

## **Crown Pastoral Land Tenure Review**

**Lease name : GLEN LYON**

**Lease number : Pt 007**

**Lease name : Huxley Gorge I**

**Lease number : Pt 106**

**Lease name : Huxley Gorge II**

**Lease number : Pt 139**

## **Conservation Resources Report - Part 1**

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

They are released under the Official information Act 1982.

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**DOC CONSERVATION RESOURCES REPORT ON TENURE REVIEW OF HUXLEY GORGE AND GLEN LYON PASTORAL LEASES**

**PART 1: INTRODUCTION**

Huxley Gorge and Glen Lyon Pastoral Leases cover approximately 46 167 hectares in the Hopkins and the Dobson valleys. The valleys run north-east from Lake Ohau and the Mackenzie Basin up to the Main Divide and the Sealy Range on the southern boundary of Mt Cook National Park. The two leases span an altitudinal range of over 2000m, from 530m above sea level (asl) on the shores of Lake Ohau to 2590 m at Mt Glenmary on the Naumann Range and 2557 m at Mauka Atua on the Ben Ohau Range. Over half of the leases lie within, or above the, alpine zone (above 1400m).

Glen Lyon Pastoral Lease extends for 47 km from Dorcy Stream at Lake Ohau to its upper limit near the head of the Dobson Valley (3km from the Sealy Range). The Hopkins Valley runs for 33km from its junction with the Dobson to the base of the Richardson Glacier (the upper limit of Huxley Gorge Pastoral Lease). Combined, the two leases are one of the largest pastoral units in Canterbury.

Road access from the nearest township, Twizel, to the Glen Lyon and Huxley Gorge Station is approximately 35 km.

The western boundary of Huxley Gorge Pastoral Lease adjoins Conservation Areas along the Main Divide. The eastern boundary of Glen Lyon adjoins a Conservation Area along the Ben Ohau Range and another pastoral lease in the south-east.

Within the boundaries of the two properties are areas of Crown Land which include most of the valley floors and the Hopkins and Dobson riverbeds. Also within the boundaries are Conservation Areas which protect much of the beech forest along both sides of the Naumann Range and the eastern side of the Ben Ohau Range.

The pastoral leases span three Ecological Regions (Tasman, Mackenzie and Lakes), and four Ecological Districts. The majority of the leases lie within, and constitute the major part of, the Dobson Ecological District. The southern portion of Huxley Gorge lies within the Huxley and Ahuriri Ecological Districts and the southern portion of Glen Lyon within the Ben Ohau Ecological District.

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

**2.1 Landscape**

The Hopkins and the Dobson Valleys have been noted as areas of outstanding scenic quality in literary references dating from the mid-nineteenth century. Currently several companies run scenic flights along the Ben Ohau and the Naumann Ranges. These ranges form an important part of the backdrop to the Mackenzie Basin.

In general the lower areas of the pastoral leases such as the Lower Hopkins and the moraine terraces along the eastern side of Lake Ohau, have been intensively modified and support relatively fertile productive soils. These areas consist of river flats, alluvial fans, and moraine terraces. They have been oversown and exotic grasses dominate the vegetation cover, although a significant number of native species are still present. There are two significant forestry plantations near the Glen Lyon homestead, one of which has been recently harvested.

The more remote areas are less modified and support more intact indigenous flora and fauna. More than 80% of the pastoral lease is higher than 1,000 m asl, a large part of which supports spectacular rock peaks, ridges, and bluffs, with extensive scree slopes, rock debris fans, and gravel deposits. The lower faces carry a mixture of beech forest, and tall and short tussock grasslands, interspersed with screes, erosion gullies, and debris avalanche fans.

For descriptive purposes the two leases can be divided into 8 distinct landscape types based on the geomorphology and land cover:

1. *Hopkins Valley – Lower Hopkins*

The unit extends downstream from the bend in the river near where Memorial Hut is sited and roughly corresponds with the change in rock type from a lowly indurated greywacke-argillite to a schistose greywacke-argillite. The lower Hopkins is a classical glaciated U-shaped valley with a braided river system on the valley floor and associated extensive river flats, including some wetland areas. Valley walls are steep and characterised by a land-cover of grass and scree/rock with remnant patches of mountain beech. Stream gullies are deeply incised with small alluvial fans at the base. Some remnant moraines are apparent at the sides of the valley, and there is a prominent terminal moraine at grid reference H38 570 775.

2. *Hopkins Valley – mid Hopkins*

The mid-Hopkins landscape type extends upstream of the Memorial Hut to the “Hopkins Gorge” above the Dodger Hut. The glaciated u-shaped valley and braided river system are still the predominant landforms in this unit, however the valley walls have distinct landcover consisting of a well-defined vegetation sequence of beech forest (primarily mountain beech with some silver beech), sub-alpine scrub (mountain celery pine and snow totara), and alpine grasslands.

There are a series of hanging valleys which drain through deeply incised and often convoluted “gorges” into the main valley. In general the eastern side of the valley appears to be slightly less steep than the western side primarily due to the nature of the underlying rock strata.

3. *Hopkins Valley – upper Hopkins*

Here the valley is closely approaching the Main Divide and starts to have more of a v-shaped river valley morphology. The glacial influences are still obvious, particularly on the western side which maintains a consistent and even slope for the length of the valley. The v-shape appears to be due to a series of catastrophic structural failures on the Neumann Range. Debris fans have blocked the valley at some stage and the river has cut down through the fans against the western wall of the valley. Relatively recent slope failures are evident, as well as very recent lateral moraines in some places.

The beech forest sequence does not occur in this area, and the land-cover consists of sub-alpine scrub, alpine grasslands, and scree and rock fields. In some places due to more recent disturbances the grasslands and scree slopes come right down to the river.

4. *"Huxley Gorge" / Rabbiters Peak*

This mountain range is on the western side of the Hopkins River, contained between the south branch of the Huxley River, the south branch of Temple Stream and the lower Hopkins River. The beech forest running along the north branch of Temple Stream in the centre of this range is a Conservation Area.

The area consists of rocky peaks and ridges rising up to Rabbiters Peak (2,285 metres asl). Surrounding these are shattered rock pavements, extensive scree slopes, and alpine herbfields. The lower faces consist of tussock grasslands with a few small patches of beech forest, interspersed with scree slopes, erosion gullies, and debris avalanche cones. The south-eastern end of the range around Ram Hill is currently grazed in the summer.

5. *Dobson Valley*

The Dobson, like the Hopkins, is a classical glaciated u-valley with a braided river system and associated extensive river flats. Larger in scale than the Hopkins, the Dobson Valley is characterised by its linear form and asymmetric valley walls, steeper on the west than the east. Stream gullies are steeply incised with small alluvial fans at the base. A larger fan above Kennedy Hut narrows the valley at this point. Remnant moraines are apparent at the head of the valley. The valley walls have a distinct land-cover consisting of a well defined vegetation sequence of beech forest (primarily mountain with some silver beech), sub-alpine scrub (mountain celery pine and snow totara), and alpine grasslands.

The Dobson is less picturesque than the Hopkins, due to its uniformity and larger scale. There are notable scenic localities along the valley, however, where a combination of geomorphic features makes for a more human scale, particularly at Kennedy Hut, Waterfall Hut and Reardon Hut.

6. *Irishman, Stony and Harris Streams*

These streams are hanging valleys on the Ben Ohau Range side of the Dobson Valley. Generally trending north-east/south-west, they veer around to the west at their lower end near where they join the Dobson and cut through deeply incised gorges, frequently with waterfalls. The combination of down-cutting by the streams, and the scree slopes off the mountain tops have combined to produce v-shaped valley cross sections. The screes are extensive, frequently running from shattered rocks near the summits down to the valley floor. Tall tussock grasslands are more extensive on the shady south-east faces which presumably retain more moisture than the sunnier north-west faces.

The gorges and waterfalls at the base of the valleys are spectacular, and particularly in the Irishman valley show the prevailing orientation of the schistosity and the cross-cutting action required to link with the Dobson. There are significant stands of beech at the entrance to the valleys and, in the case of Irishman Stream, the stand is relatively extensive.

7. *Ohau Terraces*

The moraine terraces along the eastern side of Lake Ohau and the Dobson Valley as far north as Camp Stream, together with the river flats near the Glen Lyon homestead, have the easiest hill slopes and most productive soils on the leases. These areas have been extensively oversown and exotic grasses dominate the land-cover, although a significant number of native species are still present. There are two significant plantations of exotic forestry near the homestead, one of which has been harvested recently.

The terraces are generally below 1,000 metres asl and are not visible from the greater Mackenzie Basin. Although obvious from Lake Ohau, the terraces are not significant visual features and do not cross the skyline.

8. *Alpine areas*

Although the alpine areas are included in the landscape types already described, they deserve some further attention. A great majority of the two pastoral leases would be termed 'alpine'. Less than 20% of the leases is below 1,000 metres asl (a large part of the productive land utilised by the lessees is either Crown-owned riverbed or grazing licences over conservation areas) these areas are composed of rocky peaks and ridges, extensive scree slopes and hanging valleys, alpine herb and grassfields, and permanent snow.

**Scenic quality**

The area is one of outstanding scenic quality, with the Hopkins valley being of particular note. In late 1857 John Turnbull Thomson, the Chief Surveyor of Otago, made a reconnaissance journey through the upper Waitaki including a stopover at the foot of Lake Ohau. His surveyor's notebook includes the pencil sketch showing

the unwooded slopes of the Ben Ohau Range, and a “high wide peak” on either side of the Glenmary massif at the end of the Naumann Range, Mt Ward and Mt Sefton. Of the landscape he noted “The scenery of this part of the Waitaki is magnificently picturesque; yet possessing so much dreariness, wildness and sterility as to be forbidding, and to the solitary traveller appalling (cited in Davison 1986).

In 1861 J H Baker and E Owen, two of the first European visitors to the Hopkins Valley noted that “the scenery is very beautiful and the hills heavily timbered”. On a later visit Baker camped at the junction of the Hopkins and the Huxley ... “where we obtained a most magnificent view of Mt Fraser (sic) and the other snowy peaks” (cited in Cullen 1993).

A pass to the West Coast from the Huxley was rediscovered in 1890 by Thomas Noel Broderick, District Surveyor for South Canterbury, and subsequently named after him. In the course of his work, Broderick noted that “the scenery is lovely and I think this the prettiest place in Canterbury” (cited in Davison 1986).

Ross Cullen, in the NZAC climbing guide “Barron Saddle–Mt Brewster”, notes that the Hopkins valley “provides visitors with superb scenery and some rewarding climbs”. With regard to the Dobson he refers to the western slopes of the Ben Ohau Range as containing “some awesome examples of greywacke scree slopes” while the Naumann Range peaks “provide a more attractive perspective from the Dobson valley”.

Currently there are regular scenic tourist flights over the Ben Ohau and Naumann Ranges advertised by the helicopter lines based in Twizel. The principal attraction for these tourist flights is the outstanding alpine scenery of the mountains, which constitute a large part of the pastoral leases. While overshadowed by the nearby Mt Cook, the mountain ranges are significant features in their own right, and form an important part of the backdrop to the Mackenzie Basin.

## 2.2 Landform and Geology

The leases lie a few kilometres from the highest parts of the Southern Alps. They consist of large parts of two mountain ranges (Naumann and Ben Ohau) and a subsidiary arm of a third (Barrier), which are separated by two major river valleys (Dobson and Hopkins).

Predominant basement rocks are medium induration greywacke-sandstone of the Torlesse Supergroup (Dobson Valley), and low grade chlorite schist of the Haast Schist Group (Hopkins valley and southwest tip of the Ben Ohau Range) (Gair 1967). Some thin layers of black argillite siltstone-mudstone and red and green volcanic rocks are also present. The few fossils apparent in this sequence suggest a Triassic Age (c.200 million years). Sedimentary layering has been tightly folded, and large folds are recognisable on a mountain scale.

The structure of the ranges is controlled by large north-easterly trending faults that lie generally parallel to the schistosity. The leases lie between two active faults, the Ostler

Fault at the eastern foot of the Ben Ohau Range, and the Alpine Fault west of the Main Divide. Another recent fault lies in the Hopkins valley on the western side of the Naumann Range.

The Southern Alps have been simultaneously uplifted and eroded over the past several million years at over one metre per thousand years, rates as rapid as anywhere in the world (Adams 1980). These rates decrease away from the Main Divide. Erosive processes quickened during numerous Pleistocene glaciations (last two million years). The last major ice advance (Otiran, c. 15 000 years ago) filled the major valleys with ice over 600 m thick and, upon retreat, left classic glacial u-shaped valleys, truncated ridge spurs and lateral moraines, and a scoured out glacial trough (now Lake Ohau). Minor post-glacial advances left distinctive moraine remnants and cirques near the confluence of the Hopkins and Dobson Rivers, in upper reaches of the two rivers, and on upper slopes and basins of the Ben Ohau and Naumann Ranges (McGregor 1967, Birkeland 1982).

The rocks in the alpine environment are highly susceptible to physical weathering and erosion, mediated by freeze-thaw processes, earthquake-induced slope failure, and water and wind movement. Semi-stable scree slopes, entrenching streams, talus and colluvial fans debouching into the alluvium-filled valleys and an extensive loess covering are characteristic post-glacial landforms.

The Mt Glenmarry Debris Covered Glacier Geopreservation site (Kenny & Hayward 1993) is a moderately well defined landform of scientific/educational interest. The head of Irishman Stream has a very well preserved set of recent glacial features including a cirque, lateral and terminal moraines, roche moutonnées, and tarns lying in former glacial troughs (McGregor 1967). Similar features in the head of the southern branch of Stony Stream have been used as a secondary type locality for these post-glacial features (Ben Ohau formation) (ibid.). The lateral kame ridges east of Lake Ohau and the Dobson River, between Greta and Irishman Streams, have been described as a significant glacial feature of the Mackenzie Basin (Judkins 1978) (although they are not listed by Kenny & Hayward 1993).

### 2.3 Soils

The alpine and nival zones of the leases consist of rock peaks, ridges and bluffs, shattered rock pavements (fellfield), rock scree slopes, rock debris fans, deep gravel deposits on stream beds, and some permanent ice. Scree slopes, some with an altitudinal range of over 1000 m, are a significant groundcover in the Dobson and Hopkins valleys. Only limited areas of incipient soils derived from fragmented rock and loess are present in these zones.

The lower faces of the ranges are covered by Kaikoura steepland yellow-brown earths on colluvial and talus slope deposits (New Zealand Soil Bureau 1968). These soils currently carry a mixture of beech forest, tall and short tussocklands and subalpine scrub. They are interspersed with screes, erosion gullies and debris-avalanche fans, and are susceptible to wind and sheet erosion if the vegetative cover breaks down.

The morainic slopes and terraces along the eastern side of Lake Ohau and up the Dobson Valley to Camp Stream are covered by deeper Cass yellow-brown earth soils.

Mesopotamia yellow-brown earths occur on the terrace lands and fans between the morainic slopes and the river valleys. Native vegetation is snow and fescue tussockland and shrubland. On Glen Lyon PL these soils have been largely OSTD, and now support some of its more productive pastures.

The riverflat soils have higher natural fertility than older soils on surrounding hills. Dobson gley recent alluvial soils on the lower Dobson riverflat and (although mapped as Tasman soils) on the south side of the Temple Stream fan have a natural rush and sedge swamp vegetation. The remaining riverflats and alluvial fans in the lower Hopkins and Dobson valleys have Tasman recent soils.

## 2.4 Climate

As the pastoral leases are located immediately east of the Main Divide their climate is governed by the interaction of the succession of anticyclones and depressions in the prevailing westerly airstream. Ranges at the east of the Mackenzie Basin provide some protection from easterly direction weather systems.

Rainfall, associated with moisture-laden depressions and fronts, is frequent and often heavy on the western slopes and summits of the Southern Alps, but tapers off dramatically as winds descend eastern slopes. Annual rainfall is over 4800 mm on the Ben Ohau and Naumann Ranges, 3200 mm in the upper Dobson and Hopkins valleys, 1340 mm at Glen Lyon homestead and c.1200 mm at Lake Ohau (New Zealand Meteorological Service 1973). Heavy rainfall can cause rivers to flood. During winter, and at higher altitudes, much precipitation falls as snow, and spring avalanches are common. Permanent snow is restricted to high points on the Ben Ohau and Naumann Ranges. Dry spells and droughts are not as frequent as they are in the semi-arid mid-Waitaki Basin.

Temperature decreases with rising altitude at an average lapse rate of 6° C per 1000 m. Temperatures (especially soil temperatures) are greatly influenced by aspect, and cause marked contrasts in vegetation between sunny and shady slopes. Winters are cold. Ground frosts occur throughout the year, especially in winter, and can be intense on valley floors. Summers are warm at lower eastern sites, mild in the main valleys and cool in the mountains (O'Connor 1976). Although the climate may be described as harsh, periods of fine, settled weather are common and extended periods not infrequent. Ultraviolet radiation is strong at these times.



## 2.5 Vegetation and Flora

Vegetation communities in the leases have been defined by subjective grouping of zones in relation to dominant ecological gradients (principally altitude).

Table 1 Altitudinal Vegetation Zonation, Huxley Gorge and Glen Lyon Pastoral Leases

Altitudinal Range (m)	Zone
> 2200	Nival (above permanent snowline, or exposed rock)
1900-2200	Subnival (between snowline and grassline – upper limit of continuous tussockland vegetation)
1400-1900	Alpine (between tussock-line and scrubline – upper limit of continuous woody vegetation)
1000-1400	Subalpine (from scrubline down to upper limit of developed forest where present)
Below 1000	Montane (beech and non-beech forest, induced grasslands and tussocklands, wetlands)

The nival and subnival zones on the summits of the Ben Ohau, Naumann and Barrier Ranges are predominantly rock, ice and scree, with at most, sparse vegetation. Alpine vegetation is dominated by mid-ribbed and curled snow tussocks towards the Main Divide while narrow-leaved and slim snow tussocks dominate elsewhere.

Subalpine vegetation is generally dominated by turpentine scrub in higher rainfall and shady sites. In drier sites there are multi-species scrubs, narrow-leaved snow tussocklands, fire and grazing induced short tussocklands and screes.

Montane vegetation consists of mountain beech remnants, coniferous forest, small exotic conifer plantations, matagouri and sweet brier shrublands, red and narrow-leaved snow tussocklands, fescue short tussocklands, wetlands and active riverbeds.

A total of c.350 native and c.50 adventive species have been recorded. One threatened species (orange mistletoe, vulnerable) is abundant in mountain beech forests. Yellow mistletoe (vulnerable) occurs in a mountain beech gully near Lake Ohau and a rare bladderwort (*Utricularia australis*) in a red tussockland at the Dobson River. A new site for the threatened *Pittosporum patulum* has been found in scrub above the forest on the south side of the Huxley Valley.

For ease of description and analysis, the two leases have been subdivided into six blocks of land that have broadly similar natural and pastoral features. Blocks on Huxley Gorge and Glen Lyon are prefixed HG and GL respectively. Two blocks straddle both leases. The blocks are:

- i. HG: Ram Hill - Rabbiters Peak - Steeple Peak (Barrier Range)
- ii. HG & GL: Naumann Range
- iii. GL: Northwestern Ben Ohau Range
- iv. GL: Upper Southwestern Slopes of Ben Ohau Range
- v. GL: Lower Southwestern Slopes of Ben Ohau Range
- vi. HG & GL: Lower Dobson and Hopkins Valleys

### 2.5.1 Ram Hill –Rabbiters Peak – Steeple Peak

Area: 5 600 ha (approx.)  
Altitudinal Range: 550-2285 m  
Altitudinal Zones (%): Montane (18), Subalpine (33): Alpine (39), Subnival (10), Nival 0.2  
Ecological District: Huxley

This block comprises most of Run 528 (Huxley Gorge), the mountainous portion of Huxley Gorge south of the Hopkins River. It consists of a trifurcated arm of the Barrier Range and, in the east, part of the Hopkins valley floor. Rocky peaks, ridges and steep slopes predominate. Scree gullies, spilling onto fans below, are numerous on northern and eastern slopes above the Hopkins River and North Branch Temple Stream. A glacial history is evident in the amphitheatre-like cirque basin in North Branch Temple Stream, steep ice-carved rock northeast of spot height 1294 (above Huxley Lodge), and a small morainic tarn (H38: 528778). Basement rock is chlorite schist in the north-west and greywacke in the south-east. Precipitation halves in the seven kilometres between the summits and valley floor (c.4000-2000 mm).

About 10% of the block is sparsely or non-vegetated subnival and nival rock, scree and ice.

There is a marked contrast between grazed and ungrazed alpine tussocklands and herbfields. A rocky bluff (between spot heights 1501 and 1596 on Ram Hill Ridge) and adjoining precipitous slopes prevent stock access to most of the alpine zone. Broad-leaved and mid-ribbed snow tussocks and large palatable herbs (e.g. mountain lily (*Ranunculus lyalli*), New Zealand avens (*Geum cockaynei* previously known as *G. parviflorum*) and bristly mountain carrot (*Anisotome pilifera*)) are frequent northwest of this point. Eastwards, in the grazed area, there is a high native plant species richness (35 natives) but a lack of tall tussocks and large palatable herbs. The west-east transition from mid-ribbed to narrow-leaved snow tussock also occurs about this point. Loose rock and scree is frequent in the alpine zone: scree willowherb, *Myosotis traversii*, New Zealand avens and edelweiss are present

Much of the subalpine vegetation (c.33% of the block) is narrow-leaved snow tussockland, turpentine scrub, or induced short tussocklands (e.g. alpine fescue tussock, bristle tussock). Frequency and cover of adventive species (e.g. king devil, grasses) is varied. Shrub cover (e.g. turpentine scrub, snow totara, toatoa) is greater on rocky and bluff sites, on the North Branch Temple Stream cirque walls, and on south-facing slopes. A predominantly adventive grassland, perhaps oversown and top-dressed (king devil, browntop, alpine fescue tussock, white clover and sweet vernal) is located at the summit of spot height 1294. The North Branch Temple Stream cirque basin has a diverse grass-herbfield of introduced and native

species (king devil, catsear, sweet vernal, *Acaena caesiiglauca*, white clover, tussock hawkweed, bluegrass and prickly shield fern).

The montane zone (18%) is largely restricted to the Hopkins riverflats and the lower and middle slopes of Ram Hill Ridge. Fescue tussock associations predominate on riverflats and fans, with matagouri shrubland on more fertile sites. On the hillslopes are:

- mountain beech pockets and scattered mountain beech and broadleaf trees (in gullies and on small ridges);
- mixed shrub-tussockland communities (matagouri, manuka and mingimingi, with narrow-leaved snow tussock, fescue tussock, blue tussock, bristle tussock, king devil and adventive grasses).

The mixed shrub and tussockland communities show high floristic richness (40 native species in one area). *Gaultheria crassa*, harebell, catsear, *Leucopogon fraseri*, *Brachyglottis haastii*, golden spaniard and *Helichrysum intermedium* are frequent at these sites. *Ranunculus buchananii* has been found in “Gunbarrel Pass” between the North and South Temple Valleys and *Ranunculus grahamii* and *Parahebe birleyi* have been located on Rabbits Peak.

Of the total species recorded six native and one naturalised species are found only on this block but not elsewhere on the two properties. Particularly notable are kowhai, *Corokia cotoneaster* and *Carmichaelia uniflora*, all on the grazed northeastern flanks of Ram Hill Ridge. Several naturalised species are widespread and contribute significantly to vegetation cover, especially in grazed areas (e.g. king devil, sweet vernal, catsear, browntop and mouse-ear chickweed).

### 2.5.2 Naumann Range

Area: 14 800 ha (approx.)  
Altitudinal Range: 570 - 2590 m  
Altitudinal Zones (%): Montane (10), Subalpine (25), Alpine (45): Subnival (18), Nival (2)  
Ecological District: Dobson

This block comprises Runs 314 and 727 (Huxley Gorge Pastoral Lease) and part of Run 315 (Glen Lyon Pastoral Lease). It consists of the entire Naumann Range except the beech forest conservation areas on its lower western and eastern slopes and 150 ha of developed land at its southern tip. In the uppermost Hopkins valley, above the up-valley limits of forest, the block extends west towards Mt Williams on the Main Divide. Its boundaries with the Hopkins and part Dobson conservation areas (2558 ha and 3290 ha respectively) are approximately at timberline (c.1200-1400 m in the Hopkins valley, 1000-1300 m in the Dobson valley). In the southwest and southeast, where natural montane beech forest has been replaced by tussockland, the block extends down to the Hopkins and Dobson Rivers. It also descends to the valley floor in the upper Dobson valley.

The block lies in the highest rainfall zone on the two leases (4000-5000 mm per annum on high mountain slopes, but 2000 mm pa at the southwestern tip of the Naumann Range).

The 20% of the block in the nival and subnival zones is predominantly ice, rock, fellfield and scree that is at most only sparsely vegetated (e.g. *Raoulia youngii* on Dasler Pinnacles, 2280 m).

Nearly half of the block is in the alpine zone. East of Erceg Hut, in the upper Hopkins valley, there is an upper subalpine and alpine altitudinal sequence of mid-ribbed snow tussock → curled snow tussock → snow hollow grass associations. Other frequent species were *Poa hesperia*, *Celmisia haastii*, mountain lily, sedge tussock, *Astelia petriei*, *C. hectorii*, *C. sessiliflora*, *C. verbascifolia*, *Coprosma perpusilla* and *Hebe macrantha*. Large palatable herbs (e.g. mountain lily, New Zealand avens and bristly mountain carrot) are present, and adventive species infrequent.

Grazing of upper subalpine and lower alpine basins above the Dodger Stream fan has dramatically altered the vegetation at some sites (Hunter & Basher 1992). Large palatable herbs and snow tussocks are confined to sites inaccessible to sheep. Grazing tolerant native tussocks, grasses and herbs (e.g. alpine fescue tussock, false spaniard, *Poa hesperia*, sedge tussock) have survived or increased in cover, and introduced species cover has become significant (e.g. king devil, Yorkshire fog, sweet vernal, browntop, sheep's sorrel and white clover).

Narrow-leaved snow tussock tussocklands are predominant in lower rainfall alpine and upper subalpine zones (from Jamieson and Watson Streams southwards). Frequent associated species at Jamieson Creek are false spaniard, *Poa hesperia*, *Aciphylla montana*, *Celmisia angustifolia*, *C. verbascifolia* and bristle tussock. Broad-leaved snow tussock is also present. Grazing (by thar and/or sheep) has greatly reduced tussock cover at some sites.

Prominent species in the large subalpine scrub area in the upper Hopkins valley near Erceg Hut are snow totara, toatoa, cottonwood, mountain ribbonwood and turpentine scrub. An unusual association on low post-glacial moraine on the valley floor is dominated by king devil hawkweed. Subalpine scrub dominated by turpentine scrub covers lower hillslopes in the upper Dobson valley.

The vegetation on montane hillslopes at the southern end of the Naumann Range, on greywacke, consists of mountain beech forest remnants, turpentine scrub, matagouri and fescue tussock and narrow-leaved snow tussock communities. Fescue tussock gives way to narrow-leaved snow tussock above c.800-900 m. King devil hawkweed and blue tussock are frequent associated species. Red mistletoe, a hemiparasite, is frequent in several mountain beech remnants near Glenmary Hut.

At the head of the Dobson valley, in the montane zone, is a 550 ha area of grazed red tussockland on a large aggrading fan. Red tussock cover ranges between 10-75%. Inter-tussock species include *Brachyscome* sp., browntop, sweet vernal,

catsear, white clover, silver tussock, Yorkshire fog, king devil and many native herbs and dwarf shrubs. Matagouri and other shrub species are frequent in gullies and on older surfaces, and there are several silver beech copses. Several bogs and ponds have sphagnum, *Carex gaudichaudiana* and other wetland species. The upper slopes of the fans have a grazing-induced short turf (browntop, silver tussock, king devil and sweet vernal). Heavy grazing at the southern end of the fan (inside the wing fence) has caused local extinction of red tussock. Grazing pressure is lower on the moraine at the northern end; red tussock cover is higher and the large palatable mountain lily is frequent there. A recent avalanche debris slide is revegetating largely in exotic herbs and grasses.

Seven native plant species found on the block have not been observed elsewhere on the rest of the Pastoral Leases. The Hopkins valley has the lowest numbers of naturalised species of any area on the Pastoral Leases. King devil and Yorkshire fog are the most frequent there. King devil, sweet vernal, browntop, sheep's sorrel and catsear are frequent in the Dobson valley.

### 2.5.3 North-western Ben Ohau Range – Dobson River

Area: 15 400 ha

Altitudinal Range: 560-2557 m

Altitudinal Zones (%): Montane (15), Subalpine (21), Alpine (47), Subnival (15), Nival (2)

Ecological District: Dobson

This block comprises almost all land between the Ben Ohau Range summits (2000-2557 m) and the Dobson River, from Backbone Peak north to Mt McCann. It represents a substantial proportion (c.30 km distance, >50% area) of the western side of the Ben Ohau Range. The sequence from river edge to mountaintop is broken only by the elongated, c.12 km long, 850 ha eastern Dobson beech forest conservation area, in the upper Dobson valley.

The nival and subnival zones, nearly one-fifth of the block, consist of rock, ice, fellfield and scree, and are at most only sparsely vegetated. The most conspicuous of the few vascular plant species is the South Canterbury-North Otago endemic spaniard, *Aciphylla dobsonii*. It is common in Stewart and Irishman Stream valleys at altitudes above c.1800 m. *Ranunculus haastii* is also found in the screes along with *Notothlaspi rosulatum* (penwiper).

In the alpine zone (almost one-half of the block), the predominant tussock species are curled and mid-ribbed snow tussocks from Stewart Stream northwards, and slim snow tussock and narrow-leaved snow tussock southwards. Tussock sedge (*Schoenus pauciflorus*), *Poa hesperia*, false spaniard, *Celmisia haastii*, *C. hectorii* and *C. verbascifolia* are frequent associates. Droppings and absence of palatable plant species at some sites appear to have been caused by thar and/or chamois.

A rich low herbfield in the upper Irishman Stream cirque basin, at c.1800 m, has *Oreobolus pectinatus*, *Psychrophila novae-zelandiae* (previously *Caltha novae-*

*zelandiae*), *Cardamine* sp., *Ranunculus grahamii*, *Parahebe birleyi* and other species. Another species-rich moraine and wetland community is at 1731 m near Waterfall Hut. Palatable herbs (e.g. bristly mountain carrot, *Dolichoglottis scorzonerooides* and New Zealand avens) occur at sites less accessible to browsing (e.g. gorges), and alpine rush on flushes.

The extensive upper subalpine and alpine screes on the flanks of the main range and in incised valleys (Irishman, Stony, Camp and Stewart) support scattered scree plants (e.g. *Ranunculus haastii*, *Myosotis traversii*, *Epilobium pycnostachyum* and *Lobelia roughii*). Rocky sites characteristically have *Hebe epacridea*, edelweiss and vegetable sheep. King devil and mouse-ear hawkweed are frequent below 1300-1500 m.

The subalpine zone comprises scrub, tussocklands and mixed shrub-tussocklands. Like in the alpine zone, the predominant snow tussock species are curled snow tussock and mid-ribbed snow tussock north of Stewart Stream, and narrow-leaved snow tussock southwards. Short tussocks (fescue and alpine fescue tussocks, bristle tussock, blue tussock, silver tussock), king devil, mouse-ear hawkweed and golden spaniard are frequent. Tussocklands on sunny north-facing slopes in lower Irishman and Stony Streams have been severely depleted by past grazing (and probably fire). Snow tussock cover is low, and bare ground, king devil, sweet brier, and golden spaniard are prominent. Heavy grazing east of Reardon Hut is causing extensive death of narrow-leaved and broad-leaved snow tussocks and pineapple scrub and a transition to grazing tolerant grassland.

Turpentine scrub, snow totara and toatoa are frequent in scrub in the upper Dobson valley. At some sites, these shelter large palatable herbs (mountain lily, large mountain daisy and Haast's mountain carrot). Matagouri, porcupine scrub, yellow tree daisy and mountain ribbonwood are also present in scrub in drier down-valley sites.

In the montane zone, the understorey in grazed mountain beech remnants in Stony and Stewart Stream valleys and on lower Dobson valley hillslopes is predominantly litter and bare ground. The understorey in the Irishman Stream mountain beech has a modest cover of ferns, shrubs and herbs. Silver beech occurs in the upper Dobson valley. Red mistletoe is sparse in the Irishman Stream mountain beech, but more common (and defoliated) in Stony Stream. Non-beech forest dominated by toatoa and containing cedar, Halls totara and broadleaf occurs in the upper Dobson valley north of Waterfall Hut. The waterfall gully at Waterfall Hut (on conservation land) is inaccessible to ground browsers and has many large palatable herbaceous species (e.g. *Ourisia macrocarpa*, *Cheesemanina fastigiata*, *Gingidia montana*, Haast's mountain carrot, New Zealand avens and mountain lily). *Cheesemanina fastigiata* was found during the survey only at this site.

Dense matagouri, *Coprosma*, bracken and manuka scrub covers the steep west facing slopes of the Dobson valley between Stony and Camp Streams. Other lower mountain hillslopes are covered by fescue tussock, sweet vernal and browntop

tussock-grasslands (with native herbs); fescue tussock is replaced by narrow-leaved snow tussock above 800-900 m.

Active riverbeds are sparsely vegetated (e.g. *Epilobium melanocaulon*, mouse-ear hawkweed, sheep's sorrel, Yorkshire fog and creeping poohuehue). Fans and riverflats feature matagouri shrubland and grassland dominated by fescue tussock, browntop, Yorkshire fog, sweet vernal and king devil. Some tussock sedge and red tussock occur on finer, less well drained soils. “Stony Stream Lagoon” is an in-filling pond and wetland vegetation, including red tussock, is located between the Camp and Stony Stream fans in the main Dobson valley (rf. Jarman 1987).

The most common weeds are king devil hawkweed (montane to low alpine) and mouse-ear hawkweed (montane to subalpine). Californian thistle is present in Irishman Stream. An ex-New Zealand Forest Service Corsican pine revegetation trial in lower Irishman Stream (H38: 662 791) is spreading along c.1 km of the south side of the valley. Some trees have been recently cut. Corsican pines in Stony Stream, just above the gorge, are also spreading but not yet as widely as in Irishman Stream. Larch and silver birch have been planted on the south bank of Irishman Stream 200-300 m upstream of its entry into the Dobson valley. The larch may present a risk of wilding tree spread when mature.

The block has a very high diversity of vegetation communities, and a correspondingly high level of floristic richness. Eighteen plant species found on or near the Pastoral Leases have been recorded from this block only. Many of these are in two habitats not found elsewhere on the Pastoral Leases: the non-beech forest in the upper Dobson valley, and the browser-free waterfall gully behind Waterfall Hut (which is on conservation land). The drier scree communities, like others in Canterbury, also tend to have more species than those closer to the Main Divide.

#### 2.5.4 Upper Southwestern Ben Ohau Range

Area: 4 600 ha  
Altitudinal Range: 860-2263 m  
Altitudinal Zones (%): Montane (5), Subalpine (37), Alpine (53), Subnival (5), Nival 0  
Ecological District: Ben Ohau

This block comprises the summit and upper southwestern slopes of the Ben Ohau Range, from Backbone Peak south to Dorcy Stream. Although the block is contiguous with the Northwestern Ben Ohau Range – Dobson River block (section 4.3), it is treated separately because it lies in a different ecological district (Ben Ohau). The boundary with the Lower Southwestern Ben Ohau Range block follows the retirement fence at 860-1200 m. The other boundaries, all with pastoral lease lands on the eastern side of the Ben Ohau Range (Pukaki Downs, Rhoboro Downs and Bendrose), are not fenced, but high altitude limits stock access. The block has two distinct components: the Harris Stream basin (c.2000 ha), and west facing slopes above the Dobson River. Annual rainfall decreases rapidly with increasing distance from the Main Divide (3500-2000 mm).

The subnival zone along the Ben Ohau Range summit and the ridge between Harris Stream and the Dobson valley consists of sparsely vegetated rock, fellfield and scree (e.g. *Poa buchananii*, *Koeleria cheesemanii*, *Luzula pumila*, *Raoulia youngii*, *Agrostis muelleriana*, *Epilobium porphyrium* and *Aciphylla dobsonii*).

The upper montane, subalpine and alpine zones have the following general altitudinal sequence:

- narrow-leaved snow tussock, king devil hawkweed, mouse-ear hawkweed and fescue tussock, and golden spaniard in the lower Harris Stream valley, up to 1000-1100 m;
- narrow-leaved snow tussock, blue tussock, alpine fescue tussock, golden and giant spaniards, with shrubs (turpentine scrub, coprosmas) at some sites, up to about 1500 m;
- slim snow tussock, *Poa hesperia* and false spaniard on south slopes, and bristle tussock, alpine fescue tussock and *Poa hesperia* on north slopes, up to the upper limit of continuous vegetation (1800-1900 m).

Common associated species include *Dracophyllum pronum*, *Leucopogon fraseri*, *Rytidosperma pumila*, *Luzula rufa*, *Raoulia subsericea*, *Celmisia gracilis* and *Pimelea oreophila*. Where they occur on steep slopes, these communities have considerable rock and bare ground. Occasional scree plants (e.g. *Lobelia roughii* and *Haastia sinclairii*) are present on the screes.

Sunny west facing sites above the retirement fence north of Harris Stream, and in the lower reaches of the Harris Stream basin, have depleted vegetation cover and considerable wind-mediated inter-tussock erosion. Golden spaniard is typically frequent at these sites. Vegetation is in better condition (higher biomass, species richness and cover) on south and east facing slopes. Large palatable herbs are infrequent throughout.

Compared with the OSTD pastures below the retirement fence, naturalised species are fewer in number and have less cover. Common naturalised species (mostly at lower altitudes) are king devil and mouse-ear hawkweed, sheep's sorrel, catsear, sweet vernal, hawksbeard and browntop. Several wilding Corsican pines and larches are on west facing slopes south of Harris Stream, and one in the Harris Stream basin (H38: 640 701). Two native plant species recorded on the Pastoral Leases are found only in this block.

### 2.5.5 Lower Southwestern Ben Ohau Range

Area: 3 500 ha

Altitudinal Range: 530-1200 m

Altitudinal Zones (%): Montane (95), Subalpine (5), Alpine (0), Subnival (0), Nival (0)

Ecological District: Ben Ohau



The “homestead” block is bounded to the south by Dorcy Stream; to the west by Glen Lyon Road and Lake Ohau; to the north by a fenced ridgeline west of Backbone Peak; and to the east by a retirement fence at 800-900 m north of Harris Stream and 1000-1200 m southwards. The block lies almost entirely in the montane zone.

The block has been OSTD, and fenced into c.15 medium sized paddocks (Harris 1986). Lush pasture in some areas consists of fescue tussock, red and white clover, browntop, haresfoot trefoil, king devil, Yorkshire fog, mouse-ear hawkweed, clover dodder and sweet vernal. Narrow-leaved snow tussock occurred infrequently at higher altitudes. Shrublands on some lower slopes contained matagouri, mingimingi, sweet brier and some elderberry, amongst an understorey of king devil, Yorkshire fog, browntop, white and red clover and fescue tussock.

Mountain beech remnants, survivors of Polynesian and European-era fires, partly or fully occupy eight of the larger stream gullies cutting across the block. Large red mistletoes are numerous, and yellow mistletoe is found in the mountain beech gully nearest the Dobson river mouth. The forest understorey is generally open (litter, stones, introduced grasses and herbs).

The small morainic wetland contains red pondweed, with *Carex sinclairii*, spike rush, *Juncus articulatus*, *J. effusus*, sedge tussock and *C. gaudichaudiana* on the margin.

Wildings from a larch plantation (> 50 ha) just south of the Glen Lyon homestead are spreading south (i.e. downwind). A Douglas fir plantation (20 ha) to the north has been recently harvested and replanted. Other conifers shelter the homestead, and there are recent plantings alongside Glen Lyon road near Lake Ohau. Larch and Corsican pine wildings above the retirement fence southeast of the homestead and in the Harris Stream basin are downwind of, and probably sourced from, the older of these plantings. Khasia berry, spread by birds from the Glen Lyon homestead gardens, is establishing in mountain beech forest in Harris Stream gully above the bridge.

Two of the six plant species found on the Pastoral Leases only on this block were native, and four were naturalised.

### 2.5.6 Lower Dobson and Hopkins Valleys

	Area (ha)	Altitude (m asl)	Ecological District
Wetland adjoining Dobson River	60	540-550	Dobson
Glen Lyon Flat	600	525-550	Ben Ohau
Huxley Gorge Low Hills and Flats	1250	530-668	Ben Ohau
Hopkins River Island	50	560-612	Dobson
Southern Tip of Naumann Range	150	560-900	Dobson
Glenmary Flat and Swamp	250	550-560	Dobson
Total	2360		

This block encompasses the lower valley floors of the Hopkins and Dobson Rivers. It comprises the lowest altitude parts of the two leases, and lies entirely in the montane zone. It is the most intensively developed part, with fencing, yards, tracks and two homesteads. The braided Hopkins and Dobson Rivers trisect the block. Much of the block is wetland, and some parts lie within the flood zone of the Hopkins and Dobson Rivers.

The vegetation and flora of the block are described here in six parts.

(a) Wetland Adjoining Dobson River

This long narrow wetland (c.60 ha) is located c.5 km north of the Glen Lyon homestead, on the eastern margin of the Dobson riverbed (H38: 606760). The wetland lies on pastoral lease and on Crown land riverbed. A flowing creek passing down its length marks this tenure boundary. Old river channels and hummocky land suggest the wetland is within flood reach of the Dobson River.

The wetland has predominantly native vegetation but some adventives. From east to west (road to river) there is a sequence of *Carex sinclairii*-*Juncus articulatus*-Yorkshire fog-white clover → *C. gaudichaudiana*-*C. goyenii*-browntop-Yorkshire fog-timothy-red clover → creek → red tussock-*C. geminata*-*C. sinclairii*-red clover-Californian thistle. The bladderwort *Utricularia protrusa* (rare, Cameron *et al.* 1995) is found in the creek, and a young crack willow in mid-swamp.

(b) Glen Lyon Flat

The Glen Lyon flat (c.600 ha), on the true left of the Dobson River below Glen Lyon homestead, was originally a swamp. Water is sourced from underground hydraulic pressure, flooding by the Dobson River, rainfall and the Harris Stream fan. The swamp has been progressively drained since 1957. Deep drains now flow from the Harris Stream fan down the centre and the eastern margin of the flat. Spoil has been deposited on the drain margins.

A sequence north of the Harris Stream fan (from Dobson River eastwards) has *Carex geminata*-Californian thistle-grasses (on fresh river sediments) → *C. sinclairii*-*C. gaudichaudiana* very wet swamp. Crack willows are spreading north from a large infestation on Harris Stream.

The soils and vegetation of the area between the Dobson River and willow-lined Harris Stream are periodically flooded and covered with silt. The vegetation comprises predominantly adventive species that have been oversown and/or are able to rapidly colonise fresh silt (e.g. Californian thistle, Russell lupin, timothy and red clover).

Drains on the flat south and east of Harris Stream have initiated a change from swamp vegetation to communities of drier soils (fescue tussock, *C. coriacea*, red clover, hawksbeard, browntop and patches of Russell lupin). This area has been

oversown with timothy and clovers (Harris 1986). There is a recently developed, fenced, cultivated field in the centre of the flat.

Swamp communities on the southwest margin of the flat are relatively intact. A number of shallow tarns and turf communities (e.g. *Crassula sinclairii*) and deeper oxbows lie in a matrix of wetland and drier vegetation, variously dominated by *Carex sinclairii* and *C. gaudichaudiana*, red tussock and fescue tussock. *Deschampsia caespitosa* was found here.

(c) Huxley Gorge Low Hills and Flats

This area (c.1 250 ha) comprises the balance of Run 528 (rf. Section 2.3.4.1). It consists of low morainic hills (Tekapo formation) behind the Huxley Gorge stationhouse, the active Temple Stream fan and riverflats adjoining the Dobson River.

The low hills behind the Huxley Gorge station house and Huxley Lodge typically have matagouri and mingimingi shrublands and OSTD fescue tussocklands. Wilding trees are spreading downwind from Huxley Gorge station plantations and Douglas fir, silver birch, Corsican pine and larch at Ohau base and Huxley Lodge are beginning to spread and some control work has been carried out.

Two small ponds and a wetland are nestled in the low hills. The larger pond (1-2 ha), northwest of spot height 668, has a range of marginal wetland and water plants, including several spreading crack willows. It is partly fenced. The smaller pond (c.0.5 ha), east of spot height 668, is largely infilled by encroaching vegetation, and has a rich turfy margin. The wetland (c.10 ha) is a long gently sloping basin with dense *Carex sinclairii*, sedge tussock and *C. coriacea* (Photo 45).

Much of the Temple Stream fan has been oversown, fertilised and fenced, and constitutes established pasture. Matagouri and fescue tussock shrub-tussockland at the upstream end of the Huxley Gorge flat is within the flood reaches of the Hopkins and Dobson Rivers. The balance of the flat is wetland, as follows (from north to south):

- i. the lower Larch Stream area has a west-east sequence of low grass-sedgeland (fescue tussock, sedge tussock, *Carex coriacea* and hawksbeard); red tussockland; and fescue-browntop-*C. coriacea* near the Dobson River;
- ii. between the Temple Stream fan and the Dobson River, and southwards, is an extensive area of sparse to dense red tussock intermixed with *Carex* sedgeland and *Sphagnum*;
- iii. where numerous watercourses on the active, southern Temple Stream fan are eroding and depositing material, well-established wetland vegetation is being replaced by new colonists, primarily adventives (king devil, browntop, white clover, sweet vernal, Yorkshire fog, lotus, fescue and silver tussock).

More than 20 wilding Corsican pine and larch were noted in this wetland, and crack willows along the Dobson River margin.

(d) Hopkins River Island

Low hills (c.20 ha) that rise to 40 m above the Hopkins riverbed c.3 km above its confluence with the Dobson are mapped as Birch Hill moraine (Gair 1967). Although northerly parts appear to be morainic, the southwestern part has exposed hard rock characteristic of roche moutonnée. Drainage, uncharacteristically for moraine, is good. There are four small open water bodies at the base of the low hills. Downstream of the hills, the riverflat (c.30 ha) is largely protected from the ravages of the Hopkins River but is likely to be flooded during extreme events and during phases of river aggradation.

The predominant vegetation on the hills is fescue tussock and introduced grasses, and patches of dense matagouri. It may have been OSTD. The ponds are generally grazed to their edge. Red pondweed, starwort and *Myriophyllum propinquum* are common in the water, and *Eleocharis acuta*, *Juncus tenuis*, *J. articulatus* and *Carex sinclairii* are frequent on the margins. The riverflats are dominated by matagouri and low grasses and herbs (browntop, sweet vernal, fescue tussock, mouse-ear hawkweed). Ragwort is scattered on the hills.

(e) Southern Tip of Naumann Range

This area (c.150 ha) is predominantly poorly drained rolling moraine (Birch Hill formation). Colluvial hillslopes occur at the higher altitudes, and there is a steep terrace riser above the Dobson River.

The dominant species in the grassland and shrubland on the moraine are turpentine scrub, narrow-leaved snow tussock, matagouri, manuka, browntop, Yorkshire fog, and fescue tussock. There are many other natives, including bog species (e.g. sedge tussock, *Oreobolus pectinatus*). On the drier, lower western slopes, shrubs have been burnt and introduced grasses predominate.

There is a dense cover of narrow-leaved snow tussock on the higher colluvial slopes. White clover, browntop and sweet vernal share the inter-tussock ground cover with loose rock (35%). Fescue tussockland, matagouri scrub and mountain beech remnants (with red mistletoe) cover the eastern steep slopes above Glenmary flat.

(f) Glenmary Flat and Swamp

The Glenmary flat (c.250 ha) is a river floodplain that is well drained near the Dobson River but swampy towards the base of the Naumann Range. Two clear streams, sourced from ground water and hill slope drainage, flow across the flat towards the Hopkins/Dobson confluence.

The vegetation on stony up-valley sites and within 200-300 m of the Dobson River is typically scattered matagouri among fescue and silver tussocks, browntop, and other native and adventive herbs and grasses, with sedge tussock and carices in wetter sites. Swampy sites around the Hut and at the base of the Naumann Range

typically have *Myriophyllum propinquum* and red pondweed in open water, and *Carex sinclairii*, *C. gaudichaudiana*, rushes and herbs elsewhere. Crack willows line the creeks near the hut, and there is an old orchard on a fan nearby. There are red tussockland patches along the base of the Naumann Range and a more extensive area (60-80 ha) in the fork of the Hopkins and Dobson Rivers confluence. The latter was burnt in the late 1970s (Lex Perriam pers. comm.) and now has up to 80-90% red tussock cover.

Crack willows around the hut are only slowly spreading. There is a well-established tree at grid reference H38: 599 766, and another a short distance to the west. A lone larch tree and wilding are growing on the hillslope west of the yards.

**2.5.7 Flora**

(a) Flora

A total of 360 native and 76 naturalised vascular plant species have been recorded on the Pastoral Leases (Table 2).

Table 2: Number of Native and Adventive Plant Species on Huxley Gorge and Glen Lyon Pastoral Leases

	Dobson ED		Ben Ohau ED	Huxley ED	Total
	Hopkins Valley	Dobson Valley			
Native	193	300	200	193	360
Adventive	30	49	51	23	76
Total	223	349	251	216	436

The Dobson valley had the highest number of native species. This reflects its greater size, range of habitats, strong precipitation gradient, and perhaps a greater intensity of survey effort.

Five species on the current checklist of New Zealand threatened plants (Cameron *et al.* 1995) have been found and/or have been previously recorded on or near the Pastoral Leases: two leafy mistletoes (red mistletoe and yellow mistletoe, both vulnerable), a bladderwort (*Utricularia protrusa*, rare), the grass *Deschampsia caespitosa* (vulnerable) and the shrub *Pittosporum patulum* (endangered).

Red mistletoe occurs frequently on mountain beech, particularly at lower altitudes. Yellow mistletoe was only found on mountain beech near the Dobson River mouth. The Ohau forests are a stronghold for both these species. *Utricularia protrusa* has been found in the Dobson River wetland north of Glen Lyon homestead, and *Deschampsia caespitosa* in wetlands at the lower end of the Glen Lyon Flat adjoining the Dobson River. *Pittosporum patulum* has been recorded in mountain beech forest in the Hopkins Valley (CHR 117189, opposite Elcho confluence, P. Wardle, April 1961; CHR 404190, upper Hopkins valley, P. Wardle, April 1983) and at Temple Stream (Dopson *et al.* 1999). Two of these sites are on conservation

land, the other probably so. *P. patulum* is unlikely to occur on the Pastoral Leases given the mainly remnant nature of mountain beech forests there.

Five species on the Pastoral Leases have nationally localised distributions or are at or near their northern or southern distribution limits. Pineapple scrub reaches its northern limit east of the Main Divide in the upper Dobson valley, a few kilometres north of its previously known limit at Freds Stream (Wilson 1976). It occurs a little further north on the west of the Divide, in the Copland valley. *Utricularia protrusa* is found in New Zealand in the North Island; at Westport and now at Ohau. *Aciphylla dobsonii* is a high alpine speargrass confined to the mountains of the upper Waitaki Basin and northwest Otago (Rogers *et al.* 1999). It has been found on the Pastoral Leases on the Ben Ohau Range tops above Stewart and Irishman Streams. *Epilobium purpuratum*, endemic to the Mt Cook region and west Otago, has been found on the Dasler Pinnacles. It is listed as “Local” on the New Zealand Threatened Plant List (Cameron *et al.* 1995). *Ranunculus buchananii* reaches its northern limit in the Hopkins Valley.

(b) Weeds

Some of the 76 naturalised species are actually or potentially troublesome weeds. Some of these are controlled, but practical control methods for others are not yet available (e.g. hawkweeds).

The apple, raspberry and gooseberry plants at the old Glenmary Hut site are likely to be old cultivars. They are not actively spreading.

Mouse-ear hawkweed: frequent to abundant in grazed fescue and browntop tussocklands, especially in lower rainfall eastern areas, and reaching 1800 m on the Ben Ohau Range.

King devil: frequent to abundant in all semi-natural tussocklands and shrublands, dominant in some higher rainfall sites in upper Hopkins (cf. Hunter 1991), and reaches 1800 m on Ben Ohau Range.

Sweet brier: occasional to frequent on lower altitude slopes and lower rainfall sites, especially in the lower Dobson valley.

Russell lupin: a garden escape from Glen Lyon homestead, locally abundant and spreading towards Lake Ohau. Spread of this nitrogen-fixing species could permanently alter the Hopkins and Dobson braided river systems. It is still containable, perhaps eradicable.

Crack willow: planted near Glenmary, the old homestead site, Glen Lyon and south of Huxley Gorge homesteads, with isolated trees spreading downstream towards and around Lake Ohau. Likely to slowly increase and modify habitats if not contained or eradicated.

Ragwort: quite frequent in lower Dobson valley (especially true left), and infrequent in Harris Stream and the upper Dobson. Actively controlled by station staff but well established away from easy access sites and likely to spread up valleys.

Thistles: Californian thistle is frequent to dominant on parts of the Glen Lyon flat, and scattered in wetter sites elsewhere. Scotch thistle is infrequent (e.g. upper Dobson colluvial fan).

Khasia berry: spread, probably by birds, from Glen Lyon homestead into nearby parts of the Harris Stream gully. Appears to be still controllable/eradicable, but otherwise is likely to spread slowly.

Gorse and broom: infrequent and controlled by station staff. Broom was seen in low numbers on slopes above Lake Ohau.

Introduced conifers (especially Corsican pine and European larch): spreading from Huxley Gorge and Glen Lyon homestead plantings, ex-New Zealand Forest Service plantings at Ohau base and in Stony and Irishman Streams, established wildings, and perhaps off-property sources. Wilding spread is obvious around homesteads, but more insidious in isolated areas (e.g. above retirement fence on southwest Ben Ohau Range, Stony and Irishman Stream valleys, Temple Stream swamp). Some Corsican pine trees in Irishman Stream valley had been recently cut.

## 2.6 Fauna

A wide variety of wildlife habitats occur on Huxley Gorge and Glen Lyon. The main areas for birdlife are:

### 1. *Braided River*

The Hopkins and Dobson braided river systems are important habitats for birdlife – both are ranked as outstanding sites of special wildlife significance. They provide habitat for up to 20 bird species, including three threatened species – Black stilt, black-fronted terns and wrybills and three other bird species which breed predominantly in braided river systems – banded dotterel, South Island Pied Oyster-catcher and black-billed gull.

### 2. *Valley wetlands*

#### (a) *Temple Stream wetland*

Comprises two distinct habitat types – (i) Temple Stream braided fan and (ii) floodplain wetland. The Temple Stream fan is a very dynamic open braided fan formed by outwash gravels from Temple Stream after it exits from the hills onto the river terrace. Black stilt and wrybill have been recorded here.

(ii) The flood plain wetland – below the active fan of the Temple Stream, the topography flattens out. Water out of the base of the fan becomes channelled and entrenched in deep silt deposited from Temple Stream and the Hopkins River delta. A large part of this area is covered with *Carex* sedges and pasture grasses on deep silt and varies in wetness depending on the season. There are a number of small open ephemeral ponds, which dry up during summer. These ponds provide a rich food source to wading birds following chick fledging.

The habitat values for wetland species is high. Birds species recorded at the time of the tenure review survey were pied stilt, South Island Pied Oyster catchers, white faced heron, spur-winged plover, grey duck and paradise shelduck. Marsh crake are also thought to be present.

(b) *Glen Mary Hut wetland*

This wetland is located on a low river terrace on the true right of the Dobson River just upstream of the Hopkins/Dobson confluence. The wetland receives water from a spring fed stream and hill runoff and does not appear to be influenced by Dobson River water.

The wetland contains a few small open ponds, which are very shallow with a soft mud substrate. A spring fed stream flows through the area and is deeply entrenched in places.

Waterfowl, including Canada Geese, are known to use the area and there may be some wader usage in conjunction with the river. Marsh crake could also be present.

(c) *Glen Lyon Swamp*

Glen Lyon Swamp has been extensively drained for many years and several drains have been cleared out and deepened in the last 5 years. The area is now grazed by cattle; pasture grasses and clover are established throughout, lupins have spread through many areas and weeds (especially thistle) are common particularly on disturbed ground around drains. Despite this, parts of the swamp still retain very high wildlife (bird) values. Native vegetation is present throughout most of the area and there is an extremely high potential to develop and manage the area as either a natural wetland system or specific habitat types for wader and wetland birds or a combination of both.

The area is a mosaic of vegetation zones, which overlap and intermingle depending on the water-table, and level of modification. The whole flat can be broadly grouped into 5 main areas.



1. At the southern most extent of the flat between the road and the river and mostly south of spot height 561m. This part of the wetland is relatively intact, consisting of swamp and very wet pasture including clovers, lupin, thistle and dock. A deep drain from the top end of the swamp flows along close to the hill edge. The area is drier towards the river edge.

Amongst this matrix of drier and wetter vegetation are a number of shallow tarns. These have a mud substrate and are extensively used by waterfowl and waders. At the time of the tenure review survey these tarns contained grey duck, mallard duck, black swam, paradise shelduck and several family groups of pied stilt. Previous observations have recorded black stilt, banded dotterel, South Island Pied Oystercatcher and large numbers of Canada geese. Marsh crake are probably present. The ponds provide a particularly valuable feeding area for family groups of waders, which have nested on the adjacent river.

2. North-west of the first zone, this is a large area extending out to the powerlines. This area is largely *Carex* and pasture grasses with clover and lupin patches throughout. There are areas of short carex growing on a floating mat and some small scattered patches of sphagnum. Areas of rosehip grow on drier land.
3. Scattered clumps of red tussock in pasture and *Carex*. This zone is close to major drains and drier than zones 1 and 2.
4. Denser blocks of red tussock in pasture grass.
5. This zone is influenced to a greater extent by the river. Recent floods have deposited fresh silt over large parts and *Carex* dominates. Areas not recently inundated have lush stands of grasses and clover. There are scattered clumps of red tussock. Lupins and thistles are evident in parts. There are long narrow silty ponds in old river channels. These are steep sided and some are deep and not good habitat for bird species.

## 2.7. Freshwater Fisheries

The freshwater fish fauna within the freshwaters of the area is typical of catchments at this altitude and geomorphology. Species recorded include the following : Canterbury galaxias(*Galaxias vulgaris*), longjawed galaxias(*Galaxias prognathous*), alpine galaxias (*Galaxias paucispondylous*), koaro (*Galaxias brevipinnis*), upland bully (*Gobiomorphus breviceps*), common bully (*Gobiomorphus cotidianus*), and longfinned eel (*Anguilla dieffenbachii*). None of these species are considered to be rare or endangered, although the waters are not fully explored so it is possible some rare endemic galaxiids may be present.

The waters also contain brown and rainbow trout which form the basis of significant trout fisheries.

## **2.8. Historic**

As pastoral properties Huxley Gorge and Glen Lyon were originally part of Lake Ohau Station, the western part of which was first taken up in May 1859 by John Fraser for Archibald McEwen. Land in the Dobson and the eastern side of the head of Lake Ohau came in under a separate application in September 1859, under the name of Alexander McKune. Alexander McKune is now thought to be the same person as Archibald McEwen. Around 1863 George Hodgkinson displaced Archibald McEwen/Alexander McKune and took up a series of runs in the Hopkins and Dobson forming the one property - Lake Ohau. However, not all of what is now Glen Lyon/Huxley Gorge was under Hodgkinson's name, as an Archie MacDonald held Glenmary on the eastern bank of the Hopkins in the late 1860s. After Hodgkinson's death in 1867, at somewhere around 1873-1875, John Alfred and George Augustus Sutton took on Lake Ohau through until about 1884, when the property was sold out to the National Mortgage. National Mortgage put in Herbert Maitland and William Grant Stronach lending them money to keep the property going. Not much is known about Stronach, but Maitland stayed on through until 1888.

National Mortgage continued holding Lake Ohau Station, albeit reluctantly, through until about 1891 by which time it had split Lake Ohau into two parts - Run 93, the homestead block, fronting the upper part of the lake and land west of the Hopkins River (more or less Lake Ohau Station as it is today), and run 93A which covered the Hopkins and Dobson valleys, and the hills above and between - more or less Glen Lyon and Huxley Gorge. It managed to sell Run 93 - Lake Ohau Station in 1891, but couldn't divest itself of Run 93A until about 1898 when it managed to find a tenant, John McArthur. Hugh Cameron and the Preston Company had Glen Lyon through until the Wigley family took the property on in 1948.

The only other known historic "event" connected to the property is the building of the Glen Lyon road, when 30 unemployed workers spent three years cutting the road between 1933 and 1936. It was hewed out of the hillside and banked with neat stone walls. Each of the first 2 miles took 30 men 6 months to construct while the remaining ten miles took only 5 months. The camp was only open over the summer months, as the winters were too severe.

Historic sites on the pastoral leases include the Kennedy Memorial (registered site) and possibly the old Pest Board hut (known as Le Crens Hut now) and the old homestead site.

## **2.9. Public Recreation**

### **2.9.1 Physical Characteristics**

These properties are a mix of open-space, natural, and remote experience zones. The lower valley floors, particularly the Huxley, are easily accessible by car from Lake Ohau/Twizel or Omarama (except when the road to Monument Hut gets

washed out) and would fall within an open-space zoning according to FMC guidelines. They are semi-natural grasslands with extensive grazing, low to moderate use and generally low intensity commercial recreation. The valley sides and tops of the Ben Ohau and Naumann Ranges would fall within a natural experience zone with unoccupied native forest and grassland, rivers and alpine areas. Foot tracks and bridges are very limited off the valley floors and there is a low use of many parts of the lease away from the main valley routes, except some of the passes or cols between the Dobson and Huxley and Mt Cook National Park.

### **2.9.2 Legal access**

On Glen Lyon there is legal access by formed road to a side-stream of the Dobson about 3 km north of the Glen Lyon homestead. There is legal access to the head of the valley from this point north on Crown land in the Dobson Riverbed or through Conservation Area further upstream. However this is not easy access and means keeping to the riverbed, crossing and re-crossing the braids of the river, whereas the natural inclination is to follow the 4 w.d. track to Station Hut across the pastoral lease. The runholder is happy for the public to use his road provided they gain permission first to do so. The general public can get to Irishmans Creek fan in 2 w.d. Beyond this point 4 w.d. is required.

There is legal formed access into the Hopkins River as far as the road end and Monument Hut. Beyond this point it is Conservation Area without restriction on public access.

### **2.9.3 Activities**

Huxley Gorge and Glen Lyon are two of the most important properties in the Waitaki catchment for recreation. A long history of conventional recreation based on the outdoors has occurred on these properties. Involvement with commercial tourism has its roots with the Government Tourist Bureau and the establishing in 1916 of the Red Hut in the Hopkins for guiding tourists over the high passes. Exploration, climbing and shooting are historic activities yet are still attracting visitors today. Runholders have noted a three-fold increase in recreation use in the last 5 years.

The High Peaks of Mt Ward, McKerrow and Hopkins are the main attraction for climbers. Most trampers use the valley systems. The alpine passes such as Broderick and Elcho into the Landsborough, Tragedy Col between the Hopkins and Dobson and Baron Saddle into the head of the Mueller Glacier from the Dobson are crossed by trampers but require alpine skills. The New Zealand Alpine Club has a hut in the Hopkins. Located in Elcho valley it is known as the Elcho Hut and was built in 1938.

The Ohau valley systems of the Dobson, Hopkins and Huxley and their side valleys attract shooters from all over New Zealand and overseas. Thar, chamois and to a lesser extent deer are the main attractions, especially in the Dobson.

The area is well supplied with huts, most under the control of DOC while others are station huts. The valleys give good access being typical wide braided river systems. The rivers can be a problem at times and should never be taken lightly. Four wheel drive tracks, mainly on Glen Lyon, give good vehicle access to the lower valleys especially in the Dobson but with careful negotiation also in the Hopkins.

Mountain bikes are now also being used, not only as an activity in their own right but also for access to the upper valleys. Botany, photography, painting and short walks are provided for in the Hopkins and Dobson valleys.

There are also people using four-wheel drive vehicles and motor-bikes for recreation (rather than for access for other activities) - mainly on existing tracks and normally on a daily basis with permission of the runholder. There is fishing in the lower reaches between the lake and Irishmans Creek in the Dobson and Huxley Gorge in the Hopkins. Horse trekking is growing in the area. Jet-boating is permitted but boat owners must apply to the Ministry of Transport for approval.

#### *Educational use*

There are school lodges in the Lake Ohau area which make use of the Conservation Area and Huxley Gorge and Glen Lyon properties. The Twizel Area School lodge is on land leased from Huxley Gorge. Canoeing and rafting activities usually take place over the section of the Hopkins River between the Monument Hut and Lake Ohau and overnight tramping trips usually occur in the Huxley Valley or the Hopkins. All aspects of outdoor education apply to this area eg. rivercrossing, navigation, rock-climbing, tramping etc.

#### *Commercial recreation*

With the advent of the helicopter more and more activities are revolving around the use of this means of transport. A number of companies operate scenic snow landing flights into the Naumann and Ben Ohau Ranges. Heli-skiing occurs on a limited basis on both Glen Lyon Station and on the Conservation Area at the head of the Richardson Glacier. Guided hunting trips also occur mainly using 4 w.d. access but with some helicopter use. Commercial horse trekking is also being undertaken.