxa</i>	Boraginaceae	Exotic	water forget- me-not
<i>Myosotis pulvinaris</i>	Boraginaceae	Not threatened	
<i>Myriophyllum propinquum</i>	Haloragaceae	Not threatened	
<i>Myrsine nummularia</i>	Myrsinaceae	Not threatened	
<i>Nertera balfouriana</i>	Rubiaceae	Not threatened	
<i>Olearia bullata</i>	Asteraceae	Not threatened	
<i>Olearia odorata</i>	Asteraceae	Not threatened	
<i>Oreobolus pectinatus</i>	Cyperaceae	Not threatened	comb sedge
<i>Ourisia glandulosa</i>	Plantaginaceae	Not threatened	
<i>Ozothamnus vauvilliersii</i>	Asteraceae	Not threatened	tauhinu
<i>Pachycladon novae-zelandiae</i>	Brassicaceae	Not threatened	
<i>Pentachondra pumila</i>	Ericaceae	Not threatened	
<i>Phyllachne colensoi</i>	Stylidiaceae	Not threatened	
<i>Pilosella officinarum</i>	Asteraceae	Exotic	mouse-ear hawkweed
<i>Pimelea oreophila</i> subsp. <i>lepta</i>	Thymelaeaceae	Not threatened	alpine daphne
<i>Plantago lanigera</i>	Plantaginaceae	Not threatened	hairy swamp plantain
<i>Plantago unibracteata</i>	Plantaginaceae	Not threatened	
<i>Poa cita</i> agg.	Gramineae	Not threatened	silver tussock

	(Poeae)		
<i>Poa colensoi</i> s.l.	Gramineae (Poeae)	Not threatened	blue tussock
<i>Poa lindsayi</i>	Gramineae (Poeae)	Not threatened	
<i>Poa pratense</i>	Gramineae (Poeae)	Exotic	Kentucky bluegrass
<i>Poa pygmaea</i>	Gramineae (Poeae)	Naturally Uncommon	pygmy poa
<i>Podocarpus cunninghamii</i> (previously <i>P. hallii</i>)	Podocarpaceae	Not threatened	Hall's totara
<i>Podocarpus nivalis</i>	Podocarpaceae	Regionally Significant	snow totara
<i>Polystichum vestitum</i>	Dryopteridaceae	Not threatened	prickly shield fern
<i>Ranunculus amphitrichus</i>	Ranunculaceae	Not threatened	waoriki
<i>Ranunculus brevis</i>	Ranunculaceae	Declining	
<i>Ranunculus foliosus</i>	Ranunculaceae	Not threatened	
<i>Ranunculus gracilipes</i>	Ranunculaceae	Not threatened	
<i>Ranunculus maculatus</i>	Ranunculaceae	Naturally Uncommon	
<i>Ranunculus multiscapus</i>	Ranunculaceae	Not threatened	
<i>Raoulia australis</i>	Asteraceae	Not threatened	scabweed
<i>Raoulia glabra</i>	Asteraceae	Not threatened	
<i>Raoulia grandiflora</i>	Asteraceae	Not threatened	
<i>Raoulia hectorii</i>	Asteraceae	Not threatened	scabweed
<i>Raoulia subsericea</i>	Asteraceae	Not threatened	
<i>Rosa rubiginosa</i>	Rosaceae	Exotic	sweet briar
<i>Rumex acetosella</i>	Polygonaceae	Exotic	sheep's sorrel
<i>Rytidosperma pumilum</i>	Gramineae (Danthonieae)	Not threatened	
<i>Rytidosperma setifolium</i>	Gramineae (Danthonieae)	Not threatened	
<i>Salix fragilis</i>	Salicaceae	Exotic	crack willow
<i>Schoenus pauciflorus</i>	Cyperaceae	Not threatened	bog-rush
<i>Scleranthus brockiei</i>	Caryophyllaceae	Not threatened	
<i>Scleranthus uniflorus</i>	Caryophyllaceae	Not threatened	
<i>Stellaria gracilentia</i>	Caryophyllaceae	Not threatened	
<i>Stellaria media</i>	Caryophyllaceae	Exotic	chickweed
<i>Taraxacum magellanicum</i>	Asteraceae	Not threatened	native dandelion
<i>Trifolium arvense</i>	Fabaceae	Exotic	haresfoot trefoil
<i>Trifolium dubium</i>	Fabaceae	Exotic	suckling clover
<i>Trifolium repens</i>	Fabaceae	Exotic	white clover
<i>Uncinia fuscovaginata</i>	Cyperaceae	Not threatened	
<i>Urtica aspera</i>	Urticaceae	Naturally Uncommon	grassland nettle
<i>Veronica verna</i>	Scrophulariaceae	Exotic	spring

			speedwell
<i>Vicia sativa</i>	Fabaceae	Exotic	vetch
<i>Viola cunninghamii</i>	Violaceae	Not threatened	
<i>Wahlenbergia albomarginata</i> subsp. <i>albomarginata</i>	Campanulaceae	Not threatened	harebell

4.4 PHOTOGRAPHS

4.4.1 Landscape Photos

Landscape Unit 1 (LU1)



Photo 1: Flattened tailings within lower Thomsons Creek close to Thomsons Gorge Road.



Photo 2: Alluvial flat within lower Thomson Creek. Old gold workings, a stone hut and modified vegetation patterns are the main features.



Photo 3: Thomson Creek looking SW. Scattered short tussock, exotic pasture and hawkweed on the valley floor and extensive shrubland/briar mix on the lower slopes.



Photo 4: Gully shrubland lower Thomson Creek.



Photo 5: View west lower Thomsons Creek. Modified vegetation patterns on valley floor and lower slopes.



Photo 6: Lower Thomson Gorge looking west to Mt Moka.



Photo 7: Thomson Gorge faces are generally degraded with extensive hawkweed and bare ground.



Photo 8: Tussock hawkweed and bare ground at around 1200m.



Photo 9: View west. Groundcover dominated by speargrass, blue and hard tussock. Pisa Range in distant background.



Photo 10: View SE below Mt Moka of lower Thomson's Creek. Thomson Gorge Road on left.

Landscape Unit 2 (LU2)



Photo 11: View SW across northern end of the summit plateau. Gravel, low cushion/herbfield and scattered clumps of low snow tussock are the main vegetation patterns.



Photo 12: Expansive views east across the low relief of the summit plateau to the range and basin landscape of Central Otago



Photo 13: Shallow ephemeral pond near Point 1301m



Photo 14: Snow tussock is greater within the shelter of incised gullies. Small wet zones contrast with snow tussock and herbfield.



Photo 15: Continuous snow tussock within one of the incised gullies on the eastern edge of the plateau.



Photo 16: View NE across the summit plateau with the Hawkduns Mountains in the background. Tall tussock is intact in this mid section of the summit.



Photo 17: Cushion/herbfield towards the SE edge of the plateau. Scattered tors rising above the plateau surface are a feature here.



Photo 18: The access track is the only man- made feature. Naturalness is high in a landscape context.



Photo 19: The 'domed summit' at the southern end of the lease with well developed soil hummock and extensive cushion/herbfield. Views are expansive and spectacular.



Photo 20: View NW looking into the head of the infaulted Thomson Creek



Photo 21: View west from the edge of the Fault scarp across cushion/herbfield.



Photo 22: The undulating rolling surface of the plateau leading up to the southern high point.



Photo 23: View NE from the head of Thomsons Creek. Extensive low cushion/herbfield emphasises the underlying landform.

Landscape Unit 3 (LU3)



Photo 24: View west of tributary leading down off the summit plateau at transition from summit plateau to the upper fault scarp of the southern (east face) of the Dunstan Mountains.



Photo 25: View south to Alexandra basin. Distinctive ridge and gully landform leading down the front face with extensive rock outcrops and tors and reasonably intact snow tussock.



Photo 26: Large rock tors and outcrops are a feature at the edge of the plateau and scarp face.



Photo 27: Natural processes and patterns on the upper portion of the Southern Dunstan Mountains represent an intact natural landscape.



Photo 28: Transition area from summit plateau to escarpment face is an extremely diverse area of cushion/herbfield, wetlands and peat bogs, gravel and rubble areas and rock tors on the skyline silhouette.



Photo 29: View south towards Alexandra at edge of plateau.



Photo 30: Boulders and rubble and wetlands are associated with headwater streams within the dominant cushion/herbfield.



Photo 31: Rock stacks and wetlands are a feature on the south east sector of the lease.



Photo 32: View from Ida Valley – Omakau Road. Matakanui Pastoral Lease occupies the upper scarp face and summit.

4.4.2 Historic Photos



Photo 33: View north-east to shepherds hut (GPS 079) with herringbone tailings in foreground (GPS 084).



Photo 34: Shepherds Hut (G41/631) true left Thomsons Creek



Photo 35: View over gold mining field downstream of hut (G41/631) to right of photo, Thomsons Creek. Herringbone tailings lie above hut on opposite side of Creek.



Photo 36: Lower Rise and Shine water race diversion Thomsons Creek (G41/584; GPS 69).

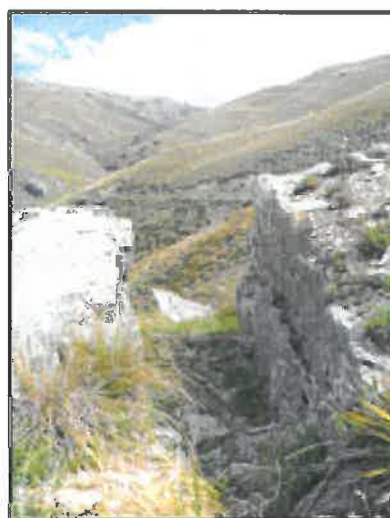


Photo 37: Lower Rise and Shine cut through rock outcrop (GPS 72).



Photo 38: Hut site (GPS 92).



Photo 39: Hut site (G41/635; GPS 102).



Photo 40: Herringbone tailings (G41/636;GPS 85).



Photo 41: Rice bowl fragment showing makers mark.



Photo 42: Trig station 'R' (G41/637; GPS 107).