Toitu te Land whenua Information New Zealand

Crown Pastoral Land Tenure Review

Lease name : Mt Creighton

Lease number : Pc 107

Conservation resources report

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

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

Copied June 2003

DOC CONSERVATION RESOURCES REPORT ON TENURE REVIEW OF

MOUNT CREIGHTON PASTORAL LEASE

and

Neighbouring FREEHOLD and CROWN LAND

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PART 1

INTRODUCTION

1.1

Mount Creighton Pastoral Lease (PL) and neighbouring areas were inspected on the 4 -8 March 2002 as part of a review of the pastoral lease tenure. This tenure review is being undertaken under the provisions of the Crown Pastoral Land Act 1998. As part of this process, a range of specialists in the assessment of inherent values have visited the property and have contributed to this report.

Mount Creighton (Note the mountain located on the property is spelt Mt Crichton) homestead is located approximately 38 km west of Queenstown on the Glenorchy–Queenstown Road. The lease fronts onto Lake Wakatipu with the rear of the property being bounded by the Moke and Moonlight Creeks.

Mount Creighton PL totals 15780 ha. The property includes several small separated areas. Two parts are near the homestead (15.7421 ha and 0.0740 ha) with another adjacent to the main Queenstown Road near Twelve Mile Creek (1.7509 ha).

Neighbouring freehold (FH) land under the same ownership and neighbouring unused Crown land (UCL) has also been included in this report.

Neighbouring freehold land is in two titles, (CT 8C/1288, 16.4202ha and CT 7B/623, 18.7192ha) near the homestead at Meiklejohns Bay. A further 8.4175ha of freehold land is located in the Moonlight Catchment but has not been reported on.

Neighbouring Crown land includes Sec 3, Block XIII, Mid Wakatipu S.D, 12.9434 ha, and Section 1, SO 23098 comprising 22.11 ha. The former is located behind the homestead area, within the pastoral lease and the latter is located on the north-western corner of the property, above the Glenorchy – Queenstown Road.

Mount Creighton as refered to in the text refers to all tenures (PL, FH and UCL).

Adjoining land administered by DOC includes:
- Wakatipu lakeshore shrublands - Conservation Area.
- Twenty-five Mile Recreation Reserve.
- Meiklejohns Bay – small terrace face – Conservation Area
- Twelve Mile Scenic Reserve.
- Marginal Strips – Lake Luna, Moke Creek and Moonlight Creeks.

The property is in the Lakes Ecological Region and the Richardson and Shotover Ecological Districts. No Protected Natural Areas Programme survey reports have been completed for these ecological districts.

PART 2

INHERENT VALUES: DESCRIPTION OF CONSERVATION RESOURCES AND ASSESSMENT OF SIGNIFICANCE

2.1 LANDSCAPE

Location and Landscape Context:

Mount Creighton is located west of Queenstown. It is bounded by Moke Creek, and Moonlight Creek, extending west to Lake Wakatipu and including part of the Richardson Mountains. This large land area is typical of mountain lands west of Queenstown with steep, rugged and very broken and dissected mountains. Rock outcrops and bluffs are common at all elevations. Dark gorges and rugged tributaries containing beech forest, with subalpine shrubland and tussock higher up are significant features. Mount Creighton also includes a large section of lake face on Lake Wakatipu above the Glenorchy-Queenstown Road.

Mount Creighton is located in a transition area between the drier Central Otago block mountain ranges and the wetter western ranges east of the main divide. The eastern zone of the Mount Creighton drains via the Moonlight and Moke Creek to the Shotover River and northern and western areas drain to Lake Wakatipu. The Moonlight Fault is a significant geological feature, which bisects Mt Crichton and represents a zone of younger sedimentary rock within an area of high-grade schist. The schist basement rock is responsible for a strong imprint on the character of the land.

Methodology:

Mount Creighton is divided into landscape units (LUs). For each unit a landscape character description is provided along with a description of the key visual and scenic attributes present. An evaluation summary is then presented using a range of criteria to assess each unit and assist with determining each unit's significant inherent values. The criteria include:

1. Intactness: - refers to the condition of the natural vegetation, patterns and processes and the degree of modification present.

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

3. 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.

4. Historic Factors - refers to historically valued attributes in the context of a high country landscape.

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

6. Significance - is the significance of the characteristics and features, or combination of characteristics and features within individual units. If they are locally, regionally or nationally significant.

7. Vulnerability - is a measure of each landscape unit's susceptibility to further ecological deterioration, which would impact on landscape values.

Landscape Units:

Mount Creighton is broken into five landscape units (refer map1) as follows:

LANDSCAPE UNIT 1 (LU1) –Lake Faces:

Character Description:

The Lake Faces divide into three sections. The two largest sections are from Rat Point to the Twenty-four Mile and from the Twenty-five Mile to Shepherds Hut Creek. The third is a small section between the Twenty-four and Twenty-five Mile Creeks.

Between the Twenty-four and Twenty-five Mile Creeks, fans and terrace formations are significant features. Beech and shrubland line the waterways and terrace faces with open pastureland and patches of manuka shrubland.

The remainder of the Lake Faces include old lake benches and terraces close to the lake with steep mountain slopes above. Glaciation has left its mark in ice scraped sides; lumpy ice sculptured landform (eg: Wee Geordie) and bare rock. Numerous watercourses are incised into steep bedrock.

The Lake Faces have a diverse range of vegetation types. They are also some of the most modified areas of Mount Creighton. Vegetation is a mix of bracken fern, short tussock and exotic grasses and legumes, bracken fern and manuka/broadleaf shrubland, and pockets of beech associated with gullies and steep areas. Above a bracken/shrubland zone is usually a short tussock belt, which grades into tall tussock higher up. The high altitude tall tussock (above 900-1000metres) is generally fairly uniform and in good condition.

There are significant patches of actively regenerating shrubland along the entire length of the Lake Faces. The largest and most significant areas are east of Bennetts Bluff and west of Rat Point. The areas of emergent and remnant shrubland are very important to landscape character.

Visual & Scenic Values:

The Lake Faces are the most visible part of Mount Creighton being viewed from parts of the Glenorchy-Queenstown Road, (an important scenic road) from on the lake, and from the Wakatipu Islands. These faces are also very visible by the high number of aircraft that fly up the lake.

The Lake Faces are also important in terms of being part of the physical and visual enclosure to Lake Wakatipu over a substantial length of the upper arm (north side) of the lake (approx

16 kilometres). The remnant shrublands and tussock lands are important to visual values as well to landscape character. The shrublands above the road are also important in the context of the existing lakeshore reserves. Shrubland above and below the road is preferable in a landscape sense to only on one side of the road (ie: to form a corridor effect).

The view from Bennetts Bluff to the head of the Lake, taking in the Twenty-five Mile fans and terraces and the distinctive pattern of open pasture, beech and shrubland remnants, as well as a large chunk of the western Lake Faces are an important part of this famous view. In some sections of the Lake Faces natural patterns are disrupted by the effects of burning and grazing. This has impacted on intactness and naturalness which also detracts from visual and scenic values (depending on the perception of the viewer).

This unit has a high level of visual sensitivity due to the high visibility. Landscape changes such as vegetation clearance, tracking, buildings and structures have the potential to impact adversely on landscape values.

Evaluation Summary:
Table 1

Criteria	Value	Comment
Intactness	Medium	Lower Lake Faces are modified, though significant and emerging areas of shrublands remain. Tall tussock belt fairly uniform.
Legibility	High	Underlying landform processes highly legible.
Aesthetic Factors	High	Part of lake visual enclosure. Dramatic landforms and lake basin setting are visually impressive. Disrupted natural vegetation patterns reduces coherence.
Historic Factors	Low	Not significant.
Visibility	High	Large areas visible from Glenorchy-Queenstown Road. Highly visible from the lake, the air, and Wakatipu Islands.
Significance	High	Part of Wakatipu lake basin nationally recognised as having outstanding landscape values.
Vulnerability	Medium	Upper tussock zones and lowers shrubland remnants vulnerable to further ecological degradation. Tracking/roading, structures, rural subdivision have potential to degrade landscape values in open areas.

LANDSCAPE UNIT 2 (LU2) – Twenty-five Mile Creek.

Character Description:

This very steep and rugged unit includes the Twenty-four Mile and Twenty-five Mile Creeks and tributaries (Reidys Creek) below Mt Crichton.

The catchment is dominated by extensive montane beech forest, which has been preserved within dark gullies and draining west to Lake Wakatipu. Manuka, with sub alpine shrub and tussock land extending to the ridgeline are also characteristic. Beech is slowly expanding its boundaries. *Hebe*, snow tussock and *Dracophyllum* are notable within the sub alpine shrubland zone.

North and west faces above the lower end of Twenty-five Mile (on the true left) above and below the access track have been burnt and grazed and are more modified than the majority of the unit. Introduced pasture species, bracken, patches of spanish heath and manuka occur here. Visually the pattern of vegetation in these modified areas is similar to the Lake Faces. The upper mountains and ridge tops have extensive bare rock and scree. Slumping is common.

The Twenty-five Mile Range creast leading up to Ben More forms a long and distinctive spur with a jagged and rocky skyline.

Visual & Scenic Values:

Like most of Mount Creighton, this unit contains significant visual values as a result of the rugged, wild and steep character of the land, and the natural character and pattern of the vegetation. The large areas of beech forest sub-alpine and alpine shrubland zones and tussock set within this rugged catchment is visually impressive. The contrasting textures, colours and patterns of beech; tussock and sub alpine shrubland contribute to the units high scenic quality. Above the beech, views to surrounding ranges and Lake Wakatipu are spectacular and highly memorable.

The majority of the unit is visually very coherent due to the level of intactness. The lower more modified slopes towards the lake rate less highly due to a degree of fragmentation of indigenous vegetation patterns.

Evaluation Summary:
Table 2

Criteria	Value	Comment
Intactness	High	High over majority of unit. Reduced in lower catchment east of Big Geordie.
Legibility	Medium to High	Large areas of beech forest mask underlying landform.
Aesthetic Factors	High	High level of coherence apart from disrupted vegetation patterns in lower

		catchment. Rugged landforms combined with vegetation patterns and views are visually impressive.
Historic Factors	Low	
Visibility	Low to medium	Parts are visible from the Lake Wakatipu and Glenorchy-Queenstown Road. Frequently viewed from the air.
Significance	High	High natural values associated with large areas of beech forest, tussock and alpine areas.
Vulnerability	Medium	

LANDSCAPE UNIT 3 (LU3) – Luna:

Character description:

This unit includes the catchment surrounding Lake Luna, Luna Creek and tributaries including Crush Creek.

Dukes Tarn and Lake Luna are nestled within a small montane valley beneath Twenty-five Mile Range and Ben More. The Lake is at 810 metres and set within a predominantly tussock landscape but includes expanding pockets of beech, manuka shrubland, and sub alpine shrubland. The landform around Luna is characteristically lumpy and rippled – the result of both glaciation and mass movement. North of Lake Luna is a small alluvial and bouldery valley floor consisting of fans and alluvial deposits. Tussock within the Luna catchment is generally in very good condition. The visual effects of pastoralism on tussock cover are very localised. Tall tussock is depleted on knobs and many lower sunny faces, toe slopes and the valley floor. The character of this montane valley in landscape terms remains distinctly natural.

The high basins above Luna (eg: Luna Basin) appear to be highly natural. Luna Creek flows north through a gorge, which becomes increasingly wild, rugged and rocky towards Moonlight Creek. Rock outcrops, bluffs and rock buttresses occur at all altitudes. The vegetation mix includes a diverse range of tussock, manuka, beech, sub alpine shrubland, matagouri and exotic grasses and herbs. Manuka is dominant on steep very rocky slopes and gullies.

Crush Creek contains similar characteristics. Small pockets of beech occur within tussock and sub-alpine shrubland.

Other common characteristics within Luna Creek and tributaries include massive slips and slumping, boulders and schist slabs. The lower end of Luna Creek is deeply incised with beech extending right down to the rivers edge. Tussock and manuka are also extensive. The whole of the Luna unit contains remote backcountry characteristics.

Visual & Scenic Values:

The Luna catchment is visually highly impressive derived from the inherent natural character of the landscape. The characteristics, which contribute to these high visual values, include:

- the presence of waterbodies (Lake Luna and Dukes Tarn) set within a sub alpine montane basin.
- The impressive array of landforms derived from glacial, fluvial, and mass movement processes including ice sculptured lumpy landform, fans and ripply slump topography.
- Impressive views to rugged ranges and peaks including Mount Larkins, Major Peak and Ben More.
- The diverse range of vegetation types from tussock to subalpine and alpine shrubland, and montane beech forest.

Crush Creek and Luna Creek contain similar high visual values. The wild and rugged landform of steep slopes, rocky bluffs, and gorges also contribute to the high scenic values of this part of the unit.

Evaluation Summary:
Table 3

Criteria	Value	Comment
Intactness	High	Overall high. Snow tussock depleted in localised areas.
Legibility	High	Landform processes very legible.
Aesthetic Factors	High	High level of coherence. Lake Luna and Dukes Tarn in their montane tussock setting are highly distinctive and memorable.
Historic Factors		Cultural values associated with mustering and recreation.
Visibility	Low	Viewed most frequently from the air being close to Queenstown.
Significance	High	Important lake within subalpine tussock basin
Vulnerability	High	Existing character vulnerable to any physical or land use changes.

LANDSCAPE UNIT 4 (LU4) – Moonlight /Moke:

Character Description:

This large unit extends from Ben More north and east to Moonlight Creek as well as the tributaries and south faces above Moke Creek. The unit includes several large tributaries, including Moke Creek Right Hand Branch, Gills Creek, Dead Horse Creek, and Butchers Creek. The unit also includes the Moonlight terrace formations at the east end of Mount Creighton. As with much of Mount Creighton, it is very rugged, steep, dissected, and similar in many respects to the western end. The main difference is likely to be the result of a rainfall gradient from east to west. East of Ben More appears somewhat drier.

There are the same very rocky and bluffy features at all elevations. Tussock is the dominant vegetation. Eastern tributaries have extensive areas of manuka shrubland and tussock on the sunny dry faces and usually beech associated with deep gullies and dark faces.

The upper section of Moonlight Creek is an extremely rugged and wild area. Steep to precipitous slopes, massive bluffs and rock buttresses, schist slabs, large slumps and scarps are characteristic of the Moonlight gorge. Burning and grazing has modified vegetative cover on the north sunny faces, basins and ridges. Manuka shrubland is extensive over large tracts. Pockets of beech, grey shrubland, short tussock grading into snow tussock, and nearer the river introduced species brought in by the miners and pastoralists are part of the mix.

Upper Moonlight Creek (as with the whole of the Moonlight) is rich in gold mining history with tailings, old huts, water-races, stone retaining walls and elaborate fluming clinging precariously to sheer rock faces.

The Moonlight terraces sit above the Moonlight lower gorge with features reminiscent of Skippers Canyon. The terraces are a significant landform feature and consist of predominantly browntop, scattered short tussock and low native herbs and grasses. The scale and openness of the terraces is also a feature.

The tributaries of Dead Horse Creek and Butchers Creek are incised into the terrace formations.

Tailings, sluice faces, water- races and dams are important historic/cultural features associated with the terraces. Naturalised exotic conifers and deciduous trees and briar occur on the terraces above the junction of Moke and Moonlight Creeks.

The south faces and tributaries above Moke Creek are also very steep and broken topography with extensive bare schist rock and matagouri/briar shrubland with snow tussock becoming more dominant higher up. The tributaries of Gills Creek, Alpha Creek, and Right Hand of Moke Creek are all very rugged with large tracts of beech forest and tussockland.

Nearer to Moke Lake the valley is more open with alluvial flats, low terraces and fan formations. These and the lower slopes between Moke Spur and Fan Creek are more modified. In these locations exotic species predominate, especially browntop.

Visual & Scenic Values:

This unit also has very high visual and scenic values, which is synonymous with the wild, rugged, and mountainous character of the unit. The whole area is visually very impressive. This impressiveness is derived from:

- The extremely rugged and steep mountain slopes with rock outcrops and bluffs at all altitudes.
- The diversity and pattern of vegetation including beech forest, tussock and shrubland and alpine communities.
- The historic/cultural dimension associated with Moonlight Creek and terraces including stonewalls, sluice areas, tailings, water races and fluming.
- The striking visual effects of the Moonlight terrace formations including their scale, openness, and grass cover.
- The visual values associated with the fans and valley floor of Moke Creek and its backcountry/montane setting.

Evaluation Summary:
Table 4

Criteria	Value	Comment
Intactness	Medium to high	Variable. High on upper elevations and in dark gorges and faces. Sunny faces and lower elevations are more modified but retain a natural character.
Legibility	High	Formative processes highly legible.
Aesthetic Factors	High	Landform and vegetation characteristics within whole of unit are highly distinctive and visually impressive. Moonlight terraces are a distinctive feature and highly scenic.
Historic Factors	High	Gold mining history very significant historic/cultural overlay within Moonlight and Moke Creeks.
Visibility	Low to medium	Moonlight terraces visible from Ben Lomond track.
Significance	High	Moonlight/ Moke is within an area generally regarded as having outstanding landscape values .
Vulnerability	Medium to high	Inherent fragility of land vulnerable to land use intensification or changes, wilding tree spread.

LANDSCAPE UNIT 5 (LU5) – Wire Creek:

Character Description:

Wire Creek is a mountainous remote area below Mt Larkins. It is a glacial valley terminating in a cirque basin below Mt. Larkins and Stone Peak. Glacial and peri-glacial features occur in the upper basin. Further down valley montane beech forest occurs within dark gullies and tributaries with snow tussock and sub alpine shrubland. Natural characteristics are entirely intact. There are little or no obvious signs of human intervention in this unit.

Visual & Scenic Values:

This truly alpine area has inherently high visual values derived from the sheer ruggedness and alpine grandeur of this unit, dramatic and impressive landforms and natural vegetation patterns.

Evaluation Summary:
Table 5

Criteria	Value	Comment
Intactness	High	Highly natural and intact
Legibility	High	Formative processes highly legible
Aesthetic Factors	High	Very coherent
Historic Factors	Low	
Visibility	Low	
Significance	High	Includes part of alpine zone of the Richardson Mountains
Vulnerability	High	Fragile alpine area

Significance of Landscape:

Mount Creighton contains very high landscape values throughout. Two categories are identified:

High Inherent Natural Landscape Values:

This includes all of the steep rugged and mountainous country that makes up a large area of Mount Creighton. It includes all the high alpine lands, tussock and sub-alpine basins, steep mountain slopes, and large tracts of beech forest. These areas retain their natural character and contain high levels of intactness and naturalness.

The high landscape values contained in these areas are in summary derived from the following characteristics and features:

- The impressive landform characteristics consisting of high alpine zones and steep and highly dissected mountainous lands with rock outcrops at all elevations.
- The intactness, naturalness and scenic values associated with the vegetation cover and patterns, including alpine and sub alpine plant communities, extensive tussock, large tracts of montane beech forest and shrubland.
- The remote backcountry characteristics.
- The high legibility of the landform.
- The impressive views to Lake Wakatipu, the Richardson Mountains and surrounding ranges and peaks from many locations.
- The water bodies of Lake Luna and Dukes Tarn and their spectacular montane/backcountry setting.

High Inherent Landscape Values:

These areas are generally more culturally modified but still retain high inherent landscape values. They include, the Moonlight terraces and upper Moonlight Gorge, Luna Creek valley floor, Moke Creek valley floor and adjacent hill slopes, and the Lake Faces.

These areas retain most of the same characteristics as in the first category, except that vegetation cover is generally more modified but retain significant natural character. The additional components or features that relate to these areas include:

- In the Moonlight and Moke early mining has contributed an additional cultural component to the landscape. Many of the historic mining features (sluice faces, dams, stone revetments and buildings etc) and their setting are visually impressive.
- The Moonlight terraces are visually very impressive. Their distinctive gently sloping landform and (combined with predominantly low grass cover and open character) are in stark contrast to the steep mountainous terrain around them.
- The Moonlight gorge is exceptionally wild, rugged and scenic with steep to precipitous slopes, massive bluffs, rock buttresses, slumps and scarps and predominantly native vegetation.
- The Lake Faces, while probably the most modified are important in a landscape context. They form a major part of the visual enclosure of the western arm of Lake Wakatipu and are also the most visible part of Mount Creighton. The areas of native vegetation associated with the road corridor, watercourses and other areas are important to landscape character and identity of the Upper Lake Wakatipu landscape and to the appreciation of the Glenorchy-Queenstown Road.

2.2 LANDFORMS & GEOLOGY

The geological features on Mount Creighton reflect in an outstanding manner the major geological events that have happened in Otago, and the whole of New Zealand. These events include the formation of the Haast schist from marine and volcanic sediments during the

Rangitata Orogeny, the period of erosion which lead to a low lying peneplain in Otago, formation of Lake Manuherikia over much of Central Otago and invasion of the sea from the west to Bobs Cove, mountain building of the Kaikoura Orogeny and glaciations associated with the recent ice age.

Basement rocks on Mount Creighton are predominantly schist, metamorphic rocks of the Caples terrane (derived from volcaniclastic sandstone and siltstone) and Rakaia terrane (variably schistose to non-schistose quartzofeldspathic sandstone ('greywacke') interbedded with mudstone ('argillite')) (Turnbull 2000, Turnbull and Forsyth 1988). The boundary between these terranes runs through the western part of the property (Turnbull 2000). They were originally juxtaposed along a complex fault zone during the Jurassic to Cretaceous collision event and the boundary is not sharply defined, and has been overprinted by thrust faults (Turnbull 2000). This overprinting is notable in the vicinity of the Moonlight Fault in the south-eastern corner of Mount Creighton.

The Moonlight Fault traverses Mount Creighton from west of Moke Lake, through Dead Horse Creek, Butchers Creek and Moonlight Creek to the east of Mt Gilbert (see Fig 18 in Turnbull and Forsyth 1988), and separates different metamorphic grades of schist (Turnbull and Forsyth 1988, Park 1909). It is a major fracture in the Earth's crust, and is a geological feature of international significance (Turnbull and Forsyth 1988) because of the lenses of marine sediments along the fault line. The sediments were deposited in the 'Moonlight Sea' which formed during the Oligocene, when rocks on the western side of the fault sank below sea level (Turnbull and Forsyth 1988). Further movement on the fault dragged sediments into the schists. The fault has been over-ridden and obscured by glaciers, but has been active in recent times and has disrupted glacial deposits (Turnbull and Forsyth 1988). It exerts little effect on the topography (Goodyear 1966). The crush zone is relatively narrow, and can be as little as 10-20m wide, for example where it is exposed at an accessible site in Fan Creek (see Turnbull and Forsyth 1988). Other exposures are at Dead Horse and Moonlight Creeks. From early Miocene times the area west of Wakatipu was being uplifted, and this intensified into a major mountain building phase (the Kaikoura orogeny) 2-3 million years ago, which has resulted in the Southern Alps and other mountain chains. This is represented on the property by Mt Crichton and Williamson spur, Twenty-five Mile Range (including Ben More) and the southern end of the Richardson Mountains (slopes of Mt Larkins).

Glaciation during the recent (Pleistocene) ice age had impacts on the Queenstown area from 50,000 BP (before present) until less than 18,000 BP. There is evidence for at least four ice advances (Turnbull and Forsyth 1988). During the earlier stages most of Mount Creighton would have been covered by a sheet of ice, which was up to 1000m above the present lake level (Turnbull and Forsyth 1988). At later stages a stream of ice from the Wakatipu glacier flowed through Twenty-five Mile Creek into the Luna basin and down Moonlight Creek.

There is ample evidence on the property of ice erosion features, and subsequent peri-glacial and post-glacial erosion. These include lateral moraines and terraces which occur on the faces above Lake Wakatipu and widespread landslides which can be visible as hummocky ground, for example above Lake Luna. Lake Luna is a glacial-cut lake and on the slopes above this lake there are many ice-cut terraces which are considered to be an exceptionally good example of this phenomenon (Park 1909).

Mineral lodes on the property include gold, copper, zinc and serpentinite, which were derived from the parent sedimentary or volcanic rocks of the Haast schist. These minerals were

concentrated during the process of metamorphism. Copper is found at the surface at Moke Creek, Dead Horse Creek and near Lake Luna (Turnbull and Forsyth 1988). The Moke Creek copper has been mined but was never economic. Alluvial gold mining has been carried out over a long period throughout Moonlight Creek. The gold in this river gravel has been eroded out of the lodes by natural processes.

An interesting feature of the Twenty-five Mile Creek is the deep slotted gorge in its lower reaches. It has a stock bridge built over the narrow gap at the top.

Significance of Landforms and Geology:

The Moonlight Fault is a major fracture in the Earth's crust, and is a geological feature of international significance (Turnbull and Forsyth 1988) because of the lenses of marine sediments along the fault line.

Exposure of the Moonlight Fault at Fan Creek is ranked as regionally important (Arnard *et. al* 1991). It is listed in the 'Inventory of important geological sites and landforms in the Otago Region' (Kenny and Hayward 1993) as the most easily accessible exposure of the Moonlight Fault, and ranked C3 (regionally important, and unlikely to be damaged by humans).

Moke Creek greenschist copper deposit, ranked regionally important (Arnard *et. al* 1991) is also listed in Kenny and Hayward (1993), as one of the very few pre-metamorphic metalliferous occurrences in the Otago schist and ranked C3.

Glacial-cut terraces above Lake Luna are ranked as a regionally important example of this phenomenon and are moderately vulnerable to damage by humans (I. Turnbull, pers. comm.).

A post-glacial phenomenon relevant to land use is the effect of widespread landslides which can be visible as hummocky ground, for example above Lake Luna. These areas may be unsuitable for grazing (I. Turnbull pers.comm.).

2.3 CLIMATE

The Lakes region has a semi-continental type climate, with warm but variable summers and cold winters. Frosts can occur throughout the year. Winters bring intermittent snow to lower parts of the property. Snow can lie for over 4 months at higher altitudes, up to the permanent snowline. Frosts and snow are more frequent and more severe in the Moonlight catchment. Rainfall at the homestead is about 825 mm, and increases in north western parts of the property. The property experiences frequent high winds, especially at higher altitudes.

2.4 VEGETATION

Description:

Parts of the vegetation description include numbered photos from Appendix 6.
The vegetation description has been geographically split as follows:

Wire Creek:

The vegetation of Wire Creek is in excellent condition, particularly when compared to that in the more modified Luna Basin in the adjacent valley. Wire Creek is no longer grazed by stock although goats and fallow deer are present. The rocky ridgeline is extremely steep and broken with screes and fellfield below (photos 1-2). The vegetation here is sparse with cushion plants such as *Dracophyllum muscoides, Raoulia hectorii, Kelleria childii, K. croizatii, Hectorella caespitosa, Abrotanella inconspicua, Anisotome imbricata* and other herbs, grasses and rushes including *Poa colensoi, Luzula pumila, Ourisia glandulosa, Celmisia angustifolia, Raoulia grandiflora, Gentiana divisa, Ranunculus pachyrrhizus* and several lichens and mosses. A small snow bank contains additional species including *Carex pyrenaica, Epilobium tasmanicum, Raoulia subulata, Coprosma niphophila, Celmisia sessiliflora* and *Phyllachne colensoi.*

Lower, scattered plants of slim snow tussock (*Chionochloa macra*) appear and the golden rush (*Marsippospermum gracile)* dominates cold damp slopes. The scree willow herb (*Epilobium pychnostachyum)* occurs on stable scree. *Leptinella pectinata* subsp *wilcoxii, Chionohebe densifolia, Colobanthus buchananii, Koeleria cheesemanii, Polystichum cystostegia* and *Agrostis muelleriana* are found in stony and bouldery places along with *Hebe buchananii, Dracophyllum pronum, Aciphylla lecomtei* and *Aciphylla kirkii.*

Below about 1700 m grasses become more prominent with slim snow tussock, blue tussock (*Poa colensoi*) and *Rytidosperma pumilum* with *Celmisia lyallii, Viola cunninghamii, Brachyglottis bellidioides, Carex wakatipu, Luzula rufa, Hebe hectorii, Pimelea oreophila, Acaena saccaticupula* and *Wahlenbergia albomarginata* (photos 4-5). The large speargrass, *Aciphylla* "lomond" occurs as scattered plants in rocky areas in the grassland (photo 3). Seepage areas may contain *Schoenus pauciflorus, Plantago lanigera, Celmisia haastii, Carex edgariae, Trisetum* sp., *Deschampsia chapmanii, Rytidosperma nigricans, Isolepis aucklandica, Psychrophila obtusa, Gaultheria nubicola, Coprosma perpusilla, Hydrocotyle montana* and *Euphrasia* sp. cushion.

On south and east facing rocky faces and ribs *Dracophyllum uniflorum* is prominent; below about 1500 m narrow-leaved snow tussock (*Chionochloa rigida*) dominates the grassland with a cover of up to 90% in places. Hard tussock (*Festuca novae zelandiae*) and blue tussock are prominent along stream edges with *Dolichoglottis lyallii, Geum parviflorum, Muehlenbeckia axillaris, Coprosma atropurpurea* and *Epilobium brunnescens.* On fine, wet screes along stream edges and adjacent slopes are found *Poa schistacea, Festuca madida, Gingidia decipiens, Ourisia caespitosa, Trisetum lepidum, Lachnogrostis striata* and *Craspedia* sp. Shrubs appearing in the grassland include *Hebe anomala, Coprosma cheesemanii,* with *Hebe pauciramosa* in wetland and *Myrsine nummularifolia* around boulders. Shrubs on bouldery slopes below about 1300 m include *Coprosma ciliata, Olearia moschata, Coprosma propinqua, Brachyglottis revoluta, Coprosma* "alpina", *Hebe anomala, Olearia cymbifolia* and *Brachyglottis cassinioides.* Grasses included *Hierochloe recurvata* and *Agrostis petriei* with *Epilobium chloraefolium, Acaena profundeincisa* and *Astelia nervosa.* Typical cover at 1200 m near the valley bottom is tall narrow-leaved snow tussock at nearly 100% cover with scattered *Dracophyllum uniflorum* and *Aciphylla* "lomond", *Celmisia lyallii* and a few small herbs such as *Raoulia subsericea* and *Geranium microphyllum,* and the club moss *Lycopodium fastigiatum.*

The occasional bog or wetland typically contains *Oreobolus pectinatus, Nertera balfourlana, Gaultheria parvula, Ranunculus gracilipes, Plantago uniflora, Schizeilema cockaynei, Nertera ciliata, Celmisia glandulosa, Ranunculus royi, Carex gaudichaudiana* and mosses.

Just above the bush line the *Brachyglottis cassinioides* shrubland contains *Hoheria lyallii* and *Phyllocladus alpinus*. Other plants on the side of a small gorge are *Myosotis macrantha, Helichrysum intermedium, Luzula rhadina, Acaena juvenca, Rytidosperma setifolium, Raoulia glabra* and *Epilobium melanocaulon.*

Luna Basin and Creek:

The head of Luna Basin is similar to that of Wire Creek. Scree slopes fall away from the jagged, rocky ridgeline (photo 11) with sparse vegetation until lower, less steep ground where cushion fields and grassland take hold. Grazing appears relatively heavy in this valley, especially in the chewed down tall tussockland below about 1600 m (photo 16) and the numerous well-trodden stock tracks.

The upper scree slope and fellfield vegetation is similar to that in Wire Creek. *Haastia pulvinaris* and *Raoulia youngii* are found in the upper fellfield with cushion plants including *Chionohebe thomsonii. Marsippospermum gracile* is conspicuous in the upper herbfields (photo 11) as is *Gentiana divisa* in flower. In a snow hollow grows the snow patch tussock (*Chionochloa oreophila),* in places well chewed and with pulled out tillers. A large terrace area at 1650 m, formed by old slumping, is covered in sheep droppings with the tussock (slim and blue) almost grazed right out (photo 12/13). The ripple landscape below is well tracked with narrow-leaved tussock heavily grazed. In spite of the grazing, there is good species diversity although the unpalatable species such as *Celmisia lyallii, Dracophyllum uniflorum* and *Aciphylla* species are more evident.

Above about 1500 m on sunny slopes, slim snow tussock dominates the grassland, while below this narrow-leaved tussock dominates with a similar range of species as described for Wire Creek. Sweet vernal (*Anthoxanthum odoratum*) appears below about 1500 m with brown top (*Agrostis capillaris*) on damper sites such as along stream edges and small wetlands. Wetlands are well utilised by sheep and grazed short. Other plants include *Agrostis pallens, Euchiton traversii, Epilobium komarovianum, Colobanthus apetalus* and *Oreomyrrhis* "bog".

The lower Luna Basin (photos 9/10) is contained by a series of dissected, shrub-covered bluffs above grassy fans and terraces. The shrublands vary in composition and species dominance and contain a similar range of species to those in Wire Creek, including *Podocarpus nivalis, Hoheria lyallii* and *Coprosma* aff. *parviflora* and with *Dracophyllum longifolium* on the bluffs. The fans are generally dominated by brown top and sweet vernal but with patchy narrow-leaved tussock and hard tussock. Silver tussock (*Poa cita*) is sometimes prominent along stream edges and on young fans.

Forest fills the lower valley and south facing slopes below about 1100 m and lower on sunny north faces. The forest is mountain beech (*Nothofagus solandri* var. *cliffortioides*) with a sparse understorey of *Podocarpus nivalis, Hoheria lyallii, Coprosma propinqua, Coprosma* aff. *parviflora,* broadleaf (*Griselinia littoralis*) and ground layer of occasional ferns (*Polystichum vestitum, Hypolepis millefolium, Blechnum fluviatile, Blechnum penna-marina*)

and grasses and sedges such as *Uncinia uncinata*. The narrow-leaved tussock grassland reaches the valley floor at Luna Creek, 800 m (photos 10, 19).

At 1000 m on a north facing slope, narrow-leaved tussock has a cover of 40%, brown top and hard tussock 20%, and *Celmisia lyallii* 5%. There are a variety of small shrubs, herbs and grasses including *Pimelea oreophila, Gaultheria depressa, Ozothamnus vauvilliersi, Dracophyllum uniflorum, Hebe subalpina, Hebe anomala,* manuka (*Leptospermum scoparium*), *Gaultheria crassa, Leucopogon fraseri, Geranium sessiliflorum, Lycopodium fastigiatum, Raoulia subsericea, Celmisia gracilenta, Luzula rufa, Rytidosperma pumilum, Dichelachne crinita, Epilobium alsinoides* and *Carex kirkii*.

At 900 m on a steep, stony, north face tussock cover has dropped to about 20% with 15% bare ground and litter, *Celmisia lyallii* 10%, *Gaultheria crassa* 20%, *Dracophyllum uniflorum* 5% with hard tussock, blue tussock and a similar variety of smaller species to that above. An east face above Luna Creek at 880 m (photo 19) has a cover of 30 - 60% narrow-leaved tussock, hard tussock 10%, *Celmisia lyallii* 10%, *Gaultheria depressa* 15%, *Dracophyllum uniflorum* 10%, browntop 5% with sweet vernal, *Lycopodium fastigiatum, Raoulia subsericea, Hebe anomala, Aciphylla* "lomond", *Dracophyllum longifolium, Ozothamnus vauvilliersii* and cats ear (*Hypochoeris radicata*). The vegetation on the east faces above Lake Luna is similar with beech forest filling parts of the lower gullies and along the lake shore above Luna hut (photos 29, 30). Manuka is scattered across the slopes and *Olearia bullata, Hebe salicifolia* and *Coprosma rugosa* are found in the wetter grassland or in gullies, while *Phormium cookianum* and *Coriaria sarmentosa* occur around bluffs. *Aristotelia fruticosa* and wild gooseberry (*Ribes uva-crispa*) are found near Luna hut along with the only sweet brier (*Rosa rubiginosa*) noticed in the western half of the property.

Around Lake Luna are sedges including *Carex coriacea, C. kaloides* and *C. petriei* and *Eleocharis acuta* with a wetland herb *Hydrocotyle sulcata*. Browntop and sweet vernal with Yorkshire fog (*Holcus lanatus*) are the main cover at the north end of the lake and on the terrace top above the hut and as far as the fence. Above, there is good narrow-leaved tussock and hard tussock with *Dracophyllum uniflorum, Raoulia subsericea,* browntop, blue tussock, *Gaultheria depressa* and small herbs with scattered shrubs of *Dracophyllum longifolium, Hebe anomala,* mountain beech and cottonwood. The terrace riser has a range of more than 25 species of mainly native plants including mountain beech seedlings, *Coprosma* aff. *parviflora,* and manuka. The beech forest edge just above Luna hut provides a contrast between the heavily grazed and seldom grazed vegetation (Photo 38). Young beech is spreading out into the tussock above the fence and up slope.

<u>Lake Luna east faces, Crush Creek and Twenty-five Mile Range:</u>

North faces of the Twenty-five Mile Range (photo 25) are very steep with numerous, more or less vertical rock ribs. Shrubland of manuka etc is returning along the lower slopes with narrow-leaved tussock grassland covering most of the upper slopes except the exposed rock ribs. *Dracophyllum uniflorum* is prominent on south faces especially where rocky.

The vegetation of the rocky ridge tops varies from scattered cushion plants and blue tussock to patchy slim snow tussock to *Dracophyllum uniflorum* shrubland. Species include *Hebe buchananii, Koeleria youngii, Chionohebe densiflora, Kelleria villosa, Dracophyllum muscoides, Raoulia hectorii, Acaena saccaticupula, Celmisia lyallii, Epilobium tasmanicum, Chionohebe thomsonii, Scleranthus uniflora, Anisotome imbricata, Rytidosperma pumilum*

and *Gentiana divisa*, hard tussock, *Rytidosperma setifolia* and sheep's sorrel (*Rumex acetosella*).

At 1300 m on a 30° southwest face (photo 33) the cover is narrow-leaved tussock 60-75%, bare ground and litter 15%, *Dracophyllum uniflorum* 10%, *Celmisia lyallii* to 15%, *Leucopogon fraseri, Epilobium alsinoides, Rytidosperma pumilum, Poa colensoi, Luzula rufa, Agrostis petriei, Pimelea oreophila, Hebe hectorii, Lycopodium fastigiatum, Raoulia subsericea, Aciphylla* "lomond", lichens and moss. The steeper, rockier northeast face is more open and *Pentachondra pumila, Gaultheria depressa* and *Rytidosperma setifolium* can be common. The small shrub *Leucopogon suaveolens* and cottonwood (*Ozothamnus vauvilliersii*) occur as scattered plants. Occasional sheep's sorrel on open ridge tops is the only introduced species recorded above about 1100 m.

Similar vegetative cover occurs down to and generally below 1000 m on these slopes (photos 28, 28, 34-36). A periodically wet hollow at 1169 m (just visible in photo 29 where the right hand ridge broadens and flattens), has an edge of dead tussock, killed by persistent high water level. The central area is moss (*Polystichum* sp.) with *Carex gaudichaudiana, Juncus gregiflorus, Poa breviculmis, Rytidosperma pumilum,* browntop and sweet vernal.

Below about 1000 m narrow-leaved tussock varies from dense to scattered plants with sweet vernal common. Manuka patches appear with *Hebe anomala, Coriaria plumosa, C. sarmentosa* and in gullies, *Coprosma rugosa, Olearia bullata, Hebe salicifolia* and *Phormium cookianum*. The most open vegetation occurs on the steep, rocky and sunny north faces and spurs below 1000 m with narrow-leaved tussock 20%, *Raoulia subsericea* 20%, *Celmisia lyallii* 5%, *Pentachondra pumila* 15%, *Leucopogon fraseri* 10%, hard tussock 10%, *Rytidosperma pumilum* 5%, *Gaultheria depressa* 5%, lichens 10%, *Luzula rufa, Dichelachne crinita*, blue tussock and moss. *Oreobolus pectinatus* occurs on damp sites. Other plants of the lower tussock slopes are *Elymus solandri, Euchiton audax, Acaena caesiiglauca, Blechnum penna-marina, Holcus lanatus* and *Linum catharticum*. A steep west face at 870 m has a cover of narrow-leaved tussock of 60%, hard tussock 10%, sweet vernal 10%, *Raoulia subsericea* 20%, litter 10% with *Leucopogon fraseri, Epilobium atriplicifolium, E. chlorifolium, Gaultheria depressa, Linum catharticum,* cats ear, manuka and a few *Dracophyllum uniflorum.*

The vegetation of Crush Creek and slopes to the north appeared to be in similar condition to that described above.

Lake Wakatipu Faces:

- North of Twenty-five Mile Creek:

Good tussock cover of 50% or better is found on all of the Lake Wakatipu faces north of Twenty-five Mile Creek above the fence line at about 900 m. The vegetation and plant communities on this side of the ridge are similar to that on the Wire Creek and Luna Basin side (photos 40, 41). Fellfield and cushion communities are found on the upper slopes with small snow banks. *Marsippospermum gracile* and *Coprosma niphophila* are common plants along with *Dracophyllum muscoides, D. pronum, Kelleria croizatii, Abrotanella inconspicua, Ourisia glandulosa, Celmisia angustifolia, Raoulia grandiflora, R. subulata, Phyllachne colensoi, Anisotome imbricata, Luzula pumila, Gentiana divisa, Hectorella caespitosa, Gaultheria depressa, Colobanthus buchananii, Chionohebe thomsonii* and *Poa colensoi.*

Snow hollows have many of the above species plus *Carex pyrenaica, Epilobium tasmanicum, Neopaxia sessiliflora* and *Ranunculus pachyrrhizus*. Mosses and lichens are also present. Around Minor Peak (1768 m) sheep camps have removed large areas of vegetation on both sides of the ridge (photo 42) and down slope for 50 m or more. *Hebe buchananii* is common along the rocky ridge top. Below is typical slim snow tussockland with hard tussock, blue tussock and small herbs and moss. *Dracophyllum uniflorum* shrublands are found on many ridge tops and on rocky spurs.

At 1380 m narrow-leaved tussock cover is 80% with litter 10-20% in the numerous hollows, heavily grazed in places. The community is similar at 1250 m with dense narrow-leaved tussock, rock, litter, *Raoulia subsericea, Lycopodium fastigiatum, Kelleria dieffenbachii,* blue tussock and other species including scattered shrubs of *Coprosma cheesemanii, Dracophyllum longifolium* and *Ozothamnus vauvilliersii*. Brown top and occasional *Uncinia purpurea* appears at about 1200 m. A scree slope contains *Epilobium pychnostachyum, E. melanocaulon, Stellaria gracilenta, Parahebe decora, Acaena saccaticupula, Gingidia decipiens, Trisetum spicatum* and *Anaphalioides bellidioides*. Porcupine shrub (*Melicytus alpinus*) grows on rocky sites. A damp area of seepage at 1000 m is dominated by silver tussock with browntop, sweet vernal, Yorkshire fog, cats ear, white clover (*Trifolium repens*), *Viola cunninghamii, Elymus solandri* and *Acaena caesiiglauca*. A turfy bank below contains *Colobanthus strictus, Helichrysum filicaule, Myosotis drucei, Wahlenbergia albomarginata, Oreomyrrhis rigida, Acaena profundeincisa, Muehlenbeckia axillaris* and *Coprosma atropurpurea*.

Below 1000 m narrow-leaved tussock cover is 30-40% with hard tussock 30-50%, and introduced grasses and matagouri (*Discaria toumatou*) become common. By 750 m shrubs and introduced grasses are dominating with scattered narrow-leaved tussock and hard tussock. Shrubs include *Coprosma propinqua, C.* aff. *parviflora, C. rugosa, Carmichaelia petriei, Coriaria sarmentosa,* and matagouri with *Polystichum vestitum, Hypolepis millefolium, Pteridium esculentum, Rubus schmidelioides* and *Muehlenbeckia australis*. *Elymus tenuis* appears occasionally in the grassland. At the roadside additional shrubs and trees grow including *Corokia cotoneaster, Gaultheria antipoda, Carpodetus serratus, Aristotelia serrata, Griselinia littoralis, Pseudopanax crassifolius, P. colensoi* var. *ternatus, Coriaria arborea, Myrsine australis, Cordyline australis, Pittosporum tenuifolium, P. eugenioides, Fuchsia excorticata, Melicytus ramiflorus, Coprosma lucida,* manuka and mountain beech.

The UCL area north of Lake Face Creek, consists of mainly bracken fern, having been burned in the recent past.

- South of Twenty-five Mile Creek:

Good tall tussock cover is mostly restricted to areas above the contour fence at 1100 m. At highest altitudes around Mount Creighton are boulderfields with pockets of cushion vegetation. Where vegetation is present *Marsippospermum gracile* dominates. Other common species include *Kelleria croizatii, K. dieffenbachii, Abrotanella inconspicua, Luzula pumila,* blue tussock, *Coprosma atropurpurea, Raoulia grandiflora, Leptinella pectinata* subsp. *villosa*, and *Chionohebe thomsonii*.
Below this, *Marsippospermum gracile* grades into slim snow tussock and narrow-leaved snow tussock with intertussock species similar to that already described for northern Lake Faces. Within such areas rocky ridges and spurs support cushionfield and bouldery areas

with high shrub and herb diversity. Common shrubs include *Dracophyllum muscoides, D. pronum, Pimelea oreophila, Hebe petriei, H. poppelwellii, H. ciliolata,* and *H. hectorii.* Other, mostly cushion and mat-forming plants, include *Celmisia sessiliflora, C. lyallii, C. angustifolia, Kellerla dieffenbachii, K. croizatii, Chionohebe thomsonii, Phyllachne rubra, Parahebe decora, Ourisia caespitosa, Raoulia grandiflora, Geum leiospermum, Leucogenes grandiceps, Aciphylla kirkii,* and *Coprosma atropurpurea.* Grasses, sedges and rushes are also present in the form of *Luzula pumila,* blue tussock, *Deyeuxia avenoides, Carex wakatipu,* and *Uncinia divaricata.*

Damp bluffs with a turfy base at 1400 m have *Parahebe decora, Lachnagrostis lyallii, Plantago novae-zelandiae, Geum parviflorum, Viola cunninghamii, Blechnum penna-marina, Leptinella* spp, *Brachyglottis bellidioides, Geranium microphyllum, Acaena saccaticupula, Ranunculus reflexus, Stellaria graclienta* and *Gentiana* spp.

Narrow-leaved snow tussockland at 1300 m contains *Dracophyllum pronum, Raoulia subsericea, Celmisia semicordata, Rytidosperma setifolium, Aciphylla aurea, Pimelea prostrata, Lachnagrostis lyallii, Poa colensoi, Celmisia lyallii, Leucopogon suaveolens, Epilobium* spp, and *Scleranthus uniflorus.*

Below the fenceline at about 950 m south west of Mt Crichton there is a dramatic change to quite modified short tussockland. This is a relatively narrow zone that quickly grades into bracken cover of varying density sometimes covered in *Rubus schmidelioides.* Small gullies amongst this support scattered *Pittosporum tenuifolium* and cabbage trees. Larger gullies have remnant beech forest with red beech forest margins dominated by *Griselinia littoralis, Fuchsia excorticata, Pseudopanax crassifolius, Carpodetus serratus* and *Olearia avicenniaefolia.*

- Reidys and Twenty-four Mile Creeks:

Both of these areas contain excellent tussockland in their upper parts with extensive shrublands, mainly manuka, and beech forest in their lower valley. Alpine communities are compositionally similar to those described for other equivalent lake face sites. Beech forest is extensive on the true right but occupies a relatively narrow band on the true left. Mountain beech dominates but red beech is also present on lower margins. The forest has a typically open understorey but on lower terraces and near the stream bed there is increased diversity with *Carpodetus serratus, Fuchsia excorticata, Rubus schmidelioides, Coprosma ciliata, Griselinia littoralis, Pseudopanax colensoi* var. *ternata, P. crassifolius, Podocarpus hallii* and manuka. Understorey and groundcover species include *Polystichum vestitum, Blechnum montanum, B. penna-marina, Leptocophylla juniperina,* and *Gaultheria antipoda.* Twenty-four Mile catchment may be in the most natural condition.

Terraces and slopes behind the homestead on the true left of Twenty-four Mile Creek comprise highly modified pasture, eucalypts, pines and some clumps of manuka shrubland. Beech forest persists in gullies. This forest is continuous right to the Glenorchy–Queenstown Road much of which has freehold tenure (but is included in this review). Above about 500 m there are larger areas of manuka which contain *Aristotelia serrata, Fuchsia excorticata, Corlaria sarmentosa, Carpodetus serratus, Polystichum vestitum* and *Coprosma pseudocuneata.* At 820 metres, grasslands are still largely induced and exotic and dominated by sweet vernal and *Festuca mathewsii.* Other species include scattered narrow-leaved snow tussock, browntop, *Anaphalioides bellidioides, Geranium sessiliflorum, Wahlenbergia*

albomarginata, Elymus rectisetus, Holcus lanatus, Hydrocotyle novaezelandiae, Leucopogon fraseri, Raoulia subsericea, Pimelea oreophila, Gaultheria depressa, Luzula rufa, Crepis capillaris, Hypochoeris radicata and *Viola cunninghamii.*

- Twenty-five Mile Creek:

The upper part of Twenty-five Mile Creek above the tree-line has extensive sub-alpine and alpine communities dominated by narrow-leaved snow tussock. Vegetation communities are similar to those already described for the Twenty-five Mile Range above. Below about 1000 m the catchment is well forested, particularly above its junction with Reidys Creek. In places there is a well developed sub-alpine shrubland above the tree-line dominated by the shrubs *Hebe anomala, Dracophyllum uniflorum, D. pronum, Ozothamnus vauvilliersii, Coprosma ciliata, C.* aff. *parviflora* and *Leucopogon suaveolens*. The ground cover consists of *Raoulia subsericea, Blechnum penna-marina, Oreobolus pectinatus, Leucopogon fraseri, Gaultheria depressa, Pimelea pseudolyallii, Pentachondra pumila, Celmisia gracilenta*, blue tussock, *Racomitrium* moss and lichen.

Mountain beech is the dominant beech species with occasional red beech at lowest altitudes. Virtually no understorey exists except in steep wet gullies where there is *Fuchsia excorticata, Aristotelia serrata, Carpodetus serratus*, and *Podocarpus hallii*. The mistletoe *Alepis flavida* is a common hemi-parasite on mountain beech. At lower altitude the mistletoe *Ileostylus micranthus* is present on *Coprosma linariifolia* hosts. On sunny slopes and margins *Leptocophylla juniperina* is the dominant ground cover. Manuka has colonized many slopes that would previously have supported beech forest. Developed pasture surrounds easy slopes above the homestead.

The UCL area behind the homestead consists of manuka shrubland indesbursed with exotic pasture and short tussock grassland.

Water-race faces and terraces above Moonlight Creek:

The tall tussocks on high ridge crests around Craigellachie (1400 m) have been heavily grazed giving much opportunity for the expansion of short tussocks and herbs. Common species include blue tussock, browntop, *Acaena saccaticupula, Kelleria croizatii, Raoulia subsericea, Ranunculus multiscapus, Gentiana divisa, Scleranthus uniflorus, Lycopodium fastigiatum*, and *Geranium microphyllum.*

Rock outcrops at this altitude have a diverse shrub and herb flora. Common species include *Melicytus alpinus, Gaultheria crassa, Myrsine nummularia, Pimelea pseudolyallii, Leucogenes grandiceps, Leucopogon fraseri, Pentachondra pumila, Chionohebe thomsonii, Stellaria gracilenta* and *Celmisia angustifolia*. The rare cress *Ischnocarpus novae-zelandiae* is occasionally present. Recesses around the base of outcrops frequently support the ferns *Polystichum vestitum* and *Blechnum penna-marina*, and desert broom (*Carmichaelia petriei*).

Upper hill slopes down to about 1100 metres in the catchment of Montgomerys Creek are mostly covered in depleted tall tussock grasslands however there are signs that narrow-leaved tussock is beginning to reassert itself. Below this, manuka forms a dense shrubland down to the water-race where it is joined by other shrubs especially matagouri, *Coprosma propinqua*, and *C. rugosa*. Damp rock faces bounding the race have tutu, *Gingidia montana* and *Chionochloa conspicua*.

The steep rocky sides of the Moonlight Creek gorge have mountain beech forest on all but the most unstable slopes. There is occasional *Phyllocladus alpinus* in the understorey. Some rock bluffs have *Helichrysum intermedium* and *H. lanceolatum*. Lower in the gorge are grassy clearings dominated by browntop but also containing blue tussock and hard tussock. These clearings become more common with scattered shrubland amongst them.

On Sheepyard Terrace browntop is the most conspicuous element of the flora but it is mixed with native grasses including blue tussock, hard tussock and silver tussock. An abundant intertussock species is the regionally uncommon *Hebe pimeleoides*. Other common species include *Raoulia subsericea* and *Leucopogon fraseri*, with occasional small patches of mouse-ear hawkweed (*Hieracium pilosella*). Sparsely vegetated gravel sluicings have *Raoulia hookeri, Epilobium melanocaulon, Leucopogon fraseri* and *Hebe pimeleoides*. Some terrace risers are shrubby with abundant *Dracophyllum pronum* and *Ozothamnus vauvilliersii*. Grey willow is present near Butchers Hut.

Terraces in the vicinity of Darkies Terrace have various exotic tree stands (hawthorn, pines and poplars), scattered sweet briar and a serious introduced broom infestation. Overall they are much weedier than the terraces further up-stream.

Butchers Creek, Dead Horse Creek and Gills Creek:

These three adjacent very steep tributaries of Moonlight Creek/Moke Creek are generally heavily forested up to the natural tree-line at about 1100 m.

Highest altitude is reached in the head of Dead Horse Creek at the summit of Ben More (1842 m). A diverse alpine cushionfield is present amongst blue tussock. Common species include *Hectorella caespitosa, Acaena saccaticupula, Anisotome imbricata, Raoulia grandiflora, Celmisia lyallii, C. viscosa, Gentiana divisa, Chionohebe thomsonii, C. densiflora, Agrostis muelleriana, Dracophyllum muscoides* and *Hebe buchananii*. Rocky outcrops are dominated by *Chionohebe thomsonii*, less common are *C. densiflora, Leucogenes grandiceps* and *Rytidosperma setifolium*.

Below the ridge crest is a shrubby tussockland comprised of narrow-leaved snow tussock, *Celmisia lyallii, Hebe hectorii, Gaultheria depressa, Ozothamnus vauvilliersii, Scleranthus uniflora, Dracophyllum pronum, D. muscoides, D. uniflorum, Aciphylla kirkii, Phyllachne colensoi, Gentiana divisa, Plantago lanigera* and *Lycopodium fastigiatum*.

Narrow, wet, mossy seepages have abundant liverworts, *Gunnera monoica, Pratia angulata, Plantago triandra, Hydrocotyle microphylla, Ourisia caespitosa, Galium perpusillum, Viola cunninghamii, Anaphalioides bellidioides, Carex wakatipu* and *Oreomyrrhis* 'bog'. A broad damp tussock face at 1370 m supports *Schoenus pauciflorus, Dracophyllum uniflorum, Astelia nervosa, Phormium cookianum, Oreobolus pectinatus, Hebe pauciramosa* and the occasional *Olearia cymbifolia*.

Sub-alpine shrublands form a discontinuous fringe around the upper beech forest tree-line and pockets in the heads of small creeks. One such area at about 1000 m has high shrub diversity including *Olearia cymbifolia, O. arborescens, O. moschata, Hebe anomala, H. subalpina, H. salicifolia, Coprosma rugosa, C.* "alpina", *C. serrulata, C. ciliata, C.* aff. *parviflora, Aristotelia fruticosa, Hoheria lyallii, Carmichaelia petriei, Gaultheria crassa* and *Dracophyllum longifolium*. These are mixed with non-woody species including *Coriaria*

plumosa, Aciphylla "lomond", *Phormium cookianum, Polystichum vestitum, Hypolepis millefolium, Blechnum novae-zelandiae, Gleichenia dicarpa* var. *alpina,* narrow-leaved snow tussock, *Chionochloa conspicua, Trisetum* sp, and *Anaphalioides bellidioides.*

The extensive mountain beech forests have a sparse understorey with a composition similar to that already described above in the Luna Basin. This vegetation patterning is repeated in Butchers Creek, Alpha Creek, and Gills Creek with some minor variation. North-facing slopes in Butchers Creek have extensive manuka shrublands as do slopes of the lower true right of Dead Horse Creek. At the latter site manuka is associated with matagouri and *Coprosma propinqua*, especially in gullies. Considerable mixed exotic/native grassland also occurs on the gentler lower valley slopes.

Fan Creek and adjacent unnamed creeks:

Fan Creek and adjacent unnamed creeks have east flowing catchments encircled by Moke Spur in the south and the prominent spur separating Fan Creek from Gills Creek in the north. In the upper part of the catchments alpine and sub-alpine communities similar to that already described predominate. Beech forest is restricted to narrow remnants in fire refuges. Lower slopes denuded of beech forest are now in mixed tall tussock and scattered shrubland comprising *Dracophyllum longifolium, Olearia odorata* and *Ozothamnus vauvilliersii.* Introduced grasses are common below about 1100 m.

Fan Creek in particular, has produced a large gravel outwash fan through which it has subsequently down-cut. This naturally highly disturbed area has an extensive montane shrubland, and short tussock and herbfield communities. Very well drained terrace risers and treads have a short tussock cover along with introduced grasses such as browntop and sweet vernal. The terrace risers have a wide range of herbs and sub-shrubs including *Gaultheria depressa, G. nubicola, Hebe pimeleoides, Raoulia subsericea, Leucopogon fraseri, Helichrysum filicaule, Gonocarpus aggregatus, Microtis unifolia, Lycopodium fastigiatum, Parahebe decora, Acaena caesiiglauca* and *Oreomyrrhis rigida.* The terrace treads while having some species in common with the more arid risers, also have *Coprosma atropurpurea, Ranunculus multiscapus, Epilobium alsinoides, Wahlenbergia albomarginata, Geranium microphyllum, Microtis oligantha, Viola cunninghamii, Celmisia gracilenta* and *Brachyglottis bellidioides.* Mouse-ear hawkweed and tussock hawkweed (*Hieracium lepidulum*) are present at low density.

The shrubland is dominated by matagouri, briar, and *Coprosma propinqua.* Other common species include *Olearia odorata, Aristotelia fruticosa* and the lianes *Muehlenbeckia complexa* and *Rubus schmidelioides.* Nearer the small gorge where Fan Creek discharges onto the flats there is progressively less matagouri with more *Aristotelia fruticosa* and *Olearia odorata* and the addition of *Dracophyllum longifolium, Coprosma rugosa, Hebe subalpina, H. salicifolia, Olearia nummularifolia, Hoheria lyallii* and *Carmichaelia petriei.*

A small wetland at the south end of the flat appears to receive periodic creek overflow via meandering channels which coalesce into a turfy wet plain. Wetter parts of the plain are dominated by rushes and sedges including *Eleocharis acuta, Carex gaudichaudiana, C. berggrenii,* and *Juncus* spp along with *Rumex flexuosus* and *Myosotis tenericaulis.* Drier turfy areas have *Hydrocotyle microphylla, Potentilla anserinoides, Ranunculus multiscapus, Gunnera monoica, Plantago novae-zelandiae,* and *Nertera balfouriana.*

Moke Creek West Branch & Moke Creek Right Hand Branch:

The head of Moke Creek right hand branch at about 1700 m is virtually devoid of tall tussock and is instead dominated by blue tussock and mat and cushion-forming plants, especially *Dracophyllum muscoides* and *Celmisia viscosa*. Other common species include *Raoulia grandiflora, R. hectorii, Anisotome imbricata, Gentiana divisa, Euphrasia* sp, *Luzula pumila, Hectorella caespitosa, Celmisia argentea, C. angustifolia* and *Marsippospermum gracile*. Steeper east-facing slopes have much bare scree with sparsely vegetated rock outcrops containing *Hebe haastii, Poa novae-zelandiae* and *Rytidosperma setifolium*.

Lower down at about 1500 m are moderately dense *Dracophyllum pronum* covered slopes on the easier relief of the true left, with steep rock and scree slopes continuing on true right. Damp rocky slopes here have *Celmisia angustifolia, Anisotome capillifolia, Brachyglottis bellidioides, Celmisia laricifolia* and *Coprosma perpusilla*. Weeds are conspicuously absent.

Streamside gravel terraces at 1360 m have *Myosotis pulvinaris, Craspedia uniflora, Geum parviflorum, Hydrocotyle microphylla, Stellaria gracilenta, Acaena saccaticupula* and *Cardamine* sp. Riparian shrubs include *Hebe hectorii, H. pauciramosa* and *H. anomala*. Narrow-leaved snow tussock grasslands have abundant *Hebe hectorii* with *Brachyglottis revoluta* being common below 1300 m.

In the lower valley steep east facing slopes are well covered in *Dracophyllum* dominated shrublands and mixed snow tussock/shrublands. Drier west facing slopes on easier terrain are dominated by moderate density and stature narrow-leaved snow tussock with abundant *Dracophyllum pronum, Celmisia lyallii, Gaultheria crassa* and *Hebe hectorii*. Occasional coral broom (*Carmichaelia crassicaule*) is also present

A dense mixed subalpine shrubland is present around the upper beech forest tree-line, particularly around minor watercourses and small peaty bogs that have developed on terraces above Moke Creek. The main species present include *Hebe hectorii, H. odora, Hebe pauciramosa, Coprosma ciliata, Brachyglottis cassinioides, Olearia bullata, O. nummularifolia* and *Aciphylla* "lomond". Mountain beech forest extends in a ribbon down both sides of the creek from about 900 m to the gorge exit near Moke Lake.

Similar vegetation patterning and composition was observed from a distance in the Moke Creek West Branch. Slopes are generally very steep with extensive *Dracophyllum* dominated shrublands below the alpine zone.

Moke Creek Gorge:

Moke Creek is confined to a narrow gorge from downstream of Fan Creek for approximately 4 km to its confluence with Moonlight Creek. The creek meanders through recent gravel terraces which are themselves confined within rocky walls or steep hill slopes. Beech forest reaches the gorge in a few places but much of the dominant vegetation is shrubby.
The highly disturbed river bed has a small number of native species including short tussocks, *Raoulia tenulcaulis, Gunnera monoica, Epilobium melanocaulon* and *Carex petriei*. There are many exotic species with some of the more conspicuous being crack willow (*Salix fragilis*), grey willow, *Buddleia davidii* and spearmint (*Mentha spicata*).

Rocky bluffs in full light have a diverse shrub and herb fauna including *Carmichaelia petriei, Olearia avicenniaefolia, Anaphalioides bellidioides, Parahebe linifolia, P. catarractae, P. decora, Gentiana* sp, *Stellaria gracilenta, Vittadinia australis, Gingidia decipiens, Myosotis macrantha* and *Chionochloa conspicua*. A common weed is tussock hawkweed. One bluff had a single shrub of the threatened *Hebe cupressoides*. Two rock bluffs in the shade of beech forest had populations of the threatened cress *Ischnocarpus novae-zelandiae*.

More densely vegetated terrace risers and hillslopes have a mixed shrubland/low treeland largely dominated by native species but with several notable weed infestations. The predominant native species are matagouri, *Olearia odorata* and *Coprosma rugosa*. Other common species include *Aristotelia fruticosa, Carmichaelia petriei, Coprosma propinqua, Corlaria sarmentosa*. Less common are *Hoheria lyallii, Hebe salicifolia* and *H. pimeleoides*. One site had three large specimens of the threatened *Hebe cupressoides*. Exotic species include apple (*Malus Xdomestica*), sweet briar, and broom (*Cytisus scoparius*), tussock hawkweed and foxglove (*Digitalis purpurea*).

Significance of vegetation:

Mount Creighton falls within the Richardson and Shotover Ecological Districts and contains a good representation of the plants and plant communities of the ecological districts. At least 273 native species are present (see plant species list appendix 1) representing more than 10 % of the entire indigenous vascular flora of New Zealand. Fourteen species are listed as threatened in the most recent threat classification system (Hitchmough in press) as follows:

Alepis flavida – Gradual Decline
Carmichaelia crassicaule – Gradual Decline
Hebe buchananii – Range Restricted
Hebe cupressoides – Nationally Vulnerable
Olearia bullata – Sparse
Pimelea pseudolyallii – Sparse
Elymus tenuis – Data Deficient
Carex berggrenii – Sparse
Carex edgariae – Sparse
Uncinia purpurata – Sparse
Aciphylla lecomtei – Range Restricted
Ischnocarpus novae-zelandiae – Gradual Decline
Myosotis tenericaulis – Sparse
Vittadinia australis – Data Deficient

Of particular note is the occurrence of the shrub *Hebe cupressoides* in the Moke Creek gorge. Taxa in this category are facing a very high risk of extinction in the wild. This plant is the subject of a national recovery plan (Norton 2000) which promotes the formal protection of its habitat.

Apart from the Lake Wakatipu Faces, areas around the homestead, and parts of the Moonlight catchment, most of the land has had little development and is in a largely natural state. Although grazed by stock in selected areas, and by deer and goats over most of the country, significant impacts are restricted to sites such as the Luna Basin, lower Lake Faces, and Moonlight/Moke Creek. Previous burning and subsequent fertilizing and oversowing,

particularly along the Lake Wakatipu faces, have had the effect of gradually reducing the beech forest patches and lake front shrubland and broadleaf species. There has been significant recovery of the latter over the last ten years with the reduction in burning, especially noticeable at the Rat Point end of the property. As a result broadleaf forest is returning through bracken, and beech forest patches show some regeneration around their margins.

The tussockland communities are in good to excellent condition over the whole area surveyed. While the impact of concentrated grazing was evident in the Luna Basin, around Minor Peak, and slopes north-west of Craigellachie, these areas still contained a diverse range of native plant species and would recover once stock were removed. Below about 1100 m, the approximate altitude of the original treeline, shrubland is increasing in many places with abundant manuka, matagouri and *Coprosma* regeneration. In inland areas, *Dracophyllum longifolium* is re-establishing in montane tussockland.

The 'grey' shrublands on the outwash gravels of Fan Creek are a rare ecosystem, now much reduced by fire and pastoralism. The importance of shrubland remnants, particularly at this relatively low (500 – 600 m) altitude has recently been given prominence by Walker et al (2002a). The Fan Creek shrublands, although modified to some extent by tracking, grazing and weed invasion, are large in extent with good connectivity to both the riverbed and hillslope vegetation. The recovery of shrublands in the absence of grazing and fire has been demonstrated at several sites in Central Otago (Walker loc. cit.) and is desirable and achievable at this site.

A small valley floor wetland between the bottom of Moke Spur and Fan Creek displays some unusual hydrological characteristics and consequent vegetation patterning and composition. This includes two species, *Carex berggrenii* and *Myosotis tenericaulis* which are considered threatened (Hitchmough in press). Wetlands nationally have undergone a 90% reduction and remaining examples, particularly those in the lowland-montane bioclimatic zone, are a priority for protection.

The Moonlight Valley is a well preserved (albeit modified by gold mining activity) uncommon type of valley environment formed by the massive accumulation of eroded headwater gravels and subsequent river down-cutting, leaving broad terraces now remote from fluvial processes. These relatively infertile and drought prone substrates support a distinctive flora dominated by short tussocks and low shrubs. Despite the ingress of exotic grasses into this terrace ecosystem, considerable indigenous plant diversity remains including species now uncommon in Otago e.g. *Hebe pimelioides*.

2.4.1 Problem Plants:

Introduced species are few or non-existent above about 1000 m. Hieracium is absent over most of the property, seemingly restricted to sites in the Moonlight and Moke catchments. Sweet brier was only recorded from around Lake Luna and in the Moke/Moonlight. Wilding trees have been removed from the Lake Wakatipu Faces and the few that remain could be easily removed. Spanish heath (*Erica lusitanica*) is becoming a big problem on Wyuna, the next station north and will spread on to the lower slopes and road edges of Mt. Creighton if not controlled. It already occurs along the track above pylons north of Twenty-five Mile Creek. The introduced grasses, mainly browntop and sweet vernal are the main introduced

species and are prominent in communities below 900 m on the Lake Wakatipu faces, around Lake Luna, lower catchments draining into Moke Creek and Moonlight Creek, and occasionally elsewhere such as the mid-valley fans in the Luna Basin. Willows are at very low density in Moke Creek and lower Butchers Creek. Terraces in the vicinity of Darkies Terrace have various exotic tree stands (hawthorn, pines and poplars), scattered sweet briar and a serious introduced broom infestation.

2.5 FAUNA

2.5.1 Invertebrate Fauna:

Invertebrate on the property are described by habitat as follows:

Alpine habitats (above 1200 m)

These areas have retained natural character as places characterised by steep relief and an alpine climate that generate skeletal soils and high rates of erosion. Twenty five alpine invertebrate species were recorded from various habitats. The giant scree weta, *Deinacrida connectens* is present in screes in Moke Creek Right Hand Branch. Two species of alpine black cicada *Maoricicada oromelaena* and *M. nigra nigra,* and alpine flightless shield bug *Hypsithocus hudsonae* are present in high herbfield- sparse grassland communities. Speargrass weevils *Lyperobius hudsoni* and *L. spedenti* were also collected. Alpine moths that are day active were collected and included *Eudonia oreas* (endemic to Central Otago), moths *Orocrambus enchophorus* and *Scoparia niphospora* were collected from grasses, and moths *Asaphodes clarata* and *Ascerodes proclora* were collected from herbs. A range of snowbank and alpine herbfield grasshoppers *Alpinacris tumidicauda*, grasshopper *Sigaus obelesci* were collected as well as the ground weta *Hemiandrus focalis* and the alpine tunnel-web spider *Hexathele* species. Adult caddis fly *Tiphobiosis montana* was recorded on sedge *(Marsipposperrnum gracile)* in alpine snowmelt and seepage areas.

These alpine invertebrates are known to have a western and central Otago distribution. Many of the invertebrates collected are representative of either the Richardson Ecological District or the Shotover Ecological District suggesting that this is a crossover point for invertebrate fauna between the two districts.

Red and mountain beech forests;

Forests and their associated invertebrates are considerably reduced in extent and mostly remain in gullies and southern aspects of valleys. There are scattered mountain beech (*Nothofagus solandri* var. cliffortioides) on northern slopes of the upper Moonlight Creek where rock bluffs and surface rock colluvium are present. Insects representative of beech forests were recorded which includes moths *Meterana dotata, Proteodes carnifex* and *Apoctena pictoriana which* are hosted on beech trees. The predatory beetle *Megadromus sandageri* and spider *Orepukia* species were among numerous invertebrates inhabiting beech litter and logs.
The mistletoe *Ileostylus micranthus* is present in the forest. This can host three species of moths (*Declana griseata, Tatosoma agrionata* and *Zellaria sphenota*) that are specialist mistletoe feeders. Although none were collected during this inspection, they are thought to be present throughout the South Island where mistletoe is present (Patrick and Dugdale, 1997).

Montane and valley floor shrubland habitats:

A range of habitats suitable for invertebrates including natural shrublands adjacent to Moke Creek and Moonlight Creek, gorges, soil slips, fans and terraces are present on the property. Higher altitude shrublands of the Lake Luna basin and landslips of Moke Creek Right Hand Branch have significant natural character. Shrublands generated after fire on the lower Lake Wakatipu Faces (western aspect) and in many other parts of Mount Creighton are also habitats of intrinsic value for invertebrates.

Specialist shrubland insects:

The moth *Epiphryne xanthaspis* (has *Aristotelia fruticosa*. Other moth species note have larvae that feed on *Coprosma, Hebe, Cyathodes, Dracophyllum*, matagouri and from *Melicytus alpinus*. The moth *Helastia angusta* was originally collected (Type Locality) in shrubland at Moke Lake. It is likely present on the property

Fauna of small-leaved *Olearia*:

Populations of the *Olearia odorata* and occasional *O. bullata* which are known to support 17 and 8 moth species respectively (Patrick 2000a) are found below 700 m on the extensive fan system at Fan Creek and also within the Moke Creek gorge. Five threatened moths discussed below, are likely to be present on Mount Creighton. Moth *Pseudocoremia cineracia* has its Type Locality at Moke Lake shrubland on the Mount Creighton boundary. Moths *Protosynaema* sp. "olearia" and *Pyrgotis* sp. "olearia" have been collected from the Shotover catchment shrublands (B. Patrick unpublished) and a further two moths *Meterana exquisita* and *M. grandiosa* are known from small-leaved *Olearia* shrubland in Otago and Southland. The fragmented distribution of these moths is a reflection of the host plant distribution.

Manuka shrubland:

Manuka was not reported from the Moke Creek Catchment, although it is present elsewhere on Mount Creighton, in the Moonlight Catchment and adjacent to the Twenty-five Mile Creek. Seasonal mass flowering will be important for many pollinating insects and their predators. A stick insect *Mimarchus* species and bug *Thamatodictya tillyardi* were the only insects collected from foliage although a few generalist insects are known and the fauna is enhanced by association with other shrubs, herbs and grasses and by litter accumulation.

Invertebrates that portray the integrity of shrub communities are also represented. The yellow and amber orbweb spider *Colaranea verutum* is common in grasslands using shrub architecture for web building. Day active cicadas *Kikihia subalpina* and *K. rosea* have nymphs feeding below ground. Copper butterfly *Antipodolycaena* species, moth *Bityla defigurata* and moth *Meterana stipata* all have larvae on *Muehlenbeckia* lianes in shrubland and forest edge. The small moth *Tingena chrysogramma* is one of many insects feeding within the litter layer of shrublands.

Montane and valley floor grassland-herbfield associations:

Natural herb and grass communities found on frosted and drought prone soils of terraces and fans provide habitat for a diversity of invertebrates including 42 species of grass and herb feeding moths. The rare grassland moth *Orocrambus sophistes* was found at Sheepyard Terrace, Butchers Flat and lower Fan Creek. These three valley floor sites provide a range of habitats including shrubland, wetland, rock faces and forest.

The endangered moth *Xanthorhoe bulbulata* was historically collected throughout New Zealand and was well known from lower slope and valley floor grasslands around Queenstown. The last two records nationally of *X. bulbulata* are from a Queenstown shop window (1979) and the entrance to Kawarau Gorge (in 1991, Patrick 2000b). As potential habitat, the mixed grassland communities that remain in the lower Moonlight Creek and Moke Creek are some of the most original in this region.

The spectacular Lake Luna basin (altitude >800 m) has high natural character and the grasslands have expanded following removal of woody vegetation. At the Lake Luna Outlet, an almost flat area of ~35-40 hectares extends downstream on the floor of the valley. Much of this is influenced by cold air and frosts and is treeless. Being reasonably high and of different relief to a similar situation at Lochnagar, this is a significant habitat area for the Richardson Ecological District. Of note is the moth *Asaphodes oraria* which has flightless females. Other moths characteristic of this habitat include *Asaphodes abrogata, A. clarata* and *Orocrambus crenaeus,* which are hosted by *Plantago*, native buttercup and *Chionochloa* respectively. Tiger beetles *Neocicindela parryi*, cicada *Kikihia angusta* and the moth *Paranotoreas brephosata* are common in open areas here and throughout Mount Creighton.

Gorge and rock bluff communities:

Gorge and bluff geology in Moke Creek gorge, Moonlight Creek catchment and Deadhorse Creek are a feature of Mount Creighton. Old tailings heaps are also present and are colonised by native herbs, mosses and lichens providing significant 'rock talus' habitat. The rare moth *Gingidiobora subobscurata* is also present and is hosted on native aniseed *(Gingidia montana)*. This plant is usually found in damp bluff situations. A number of moths recorded are rock face inhabitants including *Eudonia cymatias, E. manganeutis, E. philerga* and *Helastia cinerearia*. In addition, the moth *Dichromodes gypsotis* has cryptic larvae that inhabit rock face lichens. It is a widespread species that is rarely recorded and has its Type Locality at 'Lake Wakatipu'.

Streams and rivers:

The orange caddis *Pseudoeconesus stramineus* and black and gold stonefly *Spaniocerca longicauda* are widespread species of seepage and bush clad stream. *Spaniocerca longicauda* was noted in Moke Creek gorge, upper Moke Creek and upper Deadhorse Basin. The rarely collected aquatic predatory carabid beetle, Migadopini ngen. nsp. was recorded from a plunge pool outlet at 1400 m in Deadhorse basin. This beetle is known from western and southern Otago mountains.

Throughout Mount Creighton, stream invertebrates typical of swift waters and cobble substrates may be present and representative of eastern South Island streams. Water spiders *(Dolomedes aquaticus)*, Black bugs *Saldula* species (on wet rocks and turfs) and moth

Scoparia scripta (larvae on streamside *Epilobium*) were collected from streams on this property.

Small wetlands:

In Moke Creek, case bearing caddis flies *(Hudsonema amabile)* and invertebrates of low altitude sedge and rush such as leaf hoppers (Hemiptera: Cicadellidae) and shield bugs *Rhopalimorpha lineolaris* and *Cermastulus nasalis hudsoni* were collected as well as the long jaw spider *Tetragnatha* species. Fertile wetland habitats are small in extent and not well represented on Mount Creighton.

An extensive valley floor wetland is located adjacent to Moke Creek upstream from Fan Creek junction. This is a very rare habitat in Central Otago where the majority has been oversown and modified by grazing animals. However, a small upper area of wetland (~1-2 hectares) containing herbs, grasses and sedges. Invertebrates were not sampled from this habitat.

Significance of the invertebrate fauna:

During the tenure review inspection, 169 invertebrate species were identified. This included 104 moth species that characterise a broad range of habitats, some of which are nationally significant. Some moths are endemic to west Otago and northern Southland. Nine moth species were found that have a Type Locality nearby at Ben Lomond, Mount Aurum or Moke Lake. Mount Creighton spans ecosystems representative of moderately wet climates and includes forested valleys, native grasslands and grey shrubland. Cold air drainage and high natural rates of erosion significantly influence habitat and invertebrate richness, however this has been modified by grazing and the use of fire. Gold mining has also contributed to the degredation of terrace plant communities. However, significant natural character remains in alpine areas, less fragmented areas of forest , rock bluff and gorge sites.

Of national significance is the invertebrate fauna inhabiting the valley floor terrace grasslands and shrublands in the eastern parts of the Mount Creighton. These have retained significant invertebrate richness and are representative of intact lowland grassland ecosystems and lowland shrublands. The fauna of Moke Creek and Moonlight Creek gorges inhabiting rock faces, damp enclaves and stream bedrock are distinctive but also representative of the Shotover Ecological District. They have retained much of their natural character.

Other significant invertebrate habitats on Mount Creighton are widely represented elsewhere. These include most of the high montane and alpine lands and the Lake Luna region, beech forest remnants, shrublands (facing Lake Wakatipu) are also significant habitats. In the context of the Richardson Ecological District, few similar wooded habitats with northern or western aspect are protected particularly at lower altitudes.

Wetland habitats are all small in extent but are known to be important habitat for invertebrates. This habitat type is rare in Central Otago.

The extensive bedrock areas of Moke Creek gorge are a distinctive and are likely to provide unmodified habitat for aquatic invertebrates.

Insects ranked as threatened with extinction (Molloy *et al.*, 2001; Hitchmough 2002) present on Mount Creighton:

Nationally and regionally significant shrub land communities with significant invertebrate faunal associations are present on Mount Creighton are as follows:

- The giant scree weta, *Deinacrida connectens* is present in screes in Moke Creek Right Hand Branch (this is a new record for the Shotover Ecological District). This weta has a disjunct distribution in Otago.

- The alpine flightless shield bug *Hypsithocus hudsonae* (threat of extinction status – Range restricted, Molloy *et al* 2001) is present in high herbfield- sparse grassland communities.

- Grasshoppers *Alpinacris tumidicauda*, and *Sigaus obelesci* 'Remarkables'(Simon Morris) (Range restricted). s

- Moth *Orocrambus sophistes* (Nationally endangered) in valley floor grasslands. But recently synonymised with another *Orocrambus* species.

- Moth *Gingidiobora subobscurata* (Gradual decline) hosted by native aniseed *Gingida montana* in bluffs.

Threatened insects not collected during this survey but previously recorded from habitats similar to those occupying Mount Creighton:

- Moth *Helastia angusta* (Sparse): type Locality is Moke Lake shrubland that is immediately adjacent to Mount Creighton.

- Moth *Pseudocoremia cineracia* (Gradual Decline): type Locality is Moke Lake shrubland that is immediately adjacent to Mount Creighton and its host plant *Olearia odorata* is present.

- Moth *Meterana exsquisita* (Gradual decline): known from west Otago and its host plant *Olearia odorata* is present.

- Moth *Meterana grandiosa* (Gradual decline): known from west Otago and its host plant *Olearia odorata* is present.

- *Protosynaema* sp. "olearia" (Brian Patrick) (Nationally endangered): known from the Shotover catchment nearby and its host plant *Olearia odorata* is present.

- *Pyrgotis* sp. "olearia" (Range restricted): known from the Shotover catchment nearby and its host plant *Olearia odorata* is present.

- Moth *Asaphodes stinaria* (Nationally endangered): known from the Queenstown area and its host plant *Ranunculus reflexus* is present on the property.

- Moth *Xanthorhoe bulbulata* (Nationally critical): host unknown. Last known from the Queenstown area (Shotover Ecological District) and lowland native grassland habitat is present.

2.5.2 Herpetofauna:

The common skink *Ologosoma maccani* is present throughout the property but in low numbers. The Otago gecko, *Hoplodactylus* sp. "Otago" is also present. It seems as if much of the grassland section of the property is unsuitable for geckos as there are few schist rocks containing large crevices. As a consequence it seems that the Otago gecko is mostly restricted to the forested areas of Mount Creighton and is only confirmed from the Twenty-four Mile Creek area.

A gecko which is substantially different from the other geckos known from Otago, but very much resembles the *Hoplodactylus* "Takitimu" gecko was found in the middle reaches of the right hand branch of the Moke Creek. The specimen was a gravid female collected from beneath a schist rock slab, by day, at an altitude of 1195m.

Significance of Herpetofauna:

The "Takitimu" gecko was only known from six specimens found at one location in the Takitimu Mountains, Southland.

The Moke Creek gecko found at Mount Creighton closely resembles, and is likely to be the same species as *Hoplodactylus nebulosus* Takitimu form ("Takitimu" gecko). Until detailed genetic analyses are carried out however, the identity of the Moke Creek gecko will not be known for sure.

It is possible that the Moke Creek gecko represents a new, as yet, undescribed species of alpine gecko (M Tocher *pers.comm.*). If so, then based on the numbers known and potential distribution a threat ranking classification of nationally critical (Molloy *et al.* 2001) would be appropriate.

If the gecko is the "Takitimu" gecko then this species is currently assessed as nationally critical.

If the Moke Creek gecko is the "Takitimu" gecko, then it represents a considerable range extension for this species. With much searching of apparently suitable habitat on Mount Creighton by at least one experienced herpetologist, only a single gecko was discovered.

2.5.3 Avifauna:

Birds previously recorded on Mount Creighton include: harrier, grey warbler and NZ scaup as present in the Butchers Creek - Moonlight Creek part of the property(Bull *et al.* 1985). Along the Wakatipu Faces and in the Lake Luna - Twenty-five Mile Creek part of the property there are records of pipit, rifleman, harrier, bellbird, grey warbler, fantail and spur-winged plover.

Birds recorded on the property during the tenure review inspection and their status are shown in Appendix 2. Birds recorded in the alpine areas, grasslands and beech forest matrix present in the Wire Creek/Luna Basin and the faces above Lake Wakatipu part of the property include New Zealand falcon, yellow-crowned parakeet, rock wren, kea, pipit, rifleman, silvereye and tomtit.

Present in the middle part of the property around Lake Luna and the Twenty-five Mile Creek Catchment were NZ falcon, kea, bellbird, brown creeper, fantail, grey warbler, harrier hawk, paradise shelduck, NZ pipit, rifleman and tomtit.

A full range of forest and rangeland bird species were present in good numbers in the eastern more bush clad part of the property including the forested catchments of Butchers Creek, Dead Horse Creek, Gill Creek, Moke Creek and the true right of the middle section of the Moonlight Creek. NZ falcons were recorded in all the catchments visited. Keas were present in the head basin of Dead Horse Creek, pipit and harrier hawk were present throughout. Forest bird species recorded included bellbird, brown creeper, fantail, grey warbler, morepork, rifleman, silvereye and tomtit.

Significance of Avifauna:

New Zealand falcon are an endemic threatened species ranked as "gradual decline" (Heather and Robertson 1996; Hitchmough in press). This inspection documented groups of falcon along the Lake Wakatipu shoreline, in the Lake Luna – Twenty-five Mile Creek middle section and in the forested catchments in the east of the property. The numbers present indicate that these birds are likely to be breeding in significant numbers. The Moonlight catchment has been identified as a key habitat for NZ falcon in Otago.

The presence of the endemic nationally vulnerable rock wren in the Luna Basin is significant and is also a expansion of this species range(Heather and Robertson 1996; Hitchmough in press). This species is truly restricted to the alpine zone throughout the year. The presence of the endemic and threatened yellow-crowned parakeet which is ranked as gradual decline is also significant(Heather and Robertson 1996; Hitchmough in press). Although only recorded in the western part of the property yellow-crowned parakeets can be expected to be present and breeding throughout forest areas of the property.

The presence of the endemic and threatened kea in both the higher parts of the western part of the property and also in the head of Dead Horse Creek indicates that this species is using most of the property for foraging and breeding. Kea are ranked as Nationally Endangered and the presence of at least two groups of kea here is significant(Heather and Robertson 1996; Hitchmough in press).

Brown Creeper are an endemic species whose range limits in Otago are the Rees Valley and Richardson Mountains(Heather and Robertson 1996). The presence of brown creeper on Mount Creighton is an extension of the known range of this species.

2.5.4 Aquatic Fauna:

Thirteen freshwater fish records were sourced from the National Institute of Water and Atmospheric Research Freshwater Fish Database for Mount Creighton. These are listed in Appendix 5. Glaxiids, Brown and Rainbow trout and Common bullies have been found on the property in the past.

Short stream sections (up to 100m) on Mount Creighton were sampled by Department of Conservation and Otago Fish and Game Council staff using a backpack electric fishing machine. Fishing was conducted at a variety of locations and four species were found (see table below), two native Koaro *(Galaxias brevipinnis)* and the Upland bully *(Gobiomorphus breviceps)* and two introduced, Brown trout *(Salmo trutta)* and Rainbow trout *(Oncorhynchus mykiss)*. No populations of the Common bully *(Gobiomorphus cotidianus)* were found during the inspection.

Results of electric fishing:

Location	Grid reference	Species recorded
Lake Face Ck	E41 489776	Koaro
Dooley's Ck	E41 497747	Koaro
Twenty Five Mile Ck	E41 500697	Koaro,Brown trout, Rainbow trout
Twenty Five Mile Ck	E41 562 728	No fish
Twenty-four Mile Ck	E41 507687	Koaro, Brown trout
Reidy's Ck	E41 527707	Koaro
Moke Ck (1)	E41 609697	Upland bully, Brown trout
Moke Ck West Branch	E41 606701	Brown trout
Moke Ck (2)	E41 649740	Brown trout
Dead Horse Ck	E41 630 757	No fish
Dead Horse Ck	E41 647751	Brown trout
Moonlight Ck	E41 648752	Brown trout
Butcher's Ck	E41 643775	Brown trout
Crush Creek	E41 556 760	No fish
Luna Creek	E41 555 767	Brown trout
Moonlight/ Wire Creek Confluence	E41 564 792	No fish
Montgomery's Creek	E41 598 775	No fish
Gills Creek	E41 628 729	Brown trout
Moke Ck West Branch	E41 578 690	No fish

Water quality was high at all sites and pool-run-riffle habitats predominated. The range of streams sampled was variable and included very small streams, some that were barely more than seepages, small streams that tumbled over rocky beds both in the open and through native riparian vegetation (Lake Face creeks and Reidy's Creek), incised and bed-rock lined tributaries (Dead Horse Creek), to rivers (Twenty-five Mile Creek and Moonlight Creek). Bottom fauna abundance was variable, but typically included mayflies (often abundant), caddis and stoneflies indicating good water quality.

Streams along the western shore of Lake Wakatipu either contained Koaro only, or mixtures of Koaro and Brown trout. A few small Rainbow trout were also present in Twenty-five Mile

Creek. In some cases fish barriers were created by culverts under the Glenorchy-Queenstown Road, but Koaro are trying to colonise these streams as their juvenile stages (whitebait) were found at a number of sites. Koaro are excellent "climbers" and will invade new areas where there are not complete barriers (eg, overhanging culverts or large waterfalls) or that have high numbers of trout.

Butchers Creek, Moonlight Creek, Dead Horse Creek, Luna Creek, Gills Creek and Moke Creek (and its tributaries) contained only Brown trout in varying numbers. Interestingly, the number of small Brown trout at Butchers Creek was astonishingly high and the fish appear to be packed into a rather small stream.

Sites at Twenty-five Mile Creek, Crush Creek, Moonlight Creek, Montgomery's Creek, Dead Horse Creek & Moke Creek West Branch contained no fish.

Significance of Aquatic Fauna:

No fish of significant inherent conservation value are known from Mount Creighton.

Koaro is not of significant conservation concern. It is a species that is widespread around New Zealand and does show some ability to co-exist with trout, although usually at reduced densities. It can be found long distances inland, and landlocked populations are often found in sub-montane lakes and alpine streams at high elevation. It favours clear, swiftly flowing, boulder-cobble streams of small to moderate size, and often occurs in tussock and forested streams draining alpine areas.

Some waters in central parts of the property contained no fish and have probably never had them. Such areas can be valuable because they may contain aquatic invertebrate communities that have evolved in the absence of fish predation.

2.5.5 Problem Animals:

There are substantial numbers of goats and fallow deer on the property. Rabbits, possums and hares are also present.

Deer are widely recognised for their sporting potential and were first liberated at Bobs Cove in 1904.

Goats are a major pest requiring ongoing control. Possums and deer have the potential to have a serious impact on the vegetation and are recognised for their impact on beech forests in particular.

2.6 HISTORIC

There are no recorded Maori archaeological sites on Mount Creighton. European settlement of the property begins with the gold rush of late 1862 when miners flocked to the Shotover and its tributaries and along the shore of Lake Wakatipu. At its peak in 1863, there was said to be 3000 miners in the Moke Creek/Moonlight Creek area (Miller 1949:161). The mining population soon declined as the easily won gold was worked out and miners left for other

fields, especially on the West Coast after 1865. In the late 1860s Chinese miners moved into the area and took over much of the ground abandoned by European miners. In 1896 there were 9 Chinese miners in the Moonlight and 6 in the Moke (Ng 1993:77). The Chinese also mined in the Twenty-five Mile Creek. The Chinese continued to mine in the area using small scale hand mining techniques into the early years of the 20th century. The last Chinese miner reportedly left in 1914 (Miller 1949:161).

As the mining in the Moke/Moonlight area progressed, many of the remaining European miners formed companies with intention of working the high terraces along much of the lower Moonlight. Large water races were constructed to supply the vast amounts of water required to wash away the thousands of cubic metres of gravel with hydraulic monitors (or water cannon). Such large scale mining continued into the 1930s on the major terraces west of the Moonlight Creek. The two major claims were the Moonlight No. 1 at the junction of the Moke and the Moonlight, and the Moonlight No. 2 at the junction of Butchers Creek and the Moonlight. The depression of the 1930s also saw the return of small scale hand mining by small numbers of subsidised miners in the beds of both Moke and Moonlight Creeks.

The last major alluvial mining was undertaken by the Moonlight Valley Gold Co. who in 1938 put in the last major water race in the area to bring water to their claim at Butchers Creek. Sluicing commenced in December 1938 (AJHR 1939 C2:46), but the advent of World War 2 led to the cessation of mining in 1940. After the war small scale mining continued off and on in the Moonlight until the 1960s with Darkies Terrace the scene of much of the activity. A small scale operation is still underway in the Moonlight Creek bed using a digger and floating screen.

Mention should be made of the so-called copper lode in Moke Creek. This was first noticed by miners in 1863 and a company was formed to work it but without success. As recently as 1967 the lode was prospected but no body of copper ore was located (AJHR 1968 C2:18). This site was not visited during the survey but it is believed to lie within the marginal strip.

Sites

The mining sites on Mount Creighton are primarily concentrated in the Moke/Moonlight area, with a smaller concentration in the Twenty-five Mile Creek.

Twenty-five Mile Creek:
The mining sites are distributed along the true right or northern bank of the creek where it runs across the glacial terraces (upstream and downstream of the stock bridge) before descending to the lake. These sites run for about 300m along the edge of the creek and are mainly under beech forest. They consist of four discrete areas of ground sluicing where water from races was run over terrace edges. The resulting debris was washed through sluice boxes to extract the gold and the waste rock was stacked into tailings piles. The ruin of a stone dwelling was associated with the eastern-most set of workings.

These mining sites are typical of the second phase of the gold rush period when ground sluicing replaced the shovel, gold pan and cradle as the main form of mining. This technique was also widely used by Chinese miners throughout the 19th and early 20th centuries. Ground sluicing sites are probably the most common remaining gold mining sites in Otago.

Moke Creek:
Apart from the first two kilometres below the Moke Lake where it runs through a flat, Moke Creek flows through a steep gorge. Therefore there are no extensive river terraces similar to those in the Moonlight. The majority of the gold workings along the Moke are of the same type as described above for Twenty-five Mile Creek. Between Gill Creek and Alpha Creek there is an area of low terraces which have been extensively mined by ground sluicing. It is in this locality that the so-called copper lode is located.

Moonlight Creek:
The Moonlight may be divided into two sections, the area upstream of Sheepyard Terrace and the area including Sheepyard Terrace and below. The dominant historic feature of the upper section is the water race constructed by the Moonlight Valley Gold Co. in 1938 to bring water to their claim at Butchers Creek. The intake for this race is slightly upstream of the hut marked on the E41 mapsheet (GR 589 779). Notable features of the race are two intact siphons, a rock shelf cut into bluffs and stretches of metal fluming. Midway between the Montgomeries Creek and Sheepyard Terrace is an area of ground sluicings.

The lower section of the Moonlight is where most of the historic mining took place. Here the creek has formed extensive high level terraces which have been worked by hydraulic sluicing. This involves large volumes of water stored in reservoirs above the workings. The water is then piped down slope to a monitor where it is blasted at high pressure into the work face to break up the gravels and wash them through sluice boxes placed in tail races. Hydraulic sluicing was carried out in Otago from the 1870s onwards and was usually carried out by companies because of the comparatively large amounts of capital required for the mining plant. However evidence of extensive ground sluicing is also present in this area, some of which is associated with Chinese miners.

The Sheepyard Terrace to Butchers Creek area is remarkable for the high visibility of the mining systems. Notable features are the large 1938 water race, several smaller (and earlier) water races, large reservoirs (recorded as New Zealand Archaeological Association site no. E41/255), ground sluicings and hut sites. Also present is a Chinese miners camp. The large scale hydraulic sluicings at Butchers Creek is the area historically referred to as Moonlight No.2. It is in this area that the Moonlight Valley Gold Co. claim was located. Some of the buildings on the south side of Butchers Creek may date to the 1930s mining as the Moonlight Valley Co. was reported to have built permanent quarters and a blacksmiths on the south side of the creek (AJHR 1939 C2:46).

The area between Butchers Creek and Dead Horse Creek is similar to that north of Butchers Creek with extensive areas of hydraulic sluicings, reservoirs and hut sites. Similar sites are also present south of Dead Horse Creek. The Moonlight No.1 Claim was situated on the terraces towards the junction with Moke Creek. The workings here have been colonised by broom which has begun to obscure much of the historic features of this part of the Moonlight.

Overall the Moonlight is a superb example of a mining landscape with good examples of ground sluicing, hydraulic sluicing, water reticulation systems and dwelling sites. The only other similar historic landscape in Otago is the upper Shotover. However the Moonlight workings are highly visible because they are largely free of the wilding trees and other exotic weed species that have obscured most of the workings at Skippers and other locations.

Significance of Historic:

Mount Creighton contains a number of mining sites spanning the period from the 1860s to post World War 2. Those that date to prior to 1900 are protected by the Historic Places Act which requires an authority from the Historic Places Trust before such sites may be modified. Those dating to the post 1900 period have no formal protection.

The Moonlight is an excellent example of a historic mining landscape. The sites cover the whole period from the 1860s to the 1960s. The intactness and visibility of the historic features from the 1938 race to the junction with Moke Creek make them significant inherent historic values.

2.7 PUBLIC RECREATION

2.7.1 Physical Characteristics:

There are significant and exciting opportunities for public recreation on Mount Creighton. This is due to the:

- Large and mountainous nature of the property.
- Close proximity to Queenstown and high tourist numbers, with many seeking an outdoor experience.
- Good access possibilities provided by the long length of road boundary adjacent to Lake Wakatipu and the road end at Moke Lake.
- The feeling of remoteness generated by the broken and rugged nature of the property.
- The magnificent natural scenery.
- The opportunities for access from Arthurs Point or through the Twelve Mile Scenic Reserve.
- There are a number of existing huts on the property at Lake Luna, the Moonlight and at Butchers Creek.
- The concentration of historic sites representing early mining history of Otago.

2.7.2 Legal Access:

Legal access is mainly provided from the Glenorchy-Queenstown Road. The Moke Lake Road provides legal access to the south-eastern side of the property, but reverts to a private farm track near Moke Creek. There is a locked gate here.

From the Shotover River to the east of the property, there is a legal road up the true right of the Moonlight Creek as far as Moke Creek, but from there it takes a round about route to connect to Moke Creek. The formed track does not conform to the legal line in places. In practice there is no easy way to get from the south side of Moke Creek to Mount Creighton PL on the north side. Adjoining landowner consent may be required for practical access.

There is an existing walk from Arthurs Point over the track described above, known as the Moonlight Track. It continues in a round trip back to Queenstown via the Ben Lomond Track.

Opportunities may exist in the future to utilize the existing walking route and extend it to provide access into the upper Moonlight and possibly around into Lake Luna.

Marginal strips exist on parts of the Moke and Moonlight Creeks and on the Lake Luna margin.

2.7.3 Activities

Existing recreational opportunities include:

Hunting:
Fallow deer range over most of the Lake Faces and back through the catchments of the Twenty-five Mile, Moke and Moonlight Creeks. A commercial safari operation currently exists on the property for trophy hunting. Some public entry is also permitted for recreational hunting.

Opening public access onto the property would create a lot of interest for the fallow deer hunting opportunity, and this could be managed in conjunction with similar hunting opportunities in the Twelve Mile Creek Scenic Reserve.

Goats range over most of the property, but the rugged nature of the greater part of the terrain back from the Lake Faces mean that there is little desire from recreational hunters to access and hunt a lot of this country.

A small population of chamois are also reported to be on the property, but this appears to be a small isolated group.

Fishing:
There are trout in Lake Luna. The angling opportunity may deteriorate with increased angler pressure and unrestricted access. Lake Luna is not naturally re-stocked.

Mountain Scrambling:
Climbing opportunities on the property are not popular. Like most of the Richardson Mountains the unstable schistose rock does not make for ideal climbing. Scrambling is probably a better description of the opportunities. There are a number of peaks that present a challenge including: Mt Crichton (1870m); Ben More (1842m); and Major Peak(2126m).

These peaks may remain of limited appeal as they cannot offer the lure of the recognised NZ classic climbs.

Tramping:
Tramping interest on the property is at present very low (which may be due to the lack of defined public access). There is some local traffic into Lake Luna to camp and return. There is also limited use of the recognised route along the water race fluming through the Moonlight Gorge. Parts of this are very exposed and potentially dangerous as the fluming has collapsed in places (however traversing the route in its present state is highly memorable).

The property could present the opportunity of overnight or extended 2-3 day trips.

Options for trips include:

- On to neighbouring Wyuna Station via Luna and Moonlight Creeks and Moonlight Saddle into Wellers Creek and the Bucklerburn;

- Skippers Arum country via Luna and Moonlight Creek and Murphys Saddle via Ben Lomond Station;

- Luna and Moonlight Creeks (via the Moonlight Gorge)to Arthurs Point or to Moke Lake. This could be a round trip from Queenstown.

Of these options, the latter would hold the most appeal. The other routes are on exposed open country which is erosion prone, steep, and ill defined. Rivers are unbridged, and subject to weather difficulties and rapid flooding.

Short Walks:
The gorge over the Twenty-five Mile Creek is an attraction, that with suitable track development, could become a popular walk from the Glenorchy – Queenstown Road.

Other short walks are possible, especially from the Moke Lake Road.

Other Recreation:
The farm track into Lake Luna may offer opportunities for passive recreation and as a tramping, mountain biking or horse trekking route. However the extremely steep nature of the track and maintenance requirements would probably preclude it as a public vehicle route.

Significance of Recreation:

Opening public access onto the property would create a lot of interest for the fallow deer hunting opportunity and the herd has significant trophy potential.

There are trout fishing opportunities in Lake Luna with good numbers of rainbow trout present.

With appropriate access provisions and tracking there are significant opportunities to provide for public recreation. Tramping opportunities could be extremely popular mainly because of the close proximity of the property to Queenstown, the magnificent scenery and the remote feeling generated by the rugged nature of the property. The property could present the opportunity of short walks, overnight or extended 2-3 day trips. It may, with some track development, provide a round trip from route from Queenstown via the existing Moonlight and Ben Lomond tracks.

PART 3

OTHER RELEVANT MATTERS & PLANS

3.1 CONSULTATION

An NGO early warning meeting was held on the 8/10/01 with interested groups. The following views were expressed:

- Didn't see much that could be freeholded.
- Lake Luna – Moonlight – Arthurs Point a classic tramping trip.
- Access from Glenorchy-Queenstown road needed – track across Lake Face is good access.
- Good herd of fallow deer – commercially managed?
- Much of Lake Faces regenerating strongly.
- Moonlight historic sites important.
- Moonlight track UCL add to review.
- Freehold sections in Moonlight of note.

A submission from Dr Alan Mark dated 18 Dec 2001 makes the following recommendations (based on principles rather than first hand knowledge):

- Front country and Moonlight and Moke Creeks to be freeholded to 1400m with landscape covenant above 1000m.
- Representative parts below Bennetts Bluff be left undeveloped and managed as such.
- Legal public access be provided from Lake Wakatipu, Moonlight and Moke Creeks to areas of conservation land.

A submission from FMC dated September 2002 makes the following recommendations:

- Areas to be protected:
  - All land above 1000 – 1100 m.
  - The whole of the Luna basin.
  - Any additional areas of beech forest should have a covenant.

- Access requirements:
  - Unrestricted public foot access and mountain bike access from the Glenorchy-Queenstown Road, over Reidys Spur to Lake Luna and the upper Moonlight area.
  - A route for public foot use traversing the Wire Saddle.
  - Secure public access for foot and mountain bike use over the track on the true left of Moke Creek from Moke Lake to the lower Moonlight.
  - Secure public access for afoot and mountain bike use over the track from the Moke Creek/Moonlight Creek junction, up the terraces to Sheepyard Terrace and beyond, through the Moonlight gorge, following the old pack track to the upper Moonlight.
  - Practicable and secure public foot access to the new conservation lands (above about 1,000 to 1,100m) on the Twenty-five Mile Range and on the southern end of the Richardson Mountains.

3.2 REGIONAL POLICY STATEMENTS AND PLANS

The western side of the property is subject to the Otago Regional Plan: Water rule which requires resource consent for suction dredge mining.

3.3 DISTRICT PLANS

The western part of the property is located within the General Rural zone of the Queenstown Lakes District Plan.

In general, the proposed Queenstown Lakes District Plan (amended to incorporate Council decisions) does not act as a trigger for the protection of tussock grasslands and smaller wetlands and forest areas. Resource consent is required for subdivision and subsequent development, buildings, forestry and also ski area activities. No forestry shall be undertaken in an alpine area with an altitude greater than 1070m. There are no registered historic sites, protected features or areas of significant indigenous vegetation as set out in the appendices of the plan. The protected landscape provisions of the Plan are in the process of going through the Environment Court. However, it is likely that part of this property will be in an Area of Outstanding Landscape. Protection is limited to the controls set out above.

3.4 CONSERVATION MANAGEMENT STRATIGIES AND PLANS

The Otago Conservation Management Strategy identifies Queenstown and surrounds as Special Place 30. Mount Creighton lies within this area. The objective for this special place is as follows:

-*"To recognise the value of an extensive protected area around Queenstown as a bases for the protection of amenity, landscape, natural, cultural, and historic resources of significance to Queenstown and New Zealand and for recreational enjoyment. Then to implement and protect that system".*

The methods of implementation are outlined as follows:

-*"Walkways will be secured and gazetted where not on land administered by the department. Walking tracks will be upgraded to prescribed standards for short walks and will be maintained. Opportunities such as tenure review will be taken to negotiate the expansion of the network, close gaps in the lake edge and back country continuous walkways. Support will be given to walkways in the rural basin.*

-*Survey and monitoring of historic features and advocacy for their protection will be carried out as and when appropriate.*

-*Opportunities arising out of negotiations for tenure review of pastoral leasehold properties will be taken in order to improve the protected area system and access to it".*

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.

PART 4

MAPS ETC.

4.1 Additional information

References:

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4.2 ILLUSTRATIVE MAPS

Topo/Cadastral – Mount Creighton

Topo/Cadastral – Homestead Area

Landscape Units / Significant Landscape Features

Historic Values

Areas of significant natural values – Mount Creighton

Areas of significant natural values – Homestead Area

4.3 APPENDICIES

Appendix 1 – Plant species recorded at inspection.
Appendix 2 – Bird Species.
Appendix 3 – Invertebrate Species.
Appendix 4 – Otago CMS extract.
Appendix 5 – NIWA fresh water fish database records.
Appendix 6 – Geological Sites
Appendix 7 – Photos - Relating to Vegetation Report.
Appendix 8 – Photos –Landscape Units.
Appendix 9 – Photos – Property overview.

APPENDIX 1

Mount Creighton
Richardson Mountains, Otago
Checklist of native vascular plant species compiled from visit March 2002
J. Barkla, N. Simpson & R. Wardle

*denotes adventive species

Trees and shrubs

Alepis flavida
Aristotelia fruticosa
A. serrata
Brachyglottis cassinioides
B. revoluta
*Buddleja davidii
Carmichaelia crassicaule
C. petriei
Carpodetus serratus
Coprosma "alpina"
C. atropurpurea
C. cheesemanii
C. ciliata
C. linariifolia
C. lucida
C. niphophila
C. perpusilla
C. propinqua
C. pseudocuncata
C. rugosa
C. serrulata
C. sp. (aff. parviflora)
ordyline australis
Coriaria arborea
C. plumosa
C. sarmentosa
Corokia cotoneaster
*Crataegus monogyna
*Cytisus scoparius
Discaria toumatou
Dracophyllum longifolium
H. haastii
H. hectorii
H. odora
H. pauciramosa
H. petriei
H. pimelioides
H. poppelwellii
H. salicifolia
H. subalpina
Helichrysum intermedium
H. lanceolatum
Hoheria lyallii
Ileostylus micranthus
Leptocophylla juniperina
Leucopogon suaveolens
*Malus Xdomestica
Melicytus alpinus
M. ramiflorus
Myrsine australis
M. nummularifolia
Nothofagus fusca
N. solandri var. cliffortioides
Olearia arborescens
O. avicenniaefolia
O. bullata
O. cymbifolia
O. moschata
O. odorata
Ozothamnus vauvilliersi
Phyllocladus alpinus
Pimelea oreophila

D. muscoides	P. prostrata
D. pronum	P. pseudolyallii
D. uniflorum	*Pinus sp.
*Erica lusitanica	Pittosporum eugenioides
Fuchsia excorticata	P. tenuifolium
Gaultheria antipoda	Podocarpus hallii
G. crassa	P. nivalis
G. depressa	*Populus sp.
G. nubicola	Pseudopanax colensoi var. ternatus
G. parvula	P. crassifolius
Griselinia littoralis	*Ribes uva-crispa
Hebe anomala	*Rosa rubiginosa
H. buchananii	*Salix cinerea
H. ciliolata	*S. fragilis
H. cupressoides	

Ferns & fern allies

Blechnum fluviatile	G. poeppigiana
B. montanum	Hypolepis millefolium
B. novae-zelandiae	Lycopodium fastigiatum
B. penna-marina	Polystichum cystostegia
Gleichenia dicarpa var. alpina	P. vestitum
Grammitis billardierei	Pteridium esculentum

Climbers and lianes

Muehlenbeckia australis	Rubus schmidelioides
M. complexa	

Grasses

*Agrostis capillaris	F. novae-zelandiae
A. muelleriana	Hierochloe recurvata
A. pallens	*Holcus lanatus
A. petriei	Koeleria cheesemanii
*Anthoxanthum odoratum	Lachnagrostis lyallii
Chionochloa conspicua	L. striata
C. macra	Poa breviculmis

C. oreophila	P. cita
C. rigida	P. colensoi
Deschampsia chapmanii	P. novae-zelandiae
Deyeuxia avenoides	P. schistacea
Dichelachne crinita	Rytidosperma nigricans
*Elymus rectisetus	R. pumilum
E. solandri	R. setifolia
E. tenuis	Trisetum lepidum
Festuca madida	T. sp
F. mathewsii	T. spicatum

Sedges and rushes

Carex berggrenii	Juncus gregiflorus
C. coriacea	J. spp
C. edgariae	Luzula pumila
C. gaudichaudiana	L. rhadina
C. kaloides	L. rufa
C. kirkii	Marsippospermum gracile
C. petriei	Oreobolus pectinatus
C. pyrenaica	Schoenus pauciflorus
C. wakatipu	Uncinia divaricata
Eleocharis acuta	U. purpurata
Isolepis aucklandica	U. uncinata

Herbs

Abrotenella inconspicua	H. montana
Acaena caesiiglauca	H. novae–zelandiae
A. juvenca	H. sulcata
A. profundeincisa	*Hypericum perforatum
A. saccaticupula	*Hypochaeris radicata
Aciphylla aurea	Ischnocarpus novae-zelandiae
A. kirkii	Kelleria childii
A. lecomtei	K. croizatii
A. "lomond"	K. villosa
Anaphalioides bellidioides	Leptinella pectinata subsp wilcoxii
Anisotome capillifolia	L. sp.
A. flexuosa	Leptospermum scoparium
A. haastii	Leucogenes grandiceps
A. imbricata	Leucopogon fraseri
Astelia nervosa	*Linum catharticum

Brachyglottis bellidioides	*Mentha spicata
Cardamine sp.	Microtis oligantha
Celmisia angustifolia	M. unifolia
C. argentea	Muehlenbeckia axillaris
C. glandulosa	Myosotis drucei
C. gracilenta	M. elderi
C. haastii	M. macrantha
C. laricifolia	M. pulvinaris
C. lyallii	M. tenericaulis
C. semicordata	Neopaxia sessiliflora
C. sessiliflora	Nertera balfouriana
C. viscosa	N. ciliata
C. walkeri	Oreomyrrhis "bog"
Chionohebe densiflora	O. rigida
C. thomsonii	Ourisia caespitosa
Colobanthus apetalus	O. glandulosa
C. buchananii	Parahebe catarractae
C. strictus	P. decora
Craspedia sp.	P. linifolia
Craspedia uniflora	Pentachondra pumila
*Crepis capillaris	Phormium cookianum
*Digitalis purpurea	Phyllachne colensoi
Dolichoglottis lyallii	P. rubra
E. alsinoides	Plantago lanigera
E. atriplicifolium	P. novae-zelandiae
E. brunnescens	P. triandra
E. chloraefolium	P. uniflora
E. komarovianum	Potentilla anserinoides
E. melanocaulon	Pratia angulata
E. pychnostachyum	Psychrophila obtusa
E. tasmanicum	Ranunculus gracilipes
E. tenuipes	R. multiscapus
Euchiton audax	R. pachyrrhizus
E. traversii	R. reflexus
Euphrasia sp.	R. royi
Forstera sedifolia	Raoulia glabra
Galium perpusillum	R. grandiflora
Gentiana divisa	R. hectorii
Geranium microphyllum	R. hookeri
G. sessiliflorum	R. subsericea
Geum leiospermum	R. subulata
G. parviflorum	R. tenuicaulis
Gingidia decipiens	R. youngii

G. montana	*Rumex acetosella
Gonocarpus aggregatus	R. flexuosus
G. micranthus	Schizeilema cockaynei
Gunnera monoica	Scleranthus uniflorus
Haastia pulvinaris	Stellaria gracilenta
Hectorella caespitosa	Trifolium repens
Helichrysum filicaule	Viola cunninghamii
*Hieracium lepidulum	Vittadinnia australis
*H. pilosella	Wahlenbergia albomarginata
Hydrocotyle microphylla	

Indigenous species = 273
Adventive species = 24
Total species

APPENDIX 2
BIRD LIST: MOUNT CREIGHTON

SPECIES	WIRE CREEK, LUNA BASIN/ CREEK	LAKE LUNA/TWENTY-FIVE MILE CREEK	BUTCHERS CREEK/MOONLIGHT/ DEAD HORSE CREEK	WAKATIPU FACES	STATUS *	CATEGORY©	CONSERVATION ASSESSMENT ∞
Bellbird		✓	✓	✓	Endemic		
Black backed gull			✓		Native		
Brown Creeper		✓	✓		Endemic		
Californian quail			✓	✓	Introduced		
Chukor			✓	✓	Introduced		
Fantail		✓	✓		Native		
Grey Warbler		✓	✓		Endemic		
Harrier Hawk		✓	✓		Native		
Kea	✓	✓	✓	✓	Endemic	B	2 Nationally Endangered
Morepork			✓				
NZ Falcon		✓	✓	✓	Endemic	B	5 Gradual Decline
NZ Scaup			✓		Endemic		
Paradise Shelduck		✓	✓		Endemic		
Pipit	✓	✓	✓	✓	Native		
Rifleman	✓	✓	✓		Endemic		
Rock Wren	✓				Endemic	C	3 Nationally Vulnerable
Silvereye	✓		✓		Native		
Spur-winged plover			✓		Native		
Tomtit	✓	✓	✓		Endemic		
Yellow-crowned parakeet	✓				Endemic	C	5 Gradual Decline

* As described in (Heather and Robertson 1996)
© As described in (Molloy and Davis 1994)
∞ As described in (Molloy *et al.* 2001)

APPENDIX 3

Annotated species list of invertebrates identified from Mt. Creighton Pastoral Lease.

Locality codes

DB Deadhorse Basin	ST Sheepyard Terrace
MC Moke Creek	FC Fan Creek
BM Benmore	ML Moonlight Creek
CP Craigellachie Peak	MCRB Moke Ck. Right Branch
BC Butchers Creek & terrace	WC Wire Creek
LC Luna Creek flats	LB Luna Basin
MP Minor Peak	SC Twenty-five Mile Creek

Family/order	Taxon	Locality	Elevation	Comment
Mothes & butterflies - Lepidoptera				
Crambidae	*Orocrambus flexuosellus*	FC	520 m	
Crambidae	*Orocrambus sophistes*	FC	520 m	
Crambidae	*Orocrambus vitellus*	FC	520 m	
Crambidae	*?Orocrambus* ??sp.	FC	520 m	
Crambidae	*Eudonia* ?sp.	FC	520 m	
Crambidae	*Eudonia cataxesta*	ST, BC, DB, BM, FC	520 - 1760	Common and widespread in open areas. Larvae on Raoulia etc.
Crambidae	*Eudonia cymatias*	ST, FC	520 -550	Local species of rock faces.
Crambidae	*Eudonia feredayi*	ST, BC, FC	550 m	Common species of open areas.
Crambidae	*Eudonia manganeutis*	BC	520 m	Common rock face species. Larvae on rock face moss. Lowland to montane
Crambidae	*Eudonia melanaegis*	LC	810 m	Larvae on mosses – common in upland areas.
Crambidae	*Eudonia oreas*	CP	1340 m	Rare species endemic to OL. alpine rock faces
Crambidae	*Eudonia philerga*	ST, MC	550 m	Common and widespread species of rocky country – lowland to montane. Larvae on moss on rocks

Crambidae	*Orocrambus crenaeus*	BM	980 m	In *Chionochloa* grasslands which larvae probably feed on. Common upland species.
Crambidae	*Orocrambus enchophorus*	DB	1760 m	Alpine variety of species of Chionochloa grasslands – locally common
Crambidae	*Orocrambus flexuosellus*	MC	500 m	Most common and widespread of genus
Crambidae	*Orocrambus peraxenus*	MP	910 m	Upland species of western Otago – not common.
Crambidae	*Orocrambus ramosellus*	MC	500 m	Common and widespread in damper areas
Crambidae	*Orocrambus sophistes*	ST, BC, FC	520 -550	Rare and local in western and Central Otago & Mackenzie Country only. Female short-winged. Native short tussock grasslands.
Crambidae	*Orocrambus vittellus*	ST, MC, ML, BC, CP	520 - 1340	Common right through season.
Crambidae	*Orocrambus vulgaris*	ML, ST, MC, BC, CP, FC	520 - 1340	(14); widespread and very common grassmoth- autumn emerging. Variable form. Native and exotic grassland
Gelechiidae	*Kiwaia* ?sp.	FC	520 m	
Gelechiidae	*Kiwaia parapleura*	BC, FC, ST	520 -550	Open country species – widespread but local
Gelechiidae	*Kiwaia schematica*	BC	520 m	Open country species – widespread but local
Geometridae	*"Hydriomena" deltoidata*	MC, BC	520-600	Common and widespread geometrid. Easily disturbed by day. Larvae on Plantago.
Geometridae	*Aponotoreas anthracias*	DB	1550 m	Alpine species, diurnal, larvae on Dracophyllum – locally common
Geometridae	*Arctesthes catapyrrha*	LB	1180 - 1730	Diurnal geometrid – larvae on various herbs including Nertera. Widespread but local in open areas. Indicative of at least semi-natural area.
Geometridae	*Asaphodes abrogata*	MC, CP, LB, LC, BM, MP	520 - 1340	Larvae on Plantago – common locally in autumn-diurnal

Geometridae	*Asaphodes clarata*	LB, LC, BM	810 - 1180	Widespread but local- larvae on Ranunculus in montane to alpine areas.
Geometridae	*Asaphodes oraria*	LC, MP	815-1200	Local species of the south. Lowland to alpine. Female short-winged and flightless. Indicative of interesting habitat.
Geometridae	*Austrocidaria gobiata*	BC, FC	520 m	Larvae on small leaved Coprosma – common and widespread forest/ shrubland
Geometridae	*Austrocidaria similata*	BC	520 m	Larvae on Coprosma- common and widespread in forest and shrubland
Geometridae	*Chloroclystis filata*	ST	550 m	Self introduced, now very common and widespread lowland to alpine. Larvae on flowers.
Geometridae	*Declana flocossa*	ST, FC, BC	550 m	Polyphagous larvae – common and widespread in forests
Geometridae	*Declana leptomera*	BC	520 m	Polyphagous larvae – common and widespread in forest mainly
Geometridae	*Dichromodes gypsotis*	DB	1200 m	Rare species, widespread sea-level to alpine; cryptic larvae on rock face lichens. Central Otago is stronghold. diurnal/ nocturnal
Geometridae	*Epicyme rubropunctaria*	BC	520 m	Widespread and common, larvae on Haloragis and Gaultheria.
Geometridae	*Epiphryne xanthaspis*	BC, FC	520 m	Local species – larvae on Aristotelia fruticosa. montane shrublands.
Geometridae	*Epyaxa rosearia*	BC	520 m	Larvae on herbs – very common and widespread – lowland mainly
Geometridae	*Gellonia pannularia*	BC, FC	520 m	Common and widespread in late summer. Montane to lowland shrubland areas
Geometridae	*Gingidiobora subobscurata*	ST	550 m	Rare species with larvae on Gingidia montana. Local with stronghold in Western Otago.
Geometridae	*Helastia cinereata*	FC	520 m	Rock face mosses

Geometridae	*Helastia corcularia*	MC, ML, BC, FC, LC	500 -815	Larvae on moss etc. common and widespread species
Geometridae	*Helastia* ?sp.	FC	520 m	
Geometridae	*Hydromena rixata*	FC	520 m	Larvae on Gunnera
Geometridae	*Ischalis fortinata*	BC, FC	520 m	Larvae on hard fern – alpine to lowland- common and widespread
Geometridae	*Notoreas* ?species	BM	1600 m	
Geometridae	*Notoreas* new species	MC	500 m	Widespread in Central Otago, Otago lakes and McKenzie Basin. Larvae on various Pimelea. Diurnal and local in distribution.
Geometridae	*Paranotoreas brephosata*	BM, ML, DB, ST, MC, MCRB	540 - 1600	Diurnal orange underwing, common in montane to alpine zone. Larvae on Epilobium.
Geometridae	*Pasiphila rubella*	ST	550 m	Larvae on Hebe – local alpine species
Geometridae	*Poecilasthena pulchraria*	BC	520 m	Larvae on Cyathodes, local but widespread
Geometridae	*Pseudocoremia productata*	BC, LB	520 - 1160	Common forest polyphagous species.
Geometridae	*Pseudocoremia psuavis*	FC	520 m	Larvae polyphageous on trees
Geometridae	*Zermizinga indocilisaria*	ST, FC	520 -550	Local geometrid, larvae often on matagouri but polyphagous. Female short-winged. Widespread in Central Otago, Otago lakes and McKenzie Basin drier areas
Glyphipterigidae	*Glyphipterix clonophora*	MC	500 m	Common dry grassland species – diurnal
Glyphipterigidae	*Glyphipterix nephoptera*	MC	500 m	Dry grassland species – common
Lycaenidae	*Antipodolycaena* nsp.	ML, MC, DB, MCRB, LB, MP	500 - 1220	Larvae on Muehlenbeckia
Lycaenidae	*Zizina oxleyi*	CP, BM	860 -900	Larvae on clovers – common and widespread – unusual at high altitude
Lycaenidae	*Boldenaria* nsp.	ML, MC, ST, DB, LB, BM	540-1700	Common locally on Muehlenbeckia axillaris

Noctuidae	*Aletia cuneata*	ST	550 m	Larvae on montane to alpine herbs. common at times in Central Otago and Otago lakes region
Noctuidae	*Aletia longstaffi*	ST	550 m	Common alpine species emerging in autumn. Larvae on Dracophyllum widespread
Noctuidae	*Aletia moderata*	ST	550 m	Common species of open areas. Larvae on Raoulia etc.
Noctuidae	*Aletia virescens*	ST, FC, LC	520 -810	Common lowland to alpine. Larvae on herbs. Widespread
Noctuidae	*Bityla defigurata*	ST	550 m	Larvae on Muehlenbeckia – common and widespread
Noctuidae	*Bityla sericea*	BC	520 m	Uncommon and local but Otago lakes area is a known stronghold. biology unknown
Noctuidae	*Diarsia intermixta*	ST	550 m	Polyphagous larvae – adult local
Noctuidae	*Graphania agorastis*	BC, ST, FC	520 -550	Common wetland species. Lowland to alpine
Noctuidae	*Graphania insignis*	BC	520 m	Common herb feeding species – widespread mostly lowlands
Noctuidae	*Graphania lignana*	BC	520 m	Larvae on grasses – common grassland species – lowland to montane
Noctuidae	*Graphania lithias*	FC, ST, LC	520 -810	Larvae on *Melicytus alpinus* – widespread and locally common. Montane to alpine.
Noctuidae	*Graphania mollis*	BC	520 m	Very common grassland species – mainly lowland to montane
Noctuidae	*Graphania morosa*	ST, BC, FC	520 -550	Common and widespread – larvae on grasses – commoner in late summer
Noctuidae	*Graphania mutans*	ST, BC, FC, LC	520 -810	Very common and widespread species. Larvae on herbs
Noctuidae	*Graphania phricas*	FC	520 m	Discaria and ?other shrubs
Noctuidae	*Graphania plena*	ST, BC, FC	520 -550	Common and widespread species. Larvae on herbs.

Noctuidae	*Graphania prionistis*	ST	550 m	Widespread but not common species – montane to alpine
Noctuidae	*Graphania rubescens*	Fan Ck.	520 m	Feed on *Luzula* and other low growing elements
Noctuidae	*Graphania ustistriga*	ST	550 m	Common and widespread – larvae on shrubs.
Noctuidae	*Merophyas leucaniana*	Moke Ck.	500 m	Common and widespread open area species – lowlands to montane – polyphagous
Noctuidae	*Meterana dotata*	ST, BC	550 m	Common in beech forest with larvae on *Nothofagus*. Late summer species
Noctuidae	*Meterana meyricci*	LC	810 m	Larvae on *Pimelea*. Widespread in South Island – montane to alpine. local.
Noctuidae	*Meterana stipata*	ST	550 m	Larvae on *Muehlenbeckia* – common species especially in lowland forest edge
Noctuidae	*Persectania aversa*	ST, BC, FC, LC, BM	520 -980	Larvae on grasses. Southern armyworm- very common and widespread to montane zone
Noctuidae	*Tmetolophota alopa*	BC	520 m	Uncommon, local species of open areas
Noctuidae	*Tmetolophota propria*	ST, BC, FC, LC	520 -810	Larvae on grasses – common in montane to alpine zone
Noctuidae	*Tmetolophota semivittata*	ST	550 m	Larvae on *Carex*. Common and widespread
Noctuidae	*Tmetolophota sulcana*	BC, FC	520 m	Widespread lowland to alpine – larvae on *Microlaena*.
Oecophoridae	*Eutorna symmorpha*	ML	540 m	Rare, but widespread forest species.
Oecophoridae	*Proteodes carnifex*	ML	620 m	Larvae on *Nothofagus* – common sometimes epidemic!
Oecophoridae	*Tingena chrysogramma*	ST	550 m	Litter feeding species – common in shrublands – local
Pterophoridae	*Stenoptilia zophodactyla*	BC	520 m	Larvae on Gentian flowers and relatives – common and widespread – lowland to montane

Pyralidae	*Diasemia grammalis*	CP	1340 m	Open country – larvae on *Muehlenbeckia* roots etc – widespread diurnal species
Pyralidae	*Scoparia ejuncida*	ST, FC, MCRB	520 - 1300	Local only in montane areas. Otago lakes region is a stronghold.
Pyralidae	*Scoparia minusculalis*	ST, ML, BC	550 m	Common and widespread mainly forest moth on moss.
Pyralidae	*Scoparia niphospora*	DB	1550 m	Alpine grasslands – common
Pyralidae	*Scoparia petrina*	ST, BC	550 m	Autumn, widespread species of forest
Pyralidae	*Scoparia scripta*	LC	810 m	Larvae on streamside *Epilobium* – local but widespread in upland areas.
Pyralidae	*Scoparia ustimacula*	LC	810 m	Larvae on *Hydrocotyle* – common and widespread in forested areas.
Pyralidae	*Udea flavidalis*	ML, FC, LC	520 -810	Common polyphagous species – forest edge and shrubland
Satyridae	*Aponotoreas anthracias*	MCRB	1300-1450 m	
Satyridae	*Argyrophenga antipodum*	CP, MC,DB,ST, MCRB, WC, LB, BM, MP	520 - 1550	Tussock butterfly; (western variety & upland variety). Larvae on *Chionochloa* . common diurnal species
Tortricidae	*"Tortrix" demiana*	ST,	550 m	Local montane to alpine species. Short-winged female. Late summer species
Tortricidae	*Apoctena pictoriana*	BC	520 m	Larvae on Nothofagus – common forest species
Tortricidae	*Ascerodes prochlora*	MCRB	1400 m	Diurnal – common in western mountains. Larvae on herbs
Tortricidae	*Capua semiferana*	BC, FC, BM, MP	520 - 1450	Common and widespread open country species – larvae on litter (
Tortricidae	*Epichorista siriana*	DB, FC, MC, ML, MP	500 - 1000	Common damp grassland species. Larvae on grasses
Tortricidae	*Gelophaula* ??sp.	BM	1650 m	
Tortricidae	*Gelophaula vana*	DB	1760 m	Widespread in Wakatipu area – larvae on *Celmisia* , diurnal

Yponomeutidae	*Plutella antiphona*	MCRB,MC,FC	520 - 1400	Larvae on *Cardamine* - widespread and common
Yponomeutidae	*Protosynaema quaestuosa*	BM	860 m	Larvae on *Carex*. – common and widespread species.

Beetles - Coleoptera

Byrrhidae	Byrrhid sp. 1	BM	1650 m	
Byrrhidae	Byrrhid sp. 2	BM	1650 m	
Carabidae	*Mecodema lucidum*	CP	1340 m	
Carabidae	*Mecodema lucidum*	MCRB	920 m	
Carabidae	*Mecodema* sp.	WC, LB, LC, MP, SC	800 - 1700	Alpine species.
Carabidae	*Megadromus memes*	CP	1340 m	
Carabidae	*Megadromus sandageri*	BC, WC, LC, SC	540 m	
Carabidae	*Migadopine* ?Gen. sp.	DB	1400 m	
Carabidae	*Oopteris* sp. carabid	BM	1650 m	
Cicindellidae	*Neocicindella parryi*	BM, MC	860 m	Tiger beetle; – widespread diumal species with larval holes on flattish surfaces. Lowland to montane areas..
Curculionidae	*Anagotis latirostris*	DB,BM	1300-1750	Common in alpine to high alpine areas of Otago. locally common.
Curculionidae	*Lyperoblus hudsoni*	BM	1450 m	
Curculionidae	*Lyperoblus spedenii*	WC	1790 m	Speargrass weevil, widespread in western areas in alpine zone. On range of *Aciphylla* spp. locally common only.
Curculionidae	*Otiorhynchus sulcatus*	MC	510 m	Exotic Passion vine weevil
Curculionidae	*Zenagraphus ?metallescens*	BM	1550 - 1650	
Scarabaeidae	*Odontria smithi*	MP	910 m	Common and widespread alpine species.

Scarabaeidae	*Scythrodes squalidus*	LB	1660 m	Carapace of ; Western Otago species of alpine herbfield. Locally common chafer.
Tenebrionidae	tenebrionids (6)	WC, LB, MP	1300-1740	

Bugs & cicada - Hemiptera

Acanthosomatidae	*Thametodictya tillyardi*	ML	540 m	Bug with a snout (Myers)
Myridae	*Romna* spp.	MC, ML	500 -600	General on shrubs
Lygaeidae	*Nyslus huttonl*	BM	1600 m	
Pentatomidae	*Cermestulus nasalis hudsonl*			
Pentatomidae	*Hypsothocus hudsonl*	BM, LB	1650 m	Rare shield bug of western and Central Otago mountains. Local only
Pentatomidae	*Rhopalimorpha lineolaris*	MC, LB	520 - 1180	Shield bug common in Carex wetlands
Saldidae	*saldula* sp.	MC		Riparian rocks
Tibicinidae	*Kikihea angusta*	MC, LB, BM, MP	520 -910	Common and widespread grassland – lowland to alpine species
Tibicinidae	*Kikihea subalpina*	MC, BM	520 - 1200	Common shrubland species – montane to lowland
Tibicinidae	*Kikihia rosea*	LB, BM	810 - 1200	Common and widespread – lowland to montane
Tibicinidae	*Maoricicada nigra nigra*	BM	1650 m	
Tibicinidae	*Maoricicada nigra nigra*	MCRB	1230 m	
Tibicinidae	*Maoricicada nigra nigra*	DB	1760 m	
Tibicinidae	*Maoricicada oromelaena*	WC, BM	860 - 1770	Locally common on western mountains in alpine zone.

Grasshoppers, weta & cricket - Orthoptera

Acrididae	*Alpinacris tumidicauda*	WC, LB, LC, MP	810 - 1730	Snowbank species of south.
Acrididae	*Phaulacridium marginale*	MC, MCRB, CP, ML, LB, LC	520 - 1300	Grasshopper. common in open country

Acrididae	*Sigaus australis*	WC, LB, BM, MP	850 - 1780	Males and females and juveniles. common and widespread montane to high alpine species.
Acrididae	*Sigaus campestris*	MP	910 m	Local species of montane to low alpine areas. Widespread in south
Acrididae	*Sigaus obelisci/'remarkables' (Simon Morris)*	CP, DB, BM, WC	1340 - 1760	Larger, local species of Otago. high alpine areas only
Anostostomatidae	*Deinacrida crassidens*	MCRB	1450 m	
Anostostomatidae	*Hemiandrus focalis*	DB, BM, CP	1100 - 1650	Ground weta ; common on alpine Otago in ground
Raphidophoridae	*cave weta ?spp.*	WC, LB	1160 - 1780	Two species un-named – often on rock tors.
	Coenocephalus semivittatus	FC, ST	560 m	S I katydid; common in open country - dry grasslands
	Pteronemobius bigelowi	MC, FC, BM	520 -850	Grassland cricket – common in open areas

Caddis - Trichoptera

Hydrobiosidae	*Costachorema callistum*	BC	520 m	
Hydrobiosidae	*Costachorema psaropterum*	BC	520 m	
Hydrobiosidae	*Edpercivalia fusca*	BC	520 m	
Hydrobiosidae	*Hydrobiosis copis*	BC	520 m	
Hydrobiosidae	*Hydrobiosis spathulata*	BC	520 m	
Hydrobiosidae	*Psilochorema leptoharpax*	BC	520 m	
Hydrobiosidae	*Psilochorema macroharpax*	BC	520 m	
Hydrobiosidae	*Tiphobiosis montana*	MCRB	1400 - 1450	Caddis – – locally common in OL – wetland species
Leptoceridae	*Hudsonema amabile*	MC	520 m	
Leptoceridae	Leptocerid sp.? In wetland	MC	500 m	Species in sedge and rush wetland

Oeconesidae	*Pseudoecones us stramineus*	MCRB	1240 m	
Bees & wasps - Hymenoptera				
	native bee	ML	620 m	
Sphecidae	sphecid wasp	MC	520 m	
Lacewings - Neuroptera				
	?lacewing species	FC	520 m	
	Micromus tasmaniae	MC	500 m	Lacewing – common and widespread – also in Australia
Cockroaches - Blattodea				
	Celatoblatta quinquemaculat a	WC, LB, BM, MP		Cockroach; ; common in Otago alpine to high alpine areas.
Earwigs - Dermaptera				
Forficulidae	*Forficula auricularia*	LC	810 m	Forficula common introduced earwig
Stoneflies - Plecoptera				
Notonemuridae	*Spaniocerca longicauda*	MC, DB, MCRB,	520 - 1760	
Zealandoperlidae	*Zealandoperla fenestrata*	DB	1400 m	
Spiders - Araneae				
		DB	1760 m	Yellow and amber Orbweb of tussock shrubland
	Colaranea verutum	MC	500 m	Wetland nurseryweb like *aquaticus*
	Dolomedes sp. aff. *aquaticus*	BM	1650 m	
	Hexathele sp. alpine tunnel web.	MC	500 m	Long jaw spiders

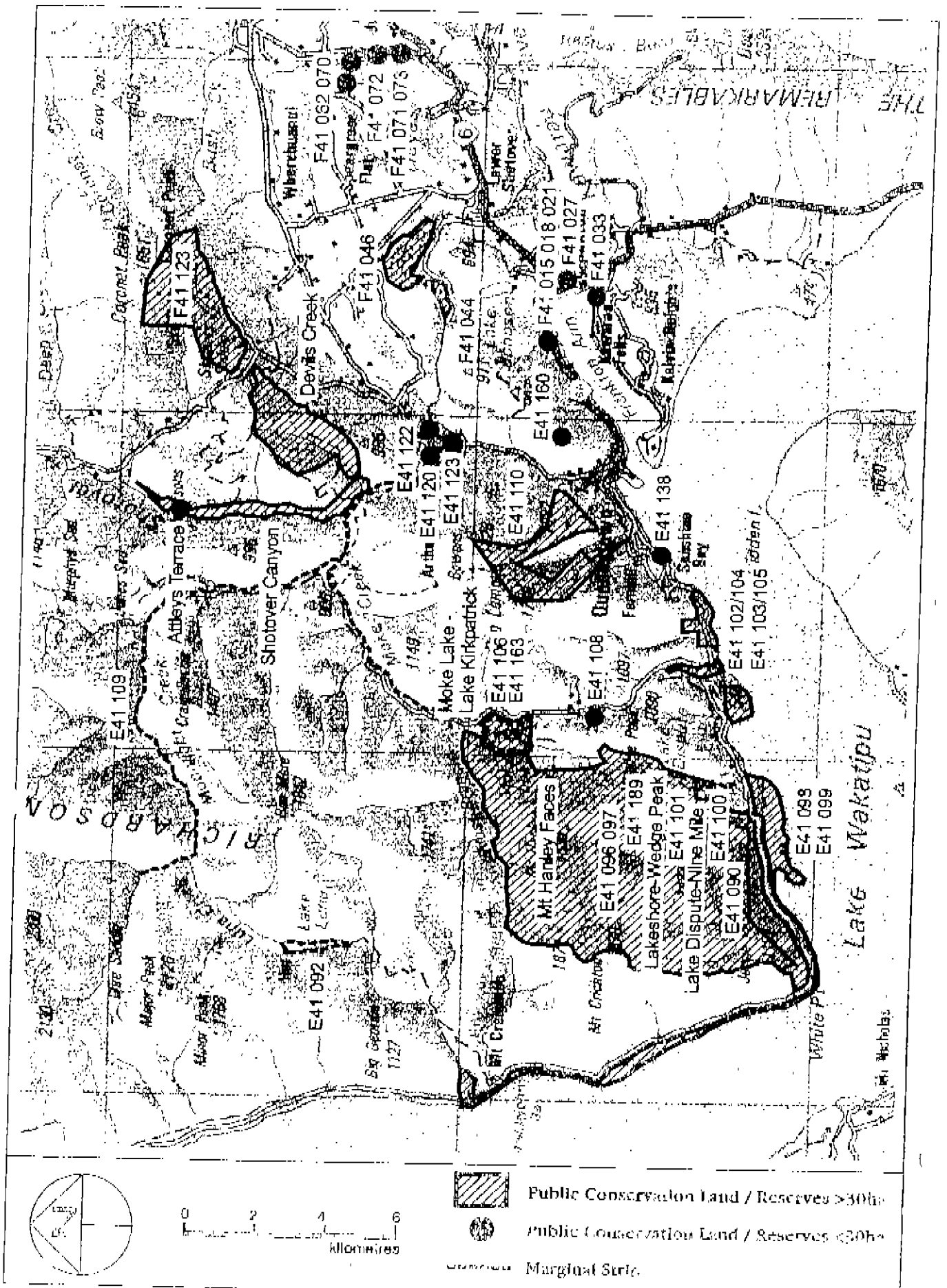
	Tetragnatha sp.			
Millipedes - Diplopoda		MCRB, DB	1400 m	Pill millipedes
	Procilliosoma lelosomum			
Pseudoscorpions		CP	1340 m	
	Pseudoscorpion species			
Velvet worms - Onychophora		CP, DB	1300 - 1400	Live bearing species locally common in west Otago Mountains
Peripatopsidae	*Peripatus* new species			

APPENDIX 4

OTAGO CONSERVATION MANAGEMENT STRATEGY
EXTRACT

Map 5 of 6

Queenstown



10.30 QUEENSTOWN

CONS. UNIT NO.	LAND	STATUS	AREA
F 41 123	Coronet Peak	Recreation Reserve	596.14 ha
R 41 122	Morning Star Beach	Recreation Reserve	9.60 ha
E 41 123	Big Beach	Conservation Area	23.30 ha
E 41 090	Queenstown-Glenorchy Road	Recreation Reserve	473.12 ha
E 41 096/097	Mount Crichton	Scenic Reserve	2584.65 ha
E 41 098	Bobs Cove	Recreation Reserve	142.79 ha
E 41 099	Bobs Cove	Conservation Area	7.52 ha
E 41 100	Lake Dispute and Nine Mile Creek	Marginal Strip	10.66 ha
E 41 101	Closeburn	Conservation Area	4.45 ha
E 41 102/104	Seven Mile	Recreation Reserve	159.80 ha
E 41 103/105	Seven Mile Recreation Reserve	Conservation Area	18.36 ha
E 41 106	Moke Lake	Marginal Strip	12.00 ha
E 41 163	Moke Lake	Recreation Reserve	32.10 ha
E 41 108	Lake Kirkpatrick	Recreation Reserve	9.00 ha
E 41 110	Ben Lomond	Scenic Reserve	472.86 ha
E 41 138	Sunshine Bay	Recreation Reserve	1.19 ha
F 41 033	Kawarau Falls	Recreation Reserve	5.00 ha
-	Mt Hanley Faces	Conservation Area	1,363.00 ha
-	Lakeshore-Wedge Peak	Recreation Reserve	223.80 ha
E41 189	Lake Dispute	Scenic Reserve	94.47 ha
-	Lake Dispute/Nine Mile	Scenic Reserve etc	24.90 ha
-	Moke Lake/Lake Kirkpatrick	Scenic Reserves	18.48 ha
F 41 071/73	Lake Hayes	Recreation Reserve	59.63 ha
E 41 160	Queenstown Hill	Conservation Area	40.85 ha
E 41 120	Oxenbridge Tunnel	Recreation Reserve	9.48 ha
E 41 109	Moonlight Creek	Marginal Strip	65.00 ha
E 41 092	Lake Luna	Marginal Strip	8.00 ha
F 41 044	Tuckers Beach	Recreation Reserve	26.18 ha
F 41 062/70	Lake Hayes	Marginal Strip	8.00 ha
F 41 072	Lake Hayes	Wildlife Reserve	1.85 ha
-	Mt Dewar	Conservation Area	680 ha
-	Atleys Terrace	Historic Reserve	0.1770 ha
-	Shotover Canyon	Conservation Area	202.00 ha
F41 046	Tuckers Beach	Wildlife Management Reserve	150.83 ha

10.30.1 ***Ecological District***

Shotover

10.30.2 ***Local Authority***

Queenstown Lakes District Council

10.30.3 ***Land Administered by DOC***

The department administers a significant number of reserves within 20 kilometres of Queenstown town centre, from Twenty-Five Mile Creek in the west to Lake Hayes in the east. These provide the basis for recreational opportunities, particularly walking, fishing and picnicking, as well as protecting some of the scenic and historic amenity which underpins Queenstown's status as a premier resort. They also protect important aspects of biodiversity in the Wakatipu Basin, from the lake margin to the high peaks.

10.30.4 ***Other Land***

The land administered by the department has a large number of neighbours, covering a wide spectrum of land uses from QLDC reserve, pastoral lease and freehold farmland, to private residential and commercial properties.

Frankton Arm, Wakatipu

10.30.5 ***Description***

The Wakatipu Basin is made up of two contrasting areas - the lake basin and the rural basin - separated by the mass of Queenstown Hill.

The glacially deepened lake has steep sides rising to mountains well over 1,000 metres, eg, Mount Crichton, 1,871 metres. Flat land is rare in the lake basin and at a premium forcing residential and commercial development up the hillsides. Roads are confined to the lake edge and gorge linking the two basins. The larger tributary valleys are also glaciated and U shaped, sometimes over-deepened with small lakes, eg, Moke and Dispute. Smaller tributary valleys are steep Vs typical of more recent erosion.

The rural basin, in contrast, is open with flat land plentiful on glacial outwash terraces or the huge delta of a previously much larger Shotover River. Low hills break up the flat land and on all sides mountains overlook the basin, each with roads to high altitude (Coronet Peak, Crown Terrace and Remarkables).

Queenstown Hill Walkway, with wilding conifers becoming evident.

The centre of tourism, Queenstown, is however located on its own bay on the lake, where space is confined. The rural basin is predominantly in "lifestyle" blocks with residential development on the periphery at Frankton, Arrowtown and Arthurs Point. Natural and historic resources which form the basis of tourist attractions are also peripheral (centred on the Shotover Gorge at Arthurs Point, Coronet Peak ski slopes, Arrowtown and Gibbston).

Notable features in the basins are:

- Wakatipu, an outstandingly clear, pure lake, very deep (380 metres) and scenically spectacular;
- the Moonlight Fault, a major fault running across the lake through Bobs Cove, Moke Valley and Moonlight Valley, Oligocene sedimentary rocks including fossil bearing limestones at Bobs Cove have been preserved despite the faulting;
- the Shotover River incised in a spectacular deep gorge before it opens out to a wide braided channel in the lower section where it crosses outwash gravels;
- Lake Hayes, a shallow glacial lake is one of New Zealand's most scenically attractive small lakes, but is eutrophic;
- Queenstown Hill, a huge roche moutonnee with sheer sides overlooking the gorge to the west, and a wide, undulating summit;
- numerous other glacial features - old lake beaches, lateral moraines, other roches moutonnees (Peninsula Heights and Ferry Hill) and erratic blocks.

Together, these features combine to provide a mosaic of landforms supporting a variety of vegetation and land uses which are particularly scenic in a magnificent mountain and lake setting.

Vegetation in the two basins is also in contrast. The lake margins retain remnants of native beech forest and scrubland. Pure stands of beech have been preserved on steeper slopes in shaded gullies. Exotic coniferous forest has spread from Bobs Peak and the Commonage above Queenstown. Elsewhere the slopes are tussock grassland modified lower down by oversowing and topdressing. Stands of eucalyptus and deciduous exotic trees such as poplar add variety and interest.

The vegetation of the basin, however, is almost entirely man modified, cultivated pasture on the low land, and extensive oversown and topdressed grassland on the hillsides.

The hill country is used for sheep farming but also has populations of feral goat and deer.

Residential development is expanding rapidly up hill and along the lake from Queenstown, Frankton and the suburbs of Kelvin Heights, Fernhill and Sunshine Bay, with sporadic development in other suitable areas along the lake and scattered over the rural basin. The airport occupies much of the ground behind Frankton.

Roads follow the lake, mostly close to the lake edge, for most of its length round as far as the Kelvin Peninsula and form a close network over the rural basin. Walking tracks have been developed below close to the lake edge and up the major valleys and onto Queenstown Hill.

10.30.6 Values

Recreational opportunity settings range from rural, through back country (drive-in and walk-in) to remote within a short distance of Queenstown.

The entire area is highly scenic with the ability to gain ready access to high vantage points, eg, Bobs Peak gondola, Coronet Peak and Remarkables roads, Queenstown Hill and Ben Lomond tracks.

The principal value of the department reserves near Queenstown itself is the protection they provide to key areas of landscape amenity, especially the lake edge and land immediately behind beaches and surrounding the small lakes. Rapid development of Queenstown and pressure from commercial enterprise for development based on natural resources, makes these protected areas increasingly valuable and poses ongoing threats to them.

Coronet Peak Recreation Reserve provides for the premier New Zealand skifield as well as being a focus for walking, hang gliding and parapenting.

The numerous walking tracks including Bobs Cove, Wilsons Bay, Sunshine Bay, One Mile Creek, Ben Lomond and Queenstown Hill are a major recreational resource whose full potential is yet to be realised. The Queenstown to Frankton lakeside walk is well used by walkers, joggers and cyclists.

The Queenstown Hill and One Mile Creek tracks commence within one kilometre of the heart of Queenstown, taking walkers directly into forest and on up to hills with outstanding views. The Seven Mile and Twelve Mile tracks take visitors to idyllic lakeside country surrounded by soaring mountain peaks. The Lake Dispute and Moke Lake tracks give access not only to these angling lakes, but also provide access to the back country beyond, including round-trip routes, ie, Mount Crichton track up the Twelve Mile Creek looping back above Lake Dispute to the start and downstream from Moke Lake via the Moonlight Track to Arthurs Point and so back to Queenstown. The One Mile Track continues on past Bobs Peak to Ben Lomond Summit or over the Bowen Saddle to the lower Moke Creek with opportunities to continue on into the Moonlight.

Walking tracks in the rural basin are generally lacking. Recreation is largely peripheral, focused on the Shotover River (jetboating, rafting), Coronet Peak and Lake Hayes. The basin, however, is popular for scenic driving and is used frequently

Moke Lake.

by tourists moving between Queenstown, Arrowtown and the Gibbston vineyards and bungy jump.

Public facilities are provided at the principal beaches. Camping is available at the Twelve Mile Delta. Swimming, boating and water skiing are carried out from beaches or jetties at a variety of places round the lake.

Gold in the creeks encourages gold panning. Remnants of former times include the lime kilns of Bobs Cove, the occasional house remains and mine tailings and machinery in tributary valleys.

Many traditional sites of significance to Kai Tahu are said to be located in this area. None are highly visible. Kai Tahu speak of waahi tapu and waahi taoka in the area, and of the significance of the mauri of the lake. The area was settled, and kaika nohoaka included Kirtkiri and Tahuna. Te Taumata a Haki te Kura (the standing place of Haki te Kura) is the traditional name of Ben Lomond, overlooking the town.

The rivers contain indigenous aquatic species including; koaro, long-finned eel, upland bully, trout and other sports fish, caddis flies and mayflies, some species of which are uncommon. At Moke Lake and Lake Kirkpatrick areas of wetland are of value for water fowl. The rare grass *Triglochin Palustre* is found in one of these wetlands. The lower Shotover beaches are important for water fowl and ground nesting birds.

Stands of native beech and eucalyptus provide habitat for a wide variety of native and exotic birdlife.

The reserves also protect sequences of indigenous vegetation and invertebrate communities, for example from the alpine crest of Ben Lomond down through snowgrass/herbfield, shrubland and beech forest to Lake Wakatipu. Included amongst these are numerous rock bluff refugia for palatable native plants and associated biota, eg, aniseed *Gingidia montana* and a large moth that has larvae feeding exclusively on it, *Gingidiobora subobscurata*.

A high diversity of alpine and forest insects are found here depending to some extent on the naturalness and largeness of the vegetation communities. A nationally threatened moth *Asaphodes stinaria* has its biggest known population in the beech forests of this area.

10.30.7 *Management Issues*

- Commercial pressure for use of natural resources and development generally for tourism.
- Protection of rural landscape values from development pressure (both tourism and residential).
- Upgrading, maintenance and expansion of the walking track system.
- Protection of Coronet Peak as a backdrop to the basin.
- Conflict between mountain bikers and walkers.
- Public access over private land in order to link longer sections of track.
- Insufficient toilets and picnic facilities.
- Wilding tree control to prevent conversion of open tussock country to coniferous or sycamore forest.
- Potential for establishment of *Lagarosiphon* in Lake Wakatipu and other smaller lakes.
- Provision for fish passage past roading and other developments.
- Encroachment of residential development on areas of high landscape value including obtrusive spread up hillsides.
- Retention of open space in the light of the growth of Frankton.
- Increasing public awareness of the existence and value of walking tracks and features along them.
- Absence of walking opportunities in the rural basin.
- Insensitive landuse changes, eg, pastoral and forestry development, changing landscape character.
- Protection of historic sites and features.
- Pressure for use from commercial development.
- Fire generally, with high risk in areas of coniferous forest, especially Bobs Peak where the Skyline tourist facilities are at grave risk in the event of fire on this steep hillside.
- Gravel extraction from the Shotover.
- Fencing of Lakes Moke, Kirkpatrick and Dispute and their tributaries to prevent stock intrusion.
- Reticulation of sewage to rationalise the system and prevent degradation of water quality.
- Maintenance of water quality in lakes and streams in the face of fertiliser runoff and pollution from urban development, especially Lake Hayes.
- Presence of Old Mans Beard (*Clematis vitalba*) on Queenstown Hill and wilding conifers above the mature Douglas fir tree line.
- Goat control on mountains.
- Retaining the threatened moth *Asaphodes stinaria* in beech forests between Fernhill and Bobs Cove.

- Control of deer with assistance of recreational hunting.
- Retention of stands of indigenous trees in the face of urban development.
- Protection of historic features from vandalism and lack of appreciation of their value or presence.
- Administration by the department of areas of local rather than national significance which would be better managed by Queenstown Lakes District Council.
- Lack of awareness of Maori sites and their significance and lack of use of traditional place names.

Objective for Queenstown

To recognise the value of an extensive protected area system around Queenstown as a basis for the protection of amenity, landscape, natural, cultural, and historic resources of significance to Queenstown and New Zealand and for recreational enjoyment. Then to implement and protect that system.

Implementation

(a) Walkways will be secured and gazetted where not on land administered by the department. Walking tracks will be upgraded to prescribed standards for short walks and will be maintained. Opportunities such as tenure review will be taken to negotiate the expansion of the network, close gaps in the lake edge and back country continuous walkways. Support will be given to walkways in the rural basin.

(b) The need for increased and public awareness of the opportunities the tracks provide will be recognised by increased onsite interpretation and liaison with other recreational providers and the Queenstown Lakes District Council.

(c) On land administered by the department, a suitable containment line for large infestations of wilding trees (douglas fir, larch and to a lesser extent, sycamore) will be established and sustained efforts will be made to remove wilding trees from outside it, using all available means. Methods for prevention of seeding out from the infestation will be studied and tested. Vegetation management on Coronet Peak Recreation Reserve will be in accordance with the approved management plan.

(d) Protection of landscape and amenity values from inappropriate development will be sought through advocacy under the Resource Management Act and liaison with QLDC and private owners.

(e) Commercial concessions may be allowed on land administered by the department where it can be shown the proposed activity will not have an adverse effect on landscape and natural heritage values, or where any adverse effects can be adequately or reasonably avoided, remedied or mitigated, and where there will be no reduction in the enjoyment of the area by the general public either now or in the future.

(f) Access by mountain bikes to walking tracks will be carefully assessed and monitored to minimise conflict with other users and values.

(g) Areas of special botanical and habitat value around the shores of Lakes Hayes, Johnston, Moke, Kirkpatrick and Dispute will be fenced and toilets and camping facilities provided as appropriate.

(h) The public will be made aware of the high risk of fire and close liaison will be maintained with the QLDC and Queenstown Volunteer Fire Brigade to prevent fire damage and risk to life and property.

(i) Assistance will be rendered to QLDC and ORC to monitor and prevent the establishment of *Lagarosiphon* in Lake Wakatipu.

(j) A review of fish passage requirements will be undertaken and the results implemented.

(k) Public awareness of the adverse effects of plant pests particularly wilding conifer spread will be raised, and community support for control will be encouraged.

(l) Land administered by the department of low natural, historic or recreational values will be available for disposal, swap or development in cases where net conservation benefits in terms of the objective can be demonstrated.

(m) Reserve areas of local significance will be considered in consultation with QLDC and vesting in the council sought as appropriate, and areas currently vested in QLDC that are of strategic importance in terms of the objective will be the subject of discussion with them.

(n) Control of deer will be assisted by encouraging recreational hunting where appropriate.

(o) Goats will be controlled in accordance with the goat control plan for Otago.

(p) Sensitive treatment of development bordering on protected areas and waterways will be sought through advocacy under the Resource Management Act and liaison with QLDC and private owners.

(q) The retention of stands of existing and regenerating indigenous vegetation will be sought through advocacy under the Resource Management Act and increased public awareness.

(r) Survey and monitoring of historic features and advocacy for their protection will be carried out as and when appropriate.

(s) Consideration will be given to managing some stands of exotic trees for commercial afforestation within containment lines and subject to the objective.

(t) Close liaison will be developed with Kai Tahu to identify and safeguard cultural sites on land administered by the department of importance to them, and traditional place names will be promoted.

(u) Further research into the biology/ecology of Asaphodes stinaria will be supported to understand its conservation needs.

(v) Advocacy for protection of significant natural and historic resources will be carried out under the Resource Management Act and other statutory processes.

(w) Coronet Peak Recreation Reserve (and skifield) will be managed according to its approved conservation management plan.

(x) Opportunities arising out of negotiations to ensure review of pastoral leasehold properties will be taken in order to improve the protected area system and access to it.

(y) A visitor centre will be maintained by the department in Queenstown to service the needs of visitors for information on both the Queenstown area and on south west New Zealand generally.

Priorities for Queenstown

The protection and enhancement of indigenous natural resources and recreational opportunities in natural walk-in settings on the higher ground around Queenstown will be priorities in this Special Place, along with servicing visitors needs for information.

See also Plant Pest Control priorities Chapter 22, and Special Place No. 33 (Upper Shotover).

Lake Hayes.

APPENDIX 5

Records for Mount Creighton from NIWA National FFWFDB

card	m	y	Locality	E41	altitude	spcode	abund
1426	2	1979	Moke Creek	21610 55698	530	galaxi	r
1426	2	1979	Moke Creek	21610 55698	530	saltru	a
1426	2	1979	Moke Creek	21610 55698	530	gobiom	c
15394	1	1996	Twenty-four Mile Ck	21506 55685	310	galbre	1
15394	1	1996	Twenty-four Mile Ck	21506 55685	310	oncmyk	1
15394	1	1996	Twenty-four Mile Ck	21506 55685	310	gobcot	5
15489	2	1996	Moonlight Creek	21565 55790	710	nospec	0
15490	2	1996	Moonlight Creek	21589 55780	620	nospec	0
15491	2	1996	Moonlight Creek	21637 55793	500	nospec	0
15492	2	1996	Butchers Creek	21646 55774	490	saltru	o
5834	4	1999	Moke Creek	21609 55696	530	gobcot	
21697	4	2001	Moke Creek	21609 55697	530	saltru	a
21698	4	2001	Moke Creek Right Hand Branch	21610 55700	530	saltru	a

Key to species

Galaxy	*Galaxias* sp.	Unspecified Galaxias sp.
Galbre	*Galaxias brevipinnis*	Koaro
Gobiom	*Gobiomorphus* sp.	Unspecified bully sp.
Gobcot	*Gobiomorphus cotidianus*	Common bully
Saltru	*Salmo trutta*	Brown trout
Oncmyk	*Oncorhynchus mykiss*	Rainbow trout
Nospec		No species

APPENDIX 6

GEOLOGICAL SITES

Joint Earth Science Societies' Working Group
on the New Zealand Geopreservation Inventory

INVENTORY AND MAPS OF IMPORTANT GEOLOGICAL SITES AND LANDFORMS IN THE OTAGO REGION

edited by Bruce W. Hayward and Jill A. Kenny

First Edition 1998

Geological Society of New Zealand Miscellaneous Publication 99

Moke Creek greenschist copper deposit

SIGNIFICANCE: One of the very few pre-metamorphic metalliferous occurrences in the Otago Schist. Remnants of a small, locally significant copper mine in Otago.

DESCRIPTION: Greenschist containing thin pyrite-chalcopyrite-pyrrhotite laminae, readily traceable for approximately 100 m. Has been mined on a small scale since 1890s with a drive into the hillside beside Moke Creek.

LOCALITY: On a sharp bend of Moke Creek about 600 m upstream from junction with McConochie's Creek, about midway between Moke Lake and the Moonlight/Shotover River. E41 637 733.

ACCESS: By foot from the end of Moke Creek Road, off main Queenstown-Glenorchy Road (private land, locked gate).

EXPOSURE TYPE: In river-banks and bluffs

CLASSIFICATION: Importance = C Vulnerability = 3

INFORMANTS: Craw, D.; Turnbull, I.M.; Ritchie, N. - 1990

REFERENCES: Wood, B.L. 1967: The copper deposits of Moke Creek, West Otago. NZ Journal of Geology and Geophysics 10 (3): 855-869. Turnbull, I.M.; Forsyth, P.J. 1988: Queenstown - a geological guide. Geological Society of NZ Guidebook 9: 10, 24. Williams, G.J. 1974: Economic geology of New Zealand. Australasian Institute of Mineralogy and Metallurgy Monograph Series No.4: 177-178. Wright, J.B. 1966: Studies on the pyrrhotite and paragenesis of the Moke Creek sulphide lode, Wakatipu district. NZ Journal of Geology and Geophysics 9 (3): 301-322.

Moonlight Fault lacustrine beach ridges

SIGNIFICANCE: Good example of fault displacement of lacustrine terraces on side of Lake Wakatipu.

DESCRIPTION: Contemporaneous displacement of late Quaternary beach ridges by single left lateral faulting event on N trending trace (1.6-2.0 horizontal and 1.2-2.0 m E side up), and right lateral events on E trending trace (3.0, 5.5 and 10.6 m horizontal, and 1.0-1.6 m vertical).

LOCALITY: Mt Nicholas Station, c.2 km SE of homestead. E42 511 570.

CLASSIFICATION: Importance = C Vulnerability = 2

HAZARDS: Overstocking

INFORMANTS: Berryman, K.R.; Turnbull, I.M.; Norris, R.J.; Suggate, R.P. - 1986

REFERENCES: Suggate, R.P. 1952: The Moonlight fault. New Zealand Journal of Science and Technology 34(B1): 21-25.

APPENDIX 7

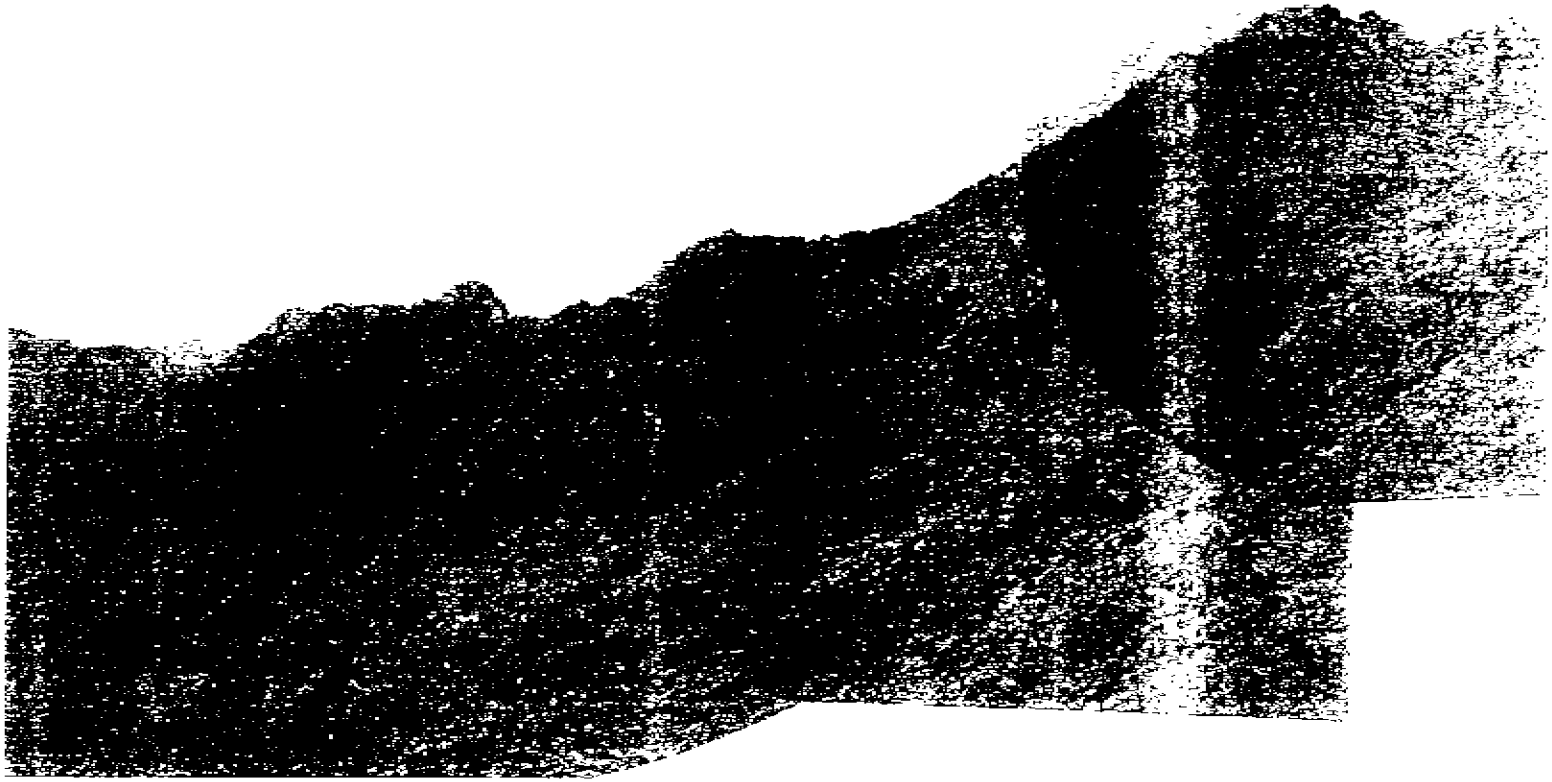
PHOTOS RELATING TO VEGETATION REPORT

P.1 Stony Peak and Mt Larkins (2300m) and cirque at head of Wire Creek, from Wire Saddle.

P.2 Steep tussock and herbfield slopes and scarp above slopes below Wire Saddle.

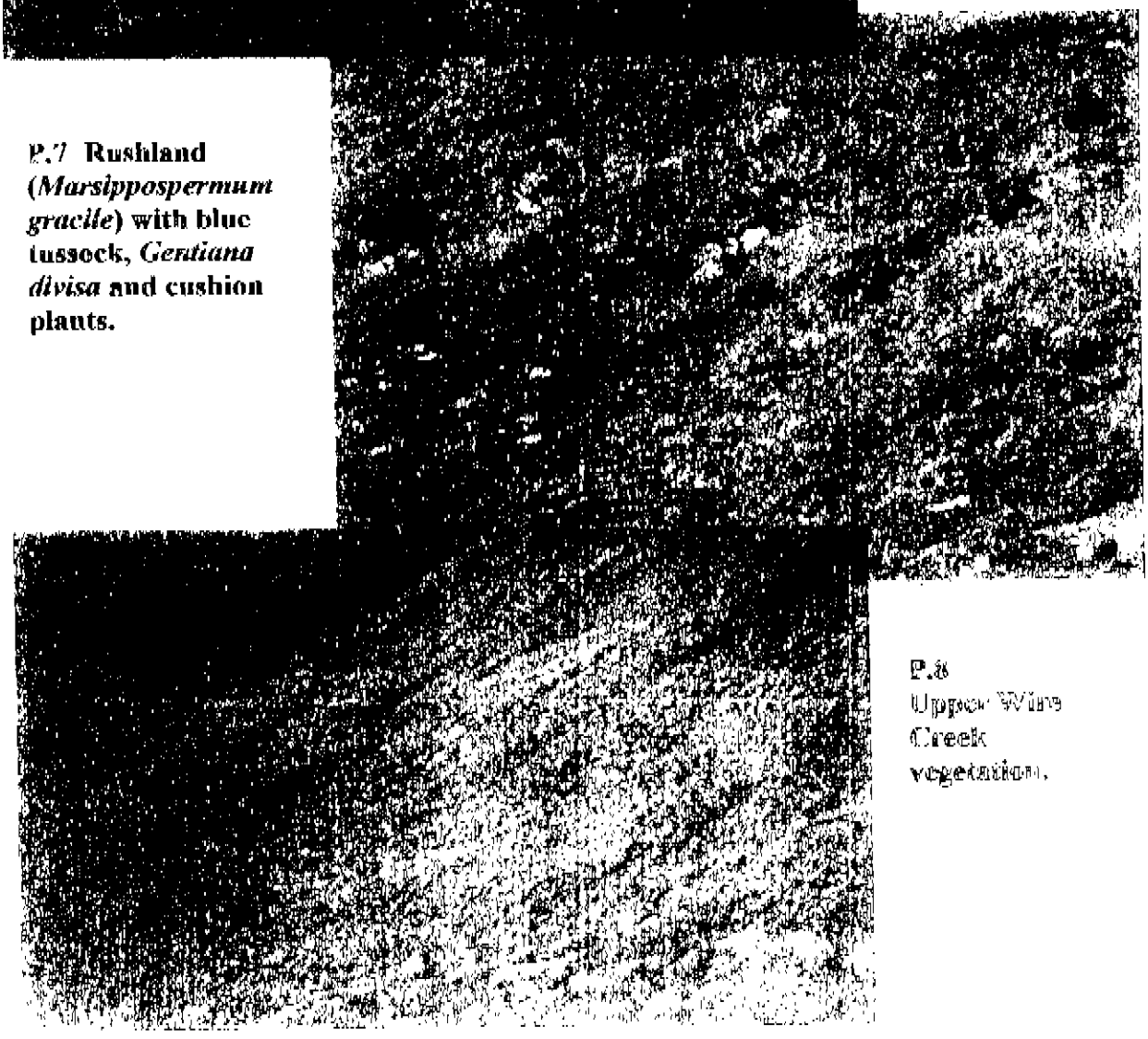
P.4 View down Wire Creek to beech forest in lower valley. *Chionochloa macra*, *Poa colensoi* and *Celmisia lyallii* below Wire Saddle.

P.5 Ridge above Wire Creek – part north boundary of Mt. Creighton F.R. *Chionochloa macra tussockland with Aciphylla "diamond".*



2.5 Wire Creek-north to north east faces. Upper slopes with blue tussock, diesel rush, *Rytidosperma pumila*, cushion plants, occasional slim-leaved snow tussock, *Celmisia lyallii*, *Carex wakatipu*, etc

P.6 Cliffline and rushland with Gentiana, blue tussocks, *Coprosma niphophila*, *Gaultheria* n.z. Lichens and mosses, etc. **Wire Creek.**



P.7 Rushland (*Marsippospermum gracile*) with blue tussock, *Gentiana divisa* and cushion plants.

P.8 Upper Wire Creek vegetation.

E9 Mid slopes just above the beech forest with good shrublands on the steep rocky slopes and bluffs. Well grazed grassland with brown top, sweet vernal and chewed down narrow leaved snow tussock, blue tussock, herbs and scattered shrubs and spargrass.

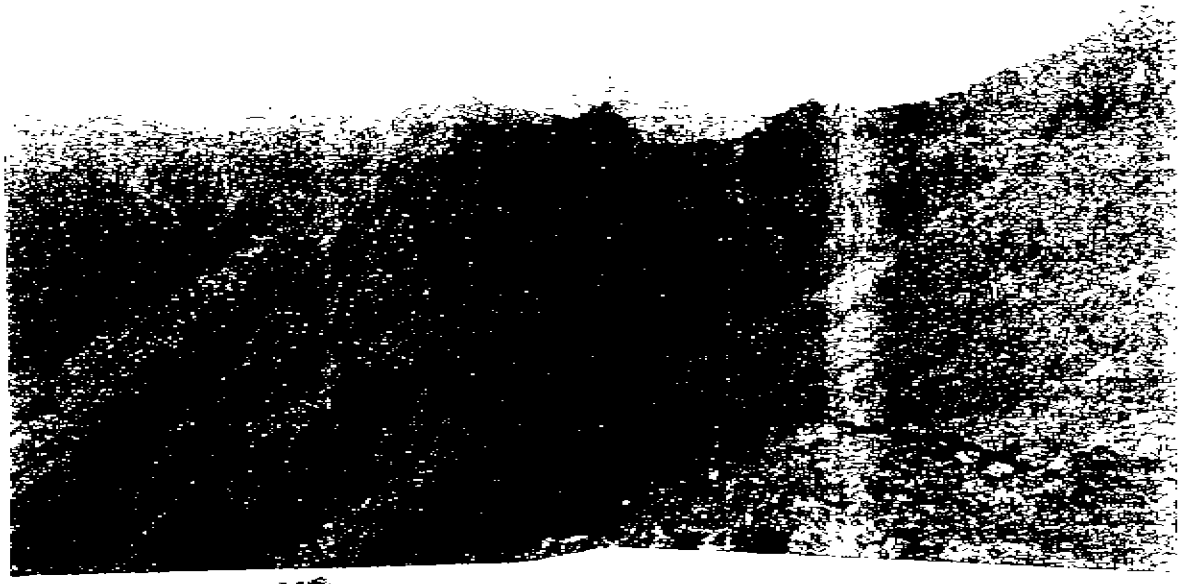
P.10 Luna Basin at right and faces towards Lake Luna at left with slumping and many *Aciphylla* "lomond", from just above beech forest.

P.11 [illegible] Alpine flora [illegible] with *Marcippospermum gracile*, *Poa colensoi*, *Gentiana divisa*, *Coprosma niphophylla*, *Luzula pumila*, *Ourisia glandulosa*, *Abrotanella inconspicua*, *Raoulia youngii* and *Haastia pulvinaris* in scree.

P.12 Snow hollow with *Carex pyrenaica*, *Epilobium tasmanicum*, *Leptinella pectinata*, *Neopaxia sessiliflora*, *Chionohebe thomsonii*, *Kelleria croizatii*, etc

P.13 Chewed out grassland and herbfield. *Celmisia lyallii* prominent.

P.14 Ridge and faces to south of Luna Creek, Mt Crichton behind. Upper fellfield and tussockland



P.15 Continuation of above showing mountain beech forest, Luna Creek, Crush Creek opposite below Ben More (1242m).

P.16 Luna Basin Chewed down tussock grassland on old slump area.

P.17 Lower Luna *Basin*

P.18 Luna Basin and Crush Creek across Luna Creek

P19 View down Lana Creek towards Moonlight Creek, Lake Lana is right. Crash Creek centre right with forest patch. Coprosma and manuka shrub patches. Dracophyllum uniformis foreground. Shrubland returning on all lower slopes. (Previously beech forest

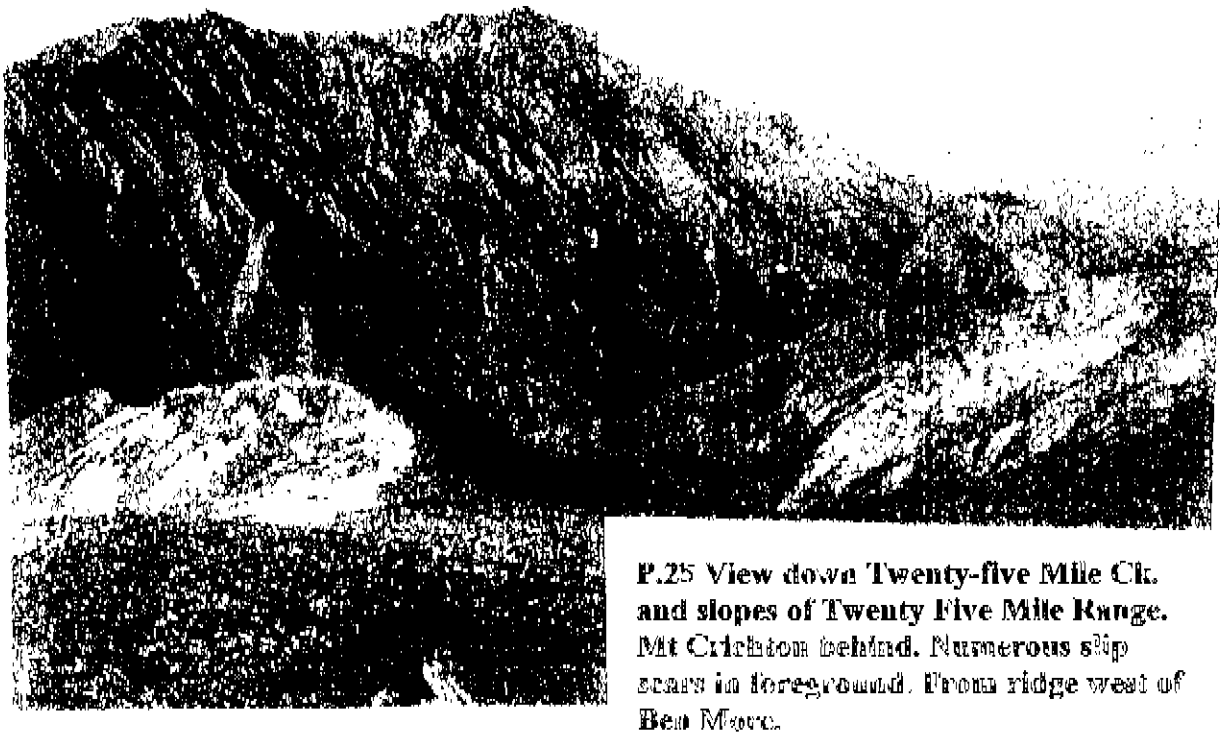
P.20 Shrubland in lower Lara Basin of *Glearia moschata*, *Coprosma ciliata*, *Hoheria hyalina*, *Carmichaelia petrei*, *Hebe anomala*, *Coprosma "spiders"*, *Podocarpus nivalis*, *Polystichum vestitum*, *Hypolepis millefolium*.

P.21 View south towards Lake Luna, Luna Creek below. Regenerating shrub patches at left. Manuka, *Coprosma* species and *Coriaria sarmentosa*.

P.32 View into Luna Basin left, Wire Creek, centre, behind dissected ridge with Stone Peak and Mt. Larkins in snow at its head. Moonlight Creek at right.

P.33 Lower Crush Creek and slopes above Luna Creek. Beech forest remnants in deep gully, ripple landform.

P.24 View westwards to Darran Mountains. Broken rock ridge with slim-leaved snow tussock, *Dracophyllum* spp. and cushion plants.

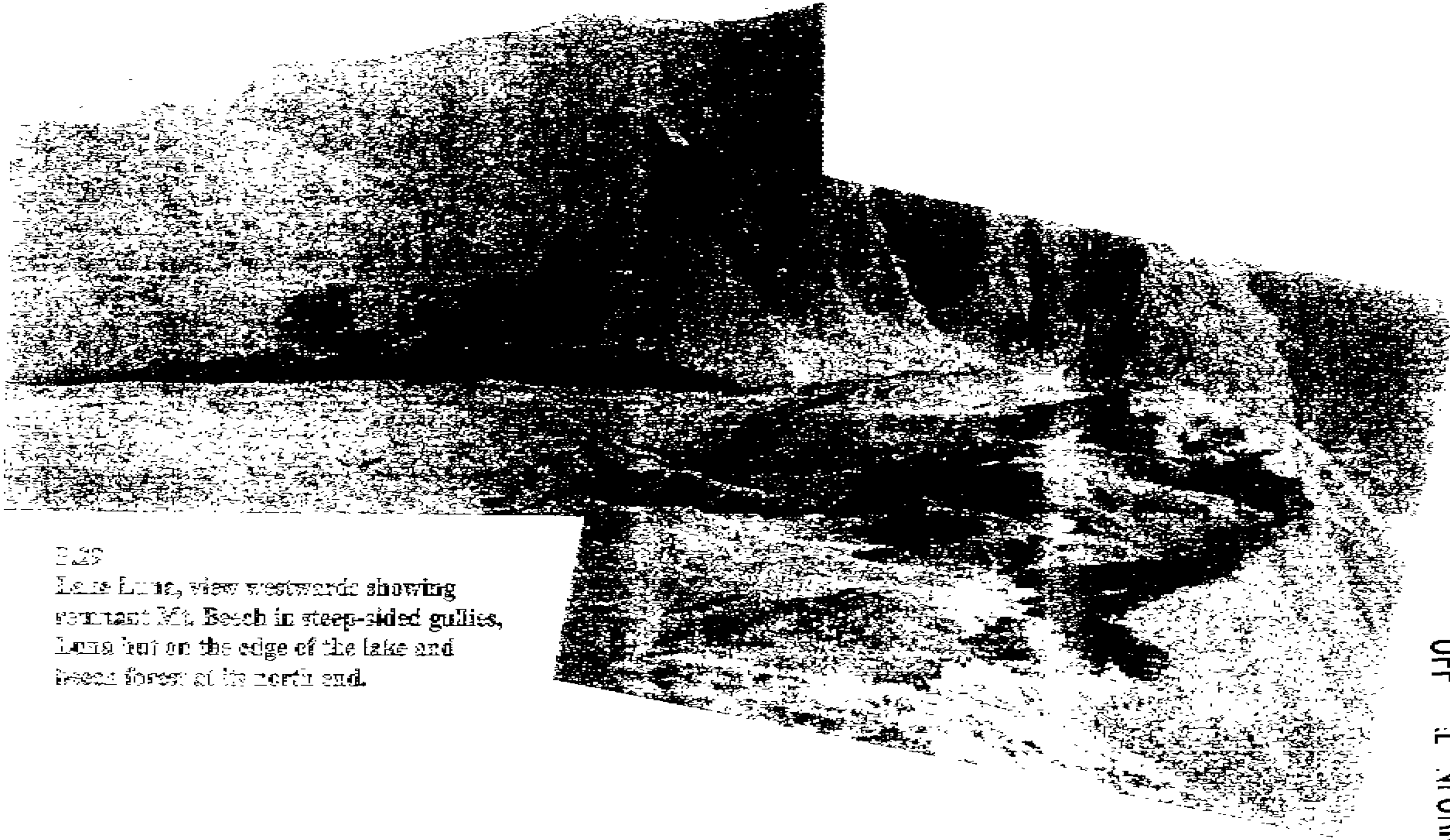


P.25 View down Twenty-five Mile Ck. and slopes of Twenty Five Mile Range. Mt Crichton behind. Numerous slip scars in foreground. From ridge west of Ben Moore.

P.26 Lena Basin (with Forest), Wire Creek with Stone Peak and Larkins (with snow), Moonlight Creek and Buttement from near Ben More. Crush Creek in foreground left.

P.27 Slumping tussock land and scree near Ben More.

P.33 Broad, easy slopes above Lake Luna east side with narrow-leaved snow tussock, *Dracophyllum uniflorum*, *Celmisia lyallii* and *Racomitrium* moss on ridge tops.



P.29
Lake Luna, view westwards showing remnant Mt. Beech in steep-sided gullies, Luna hut on the edge of the lake and beech forest at its north end.

P.30 Remnant pockets of mountain beech above Lone Creek. *Dracophyllum* on upper slopes and southeast faces. Shrubland returning on lower slopes in many places.

P.30a Crash Creek with slumping in the upper basin and remnant beech forest, *Dracophyllum* (crowns) on upper slopes area.

Fig. 1. East face (face west) above Lake Luna showing remnant moraine beach patches. View towards Ben Ahere (not visible). Top end (north) of lake at left. Note ripple landform and small dark algal patches (cyanobacteria).

P.32 View south west from near Ben More into upper Twenty-five Mile Creek with extensive beech forest. Lake Luna to right (just out of view).

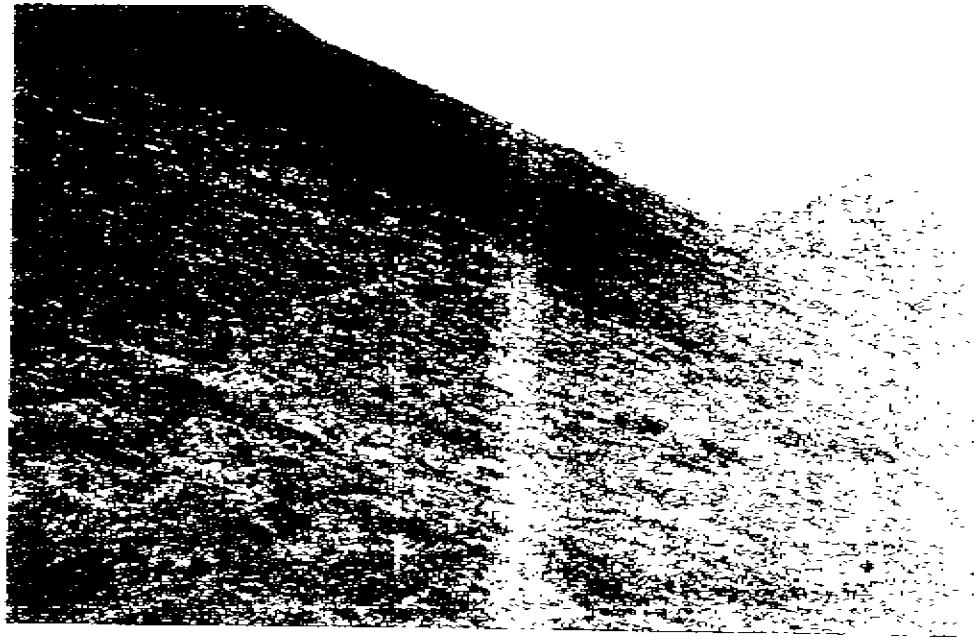
P.33 View south from ridge at GR 562748 Slopes on the east side above Lake Luna.

P.34 Good narrow-leaved snow tussock cover at 1200m on east faces above Lake Luna. *Aciphylla* "lomondi", *Dracophyllum uniflorum*, *Cassinia* *fistuloides*, [illegible]

P.36 Periodically wet hollow on east side of Lake Luna. Old slump slopes. Moss (*Polystichum sp.*) in the bottom with scattered rushes, sedges, *Rytidosperma pumilum*, *Poa breviculmis*, brown top.

P.37 Luna Creek and faces between Wire Creek and Luna Basin.

P.38 Contrast-grazed/ungrazed area above Luna hut at beech edge. *Chionochloa rigida* with beech saplings, *Dracophyllum uniflorum*, good cover above fence.



P.39 *Celmisia viscosa* herbfield near Ben More with *Dracophyllum pronum* and cushion plants. Most snow tussocks (*C. macra*) gone due to fire/grazing.

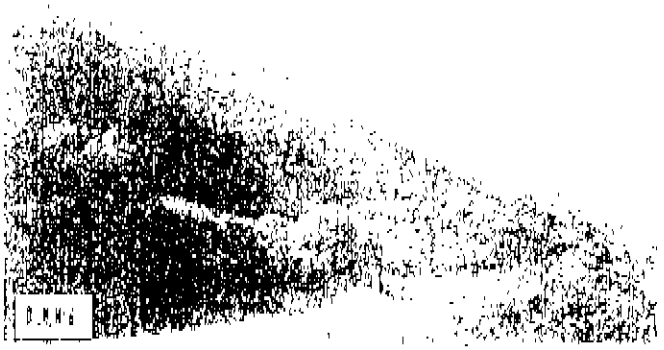
P.40 Early morning on the Lake Fesce Mount Creighton P.L. from Minor Peak. Scree, fellfield and tussockland with slumping – ripple landscape.

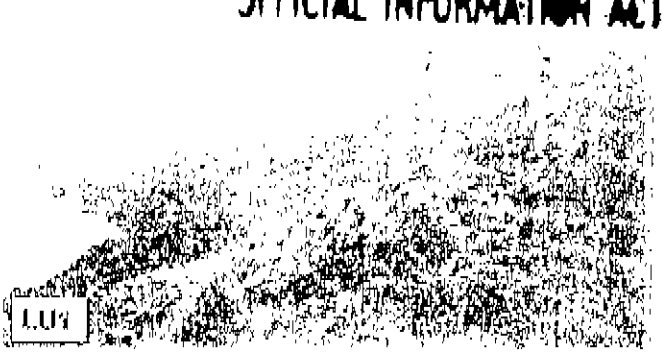
P.41 Lake Wakatipu Faces from near Bilner Peak with the homestead of the lake terraces, Mt. Crichton centre top.

P.42 Sheep camp – part of extensive sheep camps on and below ridges near Bilner Peak. All tussocks grazed to stumps. Much bare ground.

APPENDIX 8

PHOTOS – LANDSCAPE UNITS





Drawn by Blakely Wallace Associates

Legend

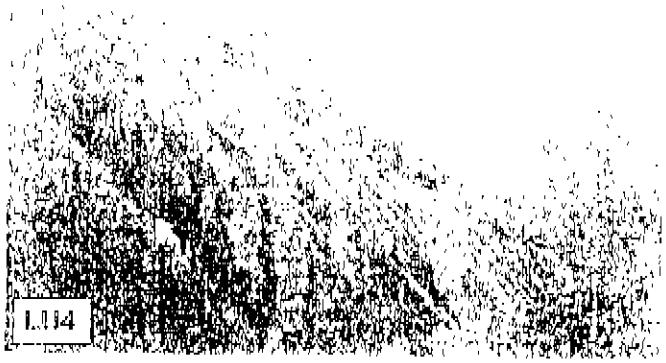
Title

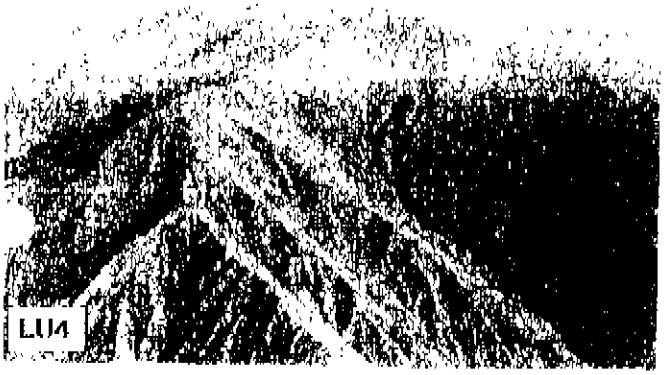
LANDSCAPE UNIT PHOTOGRAPHS

Scale

Date

Drawing Number





Drawn by Blakely Wallace Associates

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Project

APPENDIX 9

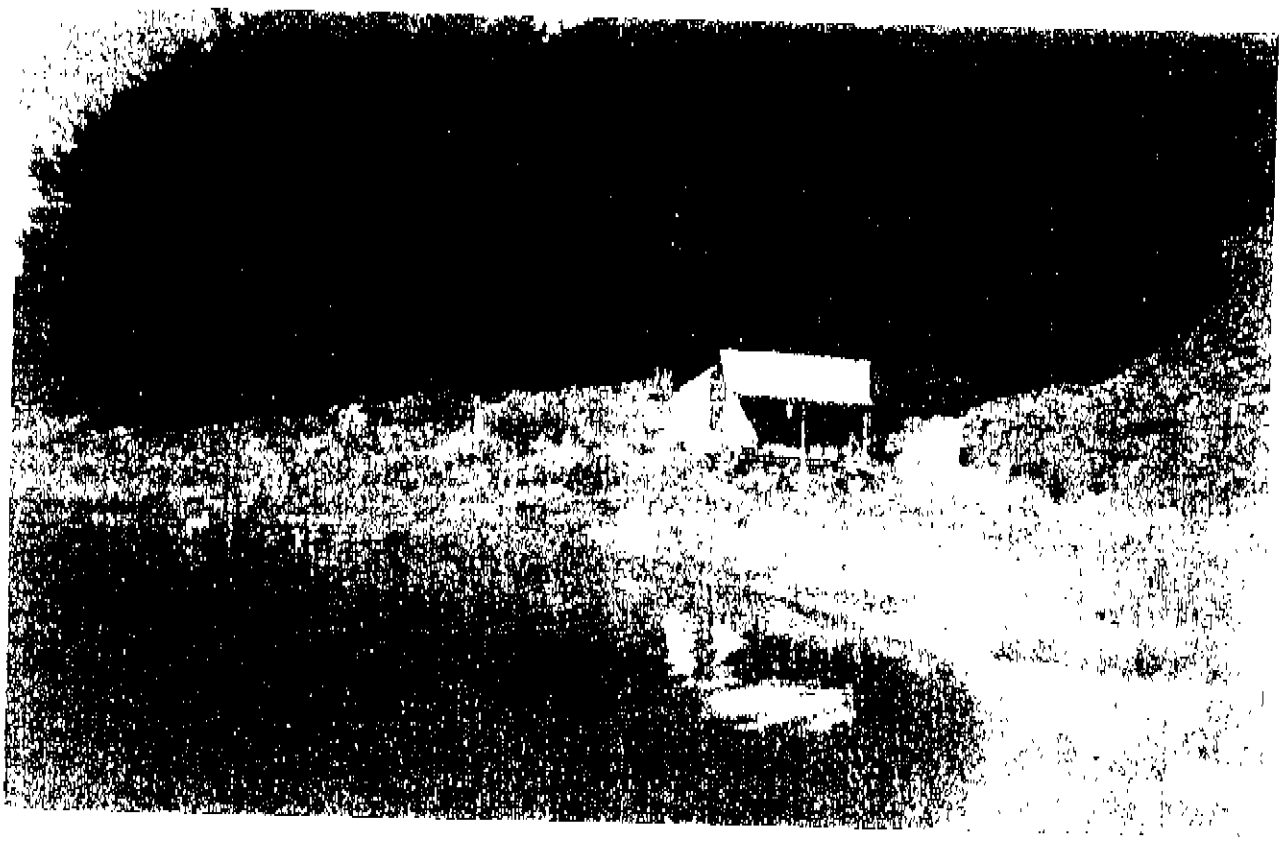
PHOTOS - PROPERTY OVERVIEW

Developed paddocks between 25 Mile and 24 Mile Creeks

North end Mt Creighton Lake faces from Generchy Road

Twenty Five Mile Creek with Lake Wanaipu at rear.

Lake Luna



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Dead Horse Creek from Moonlight Creek.