

Crown Pastoral Land Tenure Review

Lease name : WALTER PEAK

Lease number : SS 041

Conservation Resources Report – Updated 2015

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.

Please note that this is an update to the Conservation Resources Report released in 2005. This updated report should be read in conjunction with the original Conservation Resources Report.

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

July

15

**DOC CONSERVATION RESOURCES
REPORT ON TENURE REVIEW OF
WALTER PEAK SPECIAL LEASE
(PS41)
UNDER PART 2
CROWN PASTORAL LAND ACT
UPDATED MAY 2015**



Photograph: Lake Ned, Upper Lochy River

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PART 1: INTRODUCTION

Walter Peak Special Lease was originally inspected in February and March 2004. The tenure review process was discontinued and has subsequently recommenced in 2014. The length of time that has elapsed since the 2004 survey has necessitated a further reappraisal of the botanical values and updating of information where applicable like threat rankings and species names.

Appendices provided in the 2004 Conservation Resources Report are not repeated in this report as they are available through the 2004 Conservation Resources Report which can be accessed on the Land Information New Zealand (LINZ) website.

Walter Peak Station is leased by Walter Peak Corporate Trustee Limited.

The special lease is, in most respects, the same as a pastoral lease with the exception that it makes specific provision for the lessees to operate a commercial recreation business on the property.

The 25,758 ha property is located on the southern side of Lake Wakatipu and is approximately 20 km from Queenstown by boat. The Von and Mount Nicholas Roads provide road access to the property from the Mossburn-Te Anau highway (SH94), via Mavora Lakes.

The Lease is bound to the east by McKinlays Creek, Wither Peak (1772m asl.) and the ridgeline flanking Killiecrankie Creek; to the north by Lake Wakatipu and freehold land run with the property; to the west by the Afton Burn and parts of the Von River South Branch, and to the south by the Lochy River.

The property ranges in altitude from 300m at Lake Wakatipu to 1856m near Ridge Peak. River flats and terraces exist in the Von River valley and near Lake Wakatipu. The majority of the property is steep and rugged with a number of peaks over 1800m asl. including Walter Peak. Extensive screes are present.

The Lease lies within the Mavora Ecological Region and Eyre Ecological District. An ecological survey of the central part of the Eyre Ecological District has been carried out (Mark *et al.* 1987). None of the lease was surveyed, although the Lochy catchment at the southern end of the Lease adjoins the surveyed area.

No parts of the lease are currently subject to protection for conservation purposes.

The following areas which adjoin the property are managed by the Department of Conservation (Conservation Management Strategy Inventory Number in brackets):

Walter Peak-Beach Bay Recreation Reserve (E42 055)

Von River marginal strip (E42 052)

Lochy River marginal strip (E42 057)

Lake Wakatipu marginal strip (E42 054)

Eyre Mountains/Taka Ra Haka Conservation Park.

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

2.1 LANDSCAPE

2.1.1 Landscape Context

The Lease is located south of Queenstown on the south west shore of the middle arm of Lake Wakatipu. It comprises part of the Von River catchment, and the Northern Eyre Mountains, which include Walter Peak itself. Past glacial activity is a major factor in shaping the character of the landscape. The majority of the property consists of rugged glaciated mountains with narrow steep-sided, U-shaped valleys. The Lease includes a significant section of the Upper Wakatipu lake faces, as well as alluvial flats and ice-shaped landforms adjacent to the lakeshore. Part of the expansive glacial and fluvial Von Valley red tussock landscape is also included.

The Lease includes schist, semi-schist and, towards the northern Eyre Mountains, greywacke underlying basement rock. Exposed rock and scree is a feature of the upper mountains.

All creeks on the Lease drain into Lake Wakatipu. The property is part of the Kawarau River catchment.

The majority of the property is within the boundary of the Queenstown Lakes District Council (QLDC). All of it is classified as Outstanding Natural Landscape (ONL).

2.1.2 Methods

The Lease has been divided into defined landscape units (LUs). These units reflect areas of similar landscape character. Landscape character is the quality that makes an area different from another and can be defined as follows:

'Landscape character results from a particular combination of characteristics formed by the interaction of natural processes and cultural (human) activities.'

NZ Institute of Landscape Architects

For each unit a landscape character description is provided along with a description of the key visual and scenic attributes present. An evaluation summary using a range of criteria to assess each unit and assist with determining each unit's high inherent values is presented. 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. Importance: - is the importance of the characteristics and features, or combination of characteristics and features within individual units and whether 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.

2.1.3 Landscape Description

For this assessment, the Lease is divided into four landscape types (refer Map 4.2.2 and Appendix 1 for photos). These include:

- Wakatipu Lake Faces (LU1)
- Von (LU2)
- Lochy and Tributaries (LU3)
- McKinlays Creek and Afton Burn East Branch (LU4)

Wakatipu Lake Faces - Landscape Unit 1 (LU1)

Character Description

LU1 includes the Lake Wakatipu faces from Table Bay, extending southwards to include the northern faces of Walter Peak and Nicholas Saddle (the catchment boundary of the Afton Burn and Station Burn). The unit also includes the lake and river terraces, and alluvial flats between the lake and the mountain slopes. The unit forms a large section of the enclosing mountain slopes on the eastern side of the middle arm of Lake Wakatipu.

Flats terraces and ice sculptured low hills

The narrow flats comprise a mix of alluvial flats, ice-shaped lumpy landform, and a series of old lake level and river terraces. Terraces are a feature near the mouth of the Afton Burn.

Vegetation is predominately pasture especially on the flats, but with areas of bracken and scattered shrubland. Remnant shrubland is mainly present around the lake edge, below Signal Hill and within the incised Afton Burn East Branch gorge. Weeds include briar, some gorse, and broom. Spraying is controlling gorse and broom. Plantings of blue gum and Douglas fir are present. Bracken-dominated terraces are prominent at the mouth of McKinlays Creek at Table Bay.

Mountain Slopes

The mountain slopes are characterised by pyramidal forms and angular lines. The upper ridges and skyline are often very rocky and rugged with jagged rock outcrops on the skyline. The lower slopes comprise colluvial foot slopes and outwash fans of predominantly bracken and pasture. On upper slopes, there are extensive ice-shorn rocky bluffs and predominantly snow tussock and reddish-brown *Dracophyllum*. Between the upper mountain slopes and the lower colluvial slopes, is a middle zone of high basins with modified tussock and pasture which have been over sown and top-dressed.

The mountain slopes are further described within three sections:

- (i) Table Bay to Beach Bay
- (ii) Beach Bay to Afton Burn
- (iii) Afton Burn to Nicholas Saddle

(i) Table Bay to Beach Bay

The lower and mid slopes of the north and west faces of Walter Peak have been modified by grazing and burning and now support bracken, broom, pasture species and scattered shrubland. A broad band of bluffs and ice shorn rock occur above the lower foot slopes. A narrow bench above the bluffs supports pasture, short tussock and scattered shrubland. Fences appear as lines in the landscape as a result of differing farm management and grazing patterns above and below the fence. Below the fence-line is the green of bracken and grass, while above is mainly tawny short tussock and grass. The upper slopes retain tall tussock and alpine plants.

(ii) Beach Bay to Afton Burn

This area contains similar characteristics and patterns as discussed above. The mountain slopes form a steep wall rising abruptly above the flats. Lower colluvial slopes and fans give way to bands of bluffs and slump topography. Slope wash erosion is a feature possibly exacerbated by grazing and burning.

Mick O' Day and George Creeks form V-shaped valleys within the front faces. Mick O' Day Creek is a very steep basin with a deep, narrow beech forest-lined gorge in its lower reaches. Georges Creek is a more open tussock basin.

Lower slopes have predominantly pasture species, patchy bracken and scattered shrubland changing to dense bracken, pasture and scattered shrubland. Above this, short tussock and pasture gives way to tall tussock on upper slopes.

This section is also notable for lines across slopes created by different grazing management above and below fence-lines.

(iii) Afton Burn Faces

The faces above the Afton Burn have been over sown and top dressed from the mid slopes down. Mixed shrubland occupies the lower steep slopes above the river and within gullies. Elsewhere is extensive induced matagouri, some manuka and pasture. Upper slopes are dominated by tall tussock with distinctive screes below the rocky skyline ridge.

Visual & Scenic Values

The Wakatipu faces are part of the visual enclosure to Lake Wakatipu. The steep rugged schist mountain slopes, including massive bluffs and jagged rock outcrops, form the backdrop and setting for the lake and wider Wakatipu Basin. The cultural farming patterns that have developed on the valley floor, combined with the dramatic glaciated landscape, has created a visually distinctive and outstanding landscape that is strongly identified with Queenstown and the Upper Lake Wakatipu Basin.

The impact of grazing and burning is, however, having a negative effect on the visual resource. The lines across the lower slopes are usually arbitrary fence-lines and unrelated to landform or natural vegetation patterns. In addition, the lower slopes have a raw and often degraded appearance typical of bracken country which has been repeatedly burnt. These factors impact on natural and visual values. A satisfactory integration or harmonious balance of grazing and natural patterns has not been achieved on much of the Wakatipu lake faces.

The unit has very high visibility across the lake from Queenstown and the Glenorchy Road. The section between Table Bay and Beach Bay is viewed by thousands of tourists traveling by steamer to "Walter Peak High Country Farm" each year. There is great potential for ecological and landscape restoration if natural processes were allowed to continue.

Evaluation Summary

Table one:

Criteria	Value	Comment
Intactness	Medium	High on upper slopes. Low to medium on foot slopes and mid slopes. Natural patterns and processes intact.
Legibility	High	Highly expressive of formative processes.
Aesthetic Factors	High	Overall high but marred by degraded appearance of lower slopes in some areas and arbitrary lines across faces.
Historic Factors	High	Associated with early run holders and folklore surrounding a high country sheep station.
Visibility	Very High	Visual enclosure to Lake Wakatipu and backdrop to Queenstown.
Significance	High	Part of an identified Outstanding Natural Landscape of national and international significance.
Vulnerability	High	Vulnerable to degradation by any land use activities.

Von - Landscape Unit 2 (LU2)

Character Description

LU2 forms a distinct and strongly identifiable area that extends from Nicholas Saddle to the southern end of the property, and includes the Von River catchment. Tussock is the dominant vegetation that occurs in varying condition from valley floor to ridge crest. The Von Valley has an expansive open tussock character quite different from the remainder of the Lease. The characteristics that broadly define the unit include:

- broad open tussock character of the valley floor
- steep rugged and rocky upper slopes
- extensive screes on upper slopes derived from semi-schist and greywacke
- comparatively undeveloped (i.e. small areas have been over sown and top dressed, but little or no cultivation has occurred)
- Fluvial and glacial features on the valley floor. These include moraine, kettleholes and ice worn hummocky landforms, smooth rounded landforms.
- A remote backcountry feel.

In general, the upper mountain slopes within this unit form steep rocky mountain slopes with extensive screes broken by snow tussock, alpine herbfield and fellfield. The upper slopes are very natural with all natural patterns and processes intact.

The middle and lower slopes, the sunny faces and the valley floor are the most modified, consisting of pasture species, short tussock and patchy snow tussock. Shady faces generally retain tall tussock, and include herbfield and sub-alpine shrubland. Tussock and dome-shaped reddish-brown *Dracophyllum* are a common association on the mid to upper slopes.

Nicholas Saddle to low saddle east of Ridge Peak

These western faces drain north to the Station Burn. The mountain slopes are very broken and dissected. From the valley floor property boundary to midslope, aerial over sowing and top dressing has taken place. These slopes support a mix of tussock, pastures grasses and large areas of grey shrubland (predominantly matagouri). Large gravel fans and slides are a feature. Pockets of beech forest remain in incised gullies. Tussock, rock, and scree occur on the upper slopes. A large waterfall within an incised gorge of the Station Burn (probably just outside the property boundary) is a significant landscape feature.

White Burn and Bush Creek

These tributaries have steep rocky upper slopes and ridges with pasture species, scattered tussock, and grey shrubland and some beech forest remnants within lower basins. Willow is present within lower waterways. Basins are quite modified with browntop. An historic timber and tussock-lined corrugated iron musterers hut is located within Bush Creek.

The wetlands, kettleholes, and associated glacial and fluvial landforms on the valley floor within or near the White Burn are special features. There are few man-made elements, limited to the Von Road, a gravel pit, musterer's huts,

and fences. There are few fences (e.g. the public road is not fenced), which emphasises the open undeveloped character.

Black Spur Creek

Black Spur Creek has two major branches. The south branch forms the boundary of the property. Both branches have narrow valley floors with prominent fans, terraces and colluvial slopes. Upper slopes are steep and rocky with predominantly snow tussock cover. Shady faces support some mixed shrubland and dense tussock. *Dracophyllum* is also prominent. Lower sunny faces below the fence line and the valley floor have been modified through aerial over sowing and top dressing. Short tussock and pasture species are present.

Visual & Scenic Values

LU2 has very high visual values derived from the impressive glacial landforms and features, continuous tussock, and largely undeveloped and intact appearance of the landscape. The unit forms a backcountry tussock landscape of grand proportions and which is visually distinctive and spectacular.

The valley floor glacial and fluvial features within the White Burn area are of special significance. The valley floor moraines, and wetlands including kettleholes and associated vegetation (red tussock, bog pine and associated native grasses and sedges) within the context of the wider glaciated landscape and dominant tussock vegetation is visually very significant and special. Natural characteristics and patterns remain intact in this area. The naturalness of the area between the low saddle north of the White Burn and Nicholas Saddle is reduced on the mid slopes and valley floor, but otherwise retains high visual values.

Black Spur Creek is also visually very impressive with a high level of naturalness and legibility.

Evaluation Summary

Table two:

Criteria	Value	Comment
Intactness	Medium to High	High on upper slopes. Mid and lower slopes variable. Natural pattern and processes intact. Appears as an intact tussock landscape from valley floor to ridge.
Legibility	Very High	Glacial landforms and deposits within open tussock landscape highly legible.
Aesthetic Factors	Very High	High degree of coherence. Visually

		distinctive and spectacular.
Historic Factors	Low	Musterer's huts and pastoralism provide cultural overlay.
Visibility	Low to Medium	Majority visible from public road. Use currently low but increasing.
Significance	Very High	Very significant backcountry landscape.
Vulnerability	High	Open tussock landscape highly vulnerable to more intensive farm development or other land use e.g., forestry.

Lochy - Landscape Unit 3 (LU3)

Character description

LU3 includes the Lochy Valley and its tributaries including Cascade and Killiecrankie Creeks. The Lochy River and tributaries form classic U-shaped valleys with steep-sided narrow valleys, cirques, and glacial deposits on the valley floor. Tributaries terminate in cirques containing small tarns and wetlands. Bluffs and scree are prominent near the summits.

The upper Lochy Valley contains scree, moraines, alluvial and glacial deposits, meanders and extensive wetland systems. Vegetation on the upper mountain slopes, summits and cirques include snow tussock, herbfield, sub-alpine and alpine scrub fellfield and scree vegetation.

Lakes Ned and Nigel are major landscape features within the Lochy and are 'partly dammed by moraine, but also by rockfalls' (Turnbull 1999). Sub-alpine scrub is significant on moraine between these lakes. Below the glacial lakes, pockets of montane beech forest occur along the valley floor and on shady faces on the true left. The valley floor and lower mountain slopes are increasingly modified down valley, with pasture species having displaced snow tussock and scattered shrubland. The upper Lochy Valley is grazed by cattle and sheep.

Tributaries of Cascade and Killiecrankie Creeks have smaller glacial U-shaped valleys compared to the main stem; though contain similar characteristics and features. Mountain beech forest occurs at the lower end of the tributaries with scattered snow tussock and pasture. Further up the valley, tussock and alpine plant communities dominate. While naturalness is high, grazing has had a localized impact on the valley floor and sides, and within upper basins where *Chionochoa macra* is diminished. The access track linking the Afton Burn East Branch and Cascade Creek is a dominant and intrusive feature in the upper basins.

Visual & Scenic Values

Visual values for LU3 are high. The rocky summits, massive bluffs and scree, steep sided U-shaped valleys and glacial features, along with valley floor wetlands, tarns, and associated vegetation patterns are visually spectacular and outstanding. There is a high level of coherence. The ruggedness and

alpine grandeur of this unit is self-evident. The only disruptive feature is the access track within the upper basins of the Afton Burn East Branch and Cascade Creek.

Evaluation Summary

Table three:

Criteria	Value	Comment
Intactness	High	Overall very high. Natural characteristics and patterns intact. Some damage to wetlands and depletion of tussock on lower slopes and valley floor.
Legibility	High	Effects of glaciation and erosion processes highly legible.
Aesthetic Factors	Very High	Visually spectacular. Cascade access track discordant element.
Historic Factors	Low	
Visibility	Low	Not visible from public places.
Significance	High	Nationally significant. Classified as outstanding landscape in QLDC District Plan.
Vulnerability	High	Fragile alpine landscape. Vulnerable to any alteration or interference.

McKinlays Creek and Afton Burn East Branch - Landscape Unit 4 (LU4)

Character description

LU4 includes the tributaries of McKinlays Creek and Afton Burn East Branch. The unit has similar characteristics to the Lochy River and tributaries but flow north and northeast to Lake Wakatipu.

Both tributaries have very steep-sided U-shaped valleys and include very rugged and large rock outcrops and bluffs in the summit region with scree slopes. Vegetation includes the expected range of alpine plant associations, with a mixed tussock/alpine shrubland dominant on lower slopes. The valley floor and lower valley sides have been modified by grazing resulting in a mix of native and exotic species.

McKinlays Creek is a significantly longer valley and appears less modified than the Afton Burn East Branch in its mid and upper reaches.

Beech forest and advanced regenerating shrubland are significant within the lower parts of both tributaries. As the valleys open out west towards the lake, vegetation patterns are further influenced by grazing and burning to produce a mosaic of tussock on upper slopes, mixed shrubland on open slopes and within watercourses, with bracken and pasture species on moderately steep and lower footslopes. Within the lower Afton Burn East Branch, the pattern of

grazing and natural vegetation has resulted in a visually coherent and sustainable landscape.

In the upper Afton Burn East Branch, signs of grazing, the 4WD track and musterers hut are evidence of human occupation. Above bushline in McKinlays Creek, there are no tracks or huts. Within the mid and upper valleys of both tributaries, naturalness and intactness are very high.

Visual and Scenic Values

LU4 has high visual and scenic values attributable to the dramatic glacial landforms and the diverse and natural vegetation patterns from scree vegetation, fellfield and mixed tussock alpine and subalpine shrubland to beech forest and tall shrubland.

Visual values are maintained on the more modified slopes at the lower end of the Afton Burn East Branch where grazing and vegetation patterns have in general developed into a harmonious landscape which is pleasing to the eye. This is not the case with the lower slopes of McKinlays Creek where burnt-over bracken and pasture appear visually degraded.

The 4WD track leading up the steep upper basin of the Afton Burn East Branch forms an unnatural scar and detracts from visual values.

Impressive views are obtained from the tributaries where they open up to expansive views of the Lake and Upper Wakatipu Basin and also from the saddle area of both valleys.

Evaluation Summary

Table four:

Criteria	Value	Comment
Intactness	High	Natural characteristics and patterns intact. Some signs of grazing and burning but appears as a natural landscape
Legibility	High	Formative processes highly legible
Aesthetic Factors	High	Visually coherent. Very distinctive and spectacular. No discordant elements
Historic Factors	Low	
Visibility	Low	Not visible for public places apart from lower McKinlay Creek (lake faces)
Significance	High	Nationally significant. Classified as Outstanding Natural Landscape in QLDC District Plan
Vulnerability	High	Fragile alpine landscape. Vulnerable to any alteration/interference

2.1.4 Significance of Landscape Values

The Lease has exceptionally high inherent natural landscape values. The majority of the property is within the boundary of the Queenstown Lakes District Council. All of the special lease that lies within the Queenstown Lakes District Council boundary is classified as having an Outstanding Natural Landscape within the District Plan.

Areas identified as having significant inherent landscape values on the Lease are identified on the Significant Landscape Values map. They include:

- The Lake Wakatipu faces with the exception of the developed flats (part of LU1)
- The whole of the Von Unit (LU2)
- The whole of the Lochy Unit (LU3)
- The whole of the McKinlays Creek & Afton Burn East Branch Unit (LU4)

Lake Wakatipu Faces (part of LU1)

The pyramidal forms and steep rugged schist mountain slopes form the backdrop and setting for the Lake Wakatipu, Queenstown and Upper Wakatipu Basin. Walter Peak and the mountain range adjoining it are an iconic New Zealand landscape. Their significance to tourism is immense.

They are highly visible from the lake and from the Queenstown-Glenorchy Road. The landscape values are derived from the association of highly impressive mountain landforms rising steeply from the lake, schist rock, tussock and the arcadian pastoral character associated with sheep farming.

Von Catchment (LU2)

The Von Catchment as a whole is a very distinctive landscape forming part of a larger glacial and tussock landscape. It is comparatively undeveloped and is a fine example of a remote, but accessible, backcountry landscape with all natural patterns and characteristics intact despite a level of modification.

The valley floor glacial and fluvial features within the White Burn area, including valley floor moraines, wetlands, kettleholes and associated vegetation set within open tussock montane basin forms a landscape of distinction. The combination of semi-schist and greywacke is also significant.

While the lower slopes, sunny faces and parts of the valley floor have been modified through aerial oversowing and topdressing, the whole unit is coherent and homogenous in landscape terms.

The main valley is increasingly popular with backcountry users such as four wheel drives and mountain bikers.

Lochy Valley and tributaries (LU3) and McKinlays Creek and Afton Burn East Branch (LU4)

These ice carved U-shaped valleys have similar features. This mountainous area as a whole has outstanding inherent natural landscape values. The values are derived from spectacular glaciated landforms and valley floor deposits, including moraines, cirques, tarns and wetlands, and a diverse mosaic of vegetation patterns. Lakes Nigel and Ned are special landscape features within a spectacular alpine setting.



Landscape Units and Significant Landscape Values - Walter Peak

2.2 LANDFORMS, GEOLOGY AND SOILS

2.2.1 Landforms and Geology

The Lease is in the northern part of the Eyre Mountains, a rugged, mountainous area, southwest of Lake Wakatipu. The major geological influences seen in the landscape are due to the characteristics of the basement rock, folding, faulting and major uplift during the Kaikoura orogeny (late Cenozoic), and subsequent glaciation following by fluvial erosion.

Walter Peak Schist (a formation of the Caples terrane), which probably forms most of the Eyre Mountains, is mostly monotonous silvery-grey schistose siltstone and fine sandstone (Turnbull 1980). Minor lithologies are mostly within deformed (flattened) conglomerate running from Eyre Creek into the head of the Lochy (Turnbull 1999). A thick sequence of mudstone, which forms some thin 'slate' in the Slate Basin, can be traced into the head of the Lochy River. Also at the head of the Lochy River there are two areas of pale green to yellow-green medium to coarse sandstone with subordinate chipwacke and siltstone (similar to Kayes Creek formation which includes red and green sandstone and mudstone and intraformational breccia) (Turnbull 1980). Near Forks Hut, parent sediments are almost pure volcanic sandstone, and semischist derived from this is pale green, due to presence of chlorite and epidote, unlike the uniform silvery-grey of most semischist (Turnbull 1999). Outcrops of schistose pebble conglomerate occur from the head of Black Spur Creek to the Slate Basin.

Evidence of the Taieri – Wakatipu Synform downfold on the Lease can be seen on Walter Peak (especially the view from the south west), with flattened ridge crests due to gently dipping schistosity in the axis of the synform, and vertical bluffs and towers controlled by joints or fractures (see Turnbull 1999). Kaikoura orogeny uplift and subsequent glacial and alluvial erosion has resulted in a rugged landscape with peaks rising to 1800m, and many steep-sided valleys and bluffs. Glacially derived features dominate the landscape, and many cirques and associated moraines, screes, alluvial and glacial deposits are present. Glacial benches cut in the slopes above Lake Wakatipu have eroded away. These faces have landslides which are superficial, but are activated during periods of high rainfall (I. Turnbull pers. comm.)

The down valley limit of ice in the Lochy catchment during the most recent glacial advance (Late Otiran, 18 – 24,000 yrs BP) is not known (Turnbull 1999). Lakes Nigel and Ned (assumed to be Late Otiran in age because moraines higher in the catchment are almost certainly of post-glacial age) are partly dammed by moraine but also by rock falls (Turnbull 1999). The Early Otiran Wakatipu glacier extended into the lower Lochy but the only known deposit from this is a small gravel deposit in the lower Long Burn (Turnbull 1999). No glacial deposits of this age derived from the head of the Lochy are preserved, so that the down valley ice limit is not known.

2.2.2 Soils

Soils derived from schist are confined to the northeastern part of the property around Walter Peak, where Dunstan Steepland high country yellow brown earth soils occur. Elsewhere on the property, the soils are derived from greywacke. Kaikoura Steepland high country yellow brown earth soils occur above 1200m asl., while Kaikoura and Fairlight Steepland high country yellow brown earth soils occur between 1000 and 1200m asl. Small pockets of more productive soils occur near to Lake Wakatipu and within the Lochy River valley (Fairlight soils), and in the Von River valley (mainly Cass soils).

2.2.3 Significance of Landforms, Geology and Soils

The basement rocks of the Eyre Mountains contain no known mineral, geological or structural features of particular merit. The area has an unusual appearance by virtue of its synformal structure and associated landscape, and very deeply incised glacial valleys. Although such features can be found individually in many areas (e.g. U-shaped valleys in Fiordland; flat-lying semischist in the Garvie Mountains), the combination in the Eyre Mountains is unique (Turnbull, 1999).

There are no geologically significant sites requiring protection listed in Kenny and Hayward (1993). However excessive grazing and burning may activate extensive landslides which may have undesirable effects.

There are no significant soils recorded on the Lease.

2.3 CLIMATE

Climatically, the Eyre Ecological District is intermediate between the wet Fiordland region to the west and the drier more continental environment of Central Otago to the east.

Rainfall records indicate the property receives 800 mm annually at low altitudes, rising significantly at higher altitudes. Elevation is not sufficient to retain permanent snow.

Occasionally, high intensity rain storms can generate large floods which can carry a high sediment loading. Rivers respond rapidly to such events due to the relatively weak vegetative cover on the Eyre Mountains.

The property is exposed to both NW and SW weather patterns and receives rain from both quarters. Snow can lie for periods of days during winter on the flats, and frosts are seasonally common.

2.4 LAND ENVIRONMENTS OF NEW ZEALAND (LENZ)

LENZ is, as described by Leathwick *et al* (2003), “a classification of New Zealand’s landscapes using a comprehensive set of climate, landform and soil variables chosen for their role in driving geographic variation in biological patterns.” The classification units of LENZ, termed land environments by Leathwick *et al* (2003), aim to “identify areas of land having similar environmental conditions regardless of where they occur in New Zealand.” Therefore “LENZ provides a framework that allows prediction of a range of biological and environmental attributes. These include the character of natural ecosystems, the vulnerability of environments to human activity, and the potential spread or productivity of new organisms” (Leathwick *et al* 2003). Leathwick *et al* (2003) present the LENZ information at four levels of detail, with Level I containing 20 environments, Level II containing 100 environments, Level III containing 200 environments and Level IV containing 500 environments. These LENZ classes are presented nationally to assist use at a range of scales.

In an analysis of the LENZ Level IV data, with consideration of the remaining indigenous vegetation cover and the legal protection of these environments, Walker *et al* (2005) proposed a threat classification for the remaining indigenous biodiversity in New Zealand’s environments based on the two components of vulnerability (likelihood of loss): poor legal protection and risk of loss. This threat classification (Table 5) has become the recognised benchmark for the promotion of threatened LENZ conservation.

Table 5: LENZ threat categories and definitions (Walker *et al* 2005)

Category	Criterion
Acutely threatened	<10% indigenous cover remaining
Chronically threatened	10-20% indigenous cover remaining
At risk	20-30% indigenous cover remaining
Critically under-protected	>30% indigenous cover remaining <10% legally protected
Under-protected	>30% indigenous cover remaining 10-20% legally protected
Less reduced and better protected	>30% indigenous cover remaining >20% legally protected

There are several small areas present on the lease that have been classified as acutely and chronically threatened land environments, see LENZ map, page 23.

All other parts of the pastoral lease lie within 'at risk', 'critically under-protected', 'underprotected' and 'less reduced and better protected' land environments.

The 'acutely threatened' LENZ site is now primarily riverbed and grassy terrace.

The 'chronically threatened' LENZ site on the true left bank of the Lochy River is primarily a grassy terrace. The chronically threatened LENZ site in the Afton Burn and adjacent area is a mixture of regenerating native species on the steep sided river bank faces and exotic species including weeds such as gorse on gentler terrain.

2.4.1 Significance of Land Environments

Indigenous vegetation is found on part of the chronically threatened LENZ within the Afton Burn on the steep sided river bank faces. This is of significance because chronically threatened LENZ sites with indigenous vegetation present are now uncommon.

2.5 VEGETATION

2.5.1 Introduction

The botanical significance of the Eyre District in relation to endemic alpine plant species was known among early biologists from collections of several amateur botanists, particularly Poppelwell (1913) and Speden (1912-16); as well as Wall, and Simpson and Thomson (1926) in the 1920s. Later information has been provided by professionals, particularly on the alpine ranunculi (Fisher 1965), *Celmisia* (Given 1971, 1975), alpine plants (Mark and Adams 1973), and surveys of condition and trend in the forest, shrublands and indigenous grasslands of the District (Hayward 1969, Evans 1973).

Previous to this tenure review survey the most detailed ecological investigation of the Eyre Mountains was conducted in a similar way to that used for a Protected Natural Areas survey by a group of 13 biologists over a 10 day period in January 1987 (Mark *et al.* 1987). They concentrated mostly on Crown Land within the central part of the Eyre Ecological District. The Lochy catchment within the Lease adjoins this area. A priority place for protection of c. 33,000 ha was identified.

The adjoining Halfway Bay Pastoral Lease was surveyed for significant inherent values during February 1999 as part of a tenure review survey.

2.5.2 Methods

The initial botanical survey was undertaken 16 -19 February and 3-4 March 2004. The property was partitioned between the three botanists undertaking the survey. Weather conditions were challenging.

The survey of the northern sector involved driving the Mt. Nicholas road to the west and walking sections of the shoreline and lower Ashton Burn including the lower gorge, and driving along the lakeshore to Table Bay. Walter Peak ridge was reached by helicopter, followed by walking out down McKinlays Creek via several of the upper, east facing basins, then driving up both the west and east branches of the Afton Burn with stops and short walks to sample the vegetation and invertebrates.

The survey of the Lochy catchment was achieved via a flight into the head of Killiecrankie Creek followed by a walk down that creek and up the Lochy to Cascade Creek; a flight into Lake Ned and walk high up the Lochy north branch with overnight camp; a walk along most of the length of Cascade Creek.

The survey of the western Von sector involved driving the Von Road, Nicholas Saddle track and on to various terraces west of the Von Road in conjunction with short walks; aerial overview of the high country between Ridge Peak and the head of Black Spur Creek; walking the upper headwater basins of the Lochy; and walking down a Black Spur Creek tributary.

A reassessment of the findings of the earlier surveys was undertaken 17-21 November 2014 and 3-5 February 2015. This involved aerial reconnaissance of the entire property (with landings to inspect specific sites) coupled with walking and vehicle access to those parts of the property where it was feasible to do so. This report reflects relevant information gathered from all of the previous visits.

2.5.3 Vegetation Description

Walter Peak Special Lease has been broken up into units and sub-units to assist the description of vegetation on the property. These units are based on topography and lump together some of the farm blocks. The units are:

- A. Von Valley
- B. Wakatipu Lake Faces
- C. Lochy Catchment

A. Von Valley

A1. Valley floor

Hard tussockland: This community is dominated by hard tussock (*Festuca novae-zelandiae*), although the cover is variable and sometimes modest. The major ground cover is the moss *Racomitrium lanuginosum* and mouse-ear hawkweed (*Pilosella officinarum*). There is a rich diversity of associated species including shrubs, herbs and grasses. Shrubs present include *Pimelea prostrata*, patotara (*Leucopogon fraseri*), *Acrothamnus colensoi*, *Coprosma petriei*, snowberry (*Gaultheria depressa* var. *novae-zelandiae*), and *G. macrostigma*. Common herbs are *Raoulia subsericea*, *Ranunculus multiscapus*, harebell (*Wahlenbergia albomarginata*), *Celmisia gracilentia*, *Helichrysum filicaule*, *Acaena caesiiglauca*, *Euchiton traversii*, *Geranium* aff. *microphyllum*, *G. brevicaulis*, *Viola cunninghamii*, *Chaerophyllum novae-zelandiae*, *Scleranthus uniflorus*, and *Anisotome aromatica*. Native grasses include blue tussock (*Poa colensoi*), *Rytidosperma gracile*, and *R. pumilum*, with the most common exotic grasses being sweet vernal (*Anthoxanthum odoratum*), browntop (*Agrostis capillaris*) and Chewings fescue (*Festuca rubra*); other species include the orchids *Prasophyllum colensoi* and *Thelymitra longifolia*, the clubmoss *Lycopodium fastigiatum*, *Luzula rufa* and lichens.

A particularly diverse hard tussockland in good condition is found on the terrace above Black Spur Creek at Grid Ref. NZTM 1232310E 497756N. This site contains abundant hard tussock, *Racomitrium lanuginosum*, *Raoulia subsericea* and blue tussock, along with patotara, *Luzula rufa*, *Pimelea prostrata*, sweet vernal, mouse-ear hawkweed and many other species.

Red tussockland: This community is dominated by c. 1 m tall red tussock (*Chionochloa rubra*), although the cover varies amongst sites. On drier terraces and hills the major associated species include mouse-ear hawkweed, *Raoulia subsericea*, hard tussock, *Racomitrium lanuginosum*, lichen,

snowberry, *Pimelea prostrata*, catsear (*Hypochaeris radicata*), and exotic grasses. *Gentianella serotina* is locally common.

In wetter sites the red tussock is taller and denser with reduced intertussock diversity. Associated species include *Carex coriacea*, *Viola cunninghamii*, *Chaerophyllum ramosa*, *Gonocarpus aggregatus*, *Galium perpusillum*, *Hydrocotyle novae-zelandiae* var. *montana*, *Geranium* aff. *microphyllum* and locally *Ranunculus ternatifolius* and *Olearia bullata*. At some sites are clearings with turf vegetation containing *Carex gaudichaudiana*, *Hydrocotyle novae-zelandiae* var. *montana*, *Viola cunninghamii*, *Gonocarpus micranthus*, *Schizeilema cockaynei*, and *Celmisia* sp. "gracilenta rhizomatous broad". On the edge of swamp communities *Carex coriacea* and *Schoenus pauciflorus* can be common. Along stream channels red tussockland occurs and is associated with *Olearia bullata*, *Carex coriacea*, *C. tenuiculmis*, sharp spike-sedge (*Eleocharis acuta*), *Ranunculus glabrifolius*, *R. ternatifolius*, *Chaerophyllum ramosa*, *Gonocarpus aggregatus* and *Geranium* aff. *microphyllum*.

Patches of matagouri (*Discaria toumatou*) with *Gaultheria crassa* are locally common. In peaty areas the moss *Polytrichum juniperinum* is common with comb sedge (*Oreobolus pectinatus*), and *Coprosma cheesemanii*.

Ablated hollows: These are scattered through the hard and red tussock communities. Despite their small spatial extent they have a very distinct flora. The hollows are sparsely vegetated with much bare soil and stones. Their flora includes *Rytidosperma pumila*, *Agrostis muscosa*, *Senecio* sp., *Pseudognaphalium ephemereum*, *Chaerophyllum colensoi* var. *delicatulum* and sheep's sorrel (*Rumex acetosella*).

Pasture: Locally, especially in moist sites and some stream terraces, exotic grasses dominate. On a river flat terrace along Black Spur Creek (NZTM 1233412E 4977157N) mouse-ear hawkweed, exotic grasses and patotara (*Leucopogon fraseri*) dominate, with some hard tussock, *Raoulia subsericea*, *Racomitrium lanuginosum*, *Muehlenbeckia axillaris*, *Acaena inermis*, and *Ranunculus multiscapus*.

Wetlands

A special feature of the Von Valley is the extent and diversity of the wetlands.

Cushion bog: The cushion bogs are variable in composition dependent upon water table, water movement, nutrient status, slope and other factors. The vegetation is generally dominated by comb sedge with much *Carpha alpina*, *Dracophyllum prostratum*, *Abrotanella caespitosa*, *Carex echinata*, the sundew *Drosera arcturi* and sphagnum moss (*Sphagnum cristatum*). Other associated species include *Celmisia glandulosa*, *C.* sp. "gracilenta rhizomatous narrow", *Carex gaudichaudiana*, *C. carsei*, *Centrolepis ciliata*, *Gentianella amabilis*, *Gonocarpus micranthus*, *Euchiton laterale*, *Plantago uniflora*, *Coprosma perpusilla*, *Juncus antarcticus*, *Luzula leptophylla*, *Rytidosperma australe*, *Agrostis personata*, *Lachnagrostis* sp., and red tussock. Notable species of occasional presence include wirerush (*Empodisma minus*), *Ranunculus maculatus*, *Gentianella grisebachii* and bog pine (*Halocarpus bidwillii*).

Sphagnum moss can be locally dominant and is associated with *Carex echinata* and *C. gaudichaudiana*.

The fringe of the cushion bog often contains a turf community. Prominent components of this are *Hydrocotyle novae-zelandiae* var. *montana*, *Gonocarpus micranthus*, *Lobelia angulata*, and *Abrotanella caespitosa*.

Within the cushion bog are small seasonally wet depressions containing *Carex carsei* and *C. echinata*. Nearby larger pools of permanent water contain sharp spike-sedge and *Machaerina anthropylla*.

At NZTM 1233608E 4980762N is a tarn with a distinctive turf margin surrounded by cushion bog vegetation. The turf margin is dominated by *Myriophyllum pedunculare* ssp. *novae-zelandiae*, with some *Lobelia ionantha*. A feature of the cushionbog vegetation is the presence of a relict shrubland of bog pine. The margin to the tarn comprises abundant *Carex carsei* and *Gonocarpus micranthus*, along with comb sedge, *Oreostylidium subulatum*, *Gentianella grisebachii*, *Carex gaudichaudiana* and *Plantago uniflora*. The main area of the cushion bog contains comb sedge, red tussock, *Carpha alpina*, wire rush, *Androstoma empetrifolium*, *Celmisia* sp. "gracilentarhizomatous narrow", *Oreobolus strictus*, *Lycopodium fastigiatum*, *Oreostylidium subulatum*, *Gentianella grisebachii*, and *Carex gaudichaudiana*.

The November 2014 inspection revealed significant cattle impacts (crushing and breaking of branches, pugging) to the bog pine and surrounding wetland vegetation.

Valley floor swamps: These swamp communities are highly variable dependent upon water table, water movement, nutrient status, slope and other factors.

The wettest swamp sites are dominated by *Carex diandra* with the largest example located at NZTM 1234209E 4980963N. Associated with the *C. diandra* are bryophytes, sharp spike-sedge, *Schoenus pauciflorus*, *Carex tenuiculmis*, *C. gaudichaudiana*, *Epilobium insulare*, *Montia fontana*, *Ranunculus glabrifolius* and *Deschampsia cespitosa*.

In less water-logged sites *Carex gaudichaudiana* often dominates with *C. diandra*, sharp spike-sedge, *Schoenus pauciflorus*, bryophytes, *Epilobium chionanthum*, and *Ranunculus glabrifolius*. Locally *Carex coriacea*, *C. secta* or *Schoenus pauciflorus* may dominate. Swamp communities often merge into red tussocklands (see description of wet red tussocklands). The exotic species sweet vernal, Yorkshire fog (*Holcus lanatus*), birdsfoot trefoil (*Lotus pedunculatus*), jointed rush (*Juncus articulatus*) and white clover (*Trifolium repens*) are occasionally present but only as minor components.

Turf dominated wetlands: These often occur on gentle slopes surrounding swamps and are highly variable in their composition. The major species include *Hydrocotyle novae-zelandiae* var. *montana*, *Gonocarpus micranthus*,

Lobelia angulata, *Viola cunninghamii*, *Schizeilema cockaynei*, *Celmisia* sp. "gracilenta rhizomatous broad", *Epilobium komarovianum*, *E. chionanthum*, *Plantago triandra*, comb sedge, bladderwort (*Utricularia dichotoma*), bryophytes, *Eleocharis gracilis*, and *Schoenus pauciflorus*.

Tarns: There are several tarns scattered across the Von Valley flats that are surrounded by red tussockland. One of the more diverse is located at NZTM 1233508E 4981162N and it had a wide exposed turf margin when inspected in 2004 (in later surveys high water levels prevailed). The turf zone is dominated by *Myriophyllum pedunculare* ssp. *novae-zelandiae*, with much *Lobelia ionantha* and some *Lachnagrostis* sp., and *Plantago triandra*. The edge of the tarn contains *Deschampsia cespitosa*, the moss *Polytrichum juniperinum* and browntop.

Grey scrub: On fans and fertile slopes extending onto the floor of the main Von Valley, the Station Burn (most extensive) and other sites, is a shrubland dominated by matagouri.

Riparian shrubland: These occur along the White Burn and some of the other streams draining into the Von Valley. An example is at NZTM 1235009E 4981965N. This shrubland is dominated by matagouri and mingimingi (*Coprosma propinqua*), *Coprosma rugosa*, native broom (*Carmichaelia petriei*), mountain wineberry (*Aristotelia fruticosa*), *Hebe rakaiensis*, *Dracophyllum rosmarinifolium*, *Olearia bullata*, bracken (*Pteridium esculentum*), prickly shield fern (*Polystichum vestitum*), *Coriaria plumosa* and other species.

Within the Von River gorge is an area of riparian grey scrub. This is dominated by matagouri and mingimingi, along with *Coprosma tayloriae*, *C. rugosa*, native broom, *Melicytus alpinus*, *Hebe salicifolia*, *H. rakaiensis*, bracken, prickly shield fern, golden speargrass (*Aciphylla aurea*) and *A. glaucescens*.

Other communities

Braided riverbeds: This is a distinctive community along the lower portions of the White Burn, Black Spur Creek, Bush Creek and Station Burn. The cover is dominated by gravel with *Epilobium melanocaulon*, *E. microphyllum*, *E. brunnescens* ssp. *minutiflorum*, *Raoulia tenuicaulis*, *Hydrocotyle novae-zelandiae* var. *montana*, silver tussock (*Poa cita*) and the exotic sheep's sorrel, pearlwort (*Sagina procumbens*), sweet vernal, Yorkshire fog and white clover.

Scree: There is a large scree face above the Von River gorge at NZTM 1232606E 4981562N. This is sparsely vegetated and includes *Epilobium melanocaulon*, *Stellaria gracilenta*, harebell, *Senecio quadridentata*, *Raoulia glabra*, *R. subsericea*, *Kirkianella novae-zelandiae*, adders tongue fern (*Ophioglossum coriaceum*), the exotic sheep's sorrel, mouse-ear hawkweed and browntop.

(ii) Mountain slopes

A2 Mountain slopes

Slim snow tussockland: Slim snow tussock (*Chionochloa macra*) is found on the upper-most tussock slopes (above c. 1600 m). The community is not particularly extensive or diverse and includes blue tussock, *Aciphylla* aff. *horrida*, *Celmisia lyallii*, *C. verbascifolia* and *Epilobium tasmanicum*.

Narrow-leaved snow tussockland: Narrow-leaved snow tussock (*Chionochloa rigida*) is the most extensive community on the mountain slopes. The upper altitude narrow-leaved snow tussock is c. 1m tall and in good condition. The more dense snow tussock stands have leaf litter dominating the inter-tussock space. Associated species include blue tussock, *Raoulia subsericea*, *Aciphylla* aff. *horrida*, *Kelleria villosa*, *Epilobium atriplicifolium*, *Lycopodium fastigiatum*, *Plantago lanigera*, *Argyrotegium mackayi* and *Uncinia fuscovaginata*.

A lower altitude example (940 m) occurs at NZTM 1234615E 4976357N where the snow tussock retains a healthy cover, with much leaf litter. Associated species include blue tussock, hard tussock, exotic grasses, *Dracophyllum rosmarinifolium*, *Aciphylla* aff. *horrida*, *Raoulia subsericea*, catsear, snowberry, little hard fern (*Blechnum penna-marina*), *Helichrysum filicaule*, *Celmisia gracilentia*, *Ranunculus multiscapus* and harebell. Narrow-leaved snow tussock gives way to hard tussockland and exotic pasture below c. 900 m (especially on sunny faces).

Tussock-shrubland: This community occurs in the steep mid reaches of Black Spur Creek (NZTM 1235316E 4976458N, c. 1000 m). The community is dominated by narrow-leaved snow tussock, with some *Dracophyllum rosmarinifolium*, *Brachyglottis revoluta* and *Aciphylla* sp. aff. *horrida*, small amounts of *Gaultheria crassa*, *Coprosma cheesmanii*, prickly shield fern, *Hypolepis millefolium*, *Ozothamnus vauvilliersii*, *Coprosma dumosa*, *Hebe rakaiensis*, *Dolichoglottis lyallii*, *Acaena profundeincisa*, *Anaphalioides bellidioides*, *Brachyglottis bellidioides*, *Ourisia caespitosa*, *Celmisia angustifolia*, and little hard fern.

Hard tussockland: This community occurs on sunny aspects in the lower portion of the catchment. The community contains abundant hard tussock, patotara, *Raoulia subsericea* and exotic grasses. Other associated species include *Helichrysum filicaule*, *Ranunculus multiscapus*, harebell, *Acaena inermis*, *A. caesiiglauca*, *A. anserinifolia*, *Celmisia gracilentia*, *Geranium* aff. *microphyllum*, *Euchiton traversii*, catsear, white clover and bryophytes.

Pasture/hard tussockland: At lower altitude (NZTM 1234013E 4977258N, c. 780 m) exotic grasses and mouse-ear hawkweed dominate, with only a modest cover of hard tussock. Associated species include occasional harebell, patotara, *Raoulia subsericea*, *Ranunculus multiscapus*, *Celmisia gracilentia*, snowberry, *Rytidosperma gracile*, birdsfoot trefoil and catsear. Within this community are localised flushes against terrace scarps. These contain turfy areas of *Gonocarpus micranthus*, *Lagenophora barkeri*, *Celmisia* sp. "gracilentia rhizomatous broad", *Carex gaudichaudiana*, *Plantago trianda*

and comb sedge. In the wettest sites are *Carex coriacea*, Maori onion (*Bulbinella angustifolia*) sharp spike-sedge, *Carpha alpina* and comb sedge.

Wet grassy flats: This community is small and discontinuous, located at NZTM 1234615E 4976457N, c. 920 m. It is dominated by Yorkshire fog, sweet vernal and white clover, with Maori onion, *Carex coriacea*, *Uncinia divaricata*, *Rytidosperma buchananii?*, *Acaena profundeincisa*, *Hydrocotyle novae-zelandiae* var. *montana*, *Lobelia angulata*, *Anaphalioides bellidioides*, jointed rush and bryophytes.

Wetlands

Schoenus pauciflorus flush: This community is localised with a good example at NZTM 1235716E 4976358N. The community is composed of mainly *Schoenus pauciflorus* with much narrow-leaved snow tussock, *Craspedia* sp., *Hebe pauciramosa*, *Uncinia divaricata*, along with marsh marigold, *Celmisia* sp. "gracilentata rhizomatous broad", *Rytidosperma buchananii?*, *Dolichoglottis lyallii*, *Carex coriacea*, *Anisotome aromatica* var. *flabellifolia*, and *Ranunculus foliosus*.

Turf flush: This community occurs on a terrace at NZTM 1234414E 4976457N, altitude c. 880 m. This flush is composed of comb sedge, *Gonocarpus micranthus*, *G. aggregatus*, *Plantago triandra*, *Schizeilema cockaynei*, *Hydrocotyle novae-zelandiae* var. *montana*, *Lobelia angulata*, *Lagenophora petiolata*, *Viola cunninghamii*, and *Drosera arcturi*, along with *Schoenus pauciflorus*, Maori onion, *Carex coriacea*, Yorkshire fog, and crested dogstail (*Cynosorus cristatus*).

Mixed shrubland: An example of this shrubland community is located at NZTM 1234715 4976457N, altitude 930-960 m. It contains mountain ribbonwood (*Hoheria lyallii*), *Coprosma dumosa*, *C. rugosa*, *C. cheesemaniae*, *Hebe rakaiensis*, koromiko (*H. salicifolia*), *Brachyglottis revoluta*, *Dracophyllum rosmarinifolium*, mountain wineberry, *Olearia cymbifolia*, *Ozothamnus vauvilliersii*, *Gaultheria crassa*, tutu (*Coriaria sarmentosa*), *Aciphylla* aff. *horrida*, prickly shield fern, *Hypolepis millefolium*, and *Blechnum montanum*.

Other sites have additional species of mingimingi, native broom, inaka/turpentine shrub (*Dracophyllum longifolium*), *Coprosma serrulata*, *Olearia arborescens*, *Hebe pauciramosa*, mountain flax (*Phormium cookianum*) and *Astelia nervosa*. This community grades into an inaka-narrow-leaved snow tussock shrub-tussockland community comprising *Coprosma cheesemaniae*, *C. dumosa*, *C. rugosa*, *Dracophyllum rosmarinifolium*, *Aciphylla* aff. *horrida* and *Astelia nervosa*.

Dracophyllum rosmarinifolium shrubland: Occurs on shady aspect sometimes extending down to below 900 m such as the junction of the two main branches of Black Spur Creek. This community varies from shrubland to shrub-tussockland and grades into snow tussockland.

Other communities

Rocky ridge crest: The rocky ridge crest contains a characteristic flora including much *Hebe buchananii* and *Raoulia buchananii*, along with *Celmisia lyallii*, blue tussock, *Dracophyllum rosmarinifolium*, *Rytidosperma setifolium* and edelweiss (*Leucogenes grandiceps*).

Rock outcrops: On shady aspects at higher altitude characteristic species include *Raoulia buchananii*, *Schizeilema haastii* var. *cyanopetala*, *Pachycladon wallii*, *Colobanthus buchananii*, *Anisotome capillifolia*, *Poa novae-zelandiae*, *Leptinella pectinata*, *Ourisia caespitosa*, *O. spathulata*, *Aciphylla lecomtei*, edelweiss, *Celmisia ramulosa*, *Gaultheria crassa* and *Dolichoglottis lyallii*.

On sunny aspects at mid-high altitude characteristic species include *Hebe biggarii*, *Gaultheria crassa*, *Dracophyllum rosmarinifolium*, edelweiss, *Rytidosperma setifolium*, *Geum cockaynei*, *O. spathulata*, *Schizeilema haastii* var. *cyanopetala* and *Celmisia densiflora*.

At Black Spur Creek at NZTM 1234514E 4976557N, altitude c. 920 m, is a lower altitude rock outcrop community. Species here include *Gingidia montana*, *Dolichoglottis lyallii*, *Geum cockaynei*, *Anaphalioides bellidioides*, *Stellaria gracilentia*, *Myosotis macrantha*, *Notogrammitis patagonica*, *Asplenium richardii*, *Schoenus pauciflorus* and *Coriaria plumosa*.

Rock/scree slope: This community includes *Gaultheria crassa*, *Hebe biggarii*, *Rytidosperma setifolium*, *Anaphalioides bellidioides*, harebell, *Raoulia glabra*, *Celmisia densiflora*, *Gingidia montana*, *Coprosma serrulata*, *Hymenophyllum multifidum*, *Notogrammitis angustifolia* and other species.

Wakatipu Lake Faces

B1. McKinlays creek catchment

The greatest range of habitats and native plant communities in the northern section are found in the McKinlays Creek catchment. It also contains the best altitudinal sequence of vegetation from the summit of Walter Peak at 1800 m almost to lake level at 308 m. At lake level the sequence is intermittent with introduced eucalypts, broom (*Cytisus scoparius*) and gorse (*Ulex europaeus*) as well as scattered native shrubs and extensive areas of bracken fern (*Pteridium esculentum*).

Fernland

Apart from the relatively small area of tall exotic trees and broom the lower faces above McKinlays Creek are covered in dense bracken fern, some of it two metres tall, with lawyer (*Rubus schmidelioides*) and occasional clumps of mingimingi and matagouri and patches of tutu. Patches of exotic grassland also occur especially near the lake.

Shrublands

Upstream, where there has been less burning, shrubland is taking over from the bracken. This is the colder side of the hill and regeneration of shrubs and broadleaved trees is well advanced up to about 800 m. Close to McKinlays Creek patches of mountain beech (*Fuscospora cliffortioides*) survive with broadleaf (*Griselinia littoralis*), wineberry (*Aristotelia serrata*), fuchsia (*Fuchsia excorticata*), marble leaf (*Carpodetus serratus*), kohuhu (*Pittosporum tenuifolium*), tree tutu (*Coriaria arborea*), lancewood (*Pseudopanax crassifolius*) and several *Coprosma* species. Higher above the creek, matagouri, mingimingi, *Coprosma rugosa*, *Coprosma lucida* and tall snowberry (*Gaultheria antipoda*) appear above often dense bracken fernland. Forest patches continue upstream to just below where McKinlays Creek bends westwards, with shrubland and bracken patches up slope. *Coprosma dumosa* occurs on rocky slopes. Manuka (*Leptospermum scoparium*) patches also occur in the fernland areas.

The tree and shrub species mentioned above also occur up the small side gullies where they are joined by mountain ribbonwood, *Hebe rakaiensis*, *Olearia cymbifolia*, *Coprosma dumosa* and mountain flax. Further up valley as well as higher upslope, the shrubland changes to *Dracophyllum uniflorum* shrubland with *Hebe propinqua*, *Hebe rakaiensis*, *Olearia cymbifolia*, *Gaultheria crassa* and occasional *Aciphylla* sp.aff. *horrida*, inaka, *Hebe anomala*, *Ozothamnus vauvilliersii*, *Olearia moschata* and *Brachyglottis cassinioides*. Areas of narrow-leaved snow tussock grassland and hard tussock grassland are intermingled with these higher altitude shrublands, and the latter occurs on the upper river flats, above where the forest or tree line finishes at the bend in McKinlays Creek.

Dracophyllum shrublands clothe much of the steep, rocky, south and east facing slopes up to about 1250 m and right to the head of McKinlays Creek with tall tussockland descending to the valley floor in places. On wetter slopes towards the head of the valley, *Brachyglottis revoluta* is prominent with *Coprosma cheesemanii*, *Hebe hectorii* and *Hebe anomala*. *Aciphylla* aff. *horrida* can be common on some rocky slopes and *Astelia nervosa* may also be present.

Grasslands

Faces north of Walter Peak Creek, where burning has been more frequent and grazing pressure heavier, are covered in exotic grassland dominated by pasture grasses up to about 900 m. Introduced grasses occupy open spaces in the bracken fernland and lower shrublands and valley floor together with a number of small native herbs and grasses. These include patotara, *Coprosma petriei*, *Pimelea oreophila*, *Raoulia subsericea*, *Anisotome flexuosa*, harebell, *Viola cunninghamii*, *Geranium brevicaule*, *Celmisia gracilentia*, *Scleranthus uniflora*, *Luzula rufa*, blue tussock, *Rytidosperma pumilum*, little hard fern and mosses. On the lower sunny faces of Wither Peak, to about 1000 m, introduced grasses, mainly browntop and sweet vernal are locally dominant in the otherwise largely hard tussock grassland.

The slopes up valley from Walter Peak Creek and including the Wither Peak slopes, have primarily native plant cover, with hard tussock at lower levels and

tall tussock grassland dominating above about 900 m on the true left, and to about 1000 m on the true right of McKinlays.

Upper tussockland

Tall narrow-leaved snow tussock is the dominant plant community of the upper slopes except for the numerous wetlands, screes, bluff systems and occasional small snow banks. This changes to slim snow tussock above about 1500 m. On cold, wet slopes near the McKinlays Saddle with Killiecrankie Creek, and northwards towards Walter Peak, slim snow tussock descends to about 1200 m.

Associated plants of the tussockland include *Celmisia lyallii*, *Hebe hectorii*, *Dracophyllum rosmarinifolium*, *Rytidosperma pumilum*, *Celmisia densifolia*, *Aciphylla kirkii*, *Celmisia gracilentia*, harebell, *Acaena caesiiglauca*, *Acaena profundiincisa*, *Carex wakatipu*, *Pimelea oreophila*, blue tussock, *Astelia graminea*, *Hebe anomala*, snowberry, *Viola cunninghamii*, *Raoulia subsericea*, *Chaerophyllum ramosum*, and *Aciphylla* aff. *horrida*. In wetter sites *Schoenus pauciflorus* becomes prominent with *Carex sinclairii*, *Dolichoglottis lyallii*, Maori onion, curly tussock (*Chionochloa crassiuscula*), *Gentianella grisebachii*, *Hebe pauciramosa*, *Craspedia* sp., and often much sphagnum moss.

Near the saddle, red tussock is found in wet gullies and depressions with curly tussock.

Wetlands/bogs

Wetlands, and tarns with associated bogs, dot the upper basins along the eastern side of the Walter Peak ridge. Plants in this community include several moss species that dominate in places, comb sedge, *Carex echinata*, *Carpha alpina*, *Celmisia* sp. rhizomatous, marsh marigold, *Ranunculus cheesemanii*, *Abrotanella caespitosa*, *Kelleria paludosa*, *Gentianella amabilis*, *Celmisia glandulosa*, *Nertera balfouriana*, *Drosera arcturi*, *Montia sessiliflora*, *Argyrotegium mackayi*, *Colobanthus apetalus*, *Luzula leptophylla*, *Plantago uniflora*, *Agrostis pallescens* and *Carex gaudichaudiana*. Mosses, including sphagnum, are common. Some seepages contain *Aciphylla pinnatifida* and *Acaena fissistipula* along their length.

Screes and boulder fields

Small screes fall from the rocky ridges in places. Present are the few specialized scree plants including *Ranunculus pilifera*, *Haastia sinclairii* var. *fulvida*, *Epilobium porphyrium*, and *Stellaria roughii*. Around the edges of screes or on stable ground around rocks and boulderfields are a wide range of cushion plants, herbs, grasses, sedges and low growing shrubs. They include *Hectorella caespitosa*, *Aciphylla spedenii*, *A. lecomtei*, *A. kirkii*, *Rytidosperma setifolia*, *Koeleria novo-zelandica*, *Poa schistacea*, *Agrostis muelleriana*, *Celmisia laricifolia*, *C. angustifolia*, *C. sessiliflora*, *Leptinella pectinata*, edelweiss, *Brachyscome longiscapa*, *Melicytus alpinus*, *Myrsine nummularia*, *Dracophyllum muscoides*, *D. politum*, *Huperzia australiana*, *Hypolepis millefolium*, little hard fern, *Polystichum cystostegia*, *Stellaria gracilentia*, *Phyllachne colensoi*, *Gentianella divisa*, *Epilobium tasmanicum*, *Celmisia hectorii*, and *Luzula rhadina*. The rush *Marsippospermum gracile* is common on cold, damp faces of the upper slopes.

Bluffs

Bluffs provide habitat and shelter for a number of plants not found elsewhere as well as plants that are common to other habitats. They include *Pachycladon wallii*, *Myosotis macrantha*, *Anisotome capillifolia*, *Notogrammitis angustifolia*, *N. givenii*, *Polystichum vestitum*, *Ranunculus buchananii*, *Hebe petriei*, *Poa anceps*, *Luzula traversii*, *Festuca mathewsii*, *Schizeilema cyanopetala*, *Anaphalioides bellidioides*, *Geum parviflorum*, *Gingidia decipiens*, *Epilobium glabellum*, *Celmisia verbascifolia*, *Pachycladon novae-zelandiae* and *Koeleria cheesemanii*.

Herbfields

Herbfields form small patches on ridge tops where the soil is shallow, around the base of rock outcrops and in snow banks. Many of the plants already mentioned occur here as well as *Ourisia glandulosa*, *Euphrasia zelandica*, *Ranunculus royi*, *Carex pyrenaica*, *Celmisia haastii*, *Deschampsia chapmanii*, *Scleranthus uniflorus*, *Acaena saccaticupula*, *Raoulia grandiflora*, *Anisotome aromatica* and *Gaultheria nubicola*.

(ii) Afton Burn East Branch

B2. Afton Burn East Branch

Shrubland

The lower section of the Afton Burn East Branch, before it emerges from the hills onto the lake terraces, is notable for its extensive shrublands. The mid section contains a relatively large patch of beech forest that extends intermittently up valley to about 900 m with mountain and red beech (*Fuscopora fusca*) in the lower part and silver beech (*Lophozonia menziesii*) at higher altitude. Regenerating broadleaf forest grows in the many side gullies. The upper section is grassland, hard tussock on the sunny faces with introduced grasses, scattered shrubs, snow tussock and *Dracophyllum* on the colder east faces. Snow tussock is dominant on all parts over about 1200 m.

At its lower end, the river emerges from a deep, steep-sided gorge covered with a mosaic of shrubland, bracken fernland and regenerating broadleaved forest. The latter includes broadleaf, wineberry, fuchsia, marble leaf, mountain ribbonwood, cabbage tree (*Cordyline australis*), *Olearia avicenniaefolia* and an *Aristotelia* hybrid (*Aristotelia serrata* x *fruticosa*) as well as the shrubland *Coprosma* spp., koromiko, lancewood and mapou (*Myrsine australis*).

The shrubland varies from matagouri-dominated to *Coprosma*-dominated with associated species including mingimingi, *C. rugosa*, *C. tayloriae*, *C. dumosa*, and occasional *Corokia cotoneaster* and mountain wineberry. Tutu is common along damp banks. *Muehlenbeckia complexa* and bush lawyer are prominent in places, scrambling over shrubs. Patches of introduced grassland, mainly brown top and sweet vernal, occur with scattered hard tussock amongst the extensive shrublands.

Above about 900 m *Dracophyllum rosmarinifolium* becomes more prominent, both as scattered shrubs with *Coprosma* species and matagouri on the true

right (west faces) and as the dominant vegetative cover on the true left (east faces) up to about 1000 m when snow tussock takes over as the dominant cover. Shrubs associated with the *Dracophyllum rosmarinifolium* are snow totara (*Podocarpus nivalis*) especially on bouldery or stony slopes, *Coprosma dumosa*, inaka, *C. rugosa*, *Gaultheria crassa*, *Olearia cymbifolia*, *O. moschata* and, along the upper stream edges, mountain ribbonwood, *Olearia bullata*, *Hebe rakaiensis* and *H. anomala*. Steep, wet faces contain large patches of mountain fern (*Blechnum montanum*) and mountain flax.

Forest

In the mid-valley bottom is a relatively large area of mixed mountain and red beech with broadleaf, wineberry and mountain ribbonwood, the latter quite prominent. Herbs and grasses form part of the ground layer and include *Acaena anserinifolia*, *Lagenophora strangulata*, *Senecio wairauensis*, *Urtica incisa*, *Viola filicaule*, *Anaphalioides bellidioides*, *Chaerophyllum ramosum*, *Lagenophora pinnatifida*, *Uncinia uncinata*, *Chionochloa conspicua*, *Poa imbecilla*, *Rytidosperma gracile* and *Astelia nervosa*.

Snow tussockland

Above about 1000 m to 1100 m narrow-leaved snow tussock dominates with slim snow tussock above c.1500 m.

B3. Afton Burn West Branch

The Afton Burn West Branch forms the western boundary of the property. The lower section is very scrubby with much exotic broom and gorse as well as matagouri and *Coprosma* species. Burning plus oversowing and top dressing has left a mosaic of pasture, shrublands, rough grasslands and bracken fernland along the lower slopes up to about 900 m. The steeper slopes just above the river have a heavy shrub cover with the occasional regenerating cabbage tree, broadleaf, and kohuhu. Mid valley, the shrublands are more continuous and similar to those described for the east branch with grassy patches that vary from short tussock dominated to introduced grassland and patches of bracken. Areas of grassland appear to be diminishing rapidly with increasing shrub cover. This vegetation continues along the valley bottom and side slopes to about 900 m, almost to the saddle.

Above about 900 m tussock grassland forms the main cover with scattered shrubs. Extensive screes fall from the rocky ridge on the true right. This ridge is similar to the Walter Peak ridge in that it has gentle slopes to the east containing large cirque basins.

B4. The lake faces – Walter Peak and Afton Peak

The lake faces beneath Walter Peak and along to Afton Peak and westwards are the most developed on the lease with exotic grassland dominating over extensive areas up to 1000 m in places. Hard tussock is often present and snow tussock descends below 900 m in some of the steep, deep side gullies. Silver tussock occupies the more fertile soils along side streams and patches of beech forest occupy rocky gorges in Georges and Mick O'Day Creeks.

Bracken fernland forms very extensive patches across the slopes below 900 m and manuka on the faces west of Afton Burn East Branch. Broom is a problem weed above the Beech Bay area and there has been some spread of Douglas fir (*Pseudotsuga menziesii*) here. Exposed rock faces and bluffs are prominent along the face beneath Walter Peak with erosion slips evident.

B5. Lake Wakatipu shoreline

Only small remnants of the lakeshore communities occur along the shoreline between Table Bay and Beach Bay. Species include kowhai (*Sophora microphylla*), *Lophomyrtus obcordata*, *Coprosma* spp., *Corokia cotoneaster*, koromiko, matagouri and broom. Hawthorn (*Crataegus monogyna*) and *Eucalyptus globulatus* trees are present at Table Bay.

At the western end of Walter Peak Special Lease shrubland is restricted to a small area in the bay where the Afton Burn enters the lake. Here are scattered willows (*Salix fragilis*), eucalypts and broom but also a representative selection of native species including kowhai, tree tutu, mingimingi, *Coprosma rugosa*, *C. lucida*, *C. tayloriae*, cabbage tree, manuka, marble leaf, lancewood, kohuhu, broadleaf, mapou, and the green mistletoe (*Ileostylus micranthus*). This vegetation extends upstream in a small, steep-sided gorge together with wineberry, three finger (*Pseudopanax colensoi* var. *ternatus*), fuchsia, *Corokia cotoneaster*, *Olearia avicenniifolia*, *Coprosma linariifolia*, koromiko and tall snowberry.

C. Lochy catchment

C1. Main stem and headwaters

Slim snow tussockland: Slim snow tussock is found on the upper-most tussock slopes (above c. 1400 m). An example at NZTM 1235918E 4975057N, altitude c. 1560 m contains much bare ground, *Celmisia lyallii*, blue tussock, *Raoulia grandiflora* and slim snow tussock. Other components include *Abrotanella inconspicua*, *Celmisia hectorii*, bryophytes, lichens, *Coprosma perpusilla*, *Leptinella pectinata*, *Raoulia subsericea* and *Aciphylla spedenii*.

Sheep camps within grazed slim snow tussock contain *Acaena saccaticupula*, *Ranunculus foliosus*, *Hydrocotyle novae-zelandiae* var. *montana*, *Uncinia divaricata*, *Geum leiospermum*, *Poa breviglumis* and *Leptinella squalida* var. *mediana*. Common exotic species include white clover, sweet vernal, mouse-ear chickweed (*Cerastium fontanum*), mouse-ear hawkweed, sheep's sorrel and *Poa pratense*.

Narrow-leaved snow tussockland: This tussockland is widespread throughout the upper valley. At high altitude sunny aspects (c. 1500 m) amongst the rock and bare ground are *Celmisia lyallii*, blue tussock and alpine fescue tussock (*Festuca matthewsii*). Associated species include *Kelleria villosa*, *Raoulia subsericea*, harebell, *Plantago lanigera*, *Uncinia divaricata*, *U. fuscovaginata*, *Geum leiospermum*, *Carex wakatipu* and *Gentianella bellidifolia*. In damp areas *Schoenus pauciflorus*, marsh marigold, and Maori onion occurs.

Slopes at lower altitude (1100 – 1300 m), particularly those west and south-facing, have a very dense cover of tall narrow-leaved tussock with abundant litter. Inter-tussock diversity is low and includes damp grassland species such as *Dolichoglottis lyallii*, *Anemone tenuicaulis*, *Plantago raoulii*, *Craspedia* sp. and *Epilobium chlorifolium*. Near the valley bottom in the headwaters, and on the lower slopes between Lake Ned and Killiecrankie Creek, the tall tussock cover becomes increasingly more fragmented with replacement by short tussock species and/or exotic pasture grasses.

Seepage: Seepage wetlands are prevalent in high upper basins. A good example at NZTM 1235718E 4974957N, altitude c. 1600 m is dominated by marsh marigold with much *Plantago novae-zelandiae* and blue tussock, and some *Phyllachne colensoi*, *Abrotanella caespitosa*, *Carex pyrenica* var. *cephalotes*, *Ranunculus maculatus*, *Coprosma perpusilla*, *Celmisia hectorii* and *Leptinella pectinata*.

Flush: This community is often associated with seepages described above. It is dominated by bryophytes (including some sphagnum moss), with much *Isolepis aucklandicus* and *Kelleria paludosa*. Other associated species include *Euchiton lateralis*, *Carex lachenalii* ssp. *parkerii*, marsh marigold and *Abrotanella caespitosa*.

Cushion bog: This community is also found within the wider flush/seepage wetland system. It is generally dominated by comb sedge, *Celmisia* sp “gracilentata rhizomatous narrow”, *Kelleria paludosa*, *Centrolepis pallida*, *Abrotanella caespitosa*, *Gentianella amabilis*, *Drosera arcturi*, *Epilobium komarovianum*, *Carex gaudichaudiana*, *Isolepis aucklandica*, *Deschampsia* sp., *Luzula leptophylla*, *Juncus antarcticus*, and *J. pusillus*. Some sites have locally uncommon elements such *Carex ensyji*.

Sedge and rush swamp: A large wetland at the head of Lake Nigel is a mix of very wet *Juncus* and *Carex* dominated areas, small water filled depressions, and interspersed drier turf land. The wet hollows have red pondweed (*Potamogeton cheesemani*) with fringes of sharp spike-sedge and the introduced *Juncus articulatus*. Surrounding wet areas are dominated by *Carex gaudichaudiana*, *C. coriacea*, *Juncus* spp. and *Plantago uniflora*. The rare grass *Deschampsia cespitosa*, observed in 2004 was not seen in 2015 but may still be present. Turf areas are dominated by *Hydrocotyle microphylla*, *H. sulcata*, *Epilobium brunnescens*, *Leptinella squalida*, *Euchiton lateralis*, and *Carex berggrenii*. The introduced sedge *Carex ovalis* is locally invasive. Overall, the condition of this wetland has significantly deteriorated over the last ten years with evidence of considerable stock impacts.

Subalpine shrublands: The immediate surrounds of Lake Ned, extending up valley to Lake Nigel and down valley to the upper forest margins, have a variable but diverse shrubland cover on stable talus. Snow totara is the dominant shrub but other important species include mountain toatoa (*Phyllocladus alpinus*), inaka, *D. rosmarinifolium*, *Olearia cymbifolia*, native broom, *Hebe odora*, *H. rakaiensis*, *Coprosma dumosa*, *C. rugosa*, mountain wineberry, mountain ribbonwood and *Brachyglottis cassinioides*. Shrublands on the eastern edge of Lake Ned are particularly intact and diverse.

Further up valley, below the upper forks, is a small but expanding shrubland dominated by *Hebe anomala*. Other shrubs present include *Coprosma cheesemani*, *C. dumosa*, *Dracophyllum rosmarinifolium*, snow totara and *Brachyglottis cassinioides*. More extensive *Dracophyllum* dominated shrublands, mixed with snow tussock, are present on the lower hill slopes and river gorges near the old Forks Hut and elsewhere at comparable elevations.

Montane shrublands: Fragmented but regenerating shrublands are present on the lower hillslopes on the true left of the Lochy River between Cascade Creek and Killiecrankie Creek. They occupy slopes which probably supported beech forest in the recent past. The shrublands are mostly restricted to narrow ribbons running up slope with concentrations associated with bouldery talus slopes and major ravines. Briar is widespread but many native shrubs are present including matagouri, mountain wineberry, *Melicytus* aff. *alpinus*, native broom and *Olearia odorata*.

Forest: Beech forest occurs discontinuously in riparian strips and small remnants from the northern end of Lake Ned to Killiecrankie Creek. The largest forest patch is in the vicinity of the major catchment confluence between Lake Ned and Cascade Creek. Mountain beech predominates with silver beech present around the upper margins near Lake Ned. Understorey is absent or severely depleted in the smaller remnants flanking the vehicle track.

Pasture/short tussock: Exotic pasture grasses, sometimes in conjunction with short tussock species and associated native herbs, occupy the valley floor and immediate lower hill slopes from half way up the north branch down to Lake Nigel. A similar community is also present on the broad faces flanking the true left of the valley from south of the Cascade Creek confluence to Killiecrankie Creek. Here it extends up slope to 900 – 1000 m asl although the exotic pasture component appears to be weakening in favour of indigenous woody regeneration.

Other communities

Summit ridge: See Von Valley, Mountain slopes, rocky ridge crest community description.

Fellfield: On the most exposed sites fellfield replaces slim snow tussockland. This community includes *Hectorella caespitosa*, *Hebejeebie densifolia*, *Chionohebe ciliolata*, *Luzula pumila*, blue tussock, *Abrotanella inconspicua*, *Raoulia grandiflora*, *Phyllachne colensoi*, and *Gentianella corymbosa*. Some alpine cushionfield occurs on solifluction ridges and hollows. The ridges contain much blue tussock and *Phyllachne colensoi*. Associated species include slim snow tussock, bryophytes, *Marsippospermum gracile*, *Abrotanella inconspicua*, *Celmisia hectorii*, *Luzula pumila*, *Coprosma perpusilla* and *Kelleria villosa*. The hollows contain marsh marigold, *Plantago novae-zelandiae*, *Coprosma perpusilla*, bryophytes and other species.

Rock faces: Rock faces forming basin headwalls have a distinctive and diverse flora. This includes *Raoulia buchananii*, *Colobanthus buchananii*,

Hebe buchananii, *H. petriei*, *Anisotome pilifera*, *A. capillifolia*, *Ranunculus buchananii*, *Celmisia ramulosa*, edelweiss, *Chionohebe ciliolata*, *Leptinella pectinata*, *Ourisia spathulata*, *Cardamine bilobata*, *C. debilis* agg., *Myosotis pulvinaris*, *Poa novae-zelandiae*, *Koeleria cheesemanii* and *Rytidosperma setifolia*. More local species include *Pachycladon wallii*, *Aciphylla lecomtei*, *Lobelia glaberrima* and *Celmisia laricifolia*.

Scree: Scree are common in the high alpine basins. They are sparsely vegetated and typically contain *Stellaria roughii*, *Epilobium porphorium*, *Ranunculus pilifera*, *Ourisia caespitosa*, *Celmisia hectorii*, *Schizeilema haastii*, *Montia sessiliflora*, and *Luzula pumila* and occasionally *Ranunculus crithmifolius*.

Snowbank: Snowbanks vary in composition dependent upon length of snow lie, slope and other factors. Dominant species at different sites include *Celmisia hectorii*, blue tussock and *Marsippospermum gracile*. Other associated species include *Carex pyrenaica* var. *cephalotes*, *Phyllachne colensoi*, *Abrotanella inconspicua*, *Kelleria croizatii*, *Raoulia subulata*, marsh marigold, *Poa incrassata*, *Luzula pumila*, *Raoulia grandiflora*, *Epilobium tasmanicum*, and *Coprosma perpusilla*.

C2. Cascade Creek

Fellfield, cushionfield, scree and alpine wetlands: these communities are extensive along the range crests and in the basins of the upper valley and tributaries. Their composition is as described for near identical communities in the upper Lochy.

Slim snow tussockland and narrow-leaved tussockland: Tall tussock communities are present throughout the sub-alpine and low alpine zones notwithstanding some variation in density and condition in relation to aspect and grazing management. Their composition is similar to that described for these communities in the upper Lochy.

Pasture: Narrow swathes of predominantly exotic pasture (interspersed with sphagnum bogs and other native communities) have replaced areas of tall tussockland on the lower slopes, particularly along the easier north and east facing slopes of the true right.

Sphagnum bogs: These are very common along the footslopes and valley floor of the main valley and larger tributaries. They display considerable variation in species composition but common elements include sphagnum moss, *Carex guadichaudiana*, *C. berggrenii*, *C. coriacea*, *C. echinata*, *Schoenus pauciflorus*, *Carpha alpina*, *Viola cunninghamii*, *Celmisia glandulosa*, *Celmisia* sp. "gracilentia rhizomatous narrow", *Craspedia* sp., *Abrotanella caespitosa*, *Drosera arcturi* and *Hebe pauciramosa*. Weeds are limited to occasional plants of jointed rush.

Montane shrublands: These are extensive in the lower third of both sides of the valley, but are most intact either side of the vehicle track on the true left.

Those on the true right are less well developed and associated with unstable talus and screes. The dominant shrub and/or low tree species are mountain ribbonwood, *Brachyglottis cassinioides*, native broom, Hall's totara (*Podocarpus cunninghamii*), snow totara, mountain toatoa, *Hebe rakaiensis*, *Coprosma dumosa* and *Olearia nummularifolia*. Other less common shrubs include *Coprosma rugosa*, *Melicytus* aff. *alpinus*, mountain wineberry, inaka, *Olearia cymbifolia*, *Ozothamnus vauvilliersii*, koromiko and three-finger. These are associated with a range of understorey and groundcover species including *Anaphalioides bellidioides*, *Muehlenbeckia axillaris*, prickly shield fern, *Aciphylla* aff. *horrida*, *Acaena caesiiglauca*, *A. saccaticupula*, little hard fern, silver tussock and *Helichrysum filicaule*.

Forest: Beech forest is mostly restricted to the lowermost 1 km on the true left of the creek and a similar length of riparian strip on the true right. Mountain beech predominates with occasional silver beech on the margins and a few trees of red beech along the lower slopes. Understorey and groundcover composition is similar to that described for the forest of Killiecrankie Creek.

C3. Killiecrankie Creek

Cushionfield: exposed ridge crests and grazing-induced sites within the alpine zone are dominated by cushion forming herbs. Dominant species include *Hectorella caespitosa*, *Abrotanella inconspicua*, *Celmisia hectorii*, *C. laricifolia*, *Raoulia hectorii*, *Hebejeebie densifolia*, and *Phyllachne colensoi*. Other common species include club moss, *Plantago lanigera*, *Brachyglottis revoluta*, *Aciphylla lecomtei*, *Ourisia glandulosa*, *Luzula pumila*, *Agrostis muelleriana*, *Gaultheria nubicola*, *Hebe buchananii* and *Scleranthus uniflorus*.

Alpine scree: Small areas of scree are mostly bare but with occasional *Ranunculus pilifera*, *R. pachyrrhizus*, *Hebe petriei*, *Epilobium tasmanicum*, *Myosotis drucei*, *Stellaria roughii*, *Acaena saccaticupula* and *Montia sessiliflora*.

Rock talus: Alpine basins comprising large angular rock talus have sparse vegetation comprising the ferns *Polystichum cystostegia*, prickly shield fern, little hard fern, along with *Huperzia australiana*, *Brachyglottis revoluta*, *Geranium* aff. *microphyllum* and *Acaena saccaticupula*.

Rock bluffs/outcrops: Those in the alpine zone have a diverse flora reflecting, in part, the wide range of micro-habitats available. Damp, shaded ledges have *Schizeilema haastii*, *Geum cockaynei*, *Poa novae-zelandiae*, *Hebe petriei*, *Pachycladon wallii* and *Anisotome pilifera*. Damp cracks and caverns have *Notogrammitis angustifolia*, *Lobelia linnaeoides* and *Cystopteris tasmanica*. Drier sites have edelweiss, *Rytidosperma setifolium*, *Celmisia ramulosa*, *Brachyglottis bellidioides*, *Celmisia angustifolia* and *C. hectorii*.

Dry bluffs in the montane zone have *Myosotis australis*, *M. macrantha*, *Helichrysum intermedium*, *Senecio wairauensis*, and *Stellaria gracilentia* while damp bluffs have *Parahebe lyallii*, and *Gingidia montana*.

Seepage wetland: These are common in the alpine zone and tend to be dominated by comb sedge or sphagnum moss. Common associated species include *Abrotanella caespitosa*, *Galium perpusillum*, *Coprosma atropurpurea*, *Viola cunninghamii*, *Schoenus pauciflorus*, *Gentianella amabilis*, *Drosera arcturi*, *Kelleria paludosa*, *Celmisia glandulosa* and *Carpha alpina*.

Snow tussocklands: Slim snow tussock and narrow-leaved snow tussock grasslands are present, similar in composition to those described for the upper Lochy. Those on the true left of Killiecrankie Creek are particularly tall and dense with very few exotic species. Below about 1000 m the shrub component of the tussocklands increases significantly. Common shrubs include *Ozothamnus vauvilliersi*, *Hebe anomala*, *H. propinqua*, *H. hectorii*, *Brachyglottis cassinioides*, *Coprosma fowerakeri* and *C. dumosa*.

Riparian shrublands: These include many of the shrub species mentioned in the tussockland description above as well as *Olearia moschata*, inaka, mountain ribbonwood, and localised occurrences of dense native broom.

Beech forest: Beech forest is confined to the lower hillslopes and riparian zones for approximately 3 km up from the Killiecrankie Creek/Lochy confluence. Silver beech occurs as outliers to the predominantly mountain beech dominated forest. Regeneration appears adequate in all but isolated stands and along some margins. Little understorey diversity is present. Woody species include *Coprosma dumosa*, and occasional mountain toatoa while the ground cover is predominantly moss with some prickly shield fern, *Hypolepis millefolium*, *Pterostylis* sp., *Nematoceras* sp. and *Blechnum fluviatile*.

Pasture: Areas with a strong exotic grass presence occur on the true right of Killiecrankie creek, south of its western tributary. Amongst the exotic sward are native herbaceous elements including *Raoulia subsericea*, *Raoulia glabra*, and *Acaena novae-zelandiae*, along with scattered shrubs of mingimingi, *Corokia cotoneaster* and mountain wineberry.

2.5.4 .Significance of vegetation

Walter Peak Special Lease falls within the Eyre Ecological District and contains an outstanding representation of the plants and plant communities of the district, particularly those in the montane, sub-alpine and alpine bioclimatic zones. At least 441 native species (see Appendix 1) are present representing approximately 18% of the entire indigenous vascular flora of New Zealand and approximately 70 % of the indigenous vascular flora recorded for the Eyre Mountains (Druce et al. 1993). The Eyre Mountains are one of several mainly mountain regions just east of the main divide in western Canterbury, Otago and Southland which are unusually species rich (Rogers & Overton 2001).

Climatically the District is intermediate between the wet Fiordland region to the west and the drier environment of Central Otago to the east. The species composition also reflects this with the occurrence of many widespread species that are more common close to the main divide. For some of these, they appear to be at or near their eastern limit. Conversely, several of the widespread species are of greater importance further east of the District and some of these (e.g. *Hebe propinqua*) probably reach their western limit here. Another widespread species, *Ranunculus crithmifolius*, is likely to be at or near its southern limit (Mark et al. 1987).

Threatened and At Risk species

Of the native vascular plant species present, six are listed as 'Threatened' and 27 as 'At Risk' in the most recent threat classification system listing (de Lange et al. 2013). A list of these species with their threat of extinction status and distribution within Walter Peak Special Lease is provided below in Table six.

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

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

Table six: Threatened, At Risk and Data Deficient plant species found on Walter Peak Special lease

Super Category	Threat Category	Species	Location on property
Threatened	Nationally Critical	<i>Chaerophyllum colensoi</i> var. <i>delicatulum</i>	A herb in ablated hollows in the Von Valley.
		<i>Pseudognaphalium ephemerum</i>	A herb in ablated hollows in the Von Valley.

	Nationally Vulnerable	<i>Kirkianella novae-zelandiae</i>	A native dandelion within red tussockland in the Von Valley.
		<i>Ranunculus ternatifolius</i>	A buttercup within dense, moist red tussockland in the Von Valley.
		<i>Pachycladon cheesemanii</i>	A slender cress of one site in Cascade Creek and one site in Killiecrankie Creek.
		<i>Senecio dunedinensis</i>	A groundsel, on a rock outcrop in the White Burn.
At Risk	Declining	<i>Alepis flavida</i>	A mistletoe of beech forests. One site in Killiecrankie Creek, Lochy valley.
		<i>Deschampsia cespitosa</i>	A tufted grass occurring at five sites in the Von Valley and three sites in the Lochy, associated with swamps and tarns.
		<i>Mentha cunninghamii</i>	A herb of wetlands and grasslands in the Von Valley
		<i>Ranunculus pilifera</i>	A buttercup on high altitude screes, locally throughout.
	Naturally Uncommon	<i>Aciphylla lecomtei</i>	A speargrass scattered at higher altitudes.
		<i>Aciphylla spedenii</i>	A speargrass scattered at higher altitudes.
		<i>Agrostis petriei</i>	A grass of stony ground
		<i>Anemone tenuicaulis</i>	A herb in moist snow tussockland throughout.
		<i>Brachyscome humilis</i>	A small daisy of fellfield and snowbank in Lochy River headwaters
		<i>Cardamine bilobata</i>	A cress at the base of dry rock bluffs
		<i>Carex berggrenii</i>	A sedge of wet turfs in the Station Burn valley and Lochy valley
		<i>Carex capillacea</i>	A sedge of wet turfs in the Station Burn valley.
		<i>Carex carsei</i>	A sedge of cushion bogs in the Von Valley
		<i>Carex ensyii</i>	A sedge of wetlands in the Lochy headwaters
		<i>Carex lachenalii</i> subsp. <i>parkeri</i>	Widespread on damp screes and snowbanks
		<i>Carex tenuiculmis</i>	A sedge at four swamp

			sites in the Von Valley.
		<i>Celmisia thomsonii</i>	A rock daisy scattered at higher altitudes
		<i>Dracophyllum uniflorum</i> var. <i>frondosum</i>	A trailing shrub of one stream gorge in Cascade Creek, Lochy catchment.
		<i>Hebe biggarii</i>	A shrub on rocky areas throughout.
		<i>Lachnagrostis uda</i>	A grass of alpine seeps and wetland margins
		<i>Lagenifera barkeri</i>	A herb daisy of flushes and seeps
		<i>Luzula leptophylla</i>	A rush of alpine wetlands throughout
		<i>Ourisia spathulata</i>	A herb associated with high altitude rock outcrops.
		<i>Pachycladon wallii</i>	A herb associated with high altitude rock outcrops, locally throughout.
		<i>Poa incrassata</i>	A grass of high altitude ridge crest sites
		<i>Ranunculus maculatus</i>	A buttercup in cushion bogs in the Von Valley and in high altitude wetlands.
		<i>Ranunculus scirithalis</i>	A buttercup of alpine scree
Data Deficient		<i>Brachyscome longiscapa</i>	A daisy herb of boulderfields in McKinlays Creek
		<i>Coprosma brunnea</i>	A sprawling shrub of a rock outcrop on the Von Valley hillslopes
		<i>Ranunculus simulans</i>	A buttercup of alpine wetlands in the Lochy River headwaters

In addition, seven species that are uncommon in Otago (Regionally Significant) were found. A list of these species is provided below in Table seven.

Table seven: Regionally significant plants found on Walter Peak Special Lease

Status	Species	Location on property
Regionally significant	<i>Brachyglottis cassinioides</i>	Around Lakes Ned & Nigel; Cascade Creek; Killiecrankie Creek
	<i>Brachyglottis southlandica</i>	Cascade Creek
	<i>Dracophyllum politum</i>	McKinlays Creek

	<i>Halocarpus bidwillii</i>	Von Valley wetlands
	<i>Lagenophora pinnatifida</i>	Afton Burn East Branch
	<i>Machaerina anthropylla</i>	Von Valley wetlands
	<i>Phyllocladus alpinus</i>	Upper Lochy Valley; Cascade Creek

Rare Ecosystems

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

On Walter Peak Special Lease five rare ecosystems were identified, all in the wetland category (cushionbog, snowbanks, ephemeral wetland, tarns, and seepages and flushes).

2.5.5 Problem plants

At least 58 exotic species of plants are present on the lease but relatively few are of significant conservation concern. Many are plants of agricultural importance or are common pastoral weeds. Most are present only at the lower elevations of the lease. Plants of conservation concern are:

Grey willow: Scattered plants are found in the Von Valley and upper Lochy (up to 1200 m). Plants are clearly spreading by seed and increasing in abundance. Its ability to invade wetlands and wet tussockland is of major conservation concern.

Broom: Common along the lake faces and occasional plants found in the Station Burn and Killiecrankie Creek. Its ability to increase and spread through tussockland is of major conservation concern. Isolated occurrences should be a priority for control.

Gorse and Himalyan honeysuckle: mostly confined to the lake faces but Himalayan honeysuckle is also becoming prevalent in the Afton Burn West Branch.

Hawthorn, elderberry and gooseberry: Occasional plants are found within shrublands.

Briar: Scattered throughout lower Lochy valley and lake faces.

Douglas fir: There has been some spread of Douglas fir (*Pseudotsuga menziesii*) in the Beach Bay area.

2.6 FAUNA

2.6.1 Invertebrates

Introduction

The region has occasionally been visited by entomologists e.g. Pascoe (Philpott 1917), Patrick & Barratt (Mark *et al.* 1989), E. Edwards and B. Patrick (Unpublished 1999). Adjacent Pastoral Leases to the south, including Halfway Bay, have briefly been surveyed as part of the tenure review process (Edwards, 1999).

Methods

The Special Lease was inspected during 16 – 19th February 2004. The weather varied from mild temperatures and occasionally overcast, to widespread rain. Invertebrates were collected by hand or with ultraviolet light at night.

Invertebrate Fauna Description

A total of 134 species of invertebrates was recorded including 92 moths. These species characterise a broad range of habitats, and some are nationally significant.

The property has been divided into three broad faunal land units and four sub-units, and the invertebrate fauna described accordingly. These units are:

Wetland-grassland habitats of fans and flats in Von River catchment

Lake Wakatipu faces

(i) *Rolling downland*

(ii) *North facing mid altitude lake faces*

Eyre Mountains

(i) *Valleys and gorges to 1100m asl.*

(ii) *Summit and basin areas over 1100m asl.*

Wetland-grassland habitats of fans and flats in Von River catchment

This faunal land unit includes the many terraces, fans and scarps of infilled glacial sediments associated with Bush Creek-White Burn-Station Burn (>550 ha) and Black Spur Creek (>50 ha). Natural non-forest communities are extensively represented. A number of notable invertebrate species were found on the cushionfield, grassland and herffield vegetation here. The vivid orange and black moth *Notoreas* n.sp. 'Waiiau' has larvae on native daphne *Pimelea olychrom*. Elsewhere this day active moth is known only from the Waiiau Catchment, the Borland and at the Wilderness Reserve in Southland. The lowland black cicada *Maoricicada campbelli* and grasshopper *Phaulacridium marginale* were found in drier parts of this area. Elsewhere, these two insects form isolated populations in inland valleys from Canterbury to Southland and *P. marginale* is also common in coastal areas.

A new species of *Arctesthes* moth (dark with vivid orange hind wings) was discovered on cushionfields near White Burn Hut. This is the third known species for this genus. *Arctesthes* n.sp inhabits low vegetation in open fenland/cushionfield wetland. Its recent discovery indicates a very limited distribution.

The moth *Asaphodes oraria* recorded here has a disjunct distribution between coastal Southland (near Invercargill) and uplands in northern Southland-Otago. The female is flightless indicating limited dispersal ability. The black and pink moth *Meterana meyricki* is mostly known from uplands where larvae eat *Pimelea poppelwellii* or *P. traversii*. At this site it is most likely associated with *P. prostrata*.

Seepage flows, seasonal and permanent wetlands containing fertile and infertile areas are present. Short tussock, tall tussock and herbfield associations are present. This land unit is likely to be species rich for insects, some of which are not found elsewhere on the Lease.

Lake Wakatipu faces

(i) Rolling downlands

Rolling downlands occur along the Lake Wakatipu shore. The moth *Tmetolophota semivittata* was recorded at Georges Creek, and will also be found inhabiting a wetland dominated by *Carex* sedges located at the toe of Afton Peak at 440 m (GR E42 540544; 5 ha). *Carex* sedges generally have a rich fauna of insects consuming leaves, litter and seeds. This habitat is likely to support a range of other insects representative of moderately fertile wetlands throughout the South Island.

Mixed shrubland and remnants of beech forest occupy gorge refuges within the lower Afton Burn (East and West Branches), Georges Creek, Mick O'Day, and McKinlays Creek. These carry a rich representative fauna. Of the moths recorded, the majority were feeding on shrubs and understorey herbs. However, forest mosses and lichens, leaf litter (suspended and fallen), ferns and vines are also important food sources (see Appendix 5). Caterpillars of the moths *Eudonia cymatias* and *Gadira acerella* were feeding on rockface mosses at lower altitudes here.

Fragmented *Coprosma*-dominated shrubland, bracken, and scattered kowhai are present at the mouth of the Afton Burn and at the lake margin below Walter Peak. These are habitats for representative insects such as three species of moth in the genus *Austrocidaria* that feed on *Coprosma* spp., kowhai moth *Uresiphita maoralis* and the wood boring stag beetle *Ceratognathus ?foveolatus*.

Open areas of flood-disturbed river bed and thinly vegetated lake shore are habitats for day active basking insects such as the moth *Helastia corcularia* (larvae on rock mosses), grasshopper *Phaulacridium marginale* and native

bee species. Areas of tall grass, mixed shrublands, and trees adjacent to Lake Wakatipu seasonally olyph large swarms of aquatic insect adults that emerge from the lake. These sites are significant in terms of the exchange of insect biomass (e.g. caddis, non-biting midges) between adjacent wet and dry environments and for their importance to food webs.

(ii) North facing mid altitude lake faces

The mid altitude lake faces support disturbed regenerating bracken, shrubland and grassland habitats. These habitats have some intrinsic value for invertebrate fauna and are widely represented in the Mavora Ecological Region where natural and human-induced burning occurs. Areas within this land unit, where exotic herbs and grasses dominate at higher altitude, are less important.

Rocky bluffs, some of which are at lower altitudes in the more modified grazing lands, are also natural refuge for invertebrates on lichens, mosses, grasses and herbs.

Eyre Mountains

(i) Valleys and gorges to 1100m asl.

This land unit includes the valleys enclosed by steep alpine lands of the Afton Burn (including the East Branch), Georges Creek, Mick O'Day, McKinlays Creek, Cascade Creek, Killiecrankie Creek, mid Black Spur Creek, mid Bush Creek, mid White Burn, Station Burn faces and Lochy River headwaters. Invertebrate communities reflect the complex patterns of seral regenerating vegetation. Valleys are flanked by a mosaic of regenerating shrubland, fern/brackenland, dense lianes, tussock-pasture, exposed talus, and beech forest. Small streams are mostly steep and confined to gorges.

Invertebrate habitats are discussed in terms of three broad groups: aquatic, forest and shrubland, and grassland.

Aquatic habitats

The aquatic invertebrate fauna inhabiting these waterways is typical of swift streams with natural character throughout the South Island. These include predatory caddis species *Costachorema psaropteron*, *Hydrobiosis silvicol*, and *Plectronemia maclachlani*. A small purse cased caddis *Paroxyethira tillyardi* was recorded at the southern boundary of its distribution in side creeks of the Afton Burn East Branch. Caddis *Psilochorema embersoni* was recorded at its eastern limit at Georges Creek and is likely to occur in neighbouring streams as well.

Numerous slope flushes, seepages, and small areas of sedgeland are scattered but integral parts of all of the valleys in this sub-unit, and are likely to increase the diversity of aquatic and wetland invertebrates present. Of note are the habitats of Lakes Ned and Nigel and adjacent wetland (~870 m asl.). While not surveyed for invertebrates and aquatic plants (during the tenure review inspection nor previously by Mark *et al.* 1989), invertebrate

assemblages of high natural character are expected. The lakes are likely to feature organisms specific to stable, deep lake and tarn waters. The wetlands are likely to support insect assemblages intermediate in composition between alpine areas and wetlands below 500 m asl at Lake Wakatipu.

Forest and shrubland

Beech leaf roller moths *Apoctena pictoriana* and *Proteodes carnifex* and the bark bug *Ctenoneurus hochstetteri* are abundant in areas of mixed beech forest located in many of the valleys.

Forests extend to relatively low altitudes along McKinlays Creek and Lochy River, providing significant habitat for aquatic invertebrate fauna. The tall trees shade the water, provide places for aquatic insects to mate and disperse, and contribute litter, logs, and terrestrial insects to the stream ecosystem. This functioning has been truncated in many parts of the region, particularly for larger rivers.

Diverse regenerating native shrub and tree communities present at forest margins and in valleys support a range of insects. Tangles of *Muehlenbeckia complexa* and *M. australis* vines are host to many litter- and foliage-feeding insects including moths *Meterana coelena* and *Pasiphila mucosata*, boulder butterflies *Boldenaria* n.sp. and copper butterfly *Antipidolycaena* n.sp. In addition, the longhorn beetle *Mesolamia ?marmorata* is associated with *Hebe pauciramosa* shrubs in wetlands, and the pintail beetle *Mordela* species occurs on the galls or flowers of mountain ribbonwood (*Hoheria lyallii*).

Grassland

Some habitats of note are open rubbly fans, short tussock, and copper tussock near Nicholas Saddle, open valley floors in McKinlays Creek and extensive flats in the Lochy River Valley. A typical range of native grassland insects are present, most of which occur in west Otago and elsewhere in the South Island.

Eleven grassland moths are recorded. A few moths are recorded from herbs in grassland and a few from rock moss and lichens. Representative insects include the tiger beetle *Neocicindella parryi* from exposed loess banks; day active moth *Asaphodes clarata*, which are common and widespread with larvae on buttercups in tall tussock; yellow and amber orbweb spider *Colaranea verutum*, cicada *Kikihia* sp. Aff. *Rosea* and grasshopper *Phaulacridium marginale*, all inhabiting mixed grassland.

(ii) Summit and basin areas above 1100 m

More than half of the Lease lies between 1100 – 1852 m asl. The diversity and character of invertebrate associations described by Mark *et al.* (1989) for the central Eyre Mountains (including Eyre Peak) applies to the many summits and basins on the Lease. Insect records from the tenure review inspection confirm the significant natural character and range of habitats in the alpine zone.

Five insects of note were recorded. The alpine flightless shield bug *Hipsithocus hudsonae* inhabits areas of sparse vegetation, while the rarely recorded day active moth *Eudonia legnota* was found in the head of Killiecrankie Creek. A black mountain ringlet butterfly *Percnodaimon* n.sp. 'Waiiau' was recorded from the western tops on the Lease where its larvae eat short tussock *Poa* species and inhabit sparsely vegetated rock talus in alpine areas. The alpine grasshopper *Sigaus* n.sp. inhabits alpine turf and cushion vegetation. The alpine seepage caddis *Tiphobiosis Montana* was occasionally recorded in alpine flush and seepages of McKinlays Creek.

Mark *et al.* (1989) record many more caddis, grasshoppers, weta, weevils, cicada and moth inhabitants of natural alpine areas.

Significance of Invertebrate Fauna

Habitats

Areas that are naturally non-forested are of national significance for invertebrates. These include upland and alpine habitats, and the wetland-grassland of terrace and fans in the Von catchment (>600ha; 700-800m asl.). All these sites retain communities that have high natural character, species rich assemblages (see Mark *et al.* 1989), and some insects of limited distribution. The nationally rare wetland-grassland communities of the Von Catchment are regionally poorly protected.

Nationally significant valley floor communities, which are frequently continuous with upland habitats, include areas in East and West Branches Afton Burn, McKinlays Creek (as far as Walter Peak Creek confluence), Cascade Creek, Killiecrankie Creek, the Lochy River headwaters, and the mid Black Spur and White Burn Creeks (except for grassy sunny slopes to mid altitude in both catchments) and around Lakes Ned and Nigel. Regionally significant valley floor communities are present in Georges and Mick O'Day Creeks.

Highly representative of the Eyre Ecological District are fauna associated with beech forest and mixed shrubland in Station Burn, White Burn, Bush Creek, East Branch Afton Burn (extending discontinuously to its confluence with Lake Wakatipu), Georges Creek, Mick O'Day, McKinlays Creek, Killiecrankie Creek, Cascade Creek and Lochy River. The fauna associated with many valley floor shrublands and grasslands particularly in gorge, rock bluff, wetland, cold air drainage and rock talus areas appears representative and natural for the Eyre Ecological District. Many faunal inhabitants of these sites are now also colonists in areas of mixed pasture, short tussock, regenerating shrubland and treeland. This has been at the expense of native shrub and forest habitats. However, seral regenerating communities almost completely dominated by an indigenous fauna retain high intrinsic value for invertebrates as well as long-term potential value.

The mid altitude lake faces support disturbed and seral vegetation (i.e. bracken, shrubland and grassland). These habitats have some intrinsic value for invertebrate fauna and are widely represented in the Mavora Ecological

Region where natural and human induced burning occurs. Areas where exotic herbs and grasses dominate at higher altitude within this land unit are less important.

Rocky bluffs, some of which are at lower altitudes in the more modified grazing lands, are also natural refuge for invertebrates on lichens, mosses, grasses and herbs.

Moth fauna (Lepidoptera) associations in a regional context are in common with the flora. Alpine insects are typical of surrounding mountains. Many insects are found in both the mountains of west Otago and Central Otago. Some insects occur in western Southland and east Fiordland. Other than moths, only a few insects are known solely from northern Eyre Mountains and nearby mountains. This is indicative of some endemism.

Overall, it is probably that the Lease has high faunal species richness in the region due to its geography and 'crossroads' biogeography (see Mark *et al.* 1989).

Species of Conservation Interest

A summary of the threatened invertebrate species on the property is presented in Table eight.

Table eight: Invertebrate species that are listed on the Threat Classification Database (Stringer, 2012).

Threat of extinction classification (Stringer, 2012)	Invertebrate Species	Location/ comments
At Risk; Naturally Uncommon	<i>Hypsithocus hudsonae</i>	Alpine flightless shield bug. Inhabits upland areas of sparse vegetation. Isolated populations in the Eyre Mountains. Also recorded on range tops of northern Southland, Central, and West Otago.

Other insect records of note are listed below:

Day active moth *Eudonia legnota*. Recorded in Killiecrankie Creek, this is a local and uncommon moth better known in Canterbury basin areas. It is associated here with Lake Wakatipu, its Type Locality (Meyrick 1885).

Black mountain ringlet butterfly *Percnodaimon* n.sp. 'Waiiau' is recorded from the western tops. The butterfly ranges from east Fiordland to Eyre Mountains and other mountains of the Waiiau River catchment. Larvae eat short tussock *Poa* species and inhabit sparsely vegetated rock talus in alpine areas.

Caddis *Tiphobiosis olychr.* Occurs locally in seepage and wet flush. McKinlays Creek is presently the southernmost record, having a distribution scattered in the mountains as far north as Nelson.

Purse cased caddis *Paroxyethira tillyardi* is recorded at the southern boundary of its distribution in side creeks of the Afton Burn East Branch.

Caddis *Psilochorema embersoni* is recorded at its eastern limit at Georges Creek. It is likely to occur in neighbouring streams as well.

Alpine grasshopper *Sigaus* n.sp. 'Queenstown' inhabits alpine turf and cushion vegetation. It is of limited distribution, presently known from mountains surrounding Queenstown and from northern Eyre Mountains. It has no conservation status but is likely to rank as Range Restricted (Molloy *et al.* 2002) similar to a related grasshopper *Sigaus* n.sp. 'Remarkables'.

Day active moth *Arctesthes* n sp. (dark with vivid orange hind wings) was discovered on cushionfields near White Burn Hut. This is a new species of moth, the third known species for this genus. The other two species include *Arctesthes siris* inhabiting snowbank and open alpine communities of Otago Mountains and *A. catapyrrha* inhabiting vegetation mats in isolated areas from Southland coast to inland Canterbury. *Arctesthes* n.sp. similarly inhabits low vegetation but in open fenland/cushion wetland. Its recent discovery indicates a very limited distribution. It has no conservation status but is likely to rank as Range Restricted (Molloy *et al.* 2002).

While not found during the tenure review inspection, two invertebrate species are likely to occur on their host plant, a threatened cress *Pachycladon wallii* which inhabits upland rock bluffs on the property: alpine cress moth *Asaphodes frivola* has a conservation status ranking of Nationally Endangered, and rock cress leaf mining fly *Liriomyza* sp. (Agromyzidae).

2.6.2 Lizards

“Site locations of rare and endangered herpetofauna are recorded in the original report. Herpetofauna of this nature is at risk of illegal activities including damage and removal through unlawful interference and disturbance. Accordingly, information regarding the locations of any such herpetofauna has been deleted from this version of the report. The Department of Conservation has put in place mechanisms to ensure that such information can be released for genuine scientific and research purposes. Please contact the Department of Conservation directly to determine whether the information can be released.”

Introduction

The Eyre Ecological District is known for significant endemism (Mark et al. 1989). Significant effort has therefore been made to gain an adequate assessment of herpetological values.

Mark et al. (1989) recorded a diverse reptile fauna in the central part of Eyre Ecological District (ED), noting the Gorge Burn area as a significant mainland site for lizards in terms of species richness and altitudinal records. Subsequent assessments confirmed the richness of the lizard fauna of Eyre Ecological District. On Mataura Valley Station, McCann’s skink, common skink clade 5, cryptic skink, green skink, large Otago gecko and Southern mini gecko were observed in exceptional abundance in ‘relatively intact’ environments between 500 and 1446 m a.s.l. (McFarlane & Jewell 1999a). All of these species except common skink clade 5 were also found on nearby Greenvale Station (McFarlane & Jewell 1999b).

A recent revision of the cryptic skink species complex has revealed the presence of one additional species, Eyres skink, which appears to be confined to the Eyre and Hector Mountains (Chapple et al. 2011). This species was assigned a conservation status of Nationally Vulnerable in the most recent assessment of the conservation status of New Zealand reptiles by Hitchmough et al. (2013; all subsequent rankings are from this revision).

In addition, a possible Otago skink (*Oligosoma otagense*: Nationally Endangered) sighting is known from the Cascade Creek hut. The identity of “large black skinks” reported from Jane Peak on adjoining Mt Nicholas Station (Ros Cole, DOC Invercargill, pers. comm.) has not been determined. Both records could represent sightings of barrier skink (*O. judgei*: Nationally Endangered): a species discovered in 2005 with a poorly-understood distribution that ranges from the Darran Mountains in Fiordland to the Takitimu Mountains in Southland (Patterson & Bell 2008; DOC Herpetofauna Database). Other notable species known from the vicinity are jewelled gecko (*Naultinus gemmeus*: Declining) (1970s record from Glenorchy area) and Roys Peak gecko (*Mokopirirakau* “Roys Peak”: Nationally Vulnerable) (known from several sites in the Queenstown area; DOC Herpetofauna Database).

Methods

A survey for lizard fauna was conducted on February 16-19th and March 3-4th 2004. The weather varied from sunny to mild temperatures and occasionally overcast, to widespread rain.

Several techniques were used to assess the herpetological values of the property. Visual searching involved moving quietly through likely habitat looking for active diurnal species at an appropriate time of day and in suitable weather. Inactive lizards were sought by checking refuges such as under rocks or wood, beneath loose bark and within dense vegetation. These searches not only involved looking for lizards, but also for signs of their existence (e.g. faeces and sloughed skins). For nocturnal geckos, spotlighting with a powerful torch was used to detect eye-shine. This method is particularly effective in structurally-complex environments.

Weather conditions play an influential factor in surveying for reptiles. During the February survey, the weather was very unsettled, with only intermittent periods suitable for lizard activity. The weather during the March survey was warm and sunny, providing optimal conditions for reptile surveying. Large areas of the property were not surveyed, so judgments of herpetological values of the Lease can only be limited to the areas surveyed.

Lizard Fauna Description

Six species of lizard were recorded from the sites inspected, see table nine. The two morphs of 'cryptic skink' found during the 2004 survey are now known to represent two species: cryptic skink (Declining) and Eyres skink (Nationally Vulnerable) (Chapple et al. 2011).

Some uncertainty remains over the exact identity of 'green skinks' found in tributaries of Killiecrankie and Black Spur Creeks. The five specimens captured on the Lease were consistently brown to olive-brown in dorsal colouration. These animals are most likely to be the *Oligosoma* "West Otago" taxon (a specimen collected from Gorge Burn was this taxon; Greaves et al. 2007). However, genetic analysis would be required to confirm their identity. Green skinks recorded from Mataura Valley Station and Greenvale Station were described as being consistently grassy-green in dorsal coloration (McFarlane & Jewell 1999a & b).

Table nine: Lizard species found on Walter Peak Special Lease and their conservation status (nomenclature and threat rankings follow Hitchmough et al. 2012).

Species	Threat status	Distribution on pastoral lease
Eyres skink (<i>Oligosoma repens</i>)	Nationally Vulnerable	Sub-alpine scree above Cascade and Forks Hut Creeks.
Cryptic skink (<i>Oligosoma inconspicuum</i>)	Declining	Widespread and abundant in all undeveloped sub-alpine habitats.

Common skink clade 5 (<i>Oligosoma</i> aff. <i>polychroma</i> Clade 5)	Declining	Various habitats, especially grasslands.
Large Otago gecko (<i>Woodworthia</i> "Otago large")	Declining	Scree, tussockland and shrublands. Widespread and abundant in all undeveloped sub-alpine habitats.
McCann's skink (<i>Oligosoma maccanni</i>)	Not Threatened	Scree and tussock grassland.
Southern mini gecko (<i>Woodworthia</i> "Southern mini")	Not Threatened	Scree, tussockland and shrublands. Widespread and abundant in all undeveloped sub-alpine habitats.

Significance of the herpetofauna

Walter Peak Special Lease contains a rich and abundant lizard fauna comprising six species. Of these species, one is Threatened (Eyres skink; Nationally Vulnerable) and three (cryptic skink, large Otago gecko and common skink clade 5) are considered At Risk (Declining).

The lizard fauna observed on the Lease represent high herpetological diversity. Some locations (e.g. scree above White Burn hut and Black Spur Creek tributary) contained the six species in sympatry. Such diversity is most probably an excellent indicator of ecosystem function where numerous narrow niches can be occupied by highly-specialized lizard species.

Lizard species diversity was predictably greatest above 700 m a.s.l., as below this altitude pasture development has, in places, reduced the native floral diversity and structural complexity of habitat. Sites of greatest lizard diversity or abundance are not necessarily optimal habitat. For example, the association of lizards to scree may indicate such habitat provides optimal resources to these species or it may mean such environments are the only habitat sufficiently complex to allow lizards to escape from introduced predators.

Eyre Ecological District contains a regionally-unique diversity of reptiles (Mark et al. 1989; Jewell & MacFarlane, 1999a & b), indicative of functional remnants of the pre-European ecology of the area. The potential endemism of two species (Eyres skink and Southern mini gecko) to the Eyre Ecological District highlights the need to safeguard the ecological integrity of those areas that possess high biodiversity values for indigenous herpetofauna.

2.6.3 Birds

Birds seen or heard during the tenure review inspection of the Lease are listed in Table ten below.

Table ten: Birds recorded during survey of the Lease

Common Name	Scientific Name	Location
Native Birds		
Kea: (Nationally Endangered)	<i>Nestor notabilis</i>	Three keas seen on summit of Killiecrankie Creek Upper Stony Creek.
New Zealand Falcon (At Risk: Recovering)	<i>Falco novaeseelandiae</i>	Sighted in mid-lower reaches of Afton Burn. Cascade Creek.
New Zealand pipit: (At Risk; Declining)	<i>Anthus novaeseelandiae</i>	Afton East branch saddle
Bellbird	<i>Anthornis melanura</i>	McKinlays Creek forest.
New Zealand fantail	<i>Rhipidura fuliginosa</i>	Cascade Hut.
Grey warbler	<i>Gerygone igata</i>	Killiecrankie Creek; McKinlays Creek forest.
Paradise shelduck	<i>Tadorna variegata</i>	Seen near East Branch Afton Burn gorge.
South Island Rifleman:	<i>Acanthisitta chloris</i>	Cascade Hut
Tomtit	<i>Petroica macrocephala</i>	McKinlays Creek forest.
Southern black-backed gull	<i>Larus dominicanus</i>	Basin above Forks Hut.
Swamp Harrier	<i>Circus approximans</i>	Developed lakeside paddocks
Spur-winged plover	<i>Vanellus miles</i>	Developed lakeside paddocks
Introduced Birds		
Yellowhammer	<i>Emberiza citrinella</i>	Killiecrankie Creek.
Blackbird	<i>Turdus merula</i>	Killiecrankie Creek.
Chaffinch	<i>Fringilla coelebs</i>	Cascade Hut.
Common Redpoll	<i>Carduelis flammea</i>	Developed lakeside paddocks

Significance of Birds

Three bird species recorded on the Lease are listed as being under threat (Robertson; 2012): They are; kea, New Zealand Falcon and New Zealand pipit.

The mountainous country in this area provides feeding and breeding habitat for the above three species.

2.6.4 Aquatic Fauna

Introduction

Two freshwater fish records for Walter Peak Special Lease were found on the New Zealand Freshwater Fish Database (NZFFD) prior to the 2004 survey. A single record of southern flathead galaxias, (*Galaxias* "southern"), At Risk – *Declining* (Goodman et al. 2014), occurs in Bush Creek, a tributary of the Von River South Branch. Brown trout (*Salmo trutta*) have been recorded in Lakes Ned and Nigel, in the upper Lochy River.

Methods

The streams within Walter Peak Special Lease contribute to the Clutha River system and flow into Lake Wakatipu, whether directly or via the Von or Lochy Rivers. These streams were sampled during 16-18th February 2004. Each site was sampled using a backpack electric fishing machine (Kainga EFM300, NIWA Instrument Systems). Where possible, each tributary was sampled at a lower, middle and upper location to cover a range of habitats and altitude. To effectively sample most waterways within the pastoral lease a helicopter was used to gain access to most of the surveyed sites.

Sites surveyed contained both riffle/run and pool habitat. All sites were sampled at a minimum of 50m in length or 100 m² (Department of Conservation 2007). Stream width, depth, water temperature, and conductivity were recorded. Substrate and riparian composition were visually estimated according to the NZFFD form format. Site locations were recorded using a Global Positioning System receiver (Garmin Corp).

In-stream invertebrates observed during electric fishing surveys were identified and given a Macro-invertebrate Community Index (MCI) score (Stark 1993) as an indicator of water quality in stony streams.

Aquatic Fauna Description

A total of 20 sites were surveyed. A number of sites were dry despite the topographical map indicating that water should be present. These catchments were steep and appeared to only contain flowing water during periods of heavy rain or snow melt. Fish were recorded at 6 (30%) of sites surveyed. Two native fish species - koaro (*Galaxias brevipinnis*) and southern flathead galaxias, and two introduced sports fish species - brown trout and rainbow

trout (*Oncorhynchus mykiss*) were found. The southern flathead galaxias was observed at (NZG: E2144352 / N5543477; Map 4.2.3) in the lower White Burn and the lower reach of Black Spur Creek (NZG: E2143000 / N5539100; Map 4.2.3), both tributaries of the Von River South Branch. Koaro was recorded from two sites in McKinlays Creek, a tributary of Lake Wakatipu. Brown trout were present in the lower reach of Black Spur Creek, McKinlays Creek, the upper reaches of the Lochy River and Cascade Creek.

Eight macro-invertebrate taxa were observed within streams during the survey. Most had a high MCI values suggesting water quality was very good throughout waterways within the pastoral lease.

Significance of Aquatic Fauna

Southern Flathead Galaxias

The southern flathead galaxias has been classified by Goodman et al. (2014) as At Risk – *Declining* using threat classification criteria (Townsend et al. 2008). The southern flathead galaxias is endemic to South Island and occurs throughout the major river systems of the Southland plains and Stewart Island (McDowall 2010). The White Burn, Bush and Black Spur Creeks population is significant in that it lies completely outside geographical range for this species and the only known populations that occur in the Clutha River system (Burrige et al. 2006, McDowall 2010). The southern flathead galaxias is one of 10 morphological and molecular lineages that are commonly referred to as the *G. vulgaris* species complex (Allibone et al. 1996, Waters and Wallis 2001). Introduced sports fish, particularly brown trout, are responsible for the decline of many endemic freshwater fish species (McIntosh et al. 2010), causing population fragmentation (Townsend and Crowl 1991) and in many cases localised extinction (McDowall 2006). Brown trout are the most widespread introduced fish species in New Zealand (NZFFD data) and has been nominated as among the top 100 invasive species globally by International Union for Conservation of Nature (IUCN). The White Burn and Bush Creek are currently free of introduced sports fish and therefore the continued absence of brown trout, as well as rainbow trout, from this catchment is highly desirable.

Koaro

Koaro are ranked under the threat classification criteria (Townsend et al. 2008) as At Risk - *Declining* (Goodman et al. 2014). The decline in the national koaro population has been attributed to deforestation and the negative interaction with introduced salmonids (McDowall 2006 and references there in). Koaro readily develop lake locked populations, completing their life cycle entirely within freshwater environment (McDowall 1970). With the formation of Lake Wakatipu after the Pleistocene glaciation (Turnbull 2000), this has allowed koaro to colonise and then recruit directly from the lake upstream into waterways. Koaro have the ability to scale substantial water obstacles (McDowall 1990) therefore allowing them to migrate substantial distances inland to colonise unoccupied habitat.

Koaro were observed in McKinlays Creek which flows directly into Lake Wakatipu. The distribution of koaro in Lake Wakatipu tributaries is mostly likely post-glacial colonisation (Main 1989). Koaro are part of a group of large bodied migratory galaxias species (Department of Conservation 2004) that have a strong habitat association with forested streams (McDowall 1980, McDowall et al. 1996, McCullough 1998, Bonnett and Sykes 2002). There is an almost total absence of forested riparian vegetation in these water ways at higher altitudes. Although koaro are known to occupy fast flowing, tumbling streams (Main 1989, McDowall 2000) the highly unstable bed load of mobile gravels caused by natural erosion may create unfavourable conditions for occupancy at higher altitudes. The low number of koaro observed in the Walter Peak Special Lease may also be recruitment limited due to salmonid predation. The absence of koaro from the smaller tributaries may also be associated with physical barriers to migration. Due to the existence of large cascades created by glaciation, i.e. hanging valleys, ephemeral waterways, migration conditions for juvenile koaro may be restricted to infrequent flow conditions or totally non-existent.

Alpine galaxias (Southland)

Although not observed during survey work, alpine galaxias (Southland) are present in the Lochy River (Burridge et al. 2008, McDowall 2010). Survey work undertaken by Otago Fish and Game and Clutha Fisheries Trust in 2005 (Rasmus Gabrielsson pers. comm.) observed many alpine galaxias in the vicinity of Killiecrankie Creek and Lochy River confluence. Alpine galaxias (Southland) are ranked as Threatened – *Nationally Vulnerable* (Goodman et al. 2014) under the criteria of Townsend et al. (2008). The Lochy River population is the only representative of alpine galaxias (Southland) in the Clutha River system (McDowall 2010). Another population of alpine galaxias is present in the Clutha River system, alpine galaxias (Manuherikia River) (*Galaxias* aff. *paucispondylus* “Manuherikia”), situated in the upper Manuherikia River, and considered a distinct lineage from its conspecifics (Allibone et al. 2009). The Lochy River population is a significant biogeological outlier and represents a historical river connection with the Maitai River (Craw and Norris 2003).

It is highly likely that alpine galaxias (Southland) are present in the lower reaches of the Killiecrankie and Wither Creeks on Walter Peak Special Lease. Cascade Creek may also potentially contain alpine galaxias (Southland). Alpine galaxias are also susceptible to predation and range restriction by introduced sports fish (Jellyman and McIntosh 2008).

Table eleven: Summary of Threatened and At Risk freshwater fish species and their habitats on Walter Peak Special Lease

Conservation Status	Threat Category	Species	Location on property
Threatened	Nationally Vulnerable	Alpine galaxias (Southland) <i>Galaxias</i> aff.	Lochy River and tributaries

		<i>paucispondylus</i> "Southland"	
At Risk	Declining	Southern flathead galaxias, <i>Galaxias</i> "southern"	White Burn, Bush Creek, Black Spur Creek
	Declining	Koaro, <i>Galaxias brevipinnis</i>	McKinlays Creek

Sports Fish Species

Brown trout (*Salmo trutta*)

The brown trout was first introduced into New Zealand 1867 and several times since. It is found throughout New Zealand and forms an important recreation fishery. The Lochy River catchment provides a significant remote headwater brown trout fishery.

The Von River part of the property provides the setting and access to a significant trout fishery in the region.

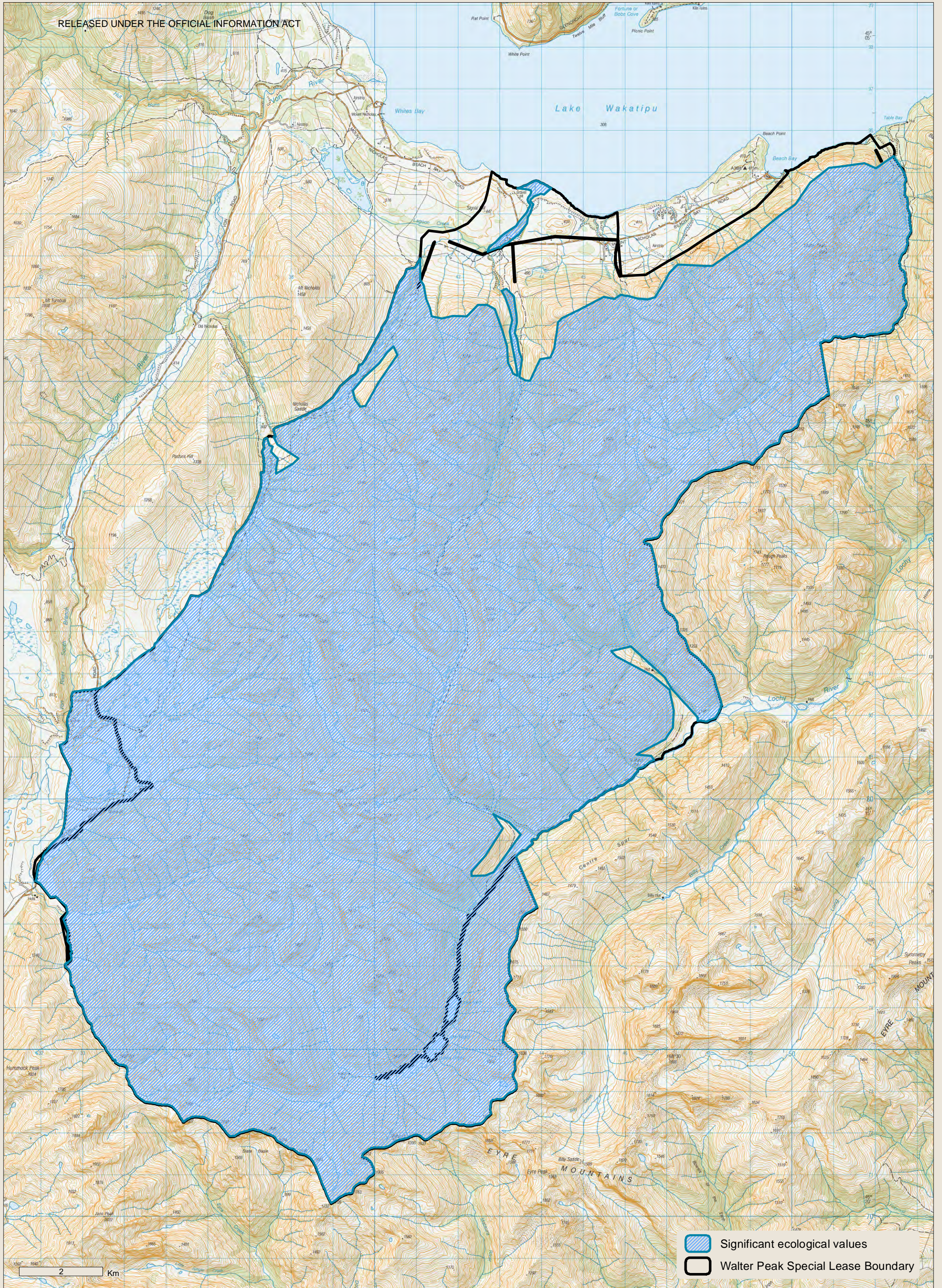
Rainbow trout (*Oncorhynchus mykiss*)



The rainbow trout was introduced in New Zealand in 1886. Its distribution throughout New Zealand is patchy in comparison to the brown trout. It is common throughout the upper Clutha catchment and forms part of an important trout fishery.

2.6.5 Problem Animals

Hare are widespread throughout the property. Goats are present in low numbers due to ongoing goat control operations that have been carried out.

Red deer and fallow deer are present. Possums, rats, mice, hedgehog, ferret, stoats, weasels, rabbits, and feral cat will also likely to be present. These species will have an effect on the natural ecology of the area effecting invertebrate and avian species.



 Significant ecological values
 Walter Peak Special Lease Boundary

2 Km

NZGD 2000 New Zealand Transverse Mercator
 Not for publication nor navigation
 Crown Copyright Reserved,
 © Geographx
 © CNES 2004-2010 Spot Image
 Scale at A4 = 1:80,000
 Produced by: adeschutter
 Date Produced: 6/05/2015
 DOC, Geospatial Services



Walter Peak Ecological Values

File path: \\hccosvr1\gis\GIS\Tenure_Review\Pastoral_Lease\WalterPeak\Walter_Peak_ecological.mxd



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 Te Papa Atawhai

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2.7 Historic

Provided is an updated overview of historic resources located on Walter Peak Special lease. This overview was carried out as a desk top exercise. The greater Walter Peak area has significance because of the associations with iwi, European people including the Mackenzie family and the World War 1 effort. The significance of specific on site historic resources, e.g. huts has not been able to be ascertained because no on site inspection has been carried out. Any areas proposed for freeholding will require an assessment of historic values and possibly an on site inspection depending on the historic resource/s within the area proposed for freeholding.

2.7.1 Maori Cultural Values

There is a Statutory Acknowledgement Area (Schedule 75, Allocation Plan MD 39: SO 24720) held over Lake Wakatipu (Whak tipu-wai-M ori) for its spiritual, historic and traditional associations of Ngai Tahu (and others) with the lake (KTKO 2005: 189). Atholl Anderson (1998: 43) notes Walter Peak was named Tapuaeenuku. Haki-Te-Kura, daughter of Tuwiroa, made a celebrated swim across Lake Wakatipu-wai-maori (Lake Wakatipu) from Kawarau Peninsula to the foot of Tapuaeenuku (Beattie 2002: 80).

Te Huruhuru drew a map showing the location of Lake Wakatipu for Sub-protector of aborigines (M ori) Edward Shortland in 1844 (Shortland 1974: facing page 205). Early M ori knew of the existence of inland lakes and held knowledge of the trails to reach their shores.

Florence Mackenzie (1948: 16 – 18, 135) notes favourite camping places for early M ori were the lower slopes of Walter Peak and the sunny beach at its base. One very large oven, 14ft diameter and 5 ft deep, was preserved at Davis paddock on the banks of the Afton Burn, seven miles inland from the lake. This oven has not been re-located. Hugh Mackenzie notes ovens were found in many places, but they were fairly deep hollows with a small number of stones in the middle (these may have been umu). These features were located about the Afton and Davis' Paddock areas (Mackenzie and Baker 1992: 11).

Members of the Mackenzie family found a number of moa bones in caves and on ledges under overhanging rocks (Mackenzie 1948: 135). On their property near the Afton Burn the Mackenzie's found little mounds of white pebbles that were moa gizzard stones. These were interpreted as natural death locations. These fields are now rich pastures. A broken moa's egg and other bones were found in a partly collapsed cave. Alexander Mackenzie found a large number of Moa bones an hour walk up the Afton from the hut, where two creeks branch (Mackenzie and Baker 1992: 11).

In 1936, a pounamu adze (toki) was found on the Walter Peak estate some miles inland from the lake when ploughing virgin land. The ploughman turned up the adze at the first push of the plough but the location is not noted. Hugh Mackenzie notes tools from a camp oven, pieces of greenstone and a moa's

egg were brought up during ploughing on the cleared flat areas. Some of the artefacts were passed to the Dunedin Museum (Mackenzie and Baker 1992: 11).

The Greenstone Melange (Wakatipu jade field: Beck and Mason 2002: 55, 61 - 63) extends as far south as the Greenstone River north of the Walter Peak special lease (Beck 1984: map page 45). The Greenstone Melange runs north along the Ailsa Mountains and Humboldt Mountains to the Bride Burn, a tributary of the Dart River. Pounamu sourced from the Te Koroka/Slip Stream Special Area (SO 24707: Landonline, lies within Mt Aspiring National Park), was highly prized by early Maori and is a unique cultural site of national and world importance (Beck and Mason 2002: 62 - 64, Ritchie 1976: 1 - 2). A T puni (Schedule 91) lies over the Te Koroka/Slip Stream Special Area that acknowledges Ng i Tahu values in this area (K i Tahu ki Otago 2005: 200 - 201).

Ian Turnbull (ex GNS geologist) has mapped slate in both the Upper Lochy River and in the head of Eyre Creek (hence the name Slate Basin). Ian Turnbull (pers comm.) notes some of the harder slate is of a grade suitable to make artefacts for cutting or scraping purposes. Slate was an important material to early Maori for the production of pounamu adzes and chisels (sawing/cutting from larger blocks or boulders). Occupation sites associated with procurement of slate may be located on the special lease in the Upper Lochy River. Chisels and other tools have been found by Hugh Mackenzie in caves high up the open slopes of the mountains (Mackenzie and Baker 1992: 11).

The Von River provided an important pathway between Lake Wakatipu and Southland. It is not clear if the lower Von River was used to access Lake Wakatipu as some historic references state the main pathway was via the Mararoa River and Pass Burn through to the mouth of the Greenstone River. There is a lack of place names on either route to verify use (Beattie 2002: 64, Brailsford 1984: 165 - 169).

It is likely waka would travel as far as the Von River from the head of the lake and walk the Von rather than stopping at the Greenstone River and walking from there. The Von appears as a wide valley from the lake side and may have provided a shorter route.

It is highly likely the shoreline of the lake at Walter Peak was used for waka landings especially to wait out bad weather. Other resources present on the lease include stands of cabbage tree located along the foreshore (Brian Allingham pers comm.) and spearing of eels (tuna) was an activity mentioned by Hugh Mackenzie in his dairies (Mackenzie and Baker 1992: 69).

2.7.2 European Heritage Values

Walter Peak station became one of the most famous pastoral runs in New Zealand. The Mackenzie family hosted gatherings and conventions providing hospitality and a memorable experience for visitors. Distinguished visitors from

around the world included Viscount Jellicoe and his staff, Lord and Lady Bledisloe, Sir Hector Mackenzie, Colonel Sir James Sleeman (aide-de-camp to the Prince of Wales), Lord and Lady Craigavon, Field Marshall Lord Birdwood, Prince Bhawani Singh (Maharajah of Jalawar), Sir Thomas (High Commissioner in London), and Sir Harry Lauder (Mackenzie and Baker 1992: 44 – 46, 55, Miller 1973: 300 - 301).

History of Walter Peak Station has been written primarily by Hugh Mackenzie and Catherine Baker (1992), Jessie Mackenzie (1983), Florence Mackenzie (1948), and FWG Miller (1973). Catherine Baker (1992) compiled a history of the Walter Peak station from the diaries of Hugh McKenzie (hence the two named authors). Jessie Mackenzie is the granddaughter of Hugh Mackenzie. Other authors have also contributed knowledge of the Walter Peak lease (Herries Beattie 1947, Irene Adamson 2004).

Nathaniel Chalmers is credited as being the first European to view Lake Wakatipu in 1853. John Chubbin, John and Colin Morrison, and Malcolm Macfarlane are believed to be the first Europeans to set foot by the lake in 1856. David McKellar travelled up the Oreti River to the Von River in 1857 and viewed the Lake from the summit of Pasture Hill, a few miles inland from the Mt Nicholas homestead. David McKellar and his brothers took up what is called McKellar Flat which was part of the Walter Peak estate (Beattie 1947: 36, Mackenzie 1948: 34, Miller 1949: 3 - 6).

Donald Hay was the first European to set foot on the present homestead site of Walter Peak in 1859 (Department of Lands and Survey 1981?: 5). Hay rowed a moki raft around Lake Wakatipu landing close by Beach Bay where he spent a cold night in a hole in the rocks with a rock slab propped up as a shield. Hay climbed part of the way up Walter Peak and also attempted to cross the Von River but the current was too strong (Beattie 1947: 52 – 53, Mackenzie 1948: 37 – 39, Miller 1949: 6 - 12).

A group of pioneer explorers came south to the lake in 1859. The group included William Sinclair Trotter, W.G. Rees, Donald A. Cameron, Angus Macdonald, and Mr Tibbets (Mackenzie 1948: 56, Miller 1949: 6 - 10). William Gilbert Rees and Nicholas Paul Baltasar Von Tunzelmann landed on the western? side of the lake in 1860 and climbed White's Point where Rees named the two rivers at the head of the lake, Dart and the Rees Rivers. William Rees named Walter Peak after his son Cecil Walter Rees. Rees named the Von River after Von Tunzelmann. It was Von Tunzelmann who first farmed the surrounding area known as Fernhill. The Lochy River was named by DA Cameron and AA Macdonald after a Highland stream (Beattie 1948: 31 - 32, Griffiths 1971: 145, Mackenzie 1948: 46).

It was thought the original Walter Peak stone homestead, woolshed and shearing shed at the lake side were built in 1865 by James McLean (a builder from Argyllshire, Scotland). The stone was quarried from Walter Peak with walls 18 inches thick. The roof was shingle and is laid under the present iron roof. The doors and window frames are cedar with floors of imported Baltic Pine (Mackenzie and Baker 1992: 9). Irene Adamson (2004: 8) notes four homes were built on Walter Peak.

John McLean held Walter Peak Station before being declared bankrupt October 1877 (The Wakatipu Mail 25 October 1877: Archives Dunedin). Hugh Mackenzie acquired the Walter Peak lease in 1880 (Queenstown Historical Society 1883 issue 29: 20). The homestead above was known as the middle house at Walter Peak (Mackenzie and Baker 1992: 9). This section with the homestead is freehold land and is not under consideration with this Review.

Excerpt from Lloyd Woods 'The ... Jean Batten Peaks' cited in The New Zealand Railways Magazine, Volume 14, Issue 6 (September 1939);

In the southern lakes district, three peaks, unnamed hitherto, will in future be known as the Jean Batten Peaks, in honour of New Zealand's great aviatrix, Jean Batten. The peaks were so named as an outcome of two visits paid by Miss Batten to Walter Peak Station, Lake Wakatipu, with the approval of the Geographic Board (one visit was in 1938: Mackenzie and Baker 1992: 69).

Hugh McKenzie married Anastasia Rossiter in 1873 and they had 6 sons and two daughters. Anastasia died in 1897 (aged 39) with typhoid and her daughter Margaret took on the household responsibilities at the age of 16. Anastasia Mackenzie was a true pioneer woman and a plaque to her memory sits in the St Josephs Church in Queenstown (Adamson 2004: 7, McKenzie and Baker 1992: 4, 12, 15, Mackenzie 1983: 9).

Hugh Mackenzie (Junior) was born at the Chimney, Bush Creek, where the conditions were rather primitive. The Mackenzie's moved to the stone house at the lakeside, once Dalgety's manager Mr Scolon left Walter Peak, and they took over the freehold section. John A Wither stated (in Mackenzie and Baker 1992: 9) his Grandfather received a letter from Mr Scolon in 1882 to say his family were leaving Walter Peak as Dalgety Company had sold the area to Hugh Mackenzie. The family were living two miles in from the lake at Bush Creek.

Alexander Mackenzie and Von Tunzelmann were the first to settle at Table Bay. Alexander and Hugh Mackenzie held the Coronet Peak run prior to obtaining the Walter Peak lease (Miller 1973: 293, 297). Hugh Mackenzie bought the sections owned by Alexander Mackenzie and started to grow wheat. Hugh applied for a transfer of a lease in perpetuity held by Alexander Mackenzie for Section 11 dated 15 August 1899 (Archives Dunedin). The homestead was a weather board cottage built at the foot of the range named the Big Top near Round Hill known later as the Chimney (Mackenzie and Baker 1992: 8).

Hugh Mackenzie formed a partnership with his children and purchased Walter Peak, Mt Nicholas and Fernhill pastoral leases (over 178,000 acres) with 1,300 acres of freehold land in 1904 (Mackenzie 1983: 8, 10 - 13). A diary entry 4 December 1897 mentioned the open boundary between Withers and Mackenzie becoming a problem. The first snow line fence was erected in 1897 on Round Hill near George Creek to stop the sheep leaving the sunny faces and moving to the back country before shearing. Hugh Mackenzie (Senior) fenced the whole property and may have been one of the first high

country farmers to do so (Mackenzie and Baker 1992: 6, 24 – 25, Miller 1973: 298).

The description of fencing locations indicates a lot of energy was put into carrying material, posts, flat standards and wire, up and over high mountains (up to 6,300 feet Mt Turnbull). Pack horses were used as far as possible then material was packed in on their own backs. Over seventy miles of mountain fences and 100 miles of internal fencing were constructed over 14 years (Mackenzie and Baker 1992: 24 – 25). Other run holders did not think the fences would stand up to the weight of snow but Miller (1973: 298) reported sections of the fence still standing in 1949 (it is not known which section of snow fence Miller is referring to).

The Crown Lands ranger, J Keppel, noted close to 100 miles of fencing had been erected mostly on difficult country requiring constant upkeep. The letter (dated 6 December 1922) stated shepherds camps were provided where necessary (Letter to Commissioner of Crown Lands: Archives Dunedin).

Men were paid seven schillings a week and W Muir was paid ten pounds per year plus one penny per rabbit skin. In contrast, the wool scouring man received forty pounds per week (Mackenzie and Baker 1992: 6).

McKenzie planted the block of trees on the present Walter Peak Reserve. In 1905, the area behind the homestead was gazetted as a landing reserve for sheltering stock or produce to be shipped. The Government took over the three main steam ships that serviced the sheep stations around Lake Wakatipu in 1902. The mixed conifers are considered important for their historical significance and association with early settlement of Walter Peak (Department of Lands and Survey 1981?: 6-8).

The Mackenzie boys constructed an excellent rifle range, mounds and butts, above the moorings and alongside the plantation at Beach Bay. It is not confirmed if these structures are located on the Special Lease under review.

The opening shoot of the season was held at Walter Peak range every year. Teams came from Queenstown, Glenorchy and Skippers and later from Garston and further afield. Hugh Mackenzie was elected Patron of the Wakatipu Defence Rifle Club and Ted Mackenzie was elected President of the club (holding that office for 27 years). One of the last shoots held at Walter Peak in 1929 attracted 79 riflemen. All trophies, medals, and prize money were donated by the Mackenzie family.

Rifle butts were set up throughout New Zealand prior to and during the First World War. Rifle butts were a platform built up for riflemen to lay down at height to shoot at targets.

Walter Michael Mackenzie (Lieutenant in the Otago Infantry Battalion of the NZ Expeditionary Forces) was mortally wounded at Gallipoli 9 August 1915 (Probate: Archives Dunedin). Walter was reputed to be the youngest officer in the New Zealand army (Miller 1973: 300). Major Peter Mackenzie was

severely gassed in France. Peter rose to the rank of Colonel and commanded the Central Otago home guard through World War 2 (Adamson 2004: 8 - 9).

The following pastoral runs were listed with Hugh Mackenzie & Sons in a letter to Ranger Keppel 28 September 1922 (Archives Dunedin) from the Deputy Commissioner of Crown Lands: run 264 (324a and 324b), run 326 (438 and 452), run 300 (2b and 3a). A letter from Hugh Mackenzie (dated 16 March 1923) lists the names of the Mackenzie family desired on the lease of Walter Peak Station; Hugh Mackenzie, Hugh (the younger), John, Alexander, Peter, and Margaret Ann (Archives Dunedin). The younger Hugh McKenzie was known as Ted.

Hugh Mackenzie's (Senior) second wife was Flora Gardiner (Mackenzie 1983: 9). The Mackenzie family grew large areas of potatoes most being for sale. They had an orchard and a hazel nut grove (Mackenzie and Baker 1992: 9, 22).

Hugh Ross worked on the station for 27 years being Head Shepherd for 19 of those years. Other shepherds included Duncan Mackenzie, W Birse, Harry Kennedy, and Jimmy Brandon. There were many others who worked on the station and some are named in Mackenzie and Baker (1992: 66).

The Mackenzie brothers gained rights to fishing from Beach Bay to the Greenstone. Hugh (the younger) and his brothers could make their own fishing nets and wood shuttles catching 40 - 50 salmon each day. The fish (salmon and rainbow trout) were smoked in their own smokehouse and taken to Kingston to be sent on to Lumsden and Dunedin to be sold. Lord Balfour was another visitor to Walter Peak and being a keen fisherman had great success at the river mouths fishing with Major Peter (Mackenzie and Baker 1992: 16, 69, Miller 1973: 297).

Nicholas Von Tunzelmann died at Beach Bay in 1900 where he lived with his wife (nee Gertrude Rose Gilbert). William Mackenzie lost his life in a snow slide on the lease August 1906. Hugh Mackenzie (Senior) died 6 May 1933 (Griffiths 1971: 145, Mackenzie 1983: 8).

Walter Peak gained the best price yet made for New Zealand wool on the market 30 November 1950). On four separate occasions Walter Peak topped the London wool sales for Australasia and awarded first prize at the Wembley exhibition (Adamson 2004: 9, Mackenzie and Baker 1992: 5, 38, Miller 1973: 300). The Mackenzie family introduced snow raking to the Wakatipu area where they hand shook snow from the tussocks around each group of sheep to enable them to feed and to free sheep stuck in heavy snow. The Mackenzies' saved many sheep this way while other run holders suffered heavy losses (Mackenzie and Baker 1992: 8).

In 1949 the Fernhill and Mt. Nicholas portions of the property were sold (Miller 1973: 296 – 301). The Mackenzie family sold the home station in 1959. Colonel Peter bought Walter Peak before selling to Cliff Heron and his wife in 1960. Walter Peak Ltd, headed by George Wiles, acquired the lease in 1968 (Adamson 2004: 10 – 11).

2.7.3 Significance of Historic Values

The greater Walter Peak area has significance because of the associations with iwi, European people including the Mackenzie family and the World War 1 effort. The significance of specific on site historic resources, e.g. huts has not been able to be ascertained because no on site inspection has been carried out. Any areas proposed for freeholding will require an assessment of historic values and possibly an on site inspection depending on the historic resource/s within the area proposed for freeholding.

2.8 PUBLIC RECREATION

2.8.1 Physical Characteristics

There are many and varied opportunities for public recreation on the Lease due to its:

- Large and mountainous nature of the property

- Feeling of remoteness generated by the rugged nature and inaccessibility

- Magnificent natural scenery, with outstanding views into other parts of the Eyre Mountains and Mt Aspiring National Park from peaks and other vantage points

- High country pastoral and early Maori history with a legacy of stories and in some cases tangible remains to aid interpretation and understanding

- Opportunities for access from Eyre Creek and headwaters of Mataura River within the Eyre Mountains/Taka Ra Haka Conservation Park. Renowned "wilderness" fisheries present in Lochy and Von

- Close proximity to Queenstown with many visitors seeking outdoor experiences, although this is tempered by the number and quality of the existing opportunities on offer

In 2009 DOC developed computer generated Recreation Opportunity Spectrum (ROS) maps for all of New Zealand based on land cover and the presence of roads and other built structures. The 2009 ROS is a theoretical picture of existing opportunities which is used as a basis for Visitor Management Zone (VMZ) maps in Conservation Management Strategies (CMS) and Park Plans. The VMZ zones and the prescriptions associated with them are the ones applied in the management of public conservation land (PCL). Since it is not PCL, Walter Peak has not been included in the draft (2012-3) CMS maps, but the 2009 ROS gives a good indication of how it might be zoned.

The 2009 ROS map zonings reflect the wide variety of terrain and recreational opportunities present.

The lake faces and those parts of the property located along the Von River and Afton Burn are mainly zoned *Rural* (characterised by remnant native

vegetation and historic or cultural sites in areas dominated by farmland). They also include some sites zoned *Front country* (limited to the vicinity of the roads and structures associated with the station). In both cases, “People’s expectations for social interaction will vary, some seeking time with family and friends, some enjoying activities with large groups, and others expecting time away from other groups, and in some cases, solitude”. (Sutton 2007)

Most of the property was zoned *Backcountry*, which are large scale natural settings and usually accessed via the *Front country*. “Organised groups will occasionally be encountered, but people will generally fulfil their expectations of experiencing time away from others in settings where there are minimal signs of development and little chance of seeing motorised transport”, (Sutton 2007).

Two areas were zoned *remote*, they are McKinlays Creek – Withers Peak ridge area and a wedge of land from Ridge Peak south encompassing the higher elevation country. *Remote*, which is described as forming the wild lands in the interior of large protected areas. “The basic facilities and unmodified physical setting are suitable for [those] who enjoy extended trips in New Zealand’s backcountry mountain ranges, typically in groups of 2-5 people, being self reliant on their backcountry skills and enjoying an uninterrupted closeness to nature”, (Sutton 2007).

2.8.2 Legal Access

Although the property is within sight of Queenstown, access can only be gained by boat across Lake Wakatipu or by vehicle from the Mossburn-Te Anau highway via Mavora Lakes.

a) Roads

Formed Roads:

The property is dissected by the formed Mt Nicholas and Von Roads along the Von valley flats, and by the Mount Nicholas – Beach Bay Road, located at the northern end of the property.

The following sections of these roads appear to have no legal status, but are maintained by the Queenstown Lakes District Council (QLDC).

i) Mt Nicholas-Beach Bay Road

There is no legal road present along an approximately 4 km stretch of the formed Mt Nicholas-Beach Bay Road between Signal Hill and the woolshed beside Georges Creek.

(ii) Von Road

An approximately 1km stretch of the Von Road in the vicinity of Bush Creek significantly deviates from the alignment of the legal road.

These roads may qualify as legal roads by virtue of historic construction and use. The roads also provide the only vehicular access to privately owned

freehold land at Beach Bay, and are used for a wide range of commercial recreational and other uses.

Unformed Roads:

There is a network of unformed legal roads at the front of the property, between the Afton Burn and McKinlays Creek. This includes several short sections which extend up Georges Creek and down to Lake Wakatipu, up towards to Afton Burn East Branch, and across to the Afton Burn. In addition, two small sections of unformed legal road are located adjacent to marginal strips on the shores of Lake Wakatipu to the eastern end of Beach Bay.

b) Marginal Strips

Fixed Section 58 Land Act strips, which are deemed to be marginal strips under Part IVA of the Conservation Act 1987, are present along the Lochy and Von Rivers and the shores of Lakes Wakatipu, Ned, and Nigel.

These marginal strips are outside the special lease.

2.8.3 Activities

Significant recreational routes are shown on the Significant Recreation values map, page 73.

At present, the growth and pattern of recreational use on the Lease is limited in part due to the restricted geographical access and the lack of legal access. However, the property's proximity to Queenstown (by boat), and location to existing and proposed conservation lands within the Eyre Mountains massif, contribute to a significant potential for recreation.

Tramping

At present the Lease offers an opportunity to people experienced in remote backcountry travel. Geographical isolation and limited facilities has seen the property little utilised. Usage may have increased since 1995 due to its inclusion in Moir's Southern Guide book (McNeill (Ed.) 1995) which describes routes between the Mataura River, over Mataura Saddle to the Lochy River, and out to Lake Wakatipu via Killiecrankie and McKinlays Creeks, or to Halfway Bay (on Halfway Bay Station). The area requires reasonable route finding skills and has traditionally been the domain of tramping clubs on annual organised trips. With landholder permission, it is possible to circumnavigate the property by following routes along the Afton Burn East Branch over Afton Saddle into Cascade Creek; down the Lochy River, and back over the ranges to Lake Wakatipu via Killiecrankie and McKinlays Creeks.

Climbing

There are numerous peaks on the property (reaching up to 1856m in altitude), however, few are named or climbed. Walter Peak (1800m) can be approached from the north eastern spur. While these peaks may have some local appeal, they lack the challenge and lure of recognised New Zealand classic climbs.

Hunting

Recreational hunting use is currently low. Restricted access and lack of information have contributed to this.

Mountain Biking and Horse Trekking

Significant opportunities for mountain biking and horse trekking may exist on the property. Existing farm tracks located within the Afton Burn East Branch, Cascade Creek and upper Lochy River as far as Lake Ned, could provide an interesting route for both mountain biking and horse trekking. A track over Nicholas Saddle provides a linkage between Afton Burn and the White Burn within the Von River valley.

Angling

The Lochy River is considered to be a premier recreational sports fishery of the region, with an international reputation for good trout. The upper river is considered to be amongst the country's finest backcountry fishing waters. Only 20 minutes flying from Queenstown, its proximity to the resort has placed it under intensive pressure. Eighty percent of the fishing occurs in the upper river as far as the Cascade confluence. Eighty percent of these anglers are non-New Zealand residents flown in and fishing with a commercial guide. In addition, the Von catchment provides an important setting and access to a significant trout fishery.

Commercial Recreation

Several concessions for guided angling have been issued over the Lochy River marginal strip.

2.8.4 Significance of Recreation

The Lease is strategic in offering recreational experiences in an area that is largely undeveloped, has a remote feel and is relatively close to Queenstown. It provides excellent opportunities for tramping, hunting, mountain biking, horse trekking and climbing of local peaks in an outstanding remote setting. Recreation values associated with the lakeshore are largely present within the lakeshore marginal strip.

The rivers provide important opportunities for backcountry trout fishing.



2.9 ECOSYSTEM SERVICES

Ecosystem services are the non intrinsic social or economic benefits to people and society provided by functioning indigenous ecosystems. Examples are water and soil conservation, water yield, water purification, natural hazard mitigation and carbon storage (amenity values being covered under recreation or landscape). These are inherent values, being attributes of the land and its natural resources. If the land is managed in an ecological sustainable way, these benefits will be retained and enhanced. New Zealand's response to global climate change includes reducing greenhouse gas emissions and maximising CO₂ storage. Growing plants extract CO₂ from the air and store it in their tissues. If plants are not burnt or grazed, the carbon remains sequestered either in the woody parts of plants or in the soil.

Tenure review can assist in increasing carbon storage by removing grazing pressure, allowing shrublands and indigenous forests to expand and tussock grasslands to increase in stature. Ungrazed tussock grasslands also deliver high water yield benefits compared with an exotic pasture or forest land cover. Increased vegetation cover and stature also increases catchment stability. Indigenous vegetation alongside lakes and waterways will help to trap nutrients that might otherwise contribute to the eutrophication of lakes.

The special lease backcountry catchments provide ecosystem services benefits for downstream users through the protection of water quality, water yield and will make a significant contribution to the sequestration of atmospheric carbon.

PART 3: OTHER RELEVANT MATTERS & PLANS

3.1 CONSULTATION

The property was discussed at an NGO early warning meeting held in Alexandra on 24th September 2003. The main points raised during the meeting were:

PANZ suggests 95% may have Significant Inherent Values.

Von is a key access corridor – practical access is needed from the Von into the head of the Lochy.

FMC sees this as potential National Park – backing into Halfway Bay.

PANZ suggests the area should be managed as quiet back water – cherish as backcountry – Conservation Area or Reserve more appropriate – points out that these values are identified in the Conservation Management Strategy.

PANZ – whatever tenure we end up with in the lower Lochy – need to formalise public access.

Anne Stephens – Front faces have landscape values – covenant protection?

Von Road area has important open space qualities.

FMC notes importance of referring to land Use Capability (LUC) classes.

The key points raised by Federated Mountain Clubs (FMC) are outlined below:

All LUC Class VIII land (9000 ha) and most VII land (10,000 ha) to be returned to full Crown ownership and control, to be managed for conservation and recreation purposes, as it is most unlikely this can be managed in a way that is ecologically sustainable.

Fencing to achieve this will be difficult. May be able to utilise existing fencing on front faces.

Need marginal strips on all qualifying waterways.

Public access for foot, mountain bike and horse from

- a) Lake Wakatipu (Mount Nicholas – Beach Bay Road) via Signal Hill, Afton Burn, Nicholas Saddle to Von Road at most westerly point on the Lease boundary.
- b) From Lake Wakatipu (Mount Nicholas- Beach Bay Road) via Signal Hill, Afton Bay East Branch and Afton Saddle to Lochy River, Lake Ned, Lake Nigel, Forks Hut and Mataura Saddle.
- c) Down true left of Lochy River from Cascade Creek to Killiecrankie Creek.

3.2 REGIONAL POLICY STATEMENTS & PLANS

a) Otago Regional Policy Statement

The Otago Regional Policy Statement (Otago RPS) provides an overview of resource management issues within the Otago region and the methods that these issues are to be managed through the regional and district plans.

The primary focus of *Chapter 5: Land* of the Otago RPS is ensuring the sustainable management of resources associated with farming while protecting values such as landscape, public access, and indigenous vegetation and fauna values. Furthermore this chapter requires that outstanding natural features and landscapes are recognised and protected. *Chapter 10: Biota* recognises that significant indigenous vegetation and the habitats of indigenous fauna may be threatened by the adverse effects of development and that biodiversity generally within Otago needs to be maintained. These issues are addressed and reiterated through the objectives policies.

The Anticipated Environmental Results for the region include:

- Otago's communities are able to utilise the region's land resources in order to provide for their well being, health and safety, and also for the reasonably foreseeable needs of future generations.
- Otago's outstanding natural features and landscapes are recognised and protected from inappropriate subdivision, use and development.
- Public access opportunities to Otago's natural and physical land features is maintained and enhanced.
- Otago's biodiversity is maintained or enhanced.
- Otago's significant ecosystems and endangered species are protected.
- The life-supporting capacity of Otago's ecological communities is safeguarded.

b) Otago Regional Plan: Water

The purpose of the Otago Regional Plan: Water (Water Plan) is to provide a framework for the management of Otago's water resources. The Water Plan includes a number of provisions, including rules, for the use of water resources. These provisions include rules for the taking and use of surface water and groundwater, the damming and diversion of water, and discharges.

The Water Plan lists regionally significant wetlands and considers that any wetlands that are located above 800m above sea level are significant. The Von Valley Wetland Complex is identified in the Water Plan and this wetland complex is partially located on Walter Peak Station. This specific wetland complex and any wetlands located above 800m are subject to the wetland rules that restrict the use, placement and maintenance (as well as other activities associated with structures) of a structure, the alteration, the introduction or planting of vegetation, the removal of vegetation within these regionally significant wetlands.

c) Southland Regional Policy Statement

A small section of Walter Peak Station is located within the Southland region and therefore the Southland District. This section of the Walter Peak that crosses the local government administration boundary is a mountainous area.

Southland Regional Council is undertaking a full plan review of the Southland Regional Policy Statement (Southland RPS). The operative Southland RPS became operative in 1997. In May 2012 Southland Regional Council publicly notified the proposed Southland RPS. At the time of preparing this report hearings had began and no decisions had been released. Given the stage where the proposed Southland RPS is at in the process it is not considered necessary to discuss the proposed Southland RPS in this report because it is subject to change.

The Southland RPS addresses landscapes and natural features and recognises the protection landscapes as a resource management issue. It is anticipated in the Southland region that outstanding natural features and landscapes are protected. The Southland RPS recognises that the Southland region supports a wide variety of ecosystems. Consequently the Southland RPS requires that protection of the significant indigenous vegetation and habitats of significant fauna, and that biodiversity generally within the region is maintained.

3.3 DISTRICT PLANS

a) Queenstown Lakes District Plan

The majority of Walter Peak Station lies within the Queenstown Lakes District. The Queenstown Lakes District Plan (Queenstown Lakes Plan) was made operative in 2009 and has since been subject to a large number of plan changes. The majority of these plan changes are now operative and those that are not operative do not have any effect on Walter Peak Station. There is one exception, which is a plan change addressing earthworks.

Walter Peak Station is wholly located in the Rural General Zone in the Queenstown Lakes Plan. The Rural General Zone covers the majority of the Queenstown-Lakes District area and is the default zoning outside of the town centre's, residential and special areas. The purpose of the Rural General Zone is to manage activities so they can be carried out in a way that includes:

- Protection and enhancement of nature conservation and landscape values;
- Sustaining the life supporting capacity of the soil and vegetation; and
- Ensuring a wide range of outdoor recreational opportunities remain viable within the Zone.

The zone is characterised by farming activities and a diversification to activities such as horticulture and viticulture. The zone includes the majority of rural lands including alpine areas. A large proportion of this zone is land under crown tenure, either as public conservation land administered by the

Department of Conservation or as pastoral lease runs administered by the Commissioner of Crown Lands. Mount Aspiring National Park is located in the Rural General Zone.

The Environmental Results Anticipated for this zone include:

- The protection of outstanding natural landscapes and features from inappropriate subdivision, use and development.
- Maintenance and enhancement of openness and naturalness of outstanding natural landscapes and features.
- Strong management of the visual effects of subdivision and development within the visual amenity landscapes of the district.
- Enhancement of natural character of the visual amenity landscapes.
- Retention and enhancement of the life-supporting capacity of the soil and vegetation.
- The continued development and use of land in the rural area.
- Retention of a range of recreation opportunities.

There are a number of objectives, policies and rules in the Queenstown Lakes Plan that are relevant to this zone. The plan includes site and zone standards which set thresholds of effects not to be exceeded. Activities are considered within a framework of permitted, controlled, discretionary, non-complying or prohibited activities.

b) Southland District Plan

As stated above a small section of Walter Peak Station is located within the Southland District. The Southland District Plan (Southland Plan) was made operative in 2001 and is currently being reviewed. No decisions have been issued on the proposed Southland Plan.

Walter Peak Station is located in the Rural Resource Area. This zoning covers a wide range of landscape character types including the coast, islands and mountains. The purpose of this zone is to provide a flexible framework to allow activities to continue while ensuring they do not adversely affect the physical and natural resources.

There are a number of objectives, policies and rules in the Southland Plan that are relevant to this zone. Activities are considered within a framework of permitted, controlled, restricted-discretionary, discretionary or prohibited activities. The Southland Plan anticipates the following environmental results in the Rural Resource Area if the provisions of the Southland Plan are implemented:

- Maintenance of the open-space and natural amenity values of the District.
- Reduced impact on the Districts water and soil resource.
- Minimal adverse effects on the amenity values and public roads of the District from buildings and structures.
- Retention of significant indigenous vegetation and habitats.

3.4 CONSERVATION MANAGEMENT STRATEGIES & PLANS

Walter Peak special lease is located at the northern end of the Eyre Mountains. The special lease is primarily covered by the Otago Conservation Management Strategy (CMS) which was approved by the Minister of Conservation in August 1998 and is known as the operative plan.

A new draft Otago CMS is currently being produced.

The southern part of the Eyre mountains which is primarily public conservation land (Eyre Mountains/Taka Ra Haka Conservation Park) is covered by the Mainland Southland/West Otago Conservation Management Strategy, 1998-2008. A new draft Southland CMS is currently being produced.

The sections of the operative Otago CMS that cover Walter Peak special lease area are section 8, The Lakes Zone (a geographic zone) and the Eyre Mountains (Takerehaka) Ecological District section (10.31).

The relevant objectives of The Lakes Zone are;

General Objective for Lakes Zone Landscape

To encourage the protection of the special landscape character and quality of the zone

General Objective for Lakes Zone Ecosystems and Species

To recognize and protect the characteristics and significant species of the ecosystems of the Lakes zone for their contribution to biodiversity, to landscape quality and their intrinsic worth.

General Objective for Lakes Zone Maori Tradition and History

To recognize and provide for the protection of places of significance to Kai Tahu.

General Objective for Lakes Zone European History

To recognize and as far as possible preserve the values of the most significant historic sites, structures and plantings for their intrinsic value and a source of interest and enjoyment for visitors.

General Objective for Lakes Zone Tourism and Recreation

Subject to section 17 of the Reserves Act 1977 (recreation reserves) where it applies, to foster the use of conservation resources for recreation enjoyment and allow commercial recreation provided natural and historic values and the quality of recreational experience can be retained.

The relevant objective for the *Eyre Ecological District* section is as follows:

Objective for Eyre Mountains (Takerehaka)

To protect, on a landscape scale, the natural resources of the Eyre Mountains, and to improve public access to and enjoyment of those resources.

Key implementation statements to meet this objective that are relevant to this tenure review include the following:

- *Appropriate wild animal and plant pest control work will be carried out to protect natural resources in protected areas managed by the department in both Otago and Southland.*
 - *Further survey of the Eyre Mountains will be carried out to check the distribution of rare, local, and endemic plants, indigenous fish, invertebrates, and other fauna.*
 - *Research into the biology and conservation needs of *Mecodema chiltoni* will be encouraged.*
 - *Information about natural resources that will assist in appropriate management being applied will continue to be collected.*
 - *Negotiate a public walking opportunity along the shore of Lake Wakatipu through and beyond Te Kere Haka Scenic Reserve and improve public access provided to Glen Allen Scenic Reserve including signposting and track development or route marking.*
 - *Tenure review of pastoral leasehold properties will be used as appropriate to provide opportunities to negotiate protection of and access to areas with high natural and recreational values.*
 - *Ongoing liaison will be maintained with Southland Conservancy to ensure complementary management of protected areas in the Eyre Mountains, and to support an extensive conservation park if initiated.*
 - *To rationalize the Walter Peak Recreation Reserve, and dispose of the surplus.*
- Advocate landscape protection in particular for scenically important parts of the Eyre Mountains not affected by farm development.*
- *Promotion of the correct use and spelling of traditional place names.*
 - *When informed of the nature and location of waahi taoka and waahi tapu on land administered by the department, consult with kai Tahu about the appropriate management of that site.*
 - *The protection of significant natural and historic resources will be advocated through the Resource Management Act and other statutory processes.*

Priorities for Eyre Mountains (Takerehaka)

Improving the formal protection over the spectacular indigenous landscapes of the Eyre Mountains will be the priority in this Special Place

Draft Otago Conservation Management Strategy

Additionally, the Department is preparing a draft Otago Conservation Management Strategy, November 2014. It is not yet operative but does provide policy guidance. Within the draft Otago CMS, Walter Peak special lease is located within the *Western Lakes & Mountains Place/Te Puna Wai Karikari a Rakaihautu (within the Remarkables/Hector/Doolan)*.

Ngai Tahu has strong traditional and present associations with Lake Wakatipu. Lake Wakatipu is identified as a Nohonga site within the Ngai Tahu Claims Settlement Act 1998.

The Walter Peak special lease adjoins the *Eyre Mountains/Taka Ra Haka Conservation Park*. In the draft Otago CMS the lakes and rivers are outstanding landscape features, highly valued for their recreation and scenic qualities.

The following is covered in the place description of the draft CMS.

A number of pastoral leases occupy eastern parts of the place. Tenure Review processes provides opportunities to protect natural and historic values and improve public access links and corridors; which may occur by transferring some areas to Public conservation land and waters. The most appropriate land classification of such areas would require consideration under the Reserves Act 1977, Conservation Act 1987 or National Parks Act 1980 once the tenure reviews are substantially completed. The most suitable land and waters status would need to take into account adjoining Places, particularly those in Southland.

The relevant policies within the draft Otago CMS relating to this area as follows:

Policy 2.3.1

Once tenure reviews have been substantially completed, undertake a review of existing status of public conservation lands and waters within the Place in accordance with the Conservation Act 1987, Reserves Act 1977, and National Parks Act 1980 to better reflect their values.

3.5 WATER CONSERVATION (KAWARAU) ORDER

This order was enacted in 1997 and protects specific characteristics of the river. In Schedule 2 of the Order, the outstanding amenity and intrinsic values of the Lochy river main stem are required to be sustained. These values are specifically the fishery and recreational purposes, in particular, fishing.

3.6 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 habitats 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.

3.7 PROTECTING OUR PLACES

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

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

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

National Priority 1:

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

National Priority 2:

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

National Priority 3:

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

National Priority 4:

To protect habitats of acutely and chronically threatened indigenous species.

PART 4: ATTACHMENTS

4.1.1 CHECKLIST OF VASCULAR PLANTS

Checklist of vascular plants compiled from visit 16-18 February 2004, 3-4 March 2004, 17-21 November 2014, and 3-5 February 2015
 Brian Rance, John Barkla and Neill Simpson

Specimen collected
 * Exotic species

LOCATION

1a Von Valley/other valley flats
 1b Von River catchment hill slopes
 2 Lochy River catchment
 3 Lake faces/catchments
 @ Earlier list by Brian Rance, Neill Simpson and Tony Druce

ABUNDANCE

u uncommon
 o occasional
 c common
 lc locally common
 f frequent
 a abundant

HABITAT

Fo Forest
 Sh Shrubland
 St Snow tussockland
 Rt Valley floor red/fescue tussockland
 Ah Abation hollows within red/fescue tussockland
 Fn Fernland
 Aw Alpine-montane wetland
 Vw Valley floor wetland
 Lt Lakeshore turf
 Ro Rock faces & outcrops
 Rb Riverbed/stream
 Sn Snowbank
 Sc Scree
 Fe Fellfield
 T/H Vehicle Tracks and Hut

Ferns

	Location	Abund.	Habitat
Asplenium appendiculatum	@		
Asplenium flabellifolium	@		
Asplenium flaccidum	@		
Asplenium richardii	1a,1b	o	Ro
Asplenium trichomanes	@		
Blechnum chambersii	@		
Blechnum fluviatile	2		

Blechnum montanum	1a,1b,2,3o	Sh,St	
Blechnum novae-zelandiae	@		
Blechnum penna-marina	1a,1b,2,3o	St,Rt	
Blechnum procerum	@		
Cystopteris tasmanica	2	o	Ro
Gleichenia dicarpa	1b	lc	St
Histiopteris incisa	@		
Huperzia australiana	2,3	o	Sc
Hymenophyllum multifidum	1b	o	Ro
Hymenophyllum sanguinolentum	@		
Hypolepis millefolium	1a,1b	o	Sh,Ro
Lycopodium fastigiatum	1a,1b	c	Rt,St
Lycopodium scariosum	1b	o	St
Microsorium pustulatum	2	o	Ro
Notogrammitis angustifolia ssp. angustifolia	1b,2,3	o	Ro
Notogrammitis billiardierei	@		
Notogrammitis givenii	3	o	Ro
Notogrammitis patagonica	1b	o	Ro
Ophioglossum coriaceum	1a,b	o	Rt,St
Phlegmariurus varius	@		
Polystichum cystostegia	1b,2,3	o	Ro,St
Polystichum vestitum	1a,1b,2,3	o	Sh,St
Pteridium esculentum	1a,1b,2,3	o	Fn,Sh

PODOCARPS

Halocarpus bidwillii	1a	o	Vw
Phyllocladus alpinus	2	o	Sh
Podocarpus cunninghamii	2	o	Sh
Podocarpus nivalis	2,3	o	Sh
Podocarpus nivalis x cunninghamii	1b,2	o	Ro

Trees & shrubs

Acrothamnus colensoi	1a,1b	0	St,Rt
Alepis flavida	2	u	Fo
Androstoma empetrifolium	1a	o	Vw
Aristotelia fruticosa	1a,1b,2	o	sh
Aristotelia fruticosa x serrata	3	o	Fo
Aristotelia serrata	3	u	Sh
Brachyglottis cassinioides	1b,2,3	lf	Sh
Brachyglottis revoluta	1b,2,3	c	St,Sh
Carmichaelia petriei	1a,1b,2	o	Sh
Carpodetus serratus	3	o	Sh
Coprosma brunnea #	1b	o	Ro
Coprosma atropurpurea	2	o	Aw
Coprosma cheesemanii	1a,1b,3	o	Sn,Rt
Coprosma ciliata	1b,2,3	o	Sh
Coprosma depressa	@		
Coprosma fowerakeri	2,3	o	St
Coprosma linariifolia	2,3	o	Fo
Coprosma lucida	3	o	Sh
Coprosma niphophila	3	o	Sn
Coprosma dumosa	1a,1b,2,3o	Sh	
Coprosma perpusilla	1a,b	c	Aw,Sn
Coprosma petriei	1a,2,3	o	Rt,St
Coprosma propinqua	1a,1b,2,3c	Sh	
Coprosma pseudocuneata	@		
Coprosma rugosa #	1a,1b,2,3o	Sh	
Coprosma serrulata	1b,2	o	Sh,Ro
Coriaria angustissima	1b	o	Rb

Coriaria arborea	3	o	Sh
Coriaria plumosa	1a,1b	o	Rb
Coriaria sarmentosa	1a,1b,2	o	Rb,Rt
Corokia cotoneaster	2,3	o	Sh
*Crataegus monogyna	1a,3	u	Sh
*Cupressus macrocarpa	1a	u	T/H
*Cytisus scoparius	1a,2,3	o	Rt
Discaria toumatou	1a,1b,2,3a	Sh	
Dracophyllum longifolium	1b,2,3	o	St
Dracophyllum muscoides	3	o	Sc
Dracophyllum politum	3	o	Sc
Dracophyllum prostratum	1a,2	lc	Vw
Dracophyllum rosmarinifolium	1a,1b,2,3c	St	
Dracophyllum uniflorum var. frondosum #	2	u	Sh
*Eucalyptus globulatus	3	u	Fo
Fuchsia excorticata	3	o	Sh
Fuscospora fusca	2,3	o	Fo
Fuscospora cliffortioides	1a,2,3	f	Fo
Gaultheria antipoda	1b,3	o	Ro,Sh
Gaultheria crassa	1b,2,3	lc	Ro,St
Gaultheria depressa var. depressa	@		
Gaultheria depressa var. novae-zelandiae	1a,1b,2,3c	St,Rt	
Gaultheria macrostigma	1a,b	o	Rt,St
Gaultheria nubicola	2,3	c	Sn
Griselinia littoralis	3	o	Fo
Hebe anomala	1a,1b,3	o	St,Rt
Hebe biggarii	1b,2	lc	Ro
Hebe buechananii	1b,2	o	Ro
Hebe hectorii	1b,2,3	o	St
Hebe pauciramosa	1b,2,3	o	St,Aw
Hebe petriei #	2,3	u	Ro
Hebe pimelioides?	@		
Hebe propinqua	1a,1b,2,3o	St,Rt	
Hebe rakaiensis	1a,1b,2,3lc	Sh,	
Hebe salicifolia	1a,1b,2	o	Rb,Sh
Helichrysum intermedium	1b,2	o	Ro
Helichrysum lanceolatum #	1b,2	o	Ro
Hoheria lyallii	1b,3	o	Rt,Sh
Ileostylus micranthus	3	o	Sh
Kelleria croizatii	2	c	Sn
Kelleria dieffenbachii	1a	o	Rt
Kelleria paludosa	2,3	c	Aw
Kelleria villosa	1b,2	o	St,Fe
Leptospermum scoparium	1b,3	o	Rt,Sh
Leucopogon fraseri	1a,1b,2	f	Rt,St
*Leycesteria formosa	3	o	Sh
Lophomyrtus obcordata	3	o	Fo
Lophozonia menziesii	2,3	o	Fo
Melicytus sp. aff. alpinus	1a,1b,2,3o	Ro,St	
Muehlenbeckia axillaris	1a,1b,2	lc	Rt
Myrsine australis	3	o	Sh
Myrsine divaricata	2	o	Sh
Myrsine nummularia	2,3	o	Ro
Olearia arborescens	1b	o	Ro
Olearia avicenniifolia	3	o	Sh
Olearia bullata	1a,1b,2,3o	Sh,Rt	
Olearia cymbifolia	1b,2,3	o	Sh,St
Olearia moschata	2,3	o	Sh
Olearia nummularifolia	2	u	Sh
Olearia odorata	1a,2	u	Sh
Ozothamnus vauvilliersii	1a,1b,3	o	St,Rt

Pentachondra pumila	1a,b	o	Rt,St
Pimelea prostrata	1a	o	Rt
Pimelea oreophila	1b,2,3	o	St
Pittosporum tenuifolium	3	o	Sh
Pseudopanax colensoi var. ternatus	3	o	Sh
Pseudopanax crassifolius	3	o	Sh
*Pseudotsuga menziesii	3	u	Fo
*Ribes uva-crispa	1a,2	o	Sh
*Rosa rubiginosa	1a,2,3	o	Rt
*Salix cinerea	1a,2	o	Rt
*Salix fragilis	3	o	Sh
*Sambucus nigra	1a,2	o	Sh
Sophora microphylla	3	o	Sh
*Ulex europaeus	3	o	Sh

CLIMBERS & VINES

Clematis marata	2	u	Sh
Clematis paniculata	3	o	Sh,Fo
Muehlenbeckia australis	1a	lc	Sh
Muehlenbeckia complexa	1a,1b,2,3o	Sh	
Rubus schmidelioides	1a,1b,2,3o	Sh	

Herbs

Abrotanella caespitosa	1a,2,3	c	Fe
Abrotanella inconspicua	2,3	c	Aw,Vw
Acaena anserinifolia	1a,1b,3	o	Sh
Acaena caesiiglauca	1a,b,2,3 c	St,Rt	
Acaena dumicola	@		
Acaena fissistipula	1a,1b,3	o	Rb,Rt
Acaena inermis	1a,b	o	Rb,Rt
Acaena juvenca	@		
Acaena novae-zelandiae	1a	o	Rt
Acaena profundiincisa	1b,2,3	o	St
Acaena saccaticupula	1b,2,3	c	St,Sb
Acaena anserinifolia x inermis	1a	o	Rt
*Achillaea millefolium	1a,2	o	Rt
Aciphylla aurea	1a	o	Sh
Aciphylla glaucescens	1a,2	o	Sh
Aciphylla sp. aff. horrida (= A. sp "lomondi")	1b,2,3	o	St
Aciphylla kirkii	3		St
Aciphylla lecomtei	2,3	o	Ro
Aciphylla pinnatifida	2,3	o	Aw
Aciphylla spedenii	1b,2,3	c	St,Fe
Anaphalioides bellidioides	1a,1b,2,3o	St,Sh	
Anemone tenuicaulis	1b,2	o	St
Anisotome aromatica	1a,1b,2,3o	St,Rt	
Anisotome aromatica var. flabellifolia	1a,b	lc	St,Rt
Anisotome capillifolia	1b,2,3	c	Ro
Anisotome flexuosa	3	o	St
Anisotome pilifera	2	o	Ro
Argyrotegium mackayi	1a,1b,2,3o	Rt,St	
Brachyscome humilis #	2,3	o	Sn,St
Brachyscome longiscapa	3	u	Ro,
Brachyscome radicata	1b	o	Sn,St
Brachyglottis bellidioides	1a,1b,2	o	St,Rt
Brachyglottis southlandica	2	o	Ro
Caltha obtusa	1b,2,3	f	Vw,Sb
Cardamine bilobata #	2	o	Ro
Cardamine debilis agg. (tall wet C. rubra) #	1a	o	Vw

Cardamine debilis agg.	(high altitude rock face)#	2	o	Ro	
Celmisia sp. aff. alpina			1a	c	Aw
Celmisia angustifolia			1b,2	o	Ro
Celmisia bellidioides			@		
Celmisia densiflora			1b,2,3	o	St
Celmisia glandulosa			1a,2,3	o	Vw
Celmisia gracilentia			1a,1b,2	c	St,Rt
Celmisia sp. "gracilentia rhizomatis broad"			1a,1b,2,3c	Vw,St	
Celmisia sp. "gracilentia rhizomatis narrow"			1a,2,3	c	Vw
Celmisia haastii			3	o	Sn
Celmisia hectorii			1b,2,3	f	Fe,Sn
Celmisia laricifolia			1b,2,3	o	Ro
Celmisia lyallii			1b,2,3	o	St,Ro
Celmisia ramulosa		1b,2		o	Ro
Celmisia semicordata var. stricta			1b,2	lc	St
Celmisia sessiliflora			2,3	o	Sn,Fe
Celmisia thomsonii			2	u	Ro
Celmisia verbascifolia			1b,2,3	lc	St
*Cerastium fontanum			1a,2	o	Rt,Rb
Chaerophyllum sp. "bog"			1a,2	lc	Aw,Vw
Chaerophyllum colensoi			1a,1b	o	St,Rt
Chaerophyllum colensoi var. delicatula	#		1a	u	Ah
Chaerophyllum ramosa			1a,1b,2,3lc	Sh,Rt	
Chaerophyllum novae-zelandiae			1a	o	Ah
Chionohebe ciliolata subsp. ciliolata			2	o	Fe
Chionohebe thomsonii			3	o	Sc
*Cirsium arvense			1a,1b,2	o	Rt
*Cirsium vulgare			1a,1b,2	o	Rt
Colobanthus apetalus	#		2,3	lc	Aw
Colobanthus buechananii	#		1b,2,3	o	Ro,Sc
Colobanthus strictus			1a	o	Rt
*Conium maculatum			1a	lc	Rt
Craspedia sp.1			1a,1b,2,3o	Rt,St	
Craspedia sp.2			@		
*Crepis capillaris			1a	o	Rt
Dolichoglottis lyallii			1b,2,3	c	St
Drosera arcturi			1a,2,3	c	Vw
*Echium vulgare			1a	o	T/H
Epilobium alsinoides			1a,1b,2	o	Rt,St
Epilobium atriplicifolium			1a,1b,2,3o	St,Rt	
Epilobium brunnescens ssp. brunnescens			1b	o	Aw
Epilobium brunnescens ssp. minutifolium			1a	o	Rb
Epilobium chionanthum	#		1a	o	Vw
Epilobium chloraefolium			2	u	St
*Epilobium ciliatum			1a	o	Vw
Epilobium elegans		1?		o	Rt
Epilobium glabellum			3	o	Ro
Epilobium insulare			1a	o	lc Vw
Epilobium komarovianum			1a,2	c	Vw,Aw
Epilobium macropus			1a,1b	o	Rb
Epilobium melanocaulon			1a,1b	c	Rb
Epilobium microphyllum			1a,1b	o	Rb
Epilobium pedunculare			@		
Epilobium porphorium			2,3	o	Sc
Epilobium pubens			1b	o	Ro
Epilobium tasmanicum			1b,2,3	o	Fe
Epilobium tenuipes			1a	o	Rt
Epilobium sp "Umbrella"?			1b	o	Ro
Euchiton audax			1a,1b	o	Rt,St
Euchiton laterale			1a,2	lc	Vw
Euchiton traversii			1a,1b	o	Rt,St

Euphrasia australis?		2	o	Sn
Euphrasia zelandica	#	1a,1b,2 ,3	o	St,Rt
Forstera sedifolia		@		
Fostera tenella		1b	o	St
*Galium aparine		1a	o	Vw
Galium perpusillum		1a,1b	o	Rt,St
Galium palustre	#	1a	o	Rt
Gentianella amabilis		1a,2,3	c	Vw,Aw
Gentianella bellidioides		1b,2	o	St
Gentianella corymbosa	?	2	o	St
Gentianella divisa		3	o	Sc
Gentianella grisebachii/ matthewsii		1a,1b	o	Rt,Vw
Gentianella serotina	#	1a,3	lc	Rt
Geranium aff. microphyllum	(eastern SI)	1a,1b,2	c	Rt,St
Geranium brevicaule		1a,1b,3	c	Rt,St
Geum leiospermum		1b,2	o	St
Geum cockaynei		1b,2,3	o	Ro
Geum uniflorum		2	o	Sn
Gingidia decipiens		2,3	o	Ro
Gingidia montana		1b	o	Ro
Gnaphalium ephemerum		1a	o	Ah
Gonocarpus aggregatus		1a,1b	lc	Rt,Vw
Gonocarpus micranthus		1a,1b,2	c	Vw,Rt
Gunnera dentata		@		
Gunnera monoica		1b	o	St
Haastia sinclarii var. fulvida		3	o	Sc
Hebejeebie densifolia		1b,2	c	Fe
Hectorella caespitosa		2,3	o	Fe
Helichrysum filicaule		1a,1b,2	c	Rt,St
*Hieracium lepidulum		1a,2	o	Rt
Hydrocotyle heteromera		@		
Hydrocotyle hydrophila?		@		
Hydrocotyle microphylla		1,2	o	Vw,Aw
Hydrocotyle novae-zelandiae var. montana		1a,1b,2	c	Vw,Aw
Hydrocotyle nz var. novae-zelandiae?		1b	o	St
Hydrocotyle moschata		@		
Hydrocotyle sulcata		1a,2	lc	Vw
*Hypericum perforatum		1a	o	Rt
*Hypochaeris radicata		1a,2	o	Rt,St
Kirkianella novae zelandiae		1a	o	Rt
Lagenophora barkeri		1a,1b	lc	Vw,Rt
Lagenophora cuneata		1a,1b,2	o	St,Rt
Lagenophora pinnatifida		3	o	Fo
Lagenophora strangulata		3	o	Fo
Leptinella pectinata var. wilcoxii		1b,2,3	c	Fe,Ro
Leptinella squalida var. mediana		1a,1b,2	c	Vw,Aw
Leptinella pusilla		@		
Leucogenes grandiceps		1b,2,3	c	Fe,Ro
*Linum catharticum		1a,1b,2	o	Rt,St
Lobelia angulata		1a,b	c	Vw,Aw
Lobelia glaberrima		2	o	Ro
Lobelia ionantha		1a		If Lt
Lobelia linnaeoides		2	o	St
Mazus radicans		@		
*Matricaria matricarioides		1a,1b	lc	T/H
Mentha cunninghamii		1a,1b	o	Vw,Rt
*Mimulus moschatus		1a,1b,2	o	Vw,Rb
Montia fontana		1a,2	o	Vw,Rb
Montia sessiliflora		2,3	o	Sc
*Mycelus muralis		1a	o	Sh
Myosotis australis		2	u	Ro

*Myosotis laxa ssp. caespitosa		1a	o	Vw
Myosotis macrantha		1b,2,3	o	Ro
Myosotis pulvinaris	#	2	o	Ro
Myosotis drucei		2	o	Fe
Myriophyllum pedunculatum ssp. novae-zelandiae		1a	a	Lt
Myriophyllum triphyllum		1a	o	Vw
Nertera bafouriana		1a,3	o	Vw
Oreostylidium subulatum		1a	lc	Vw
Ourisia caespitosa		1b,2	c	Ro,Rb
Ourisia glandulosa		2,3	o	Sn
Ourisia spathulata ?	#	1b,2	o	Ro,Fe
Oxalis magellanica		@		
Pachycladon cheesemanii		2	u	Ro
Pachycladon novae-zelandiae		3	o	Ro
Pachycladon wallii		1b,2,3	o	Ro
Parahebe decora		1a,1b	o	Rt,St
Parahebe brevistylis		@		
Parahebe lyallii		@		
*Parentucia viscosa		1a	lc	R/H
Phyllachne colensoi		2,3	c	St,Sn
*Pilosella officinarum		1a,1b,2	c	Rt,St
Plantago lanigera		1b,2	o	St
*Plantago major		1a	lc	R/H
Plantago novae-zelandiae		2	o	St
Plantago raoulii		2	u	St
Plantago triandra		1a,1b,2	lc	Vw,Lt
Plantago uniflora		3	o	Aw
*Prunella vulgaris		1a,2	o	Rt
Pseudognaphalium luteo-album		1a	o	Rt
Ranunculus amphitrichus		2,3	o	Fo
Ranunculus buchananii		2,3	o	Ro
Ranunculus cheesemanii		3	o	Aw
Ranunculus crithmifolius		2	o	Sc
Ranunculus foliosus		1a,1b,2	o	Aw,Vw
Ranunculus glabrifolius		1a	o	Vw
Ranunculus gracilipes		1b,2	c	Aw,St
Ranunculus multiscapus		1a,1b,2	c	Rt,St
Ranunculus maculatus	#	1a,2	lo	Aw,Vw
Ranunculus pachyrrhizus		2	u	Sc
Ranunculus pilifera		2,3	o	Sc
Ranunculus reflexus		1b	o	Sh
Ranunculus royi		3	o	Sn
Ranunculus scripthalis		2	r	Sc
Ranunculus simulans		1a	r	Vw
Ranunculus ternatifolius	#	1a	o	Rt
Raoulia australis		1a	o	Rt
Raoulia buchananii		1b,2	c	Ro
Raoulia glabra		1a,b,2	o	Rt,St
Raoulia grandiflora		1b,2,3	c	St,Sn
Raoulia subsericea		1a,1b,2,3f	Rt,St	
Raoulia subulata		2	lc	Sn
Raoulia tenuicaulis		1a,1b,2	o	Rb,Fe
*Rumex acetosella		1a,1b,2	o	Rt,St
*Rumex crispus		1a	o	Rt
Rumex flexuosus		1a,b	o	St,Rt
*Sagina procumbens		1a,b	o	Rb
Schizeilema cockaynei		1a,b	lc	Vw
Schizeilema cyanopetalum		3	o	Ro
Schizeilema haastii		1b,2	c	Ro
Schizeilema trifoliolata		@		
Scleranthus brockiei		1a,1b	o	Rt

Scleranthus uniflorus			1b,2,3	o	Fe,St
Senecio aff. sylvaticus	#		1a	lo	Ah
Senecio dunedinensis			1b	lo	Ro
*Senecio jacobaea			1a	o	Rt
Senecio quadridentatus			1a	o	Ro
Senecio wairauensis			1b,2,3	o	Rb,Fo
*Spergularia media			1a	o	T/H
*Stellaria alsine			1a,2	o	Vw
Stellaria gracilentia		1a,1b,2,3		o	Ro,Ah
*Stellaria media			1a	o	Rt
Stellaria roughii			2,3	c	Sc
Taraxicum magellanica			2	o	Sn,St
*Trifolium pratense			1a	o	Rt
*Trifolium repens			1a,1b	c	Rt,St
Urtica incisa			3	o	Fo
Utricularia dichotoma			1a	lc	Vw
*Verbascum thapsus			1a	o	Rt
*Veronica serpyllifolia			1a,2	o	Vw
Viola cunninghamii			1a,1b,2,3	o	Rt,St
Viola filicaulis			3	o	Fo
Wahlenbergia albomarginata			1a,1b,2,3	c	Rt,St

Monocots

Grasses

*Agrostis capillaris			1a,1b,2	c	Rt
Agrostis muelleriana			2,3	o	Fe,Sc
Agrostis muscosa			1a	lc	Rt
Agrostis pallescens			3	o	Aw
Agrostis personata	#		1a,3	o	Vw,Sn
Agrostis petriei			@		
*Anthoxanthum odoratum			1a,1b,2,3f		Rt,St
*Bromus mollis			1a	o	Rt
Chionochloa conspicua			3	o	Fo
Chionochloa crassiuscula			3	o	St
Chionochloa macra			1b,2,3	a	St
Chionochloa rigida var. rigida			1a,1b,2,3a		St
Chionochloa rubra var. cuprea			1a	a	Rt
*Cynasorus cristatus			1b	o	Rt
*Dactylis glomerata			1a	o	Rt
Deschampsia cespitosa	#		1a,2	o	Vw,Lt
Deyeuxia avenoides		#	1b,2	o	St
Dichelachne crinita			@		
Elymus rectisetus?			1a,1b	o	Rt,St
Elymus sp. "glaucous"			1a		
Festuca matthewsii			2,3	o	St
Festuca novae-zelandiae			1a,1b,2,3a		Rt,St
*Festuca ovina			1a	o	Rt
*Festuca rubra			1a,1b,2	o	Rt,St
*Holcus lanatus			1a,1b,2	c	Rt,St
Koeleria cheesemanii			1b,3	o	Ro
Koeleria novo-zelandica			3	o	Sc
Lachnagrostis lyallii		#	1a	lc	Lt
Lachnagrostis pilosa ssp. pilosa?			@		
Lachnagrostis striata					
Lachnagrostis uda?		#	1a	o	Vw
Poa anceps			3	o	Ro
*Poa annua			1a,2	o	T/H,Rt
Poa breviglumis			1b,2	o	Ro,St
Poa cita			1a,1b	o	Rb,Rt
Poa colensoi		#	1a,1b,2,3	f	Rt,St
Poa incrassata	#		2	lc	Sn

Poa imbecilla		3	o	Fo
Poa kirkii		2	o	St
Poa lindsayii		1a	o	Ah
Poa novae-zelandiae	#	1b,2	lc	Ro
*Poa pratense/trivalis		1b,2	lc	St
Poa schistacea		3	o	Sc
Rytidosperma australis		1a,1b,2	o	Aw,Vw
Rytidosperma buchananii		1b,2	c	Rb
Rytidosperma gracile		1a,1b,3	o	Rt,St,Fo
Rytidosperma pumilum		1a,2,3	o	Rt,Ah
Rytidosperma setifolium		1b,2,3	o	Ro
Trisetum lepidum		1b	o	St
Trisetum tenellum		1b	o	St

Sedges

Carex berggrenii		1a,b,2	o	Vw
Carex breviculmis		1a	o	Rt
Carex capillacea?		1a	o	Vw
Carex carsii	#	1a	c	Vw
Carex colensoi		1a	o	Rt
Carex comans		@		
Carex coriacea		1a,1b,2	lc	Vw,Rt
Carex diandra		1a,1b	lf	Vw
Carex echinata	#	1a,2,3	c	Vw
Carex ensyii	#	2	lc	Aw
Carex flagellifera		1a	o	Rt
Carex gaudichaudiana		1a,1b,2,3c	Vw,Aw	
Carex lachenalii subsp. parkeri		2	lc	Aw
*Carex ovalis		1b,2	lo	Vw
Carex petriei		1b	o	Rb
Carex pyrenaica var. cephalotes		3	o	Sn
Carex secta		1a,3	lo	Vw
Carex sinclairii		1a,3	lc	Vw
Carex tenuiculmis	#	1a	lc	Vw
Carex wakatipu		1a,1b,2,3o	St,Rt	
Carpha alpina		1a,2,3	c	Aw,Vw
Eleocharis acuta		1a,1b	lc	Vw
Eleocharis gracilis		1a,1b	lc	Vw
Isolepis aucklandica		2	c	Aw
Isolepis habra		1a	o	Vw
Machaerina anthrophylla		1a	lf	Vw
Oreobolus pectinatus		1a,1b,2	f	Vw,Aw
Oreobolus strictus		1a	lo	Vw
Schoenus pauciflorus		1a,1b,2,3f	Vw,St	
Uncinia clavata		@		
Uncinia divaricata		1a,1b,2	c	Rb,St
Uncinia fuscovaginata		2	o	St
Uncinia gracilentata		@		
Uncinia rubra		1a	o	Rt
Uncinia uncinata		3	o	Fo

Orchids

Chiloglottis cornuta		@		
Corybas trilobus		@		
Microtis oligantha		1a	o	Vw
Microtis unifolia		1a,1b	o	Rt,St
Prasophyllum colensoi		1a,1b	o	Rt,St
Thelymitra longifolia		1a	o	Rt
Pterostylis sp.		2	u	Fo

Rushes

Centrolepis ciliata		1a,2	o	Vw
Centrolepis pallida		2	o	Aw
Empodisma minus		1a	o	Vw
Juncus antarcticus		1a,2	o	Vw,Aw
*Juncus articulatus		1a	o	Vw
*Juncus bufonius		1a	o	T/H
*Juncus conglomeratus?		1a	o	Vw,Rt
Juncus gregiflorus		@		
Juncus novae-zelandiae		1b	o	Vw
Juncus pusillus	#	1a,2	lc	Aw,Vw
*Juncus tenuis		1a,b	o	T/H
Luzula leptophylla		1a,2,3	o	Aw,Vw
Luzula limosa?		@		
Luzula migrata		@		
Luzula pumila		1b,2	c	Fe
Luzula rhadina		3	o	Sc
Luzula rufa		1a,2,3	c	Rt,St
Luzula traversii		1b,2	c	Ro
Marsippospermum gracile		2,3	f	Sn,St
Other monocots				
Arthropodium candidum		@		
Astelia graminea		3		
Astelia nervosa		1b,2,3	o	Fo
Bulbinella angustifolia		1b,2	c	St,Vw
Cordyline australis		3	c	Sh
Phormium cookianum		1b,2,3	o	St
Potamogeton cheesemanii		1a	lo	Vw

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