Toitu te Land whenua Information New Zealand

Crown Pastoral Land Tenure Review

Lease name :Gem Lake

Lease number :PO 122

Conservation resources report

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

DEPARTMENT OF CONSERVATION

REPORT ON TENURE REVIEW OF

GEM LAKE PASTORAL LEASE (P122)

UNDER PART 2

CROWN PASTORAL LAND ACT

(24917)

TABLE OF CONTENTS

		Page
PART 1		
1.1	Introduction	3
PART 2		
Inherent Values: Description of Conservation Resources and Assessment of Significance		3
2.1	Landscape	3
2.2	Landforms and Geology	11
2.3	Climate	12
2.4	Vegetation	13
2.5	Fauna	24
2.5.1	Invertebrate Fauna	24
2.5.2	Herpetofauna	27
2.5.3	Aquatic Fauna	28
2.5.4	Avifauna	28
2.5.5	Problem Animals	29
2.6	Historic	31
2.7	Public Recreation	32
2.7.1	Physical Characteristics	32
2.7.2	Legal Access	32
2.7.3	Activities	33
PART 3		33
Other Relevant Matters and Plans		
3.1	Consultation	33
3.2	District Plans (Matters of National Significance)	34
3.3	Conservation Management Strategy	34
3.4	New Zealand Biodiversity Strategy	34
PART 4		35
Maps etc.		
4.1	Additional Information	35
4.2	References	35
4.3	Illustrative Maps	36
4.3.1	Topo/cadastral	36
4.3.2	Landscape Values	36
4.3.3	Ecological Values	36
	Appendices	

PART 1

1.1 INTRODUCTION

The lessees of Gem Lake pastoral lease have applied to the Commissioner of Crown Lands for a review of tenure. The property was inspected on several occasions over the summer of 2001/02. Repeat inspections were required to complete the assessment of the inherent values present on the property due to inclement weather.

The property had been assessed for some of its conservation values previously, namely the Protected Natural Areas Programme Survey (PNAP) of the Umbrella Ecological District in 1986 and subsequent inspections by the department in the late 1980's for PNAP Implementation and assessment of historic resources.

The PNAP survey identified a large recommended area for protection (RAP) on the central and northern end of the Whitecoomb Range in the Umbrella Mountains. The northern part of this RAP, Umbrella 1, Whitecoomb - Gem Lake - Argyle Burn, is located on Gem Lake pastoral lease.

Gem Lake is a medium sized pastoral lease of 5613ha. It comprises a large run block of 5500 ha, located off Aitcheson Runs Road in the upper catchment of the Pomahaka River some 32km from Ettrick. A smaller cultivated holding of pastoral lease (113ha) is located on Wilden Runs Road, 20km's distant from the run block. The homestead and supporting freehold is located 2km from Ettrick.

This report describes the conservation resources of the run block only. There are no conservation resources remaining on the small cultivated part of the property.

PART 2

Inherent Values : Description of Conservation Resources and Assessment of Significance

2.1 LANDSCAPE

METHODOLOGY

For this assessment, Gem Lake has been divided five landscape units with the boundaries being defined principally by changes in aspect and land cover. After defining the landscape units (LU's) the following assessment criteria was applied to each unit to help determine its distinctive character and landscape values.

LANDSCAPE CHARACTER DESCRIPTION

This section of the assessment explains the overall appearance of the LU using common descriptive terms to help create a "mental picture" of the primary elements, which include:

- Landform - which reflects the topography and natural processes such as erosion and weathering.
- Land cover - which covers vegetation and water bodies.
- Land use - which reflects cultural and social processes such as farming.

ASSESSMENT OF LANDSCAPE VALUES

The criteria used to assess and evaluate each of the landscape units is based on the following attributes.

- Naturalness - which is an expression of the degree of indigenous content of the vegetative cover, and the extent of human intervention.

- Legibility - which is an expression of the clarity of the formative processes and how striking these physical processes are.

- Aesthetic values - which includes the concepts of memorability and naturalness. Aesthetic factors which can make a particular landscape vivid include simplicity in landform, muted colours and fine textured ground cover.

VALUES THAT WILL BE ASSESSED WHEN APPROPRIATE

Other values that may be assessed when considered appropriate include:

- Transient values - ephemeral events such as the occasional presence of wild life.

- Landscapes commonly valued - quintessential landscapes reflected in popularity through photographs, art work, tourism and recreation.

- Historical values - areas containing high heritage importance.

VISUAL VALUES

Visual values is a subset of landscape values and relates to the visibility of a particular landscape or natural feature as seen from key viewing locations such as regional highway system, viewing points within a township, tourist routes and recreational areas.

A term frequently used is "visual amenity" which is basically the value of a particular view in relation to what is seen and how people respond to it.

POTENTIAL VULNERABILITY TO CHANGE

This is a measure of each landscape unit's susceptibility to further modifications based primarily on the criteria set out in the Methodology. In general terms the less modified an area is, the more vulnerable to further change as a result of human activities that unit is likely to be.

LANDSCAPE UNIT 1

DESCRIPTION

This unit encompasses the south-east corner of the property, where it adjoins the adjacent Whitecoomb pastoral lease. The eastern boundary is physically defined by the Pomahaka River. The north and west boundaries are less definable but generally follow the 900m. asl. contour, the level at which there has been response to previous oversowing and topdressing. The unit has primarily a southern aspect which makes it naturally cold country for farming. It also has a

cross section that changes from being a wide v-shaped valley in its upper and mid sections to a more enclosed river gorge in the lower section.

The dominant landform is the series of long round crested ridges that lead off The Nobbies. These moderately steep ridges are separated by gullies, some of which are incised by the entrenched channels of water-courses that follow a sequence of plunge pools, rocky white water and the occasional waterfall before draining into the Pomahaka River.

The sources of many of the water-courses are the waterlogged flushes on the summit and upper slopes of The Nobbies. Another physical feature is the old earth flows that are detectable by localised rotational slumping. Protruding out from the side gullies is the occasional outcropping of base rock, with smaller rock formations scattered close to the crest of the spurs.

The vegetative pattern within the unit has been heavily influenced by past progressive farming methods with most of the colluvial side slopes now clad in a sward of introduced grasses - legume pasture. A notable feature is the wide distribution of *Bulbinella*, or Maori onion, through the pasture; its presence may be due to the naturally damp conditions or the induced state of the land. There is a spasmodic representation of short tussock on steeper slopes while on the colder shady faces there are patches of fernlands.

Several of the more substantial gullies contain fingers of continuous beech remnants. These ribbons of forest span from the top edge of the unit down to the river's margin. Natural barriers to fire and inaccessibility for stock grazing govern the width of the remnants. Small outliers of both beech and *Olearia* shrublands are intermittently located away from the main remnants; these outliers are again usually located in areas protected from previous fires and stock grazing. The species of beech varies depending on the stream catchment with silver beech being the dominant in the McEwens Bush catchment while in the neighbouring catchment red beech and hybrids are more prominent. The shrub layer within each beech remnant is consistent with a strong representation of *Coprosma*, broadleaf , peppertree, weeping mapou, wineberry, *Astelia*, marbleleaf and filmy ferns. There are discontinuous lines of crack willow extending down the margins of some of the tributaries as well as the occasional willow along the river's edge.

The primary land use is extensive grazing of both wethers and cattle with the unit being subdivided into two large grazing blocks. A well maintained access track follows the 550m.asl. contour before it drops down to the Jordan Creek. Close to the southern boundary the pastoral lease's covered yards and other facilities associated with the farming operation are located.

LANDSCAPE VALUES

In an aesthetic context, this unit is distinctive and vivid owing to:

- The repetitive nature of the beech remnants helps to generate a sense of local identity.
- The lineal pattern formed by the beech remnants that contrast with the open grasslands.
- The striking contrast in colour between the dark olive green of the beech forest and the light green of the pasture.
- The coarse texture of the forest canopy that contrasts sharply with the fine texture of the surrounding grasslands.

Collectively these attributes create a rural landscape, which has distinctive parkland qualities primarily owing to the edges of the remnants being continually "manicured" by stock browsing and camping. In a natural situation the beech remnants would be surrounded by a margin of woody shrublands that provide the beech forest with protection from adverse climatic conditions. Although the existing artificial conditions are aesthetically pleasing, from an ecological aspect there is concern about the remnants' long term sustainability as the edges are slowly being depressed.

The beech forest that lines the gorge provides the river with a natural setting, in many places these forest remnants help to screen the extensive modifications that have occurred to the lower and mid altitude slopes.

VISUAL VALUES

The beech remnants juxtaposed against the introduced grasslands are visually striking and memorable. Additionally the line of beech helps to enclose the river gorge and provide it with wild and scenic characteristics that again contrast markedly with the open section of the river further down stream.

POTENTIAL VULNERABILITY TO CHANGE

The potential changes to the inherent landscape characteristics of this unit include:

- Decline in the ecological health of the forest remnants due to the depletion in species, especially the more palatable fringe species such as wineberry and broadleaf.
- Further breaches in the forest's edge which will allow for wind damage and invasion of weed species.
- Loss of wild and scenic qualities along the river due to the forest remnants becoming discontinuous.
- Introduction of large scale plantation forestry.

LANDSCAPE UNIT 2

DESCRIPTION

This unit consists of the long ridge that runs parallel with the Whitecoomb Range and is defined in the west by Jordan (Black) Creek and on the eastern side by the mid slopes (about the 900m.asl. level) that overlook the Pomahaka River. This ridgeline is commonly known as The Nobbies, and features a flat narrow crest, the highest point being at the southern boundary at 1,155m.asl. The flat top contains several waterlogged flushes some of which extend over the shoulder of the crest. Also featured along the crest are a scattering of tors some of which have a distinctive castellated appearance. The side slopes are typified by a sequence of rounded colluvial faces which are divided by lightly indented gullies, many of which have permanent water courses that drain into Jordan Creek.

The ground cover is strongly influenced by altitude, aspect and grazing pressure. On both the north and eastern flanks there is a co- dominance between modified tussock and pasture grasses while above the 900m.asl. contour the composition changes to primarily narrow-leaved tall

tussock with an intermingling of golden speargrass. The stature and density of the tall tussock depends primarily on aspect with the tussock being more vigorous on the shady slopes. The margins of the tarns and flushes still have turf communities, although these fragile areas have been modified in localised areas by cattle pugging. On the warmer faces there are isolated mats of hawkweed.

The land use is primarily extensive summer grazing with the unit being subdivided into several large grazing blocks.

LANDSCAPE VALUES

This unit conveys a relatively high degree of indigenous natural character owing to the large component of native ground cover. Although the landscape does not have any vivid or outstanding natural features, it is representative of the West Otago high country with its flat-topped crest, tall tussock grasslands, castellated tors and wetlands.

The unit's aesthetic appeal stems from the continuous cover of the tall tussock that is only broken intermittently by stock camping around the tors. This unit conveys "back country" qualities attributable to the lack of formed tracking and the presence of any other "built" elements.

From an ecological perspective there is still an opportunity to link these tall tussock grasslands with the lower beech forests in at least one whole catchment of the eastern tributaries.

VISUAL VALUES

This unit represents much of the middle ground that gives the high country its open and spacious qualities. It is only visually significant from localised viewing points owing to the higher ridges and rangelands that surround The Nobbies.

POTENTIAL VULNERABILITY TO CHANGE

This unit is relatively vulnerable to change due to:

- Intensification of land-use.
- Fragmentation of the tall tussock grassland by further subdivision that would break up the coherent tussock cover.
- The replacement of the existing tall tussock with other native or introduced species.
- Insensitive earth disturbances associated with the formation of tracks. Such earthworks could create corridors for adventive species to encroach into natural areas.
- Damage to wetlands by stock concentration.
- Loss of backcountry qualities by the introduction of "built" elements.

LANDSCAPE UNIT 3

DESCRIPTION

This unit incorporates the crest of the Whitecoomb Range at the northern tip of the Umbrella Mountains and the south east facing slopes that overlook Jordan Creek. The altitudinal range extends from 1,442m.asl. which is the high arête directly behind Gem Lake, then descending to 800m.asl. close to where Jordan Creek connects with the Pomahaka River. The cross section of the valley that incorporates the corresponding faces of The Nobbies varies in width, with the upper catchment characterised by a large basin (located within Whitecoomb pastoral lease) while the mid section is a wide v-shaped valley that becomes gorge-like in appearance as it descends towards the Pomahaka gorge.

This unit contains a diverse assemblage of ground surface features, many of which are associated with earth slumping and water logging which gives the landscape a rumpled appearance. The side slopes are dissected by steep sided gullies that are etched into the colluvial surface. The water-courses that are contained within these gullies follow a winding route that connect up to form major tributaries that feed into the Jordan Creek. Frequently where the slopes are over-steepened the streams tumble down over short waterfalls. Breaking the rounded slopes are the occasional outcroppings of base rock, some of which form impressive bluffs.

A notable feature along the crest of the Whitecoomb Range is the legible glacial activity, especially the cirque that penetrated into the eastern side of the crest. Enclosed within this cirque is Gem Lake, an alpine glacial lake formed by a terminal moraine that has created a natural dam to restrict the release of melted snow water. Other natural features associated with glaciation include the deposits of talus around the edges of the lake as well as the rocky head walls.

For most of the unit, good condition tussock grasslands dominate the vegetation with intact wetlands occupying the damp flushes. There is also a wide distribution of shrublands that include both *Hebe* and turpentine scrub. Below the 900m.asl. level there is a grading in of exotic grasses, which generally follows a transition with the introduced grasses becoming dominant below this level. Within the alpine zone there are large tracts of bare ground with a presence of low cushion plants.

LANDSCAPE VALUES

The assemblage of natural features and processes within this unit are highly legible making it a memorable high country landscape. The physical processes, which are most conspicuous, include those associated with glaciation in the form of vertical buttresses, arête, deposits of talus and the alpine glacial lake. There are also numerous scalloped hollows (nivation process) that are usually occupied by permanent snow. A dynamic characteristic of this unit is the large lobes of water-logged ground that convey an overall impression of land instability. In a broader context this unit forms an integral part of a much wider West Otago high country landscape that extends over much of the Umbrella Mountains and is typified by its extensive, wild and remote qualities.

VISUAL VALUES

Along the summit of the Whitecoomb Range limitless views of the surrounding district are obtained, especially towards the Waikaia Forest and the Garvie Mountains. Furthermore the

Umbrella Mountains form the backdrop and setting for much of the West Otago upland country.

POTENTIAL VULNERABILITY TO CHANGE

This unit is highly vulnerable to possible change, with the risks including:

- Inappropriate siting and style of structures along the skyline.
- Fragmentation of the unified native vegetation above the 900m.asl.
- Modifications to the wet flushes due to stock pugging.
- Any earth works that would be visible from the key viewing points.

LANDSCAPE UNIT 4

DESCRIPTION

This unit incorporates the large dome shaped ridge that extends out towards the north from the Jordan Creek catchment. The landform is dominated by the gently convex slopes that are slightly indented by the heads of numerous water courses that penetrate into the crest and form the origins of Island Creek. The flat sections of the crest are covered with bogs and wetlands that frequently extend below the crest line. Where the slopes dip there is a wide distribution of tors.

The vegetative cover is dictated strongly by drainage with the inherently wet areas being covered in a mosaic of sedges and mosses with a representation of red tussock around the margins. Over the free draining land, good condition snow tussocks are the dominant species.

LANDSCAPE VALUES

This unit has relatively high landscape values due to the overall impression of coherence of the vegetation. The variations in colour and texture of the different communities of sedges and tussocks form a recognisable visual pattern. The lack of variation in the relief contrasts markedly with the more dissected surrounding hill country which again gives landscape unit 4 a special identity. Additionally, the lack of "built" elements helps to reinforce the natural qualities and back country image.

VISUAL VALUES

This unit has limited visual resource values owing to the subdued nature of the terrain and few tracks in the area.

POTENTIAL VULNERABILITY TO CHANGE

This unit is highly vulnerable to change due to:

- Damage to wetlands by stock concentration and 4-wheel drive vehicles.
- Fragmentation of the existing mosaic of plant communities.
- Insensitive earth disturbances associated with the formation of tracks and dozed fence lines.

LANDSCAPE UNIT 5

DESCRIPTION

This unit is located at the north-east corner of the property and incorporates what is commonly known as the Island Country and the McGregor Country. The landform is dominated by a complexity of short spurs that extend out from the dome-shaped ridge to the west. Winding around these inter-locking spurs are several major streams that drain into the Pomahaka. Rocky formations are a feature along the ridges of the spurs.

Further to the south the slopes on the spurs become sheer, forming a gorge through which the Pomahaka flows. This gorge opens out into a wide valley below the McGregor Country.

The vegetative cover is determined by aspect and stock pressure with much of the original tussock cover now being sparse. The north-east faces are primarily modified short tussocklands, while on the darker faces there is still a representation of small stature snow tussock.

LANDSCAPE VALUES

A large proportion of this unit contains only moderate landscape values owing to the extensive modifications to the original ground cover with much of the Island Country and McGregor Country being described as representative of the local dissected hill country. Conversely the Pomahaka River gorge with its over-steepened slopes, rocky cliffs and ribbon of beech forest has high scenic values. The legibility of the natural processes involved in cutting down the river channel is extremely obvious and spectacular.

VISUAL VALUES

This unit is only visually accessible from a few tracks, which helps to reinforce the area's remoteness qualities. The river gorge is completely visually inaccessible which adds to its wild and scenic image.

POTENTIAL VULNERABILITY TO CHANGE

This unit's primary threats would include:

- Further depletion of the ribbon of beech through the gorge, eg. by uncontrolled fire.
- The opening up of the depleted tussocklands allowing opportunist species such as hawkweed and sorrel to establish.
- Further tracking over sensitive dry slopes where rehabilitation would be difficult.

SIGNIFICANCE OF THE LANDSCAPES

Two distinct landscape zones of significance have been identified on the property.

The first is the scenic river corridor (Parts of LU1 and LU5) along the Pomahaka River. This zone is visually striking and memorable, due to the presence of extensive beech forest remnants contrasting with the manicured adjoining grazing land, which creates a "parkland" appearance. There are concerns about the area's long term sustainability as edges are slowly being depressed through grazing pressure and overall lack of edge regeneration. This zone contributes to the

wild and scenic setting of the river landscape. The scenic river corridor extends into LU5 which is notable for its remoteness and lack of visibility from surrounding tracks.

The most extensive significant landscape is the uplands (Parts of LU3 and 5 and all of LU4, LU3 and LU2). This zone conveys a high degree of indigenous natural character, derived from an unbroken cover of tall tussock, dominant landforms including evidence of glaciation, large scale slumping activity, extensive wetlands. In a broader context, the zone forms an integral part of a much wider West Otago high country landscape that extends over much of the Umbrella Mountains and is typified by its extensive, wild and remote qualities.

2.2 LANDFORMS AND GEOLOGY

Overview

Basement rock of the property is Palaeozoic Haast Schist Group metamorphosed to textural sub-zone II, displaying strong schistosity with either weak or no foliation.

Landform is typically block-faulted and dictated to by the north-south trending Whitecoomb Range. Extensive upland plateaus are the eroded remnants of a mid Tertiary erosion surface which has undergone differential uplift and subsidence plus local tilting and warping have formed the lower hill country.

The present drainage pattern is largely superimposed and random. In cases where streams were present prior to uplift and the terrain has been greatly elevated, deeply incised and often gorge-like drainage channels have resulted eg. Pomahaka River and Jordan Creek.

Altitude ranges from 450m to the high point 1442m on the Gem Lake cirque headwall, on the summit ridge of the Whitecoomb Range.

Colluvial slopes flank water courses with rock bluff outcrops, which also feature along rounded ridge crests.

Geo-preservation Sites

There is one record of significant landform features located on the property which is listed in the Geo-preservation Inventory. This is a soil site (Soil site no. 400, Inventory of New Zealand Soil sites of International, National and Regional Importance, Part One, 1st edition). (See Appendix 1).

The site is located within RAP Umbrella 1, Whitecoomb – Gem Lake – Argyle Burn.

Soil types present include upland yellow-brown earths (Carrick, Dunstan) and organic soils (Kaherekoau). The site is ranked at 2 for importance. It is significant as it is a large area including a wide range of relatively undisturbed soils and soil-vegetation associations. Vulnerability is ranked at 2 as soil and/or vegetation is threatened by modification, in this case, threats include deer and possum, vehicle damage to wetland bogs and vegetation burning for pastoral farming.

PNAP Survey Results

The PNAP survey report for the Umbrella Ecological District identified RAP Umbrella 1 partly because of its landform values. These are described as follows, with particular reference to those landform features located on Gem Lake pastoral lease.

The Whitecoomb Range forms one of two major fault blocks present within the ecological district. The range has undergone uplift possibly combined with some warping and tilting. The altitude attained was great enough to allow minor glaciation in the pre-glacial heads of which the Gem Lake cirque presents the best example on the range and within the ecological district. A small terminal moraine blocks Gem Lake at c.1300m while lateral moraines descend eastwards towards Jordan Creek down to c.1220m. The cirque's southern spur comprises a colluvial crest while the northern spur is a lateral moraine. Within the cirque itself the initially scoured bedrock has been covered by solifluction debris with deposition of fine material within flushes. Rock bluffs forming the cirque headwall provide examples of ice-worn mammilated buttresses.

Seasonal nivation is still in progress with snow persisting in the most sheltered areas until mid to late December. Boulderfields are common on slopes below the rock bluffs.

Below the terminal moraine bordering Gem Lake, slumping and earth flow still occur.

McGregor Country/Island Country

The McGregor Country-Island Country block marks the landform transition in the Pomahaka valley from a deeply incised narrow gorge (e.g., at the Jordan Creek confluence) to an open, shallow basin profile at the Island Country and beyond. The river course correspondingly transitions from a more straight-running, swift passage to a contorted meander passage at the Island Country. An irregular pattern of lobate slump topography, with large solifluction lobes, in this block contrasts with the regular pattern of colluvial creep slopes below the Jordon Creek confluence.

SIGNIFICANCE OF THE LANDFORM

Soil sequences in the Gem Lake portion of RAP Umbrella 1 are ranked as being nationally significant due to the side range of relatively undisturbed soils and soil-vegetation associations. These soil sequences are vulnerable to threats such as modification through pastoral farming activities eg. burning, and vehicle damage to wetlands. The significance of these features is reflected in its identification in the Geo-preservation Inventory.

The evidence of glaciation, ie. the Gem Lake cirque and related landforms, is significant as being the best example present in the ecological district. This is the most easterly example of glacial landform in Southland.

2.3 CLIMATE

The property experiences a cool temperate, humid-subhumid climate. Precipitation rises to c.1500mm per annum in the uplands. In winter, a large proportion falls as snow, which can lie for up to four months of the year. Rainfall at lower altitudes is approximately 800mm per annum. Rainfall is generally evenly spread throughout the year and invariably is from the southwest quarter. Fogs may occur during all seasons and are often accompanied by rain. This climatic feature is characteristic of the ecological district. Summers tend to be mild and winters are cold with frequent frosts.

2.4 VEGETATION

Ecological Setting

Gem Lake Station is located on the eastern side of the Umbrella Mountains, in the central portion of the Umbrella Ecological District. The property extends from the Pomahaka River up to the summit of the Umbrella Range.

The Umbrella ED is c. 150, 000ha in area (Dickinson, 1988), which extends from the Clutha River in the east, to the Waikaia River in the west and from the southern extent of the Old Man Range in the north, southwards including the foothills, but generally excluding the lowlands and rolling hills of the Gore ED.

The original vegetation was dominated by beech forest (consisting of silver, mountain and red beech or a combination of these depending of the site), with narrow-leaved snow tussock above a treeline at 1000-1100m. Other sub-alpine and alpine communities include: red tussockland on poorly drained, broad summit ridges, slim snow tussock, shrubland, wetlands, rock faces and outcrops, snow banks and fellfields. Other communities include valley floor red tussockland, swamps and shrubland.

As a consequence of fires the forest has been heavily fragmented and much reduced in extent, with narrow-leaved snow tussockland moving down slope and red tussockland moving upslope. The arrival of Europeans and pastoralism, with associated grazing, burning, over-sowing, topdressing and cultivation, lead to a further wave of modification to the vegetation. The snow-tussocklands and other communities are generally much modified below 1000m, while sub-alpine and alpine areas generally remain little modified. The Southland Protection Strategy (Harding, 1999) listed the major ecosystems of the Umbrella ED (see Table 1).

TABLE 1 ECOSYSTEM ANALYSIS UMBRELLA ECOLOGICAL DISTRICT

Ecosystem type	Original extent (% of ED)	Proportion of original extent remaining (%)	Proportion of original extent protected (%)	Proportion of remaining area Protected (%)
Montane toutouwai-mixed beech forest	40	30	19	65
Montane titipounamu-silver beech forest	35	5	5	40
Montane mixed shrubland on colluvium	2	5	<1	5
Montane gecko-lichenfield on tors and bluffs	1	90	36	40
Subalpine red tussockland-mossfield-rushland	2	90	0	0
Alpine karearea-snow tussockland	10	100	0	0
Alpine mossfield-sedgeland	5	100	0	0
Alpine herbfield-cushionfield-rockland	5	100	0	0

DESCRIPTION OF THE PROPERTY

The property can be considered in three parts, these being The Nobbies block, the Umbrella block and the Island Country/McGregor Country block.

The Nobbies block consists of the area containing The Nobbies, bounded by the Pomahaka River to the east, Jordan Creek to the north and west and Whitecoomb Station to the south. This block has an altitude range of c.350m along the Pomahaka River up to 1155m on the summit of The Nobbies. The upper altitudes are dominated by narrow-leaved snow tussockland with wetlands, shrubland and rock tors. Below c.1000m the tussock cover becomes more open, with exotic grass cover becoming dominant. On the lower slopes there is extensive modified fescue tussock with pasture below. The other native communities found are beech forest and shrublands, which are largely confined to gullies and along the Pomahaka River.

The Umbrella block extends from the Jordan Creek onto the summit of the Umbrella Mountains (including the eastern and northern tributaries. This block has an altitude range of c.500m at the mouth of the Jordan Creek up to 1442m on the summit of the Umbrella Range above Gem Lake. The upper altitudes are dominated by narrow-leaved snow tussockland with some major wetlands, and small amounts of shrubland, shrub-tussockland, fellfield, herbfield, snowbanks and rock tors/rock faces. Below c.900m the tussock cover becomes more open, with exotic grass cover becoming dominant. On the lower slopes there is extensive modified fescue tussock with pasture below. Other native communities found are beech forest and shrublands, which are largely confined to the lower Jordan Creek.

The Islands Country/McGregor Country block is the northern part of the property, including Island Creek catchment and other tributaries of the Pomahaka River north of Jordan Creek. This block extends from c. 600m along the Pomahaka River up to c.1380m on the summit north of Gem Lake. The upper altitudes are dominated by narrow-leaved snow tussockland with some major wetlands, and small amounts of red tussockland, shrub-tussockland, fellfield, herbfield, snowbanks and rock tors. Below c.1000m the tussock cover becomes more open, with exotic grass cover becoming dominant. On the lower slopes there is extensive modified fescue tussock with pasture below. Other native communities found are beech forest and shrublands, which are largely confined to the Pomahaka Valley.

DESCRIPTION OF THE VEGETATION

The vegetation is described for each of the three blocks on the property.

A THE NOBBIES BLOCK

Overview of the Ecological Values

Within this block the key values include:

- Extensive narrow-leaved snow tussockland
- Several large and diverse wetland/seepage systems
- Scattered large rock tors/outcrops
- Beech forest
- Sequences from the summit of The Nobbies down to the Pomahaka River

VEGETATION DESCRIPTION

Beech Forest

There are a series of beech forest on the eastern flanks of The Nobbies. These are largely confined to gullies flowing into the Pomahaka River and the Pomahaka Valley floor. The forest is dominated by silver beech (*Nothofagus menziesii*) with occasional red beech (*N. fusca*), mountain beech (*N. solandri* var. *cliffortioides*), hybrid beech and Hall's totara (*Podocarpus hallii*). Understory trees include scattered trees of marbleleaf (*Carpodetus serratus*), broadleaf

(*Griselinia littoralis*) and black mapou (*Pittosporum tenuifolium*). Other understory species include *Coprosma rhamnoides, C. ciliata,* hard fern (*Blechnum procerum*), water fern (*Histiopteris incisa*), *Hypolepis millefolium, Lagenifera strangulata, Viola filicaulis, Uncinia filiformis* and few other species.

Tussockland

Narrow-leaved snow tussockland: This is the major vegetation on the upper slopes and crest of The Nobbies. The snow tussockland is composed of narrow-leaved snow tussock (40% average, 30-60%), sweet vernal (*Anthoxanthum odoratum*, <15%), the moss *Polytrichum juniperinum*? (<10%), blue tussock (*Poa colensoi*, 6%), snowberry (*Gaultheria depressa* 5%), catsear (*Hypochaeris radicata*, 3%), Maori onion (*Bulbinella angustifolia*, 2%), *Viola cunninghamii* (2%), mouse-ear hawkweed (*Hieracium pilosella*, 2%), *Ranunculus multiscapus* (1%), *Lycopodium fastigiatum* (1%), comb sedge (1%), *Plantago lanigera* (1%), *Leucopogon fraseri* (1%) and many other species.

The areas of densest snow tussock (50+% cover) tend to be in damp sites. This community has much leaf litter and/or blue tussock or *Polytrichum juniperinum*, some snowberry, *Oreomyrrhis colensoi*, Maori onion, *Geranium microphyllum* and other species.

Wetlands

There is a series of relatively large wetlands that extend from the summit or upper slopes downslope on the eastern side. These wetlands contain a mosaic of communities depending upon slope, water table and other factors.

Wetland 1

The area described was at Grid Ref. NZMS F43 093 048 and is typical of wetlands on gentle slopes on the summit area.

Cushionbog

The cushion bog was dominated by comb sedge (*Oreobolus pectinatus*, 48% cover), bryophytes (35%, composed of *Dicranaloma* sp. 25%, *Racomitrium lanuginosum* 4%, others 6%), *Dracophyllum prostratum* (8%), *Abrotanella caespitosa* (6%), *Carex gaudichaudiana* (2%), *Drosera arcturi* (1%), *Phyllachne colensoi, Gentiana amabilis, Celmisia* sp. "gracilenta rhizomatous" and other species.

Sphagnum bog

This community was dominated by Sphagnum moss (*Sphagnum cristatum*, 70%), other bryophytes (20%), *Carex gaudichaudiana* (5%), *Phyllachne colensoi* (2%), comb sedge (1%), *Drosera arcturi* (1%), *Abrotanella caespitosa* (1%), *Gentiana amabilis* (1%), *Celmisia* sp. "gracilenta rhizomatous" and other species.

Wetland margin

This community is dominated by bryophytes (70%), *Carex gaudichaudiana* (12%) and narrow-leaved snow tussock (*Chionochloa rigida*, 10%), with *Dracophyllum prostratum* (5%), comb sedge (3%), *Phyllachne colensoi* (2%), *Abrotanella caespitosa* (2%), lichen (2%), *Drosera arcturi* (1%), *Carpha alpina* (1%), *Gentiana amabilis* (1%) and other species.

Wetland 2

This wetland is a hill slope flush area located at GR F43 086 043.

Upper flush

This area was dominated by bryophytes (60%) with *Celmisia* sp. "gracilenta rhizomatous" (8%), *Schoenus pauciflorus* (6%), Maori onion (4%), *Hydrocotyle microphylla* (4%), *Euchiton laterale* (4%), *Plantago uniflora* (3%), comb sedge (2%), *Uncinia divaricata* (1%), *Carpha alpina* (1%), *Viola cunninghamii* (1%), *Juncus pusillus* (1%), *Epilobium komarovianum, E. brunnescens, Pratia angulata* and other species.

Hill slope flush

This main part of the flush system is composed of bryophytes (70%), the liverwort *Marchantia berterona* (6%), *Epilobium komarovianum* (5%), *Hydrocotyle microphylla* (3%), Maori onion (2%), sweet vernal (2%), Yorkshire fog (*Holcus lanatus*, 2%), *Montia fontana*, (1%), *Pratia angulata* (1%), *Galium perpusillum* (1%), white clover (*Trifolium repens*, 1%), *Juncus articulatus* and other species.

Wetland 3

This wetland was a relatively large system on a hill slope at GR F43 093 043.

Herb bog

This community was composed of bryophytes (40%), *Hydrocotyle microphylla* (12%), comb sedge (10%), *Plantago uniflorum* (10%), sweet vernal (5%), *Celmisia* sp. "gracilenta rhizomatous" (4%), *Carex gaudichaudiana* (3%), *Juncus pusillus* (3%), *Euchiton laterale* (3%), *Ranunculus gracilipes* (2%), *Viola cunninghamii* (1%), *Ranunculus cheesemanii* and other species.

Other Communities

Rock outcrops

There are a series of rock outcrops along the summit ridge. Species associated with these outcrops include *Ranunculus royii, Leptinella pectinata, Schizeilema cyanopetalum, Celmisia lyallii, Cardamine debilis* agg., *Asplenium richardii, Acaena profundeincisa, A. caespitosa, Leucopogon fraseri* and others.

There was also some rock outcrops above bushline in McEwens Creek.

Other features

On some south faces were localised areas of *Dracophyllum uniflorum.* In McEwens Creek above bushline were some scattered mountain flax (*Phormium cookianum*).

B UMBRELLA BLOCK

Overview of the Ecological Values

Within this block the key values include:

- A diversity of alpine communities, which form a mosaic determined by exposure, the length of snow lie, exposure, water table/drainage, topography and other site factors. These communities include tussocklands, wetlands, snowbanks, rock faces, boulderfields, herbfields and fellfields.
- Several large and diverse wetland/seepage systems.
- Extensive narrow-leaved snow tussockland.
- Beech forest remnants
- *Olearia fimbriata* stands
- Low altitude shrublands
- A very diverse flora
- A number of nationally and regionally threatened and uncommon species

VEGETATION DESCRIPTION

Forest

Beech forest

A narrow and discontinuous tongue of silver beech forest is found in the lower and middle reaches of Jordan Creek. The general description and values are similar to forest areas within The Nobbies block.

Olearia treeland

Olearia fimbriata occurs as small stands of a dozen to several dozen trees. These are a minor but important community. It is likely that the community was more widespread and has been confined by fires. The community either forms a dense or discontinuous canopy about 6m tall. These stands are often dominated by *O. fimbriata* with no other species. Stock tend to concentrate under these stands and as a result the ground is often bare and there is no regeneration.

Shrubland

Shrubland is uncommon both on the property and in this block. There are two major types of shrubland, these being low altitude *Coprosma* dominant and high altitude *Dracophyllum uniflorum* shrubland.

Coprosma-mixed shrubland

This community is uncommon having been fragmented by past fires. It is generally associated with forest margins. The major species is mingimingi, with some *Coprosma rigida, Corokia cotoneaster*, matagouri (*Discaria toumatou*) and sometimes *Olearia lineata, O. fimbriata*, black mapou (*Pittosporum tenuifolium*) and other species. This community is a successional stage back to forest.

Dracophyllum uniflorum shrubland

Dracophyllum uniflorum forms a shrubland on shady aspects above c. 1200m.

Shrub tussocklands

Shrub-grassland

This community is found on shady faces above and between beech forest in the mid Jordan Creek. The community is discontinuous and the condition and density of the non grass component is variable. The species found include mountain flax, prickly shield fern, mingimingi, native broom, mountain ribbonwood (*Hoberia lyallii*), koromiko (*Hebe salicifolia*), inaka (*Dracophyllum longifolium*), golden speargrass (*Aciphylla aurea*), *A. glaucescens*, narrow-leaved snow tussock and *Chionochloa conspicua*.

Shrub-tussockland

Both *Hebe anomala* and cottonwood (*Ozothamnus vauvilliersii*) are co-dominant with narrow-leaved snow tussockland at some sites. These sites are generally on shady aspects with the cottonwood on damper sites than *Hebe anomala*.

Tussockland

Tussocklands are the most extensive community on the property. Narrow-leaved snow tussock is dominant above c. 900m, below this is a fescue tussock zone grading into exotic grass. Other minor communities are blue tussockland and slim snow tussockland.

Modified fescue tussockland

This community is found below the narrow-leaved snow tussock zone. The condition and naturalness increases with altitude. Above Jordan Creek (Grid Ref. NZMS 260 099 070) the community is dominated by exotic grass with fescue tussock (5%), bryophytes (10%), snowberry (3%), catsear (3%), hawkweed (3%), blue tussock (2%), *Leucopogon fraseri* (2%), *Ranunculus multiscapus* (2%), Maori onion (*Bulbinella angustifolia*, 2%), *Wahlenbergia albomarginata* (1%), *Hydrocotyle novae-zelandiae* var. *novae-zelandiae* (1%), *Raoulia subsericea* (1%), *Celmisia gracilenta*, little hard fern, *Lycopodium fastigiatum* and others including occasional narrow-leaved snow tussock and *Aciphylla* sp. aff. *horrida*.

Snow tussockland

These communities have been discussed in the Umbrella ED PNAP survey report (Dickinson 1988). Narrow-leaved snow tussock is generally the most common species, with browntop becoming more common at lower altitude and blue tussock and/or slim snow tussock at higher altitude. In some sites shrubs (particularly *Hebe anomala, H. rakiensis, Brachyglottis revoluta* and *Dracophyllum uniflorum*) and herbs (particularly *Celmisia semicordata* var. *aurigans* and *C. prorepens*). Only two sites were described from within this block (see below).

Lower altitude narrow-leaved snow tussockland

This site was in the mid Jordan catchment adjacent to the stream, above the forest limit (NZMS 260 F43 083 059). Sunny faces have a moderate cover of narrow-leaved snow tussockland (5-30% cover), but is generally dominated by browntop. Drier faces contain much *Leucopogon fraseri*, snowberry, blue tussock, *Raoulia subsericea* and catsear.

The shady faces contain a dense cover of narrow-leaved snow tussockland (c.80% cover), with bryophytes (5%), browntop (3%), catsear (2%), *Anisotome aromatica* var. *flabellifolia*, Maori onion, *Lycopodium fastigiatum*, little hard fern, with occasional inaka, prickly shield fern and other species.

High altitude snow tussockland

This community is a diverse community sampled Grid Ref. NZMS F43 066 076. The major components are narrow-leaved snow tussockland (35% cover), blue tussock (15%), *Brachyglottis revoluta* (10%), *Celmisia semicordata* var. *aurigans* (8%) and leaf litter (6%). Other components include rock (5%), bryophytes (5%), *Dracophyllum uniflorum* (3%), *Rytidosperma pumila* (2%), *Uncinia divaricata* (2%), browntop (2), *Hebe anomala* (1%), *Astelia nervosa, A. nivicola, Celmisia prorepens, Lycopodium fastigiatum*, prickly shield fern alpine shield fern (*Polystichum cystostegia*) and other species.

Wetlands

There are a number of large alpine bogs and small flush areas. These wetlands are relatively diverse, with variation dependent upon slope, water table, fertility and other site factors. Much of this variation is described in Dickinson, 1988). Only one bog system was described in detail (see below).

Alpine bog

This community was part of a large wetland in Gem Lake catchment (Grid Ref. NZMS F43 066 074). The community was dominated by comb sedge (35%), sog (18%) and sphagnum moss (8%), with *Phyllachne colensoi* (8%), *Carpha alpina* (6%), *Celmisia* sp. "gracilenta rhizomatous" (5%), *Carex gaudichaudiana* (4%), *Dracophyllum prostratum* (4%), *Abrotanella caespitosa* (3%), other bryophytes (3%), *Euphrasia dyerii* (2%), *Gentiana amabilis* (1%), *Isolepis aucklandicus* (1%), *Drosera arcturi* (1%), *Agrostis pallescens* and other plant species. Dickinson described some cushionbogs as being dominated by *Donatia novae-zelandiae.*

Seepage

Within the large wetland system examined there are several associations. In the wettest areas is a seepage community this is dominated by *Carex gaudichaudiana* and moss with turf areas. The turf species include *Euchiton laterale, Epilobium komarovianum, Gentiana amabilis, Viola cunninghamii, Coprosma perpusilla, Leptinella squalida* var. *mediana, Ranunculus gracilipes, Plantago uniflora*, bryophytes, the liverwort *Marchantia berteronana* and other species.

Stream side seepages

Along many high altitude sections of streams there is a distinct wetland community. This community includes *Schoenus pauciflorus*, sphagnum moss, *Hebe pauciramosa, Aciphylla pinnatifida* and a number of smaller herbs

Other communities

These communities were not inspected in detail however have been described in the Umbrella ED PNAP survey report (Dickinson 1988).

Slim snow tussockland

This community generally has similar species associated as the higher altitude narrow-leaved snow tussockland.

Herbfield

This is generally localised and is found where herb species dominate. The most common species are *Celmisia semicordata* var. *aurigans* and *C. prorepens*. Associated species generally include blue tussock, *Gaultheria nubicola, Brachyglottis revoluta, Kelleria villosa* and *Raoulia grandiflora*. There is often scattered snow tussock present.

Snowbanks

These are somewhat variable in their composition dependent upon the length of snow lie and other site factors. Early snowbanks are often dominated by *Marsippospermum gracile*. Other species include *Celmisia haastii, Carex pyrenaica var. cephalotes, Epilobium tasmanicum, Anisotome imbricata* var. *prostrata, Kelleria childii, Raoulia subulata, Ranunculus pachyrrhizus, Parahebe trifida*, blue tussock, *Hebe subulata* and other species.

Rock bluffs/outcrops

These have some characteristic species including edelweiss (*Leucogenes grandiceps*), *Chionohebe thomsonii, C. densifolia, Leptinella goyeni, L. pectinata, Celmisia laricifolia, Pachycladon novae-zelandiae, Grammitis poepeigiana, Rytidosperma setifolium* and others. These areas also provide a refuge site where some shrubs and herbs survive, including snow totara (*Podocarpus nivalis*), *Coprosma serrulata, Hebe buchananii* and *Anisotome haastii*.

Boulderfields

Boulderfields are similar to rock bluffs and outcrops in that they have some characteristic species and provide a refuge for other species. Species found include alpine shield fern, *Celmisia hectori, C. semicordata* var. *aurigans* and *Hebe dilatata*.

Fellfield

This community occurs on the summit ridge and locally on other exposed areas. The composition varies somewhat dependent upon the degree of exposure. The major species include *Dracophyllum muscoides, Phyllachne colensoi, Raoulia hectori* and *Celmisia sessiliflora*. Other species include blue tussock, *Celmisia brevifolia, C. laricifolia, Chionohebe densifolia, Hectorella caespitosa, Leptinella goyeni, Myosotis pulvinaris, Schizeilema exiguum*.

C ISLAND COUNTRY/MCGREGOR COUNTRY BLOCK

Overview of the Ecological Values

Within this block the key values include:

- Extensive narrow-leaved snow tussockland
- Extensive wetland systems
- Scattered rock tors
- Beech forest
- A small stand of *Olearia hectorii*

VEGETATION DESCRIPTION

Beech forest

There is a narrow and discontinuous tongue of beech forest that extends up the Pomahaka Valley above the Jordan Creek confluence.

Shrubland

Shrublands are uncommon in this block. There are small fragments associated with the Pomahaka River and the associated beech forest remnants. This community is described under the Umbrella Block.

Tussockland

Narrow-leaved snow tussockland is the most extensive tussockland community in this block. The narrow-leaved snow tussocklands found in this block are generally similar to those found elsewhere in the property.

The broad upper ridges are dominated by narrow-leaved snow tussock although in parts there is red tussock and hybrid red-snow tussock. A site sampled was at 1220m (Grid Ref. NZMS 260 F43 084 105). This tussockland consisted of narrow-leaved snow tussock (30-60% cover, average 40%), bryophytes (15%), leaf litter (15%), blue tussock (8%), browntop (1-5%), snowberry (2%), *Coprosma perpusilla* (2%) and other species.

Within the tussockland are more open areas dominated by blue tussock with browntop, *Aciphylla hectori, Euchiton mackayii, Raoulia subsericea*, catsear and other species.

Open damp sites also occur and contain much bryophyte, with *Carex gaudichaudiana, Epilobium brunnescens, Celmisia* sp. "gracilenta rhizomatous", *Gentiana amabilis, Abrotanella inconspicua, Carpha alpina, Rytidosperma australe* and other species.

Another sample site was at 1260m (Grid Ref. NZMS 260 F43 083 098). At this site, the community is composed of narrow-leaved snow tussock (35%), leaf litter (25%), blue tussock (8%), *Hebe anomala* (3%), *Celmisia lyallii* (3%), browntop (3%), snowberry (2%), *Celmisia prorepens* (2%), *Coprosma perpusilla* (2%), rock (2%), *Celmisia semicordata* var. *aurigans* (1%), *Raoulia subsericea, Astelia nivicola, Aciphylla hectori, A. kirkii, Epilobium alsinoides* and other species.

Wetlands

The large wetland systems found on the broad summit ridges contain a diversity of associations varying from wet flushes, to sphagnum dominant, to cushionbogs. One of these large wetland systems was sampled (Grid Ref. NZMS 260 F43 083 100).

Sphagnum bog

This is the major community in the wetland system examined. The community is dominated by sphagnum moss (65%) and other bryophyte species (20%). Other species include *Gentiana amabilis* (4%), *Abrotanella caespitosa* (4%), *Carex gaudichaudiana* (3%), *Euphrasia dyeri* (2%), comb sedge (1%) and *Drosera arcturi* (1%).

Bryophyte-Dracophyllum prostratum bog

Some parts of the wetland contained a semi-cushion bog area. This community contained bryophytes (30%) sphagnum moss (18%), *Dracophyllum prostratum* (15%), *Isolepis aucklandicus* (15%), *Carex gaudichaudiana* (6%), *Euphrasia dyeri* (4%), *Abrotanella caespitosa* (3%), *Phyllachne colensoi* (3%), *Gentiana amabilis* (2%), *Celmisia* sp. "gracilenta rhizomatous" (2%) and other species.

Flush slopes

This community was found on hillslope parts of the wetland system. These flushes are dominated by bryophtyes (60%), with *Carex gaudichaudiana* (5%), *Hebe pauciramosa* (4%), *Epilobium brunnescens* (3%), *Carpha alpina* (3%), *Craspedia* sp. (3%), the liverwort *Marchantia berteroana* (3%), *Schoenus pauciflorus* (2%), *Euphrasia dyeri* (2%), *Gentiana amabilis* (2%), *Juncus pusillus* (2%), narrow-leaved snow tussock (2%), sweet vernal (2%), *Viola cunninghamii* (1%), *Plantago uniflora* (1%), *Ranunculus gracilipes, R. cheesemanii* and other species.

Wetland margin

Generally the wetland community merges into a narrow-leaved snow tussock community. The down slope margin of the community differed somewhat. This community is dominated by the bryophyte *Polytrichum juniperinum* (75%), *Dracophyllum prostratum* (8%) with red tussock (6%), comb sedge (3%), *Phyllachne colensoi* (3%), *Anisotome aromatica* and other species.

Other communities

Rock Outcrops

These are less common than in the Umbrella block, however are similar in composition to in the other blocks.

Snowbanks

This block is at lower altitude and contains more gentle topography, and mainly early snowbanks are found.

One site that was sampled was south of the track to Gem Lake at c. 1260m (Grid Ref NZMS 260 F43 083 097). This early snowbank community is composed of slim-leaved snow tussock (18%), blue tussock (12%), *Celmisia prorepens* (8%), *C. densiflora* (6%), *Euchiton mackayi* (5%), leaf litter (5%), snowberry (4%), *Kelleria laxa* (3%), bryophytes (3%), *Trisetum tenellum* (2%), *Epilobium alsinoides* (2%), rock/bare (2%), *Coprosma perpusilla* (1%), browntop (1%), *Aceana tesca, Aciphylla hectorii, Hebe subulata, Rytidosperma australe* and other species.

Fellfields

These are less extensive than in the Umbrella block, however they are similar in composition to these in other blocks.

Problem Plants

Species recorded were:

Broom – a few scattered plants along the Pomahaka River and Jordan Creek.

Scotch thistle - scattered along the main Pomahaka Valley form access track.

Californian thistle - varying infestations along the banks of the lower section of Jordan Creek.

Hieracium

H. pilosella is widespread throughout much of the open unimproved tussock country, especially on sunny faces.

Scattered *H. lepidulum* in low density exists at several sites including near the lower ford over Jordan Creek and The Nobbies. This species can be expected to increase in both distribution and abundance but its ecological impact is expected to be limited.

None of the above species are currently a significant problem. Broom should not become so if control measures are continued.

Significance of the Vegetation

Gem Lake Station is a moderate sized pastoral lease which retains a rich diversity of communities and plant species which in combination are highly representative of the ecological values of the Umbrella ED. The property contains samples of all 8 ecosystems listed in the Southland Protection Strategy (Harding, 1999), although the mixed beech forest, mixed shrubland and red tussockland-mossland-rushland are all minor in extent. The snow tussockland, sub-alpine and alpine communities are the most extensive and most intact communities, both on Gem Lake Station and within the ecological district. Much of the original extent of these communities still remains, however very little of these communities is protected. The situation is quite different for the lower altitude forest and shrubland communities. Only a small proportion of the original extent of shrubland and *Olearia* treeland, and a moderate extent of forest remains, both on Gem Lake Station and within the ecological district.

The property contains a substantial part of RAP Umbrella 1, (see Appendix 3), with the vegetation sequences of the Gem Lake/Gem Creek catchment being notable. Wetland extent and diversity is a key feature of uplands.

The McGregor Country-Island Country marks the upper altitudinal limits of beech forest in this large catchment. Further, there are scattered Hall's totara trees and *Olearia* shrublands about the beech remnants that originally formed a low conifer-hardwood forest and subalpine scrub immediately above the beech. In terms of tussock grassland, despite some loss of narrow-leaved snow tussock on the warmer northeast faces of the McGregor Country above the Pomahaka River, tussock cover is relatively high for the entire block. Importantly, tussock density is such as to allow potentially rapid recovery to an intact cover. The remainder of this large block is noteworthy for its more or less extensive intact sequences of subalpine to alpine tussockland, herbfield, wetland, and fellfield.

Flora

This property has an extremely diverse flora, with 381 native plant taxa being recorded (see Appendix 2), comprising almost 70% of the flora of the Umbrella ED (total of c.548 taxa, amended from Dickinson et. al.). This richness of flora makes Gem Lake Station the most diverse of any Southland property inspected for tenure review and especially rich for pastoral lease land. Floristically, it stands apart from other properties.

The flora includes several nationally threatened and uncommon species, these are:

Olearia hectori (status - Nationally Vulnerable) A group of this tree daisy was found above the Pomahaka River.

Olearia fimbriata (status - Serious Decline) This species has a scattered distribution and is generally found in small stands and as scattered individuals above the bush remnants (especially along Jordan Creek and the Pomahaka River)

Epilobium chionanthum (status - sparse) Found in a low altitude *Carex* swamp.
Hebe dilatata (status - sparse) - Recorded from a boulderfield adjacent to Gem Lake.
Hebe propinqua (status - sparse) - Recorded from tussockland.
Olearia bullata (status - sparse) - Occasional plants found in wet grassland/tussockland.
Olearia lineata (status - sparse) - Occasional plants in lowland shrubland and grassland.
Pimelea poppelwellii (status - sparse) - Recorded in shrub-tussockland.
Poa incrassata (status - sparse) - Recorded in alpine communities.
Uncinia purpurata (status - sparse) - Scattered through snow tussockland.
Uncinia sinclairii (status - sparse) - Recorded in upper altitude snow tussockland.
Uncinia viridis (status - sparse) - Recorded in upper altitude snow tussockland.
Acaena tesca (status - Range Restricted) - Found in open high altitude tussockland.
Carex pterocarpa - (status - Range Restricted) - Found in fellfield.
Gingidia baxterae - (status - Range Restricted) - Associated with rock tors.
Hebe buchananii (status - Range Restricted) - Associated with rock tors.
Cardamine bilobata (status - Data Deficient) - Associated with rock tors/faces.
Deschampsia pusilla (status - Data Deficient) - Recorded in alpine communities.
Pratia aff. *macrodon* (status - Data Deficient) - Associated with rock tors/faces.

Regionally uncommon species include:
Brachyglottis buchananii
Brachyglottis cassinioides
Coprosma serrulata
Hebe poppelwellii
Hebe rakiensis
Hebe subulata
Hoberia lyallii
Parahebe trifida
Podocarpus hallii
Podocarpus nivalis
Pseudopanax colensoi var *ternatus* (three finger)
Sophora microphylla (kowhai)

Some other interesting aspect of the flora are the abundance of some species groups, notably *Epilobium* (17 taxa), *Celmisia* (16 taxa), *Coprosma* (14 taxa), *Carex* (12 taxa), *Hebe* (10 taxa), *Uncinia* (10 taxa), *Ranunculus* (9 taxa), *Acaena* (8 taxa) and *Aciphylla* (7 taxa). A number of typically Central Otago alpine species reach their southern or south-eastern distribution limit on the Umbrella Mountains.

2.5 FAUNA

2.5.1 Invertebrate Fauna

The pastoral lease is located in the Umbrella Ecological District of the Waikaia Ecological Region. A reasonable inventory of invertebrates exists for the lease and also and also the

Waikaia Ecological Region (see Dickinson, Mark, Barratt and Patrick 1998). The invertebrate fauna is rich in associations with grassland, wetland and shrub habitats. Some invertebrates are endemic to the Ecological Region. Others are part of a fauna near its eastern limit extending in a band from the Eyre Mountains or other western mountains across Northern Southland. Lastly, there are moths in Central Otago that also extend their distribution to the Umbrella Mountains (Dickinson, Mark, Barratt and Patrick 1998). The array of communities present, represent almost all of the communities with natural character known in the Umbrella Ecological District and there are large scale mountain systems spanning from 370 m to 1442 m.

Feature sites or habitats with significant inherent value for invertebrates are described as follows.

Gem Lake and Associated Ponded Waters

These waters have been sampled for small invertebrates (meiofauna, see Burns C.W. in Dickinson 1988). They are representative of alpine ponded waters and have features of scientific importance. Rotifera, micro-crustaceans, a water mite and representative insects are named from the lake and from adjacent ponds (Burns C.W. in Dickinson 1988). The crustacean *Boeckella dilitata* has distinctive morphology and life history at Gem Lake (Burns C.W. in Dickinson 1988).

Gem Lake Cirque and Adjacent Summits Above 1150m

Habitats include rock fell, bare colluvium, shrubs, tussock, snowbank, cushionfield, herbs (particularly Compositae-daisies), turfs and extensive flush/sog wet areas. In the cirque site, 79 moths, 75 beetles, 3 grasshoppers and one Hemipteran bug are known. Significant elements include grasshopper *Sigaus obelisci* (range restricted Molloy et al. 2002) alpine flightless shield bug *Hypsithocus hudsoni* (range restricted, Category I, Molloy and Davis 1994), Speden's landsnail *Powelliphanta s. spedeni* (remains in 1980's only, serious decline), moths *Aoraia flavida* (Type locality) and *A. aspina* (Type locality).

Slopes Between 900- 1150m

Extensive gully flush wetlands, isolated tors, small areas of shrubland, snow lie areas in solifluction landforms and extensive tussock associations are features. A new locality record of the flightless chafer *Stethaspis pulcher* (data deficient, Molloy et al. 2002) was found during the survey. This large chafer (13 mm) is only known elsewhere from two sites in the Garvie Mountains and had not been recorded since the 1960's (Bruce Given pers comm.). Many day flying moths have been noted on both The Nobbies and McGregor Country. These are associated with tors, speargrass, tussock grasses, *Celmisia* species daisies and many herbs. Illustrating the relative richness of this region, 7 moth species are known from the genus *Notoreas*. These are hosted on two species of the low prostrate shrub/herb *Pimelea* and five species of prostrate or cushion forming *Kelleria*. Also known among the wetlands are many stoneflies in the genus *Zealandobius*. The sphagnum bog moth *Heloxycanus patricki* (gradual decline) is almost certainly present here and at much lower elevations as well. The assemblage of known invertebrates is representative of the regions diverse upland ecosystems and includes insects of limited distribution in south-eastern South Island.

Complex Communities Below 900m

The Pomahaka River has at least 16 kilometres of riparian bordering the east of the lease. The Pomahaka River is a large 4th order river with numerous steep first order streams entering it and two 3rd order streams, Jordan Creek and Island Creek both in large measure enclosed in the lease. Thus riparian communities are an important feature. There are few large river

riparians in the eastern South Island buffered from the effects of grazing. The natural character of the extensive open grass shrub and flush riparians is significant. This includes over five kilometres on the Pomahaka River and eight kilometres along both sides of Island Creek. The extensive forested and rock bluff riparians are significant. Also the distinctiveness of the confined channels with limited floodplain terrace associations but extensive rapids and meandering reaches (at the Island Creek Junction) is significant.

Solifluction, soil slip and debris slumps are common and have brought water to the surface in seepage and flush. There are also areas of eroding colluvium and the Jordan Creek catchment particularly is exporting and re-depositing large volumes of schist particles. On the lease, the lower parts of all the tributaries feeding the Pomahaka River (apart from Island Creek) are steep or have cataracts that exclude upstream passage of fish.

Below 900 metres, fire, grazing and mining activity have removed most of the shrub and forest vegetation and modified low altitude grassland associations dominate. A few of the moths recorded indicate that some of the low altitude grasslands are naturally occurring. Remnant elements of native vegetation, adventive native flora and nationally significant invertebrates remain. 137 moths and a range of other insects are documented in the area.

Significant Communities

Jordan Creek

Surprisingly, no fish are recorded as resident and the lower reaches are a barrier to trout. Thus this may possibly be the only third order stream known in Southland where the fauna is entirely dominated by invertebrates. The absence of any fish, particularly trout make this community distinctive and accord significant inherent value. The natural character of the catchment is high although there is a historical reduction in importance of woody debris, leaf material or organic matter derived from forest and shrub. Here, as in all the streams on the lease, stream insects are representative of swift stony streams. The high relative abundance of stoneflies in kick-net samples indicates natural character.

Beech forest

Narrow fingers of mixed beech and silver beech forests are confined to stream gullies on the eastern flank of The Nobbies or the riparian of the Pomahaka River and lower Jordan Creek. A few invertebrates found only in beech forest fragments of the Waikaia Ecological Region continue to survive here (they are endemic). These include spider *Pianoa isolata* (threat status; range restricted), weevil *Megacolobus garviensis*, and an undescribed velvetworm species.

***Olearia fimbriata* & *O. hectorii* shrubs**

Patrick (2000) demonstrated high insect species richness and a number of moth species hosted only on *O. fimbriata, O. hectori* and other closely related species. A number of rare moths are present including *Protosynaema* sp. "olearia" (nationally endangered), *Pyrgotis* sp. "olearia" (undescribed, range restricted), *Meterana grandiosa* (gradual decline) and *M. exquisita* (gradual decline).

Small slump flushes

In isolated pockets throughout the lease are areas of flush vegetation including native plants such as *Olearia bullata, Carex coriacea, C. secta, C. sinclairii, Epilobium chionanthum, Eleocharis acuta,* and *Juncus gregiflorus*. A range of exotic plants are also found. Regardless,

these are productive associations for insects. *Olearia bullata* and *Carex* sedges are both rich in herbivore and detritus feeding insects. In addition, a number of insects are abundant, producing considerable biomass or secondary production in wet and fertile situations. These include insects such as damselflies (*Austrolestes colensoi, Xanthicnemis zealandicus*) craneflies (families Tipulidae, Tanyderidae), plant hoppers (families Aphrophoridae, Cicadellidae), moths, many species, midges (families Chironomidae, Sciaridae), diving beetles (*Rhantus pulveruosus* and caddis (*Hudsonema amabilis, Triplectides cephalotes, Oecetis unicolor*). The assemblages are characteristic and representative of montane to lowland wetlands in eastern South Island.

Extensive Grassland Assemblages

These are poorly sampled for invertebrate fauna though many moth species were noted. However, they will be important for the range of litter and soil dwelling invertebrates and for the associated indigenous host plants present throughout. Of note is the presence of several moths of low altitude or valley floor open grassland/wetlands. The moth *Asaphodes ida* is known from open wetland herbs in Central Otago and this is only the fourth know locality of this naturally rare species. Though generally the sunny aspects and more gentle/accessible slopes are modified and have less natural character, many elements of the invertebrate fauna persist. Elements known to thrive in similar situations elsewhere include several species of; grassland weevils, porina moths and chafer beetles. The ground weta *Hemiandrus* 'Nokomai' (P.M. Johns, data deficient) is likely to be present. The invertebrate fauna will have less than 5% of exotic species present. However, a change in soil moisture, soil compaction, loss of litter layers and enhanced fertility associated with farm development will result in loss of present natural character.

2.5.2 HERPETO FAUNA

No skinks were found on the property and this is thought to be an artefact of unfavourable weather conditions and no specialist survey being undertaken.

The gecko *Hoplodactylus* "Otago" and the skink *Oligosoma maccanni* are the two lizard species encountered on similar habitat on the nearby stations of Whitecoomb, Crown Rock and Hukarere. Similar habitat is found on Gem Lake and Whitecoomb Stations ie. north facing rock outcrops and rock slabs, therefore it would be expected to find these two lizard species.

The rocky alpine areas of Archies Spur and Sandy Spur on Crown Rock Station were notable for the reasonable number of H. "Otago". This type of habitat continues along Whitecoomb Range and the Nobbies. The gecko H. "Otago" is ranged by Hitchmough (2001) as not threatened and is widespread throughout rocky alpine areas of inland Southland.

To date O. *maccanni* was the only skink encountered on nearby Crown Rock and Hukarere Stations and it would be expected to find this species present also on Gem Lake Station. This species was found in lowland shingle screes and shrubland sites and would be expected to be found in this type of habitat on Gem Lake. It is ranked by Hitchmough (2001) as not threatened.

It could be expected to find other skink species present such as O. *inconspiruum* (ranked by Hitchmough (2001) in gradual decline), O. *nigriplantare polychroma* (ranked by Hitchmough (2201) as not threatened) and O. *chloronoton* (ranked by Hitchmough (2001) in gradual decline). These species have been recorded in nearby areas of Hokonui Mountains, Mid Dome and the Lumsden – Nokomai area, so there is a high possibility of being present along the Umbrella Mountains.

2.5.3 AQUATIC FAUNA (Freshwater Fish)

Fish were surveyed by observation for larvae in small stream pools and by spot fishing with a backpack mounted electric fishing machine (EFM). Observations from nine remote localities are noted in Table 1 below. The significance of the flowing waters of the lease in the context of the Umbrella Ecological District are also discussed.

Table 1. Sites spot fished by EFM

Locality	elevation	fish species recorded	grid reference
Tributary Pomahaka R. at McEwens Bush	500 m	none	G43 113030
Unnamed tributary Pomahaka R. (east aspect The Nobbies)	575 m	none	G43 114 049
Unnamed tributary Pomahaka R. (east aspect The Nobbies)	580 m	none	G43 113 053
Unnamed tributary Pomahaka R. (east aspect The Nobbies)	640 m	none	G43 110 062
Ford, lower Jordan Creek	565 m	none	G43 110 076
Middle Jordan Creek above gorges	780 m	none	F43 083 060
Gem Creek	1185 m	none	F43 067 074
Upper Island Creek	1050 m	none	F43 068 112
Island Creek-Pomahaka River Junction	710 m	brown trout *Salmo trutta*	G43 107 122

No native fish are known and brown trout only are found in the Pomahaka River and in Island Creek. These are significant spawning areas of sports fish and remote headwater sports fisheries. The presence of large trophy fish will be limited by:

1) the low temperature and slow growth of resident fish, except possibly in years following beech and tussock mast seeding seasons, and

2) the extensive series of rapids that must be negotiated by large trout migrating from distant downstream reaches.

The central Umbrella Mountains and the central Garvie Mountains both have depauperate fish assemblages. Despite experiencing less severe glaciation than mountains further west, only one or no native fish species are present. Bullies (*Gobiomorphus* species) are absent but present in very many other regions remote from the sea. The upper Pomahaka River Catchment has some tributaries with *Galaxias* species 'D', a non-migratory Galaxiid fish. This is present in low gradient tributaries adjacent to the lease. It may have been present in Island Creek and possibly the main-stem of the upper Pomahaka River prior to trout introduction. There may be undiscovered populations that remain in the Island Creek catchment. Long finned eel (*Anguilla dieffenbachii*) while not found during the survey, will be present as rare, sparsely distributed individuals. Freshwater crayfish *Paranephrops zealandicus* may also be present in some streams.

2.5.4 AVIFAUNA

Bird species recorded during the PNAP survey include:

Kea	- open country, high altitude (2 records)
South Island pied oyster catcher	- wetlands
paradise shelduck	- Gem Lake
Southern black-backed gull	- Gem Lake
Sky lark	- open country
New Zealand pipit	- open country
New Zealand falcon	- open country
Australasian harrier	- open country

Bellbird	- beech remnants
Chaffinch	- beech remnants
Blackbird	- beech remnants
Yellow breasted tit	- beech remnants
Yellow-crowned parakeet	- beech remnants
Rifleman	- beech remnants
Grey warbler	- beech remnants
New Zealand robin	- beech remnants
Pied fantail	- beech remnants

Additional species recorded by P and M Child March 1986 include:

Redpoll	- beech remnants/shrubby gullies
Silvereye	- beech remnants/shrubby gullies
Grey warbler	- beech remnants/shrubby gullies
Australian magpie	- open country, beech margins
Goldfinch	- scrubby gullies
Hedge sparrow	- scrubby gullies
Spur winged plover	- low altitude open grassland

Additional species recorded during the tenure review inspection include:

Black shag	- Pomahaka River
White-faced heron	- Pomahaka River
Mallard duck	- Pomahaka River and lower Island Creek
Morepork	- Beech forest in Jordan Creek
Yellow hammer	- open country, low altitude
Greenfinch	- forest margins, open country

The most significant species records are:

Kea - up to eight birds at a time, although mostly single, occasional visitors. Sightings made around Gem Lake and Whitecoomb Range summit ridge.
New Zealand falcon - Pomahaka River gorge and Jordan Creek.

Both species are listed as Category B threatened species, (Molloy and Davis, 1994).

Other species of note are Morepork and Rifleman, the latter from McEwens Bush. Like the forest, these birds have suffered considerable range contraction in the Umbrella E.D. Their survival here in such an isolated locality is of note.

2.5.5 PROBLEM ANIMALS

Hares are present throughout, especially in lower unimproved country. Possums are scattered throughout, especially in or adjacent to beech forest remnants. Red deer are present in low numbers, confined mostly to beech remnants. None of these species are seen as a significant threat to inherent values.

Significance of the Fauna

Invertebrate Fauna

The array of communities present represent almost all of the communities with natural character known in the Umbrella Ecological District. There are large scale mountain systems spanning from 370m to 1442m.

Numerous species of insect and a spider are endemic to the Waikaia Ecological Region and present in the lease. Species richness of the flora and fauna is extremely high in a national context. High diversity is documented in the plant groups with corresponding high diversity documented in the invertebrate groups aquatic crustacea, stoneflies, caddis, carabid beetles, weevils and moths (see Dickinson et al. 1998). Two large primitive moths *Aoraia flavida* and *A. aspina* have their type locality here. They are endemic to the Waikaia and Lammerlaw Ecological Districts.

Invertebrates with priority for conservation (Molloy and Davis, 1994) or with some degree of threat of extinction (Molloy et al. 2001) include:

Grasshopper *Sigaus obelisci* (range restricted)
Alpine flightless shield bug *Hypsithocus hudsoni* (range restricted)
Speden's landsnail *Powelliphanta s. spedeni* (remains in 1980's only, serious decline)
flightless chafer beetle *Stethaspis pulcher* (data deficient)
Spider *Pianoa isolata* (range restricted)
Protosynaema sp. "olearia" (nationally endangered)
Pyrgotis sp. "olearia" undescribed (range restricted)
Meterana grandiosa (gradual decline)
Mexquisita (gradual decline)
Megacolobus garviensis, weevil (endemic)

Other invertebrates probably present include:

sphagnum bog moth *Heloxycanus patricki* (gradual decline)
ground weta *Hemiandrus* 'Nokomai' (P M Johns) (data deficient)

Very distinctive water environments are present with natural character in four broad scales. All are significant habitats of indigenous flora and fauna.

1 Extensive wet flush/sog on summits and slopes. These are representatives of the ecological district and nationally significant.

2 Numerous steep first order streams with no fish present.

3 Two 3rd order streams, Jordan Creek and Island Creek both in large measure enclosed in the lease. These are significant for being non-forested catchments with indigenous grass, herb and flush vegetation. Low elevation is significant and Jordan Creek has no fish present. This is nationally significant.

4 Lastly, an extensive boundary on the Pomahaka River (at least 16 kilometres). This is a fourth order stream, nationally significant for:

- natural character of the riparians;

- water quality;
- natural character of flow regime;
- landform and flow diversity with both open meander and rapids in gorges;
- trout fishery.

Gem Lake in association with its cirque basin has a distinctive flora and fauna rich in documented species and species endemic to the Umbrella Ecological Region. It also has significance for ecological interpretation and research.

Gem Lake and associated wetlands to the northwest are "type habitats" for several species of giant copepods (crustacea).

The Gem Lake portion of RAP Umbrella 1 is considered to be a key site for invertebrate conservation in the Umbrella ED.

Aquatic Fauna (Freshwater Fish)

The numerous and extensive catchments in the lease (and the Pomahaka River, a large 4th order river spanning an altitudinal sequence from 370m to 720m on the lease boundary) feature either one or no fish species. This is a significant feature, characteristic and representative of the block mountains in the region. The lack of exotic fish species is significant. The river and streams and their riparian margins have high natural character. There are significant spawning areas of brown trout and a headwater fishery mainly accessed from the property.

Avifauna

Significant bird species include kea and New Zealand falcon, both Category B threatened species (Molloy and Davis, 1994).

The record for rifleman and morepork is also notable. In the face of widespread range contraction and loss of habitat in the region, their presence in this isolated locality is significant.

2.6 HISTORIC

The property was surveyed by Jill Hamel (DOC) for historic sites in 1989 as part of a survey of historic sites present in the Umbrella Ecological District.

The Gem Lake pastoral lease is located in the upper reaches of the Pomahaka River. There are no recorded historic of Maori origin in the area, although Maori sites have been recorded in the wider Oldman/ Umbrellas region. The upper Pomahaka was the scene of extensive alluvial mining for gold in the 19th century. The remnants of these mining sites are still visible for many kilometres along the banks of the river.

Jill Hamel in her 1989 report recorded 21 sites along the river between the northern and southern boundaries of the Gem Lake lease. The majority of these sites are on the true left of the river and outside the lease. Most of the sites on the Gem Lake side occur on low terraces immediately adjacent to the river and lie largely within the marginal strip.

Between the northern boundary of the lease and Island Creek there are 6 sites on the true right bank. These consist of 3 small areas of worked ground on the river terrace resulting in humps and hollows of tailings and worked areas and 3 areas of stone revetment along the river bank. There are also 3 wing dams in the bed of the river.

At the junction with Island Creek is a larger site extending for about 400 m up Island Creek. The site consists primarily of an aqueduct bringing water across the river flat and a stone reservoir, with an area of sluicing at the junction of the two streams.

Between Island Creek and Bullock Creek there are several sites on the true left of the river but only 2 hut sites on the true right. Both of which consist of the remains of low stone walls built from flat river stone.

From Bullock Creek to the southern boundary of the lease the river is confined to a narrow gorge and there are no terraces present. Consequently no mining sites were recorded in this area.

The sites recorded on the Gem Lake lease are typical of 19th century mining sites in the high country. Small areas of ground sluicing with associated tailings and hut sites are located on low river terraces immediately above the river. In this region of the upper Pomahaka there are few such terraces on the true right (Gem Lake side) of the river and therefore few sites within the area of the lease. Almost all the sites would fall within the area of the marginal strip. The one exception is the site at the mouth of Island Creek which extends beyond the marginal strip.

2.7 PUBLIC RECREATION

2.7.1 Physical Characteristics

The property is located on the northern end of the Whitecoomb Range in the Umbrella Mountains, in the upper part of the Pomahaka River catchment. Apart from the main river, major catchments include Island Creek and Jordan Creek. There are many minor water courses draining the Pomahaka River faces.

There is a good internal network of 4WD farm access tracks, which provide access onto The Nobbies, Whitecoomb Range and Island Creek parts of the property. Tracks become greasy and dangerous in wet weather.

27.2. Public Access

Marginal Strips

An existing marginal strip is located along the Pomahaka River throughout the frontage of the property.

Jordan Creek and much of Island Creek would qualify for marginal strips to be created on disposal.

Legal Roads

Aitchison Runs Road, a good metalled road, provides access to the southern boundary of the property, although for much of its length through the adjacent Whitecoomb Station, the formation significantly diverges from the legal alignment.

This legal road swings uphill through Whitecoomb Station and enters the property on the crest of The Nobbies before descending to the Pomahaka River immediately south of the confluence of Jordan Creek. Along the crest of The Nobbies, the farm access track corresponds closely with the legal road alignment to the point where it joins the main farm access track just south of the Jordan hut.

Another legal road extends northwards along the summit of the Whitecoomb Range before entering the adjacent Argyle pastoral lease approximately half way down the Island Creek catchment. A poor condition farm access track follows this legal road from the ridge crest above the Gem Lake cirque for a distance south towards the Whitecoomb Station boundary.

2.7.3 ACTIVITIES

There are no authorised commercial recreation activities on the property. The main private recreation activity relates to access for angling on the Pomahaka River. The river is a popular trophy brown trout fishery. Other recreational use would include occasional deerstalkers and groups of horse trekkers and motorcyclists passing through the property. Some 4WD trips occur to Gem Lake.

The property has some potential for ski touring and tramping and mountain biking especially into the Gem Lake and Island Country, with extensions possible onto the remainder of the Umbrella Mountains and maybe also to the Old Man Range.

Significance for Recreation

Legal public access to the Pomahaka River for angling in its upper reaches is the most significant existing demand. The Umbrella Mountains and Whitecoomb Range has potential for recreation use but the lack of adequate legal access is a major constraint.

PART 3

OTHER RELEVANT MATTERS AND PLANS

3.1 CONSULTATION

The property was commented on by NGO's at an early warning meeting held in Alexandra on 8 October 2001. Key points raised were:

- The Gem Lake portion of the RAP Umbrella 1 is highly valued for conservation. The RAP and adjacent wetlands and tussocklands of the Jordan Creek catchment extending onto the crest of The Nobbies should become conservation land.

- Larger beech forest remnants including McEwens Bush on the Pomahaka faces should be protected.

- Recreational access to proposed conservation land is required to be legally secure. Noted that the road to the property is not legal through Whitecoomb Station and suggested the bridge over the Pomahaka River could be privately owned.

- Access to Pomahaka River for angling required.

Additional written advice from some NGO's has also been received and details are as follows:

Dr Alan Mark

- Recommends the whole of the Jordan Creek catchment plus the upper Pomahaka catchment upstream of the Jordan Creek confluence become conservation land. This

land includes the Gem Lake portion of RAP Umbrella 1 and other areas of high conservation value. Area also justified because of its importance for water yield. The legal road along The Nobbies crest to Pomahaka valley floor be retained for formal public access.

Royal Forest and Bird Protection Society of NZ

The Society recommended the following:

a) All land west of The Nobbies become conservation land.
b) Access be secured on legal roads up The Nobbies ridge.
c) Marginal strip required up Pomahaka River.
d) Beech remnants along Pomahaka River to be protected.
e) Suggested Crown purchase whole of Gem Lake lease.

Copies of these NGO formal responses are attached.

3.2 District Plans

The property is located within Clutha District. In general, the operative Clutha District Plan does not act as a trigger for the protection of tussock grasslands and smaller wetlands and forest areas. It requires resource consent for clearance of areas of 5ha of indigenous forest vegetation or 2ha of wetlands, and development within 10m of any watercourse or greater in area. Resource consent is required for clearance or removal of indigenous vegetation from areas for protection identified by the Protected Natural Areas Programme. In addition, ground exceeding 30° slope that has been made bare by removal of vegetation shall be revegetated.

There are no Potentially Outstanding Landscapes, Outstanding Natural Features, registered archaeological sites, significant wetlands, or areas of significant habitat of indigenous fauna as set out in the tables of the plan. Protection is limited to the controls set out above.

3.3 Conservation Management Strategy (CMS)

The Southland Conservancy CMS has identified the Umbrella Mountains as a significant landscape unit and has described the conservation features within the unit (see section 6.16, Umbrella extract attached as Appendix 4).

Statements made that are relevant to Gem Lake pastoral lease are the recommended protection of RAP Umbrella 1, any threatened plant species present, identification of sites where the giant land snail, *Powelliphanta spedeni spedeni* occur, and determining what opportunities exist for preserving indigenous fisheries habitats.

3.4 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 else is necessary to:-

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

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

PART 4

MAPS ETC.

4.1 ADDITIONAL INFORMATION

4.1.1 Extract from Inventory of New Zealand Soil Sites of International, National and Regional Importance, New Zealand Society of Soil Science Occasional Publication 1, page 115.

4.1.2 Extract from Umbrella Ecological District - Survey Report for the Protected Natural Areas Programme, pp 68-77.

4.1.3 Gem Lake Station - Plant list.

4.1.4 Extract from Southland Conservancy Conservation Management Strategy, pp 276-278.

4.2 REFERENCES

Arañd J et al, Inventory of New Zealand Soil Sites of International, National and Regional Importance, Part One.

- South Island and Southern Offshore Island (1st edition) New Zealand Society of Soil Science Occasional Publication 1.

- Conservation Management Strategy for Mainland Southland/West Otago, 1998-2008, Department of Conservation, Invercargill.

- Dickinson KJM (1988). Umbrella Ecological District: Survey report for the Protected Natural Areas Programme. Department of Conservation, Wellington.

- Dickinson KJM Mark AF, Barrett BIP and Patrick BH (1998) Rapid ecological survey, inventory and implementation: A case study from Waikaia Ecological Region, New Zealand. Journal of the Royal Society of New Zealand, Vol. 28: 83-156.

- Hamel J 1988: Survey of the Historic and Cultural Values on Pastoral Leases in the Umbrella Ecological District and the southern tops of the Old Man Range. Unpublished to the Department of Conservation, Dunedin.

- Harding, MA (1999) Southland Protection Strategy. Nature Heritage Fund, Wellington.

- Hitchmough, R (2001). Threat classification spreadsheet. Science and Research Division, Department of Conservation, Wellington.

- Molloy et. al. (in prep). Classifying species according to threat of extinction. Biodiversity Recovery Unit, Department of Conservation, Wellington.

- Molloy J and Davis A, updated by Tisdall C, Setting Priorities for the Conservation of new Zealand's Threatened Plants and Animals, 2nd Edition, 1994, Department of Conservation, Wellington.

- Patrick, B (2000) "Lepidoptera of small-leaved divaricating *Olearia* in New Zealand and their conservation priority". Science for Conservation 168. Department of Conservation, Wellington.

4.3 Illustrative Maps

4.3.1 Topo Cadastral
4.3.2 Landscape Values
4.3.3 Ecological Values