

Crown Pastoral Land Tenure Review

Lease name :Halfway Bay Station

Lease number :PS 032

Conservation resources report

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

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

Copied October 2002

**DOC CONSERVATION RESOURCES REPORT
ON THE TENURE REVIEW OF
HALFWAY BAY PASTORAL LEASE,
ADJACENT FREEHOLD LANDS AND
ADJACENT UNALLOCATED CROWN
LANDS**

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PART 1

1.1 INTRODUCTION

The lessee of Halfway Bay Pastoral Lease has applied to the Commissioner of Crown Lands for a review of tenure.

The lessee owns the adjacent Allandale and Greenvale Pastoral Leases which are undergoing tenure review also. Those properties are run separately to Halfway Bay and have therefore been reported on separately by DOC.

Halfway Bay was inspected by DOC staff in early February 1999. Part of the property, namely the very head of Robert Creek, catchment had been previously assessed for some of its conservation values during the Protected Natural Areas Programme survey of the central part of the Eyre Ecological District in 1987.

The PNAP survey identified a very large recommended area for protection (RAP) covering the Upper Eyre Creek catchment and the southern slopes of the Eyre Mountains as far eastwards as Robert Creek. This RAP was mostly located on the Eyre Creek/Cainard Farm Settlement and has since become conservation land administered by DOC. This conservation area adjoins the southern boundary of Halfway Bay Pastoral Lease. The RAP includes the western side of the upper catchment of Robert Creek within the property.

Halfway Bay lease comprises 16,733 ha with supporting freehold land. The homestead is located on the western shore of Lake Wakatipu. There is no road access to the property, and it is 25 km from Queenstown by boat. The property includes all of the Billy Burn, Long Burn and Short Burn catchments and part of the Lochy River catchment which drains into Lake Wakatipu. A catchment board run plan has restricted grazing in the Lochy, Billy Creek and Long Burn upper valleys to cattle only.

This report also covers three freehold sections owned by the lessee and sections of unallocated Crown lands and describes their resources.

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PART 2

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

2.1 LANDSCAPE

METHODOLOGY

For this assessment Halfway Bay has been divided into five landscape units with the boundaries being defined principally by the changes in physical features, ground cover and land use. After defining the landscape units (LUs) the following landscape criteria was applied to each unit to help determine each unit's distinctive and high inherent values.

1. 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, landcover, and where appropriate, land use.

2. QUALITY ATTRIBUTES:

The following are the attributes which contribute to the overall quality of each landscape unit:

- (a) **Intactness:** Which is the condition of the natural vegetation and the degree of modifications to natural processes. In a landscape context intactness can be looked upon within a continuum of areas being completely pristine to being heavily modified.
- (b) **Coherence:** This is the level of harmony visually evident between natural elements, in other words coherence refers to the way a landscape "hangs together".
- (c) **Distinctiveness:** This is the special elusive quality which makes a particular landscape visually striking, frequently this occurs when contrasting natural elements combine to form a distinctive and memorable visual pattern.
- (d) **Visibility:** Although this is not a quality attribute, it is an important factor to consider for future management decisions to understand what type of audience each landscape is viewed by.

3. VULNERABILITY:

This is a measure of each landscape unit's susceptibility to further ecological deterioration based primarily on the intactness and coherence attributes. In general terms, the less modified a LU is, the more vulnerable to further change as a result of human activities that unit is likely to be.

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Landscape Unit 1

This unit includes all of the steep eastern faces overlooking Lake Wakatipu. It extends from Halfway Bay in the north to Southwest Bay which is about 10 km from the township of Kingston in the south. The whole of the unit is highly visible from State Highway 6 which runs parallel with the unit on the opposite side of the lake. It is particularly visible from tourist lookout points such as that recently developed on Devil's Staircase.

Within a broader context, the lake faces that rise directly from the lake's edge, are a part of a larger glaciated landscape that envelopes the whole of the Southern Lakes district. The physical character that gives this area its special identity includes natural features such as serrated skyline, high backwalls around mountain summits, and cirques that frequently contain tarns from which many mountain streams originate. In other places streams arise from within high hanging valleys which then descend directly to the lake as a series of long waterfalls. The mid-section of the lake faces feature a band of protruding rocky bluffs while the base of the slopes is smooth and stratified, showing the signs of previous ice scouring.

The glaciated landforms along the lake faces on this pastoral lease are the most pronounced and spectacular within the whole of the southern arm of Lake Wakatipu. On the neighbouring properties the cragginess of the terrain becomes less severe with the rangelands beginning to reduce in altitude.

The pattern of vegetation that covers the lake faces has been greatly influenced by fires, grazing patterns and altitudinal limitations. The high fellfields are sparsely covered by cushion plants, while amongst the rocky bluffs there is a band of snow tussock and a representation of woody shrubs, particularly *Hebe*. Below about 1000m the influence of past burn-offs becomes more apparent with the sunny side of the ridges being clad principally in bracken fern with a diversity of woody species that include lemonwood, mahoe, *Fuchsia*, *Coprosma*, and lancewood occupying the shady sides of the ridges. The most advanced area for regeneration back to broadleaved shrublands is on the shady faces of Southwest Bay where mature kowhai and cabbage trees line the margin of the lake. In the deeper gullies of Southwest Bay there are pockets of beech forest, the most extensive bush remnants being in the fire sheltered areas.

Although these faces are generally free of woody weeds, there is a scattering of semi-mature pines along the upper ridgelines.

Human intervention over this inherently robust landscape is mainly restricted to the way the vegetation has been previously manipulated for grazing. There are no "built" elements obvious from the main tourist viewing points.

Landscape Quality:	Intactness	moderate
	Coherence	moderately high
	Distinctiveness	high
	Visibility	high

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The above landscape quality attributes indicate that this unit has high natural landscape and visual values with the glaciated landform being the dominant element. The craggy landform, juxtaposed against the usually placid waters of Lake Wakatipu, coupled with the contrasts in colours of the mountainous terrain, against the turquoise waters leaves a lasting impression on the viewer. As well as being an important backdrop for tourists the immediate slopes of this unit form the setting for popular water-based recreation.

Although an inherently robust type of landscape, this unit's main vulnerability to change would be for the existing secondary succession of the woody shrublands to be restricted by fire, as well as any earth disturbances such as bulldozing of fencelines or tracks.

Landscape Unit 2

This unit includes all of the pastoral lease that is primarily on the southern side of the Lochy River catchment. The upper boundary of the unit is unnaturally truncated by the neighbouring property that occupies the headwaters of the river. There are sequential changes in the river's physical environment, starting with the cut down terraces close to Lake Wakatipu, followed by the narrow V-shaped valley (primarily the Home Faces) that extend up to the confluence of Billy Creek. Upstream from this point the unit develops into a wider u-shaped valley that has been formed with the retreat of the last glacier.

The altitudinal range of the unit is from 1540m along the crest of Centre Spur down to 400m close to Halfway Bay. The upper Lochy catchment is different to the other main valley systems as its relief and drainage pattern is asymmetrical, with the south side of the Lochy featuring long abraded slopes while on the northern side there is a series of deeply entrenched gullies which include Cascade and Killiecrankie Creeks. Although these tributaries are on the neighbouring property they still make a major contribution to the natural character of the Lochy River.

The vegetation cover within this unit depends greatly on aspect, altitude and pastoral farming activities, but generally follows the pattern of the lake front terraces being developed into improved pasture with the paddocks being surrounded by exotic shelter planting. Away from the lake terraces the physical relief becomes more enclosed with the steep Home Faces being covered in short grasslands, bracken fern and shrublands. There is a ribbon of continuous beech forest following the river's edge, with the forest in some places extending up side tributaries.

Above the Billy Creek confluence there is a distinctive change in landuse pattern and vegetation composition with relatively uniform grasslands occupying both the valley floor and the sunny faces of Central Spur. There is a gradual change in the grassland composition from the valley floor which is dominated by introduced grasses to vigorous snow tussock above 1000m. There are several pockets of beech forest scattered along the Lochy River, that provide the immediate setting for back country huts.

A cultural feature of the unit is the of Macleans homestead situated just where the river enters the lower narrow valley, with the cleared homestead site being surrounded by several mature lombardy poplars.

Landscape Quality:	Intactness	moderately high
	Coherence	moderately high
	Distinctiveness	moderately high
	Visibility	low (reinforces wilderness and remoteness qualities)

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In general terms this unit could be described as a managed natural landscape with the extent of modification to native vegetation becoming less apparent at higher altitudes. While the influence of previous pastoralism is conspicuous within the mid and lower sections of the Lochy catchment, the lack of intensive development helps this unit to convey an overall impression of a back country landscape, which is significant, as the Lochy River is recognised as an important destination for guided fishing.

The unit's vulnerability would mainly stem from any changes to the "natural looking" vegetation patterns, while any further intrusive man-made elements such as tracking or buildings would lessen the existing back country experience.

Landscape Unit 3

This unit encompasses the whole of the Billy Creek catchment which is one of the major tributaries of the Lochy River. Like all of the main valley systems on the pastoral lease, Billy Creek would originally have been occupied by ice that has now created a relatively uniform and straight U-shaped valley. Physical characteristics that are a feature of such a previously glaciated valley include the smooth abraded side slopes formed by retreating ice, while at the head of the valley there are the impressive headwalls of Eyre Peak which rise to a pinnacle of 1969m. The summit of the peak is surrounded by cirques, tarns, and uplifted basins that combine to form a spectacular landscape. These headwaters form the watershed between the Lochy and Upper Mataura Rivers. The distinctive serrated silhouette of Eyre Peak is a highly recognisable landmark of Northern Southland.

The lower section of the catchment contains extensive shrublands that grade into short grasslands that rapidly change into coherent snow tussock grasslands in the mid section of the valley. A lineal pattern of gorse has established within the mid section of the valley floor, this infestation would appear to be confined to the edges of Billy Creek.

Although in a landscape context, the landform is the dominant element, a special characteristic of this unit is the uniformity of grasslands within the mid and upper sections of the catchment. The cladding of the previously glaciated slopes with fine textured grasses creates a vivid high country landscape.

Landscape Quality:	Intactness	moderately high
	Coherence	high
	Distinctiveness	high
	Visibility	low

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The glaciated landform, coherent vegetation pattern, and overpowering sense of remoteness combine to create a special high country landscape, and along with the adjoining valleys on Halfway Bay, create a core area of the Eyre Mountains that contain high inherent values due to the intactness of ecosystems and highly visible natural processes.

The unit's vulnerability to further change would come from any alteration to the existing uniform vegetation pattern and the introduction of any built elements.

Landscape Unit 4

This unit comprises the whole of the Long Burn catchment which runs parallel with Billy Creek. The valley follows a north-west alignment, a notable feature being Disputed Spur which protrudes out from the north ridge forming Crooked Valley. The headwaters of the Long Burn are characterised by a sharp rugged crest that separates this catchment from the adjoining Billy Creek. This crest or arete contains rock bluffs and sparsely vegetated fellfields.

The main axis of the Eyre Mountains forms the southern boundary of the unit (and Halfway Bay) with the highest point being the Symmetry Peaks. One of the features of the slopes surrounding these peaks is natural erosion which frequently extends down to the Long Burn. There are consecutive changes to the drainage pattern of the Long Burn from being etched into

the valley floor, in the upper section, followed by a meandering pattern and then a watch channel which is enclosed by a deep gorge.

The vegetation follows the same pattern as the other valley systems with the degree of intactness becoming noticeable as stock access becomes more difficult. The upper and mid sections are clad in short and snow tussock grasslands, while the lower sunny McAlister Faces are covered in short grasslands. The more intensively grazed lower blocks have a large component of introduced grasses, with browntop being very conspicuous. Access to these grazing blocks has recently been improved with the upgrading of a track which sidles around the slopes. Just above Disputed Spur at 975 m, there is extensive beech forest cladding the valley floor. The upper edge of the forest is irregular, but generally follows the shoulder of the slopes where the forest has been protected from past fires. On the corresponding dark faces the tussock cover is in good condition, which along with the beech forest in the deeper gullies conveys an overall impression of being natural.

Landscape Quality:	Intactness	moderately high
	Coherence	moderately high
	Distinctiveness	moderately high
	Visibility	low

Within this landscape unit there is an overall impression of inherent values becoming more intact as access for stock becomes more difficult.

Landscape Unit 5

This unit incorporates the whole of the Short Burn which is enclosed by the Bay Peaks to the north and the lake faces to the south. The stream enters Lake Wakatipu on the opposite side of the main valley to the Lochy River where it has cut down through the alluvium forming a series of terraces.

The headwaters of the catchment do not have the glaciated features of the other valleys, with the crest of the upper ridgeline being at 1650m. The physical characteristics are similar to the lower section of the Long Burn, being a rather crooked valley with short interlocking spurs. There are a number of small tributaries flowing into the main water course, the largest of these being Wards Creek which originates near the summit of the lake faces.

The vegetation pattern is similar to the lower Long Burn with beech forest occupying the valley floor which then changes into short grasslands within the montane section.

Where the Short Burn enters the main Lochy Valley the steep rocky faces that have previously been heavily grazed and are now showing signs of extensive regeneration in a sequence of fernland followed by shrublands.

The landscape value of this unit is basically complementary to those contained within landscape units 3 and 4 as it generally helps to sustain the natural quality and integrity of the high country.

Landscape Quality:	Intactness	moderately high
	Coherence	moderately high
	Distinctiveness	moderate
	Visibility	low

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The landscape quality of the Short Burn, particularly its intactness and coherence, is similar to that of the adjoining valleys with the gradient in vegetation changes decreasing in altitude and accessibility.

SIGNIFICANCE OF THE LANDSCAPES

The landscape of Halfway Bay is one dominated by landforms and natural features that have been produced by the action of glacial and stream processes. Distinctive physical features include the serrated peaks, truncated ridgelines, and the long straight U-shaped valleys that have been scoured out by ice. In the more accessible areas of the property the original vegetative cover has been altered by extensive pastoralism, with the extent of farm development being dictated by the lack of front country.

The back country units (LU2 to LU5) which have intact ecological and natural processes form the core area of the Eyre Mountains.

In a wider context the Lake Wakatipu basin has been recognised as an area of outstanding scenic quality with the internationally known tourist town of Queenstown nestled amongst the mountain ranges. The lake faces of Halfway Bay (LU1) make a major contribution to the character of the district with the spectacular craggy slopes being highly visible from one of New Zealand's most important tourist routes, the Queenstown-Milford circuit.

2.2 LANDFORMS AND GEOLOGY

OVERVIEW OF GEOLOGY

The Eyre Mountains form a distinctive topographic block southwest of Lake Wakatipu, rising to 2000 m at Jane Peak. The area is mountainous and rugged, bush-clad in the southwest but tussock-covered elsewhere, with rocky bluffs and fellfields at higher altitudes. Geologically, the Eyre Mountains are underlain by greywacke and semischist of the Caples terrane of Permian Age, and are separated from other Caples rocks of northern Southland by the major valley systems of the Maitara and Von-Oreti catchments which are infilled by extensive glacial and fluvioglacial deposits of Quaternary Age. The Eyre Mountains block is cut by several faults, the most significant being the South Von Fault (Turnbull 1980). The regionally significant and much larger Moonlight Fault follows the Von - Oreti valley, where it is almost entirely concealed by glacial gravels. The Eyre Mountains have been heavily glaciated, and glacial erosional features dominate most of the modern landscape. The inferred down-valley limits of the major advances of the Wakatipu glacier are summarised in Figure 1.

Semisichist

With increasing metamorphism (heat and pressure), greywacke is converted to semischist and then schist. This metamorphism is dated (radiometrically) as late Jurassic (200 Ma), with uplift and cooling of the rocks lasting into Cretaceous time (100 Ma) (Mortimer 1993). The Eyre Mountains rocks show a very well-developed transition from greywacke into semischist. The transition is mapped in terms of textural zones, which reflect increasing development of schistosity * 3, as well as coarser grain size of metamorphic mica minerals, increasing amounts of quartz veining, and folding of original bedding in the parent sandstones.

*3 Schistosity or more generally foliation, refers to the slabiness or "splittability" of metamorphic rocks

Placing boundaries ("isotects") between the various textural grades of schist is subjective, and the isotects should not be regarded as contacts easily seen on the ground – they reflect points in a continuum of changing metamorphic grade. The textural grade is imposed on pre-existing sedimentary textures, and where the parent rock is mudstone (as in the head of the Lochy, and especially in Slate Basin), the semischist is very easily split and eroded. Where the parent is sandstone, for example around Symmetry Peaks, the semischist forms slabby but resistant outcrops.

Minor lithologies within the Eyre Mountains semischist are mostly restricted to a zone of deformed (flattened) conglomerate running from Eyre Creek into the head of the Lochy. Deformed conglomerate is also mapped along the Lake Wakatipu shoreline and in the head of Allen Creek. A thin band of metamorphosed volcanic rocks occurs in a gully north of Matura Saddle at the head of the Lochy, and other metavolcanic ("greenschist") bands occur along the shore of Lake Wakatipu. These metavolcanic bands are a distinctive greenish colour, due to the abundance of chlorite and epidote minerals.

Schistosity in the Eyre Mountains is folded into a major synform (downfold), named the Taieri-Wakatipu Synform (Mortimer and Johnston 1990) which runs from Walter Peak into the upper Matura Valley. A secondary warp or upfold has been mapped through Cecil Peak from the lower Long Burn, and another minor downfold runs beneath Bayonet Peaks. The effect of this folding is to produce flat-lying semischist in the axis of the fold; the landscape reflects this with flat ledges, steep bluffs (controlled by sub-vertical fracturing or jointing), and "mesa-like" ridge crests and minor summits. Symmetry Peaks are a good example of this, as is Walter Peak. Isolated "gendarmes" or pillars and detached bluffs are joint- and schistosity-controlled landscape features.

Geochemically, the Eyre Mountains semischists are very similar to the parent greywackes, with relatively low quartz content. There is one locality in the upper Lochy below the ruined Forks Hut, where the parent sediments are almost pure volcanic sandstone, and the semischist derived from them is a pale green colour, unlike the more typical silvery-grey colour of most semischist.

Faults

Mapping of most of the faults within the Eyre Mountains – the Forks Fault, the South Von Fault and the Lochy Fault – is based on offset or juxtaposition of the textural zonations within the schists. The faulting marks a major readjustment of the earth's crust during the late Tertiary, partly influenced by movements on the distant Alpine Fault which was at that time pushing the Fiordland massif into the schist terrain around Lake Wakatipu.

GLACIAL GEOLOGY

The Eyre Mountains landscape is dominated by the effects of valley glaciation, with spectacular U-shaped valleys and cirques, and terminal moraines and outwash plains in the bounding Matarua and Von-Oreti catchments. The Lake Wakatipu trough, with its tributary and outlet valleys, records a succession of glaciations which date back at least 500,000 years. It must be noted however that nowhere within the area shown in this figure is there any absolute age control from radiometric dating, and that the following correlations and discussions are based on ages extrapolated from the adjoining Mararoa-Te Anau and Clutha-Kawarau catchments; an element of mis-correlation is likely. Glacial advances and events are here correlated using the International Oxygen Isotope Scale (Imbrie *et al.* 1984).

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Major ice advances and deposits

Late Otiran glacial advance, Oxygen Isotope (OI) stage Q2, 18-24000 yrs BP

The most recent major glacial event saw Wakatipu ice reach Kingston to form a spectacular terminal moraine. Although an outwash gravel plain formed downstream from the terminal moraine early in this advance, for much of the time the Kingston glacier terminus was static and provided an outlet for meltwater draining from the Wakatipu glacier into the upper Mataura catchment. The glacier front is inferred to have moved relatively little during Late Otiran time, producing a succession of terminal ridges within one major moraine deposit. Tributary catchments such as the Von and Lochy had ice in their headwaters only, and drained along the western side of the Wakatipu glacier into the Mataura system. The major abandoned meanders which cut into the older outwash plains south of Kingston formed at this time, and continued to erode the Otiran outwash as the Wakatipu ice melted. There were two meltwater streams, one east of Kingston and a slightly younger one to the west where the Kingston Flyer now runs.

Later, this situation changed when the Kingston outlets were dammed and the Kawarau River became the major outlet for the Wakatipu system during glacial retreat. The eastern Mataura outlet was blocked by alluvial fan gravels from Lorn Peak; the western outlet was closed off by a small moraine wall (now preserved across the Kingston Flyer track). A major post-glacial lake formed in the Wakatipu basin, with well-developed lake benches eroded into the surrounding slopes at an elevation of ca. 350m asl – including the terrace on which most of Kingston is built. This lake drained via the Kawarau system, not via the Mataura.

Submerged moraine topography off the Kingston waterfront, together with drowned trees around the western Wakatipu shoreline near Elfin Bay and flooded storm beaches in Frankton Arm, indicate that Lake Wakatipu has been naturally raised several metres. Thomson (1984) has suggested the cause was a landslide at the Kawarau Falls at Frankton, which dammed the lake some 6000 years ago.

The ice limits in the tributary valleys west of the lake in the Eyre Mountains are neither well defined nor dated. An assumed upper ice limit of ca. 500m asl at Halfway Bay (based on down-valley ice profiles by Matthews (1967)) would push a diffluent ice tongue into the valley between Bayonet Peaks and Cecil Peak where glacial moraine is preserved. The down-valley limits of the Lochy and other valley glaciers are not known. Lakes Nigel and Ned are moraine-dammed in part, but their barriers are also partly rock falls. It is assumed that these lakes are Late Otiran in age, as there are further moraine deposits higher in the Lochy headwaters, including well-preserved cirque moraines which are almost certainly of post-glacial age. Most if not all of the minor cirques of the Eyre Mountains were probably ice-occupied in Late Otiran time. Well-preserved lateral and terminal moraines in the Long Burn and upper Billy Burn may also be Late Otiran, but could also date from a younger mini-advance at ca. 6-10 000 years BP*1.

*1 BP = before present day

Early Otiran glacial advance, OI stage Q4, 60-70 000 yrs BP

The preceding ice advance also reached Kingston, but little of its terminal moraine is preserved. Most of it has been degraded, leaving only lag boulders and a subdued surface south of the more prominent Late Otiran moraine ridge. However, the extensive outwash plain draining south from there to the Kingston Flier station at Fairlight has a surface gradient which ties it back up-valley to a terminal moraine level higher than the Late Otiran moraine (and now represented by the deflated moraine and lag boulders), and on this basis it is inferred to be Early Otiran (OI stage 4) in age. The dry meander which cuts this outwash plain was probably formed late in the OI stage 4 advance as the ice began retreating upvalley.

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ce from the Wakatipu glacier would have pushed up-valley into the lower Lochy, but no deposits associated with this ice level are known, apart from a small gravel deposit in the lower Long Burn. The down-valley limit of Q4 ice from glaciers in the head of the Lochy is not known, as no deposits are preserved.

Waimean glacial advance, OI stage Q6, 130-180 000 yrs BP

Identification of glacial deposits of this age is tenuous, because these deposits are outside the range of radiocarbon dating. Mapping and correlations are based on degree of preservation of surfaces, relative heights of moraine and outwash deposits, and tracing of down-valley terrace profiles into the Mararoa - Te Anau catchment.

At this time, it is likely that most of the larger valleys within the Eyre Mountains were ice-filled, and the high ridges supported many small cirque glaciers.

Waimaungan glacial advance, OI stage Q8, 250-300 000 yrs BP

Extensive outwash plains in the Oreti and Mararoa valleys are correlated with this glacial period, but no major Q8 valley moraine is known within the Eyre Mountains region. However, all the high cirques, including those on southern Eyre Mountains ridges, would have been occupied by ice.

Nemonan glacial advance, OI stage Q10, 340-360 000 yrs BP

A high-level degraded terrace on the eastern side of the Oreti Valley at the mouth of the Ashton Burn is the only deposit in that catchment correlated with this advance; the gravels in it are somewhat more weathered than in younger units. In the Mataura catchment, probable Q10 age lateral and possibly terminal moraines are preserved on the high terraces east of Fairlight (on Lorn Peak Station) and Garston, with outwash terraces further downstream toward Parawa.

Ice would have occupied all the central Eyre Mountains valleys, and the headwaters of the upper Mataura, Robert Creek, and Eyre Creek as well as the tributaries of the Oreti such as the Ashton Burn. If the ice limit inferred for Stage 10 shown on Fig. 1 is correct, the upper Mataura valleys would have been the site of a glacially-dammed lake; no evidence has been found to confirm this, and possibly the Q10 ice limit lay upstream around Greenvale, allowing the upper Mataura drainage to run along the hill south of Fairlight. Remnants of outwash gravel are preserved on that hill slope, but their age is unknown.

OI stages 12 and older (=430-500 000 yrs BP)

The only deposits known from these advances are within the Mataura catchment, downstream from Garston.

Landslides

Large-scale landsliding is a feature of much of the schist terrain of Otago and Southland, and the eastern Eyre Mountains include several major landslides. The slopes east of Robert Creek, east of Allen Creek, and above the Long and Short burns are all major complex landslides. Many other landslides are also present in the eastern Eyres; most are too small to show on the 1:250 000 scale map but they are mapped in detail on the 1:50 000 scale data record maps held by GNS.

These large and complex slope failures are characterised by hummocky topography, a lack of blocky bluffs and steep rocky faces, sometimes actively eroding scarps, and small springs and wet flushes. They are controlled by down-slope failure on schistosity planes within the underlying rock, often released in the head region by pulling apart along joint planes. Gravitational collapse

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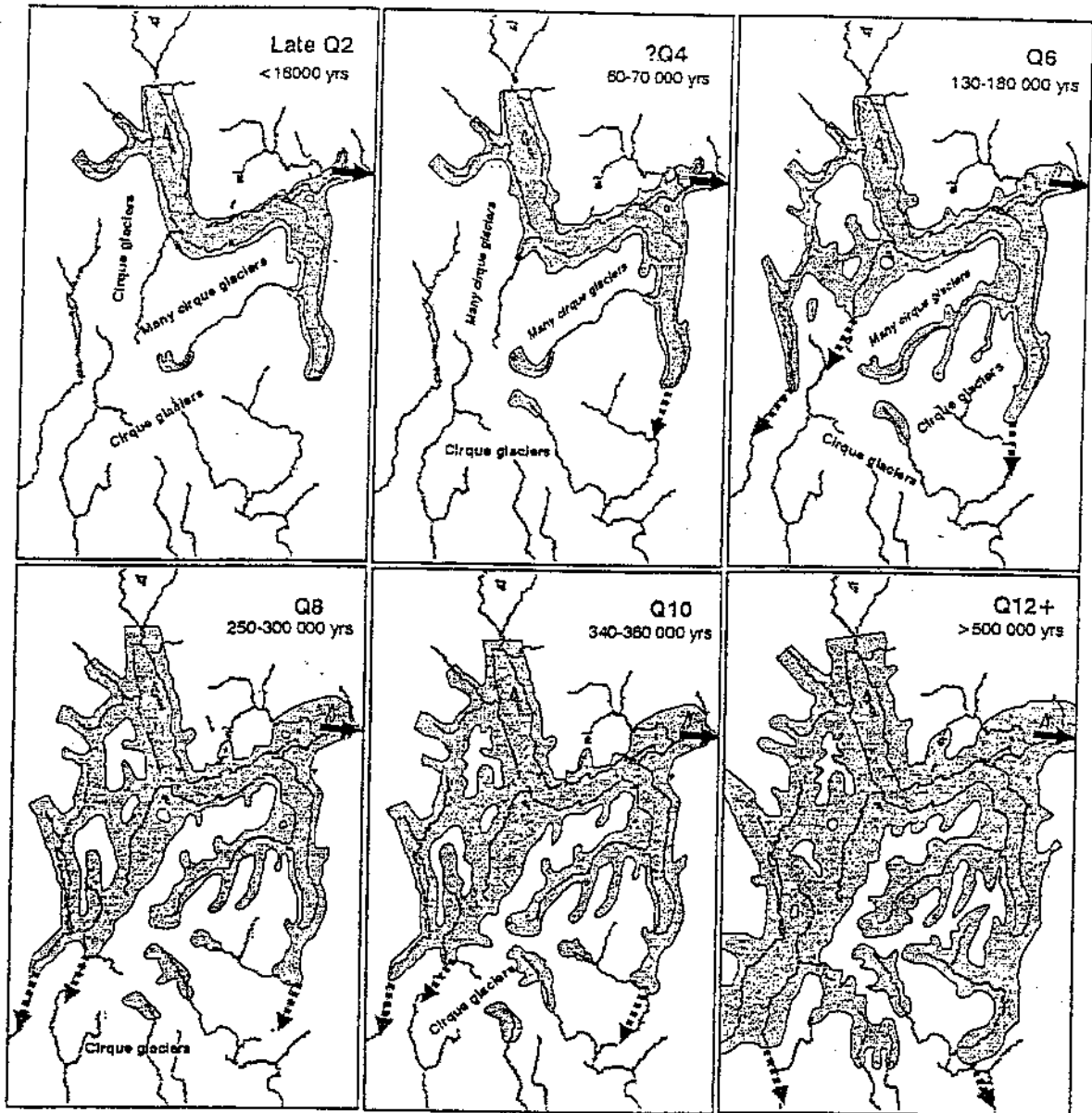


Figure 1: Inferred ice limits for various advances of the Wakatipu Glacier, for Oxygen Isotope stages Q₂ to Q₁₂₊. Modified from Fig. 13 in Turnbull and Forsyth (1988).

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Following removal of ice support, especially in deep narrow valleys such as the Short and Long burns, was probably the major factor inducing initial movement. Subsequently, large earthquakes and/or high groundwater pressures provoked continued movement down the glacially over-steepened slopes. Episodic movement continues to the present time by down-slope creep, rotational slumping, and debris flows.

Other, smaller landslides are mapped in Cascade Creek, in the upper Lochy, and in the serpentinite belt in the southwest. The central Eyres have fewer landslides, as the rocks are less schistose and stronger and foliation is generally flat, a much more stable configuration. Dipping foliation in the upper Lochy makes this area landslide-prone, but the absence of landslide deposits is attributed to more recent ice erosion; the large landslides of the eastern Eyres may date back for several hundred thousand years, as has been demonstrated elsewhere in Central Otago (McSaveney *et al.* 1992).

Smaller landslide deposits mapped in the upper Lochy, and occurring elsewhere, are inferred to be block falls, caused by catastrophic collapse of bluffs or oversteepened slopes. They are characterised by fan-shaped or semicircular accumulations of large to small angular boulders spread out over the valley floor and often over-riding older deposits. They are more common in regions where foliation is flat-lying and bluffs are steep and high.

Valley floor alluvium, scree and alluvial fan deposits

All the major and minor valleys of the Eyre Mountains contain deposits of post-glacial stream alluvium. In the Lochy, these deposits include the stepped terraces about Halfway Bay homestead, and terrace remnants in the upper valley. Alluvial fan deposits are widespread, and form at the mouths of side streams of all sizes. These fans grade out and down-valley into terraces with flatter profiles, and the distinction is made on slope angle as much as different gravel properties within them. Both fans and terraces are more fertile, easier to fence and graze than steeper hill slopes, and consequently are the most developed areas within the Eyre Mountains.

Extensive scree deposits are a feature of the central Eyre Mountains draping the bluff topography and grading out onto the valley floors. Scree also mantle the slopes of most high cirques. Scree debris ranges from loose fine material in areas of higher schist grade, to coarse, blocky scree in the greywacke-dominated area such as around Eyre Peak. The scree deposits are inferred to be many thousands of years old, dating from the last glaciation (Q2) or beyond.

SIGNIFICANCE OF THE LANDFORM AND GEOLOGY

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

2.3 CLIMATE

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

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

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

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

2.4 VEGETATION

INTRODUCTION

Halfway Bay Pastoral Lease is a large property in the central Eyre Mountains. The Lochy River forms the northwest boundary and the property includes the entire catchment of Billy Creek and Long Burn (both tributaries of the Lochy with strong glacial profiles). These tributaries are separated by high ridges with numerous alpine basins, cirque basins and associated small tributaries. The south-eastern boundary is the high dividing range separating the Lochy catchment from the Mataura catchment. The headwaters of Robert Creek, a Mataura tributary, falls within the pastoral lease. Lake Wakatipu forms the eastern boundary. The Short Burn, a small catchment in the east, flows directly into Lake Wakatipu at Halfway Bay.

The Eyre Mountains are recognised as the most spatially heterogenous and species rich mountains in southern New Zealand. The Eyres and adjoining mountain ranges have a high degree of endemism.

2.4.1 DESCRIPTION

Billy Creek

Billy Creek runs for about 15 km in a south-west direction from its junction with the Lochy River to its head near the second highest peak in the Eyre mountains, Eyre Peak (1969 m). After dropping steeply from small cirques at the valley head, the stream flows relatively gently through a narrow valley until near its lower end. There it drops through a slot gorge before reaching broad, shingly flats at its junction with the Lochy River.

It is separated from the Long Burn to the east by steep bluffy slopes with several spectacular hanging basins. Slopes are more gentle and broader towards the valley head. To the west, Centre Spur separates Billy Creek from the parallel valley of the Lochy River. These slopes are gentler in the lower section, but at the upper end several cirque basins with huge, vertical rock walls provide ideal habitat for the rare Eyre Mountains endemic, *Celmisia thomsonii*. The U-shaped valley sides show evidence of glaciation. Valley fans cover all lower slopes.

Vegetation

The valley appears to be in almost pristine condition over most of its length. In the upper valley above 1200 m, no adventive plants were seen. At 1120 m the ubiquitous cats ear (*Hypochaeris radicata*) and two small patches of mouse-ear hawkweed (*Hieracium pilosella*) were recorded. From about 1050 m on the valley floor to its junction with the Lochy, small patches of brown top (*Agrostis capillaris*) and sweet vernal (*Anthoxanthum odoratum*) appear. The size of the patches

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increase down stream, but are primarily on the true right occupying parts of the flat valley floor and extending up some valley fans to the foot of the steeper slopes above. Narrow-leaved snow tussock and native shrubland surround and separate these patches in the mid and upper valley. There are signs of cattle pats and pugging of wet areas in the valley bottom but these become less towards the valley head.

On the true left very few adventive species appear and cattle sign is negligible. Below the Billy hut site, gorse makes an appearance and continues in a narrow strip on both sides of the river to the slot gorge. Only a few plants are found away from the riparian area. The lower slopes of the lower valley on the true right also show the effects of increased grazing pressure by cattle and sheep with adventive species dominating over larger areas.

The native plant communities in Billy Creek are diverse with a very high number of species, several of which are endemic to the Eyre Mountains. Five species of snow tussocks make up the extensive snow grass communities. Other genera well represented here are: *Celmisia* 20 species, *Aciphylla* 7 species, *Raoulia* 10 species, *Epilobium* 17 species, *Ourisia* 5 species, *Ranunculus* 10 species, *Coprosma* 12 species and *Dracophyllum* 5 species.

Plant communities

High Alpine Zone – above 1500 m

Above about 1500 m rock dominates the landscape with plants appearing on stable fellfield, gentle scree slopes, flat areas where soil can accumulate, along water courses, and clinging to ledges and cracks in bluffs. There is a mosaic of plant communities with mosses and lichens often important. In this area is found slim snow tussock and curly tussock where the soil is deeper. Other species include *Aciphylla pinnatifida*, *Ourisia confertifolia*, *Aciphylla spedenii*, *Carex pyrenaica*, *Kellaria croizatii*, *Hectorella caespitosa*, *Dracophyllum pronum*, *Celmisia sessiliflora*, *Chionohebe ciliolata*, *Myosotis pulvinaris*, *Gentiana divisa*, *Hebe petriei*, *Microlaena colensoi*, *Celmisia verbasifolia*, *Epilobium pernitens*, *Gaultheria nubicola* and *Marsippospermum gracile*.

On stable scree grows *Haastia* sp. (aff. *H. sinclairii* var. *fulvida*), *Ranunculus haastii* subsp. *piliferus*, and *Epilobium porphyrium* and *Stellaria roughii*. The mountain fern *Polystichum cystostegia* is found amongst rocks and boulders. *Celmisia hectorii* can form large mats on rocky foot slopes. Fine screes may contain the relatively rare endemic *Ranunculus scritchalis* (fig. 34). On bluffs are *Schizeilema haastii* var. *cyanopetalum*, *Celmisia thomsonii*, *C. bellidoides*, *C. ramulosa*, *C. verbasifolia*, *Anisotome capillifolia*, *A. pilifera*, *Leucogenes grandiceps*, *Gentiana* sp. "skeleton", *Aciphylla lecomtei*, *Pachyrrhizus novae-zelandiae*, *Grammitis patagonica*, *Parabebe linifolia* ssp. *brevistylis*, *Myosotis macrantha*, *Epilobium glabellum*, *E. mathewsii*, *Epilobium* sp. (species (d) of Druce 1993), *Lycopodium australe* and *Cheesemania wallii*. Large south facing bluffs are found in several of the cirque basins in the upper Billy Creek. All are likely to contain the endemic *Celmisia thomsonii* as well as other special plants mentioned above. No adventive plants were seen.

Mid to High Altitude Snow Tussocklands

Below about 1500 m on steep bluffy slopes such as the head of Billy Creek and various side valleys, there is a mix of slim snow tussockland, cushion plants, snowbank, flush and fellfield communities. Typical plants are slim snow tussock, curly tussock, *Celmisia hectorii*, *C. verbasifolia*, *Marsippospermum gracile*, *Poa colensoi*, *Dolichoglottis hyalii*, *Aciphylla pinnatifida*, *Phyllachne colensoi*, *Gentiana bellidifolia*, *Forstera tenella*, *Carex pyrenaica*, *Pratia* cf. *macrodon* (non scented) *Psychrophila obtusa*, *Schoenus pauciflorus*, *Raoulia subulata* and *Chionochoa oreophila*. No adventive plants were seen.

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Mid Altitude Snow Tussocklands

At 1280 m where the slope lessens and large boulders dot the slopes, the tussock changes to narrow-leaved snow tussock with some slim and curly tussock. Other plants include *Celmisia walkerii* (probably at its eastern limit here), *C. hyalii*, *Coprosma cheesemanii*, *Coprosma* sp. (*C. sp.* (a) of Eagle), *Astelia niticola*, *Pimelea poppelvelli*, *Dracophyllum uniflorum*, *Brachyglottis revoluta*, *Hebe hectorii* and *Myrsine nummularia*. Wet seepages at this altitude have *Sphagnum cristatum* and other mosses, *Schoenus pauciflorus*, *Hebe pauciramosa*, *H. odora*, *Carpha alpina*, *Oreobolus pectinatus*, *Gaultheria parvula*, *Gentiana griesbachii*, *Bulbinella angustifolia*, *Celmisia glandulosa*, *Euphrasia zelandica*, *Drosera arcturi*, and scattered curly tussock.

At 1200 m in a tributary basin, where drainage was impeded, additional plants were present including midribbed snow tussock *Chionochloa pallens*, *Dracophyllum prostratum*, *Cyathodes dealbata*, *Carex echinata*, *C. gaudichaudiana*, *Celmisia semicordata* and *Astelia niticola*. No adventive plants were seen.

Valley Bottom

Narrow-leaved snow tussock dominates the valley bottom at 1100m (and down valley) with a few areas of boulders. Hard tussock (*Festuca novae-zelandiae*) features with blue tussock (*Poa colensoi*), *Anisotome flexuosus*, *Raoulia subsericea*, *Brachyglottis bellidioides*, *Gaultheria novae-zelandiae*, *Luzula rufa*, *Pimelea oreophila*, *Aciphylla* sp. "lomond", *Celmisia semicordata*, *Geum leiospermum*, *Celmisia gracilentia*, *Epilobium chlorifolium*, *Hebe anomala*, *Ozothamnus vauvilliersii* and several lichens.

Around the boulderfields are *Muehlenbeckia axillaris*, *Luzula petriana*, *Rytidosperma setifolia*, *Epilobium melanocaulon*, *Celmisia densiflora*, *Gingidia decipiens*, *Dracophyllum uniflorum*, *Coprosma ciliata*, *C. cheesemanii*, *Melicactus alpinus*, *Brachyglottis revoluta*, *Hebe buchananii*, *Hypolepis millesfolium* and *Celmisia angustifolia*. The grey moss *Racomitrium crispulum* is often prominent. The occasional adventive such as cats-ear and mouse-ear hawkweed are present.

Further down valley, between the valley fans and the stream bank, but mainly on the true right, numerous small wetlands occur and brown top and sweet vernal make an appearance. The species present are similar to those mentioned above with also *Abrotanella caespitosa*, *Gentiana amabilis*, *Gnaphalium laterale* and *Ranunculus glabrifolius*. Cattle trampling is evident from the uneven surface of the wetlands.

Shrublands

Sub-alpine shrublands are extensive and diverse, particularly on the true left where they continue to occupy the lower slopes all the way down the valley. Species here include *Hebe anomala*, *Ozothamnus vauvilliersii*, *Dracophyllum longifolium*, *D. uniflorum*, *Brachyglottis cassinioides*, *B. revoluta*, *Coprosma cheesemanii*, *C. ciliata*, *C. rugosa*, *Podocarpus nivalis*, *Gaultheria crassa*, *Coprosma* sp. (t) (of Eagle 1981), *Olearia cymbifolia*, *O. nummulariifolia*, *Aristotelia fruticosa*, *Chionochloa rigida*, *Aciphylla* sp. "lomond" and *Hebe rakaiensis*.

Mid Valley

The east side of the valley is slightly steeper with valley fans falling from a series of small bluffs. In the upper section these slopes are totally tussock covered, but below the 1000 m contour in the valley bottom, brown top and sweet vernal with small patches of mouse-ear hawkweed and a few other adventive plants appear. Further down valley are more extensive patches, although overall these areas are relatively small. Narrow-leaved snow tussock with *Aciphylla* and shrubs still dominate over large areas but in places the adventive grassland extends to the top of the fans at the foot of the bluffs above.

Lower Valley

Below the derelict Billy Hut, adventive grassland is more extensive and gorse grows along the stream edge, with a few plants extending uphill. On the west bank, the indigenous vegetation is largely intact all the way to the lower gorge, except for a narrow strip along the stream and occasionally extending up slope a short distance.

Regenerating beech forest and shrubland fills the slot gorge and extends up slope, especially on the east side. Billy Creek then emerges from a small patch of beech forest onto the gravel flats of the Lochy valley with its largely adventive vegetation.

Long Burn

The Long Burn runs more or less parallel to Billy Creek and Lochy River. In its upper section, at least as far as the Crooked Valley, it has very similar topography and vegetation to Billy Creek. A description of the upper valley vegetation will not be repeated but some notable differences and plant additions are mentioned below. Grazing impacts and adventive vegetation is limited to a small strip along the valley bottom, from above the bushline to the junction of the two upper branches. Elsewhere in the upper valley the vegetation is almost pristine.

The impressive, south facing bluffs at the valley head contain several rare and/or threatened plants including *Celmisia thomsonii*, *Gentiana* sp. "skeleton", *Aciphylla spedenii*, *Cheesemania wallii*, *Hebe petriei*, *H. biggarii*, *H. dilatata*, *Ranunculus haastii* var. *pilifera*, *Ourisia spatulata* and *Ourisia confertifolia*. A damp bluff in the bottom of the north branch at about 1300 m has an unnamed *Melicytus* sp. "Matiri". This is a very rare plant yet to be described. The cress *Ischnocarpus novae-zelandiae* was discovered during this survey at five new locations on dry north facing bluffs on the true right of the upper Long Burn. These sites ranged from 1600 m (perhaps the highest recorded altitude for this species) to 900 m.

At about 1100 m in the most southern branch are a series of valley bottom peat wetlands that have small tarns with tiny islands. Common species include *Dracophyllum prostratum*, *D. pronum*, *Drosera arcturi*, *Oreobolus pectinatus*, *Carpha alpina*, *Schoenus pauciflorus* and *Astelia nervosa*.

A little further down valley is a patch of red tussock *Chionochloa rubra*.

A nearby terrace riser has a small, but distinctive, patch of whipcord hebe shrubland dominated by *Hebe hectorii* and *H. propinqua*.

Mid Valley

The middle section of the Long Burn from the upper limit of valley floor forest down through Crooked Valley includes the steep slopes flanking Disputed Spur and the broad open slopes from the Symmetry Creek headwaters, through to Lambing Saddle and beyond.

The alpine basins are very similar to those in the upper valley and are little affected by stock or exotic plants. The steep south-facing slopes of Disputed Spur have dense shrublands dominated by *Dracophyllum pronum*, *D. uniflorum*, *Hebe anomala*, *H. biggarii*, *Brachyglottis cassinioides*, *Podocarpus nivalis*, *Ozothamnus vauvilliersi* and *Phormium cookianum*. Near the end of the spur, tongues of beech forest extend through the shrublands reflecting past disturbance patterns.

On the other side of the valley, below Lambing Saddle, slim snow tussocklands and *Oreobolus* wetlands have been targeted by sheep and show reduced stature. Narrow-leaved tussocklands at lower altitude are generally in good condition with a diverse native groundcover. Mouse-ear hawkweed is present but restricted to dry spur crests. *Hieracium lepidulum* is very sparse. Shrubs

are common throughout the tussocklands, especially *Ozothamnus vanvillersii* and to a lesser extent *Hebe propinqua*, *Dracophyllum prunum*, *D. uniflorum* and *D. longifolium*.

Rock outcrops have many of the above shrub species and also *Hebe biggarii*, *Olearia avicenniaefolia*, *Leptospermum scoparium* and *Phormium cookianum*.

Below about 1000 m there is an abrupt change to vegetation dominated by sweet vernal and browntop with a range of pasture weeds including *Cirsium vulgare*, *C. arvense*, *Verbascum thapsus*, *Rumex acetosella* and *Mimulus moschatus*. Native short tussocks are present as are scattered shrubs of *Carmichaelia petriei*, *Coprosma rugosa*, *C. propinqua* and *Coriaria sarmentosa*.

Lower valley

The very highest slopes on the ridge crests above the McAlister Faces have cushion/fellfield as described for the Short Burn. Upper slim snow tussocklands have a high component of *Celmisia hyalii* indicating past grazing pressure. Sunny mid-slope faces are comprised of semi-depleted, narrow-leaved snow tussocklands contributing about 20% cover. There is up to 40 % bare ground and scree but remaining vegetation is almost entirely native and includes *Acaephylla aurea* and *A. "lomondii"*, *Raoulia subsericea* and *Leucopogon suaveolens*.

Vegetation continues to be dominated by native species down to the fence across the face at about 900 m although with an increasing short tussock cover. Below the fence the vegetation is strongly dominated by exotic grasses and short tussocks. Some matagouri and *Coprosma* shrubs are present amongst the sward.

Vegetation on the much steeper true left side of the Long Burn is in good condition with considerable shrub development especially on the numerous rock outcrops.

The riparian forests of the lower Long Burn occupy a continuous strip from the Crooked Valley to the Lochy confluence, and are dominated by mountain beech *Nothofagus solandri* var. *cliffortioides* with red beech *Nothofagus fusca* present on alluvial terraces and fans. These have a surprisingly diverse understorey with over 50 native species recorded. Tree and shrub species include *Carpodetus serratus*, *Griselinia littoralis*, *Hoheria hyalii*, *Coprosma ciliata*, *C. colensoi*, *C. intertexta*, *C. linariifolia*, *C. rotundifolia*, *Fuchsia excorticata*, *Hebe salicifolia*, *Olearia arborescens*, *O. avicenniaefolia* and *Helichrysum aggregatum*. Ten exotic species are present, but with the possible exception of *Hieracium lepidulum* suggest little threat to the native vegetation.

Lochy Valley

The upper Lochy River faces above the Billy Creek junction and within the Halfway Bay Pastoral Lease have similar vegetation to that in the upper Billy Creek with upper slopes of scree, boulderfields and rock outcrops. Snow tussock covers the slopes, and below about 900 m shrubland, tussock and adventive grassland plants form a mosaic of intermingling plant communities. These areas would once have been forested with beech. As with the faces on the east side of Billy Creek, the Lochy faces are steeper with a series of bluffs along much of their length, but particularly on slopes north of the Cascade Creek junction.

The Lochy River valley is more modified than that of the Billy Creek. It is wider and more open and all the river flats are covered in exotic grassland, but with scattered shrubs of matagouri and *Coprosma propinqua* or patches of native shrubland. The exotic grassland extends up the lower slopes, in places to the foot of the series of bluffs (at about 900 m) which have probably been instrumental in preserving the largely intact indigenous vegetation above.

Regenerating shrubland covers a large percentage of the slopes from the Billy Creek junction well upstream to above the Cascade Creek junction. This shrubland includes matagouri, *Corokia cotoneaster*, *Coprosma propinqua*, *C. rugosa*, *C. sp.(t)*, *Aristotelia fruticosa*, *Olearia odorata*, *Carmichaelia petriei*, *Muehlenbeckia complexa*, *Rubus schmidelioides*, and *Polytichum vestitum*. Along the edge of the bluffs grows *Coriaria sarmentosa*, *C. plumosa*, *Phormium cookianum*, *Gaultheria antipoda*, *G. crassa*, *Dracophyllum longifolium*, *Aciphylla* sp. "lomon", *A. glaucescens* and patches of bracken *Pteridium esculentum*. Narrow-leaved snow tussock is also present and above about 900 m becomes dominant but with scattered shrubs and speargrass (*Aciphylla* species). The latter can form quite dense patches. Small remnant pockets of beech occur along the river edge, but have disappeared from the steep gullies that now contain a dense shrubland.

Above the bluffs (ie, >900 m) the shrubland continues in places to about 1000 m or is replaced by narrow-leaved snow tussock and intermingles with it. Speargrass is an important component on rocky colluvial slopes. Erosion scars are extensive in places. On these warm, north-west faces, narrow-leaved snowgrass grows right to the top. Higher up valley where the faces are westerly and higher, slim snow tussock takes over above about 1500 m.

Home Faces

High rock tors support a variety of palatable species including *Cheesemania wallii*, *Schizaelema haastii* var. *cyanopetalum*, *Helichrysum intermedium* and *Anisotome capillifolia*. The upper faces have an intact narrow-leaved snow tussock cover with some slim snow tussock on the upper most part of ridge. A large range of native inter-tussock herbs and sedges are present including *Acaena saccaticapula*, *Anisotome aromatica*, *Carex wakatipu*, *Celmisia* spp., *Kelleria dieffenbachii*, *Lobelia linnaeoides*, *Pentachondra pumila*, *Raoulia grandiflora*, *Uncinia divaricata*, *Wahlenbergia albomarginata*, *Geum leiopermum*, *Luzula pumila* and *Gentiana* spp.

With decreasing altitude there is a corresponding increase in shrub abundance. Common species include *Hebe odora*, *H. propinqua*, *H. rakaiensis*, *Olearia cymbifolia*, *Ozothamnus vauvilliersi*, *Dracophyllum uniflorum* and *Pimelea oreophila*. Rock tors at 1250 m have *Phormium cookianum*, *Dracophyllum longifolium*, *Hebe biggarii*, *Celmisia byallii*, *C. verbascifolia*, *Brachyglottis revolutus*, *Dolichoglottis byallii* and the ferns *Hymenophyllum multifidum* and *Polytichum vestitum*.

Flush areas have *Plantago novae-zelandica*, *Psychrophila obtusa*, *Schoenus pauciflorus*, *Oreobolus pectinatus*, *Euphrasia zelandica* and *Celmisia gracilentia*.

Exotic species in this zone are sparse and include *Hypochaeris radicata*, *Rumex acetosella* and *Hieracium pilosella*. However, there is a rapid change towards exotic species at about 1000 m where the vegetation described above changes to sweet vernal *Anthoxanthum odoratum*, silver tussock, matagouri, hard tussock, kanuka and *Coriaria sarmentosa*. Bluffs retain native vegetation to relatively low altitudes (650 m) but adjoining faces are dominated by bracken, wild majoram *Origanum vulgare*, *Hypericum perforatum*, *Senecio jacobaea*, *Clematis marata*, *Cordyline australis* and *Elymus solandri*. An area of coarse blocky colluvium 1 km up the Lochy River from its junction with the Long Burn has a significant kowhai *Sophora microphylla*, broadleaf *Griselinia littoralis* and *Aristotelia fruticosa* shrubland.

A narrow zone of largely riparian beech forest extends down the true right of the Lochy from just below the Billy Creek confluence. This soon gives way to the shrublands on very steep slopes already mentioned above.

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Short Burn

At highest elevations above 1600 m is a cushion/fell field with *Celmisia baastii*, *Chionebebe densiflora*, *C. thomsonii*, *Dracophyllum mucroides*, *Hectorella caespitosa*, *Kelleria* spp, *Raoulia hectorii* and *Ranunculus baastii* subsp. *piliferus*.

Between 1400–1600 m is a zone of slim snow tussock where there are areas of moderate to heavy sheep grazing. The relative abundance of *Celmisia lyallii* suggests it has benefited at the expense of *C. macra*. Rocky areas in this zone have *Celmisia angustifolia*, *Coprosma niphophylla*, *Carex wakatipu*, *Ourisia caespitosa* and *Hebe buchananii*.

Areas of heavily cropped sheep camps support grazed *Chionochloa macra*, *Psychrophila obtusa*, *Poa breviglumis*, *Wahlenbergia albomarginata*, *Coprosma niphophila*, *Plantago novae-zelandiae*, *Marsippospermum gracile*, *Gentiana* spp, *Rytidosperma pumilum*, *Carex wakatipu* and *Acaena saccaticupula*. Bluffs overhanging the camp support *Cheesemania wallii*.

Tussocklands below 1400 m down to the bushline are dominated by narrow-leaved tussock with silver, blue and hard tussock also present. Very tall narrow-leaved tussock (1–1.5 m tall) occurs on the sunny slopes on the true right of the Short Burn. A large range of native inter-tussock herbs and sub-shrubs form the groundcover. Exotic plants are sparse and include *Hieracium lepidulum*, *Trifolium repens*, *Rumex acetosella*, *Prunella vulgaris*, *Hypochaeris radicata*, *Achillea millefolium* and browntop. The presence of palatable *Elymus solandri* and *Gingidia montana* indicates negligible grazing pressure in this part of the catchment.

Rock outcrops in the tussock zone support a range of shrub, fern and herb species including *Coprosma rugosa*, *Helichrysum intermedium*, *Hebe biggarii*, *Olearia nummularifolia*, *Carmichaelia crassicaule*, *Leucogenes grandiceps*, *Raoulia grandiflora*, *Asplenium richardii*, and *Blechnum penna-marina*. Shady bluffs have a strong shrub cover of *Hebe hectorii*, *Dracophyllum uniflorum* with a range of herbs including *Aciphylla lecomtei*, *Celmisia laricifolia*, *C. ramulosa*, *C. verbascifolia*, *Dolichoglottis lyallii*, *Phyllachne colensoi*, *P. rubra*, *Polystichum cystostegia* and *Stellaria roughii*.

Shrublands become increasingly prevalent on damper aspects closer to the treeline. Common species include *Hebe hectorii*, *H. odora*, *H. pauciramosa*, *H. propinqua*, *Dracophyllum uniflorum* and *Ozothamnus vauvilliersi*.

The upper forest in the Short Burn is almost solely mountain beech *Nothofagus solandri* var. *cliffortioides* with a little more diversity around gullies and stream margins where *Hoberia lyallii* is present. Understorey and ground cover species include *Coprosma pseudocuneata*, *C. ciliata*, *Polystichum vestitum*, and *Pratia angulata*.

Robert Creek

The head of Robert Creek within Halfway Bay Pastoral Lease has a gentle gradient and shows signs of moderate to heavy grazing throughout the slim snow tussocklands. The vegetation composition and patterns are similar to that observed in the Short Burn and includes many wetland areas. Additional species in this catchment include *Celmisia viscosa*, *Raoulia hectorii*, *Colobanthus strictus*, *C. buchananii*, *Anisotome imbricata* var. *imbricata*, *Scleranthus uniflorus* and *Gnaphalium mackayi*.

Lakeshore and Faces

Regeneration is well advanced along much of the face with shrubland and small patches of beech extending well up slope. In the absence of fire, regeneration to forest will occur up to the natural forest line of about 1150 m.

Above about 1100 m is a narrow-leaved snow tussock (*Chionochloa rigida*) grassland which gives way to slim snow tussock (*Chionochloa macra*) at about 1500 m or lower in the colder gullies. Snow tussock extends downhill to the present beech or shrub zone, as low as 800 m, where no burning has occurred in recent times.

Cushionfield

This occurs on the more exposed ridge tops and areas with skeletal soils. *Dracophyllum muscoides* is usually dominant with much rock and bare ground. Mosses and lichens including *Racomitrium* and *Polytrichum* species are important with *Raoulia hectorii*, *Abrotanella inconspicua*, *Poa colensoi* and *Luzula pumila* also present. Other associated plants include *Chionohebe thomsonii*, *Hectorella caespitosa*, *Myosotis pulvinaris*, *Leptinella goyenii*, *Ourisia glandulosa*, *Hebe buchananii*, *Dracophyllum pronum*, *Raoulia grandiflora*, *Chionohebe densiflora*, *Agrostis muelleriana*, *Kelleria dieffenbachii* and *Colobanthus buchananii*. Large clumps of *Aciphylla lecomtei* are common and occasional plants of the tiny *Aciphylla hectorii* and *Myosotis byallii* are found. Slim snow tussock occurs where the soil is deeper.

Rock Bluffs/cliffs

These are home to many of the plants that also grow in the tussock grassland but a number of plants are confined to these sites. They include the rare Otago endemic *Cheesemanina wallii*, *Grammitis poepigiana*, *Anisotome capillifolia*, *Epilobium glabellum* and *Ourisia caespitosa*. Other plants of interest generally associated with these sites include: *Ranunculus buchananii*, *Celmisia verbascifolia*, *Celmisia ramulosa*, *Parabebe planopetiolata*, *Poa schistacea*, *Geum parviflorum*, *Myosotis macrantha*, *Celmisia angustifolia*, *Pachycladon novae-zelandiae* and *Coprosma* sp. (a) (Eagle 1982).

Boulderfields

Debris slopes below the bluffs contain the endemic *Hebe dilatata*. *Brachyglottis revoluta*, *Coprosma ciliata*, *Melicactus alpinus*, *Aciphylla* sp. "lomond", *Celmisia hectorii*, *Polystichum cystostegia*, and *Dracophyllum uniflorum* are other species prominent here. *Myrsine nummularia* is uncommon.

Scree and fellfield

On stable scree, *Hebe haastii*, *Epilobium pycnostachyum* and *Haastia recurva* are present. The endemic *Aciphylla spedenii*, *A. simplex*, *Celmisia viscosa*, *C. brevifolia*, *C. laricifolia*, *Craspedia lanata*, *Acaena saccaticarpula*, and *Myosotis drucei* are species found in fellfield together with mosses and lichens.

Shrubland

As well as shrubs on the boulderfields, shrubs occur scattered throughout the snow tussock grassland with *Dracophyllum uniflorum*, *Hebe hectorii* and *Ozothamnus vauvilliersii* common. *Dracophyllum uniflorum* forms pure stands on cold, rocky faces and on more exposed ridges *Dracophyllum pronum* forms large patches, often associated with cushion vegetation.

Slim snow tussockland

Reaching down to about 1300 m on the colder lake faces, slim snow tussock forms the dominant cover. At lower altitudes and in sheltered sites its cover is up to 80% with *Celmisia byallii* and other herbs. On damp slopes curly tussock (*Chionochloa crassiuscula*) also occurs and on rocky sites *Dracophyllum* species can be prominent. Cold, rocky, colluvial slopes have a mosaic of snow tussock, shrubland, with *Brachyglottis revoluta*, *Hebe hectorii*, *Astelia nivicola*, *Dracophyllum uniflorum* and herbfield with *Celmisia hectorii* prominent. On more exposed sites along the ridge top, slim snow tussock is interspersed with cushion plant, fellfield and boulderfield communities.

Narrow-leaved snow tussockland

This is present below slim snow tussock, and to the regenerating forest and shrublands along the lake faces. The exception to this is the north end of the lake faces where the tussockland has

been depleted by burning and grazing. The snow tussock is generally in very good to excellent condition with little bare ground, a good inter-tussock flora and few adventive species present.

Beech Remnants

Notably in the vicinity of Southwest Bay, the remnants are of mountain beech and show good regeneration.

2.4.2 PROBLEM PLANTS

Weeds present are broom, gorse, briar, *Hieracium*, wilding trees and various agricultural weeds, eg. thistles, ragwort, etc.

Broom and Gorse

Generally broom and gorse infestations are confined to the river flats and marginal strips of the mid and lower Lochy River. One area of concern is in Billy Creek where gorse has colonised both sides of the creek from an old hut site down to the main Lochy. The joint farm, LINZ and DOC spray programme is presently containing this.

Briar

Briar is present but does not appear to be a dominant weed and is mainly confined to river flats and lower valley slopes. At this stage no control is needed, but monitoring would be needed in the Upper Lochy Valley.

Wilding Trees

Wilding trees present the most significant threat to the Eyre Mountains. Wilding trees of various species are now colonising the property, particularly the lake faces, Short Burn, the Lower Lochy River and adjacent Cecil Peak Station. Some work has been carried out in the area, after an aerial survey involving DOC staff from Otago and Southland. This work entailed complete removal of wilding trees on the lake faces from Kingston to Southwest Bay. Further work is planned this year on Halfway Bay Station. Future ongoing work is needed to stop small trees seeding and control the colonisation of the Eyre Mountains tussock grasslands.

SIGNIFICANCE OF THE VEGETATION

- The **Billy Creek catchment**, at least as far as the Billy Hut site has exceptional conservation values. It has some of the most intact, diverse and natural plant communities seen by the authors. The size and vigour of the snow tussocklands is exceptional. The number of plant species present is in the vicinity of 400 species, which is very high for such a small area. Most of the rare and endemic species are present and the range of *Celmisia thomsonii* has been increased. The catchment contains sequences of indigenous vegetation including bluff, fellfield, scree, snowbank, wetland/bog, boulderfield, varied snow tussocklands, shrubland and remnant forest. Altitudinal and moisture gradients are represented. A few plants reach their eastern limits in this area including *Celmisia walkerii* and *Chionochloa pallens*.
- Below the derelict Billy Hut in Billy Creek, grazing in particular, and probably past burning, has reduced the conservation values from exceptional to high. All except the valley bottom and then primarily on the true right, has high to very high conservation values. Vegetation on the true left is almost totally indigenous with few adventive species for most of its length and those that do occur are confined to the lower slopes.

A relatively narrow area extending 3 km above the bottom gorge (true right) and contained by bluffs above and Billy Creek below, has the most extensive exotic grassland. Even here though native shrubs and herbs grow amongst the brown top and sweet vernal grassland. This would at one time have been beech forest, and if left undisturbed would return to forest through shrubland and bracken. Certainly the shrubland can be expected to increase relatively quickly with the removal of grazing. Gorse would continue to be a component for a time but would eventually succumb as forest took over, although a few plants may persist along the river edge.

- The **Long Burn catchment**, at least as far as Crooked Valley, has the same values as for the upper Billy Creek. It is outstanding with its intact altitudinal sequences, diverse plant communities, high species numbers and endemic, rare and threatened plant species. It adjoins the Eyre Conservation Area to the east and south.
- Below Crooked Valley has high to very high conservation values with the exception of the land below about 900 m on the true right.
- The **Lochy River faces** above, including the bluff system at about 700 m to 800 m on Centre Spur, have high conservation values. Forest would have clothed these faces to about 1100 m and there is now well developed shrubland and snow tussockland. The shrubland extends to the valley floor at the north end of Centre Spur and parts of the west faces. These areas are interspersed with exotic grassland but have native shrubs, herbs and grasses scattered throughout. These lower slopes have a moderate to high conservation value as they have the potential to return to forest through a bracken and shrubland succession in the long term.
- The valley floor and some lower fans are now largely in exotic vegetation with patches of beech forest and native shrubland. They are classified as having moderate to low conservation values. There is the long term potential for their recovery to largely indigenous cover with removal of grazing and fire.
- The **Short Burn catchment**, with the exception of an area near the mouth, has high conservation values with good altitudinal zonation from high cushionfield through tussocklands, shrublands to mountain beech forest. Grazing impacts above the bushline are restricted to a relatively narrow zone of slim snow tussocklands. There are few exotic plants.
- Except for the relatively small areas previously burnt, the **Lake Faces** have high conservation values. Most of the area is still in a natural state with the forest regenerating well along most of the lake faces. There is high diversity both in the communities represented and in the species present. Several species are threatened or of special note.
- The head of **Robert Creek** has high conservation values similar to the adjoining upper Short Burn. There are many small wetlands. Grazing impacts in slim snow tussocklands have been moderate - heavy but the communities are still intact.

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PLANTS OF SPECIAL DISTRIBUTION AND SIGNIFICANCE

Species	Distribution within Halfway Bay PL	Significance ¹ de Lange <i>et al</i> 1999 ² Molloy & Davis 1994
<i>Aciphylla spedenii</i>	Throughout	Eyre/Thomson mountain endemic
<i>Celmisia thomsonii</i>	Long Burn, Billy Creek	Naturally uncommon - range restricted, ¹ Eyre Mountains endemic
<i>Celmisia walkeri</i>	Billy Creek	Probably at eastern limit
<i>Cheesemania wallii</i>	Throughout	West Otago endemic
<i>Chionochloa pallens</i>	Long Burn, Billy Creek	Snow tussock of wet western mountains at eastern limit
<i>Gentiana</i> "skeleton"	Long Burn, Billy Creek	Unnamed species also recorded from Garvie Mountains, Mt Earnslaw and Wye Valley
<i>Gentiana bellidifolia</i> "wet flush"	Long Burn	Eyre Mountains endemic Taxonomically indeterminate
<i>Hebe biggarii</i>	Long Burn, Lochy faces	Eyre Mountains endemic
<i>Hebe dilatata</i>	Long Burn	Naturally uncommon - sparse ¹
<i>Hebe petriei</i>	Long Burn, Billy Creek	Wakatipu area endemic
<i>Isochnocarpus novae-zelandiae</i>	Long Burn, Lake Faces	Naturally uncommon - sparse, ¹ category B ²
<i>Meliccytus</i> "Matiri"	Long Burn	Taxonomically Indeterminate, ¹ - insufficiently known - only location outside NW Nelson
<i>Ourisia spathulata</i>	Long Burn, Billy Creek	naturally uncommon - range restricted, ¹ confined to Garvie, Eyre and Thomson Mountains
<i>Pimelea poppelwellii</i>	Billy Creek	Confined to mountains from Umbrella Range to Thomson Mountains
<i>Ranunculus haastii</i> ssp <i>piliferus</i>	Throughout	Naturally uncommon - sparse ¹
<i>Ranunculus scitibalis</i>	Long Burn, Billy Creek	Naturally uncommon - range restricted, ¹ Eyre/Thomson Mountains endemic

2.5 FAUNA

2.5.1 INVERTEBRATE FAUNA

Introduction

Large parts of the lease were surveyed during 2-5 February 1999. Weather was fine and warm with little wind but cool evenings. This followed a dry summer which reduced the presence of ground-dwelling insects, but moth fauna was active during warm periods. 275 invertebrates were recorded, 147 species were collected and observations were made.

Context

This large lease forms a wedge from Lake Wakatipu stretching into the heart of the extensive Eyre Mountains. Glacial erosional processes, with limited fault movement, have carved out long deep valleys across schist and partly foliated greywacke rocks (Turnbull 1999). A variety of landforms have resulted from historical cold climate processes. A small proportion of the lease is on valley floor and low elevation terraces. Soils here and also on the slopes are stony and nutrient poor. Better soils are found on the toes of colluvial slopes. Following fire, beech dominated forests are confined to lower enclosed parts of valleys. Terraces, mid-altitude slopes and less confined valley floors have fescue and snow tussock grasslands, and extensive shrublands in place of forest. In the remote valley heads and above mid-altitudes (800 m asl.), fire frequency has been low and largely natural vegetation patterning can be seen. Stream reaches and tarns with stony substrates and old rock slides, rubble and moraine are very stable having moss and algae in wet sites and a red lichen on drier sites. This is in contrast to mountains south of the lease where erosion is more active. The insects of this lease link to eastern South Island main divide and more particularly alpine west Otago. Significant additional communities are at low elevation, near Lake Wakatipu shore (310-380 m asl.)

Alpine Communities

Above 1400 m asl., a range of environments with bare rock provide for a diversity of invertebrate communities. Scree weta *Deinacrida connectens* were recorded for the first time in the Eyre Mountains. This species is restricted to the stable parts of high mountain screes throughout the South Island. Measurements of genetic drift indicate each mountain system holds population islands with no migration between them in recent evolutionary time (Morgan-Richards and Gibbs 1996). This population together with others is likely to be instructive about evolutionary potential in New Zealand's alpine environments (Mary Richards and Steve Trewick personal communication 1999). The black mountain ringlet butterfly *Percnodamon merula* is also associated with screes and the larvae feed on *Poa* species grasses.

The large geometrid moth *Xanthorhoe frigida* is a specialist on the Eyre Mountain endemic plant *Cheesmania wallii*. The plant is present in alpine sheltered rock bluff sites. Deep rock crevices also harbour the alpine cave weta *Pharmacus* species.

Areas of patterned ground, fellfield and wind derived soils have a range of cushion and prostrate heath plants. Alpine insects on these include: moths *Gelophaula* n.sp. and *Asterivora marmarea* on *Celmisia* species, moth *Dasyuris anceps* on *Anisotome* species, moths *Notoreas chioneres* and *N. galaxias* on *Kelleria* species. Large bodied flightless weevils are found and includes *Anagotis latirostris*, and speargrass weevils *Lyperobius hudsoni* and *L. spedenii*. *L. spedenii* is common on the speargrass *Aciphylla spedenii*. The large carabid beetle *Mecodema costipenne* is found over 1500 m at Billy Creek, a high altitude record. Additional species of interest are a porina moth caterpillar (*Aoraia* sp.) possibly feeding on the cushion *Hectorella caespitosa* and a large ground weta *Hemiandrus* species.

Snowbanks are extensive on the flanks of ridges and have the grasshopper *Alpinacris tumidicauda* and bugs *Nysius* sp. aff. *huttoni*. Widespread in rocky or open areas are grasshopper *Sigaus australis* and black mountain cicadas *Maoricicada otagensis* and *M. nigra frigida*.

The snowmelt channels and high tarn seepages and outlets have a large bodied flightless stonefly *Holcoptera magna*. The stonefly is best known from Fiordland and Takitimu Mountains and is not known east or north of the Eyre Mountains. An undescribed predatory mayfly *Nesameletus* species "A" (Terry Hitchings) is common in high cirque tarns and also a valley floor tarn and most streams.

100-1000 m

This zone contains a diversity of habitats which are lower alpine and have a longer growing season. Wet snow tussock grasslands are extensive and have numerous moths including *Metacrias huttoni*, *Orocrambus crenaeus*, *O. philpotti*, *Udea flavidalis* and *Tingena xanthodesma*. These are common in natural areas. Moraines and terrace scarps cross the valley floors and rock heaps and wet kettle depressions mark rock dumped during old ice decay. This provides sites for herb and cushionfield. The shrub *Dracophyllum uniflorum* supports the moth *Aponotoreas anthracias*, the shrub *Hebe odora* hosts the moth *Pasiphila rubella* and a longhorn beetle (family Cerambycidae) and the shrub *Pimelea poppelwellii* hosts the moth *Meterana meyricki*. Some deep stable rock slides had sparse vegetation and provided basking sites for insects adjacent to grass and shrubland. The vine *Muehlenbeckia axillaris* growing in the boundary between rock heaps and waterlogged soil supports a rich array of insects including boulder butterfly *Boldenaria* n.sp. and Copper butterfly *Antipodabycaena* n.sp.. These butterflies bask along with the grasshopper *Sigaus australis* among the rocks. Alpine stick insects ?*Mimarchus* sp. are abundant at night also feeding on *Muehlenbeckia*.

Shrubland patches retained some fire prone plant species such as *Brachyglottis cassinioides* and *Olearia cymbifolia* and provide diverse hosts for a range of pollinating, plant sucking, root feeding foliage feeding and litter feeding insects (Mark et al. 1989 and Edwards personal observation).

Water

The aquatic environment in the head of the Lochy River, Billy Creek and Long Burn is very diverse and complex. Meltwaters and rainwater periodically flow in smears across rock surfaces and plunges over slopes with no channel form at all. In addition some channels are formed at tarn outlets and weave among valley floor bogs. These have more permanent flow and are of low gradient with stable cobble substrates. Water also flows into screes, and emerges from the foot of scree slopes and moraine. In adjoining sites, old scree mantle has impeded drainage and extensive bog flushes blanket the valley sides. Lastly, large alpine cirque basins emit streams which cascade down in a series of falls and plunge pools below. Aquatic invertebrate and algal diversity match this physical diversity (see table 1).

Table 1. Aquatic habitats and insects noted from Billy Creek headwaters

Habitat	Insect
tarns	diving beetle <i>Rhantus</i> species, mayflies <i>Deleatidium vernale</i> , <i>Nesameletus</i> sp. A. and caddis <i>Philorheithrus lacustris</i>
tarn seep and snowmelt channel	stonefly <i>Holcoperla magna</i>
tarn outlet channels	caddis <i>Pseudoeconemis stramineus</i>
cascade streams	caddis <i>Tiphobiosis cataractae</i> , <i>Hudsonema aliena</i> , <i>Psilochorema cheirodes</i> , <i>Synchorema zygoneurum</i>
springs	caddis <i>Pseudoeconemis stramineus</i>
bog flushes	stoneflies <i>Zealandobius childi</i> , <i>Spaniocercoides howesi</i>
small permanent streams	caddis <i>Costachorema callistum</i> , <i>C. psaropteron</i> , mayflies <i>Deleatidium vernale</i> , <i>D. autumnale</i> , <i>Austroclima jolliae</i> , and stoneflies <i>Spaniocerca zwicki</i> , <i>Zealandoperla tillyardi</i>

Below 1000 m

Given the large scale and remoteness of the property, a large range of habitats with natural character remain. In the lower parts of Billy Creek, Lochy River, Long Burn and Short Burn catchments, there are slumped slopes with wet flush communities. These are almost all on westward facing slopes. Beech forest communities finger along all the major valley systems. Gully shrublands form different assemblages in each of a multitude of gullies. Sunny and shaded

Rock bluff sites are common. Gully outlets often have flood disturbed gravels, and rock colonised by shrubs and trees of disturbed sites. Numerous small scale communities exist on rock slides, seepages, terrace scarps and the lake shoreline. Pocketed across the lease are areas modified by fire and grazing, these include: 1) river flats near the junction of Billy Creek and Lochy River; 2) slopes, terraces and flats of the lower Lochy River, Long Burn and Short Burn catchments; and 3) Lake Wakatipu faces. These places are generally drier and invaded by low producing introduced grasses, native shrubs and grasses as well as broom, bracken and gorse. Communities of note are discussed below.

Valley slope grassland and wet flush

Despite a varied disturbance history, numerous species of native and day-active grassland insects are present. Their regional distribution generally includes west Otago. An unrecognisable cicada species *Maoricicada* ?n.sp was discovered in the middle Lochy River catchment. The day active moth *Heliothela atra* is common on flushes of the Home Faces.

Beech forest

For invertebrates, beech forest habitat adds additional richness to the valley floors. In addition, their low elevation and presence in riparian zones of moderately large rivers is significant. The fire disturbed margins of the forest are developing diverse shrub and tree communities in some parts. Thus, 23 species of moths along with a range of beetles and weta were noted. They generally represent forest and shrubland insects of the region and are not specific to the Eyre Mountains. However, some insects are of interest. The moth *Proteodes carnifex* is a beech foliage specialist. The large predator beetle *Mecodema costipenne* was noted from the Lochy River. While little studied, this beetle is a sister species to *M. chiltoni* (a beetle with noted conservation priority) which is present in adjacent valleys to the south. These two species are widespread in the Eyre Mountains but are not found together at a site. A small forest shaded cascade at 450 m has the leaping stonefly *Halticoperla tara* a specialist of such sites. The stonefly's distribution is confined to wet valleys from West Otago to the West Coast.

Along some waterways, the tall riparian tree architecture and shading enhance the aquatic fauna by providing places for aquatic insect mating and dispersal and also contribute litter, logs and terrestrial insects to the stream ecosystem. This functioning has been truncated in many parts of the region- particularly for larger rivers.

Kowhai shrubland

About one kilometre up the Lochy River from its junction with the Long Burn is a large kowhai (*Sophora microphylla*) stand. It is found growing on a slope and ends 100 m above the river on a bluff. Trees are established in coarse blocky colluvium deposited by surface flooding. Being rich in other shrubs and trees (particularly broadleaf *Griselinia littoralis*) and developed on a naturally disturbed site indicates a potentially rich insect community. Kowhai were totally defoliated by the moth *Uresopheta maoralis*. Eruptive population outbreak behaviour by *U. maoralis* may possibly be a natural phenomenon.

Fans and terraces near the Lochy River outlet

Manuka and short tussock grasses, and some beech forest, continue to have a presence here along with insects of lowland open stony grassland. These include undescribed boulder and copper butterflies *Boldenaria* n.sp. and *Antipodalycaena* n.sp. on the prostrate liane *Muehlenbeckia axillaris*. At least seven day flying crambid moths are present. The Katydid *Conocephalus semivittatus* and grasshopper *Phaulacridium marginale* are common and matched by the noise of cicada *Kikiba* ?species and *Maoricicada campbelli*. This insect assemblage is supported by a range of native herbs and grasses which persist despite the effect of pastoralism.

Large Rivers

Caddis, stoneflies, mayflies and dobsonfly were noted, all being common and also widespread in the eastern lower South Island. All species live in fast flowing water, and generally reflect the stony substrates and clear, cool oligotrophic state. Catchment morphology overall is narrow and linear with trickles and first order streams joining the main channel directly rather than the usual pattern of coalescing streams of equal size. The mid and lower reaches of the Lochy River and Long Burn are relatively confined in gorges with little sinuosity. Thus, aquatic habitat diversity for insects is provided by a contrast between numerous small seepages and near permanent streams and a large swift river. As elsewhere on the lease this arises from the effect of glaciations on uplifted hard schist rock (see Turnbull 1999).

Lake faces

Not sampled in this survey, however, similar habitats occur on Allandale Pastoral Lease to the south. Grasslands contain representative insects such as cicada *Kikiba* species, bugs *Nabis maoricus*, *Stenotis binotatus* and *Stenotis norvegicus*. Slopes have areas of rock outcrop and a history of fire followed by regeneration of mixed shrub/grassland. These habitats are extensive with sources of insect colonists from fire refugia among the bluffs and deep gullies. Patches include inaka *Dracophyllum longifolium*, speargrass *Aciphylla glaucescens*, snow tussock *Chionochloa rigida*, bracken *Pteridium esculentum* interspersed with shrublands of kohuhu *Pittosporum tenuifolium*, manuka *Leptospermum scoparium* and *Coprosma propinqua*. Thickets of kowhai and mountain/silver beech provide refuge and carry representative insects such as kowhai moth *Uresipheta maoralis* and beech leafroller *Proteodes carnifex* noted nearby.

On these faces, first order stream channels have high stream power and drain directly to the lake. They are confined to deeply incised gullies and gorges. Water often steps down over bedrock in a series of falls and plunge pools. This habitat is widespread in the Otago Lakes region and is characterised by fishless communities where the dominant predators are large bodied stoneflies.

2.5.2 HERPETOFAUNA

Four common skink *Oligosoma inconspicuum* were found in the Short Burn, four skinks (probably Maccon's skink *O. maccanni*) and one *Hoplodactylus*. 'Otago,' was found in the Long Burn, several *O. n. polychroma* in the Lochy River, and *O. n. polychroma*, *O. maccanni*. and one *H.* 'southern mini' in Billy Creek. All skinks found are widespread in Otago and relatively common. The paucity of lizards in places where they might normally be expected is partly explained by the hot, dry conditions during the survey. Given the good habitat in many areas inspected, especially above 1000m, there are likely to be other species present, and some habitat seemed ideal for rare species such as scree skinks (*O. waimatense*) and orange-mouthed geckos (*Hoplodactylus* sp.) The *O. n. polychroma* found in rocks at the Lochy river site were in refuge habitat – this species prefers grasslands, which were highly modified.

The blocky, 'greywacke' in the western Eyre mountains grades into a well developed transition to semischist to the east (Turnbull 1999). Schistosity or foliation refers to the splittability of rock. There may be a relationship between the underlying strata and suitability of rocks for lizard habitat at least where geckos are concerned.

5.3 AVIFAUNA

PREVIOUS SURVEYS

Bird Atlas

The Ornithological Society of NZ compiled bird distributional data (Bird Atlas) from 1969 to 1979. (Bull *et al.* 1985).

The properties covered by the society report were not covered by this survey so we have no direct records of birds from this time, but the Bird Atlas gives information on the distance to the nearest record of any given species. From the Bird Atlas data the closest records for NZ falcon are in the Von Valley and Hector Mountains 10-20 kms from these properties. Data for this and other species are summarised in the table below:

Species	Location of Nearest Record	Approximate Distance to Nearest Record
Falcon	Von Valley	10 kms
	Hector Mountains	20 kms
NZ Pigeon	Mavora Lakes	30 kms
	Queenstown	30 kms
Kea	Remarkables	20 kms
	Greenstone River Mouth	40 kms
	Stuart Mountains	60 kms
Rifleman	Hector Mountains	20 kms
	Oreti Valley	10 kms
	Queenstown	30 kms
Rock Wren	Murchison Mountains	70 kms
	Richardson Mountains	45 kms
Brown Creeper	Oreti Valley	10 kms
	Queenstown	20 kms
Fantail	Von Valley	10 kms
	Hector Mountains	20 kms
	Garston	10 kms
	Mavora Lakes	30 kms
Tomtit	Queenstown	20 kms
	Mavora Lakes	30 kms
Bellbird	Hector Mountains	20 kms
	Athol	20 kms
	Oreti Valley	10 kms
	Von Valley	10 kms

This analysis shows that populations of the species listed in the tables are isolated from other populations. This particularly applies to rock wren and kea.

PNAP Survey

In 1987 a PNAP survey of the Central Eyre Mountains was undertaken (Mark *et al.* 1989).

The key focus of the survey was the head waters of the Matura catchment immediately south of these properties.

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Rock Wren

The PNAP survey was the first to record rock wrens in the Eyre Mountains. They were present on the main watershed ridges of this part of the Eyres in four locations. All these records were at high altitude (1130 - 1840 m).

NZ Falcon

Recorded by the PNAP survey in the Eyre Creek, Mataura River and Robert Creek catchment below 1000 m. It is considered to be as common as recorded elsewhere.

Kea

A small population was recorded in the upper Mataura and birds were recorded in the upper Lochy Valley. They have also been present in Robert Creek (Greenvale Station) in the past.

PRESENT SURVEY**Rock Wren**

Rock wrens were recorded in the head of both the Long Burn and Billy Creek. Both records were in boulder systems. Not all available habitat was searched.

It is clear from this and the PNAP survey that there is a population of rock wrens located in separated head basins along the watershed ridge of the Northern Eyre Mountains.

Unlike other species in this survey rock wren are restricted by habitat and dispersal ability to small sites of a specific nature. Conservation of this disjoint population requires the maintenance of a network of habitats to ensure its continued survival.

NZ Falcon

Falcons were recorded in all the main valleys except the Short Burn. The birds at Killiecrankie Hut were breeding as a fledgling was present.

Falcons are a wide ranging species and individuals will use extensive areas for feeding and breeding.

Previous research by Nick Fox shows that falcons have a home range of 20 square miles. Falcons present in the Long Burn can be expected to use the entire valley or its equivalent as their home range.

Kea

Keas were recorded in Billy Creek, and various parts of the Long Burn.

Similarly to NZ Falcon, Keas are a wide ranging species with extensive habitats. Keas are present and breeding on the Remarkables Mountains and have been recorded flying across Lake Wakatipu on a regular basis. In previous relocation work at Arthurs Pass it has been shown that Keas are familiar with an area of about 30 km in diameter.

Kereru (NZ Pigeon)

Kereru were recorded only on the Lower Lochy River Flats. They could be expected to be utilising forest areas in the Lower Lochy River. Kereru are able to travel large distances to exploit seasonal food sources. For example, birds resident in Dunedin travel to the Taieri River in early spring to feed on willow buds.

Forest Birds

(tomtit, brown creeper, rifleman, bellbird and fantail)

In contrast to kea, falcon and kereru, this group of forest species are relatively sedentary and restricted to discreet forest patches. Their distribution on these properties is dictated by the distribution of beech forest.

Of particular note is the presence of a large patch of kowhai on the Lochy above the Long Burn confluence where bellbird were recorded in numbers feeding on scale insects.

EVALUATION

Table 2 summaries the status of the bird species discussed above.

SPECIES	RANKING CATEGORY	STATUS
Kea	B	Endemic
Falcon	B	Endemic
NZ Pigeon	B	Endemic
Rock Wren	C	Endemic
Bellbird	-	Endemic
Tomtit	-	Endemic
Fantail	-	Native
Brown creeper	-	Endemic
Rifleman	-	Endemic

The species listed on Table 2 are all breeding within the property or can be reasonably expected to be breeding.

For kea and rock wren, the populations in the Eyre Mountains are well away from core habitats and in the case of rock wren extend their distributional range by tens of kilometres.

Populations of bellbird, tomtit, fantail, brown creeper and rifleman in the northern Eyre Mountains are on the north western edge of distribution. Sparse records for some of these species exist in the Hector Mountains or around Queenstown but these properties contain the last large areas of beech forest habitat when travelling north west.

From the distribution records made on this survey, rock wren are inhabiting the high alpine country along the head waters of Billy Creek and the Long Burn.

NZ Falcon are present throughout the Lochy Valley, Billy Valley, the Long Burn, Robert Creek, and the faces about Lake Wakatipu. They are breeding at least on the faces above Lake Wakatipu and also the Lochy Valley.

Kea are inhabiting the ridge systems of Centre Spur, the ridge between Billy Creek and Long Burn and the Symmetry Peaks area. They are also present sometimes in Robert Creek.

Kereru are utilising the beech and mixed hardwood of the lower Lochy Valley and the Long Burn.

The forest bird community is present throughout beech forest areas and remnants on the property.

2.5.4 FRESHWATER FISH

INTRODUCTION

At the time of the survey (February 1999) water levels were dropping following a minor fresh associated with the melt of an unseasonal snowfall. Prior to this, dry conditions and associated low flows had prevailed for an extended period of time. A total of thirteen sites were sampled from four river systems within the property boundary, as well as two sites on the mainstem Lochy river just outside the property boundary. Sites were fished using a backpack DC "Kainga" electric fishing machine. Reaches were sampled with a single pass into a stop net, set downstream.

AQUATIC FAUNA

The NIWA Freshwater Fish Database holds no records for this property.

Four fish species were recorded from the thirteen sites sampled, two native and two introduced. Brown trout (*Salmo trutta*) were the most widespread species and were present at eight of the sites sampled, as well as at the two Lochy River sites outside the property. Koaro (*Galaxias brevipinnis*) were the next most widespread species and were recorded at five sites, in the lower reaches of Billy Creek, Long Burn and in the Short Burn (both above and below the first waterfall). They were abundant at the two latter sites. Alpine galaxiids (*Galaxias paucispondylus*) were present at one site in the mainstem of the Lochy River. Rainbow trout (*Oncorhynchus mykiss*) were present in the mainstem of the lower Lochy and were recorded also in the Short Burn deviation, below the small hydro structure.

Healthy populations of koaro were present in the lower reaches of the Long Burn and in the Short Burn. Above the waterfall in the Long Burn between sites 6 and 7 they were the only fish present. Although most fish were in the smaller size classes around 50 mm, some larger specimens were collected (max. size 127 mm). They were not present at the mainstem Long Burn site fished just below the Siberia hut, nor in the unnamed tributary immediately below Symmetry Creek on the true right (there were no fish recorded at both sites), so they obviously drop out somewhere between those sites and site 6. They are likely to be present throughout the Lochy below the subterranean outlet from Lake Ned, but probably only in limited numbers due to competition with brown trout.

There was a good whitebait (juvenile koaro) run occurring at the mouth of the Short Burn at the time of the survey and adult koaro were particularly numerous at the upstream site fished above the first waterfall, near the Station's water supply intake.

The record of alpine galaxiids within the Lochy River is the first record for the Clutha catchment and as such it has some historic significance in explaining the pattern of fish diversity within the region. These alpine galaxiids are likely to be recent colonists since the last ice age from the time when the Maitai River flowed out of Lake Wakatipu. Where appropriate habitat is available (shallow gravel riffles and runs) alpine galaxiids are likely to be present within the Lochy River.

The absence of flathead-type or roundhead-type galaxiids which are also found with alpine galaxiids in the Maitai River may relate to the subsequent colonisation by koaro of the Lochy River system. Koaro are thought to exclude flathead-type and round head-type galaxiids.

The low diversity of fish within the streams sampled is probably related to the most recent ice age which would have scoured these streams out. The fauna represent those species which have been capable of recolonising the system since then, although competition or predation by koaro and brown trout is likely to have affected the fauna as well.

Type specimens were collected, preserved in formalin and sent to Dr Richard Allibone (NIWA), for confirmation of species identification.

Table 1. Species present, relative abundance and site locations of all fish taxa collected from Halfway Bay Station, February 1999.

Site numbers	1	2	3	4	5	6	7	8	9	10	11	12	13	14
<i>Galaxias paucispondylus</i> (alpine galaxiid)	A													
<i>Galaxias brevipinnis</i> (koaro)				R		A	C						C	A
<i>Salmo trutta</i> (brown trout)	C	O	O	C			C	A	A	O			C	
<i>Oncorhynchus mykiss</i> (rainbow trout)													R	

R = rare (1);

O = occasional (2-5)

C + common (6-10);

A = abundant (>10)

Site Names:

- 1 Lochy River. Mainstem about 1 km below Killiecrankie hut: Map ref. E42 591 440
- 2-4 Billy Creek: Map refs. E42 574 398, 599 435, 601 439.
- 5-8 Long Burn: Map refs. E42 609 387, 671 483, 672 492, 675 499.
- 9 Lochy River. Mainstem directly upstream of confluence with Long Burn: Map ref. E42 675 501.
- 10 Mainstem Lochy between Lakes Nigel and Ned: Map ref. E42 517 363.
- 11 Unnamed Long Burn tributary below Symmetry Creek confluence: Map ref. E42 653 417.
- 12 Long Burn, below Siberia Hut: Map ref. E42 715 478.
- 13 Short Burn, below hydro station: Map ref. F42 715 478.
- 14 Short Burn, above water intake and first waterfall: Map ref. F42 704 477.

2.5.5 PROBLEM ANIMALS

WILD ANIMALS PRESENT

- Red Deer very low numbers
- Chamois low numbers but slowly increasing
- Goats very low numbers, but areas bordering these stations hold high populations – remnants of escaped domestic goats
- Fallow deer one stag seen on Halfway Bay station in 1996. Possibility of very low numbers in Lochy River area

Red Deer

Red deer are in very low numbers and occupy bush areas in Long Burn and the main Lochy catchments, using mainly the forested areas in these catchments. These animals are not considered a threat, as commercial and recreational shooting will control remnant populations.

Chamois

These animals have colonised the whole of the Eyre Mountains and are present in the scrub belts and higher basins on to the alpine areas. Previous control was by DOC Te Anau, but control is now by recreational shooting and some commercial recovery. Interest is evident in guided hunting for chamois in this area.

Chamois have been slowly increasing over the last few years and if allowed to increase will have impacts on the area's vegetation. Control by commercial harvesting is possible and with better access, recreational shooters could be used for control. The department should monitor the chamois population and distribution, possibly in conjunction with goat control programmes.

Goats

Goats are present in low numbers on Halfway Bay Station on the true right of the Lochy River from Billy Creek to the Short Burn. The Wakatipu Area Office, following the Eyre Mountains Goat Control Plan presently controls this programme. Six Judas goats are also operating in this area to assist in limiting goats from building up and colonising conservation lands adjacent to the Lochy River catchment. There is also a small remnant of escaped domestic goats in the Lake Faces/Shortburn area.

Goats are now confined to the large scrub and forest areas on the Home Faces. However, in the last two years goats have moved from Walter Peak, down the Von River and now threaten the head of the Lochy River (Halfway Bay Station) and the adjoining conservation lands. This is presently being addressed by a Southland/Otago Conservancy approach to stop further infiltration. A new Eyre Mountains Goat Control Plan has been written and a draft is now available.

Fallow Deer

These animals will need to be monitored in the future. No fallow deer have been seen on the property since 1996, however they are present on Cecil Peak Station in a free range situation.

PESTS

Animal pests present are possums, rabbits, hares, feral cats, stoats, ferrets and hedgehogs.

Possums

Possums have colonised the whole of the property except high alpine areas, and large populations have been observed in the past, particularly on the lake faces above Kingston, the mid-Lochy area and Long Burn.

Previously commercial trappers exerted some control over possums, but since the market for possum fur is very poor only the Animal Health Board has targeted possums for TB control. This has been mainly on the Allandale Station. Areas of defoliation caused by possums have been noted on beech forests in the Long Burn and Lochy particularly during winter. It is assumed that the possum population fluctuates over a number of years depending on the seasons and spasmodic control programmes. The impacts of possums definitely influence vegetation but in this area the impacts are not known.

Rabbits

These areas have pockets of rabbits over the river flats in the main Lochy from the mouth to the Cascade Creek area. It is unknown if the RHD virus is present in the rabbit population but generally the population is low and only requires monitoring.

Hares

Hares are present over the entire tussock grasslands and occupy scrub and bush areas in winter. Hares have been observed in the high basins even in winter. Their impacts are unknown.

Feral Cats, Stoats and Ferrets

These animals are present throughout the station with preference for rabbit areas, and impacts are unknown.

Hedgehogs

Hedgehogs are present but impacts are unknown. Hedgehogs are mentioned due to predation on insects, notably native beetles.

SIGNIFICANCE OF THE FAUNA

Invertebrate Fauna

The lease physically encompasses an extraordinary range of habitats. Scree weta *Deinacrida connectens* is recorded for the first time in the Eyre Mountains on this lease. The rare alpine cress moth *Xanthorhoe frigida* is also present and the rich fauna includes speargrass weevils *Lyperobius spedenii* and *L. hudsoni* – characteristic for the region. The large black flightless and alpine stonefly *Holcoperla magna* is found in the region of Eyre Peak. The range and naturalness of communities preserved on valley floor, and lowland parts of the lease, stand out for the region. They are of high value. The complex aquatic environment in the head of Billy Creek is of particular note. Characteristic insects were associated with many of the above habitats. Some indicator insects being: moth *Meterana meyricki*, stick insect *Mimarchus* species, caddis *Pseudoeconemis stramineus*, stoneflies *Triphobiosis cataractae* and *Halticoperla tara*, cicada *Maoricicada* spp., carabid beetle *Mecodema costipenne*, beech moth *Proteodes carnifex* and kowhai moth *Uresopheta maorialis*.

Avifauna

The property contains large intact valley systems with a full complement of rangeland wildlife. Species of note are New Zealand falcon, kea and New Zealand pigeon, (all are Category B threatened species for conservation (Molloy and Davis 1994)) and rock wren (a Category C threatened species). There is evidence that these species breed on the property.

Rock wren are notable as a species with very restricted distribution.

Records for rock wren significantly extend their distributional range.

Several forest bird species are at their distributional limits, eg, bellbird, tomtit, fantail, brown creeper and rifleman are at the edge of the Central Otago grasslands.

Freshwater Fish

Koaro is a Category C threatened species and the presence of healthy, landlocked populations in the lower reaches of the Long Burn and in the Short Burn is significant. The record for alpine galaxiids in the Lochy River helps to explain post glacial fish distribution and colonisation patterns in the Clutha Catchment.

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MAORI SITES

No Maori sites have been recorded from Halfway Bay but it would be surprising if there were not at least some oven sites present around the mouth of the river.

EUROPEAN HISTORY AND SITES

The first Europeans to enter this area were explorers whose main motive was the search of new land for grazing sheep. The first to visit Lake Wakatipu were John Morrison, John Chubbin and Malcolm Macfarlane who reached the shores of the lake in the vicinity of Kingston in late 1856. Apart from being the first Europeans to reach the lake their other claim to fame was to have to retreat to the waters of the lake to escape a large scrub fire that they accidentally started (Beattie 1947:47). They seem to have not been interested in the farming potential of the area but were soon followed by others who were and a steady flow of would-be pastoralists reached the area over the next few years.

The first European to reach Halfway Bay was probably Donald Hay who navigated part of the lake during the winter of 1859 in a flax mokihi. Paddling up the western shore of the lake from Kingston he is said to have spent a night at Halfway Bay and roasted a weka for dinner (Mackenzie 1948:37). Although from Hay's own account quoted in Beattie (1947:52) it is not clear where along the western shore he ate his weka.

The early pastoral history of Halfway Bay is in contrast to Greenvale and many other pastoral leases. Instead of an initially large lease which was gradually reduced through time to a smaller size the current Halfway Bay lease is comprised of three leases originally taken up last century.

The first person to run stock in the Lochy was Captain John Howell who had Fairlight Station. Howell was one of the pioneers of Southland having established what is now Riverton as a whaling station in 1836. In 1869 Howell, along with his manager Fred Daniels and shepherd William Boyer went in search of further grazing land. According to Boyer they went up the Mataura and then up a ridge heading for a break in the mountains. The break was named Billy Saddle after Boyer, as he was the first to pass through it. Then Boyer states they went down the Long Burn until they reached the Lochy. From there they attempted to proceed down the Lochy but were blocked by impenetrable bush. They then returned to the mouth of the Long Burn and then back via Billy Saddle to Fairlight. Howell took up the upper Lochy country as run 438 until his death in 1874 (Beattie 1947:43, Southland Times 29 July 1989:17).

However, Boyer's description seems to be at odds with the geography of the area. Billy saddle gives access to Billy Creek not the Long Burn. Furthermore the junction of the Long Burn with the Lochy is only about 4.5 km from the lake through fairly open country. It seems, therefore more likely that the explorers went down Billy Creek and then got bushed in the narrow valley of the Lochy below the Billy Creek junction. This conclusion is reinforced by the area that was eventually leased to Howell; Run 438. This was of 37000 acres on both sides of the head of the Lochy, extending downstream only as far as the valley of Billy Creek.

Howell died in 1874 and the fate of Run 438 for the next few years is unclear, but in 1887 it along with Run 452 (18,690 acres in the Eyre mountains at the head of the Lochy and Eyre creek) was taken up by James Maclean. The annual rental was £5. Maclean built a stone hut

below the junction with Billy Creek in which he lived with his three young daughters. (Southland Times 29/7/89:17).

According to an early run register held by the National Archives (Dunedin) the two other early runs were 5 and 6. Run 5 was 15130 acres between the Long Burn and Billy Creek. Run 6 was 11240 acres between the Long Burn and the main ridge line overlooking the lake. In the early 1880s Run 6 was held by William McAllister and Run 5 by George Atkins and then D McKinley. Both runs were acquired in the mid-1880s by John Wither, who held Cecil Peak with Bendix Hallenstein. This lower part of Halfway Bay was known as Birchgrove (although it is unclear whether this name was initially only applied to Run 5). The homestead was situated at the junction of the Long Burn with the Lochy. This burnt down late in the 1800s and a new homestead built at the current site near the lake. By the turn of the century James Maclean had acquired Birchgrove and set up his sons there while he ran another run at Waikaja, also known as Greenvale (Southland Times 29/7/89:17).

Recorded site: The site description below based on information supplied by other members of the inspection team.

- (1) Homestead site (grid ref. E42 614 448). This is located on the true right of the Lochy river below the junction with Billy Creek. This site was the homestead which James Maclean occupied when he first took up Run 438. The homestead is now a one roomed stone ruin approximately 5.5m square with a chimney at the eastern end. The ruin is in fairly good condition.

HISTORIC SIGNIFICANCE

The old Maclean homestead ruin in the valley of the Lochy below the junction with Billy creek is a site of local and regional significance. Despite being well over 100 years old the stone ruin of the single roomed building are still quite substantial. It is a permanent reminder of the almost complete isolation that some of the early runholders in the lakes area lived in. This sense of isolation and history is heightened by the knowledge that James Maclean lived in this one roomed homestead with three daughters.

The site of the old Birchgrove homestead at the junction of the Lochy and the Long Burn is of some significance as an archaeological site. Because the site was destroyed by fire in the late 1800s it provides an historical "snap shot" of life on a remote high country homestead at that time. Other homestead sites dating from the same period have been redeveloped either by agricultural activities after the sites were abandoned or by subsequent building activities (and are often still occupied). In either case these sites have lost much of their archaeological merit. In contrast the Birchgrove site remains comparatively untouched since its destruction more than 100 years ago as and has the potential to yield significant archaeological information about life on a remote homestead at that time.

2.7 PUBLIC RECREATION

2.7.1 PHYSICAL CHARACTERISTICS

In 1992, DOC completed a Recreation Opportunity Spectrum for the entire conservancy whereby all land areas, regardless of land tenure, were classified and mapped according to setting, activity and recreational experience characteristics.

This exercise included Halfway Bay Station and the zonings made reflect the wide variety of terrain and recreational opportunities present.

The lake faces and the lower Lochy Valley are zoned Backcountry 4x4 Drive-in, which is "characterised by a feeling of relative remoteness from populated areas". The highly natural setting is a valued part of the experience and may be associated with motivations of escape from town, education, exercise and/or a sense of being close to nature.

The upper Lochy Valley and Short Burn are zoned Backcountry Walk-in, which is "characterised by a feeling of relative remoteness from populated areas. The highly natural setting is a valued part of the experience and may be associated with motivations of escape from town, education, exercise, and/or a sense of being close to nature. Although relatively close to visitor facility developments, access to these areas is only possible on foot and is often associated with tramping tracks or routes".

The uplands of the Lochy Valley, the Billy Creek and Long Burn catchments are located within the Remote Experience Zone. The opportunity is characterised by a sense of complete isolation from human interaction and activity. The naturalness of the setting is an important part of the experience. Outdoor survival skills and experience will be essential to minimise risk. A high degree of self-reliance will be necessary.

2.7.2 LEGAL ACCESS

Practical access to the pastoral lease is available only by boat or by air.

Legal access from adjoining properties is via marginal strip (eg, along the shoreline of Lake Wakatipu to Kingston township). The lower Lochy Valley is mostly freehold sections and legal roads through this subdivision provide access from the railway wharf reserve at Halfway Bay to the various parcels of pastoral lease land.

Marginal strips exist along the Lochy River and Long Burn. The riparian strip along the subdivided freehold land in the lower Lochy is legal road.

The entire length of the lake frontage at Halfway Bay is shown as railway wharf reserve (Crown land) subject to section 129 Land Act 1948. This may be an error as the reference should be the 1924 Land Act 1948 and section 129 of that Act creates marginal strips, not reserves. This land may well be marginal strip, but a status check is required to confirm this.

2.7.3 ACTIVITIES

PRESENT OPPORTUNITIES

- | | |
|-------------------|------------|
| - Tramping | - Climbing |
| - Fishing | - Hunting |
| - Mountain biking | |

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At present the growth and pattern of recreational use on Halfway Bay is limited in large part to restricted geographical access. Being effectively "landlocked", the most common means of access to the property is by either water or air. Foot access is more difficult and time consuming due to absence of good roading. Access can be gained by:

- boat across Lake Wakatipu to Halfway Bay wharf
- by air onto the Halfway Bay airstrip or heli landings onto any of a number of sites in the Lochy Valley
- foot via Kingston/Roberts Creek, Way Spur and Lambing Saddle into the Long Burn
- foot via the Von and Black Spur Creek
- foot via Walter Peak Station, the Afton Burn East Branch and Cascade Creek.

It should be noted that road access by 4x4 quad is also possible via the East Afton Burn/Cascade route, but entry is through Walter Peak Station, and is not a viable public option at present.

Facilities

Two huts were built on Halfway Bay by the New Zealand Forest Service to assist with animal control. Siberia hut was built in the 1960s and sits on the pastoral lease. This hut is currently used by both musterers and to a less amount by tramping parties. It does hold potential for both hunting and tramping parties. The Long Burn Hut is located on freehold owned by the lessee. This was built in 1967-68, is in excellent condition and 90% of use is by anglers fishing the Lochy River.

There are no other huts, tracks or bridges in which the department holds any maintenance or pecuniary interest.

Tramping

At present Halfway Bay Station offers a semi-wilderness opportunity to persons with good experience in backcountry travel. Restricted access and limited facilities has seen the property little utilised. It has been suggested that uses have increased since 1993 due probably to the inclusion of the area in Moirs Southern Guide book describing routes through the Mataura, Halfway Bay Station and Roberts Creek. Current figures are estimated at less than 20 people per year. Most tramping movement appears to be via Robert Creek into Long Gully. The area requires reasonable route finding skills, and has traditionally been the domain of tramping clubs on once a year organised trips.

Hunting

Current hunter numbers currently are low. Restricted access and lack of information have contributed to this. Halfway Bay has a small chamois population and limited numbers of red deer. Goats are found on the Home Faces of the Lochy, but these are controlled by DOC in annual helicopter culling operations. Chamois recreational hunting can offer high trophy potential. Up to 100 hunters per annum could utilise this area on an open permit system with entry and exit by heli access.

Climbing

Climbing opportunities are not well utilised at present. Difficult access to the area probably contributes to this. Climbing activity in the neighbouring Eyre Mountains Conservation Area is also modest, but climbs on Eyre, Jane and Helen Peaks are attempted.

Angling

The Lochy River is considered to be a premier recreational sports fishery of the region, with an international reputation for good rainbow and brown trout. The river was the first in New Zealand to have a catch-and-release policy from the Long Burn to the river's source. The river is broken into two parts for fisheries management purposes: upper, the gorge and above; and the lower from the gorge entrance to the lake confluence.

Lower tributaries like the Long Burn are major spawning grounds for lake run fish, and well patronised by anglers both guided and individuals who boat across the lake to Halfway Bay.

The upper river is considered to be amongst the country's finest backcountry fishing waters. Only 20 minutes flying from Queenstown, its proximity to the resort has placed it under intensive pressure. Eighty percent of the fishing occurs in the upper river as far as the Cascade confluence. Eighty percent of these anglers are non-New Zealand residents flown in, and fishing with a commercial guide.

CONCLUSIONS

The Eyre Mountains are likely to continue to experience a modest level of recreational use, except for angling on the Lochy, due to the relative difficulty of access. Backcountry adventure tramping opportunities will prevail in an area which allows relatively safe subalpine travel during summer through passes and alpine ridges from watershed to watershed.

Recreation usage has increased in recent years but probably no more than 50 persons per annum are moving through the Eyre Creek/Mataura area.

The area is best suited to the traditional New Zealand backcountry trampler/hunter who has a reasonable amount of route finding and backcountry skills.

Signposting the public access easement up the Robert Creek from Cainard Road could promote trips into the Long Burn.

The Eyre Mountains do not hold good snow cover. It is not anticipated that the area will therefore offer more than modest winter snow based activities.

Both horse trekking and mountain biking could occur if some form of road access was publicly available, eg. the East Afton/Cascade 4WD track.

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PART 3

OTHER RELEVANT MATTERS AND PLANS

3.1 CONSULTATION

The property was commented on by public interest groups at an early warning meeting on 3 December 1998. Key points raised were:

- Wakatipu lake faces are important visually and are actively regenerating to forest. This process should continue to be encouraged for landscape protection reasons.
- Public access from Kingston to Halfway Bay via the lake face cattle droving track should be provided for and developed.
- Lake faces to become conservation land due to their visual importance and regenerative capacity.
- Public access to the Lochy River, an internationally renowned fishery should be secured through tenure review.
- The remote experience recreational opportunity of the Eyre Mountains should be recognised and provided for.
- High inherent values present in the upper Billy Creek above Billy Hut and Long Burn above Siberia Hut justify land being retained for conservation purposes.
- Forested areas in lower Long Burn to become conservation land if significant inherent values warrant.
- Upper part of Robert Creek catchment should become conservation land.
- Access to the Lochy River via the legal roads through the freehold sections at Halfway Bay needs to be confirmed. There appears to be doubt about whether the farm road formation corresponds to the legal alignment.
- The jetty should remain public property.
- Railway wharf reserve (Crown land) should remain as a reserve but not necessarily under DOC control.

A written record of the above interests has been supplied by Mike Floate on behalf of Federated Mountain Clubs and Bruce Mason on behalf of Public Access New Zealand. FMC has also supplied a Preliminary Report on the Recreational and Related Significant Inherent Values of Halfway Bay Station. Copies of these written materials are attached.

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3.2 REGIONAL POLICY STATEMENTS

The property is located within Otago Region and Queenstown Lakes District Council boundaries except for a small area located in the head of Robert Creek which is within Southland Region and District Council areas.

3.2.1 OTAGO REGIONAL POLICY STATEMENT

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

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

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

It also includes the following policy in respect of landscapes and natural features:

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

3.2.2 SOUTHLAND REGIONAL POLICY STATEMENT

The Regional Policy Statement for Southland provides a framework for all of Southland's significant resource management issues. It does not contain rules. District plans shall not be inconsistent with the Regional Policy Statement. In respect of natural values the Regional Policy Statement includes the following objectives and policies:

Objectives

- To protect areas of significant indigenous vegetation and significant habitats of indigenous fauna within Southland where this will maintain and enhance biodiversity of indigenous ecosystems.

To maintain and enhance the biodiversity of indigenous species within the Southland Region.

Policy:

Identify and encourage the protection of areas of significant indigenous vegetation and significant habitats of indigenous fauna which maintain or enhance the biodiversity of indigenous ecosystems within Southland.

It also includes the following objectives and policies in respect of natural features and landscapes.

Objectives

- To protect outstanding natural features and landscapes of the region.
- To avoid remedy and mitigate adverse effects on ecosystems which contribute to the diversity of landscapes in the region.

Policies:

Identify and encourage the protection of outstanding natural features and landscapes within Southland.

Promote, and where appropriate provide for the protection of significant trees, areas of indigenous forests and scrublands, groups of trees, wetlands and tussocklands which contribute to the diversity of landscapes within the region.

3.3 DISTRICT PLANS (MATTERS OF NATIONAL IMPORTANCE)

3.3.1 QUEENSTOWN LAKES DISTRICT

The District which is currently subject to the amended Proposed Queenstown Lakes District Plan (1998). The 1995 version of the Proposed Plan was amended in 1998 to incorporate the Council's decision on submissions received and heard. The amended Proposed Plan is now the principal planning document in the Queenstown Lakes District except where provisions are subject to appeals lodged to the Environment Court. The Minister of Conservation has appealed provisions in respect of significant natural areas. Appeals are currently in the process of being heard or negotiated and will take at least another 12 months. The plan will not become fully operative until these appeals have been resolved. During this period the Transitional District Plan is also relevant.

Under the amended Proposed District Plan the entire property is zoned Rural General. The Rural General Zone includes the majority of the District's rural lands and is characterised by farming activities, diversification to activities such as viticulture and includes the vast majority of the District's natural areas.

Section 6(c) of the Resource Management Act 1991 requires the Council to recognise and provide for the following matters of national importance:

- (a) The preservation of the natural character of the coastal environment (including the coastal marine area), wetlands, and lakes and rivers and their margins, and the protection of them from inappropriate subdivision, use and development.
- (b) The protection of outstanding natural features and landscapes from inappropriate subdivision, use and development
- (c) The protection of significant areas of indigenous vegetation and significant habitats of indigenous fauna

The amended Proposed Queenstown Lakes District Plan includes the following policies:

- (i) To promote the long term protection of sites and areas with significant conservation values.

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- (ii) To encourage the protection of sites having indigenous plants or animals with significant nature conservation values
- (iii) To avoid any adverse effects of activities on the natural character of the District's environment and on indigenous ecosystems; by ensuring that opportunities are taken to promote the protection of indigenous ecosystems, including at the time of resource consents.
- (iv) Encouraging the protection of areas of significant indigenous vegetation and significant habitats of indigenous fauna.
- (v) To maintain or enhance the natural character and nature conservation values of the beds and margins of lakes, rivers and wetlands.
- (vi) To encourage and promote regeneration and reinstatement of indigenous ecosystems on the margins of lakes, rivers and wetlands.

The amended plan includes the following objective for landscapes:

- (i) Subdivision, use and development being undertaken in the District in a manner which avoids potential adverse effects on landscape values.

Only those significant natural areas with current formal protection have been identified as areas of significant natural value in the plan. The plan does not identify outstanding natural features and landscapes. For these reasons no such areas on Halfway Bay Station are recognised in the amended District Plan.

Controlled activities in the amended Proposed Plan for the Rural General Zone are buildings, retail sales, commercial recreation, mineral exploration and residential flats. Discretionary activities are residential units, commercial activities, visitor accommodation, structures and moorings, forestry activities, factory farming, mining activities, ski areas outside special ski area sub-zones and including breaches of site standards for significant indigenous vegetation, earthworks and forestry and shelterbelt planting. Non-complying activities include power generation facilities and commercial activities, factory farming and residential units that do not meet other activity categories. There are no rules protecting outstanding natural features and landscapes, clearance of indigenous vegetation in general and significant natural areas in the interim (ie until they have all been identified in the plan). These matters are all under appeal.

Due to these appeals the landscape and significant natural value provisions of the amended Proposed Plan are likely to be amended. The department has negotiated a settlement (not yet lodged with the Court) in respect of the identification of significant natural areas. Matters in respect of an indigenous vegetation clearance rule and interim rule protecting significant natural areas remain unresolved.

3.3.2 SOUTHLAND DISTRICT

The Resource Management Act 1991 requires territorial and regional authorities to take into account section 6 *Matters of National Importance* when exercising their functions, powers and duties under the Act.

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The Southland District Council has recently made their District Plan operative in part. However, the *Heritage* section of the plan, which addresses the principles of section 6 in the Resource Management Act 1991, including protection of significant habitats of indigenous fauna and areas of significant indigenous vegetation is still the subject of outstanding references by the Minister of Conservation and other parties. These outstanding references by the Minister of Conservation and other parties. These outstanding references were the result of the proposed plan having few rules to act as a trigger for protection of values of significance to the department in areas such as the area under review. The appeal process for the *Heritage* section has been in effect for over three years and is unlikely to be resolved in the near future. Until the references are resolved there are almost no rules that could act as a trigger for protection of areas of significant indigenous vegetation and significant habitats of indigenous fauna for this area. The exception is that a forestry plantation in excess of at least 100 hectares requires a landuse consent.

3.4 CONSERVATION MANAGEMENT STRATEGIES (CMS)

The property mostly is located within the Otago Conservancy except for the small area at the head of Robert Creek catchment which is located within Southland Conservancy.

Both Conservancy CMSs contain statements of relevance to the property.

3.4.1 OTAGO CONSERVANCY

The Eyre Mountains (Takerehaka) is identified as a Special Place within the Otago Conservancy CMS. Halfway Bay Station is located within the Special Place.

As a whole, the Eyre Mountains contain a wide range of natural and historic values from the alpine tops to the grassed valley floors. Scenic values are high and recreational opportunities are available in backcountry drive-in and walk-in and remote settings. Natural values are significant because the Eyre Mountains are a centre for endemism for both native plants and invertebrates. These mountains have an unusually diverse range of lizard species, several of them at the limits of their distribution. Kea, falcon and rock wren have populations here which have significance on account of their distribution.

That part of the Eyre Mountains in Southland Conservancy contains large areas of land administered by the department, with high nature conservation values, which have informally been proposed for conservation park status. These areas are immediately adjacent to Otago Conservancy and Otago has carried out goat control in adjoining catchments (with land occupiers' approval) to prevent infiltration into conservation areas.

Takerehaka area was traditionally used by Kai Tahu for the seasonal hunting of weka. There are said to be waahi tapu and waahi taoka in the area.

Relatively few people visit the Eyre Mountains, but many people enjoy their striking scenic attributes from the highways and settlements on the eastern side of Lake Wakatipu. In particular, parts of the Eyre Mountains visible from SH 6 between Queenstown and Kingston have not been affected by farm development. This is the major tourist route to Milford.

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Objective for Eyre Mountains (Takerehaka)

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

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

- Appropriate wild animal and plant pest control work will be carried out to protect natural resources in protected areas managed by the department in both Otago and Southland.
- Further survey of the Eyre Mountains will be carried out to check the distribution of rare, local and endemic plants, indigenous fish, invertebrates and other fauna.
- Research into the biology and conservation needs of *Mecodema chiltoni* will be encouraged.
- Information about natural resources that will assist in appropriate management being applied will continue to be collected.
- Negotiate a public walking opportunity along the shore of Lake Wakatipu through and beyond Te Kere Haka Scenic Reserve.
- Tenure review of pastoral leasehold properties will be used as appropriate to provide opportunities to negotiate protection of and access to areas with high natural and recreational values.
- Ongoing liaison will be maintained with Southland Conservancy to ensure complementary management of protected areas in the Eyre Mountains, and to support an extensive conservation park if initiated.
- Advocate landscape protection in particular for scenically important parts of the Eyre Mountains not affected by farm development.
- Promotion of the correct use and spelling of traditional place names.

Priorities for Eyre Mountains (Takerehaka)

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

3.4.2 SOUTHLAND CONSERVANCY

The Eyre Mountains are identified as a significant landscape unit in the Southland Conservancy CMS.

Ecological Values

The vegetation of this unit is dominated by tussock grasslands, with large areas of beech forest and alpine communities. Much of the natural character is intact, particularly the forest and higher altitude communities. There is a high degree of endemism of indigenous plant species, and a large number of threatened species which are reliant on tussock habitats. Halfway Bay hosts the threatened plant species *Celmisia thomsonii*, the endemic species *Hebe biggarii*, *Ranunculus scirithalis* and *Acahylla spedenii*. Threatened animal species include rock wren, kea and New Zealand falcon.

Ecological Objectives Relevant to Halfway Bay

- *To investigate options for a conservation park for the Eyre Mountains and adjoining land administered by the department and implement if feasible.*
- *To survey for new galaxiid species in the subalpine areas in the northeast of this unit.*
- *To monitor and/or inspect the population status of endemic and other threatened plant species.*

Recreation and Tourism

The Eyre Mountains are possibly the most under-utilised backcountry recreation area in Southland. They provide for extensive backcountry and remote recreation opportunities.

Public access rights are via an easement into the Mataura Valley.

There is considerable potential for the area as the forested and open valleys and open tops are attractive and the terrain is easily navigated.

The unit plays an important role in the spectrum of recreation opportunities available in Southland, particularly as it is easily accessible but remote, with low levels of facilities and use and can cater for those people desiring a more traditional style New Zealand backcountry recreation opportunity.

Opportunity Objective

- *To provide opportunities for visitors to explore readily accessible mountain lands with only basic facilities. An area utilised for low impact recreation by low numbers of self reliant parties.*

The following Implementation statements apply to meeting this objective:

- In order to protect the quiet nature of the area and to advance an atmosphere of remoteness, aircraft landings will only be allowed for management purposes.
- In order to maintain the current low level of use and remote opportunities provided in the Eyre Mountains, no concessions will be granted.

3.5 WATER CONSERVATION (KAWARAU) ORDER

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

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 PART 4

MAPS, etc

 4.1 ADDITIONAL INFORMATION

4.1.1 REFERENCES

- Allibone R M, 1996 : Ecology and Distribution of the Taieri River Galaxiids. Unpublished PhD Thesis, University of Otago
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4.1.2 ATTACHMENTS

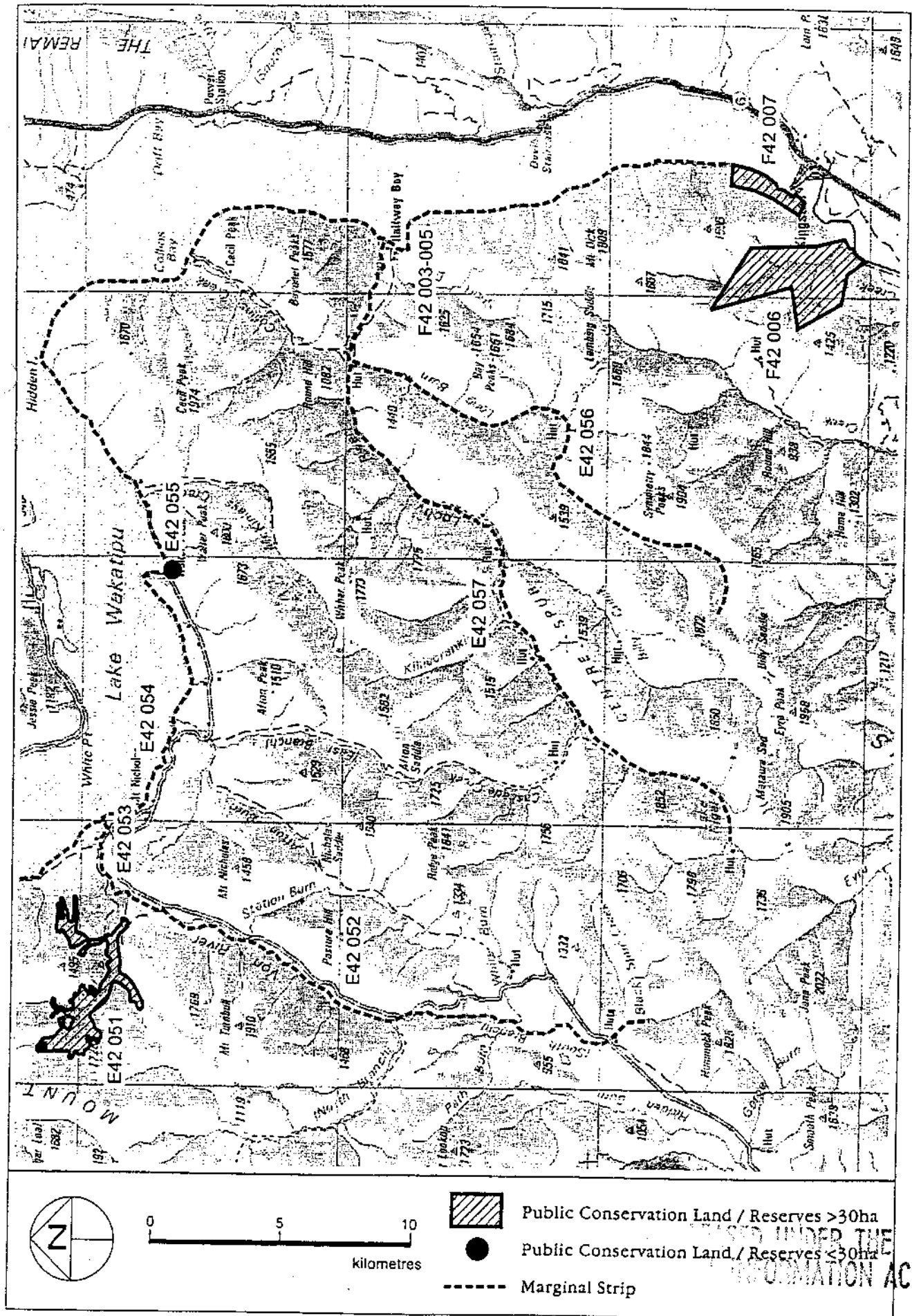
- i Department of Conservation (1998) Otago Conservancy Conservation Management Strategy. pp 368-373.
- ii Department of Conservation (1996) Southland Conservancy Revised Draft Mainland Southland/West Otago Conservation Management Strategy. pp 273-278.
- iii Floate M, Federated Mountain Clubs. Notes on NGOs' Early Warning Meeting, December 1998.
- iv Floate M, Federated Mountain Clubs. Preliminary Report on Recreational and Related Significant Inherent Values, Halfway Bay Station, April 1999.
- v Mason B, Public Access New Zealand. Notes on NGOs' Early Warning Meeting December 1998.

4.2 ILLUSTRATIVE MAPS

- 4.2.1 Topo/Cadastral
- 4.2.2 Values – Landscape/Historic
- 4.2.3 Values – Ecological

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Map 5-31 Eyre Mountains



10.31 EYRE MOUNTAINS (TAKEREHAKA)

CONS. UNIT NO.	NAME	STATUS	AREA
F 42 007	Te Kere Haka	Scenic Reserve	195.91 ha
F 42 006	Glen Alien	Scenic Reserve	998.84 ha
E 42 055	Walter Peak-Beach Bay	Recreation Reserve	9.81 ha
F 42 003-5 / E42 054	Lake Wakatipu	Marginal Strip	100.00 ha
E 42 057	Lochy River	Marginal Strip	115.00 ha
E 42 056	Long Burn	Marginal Strip	40.00 ha
E 42 051	Mt Nicholas	Conservation Area	627.50 ha
E 42 052	Von River	Marginal Strip	110.00 ha
E 42 053	Hut Burn	Marginal Strip	5.00 ha

10.31.1 *Ecological District*

Eyre

10.31.2 *Local Authority*

Queenstown Lakes District Council

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10.31.3 *Land Administered by DOC*

The northern part of the Eyre Mountains is within Otago Conservancy. In this area only two forested scenic reserves, a beech forest conservation area in the lower Von catchment, a small recreation reserve and several marginal strips are the responsibility of the Department of Conservation. Much larger blocks of the Eyre Mountains are the responsibility of the department in Southland Conservancy, adjoining the area covered by this CMS.

10.31.4 *Other Land*

Pastoral leasehold land covers all of the remaining Eyre Mountains area, but large parts of the rugged mountain lands are not suitable for grazing. The economics of some of the properties increasingly involve aspects of tourism or enjoyment of a secluded lifestyle in magnificent surroundings. Some properties have entered the tenure review programme.

10.31.5 *Description*

The majority of the Eyre Mountains is steep mountain land with several peaks over 1,900 metres, and beech forested valleys with some open tussock grassland slopes.

Otago schist is the basement rock but here it does not form broad block mountain ranges. Instead, the rugged crests which stood above the eroding glaciers during glaciation comprise bare rock and fellfield. Valleys have the smooth sides and relatively flat floor of typical U shaped glaciated valleys. Vegetation consists of sparsely vegetated fellfield, dwarfed herbfield and

cushion plants with snow tussock grassland at lower altitude. Varying amounts of shrubland and wetland are found above the upper limit of beech forest. Alpine tarns and steep streams provide habitat for aquatic organisms.

10.31.6 Values

Te Kere Haka Scenic Reserve is important as a steep rocky broadleaved forest containing refugia for rare palatable plants such as the cress *Ischnocarpus novae-zelandiae*, as well as an assortment of native shrubs, ferns and forest tree species including southern rata, matai, the only tree fern (*Dicksonia squarrosa*) so far seen in the Wakatipu Basin and the rare *Olearia fragrantissima*. Tracks within it provide recreation for fit walkers direct from the township of Kingston and rewarding views are obtained from the top of the climb. Three species of beech are found here; red, silver and mountain. The reserve is important for its diversity of plant species.

In contrast the Glen Allen Scenic Reserve protects a complete ecosystem at the base of the Eyre Mountains. Of importance is a sequence of vegetation from the base of Mount Dick at 365 metres through a mosaic of three beech forest species, subalpine shrubland and herbfield/grassland to 1,220 metres. A key conservation value present is a large carabid beetle *Mecodema chiltoni* that is local in occurrence but appears to have a stronghold in the many beech forests flanking the Eyre Mountains.



Mecodema chiltoni.

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As a whole, the Eyre Mountains contain a wide range of natural and historic values from the alpine tops to the grassed valley floors. Scenic values are high and recreational opportunities are available in back country drive-in and walk-in, and remote settings if permission is obtained. Natural values are significant because the Eyre Mountains are a centre of endemism for both native plants and invertebrates. The rare mountain daisy, *Celmisia thomsonii* and the blue cushion speargrass *Aciphylla spedenii* are both endemic species found in the alpine rocklands of the Longburn and northern Eyre Mountains. These mountains have an unusually diverse range of lizard species, several of them at the limits of their distribution. Kea, falcon and rock wren have populations here which have significance on account of their distribution.

The part of the Eyre Mountains in Southland Conservancy contains large areas of land administered by the department, with high nature conservation values, which have been informally proposed for conservation park status. These areas are immediately adjacent to Otago Conservancy and Otago has carried out goat control in adjoining catchments (with land occupiers' approval) to prevent infiltration into conservation areas.

The Te Kere Haka area was traditionally used by Kai Tahu for the seasonal hunting of weka. There are said to be waahi tapu and waahi taoka in the area.

The Lochy is an important "wilderness" fishery particularly popular with overseas anglers who are generally taken to the river by professional fishing guides.

Although less remote, the Von also has value as a wilderness trout fishery with about one-third of its anglers brought in by professional guides.

The draft Water Conservation Order for the Kawarau River and its tributaries found the mainstems of both the Lochy and the Von "Outstanding" for characteristics of their "fishery; recreational purposes, in particular fishing".

The Walter Peak Recreation Reserve is small and infested with broom. It contains some notable specimen exotic trees. It is used infrequently, mainly by boaties looking for a picnic spot in the sheltered cove south of Walter Peak Station, and receives little maintenance.

Relatively few people visit the Eyre Mountains, but many people enjoy their striking scenic attributes from the highways and settlements on the eastern side of Lake Wakatipu. In particular, parts of the Eyre Mountains visible from SH 6 between Queenstown and Kingston have not been affected by farm development. This is the major tourist route to Milford.

10.31.7 *Management Issues*

- Management of the small existing reserves is relatively straightforward but could be enhanced by acquisition of adjacent alpine areas.
- Wild animal control (eg, goats, possum, chamois and thar) and wilding conifers.

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Wilding conifers spreading on Cecil Peak Station, beech forest remnant at left.

- Plant pest control along forest and lake fringes.
- Survey, monitoring and research of trends in biological values with priority for *Mecodema chiltoni* populations.
- Improved public access and signposting to Glen Allen Scenic Reserve.
- Landscape protection in the Eyre Mountains, particularly of scenically important areas not currently affected by farm development.
- Lakeside walkway from Te Kere Haka Scenic Reserve.
- Improved fencing of Glen Allen Scenic Reserve.
- Whether or not to retain the Walter Peak Recreation Reserve.
- Coordination of Eyre Mountains activity with Southland Conservancy.

Objective for Eyre Mountains (Takerehaka)

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

Implementation

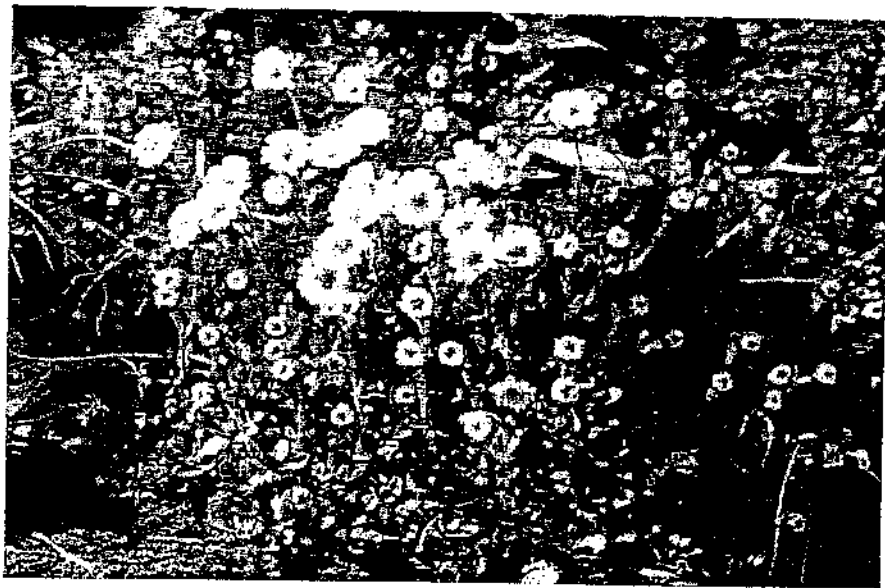
- (a) Appropriate wild animal and plant pest control work will be carried out to protect natural resources in protected areas managed by the department in both Otago and Southland.
- (b) Further survey of the Eyre Mountains will be carried out to check the distribution of rare, local and endemic plants, indigenous fish, invertebrates and other fauna.
- (c) Research into the biology and conservation needs of *Mecodema chiltoni* will be encouraged.
- (d) Information about natural resources that will assist in appropriate management being applied will continue to be collected.
- (e) Negotiate a public walking opportunity along the shore of Lake Wakatipu through and beyond Te Kere Haka Scenic Reserve and improve public access provided to Glen Allen Scenic Reserve including signposting and track development or route marking.
- (f) The cooperation of adjacent farmer will be sought to limit stock access to parts of Glen Allen Scenic Reserve that is impractical to fence.
- (g) Tenure review of pastoral leasehold properties will be used as appropriate to provide opportunities to negotiate protection of and access to areas with high natural and recreational values.
- (h) Ongoing liaison will be maintained with Southland Conservancy to ensure complementary management of protected areas in Eyre Mountains, and support an extensive conservation park proposal if initiated.
- (i) To rationalise the Walter Peak Recreation Reserve, and dispose of the surplus.

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- (j) Advocate landscape protection in particular for scenically important parts of the Eyre Mountains not affected by farm development.
- (k) Promotion of the correct use and spelling of traditional place names.
- (l) When informed of the nature and location of waahi taoka and waahi tapu on land administered by the department, consult with Kai Tahu about the appropriate management of that site.
- (m) The protection of significant natural and historic resources will be advocated through Resource Management Act and other statutory processes.

Priorities for Eyre Mountains (Takerebaka)

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



Celmisia thompsonii, near Billy Saddle.

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6.18 Eyre

Physical Description

This landscape unit is centred on the steep and dissected Eyre Mountains. The altitude climbs from approximately 600m in the narrow valleys to 2050m on Jane Peak. There are both natural screes and man-made erodible areas with ultramafic soils found in West Dome. The climate is cool temperate, with a rainfall of 800-2400mm and snow may lie for several weeks above 1000m.

The vegetation of this unit is dominated by tussock grasslands, with large areas of beech forest and alpine communities. Much of the natural character is still intact, particularly the forest and higher altitude communities. There is a high degree of endemism, meaning the existence of species in this unit which are found nowhere else in New Zealand.

Generally the valley floors, lowlands and gentle slopes have been modified by pastoral use. Some extensive areas of red tussock remain around West Dome and the Oreti Valley.

There are extensive forest areas in the south and forest remnants further to the north. This forest is mainly mountain beech. There are shrublands scattered throughout the unit. Some of these shrublands represent a successional stage to beech forest, if they are not burnt.

This unit is part of the Eyre Ecological District.

Areas Managed By The Department

A little under half of this landscape unit comprises lands administered by the Department. Several of the areas contain intact sequences of vegetation through a variety of ecosystems. The largest protected area is Eyre Forest Conservation Area. Other significant conservation areas include the upper Eyre Creek, land at the head of the Mataura catchment, West Dome, south-western Eyre Mountains and Ashton Flats.

At present a large area of unallocated Crown land is in the process of being transferred to the Department. It includes the unshaded land between the two major conservation areas identified on the map. The area contains significant natural values, and will enable a more holistic management regime for the Eyre Mountains to be implemented.

Ecological Management

Ecological Values

The Eyre Mountains are very important and contain a number of features special to this unit. There are several local endemic species including plants *Brachyscome* "Westdome", *Carex uncifolia*, *Celmisia thomsonii*, *Hebe biggarii*, *Ranunculus scritchalis*, *Aciphylla spedeni*, *Myosotis* "Mossburn", *Celmisia philocremna*, and

C. visia spedeni. The vegetation represents a transition between wet Fiordland and dry Central Otago.

Around Eyre Creek and the upper Mataura River there are extensive and diverse alpine communities and large areas of snow tussock grassland. Eyre Creek has significant natural scree communities and a large diversity of shrublands. Apart from the endemic plants there are a number of other threatened plant species which are reliant on alpine conditions. These include *Celmisia bookeri*, *Cheesemaniania wallii*, *Epilobium purpuratum*, *Hebe dilatata*, *Pimelea poppelwellii*, *Ranunculus haastii* subsp *pilliferus* and *Senecio dunedinensis*. Intact altitudinal sequences are evident in Eyre Forest, Eyre Creek and the upper Mataura River valley. The Eyre Forest is significant in that it contains large tracts of unmodified indigenous forest.

This unit contains a large number of threatened species many of which are reliant on tussock habitats. Some not mentioned include plants *Uncinia purpurata*, *Ourisia spatulata*, *Myosotis "glauca"*, and *Deschampsia caespitosa*, the green-backed skink and the snail *Powellipbanta spedeni spedeni*. The only population of rock wren known to exist outside the Southern Alps is found in this unit. Yellowheads and the mistletoe *Alepis flavida* are found in beech forest, other bird species such as NZ falcon, NZ pigeon, kea, banded dotterel and yellow-crowned parakeet, and the mistletoe *Ileostylus micranthus*, are found in a number of habitats. The large beetle *Mecodema chiltoni* has been found under dead trees in the Irthing Valley. The priority A threatened species *Olearia bectori* is found in primary shrubland off lands administered by the Department in this unit.

At West Dome there are large areas of red tussock and ultramafic soils which contain plant species restricted to these types of soils.

Ecological Issues

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An investigation of conservation park status for the Eyre Mountains has been proposed. There are a number of separate pieces of land in the Eyre Mountains that are all administered as conservation areas. Managing this area as one unit will help ensure integrated management. The special features such as the high level of endemism and ultramafic rocks, would be given more recognition.

Other smaller protected areas in the Eyre Mountains fall into the Otago CMS area, but these could be incorporated into the Conservation Park. Management co-ordination is necessary, particularly for pest control.

Seasonal grazing still occurs in the valley floor of Eyre Creek in the Eyre Valley. Monitoring is undertaken to assess the effects of exotic grasses in the tussock grasslands. Burning of tussock and oversowing occurs outside of lands administered by the Department. Current evidence suggests that limited grazing may be necessary in some lowland areas to control the spread of exotic grasses. In the higher areas it was determined that grazing was not necessary to control exotic grasses and was in fact having a detrimental effect on the tussock. Grazing of these areas has ceased.

At Mount Bee, exotic tree species including *Pinus contorta* were planted for land stabilisation on natural scree communities. Some of the species planted have the ability to spread into indigenous habitats. It can be argued that these trees were not necessary

for station as the scree slopes are a natural feature of this unit. It is generally agreed that these trees should be removed.

The University of Otago has been investigating new galaxiid species including those from the Taieri river catchment. It is suspected that they will be found in some areas adjoining the Otago CMS area. These areas have been identified as a priority for survey. This includes the sub-alpine areas of the north eastern regions of this unit.

Generally, the Eyre Mountains are relatively weed free, though control is undertaken in some areas. At West Dome control of gorse and broom is undertaken, and at Mt. Bee control of *Pinus mugo* and broom is undertaken.

Agricultural development and burning of tall tussock grasslands poses the greatest threat to *Powelliphanta spedeni spedeni*. There is a need to survey areas to ascertain the location of these snails and to assess their population status.

Ecological Objectives

1. To continue monitoring the effects of grazing on lowland tussock systems on lands administered by the Department. Should continued degradation occur cease all grazing.
2. To investigate options for a Conservation Park for the Eyre Mountains and adjoining land administered by the Department and implement if feasible.
3. To survey for new galaxiid species in the sub-alpine areas in the north east of this unit.
4. To survey habitats and populations of the snail *Powelliphanta spedeni spedeni*.
5. To remove the exotic trees at Mount Bee.
6. To monitor and/or inspect the population status of endemic and other threatened plant species.

Resource and Estate Use

Currently three grazing concessions have been granted in this unit. One is along the Eyre Creek, and the other two are located in the Oreti Forest (refer 5.6).

One telecommunication facility is located on land administered by the Department at West Dome. This is unlicensed (refer 5.11).

Historic Conservation

The Beech Hut in the Upper Mataura Valley is the only actively managed site on lands administered by the Department in this landscape unit. It dates from at least 1913 and was built as a shelter for musterers from Fairlight and Mount Nicholas Stations. This use has continued until recently. It is one of the oldest mustering huts in Southland.

Proposed management of this site is outlined in Part 3.

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There are no other known protected sites on lands administered by the Department in this unit.

Recreation and Tourism

Visitor Use

The Eyre Mountains are possibly the most under-utilised backcountry recreation area in Southland. Although there are several huts and a system of marked routes, largely as a result of earlier wild animal control operations, few hunters and trampers make use of the area. Some huts receive as few as 4 visitors per year. Low numbers of red deer, chamois and wild pig are found in the area.

Most major catchments have legal access; elsewhere, access is over private roads or runhold land. There is some local use of the periphery for 4WD. Mount Bee hut can be reached by off-road vehicles and has potential for access by mountain bike.

A picnic and camping area on a riverside clearing in the Lower Irthing receives use mainly from local people.

Nearby West Dome provides a marked contrast to the Eyre Mountains. A road runs around West Dome. Some use has been made of the area for trail riding, though on the upper sections of the Dome there have been problems with use in fragile areas off the road. Off-road use will be actively discouraged.

Recreation Facilities

Eight marked routes are currently maintained in this unit.

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4WD Tracks	Marked Routes
Five Rivers Station - Cromel Hut Irthing Rd - Mount Bee Ridge	Cromel Hut - Acton Junction Acton Hut - Island Hut Cromel Branch Hut - Cromel Bivvy Irthing Valley Track Mount Bee - Irthing Bivvy Acton Hut - Cromel Junction Mount Bee - Cromel Branch Hut Cromel Hut - Acton Hut

Fourteen huts and shelters administered by the Department are scattered throughout the Eyre Mountains with one or more in every catchment, some within a few hours of road ends. Other tracks and huts will be signposted as not being maintained. Offers by local clubs or groups to maintain these facilities will be considered. Huts not being maintained may be removed or relocated to other areas only after public consultation.

Category 4 (Basic) Huts	Bivvies / Shelters
Cromel Hut Mount Bee Huts Complex	Irthing Bivvy Mansion Bivvy

Cromel Branch Hut	Cromel Bivvy
Oreti Hut	Lincoln Bivvy
Shepherds Creek Hut	Windley Bivvy
Island Hut	
Windley Hut	
Beech Hut	
Ashton Burn Hut	

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A small picnic and camping area is located on a riverside clearing in the Lower Irthing. This is maintained by the Lumsden Lions Club in agreement with the Department. Access is by an all weather vehicle track off Irthing Road.

Recreation Opportunities

The Eyre Mountains provide for extensive backcountry and remote recreation opportunities. The area is easy to navigate and allows good opportunities for inter-valley and open tops walking and camping. Roads through bordering exotic forests enable good all-weather access to the Windley and Acton Catchments.

As the Eyre Mountains are dry by Southland standards the opportunity to develop a good mountain bike track may exist, though currently the best opportunity is along the Mount Bee access and in bordering production forests. Current access rights are via easements in the Cromel, Acton, Eyre Creek and Mataura Valleys and on West Dome Road.

There is considerable potential for the area as the forested and open valleys and open tops are attractive and the terrain is easily navigated.

Along with the Takitimu and Snowdon Mountain areas the Eyre Mountains have sometimes been suggested as areas to promote for absorbing some of the pressure on high use areas in Fiordland and Mount Aspiring National Parks. This fails to acknowledge the important role they play in the spectrum of recreation opportunities available, particularly their importance as easily accessible but remote areas, with low level of facilities and use, and their role in catering for those desiring a more traditional style New Zealand backcountry recreation opportunity. In the Eyre Mountains an important opportunity exists to maintain easily accessible lowland areas relatively free of marked routes. It is for these reasons that concessions will not be allowed in this unit.

The Southland Fish and Game Council identifies the upper reaches of the Mataura River as having good fishing opportunities and high game bird numbers.

Opportunity Objectives

1. To provide opportunities for visitors to explore readily accessible mountain lands with only basic facilities. An area utilised for low impact recreation by low numbers of self reliant parties.
2. To provide opportunities for recreational activities involving the use of vehicles (including mountain bikes), while avoiding possible conflicts with other recreation opportunities available in the area.

- 7 provide an informal picnicking and camping site beside the Irthing stream.

Implementation

1. The more remote huts were once interconnected by well maintained tracks that have generally become overgrown with the end of wild animal control operations. These huts are rarely visited and the potential high cost of their upkeep is difficult to justify. Therefore the Department will put its resources into maintaining five tracks as marked routes, with huts provided for overnight accommodation. They are those in the Acton, Cromel and Irthing Valleys. Beech Hut in the Mataura Catchment will be maintained for its historic value and the Shepherds Creek Hut shall be maintained because it is an easily accessible location. The other seven huts and bivvies will receive only minimal maintenance. Assistance will be sought from user groups to keep these facilities in good repair. Priorities for resourcing will be reviewed if there is a marked increase in use. No increase in track or hut facilities will be allowed.

The Southland Tramping Club has assisted with the maintenance of routes in this area especially the marked route from the Acton to Island Hut.

2. The Windley Burn Catchment will be provided as an area free of marked routes.
3. Mountain biking will be allowed on all formed roads. Specifically, access to Mt. Beech Hut, along Mt. Beech ridge and around West Dome by mountain bikes will be allowed.
4. In order to protect the quiet nature of the area and to advance an atmosphere of remoteness aircraft landings will only be allowed for management purposes. This is in contrast to most other areas managed by the Department around the Wakatipu region to where helicopter access is allowed.
5. Horse riding will be allowed in the Eyre Creek and Upper Mataura Valley only. No other areas may be used. Stock holding paddocks at Shepherd Creek Hut should be used.
6. In order to maintain the current low level of use and remote opportunities provided in the Eyre Mountains, no concessions will be granted.

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LAND ADMINISTERED BY THE DEPARTMENT - EYRE

CONSERVATION UNIT NUMBER	LEGISLATIVE CODE	NAME	PRIVILEGE	AREA (ha)
CONSERVATION ACT 1987, SECTION 62				
E420001	CA62	EYRE MOUNTAINS (CAINARD)		7953.7
E430002	CA62	EYRE MTNS (EYRE FOREST)		30
E430003	CA62	EYRE MTNS (EYRE CREEK)	Grazing (part)	11878
E430004	CA62	EYRE MTNS (ORETI FOREST)	Grazing	488
E430005	CA62	EYRE MTNS (EYRE FOREST)		24373
E430006	CA62	EYRE FOREST (COAL HILL)		2375
E430007	CA62	EYRE MTNS (WEST DOME FOREST)		3643.5
E430010	CA62	JOLLIES HILL PASS		0.8
E430064	CA62	EYRE MTNS (ORETI FOREST)	Grazing	480
E430065	CA62	MATAURA VALLEY		654
ACTON RESERVE RESERVES ACT 1977				
E44	RARR	ACTON STREAM REC RESERVE		5.7429
MISCELLANEOUS RESERVES, RESERVES ACT 1977				
E430014	RALP	REFUSE TIP		0.2024
MARGINAL STRIP, CONSERVATION ACT 1987				
E430032		MATAURA RIVER, THOMSON CREEK		
E430022, 45		MATAURA RIVER		
E430044, 46, 48		MATAURA RIVER		
F430011, 12		MATAURA RIVER		
E430034		PIG CREEK/MATAURA		
E430038		QUOICH STREAM		
E430035, 36		EYRE CREEK		
E430067		EYRE CREEK		
E430031		IRTHING STREAM		
E430030		ACTON STREAM		
E440057		ACTON STREAM		
E430025, 26		WINDLEY RIVER		
E430024		ORETI RIVER		
38		ORETI RIVER		
E43002		ROBERT CREEK		
E430033		ROBERT CREEK		
E430034		PIG CREEK/MATAURA		

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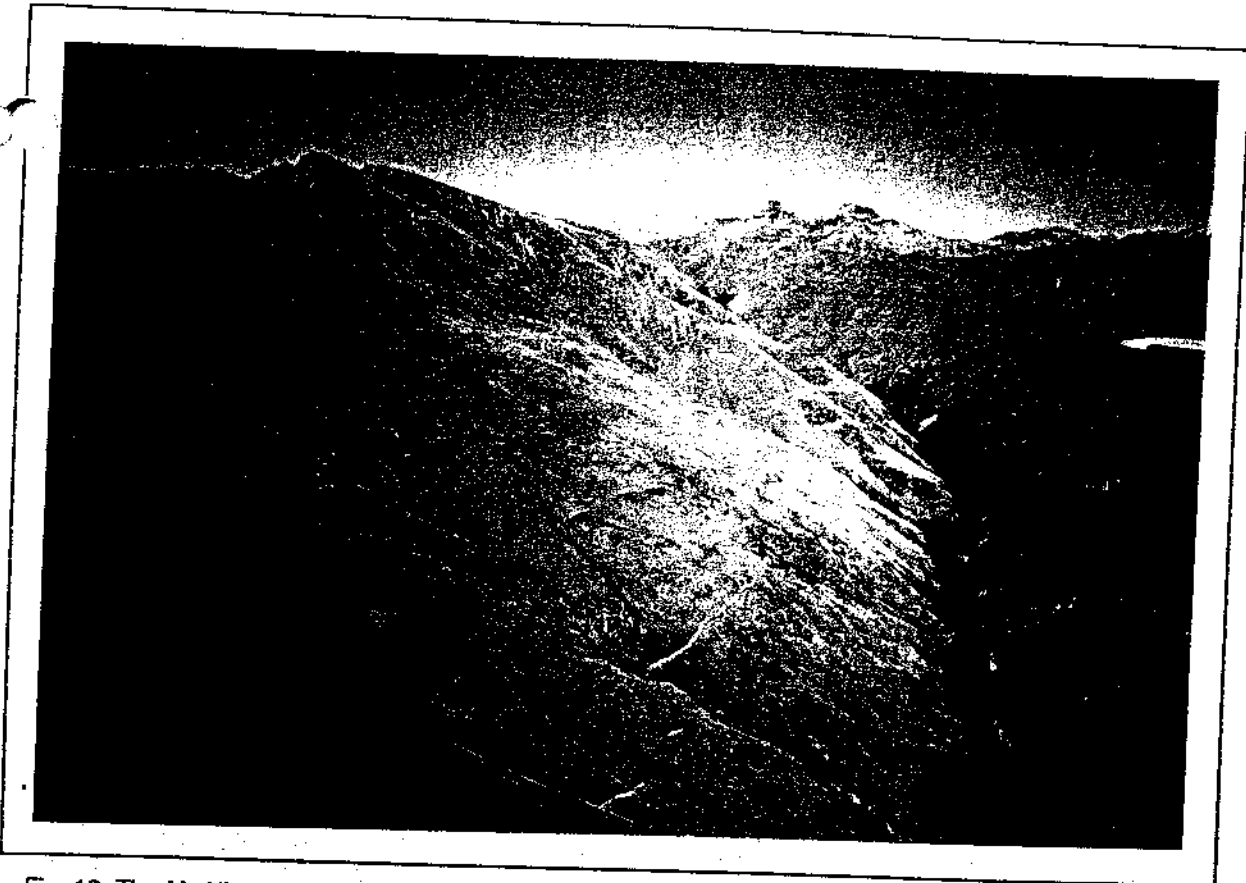


Fig. 13 The McAlister faces, on the sunny side of the lower part of the Long Burn, are one of the few areas on the property which appear to be capable of supporting ecologically sustainable pastoral use, at least up to about 1000m. The ridge on the left separates the Long Burn from the Short Burn.



Fig. 14 There are corresponding sunny faces on the true right of the Short Burn valley. Good beech forest can be seen on the left of the valley in this view looking down to the junction with the Lochy River. Each of the main tributary valleys displays its own individual landscape characteristics.

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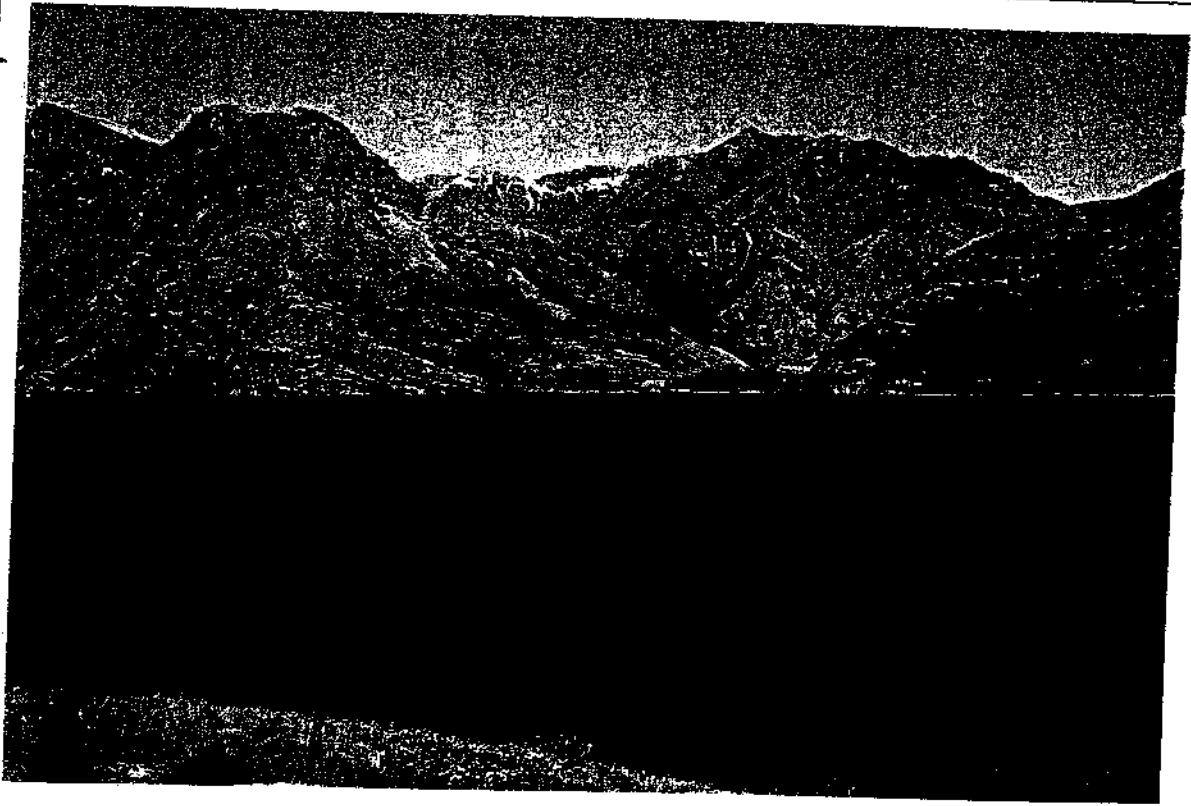
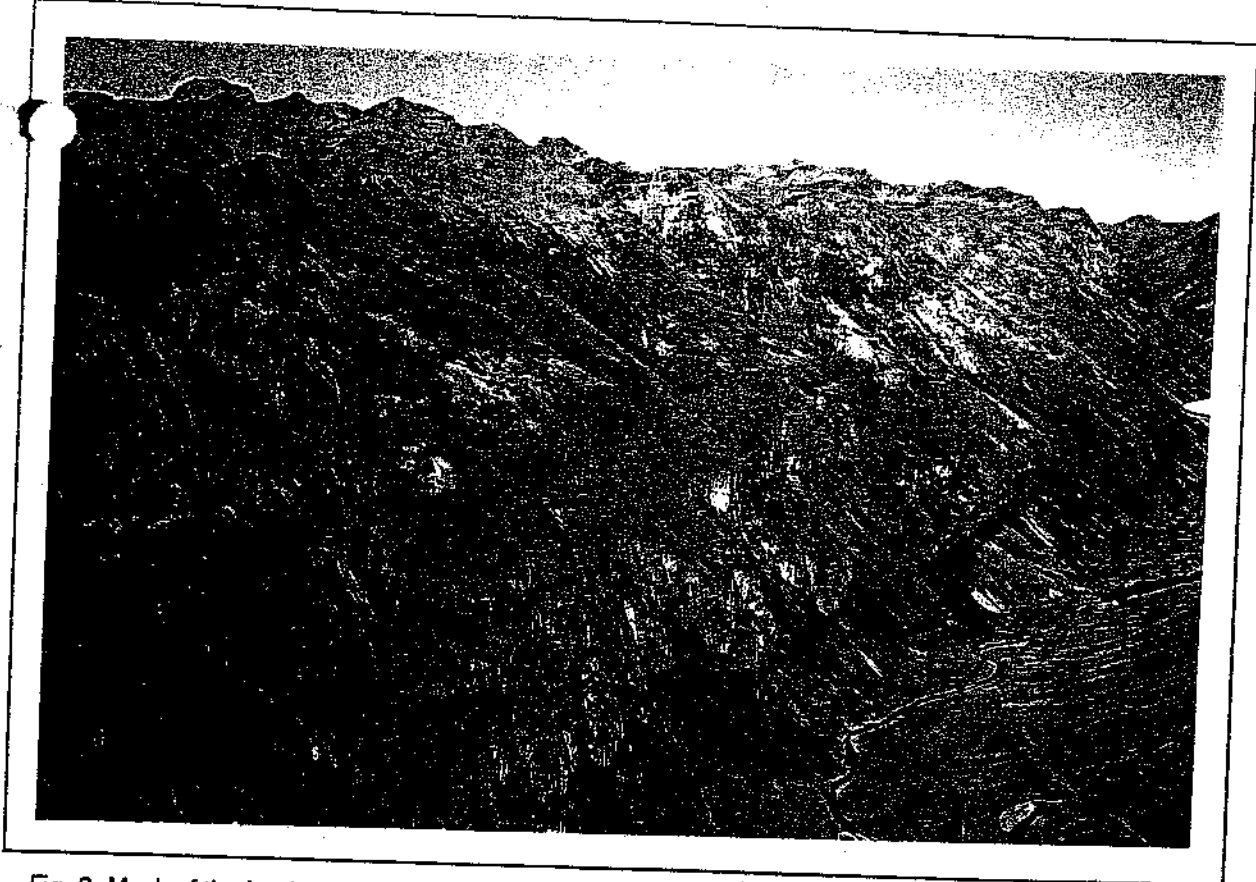


Fig. 1 Halfway Bay Station extends from its frontage on Lake Wakalipu for some 30km up the Lochy River valley. It is remote and rugged with the only practicable access by barge across the lake. There is only a small area of land which can support ecologically sustainable pastoral use, but a very large area with outstanding intrinsic natural and landscape values.



Fig. 2 Halfway Bay Station rises from about 300m at the lake to almost 2000m on Eyre Peak (left of centre) some 25km as the crow flies from the homestead. The back boundary runs along Centre Spur (the high ground on the left) while Lake Nigel and the upper Lochy is on Walter Peak Station.

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Fig. 3 Much of the land on Halfway Bay is high, rugged and very steep. This view shows the Lochy River valley near St Mary's Hut (at 600m), the ridge of Centre Spur (at about 1500m), and the Eyre Mountains beyond the crest of the spur.



Fig. 4 The Lochy River is an internationally renowned wilderness fishery. The river forms the western boundary of Halfway Bay. This section of the valley includes St Mary's Hut (on the terrace by the tongue of bush, on Walter Peak Station), and is the limit of the area which is suitable for freeholding.

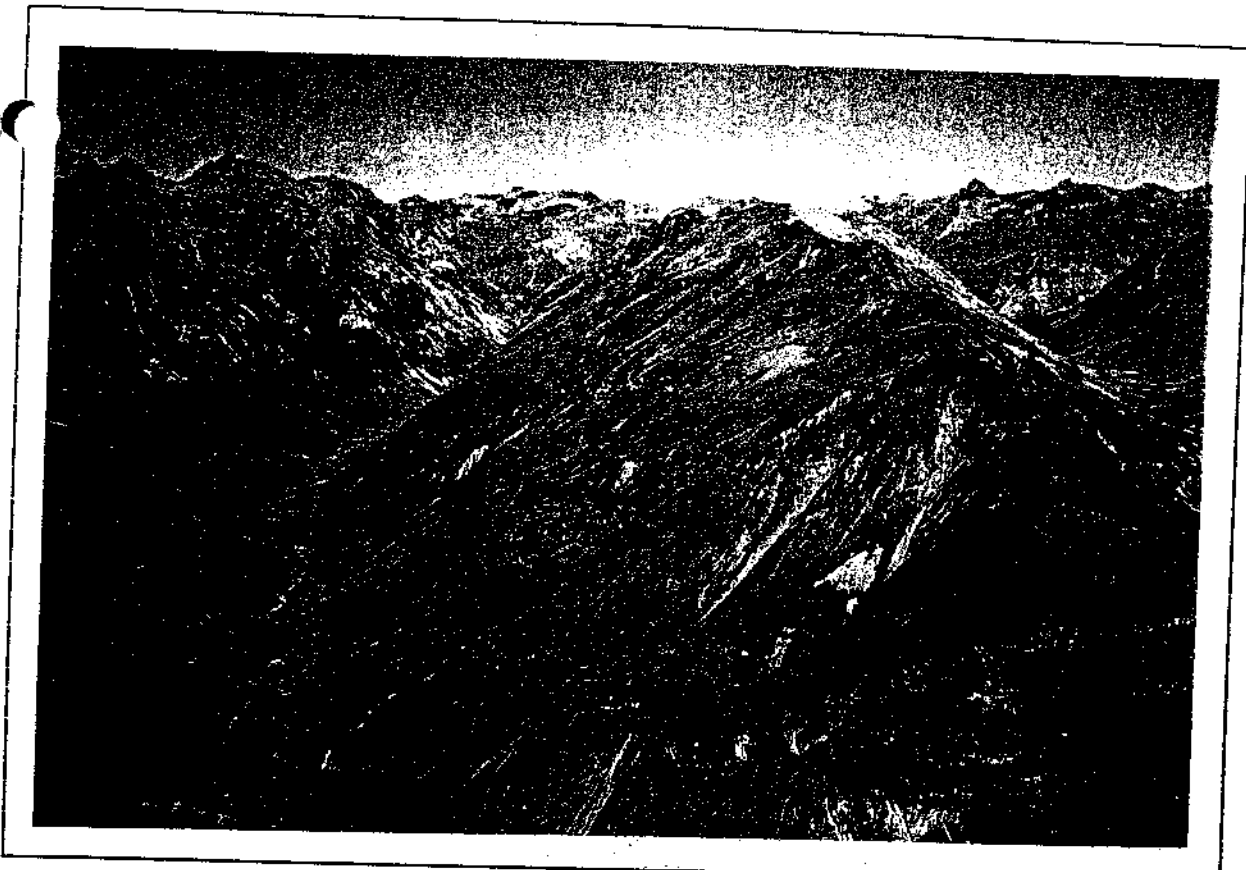


Fig. 5 Centre Spur, the dominant feature just right of centre in this view, separates the valleys of the Lochy River (r) and Billy Creek (l). It is likely to offer great ridge travel, but with a steep drop-off at the end. Billy Creek occupies a classic glaciated valley.

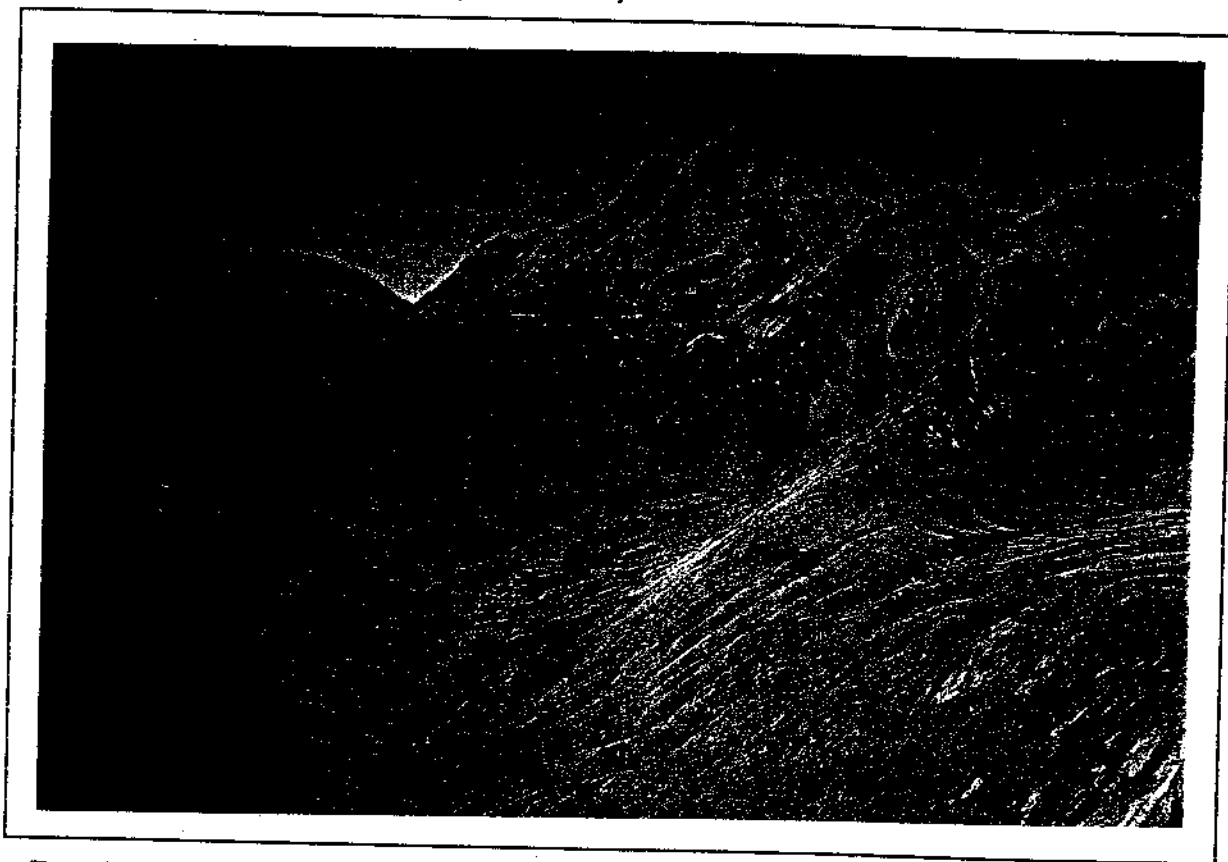


Fig. 6 The major peaks of the Eyre Mountains, and the boundary of the Eyre Conservation Area dominate the head of Billy Creek. This pristine environment displays many glacial features including the hanging valley on the right, and the whole landscape is of outstanding intrinsic value for recreation and conservation.

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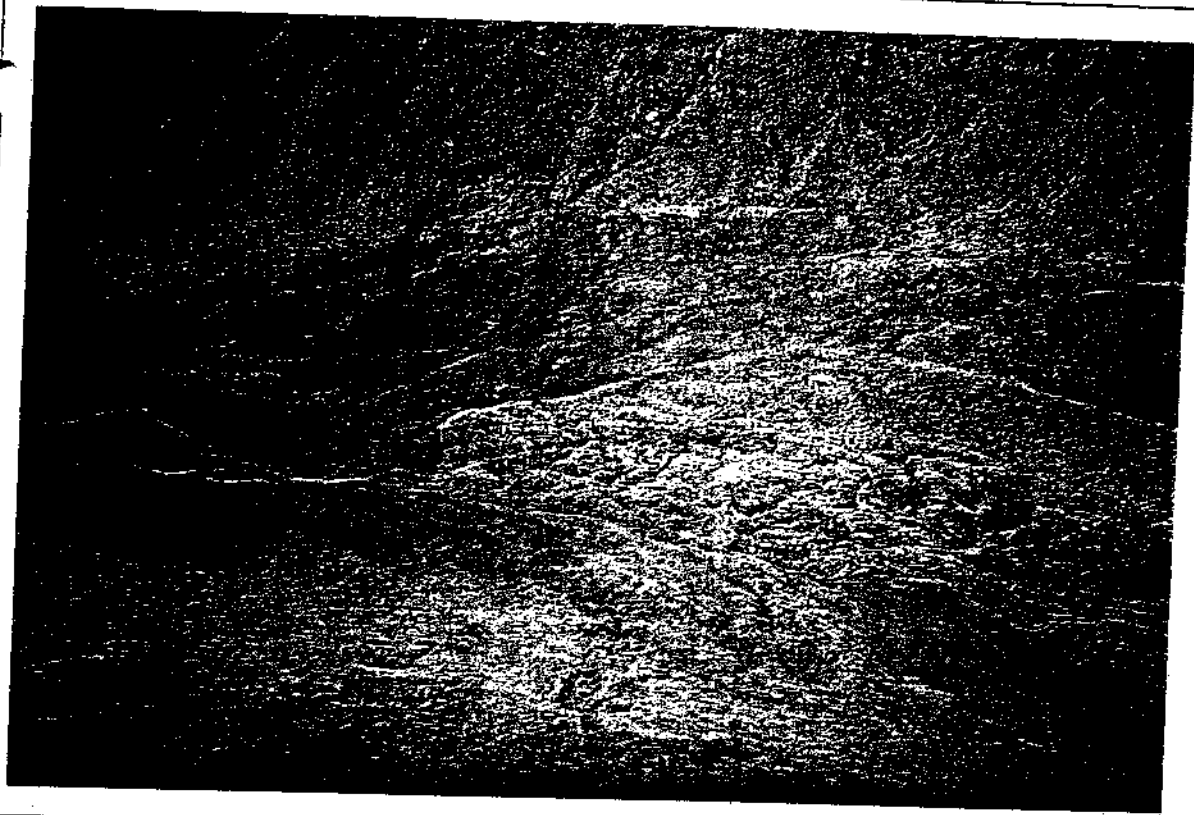


Fig. 7. The valley floor at the head of Billy Creek contains many features of natural and scenic interest including moraine and solifluction deposits, and wetland and scree plant communities.

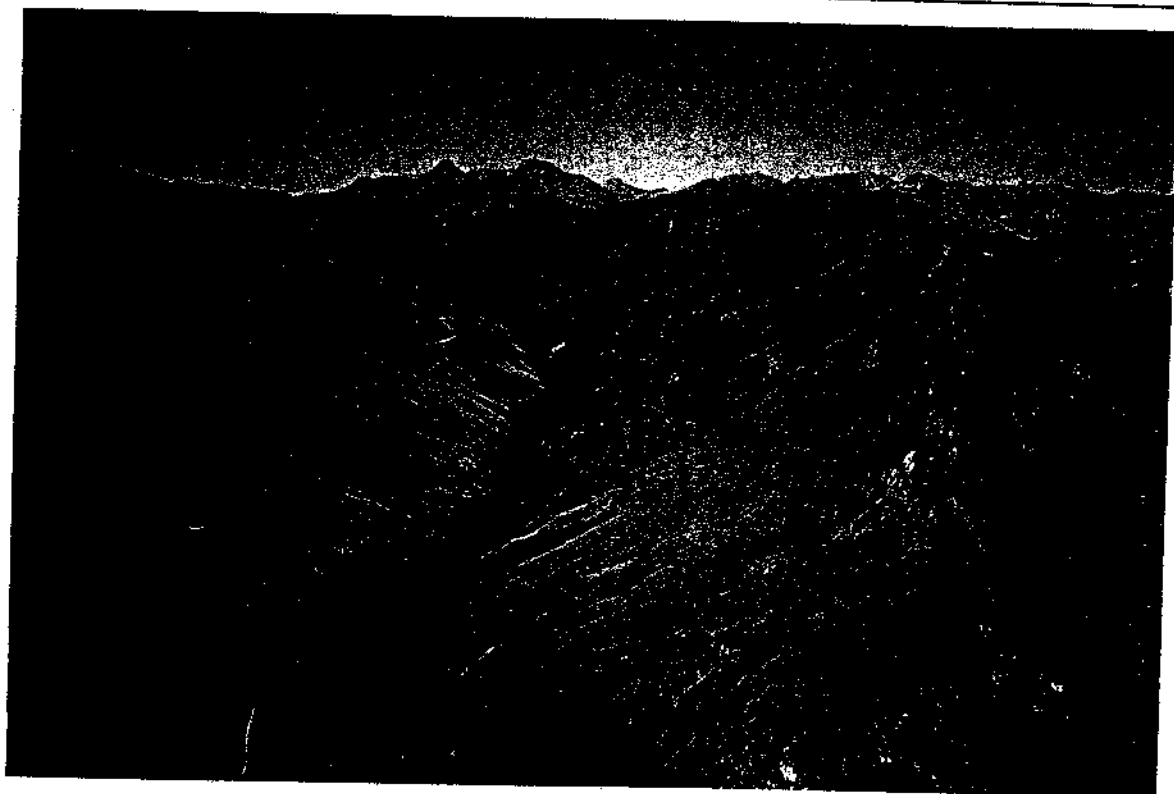


Fig. 8 As its name implies, the Long Burn is the longest tributary of the Lochy but appears foreshortened in this view because of the great bend halfway up the valley caused by the intrusion of the Disputed Spur. The main peaks of the Eyre mountains overlook this spur. Note the farm track which leads to Siberia Hut and provides one of the opportunities for mountain bike trips.

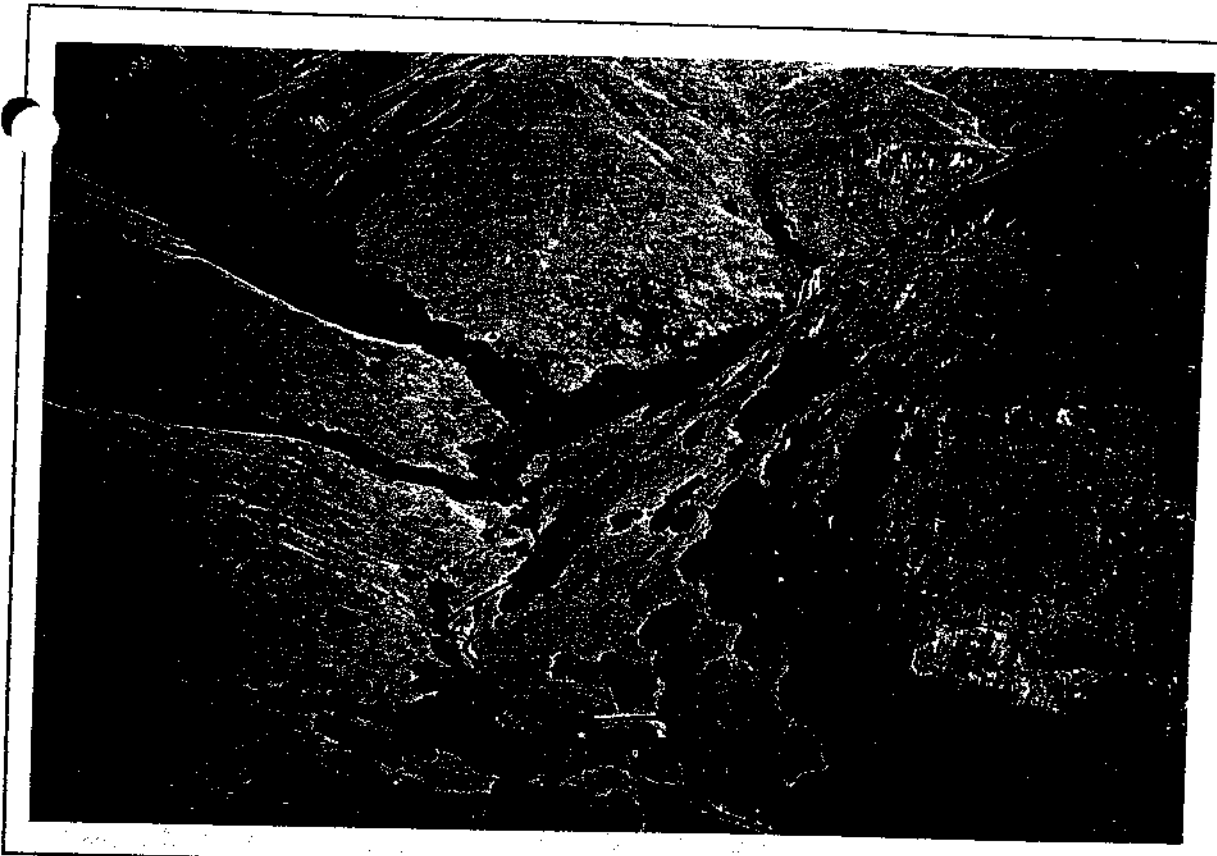


Fig. 9 The great bend in the Long Bum known as Crooked Valley differs from the rest of the valley in its park-like landscape with grassy terraces and patches of beech forest. This makes a very attractive setting for the Siberia Hut which would be very useful to all kinds of recreational users of the area.

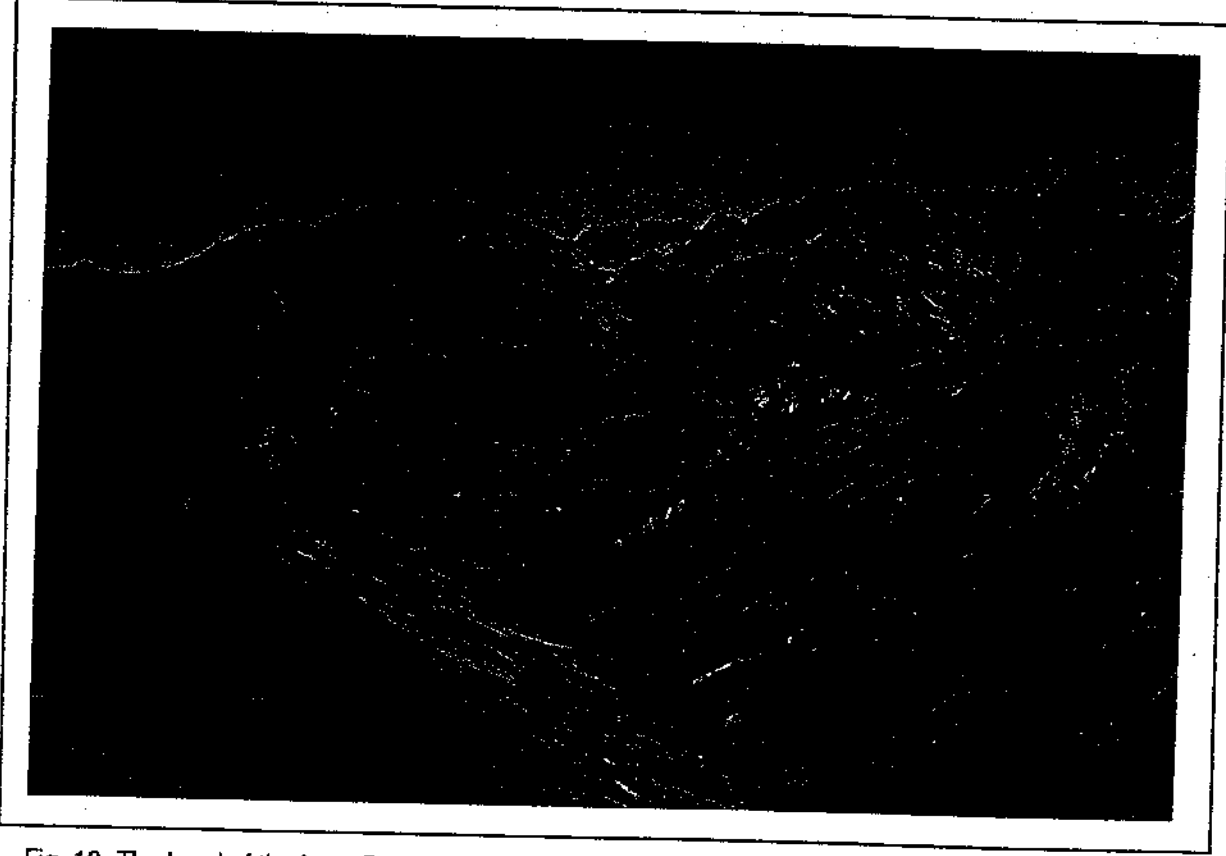


Fig. 10 The head of the Long Bum is more rugged and leads to the Eyre Conservation Area, over the high ridge of the Eyre Mountains on the skyline. This valley also has very high intrinsic natural and landscape values and contains many glacial features including cirques, tarns and hanging valleys.

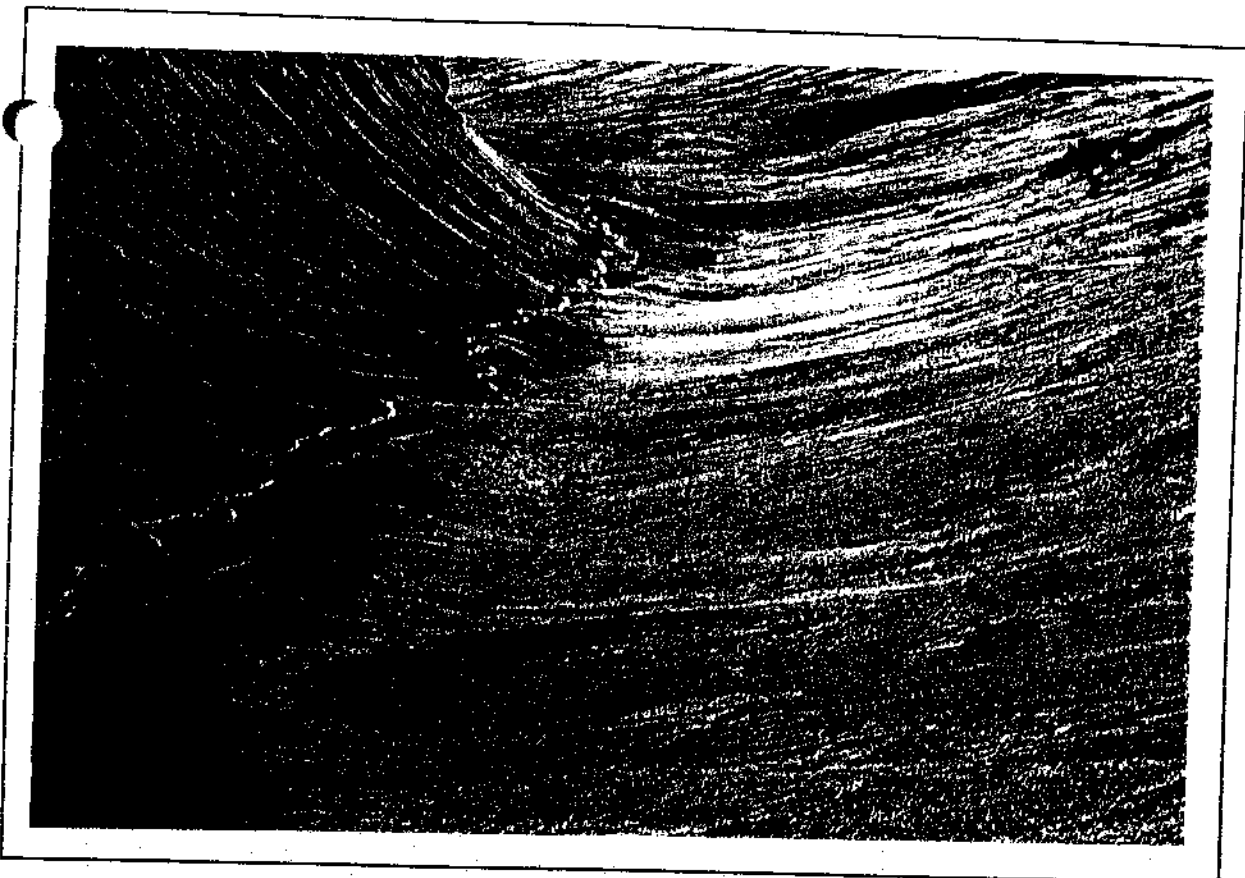


Fig. 11 The head of the Long Burn is a wild and dramatic place bounded to the south by some of the highest peaks in the Eyre Mountains and enclosing spectacular natural landscapes including untamed scree runs and a pristine mountain stream. The natural and recreational values are outstanding.

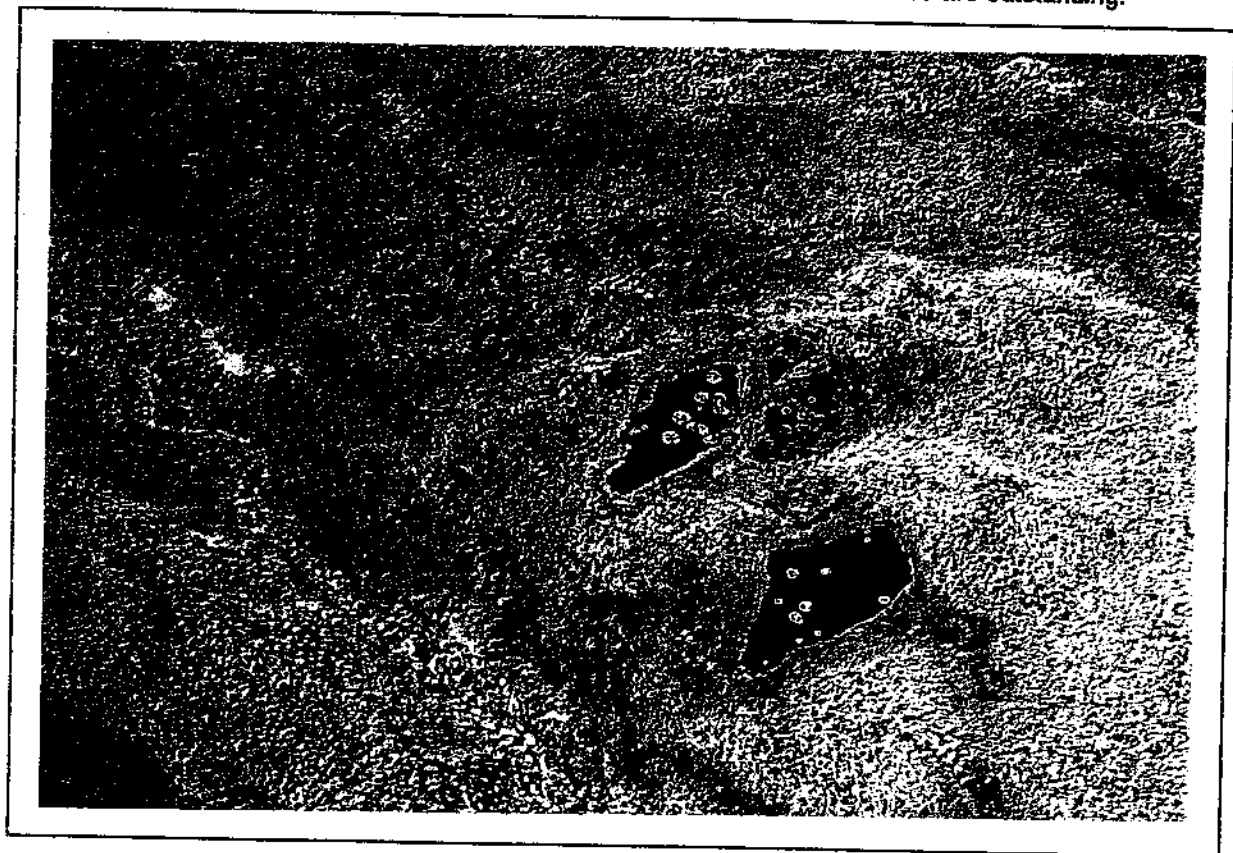
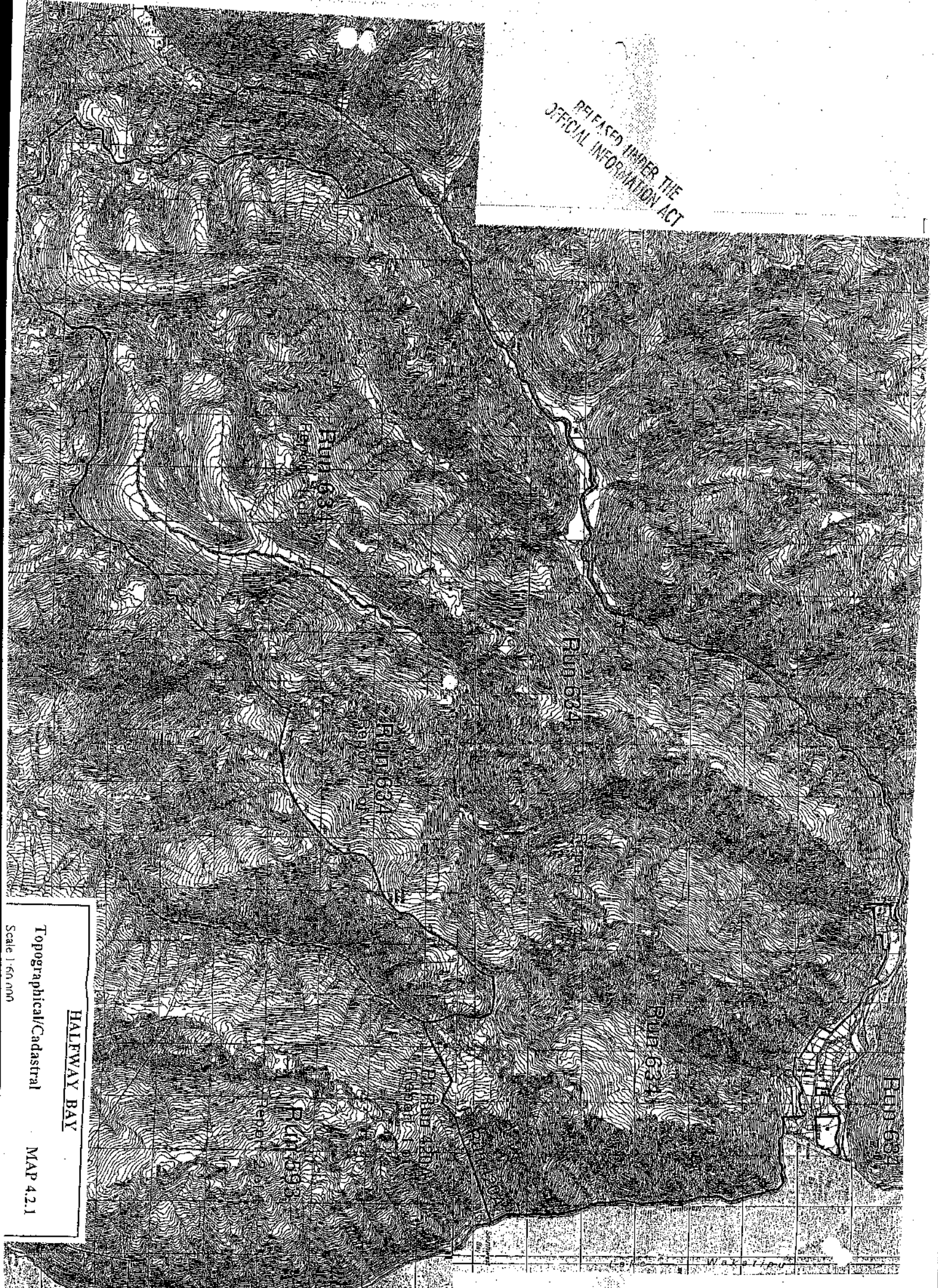


Fig. 12 On closer inspection the valley floor reveals many interesting moraine features like these kettle holes and wetland plant communities. There is much of interest for photographers and naturalists.

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HALFWAY BAY

Topographical/Cadastral
MAP 42.1

Scale 1:50,000

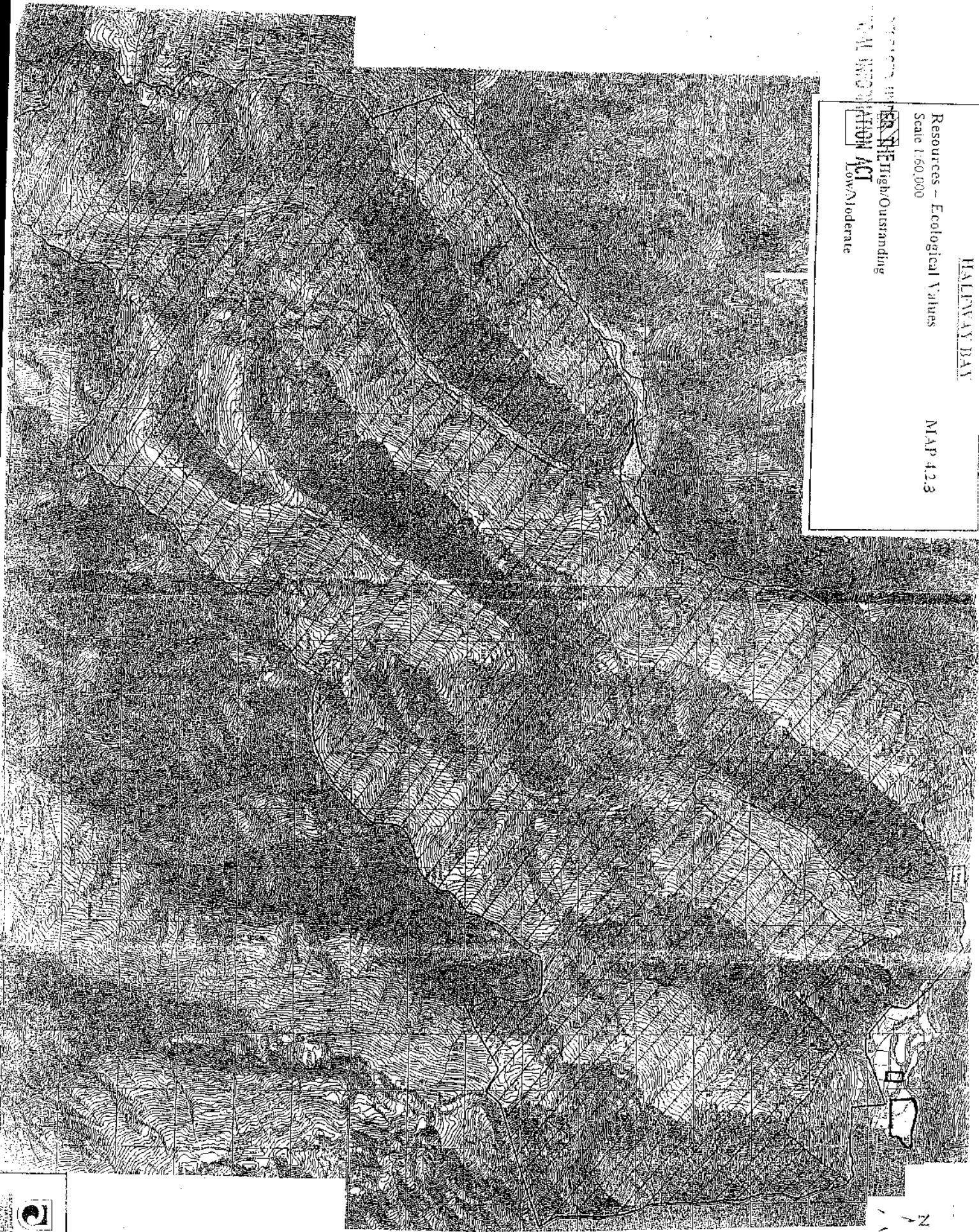
HALLETT BAY

Resources - Ecological Values

MAP 423

Scale 1:50,000

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Low/Moderate



HAIFWAY BAY

Resources - Landscape/Historic
Scale 1:60,000

MAP 4.2.2.

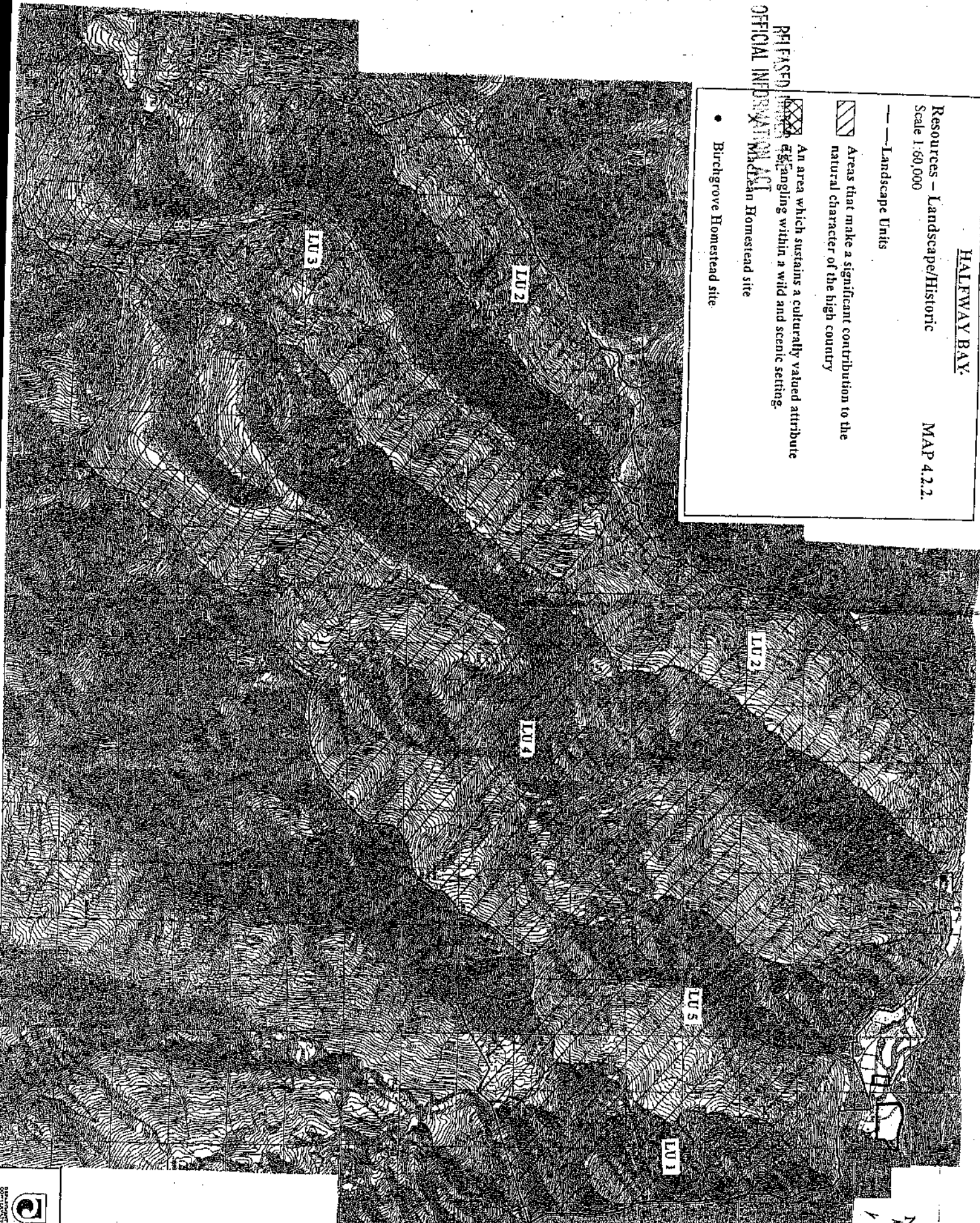
— Landscape Units

▨ Areas that make a significant contribution to the natural character of the high country

▩ An area which sustains a culturally valued attribute (e.g. tangling within a wild and scenic setting)

• Birchgrove Homestead site

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MADALEN HOMESTEAD SITE



GOVERNMENT OF WESTERN AUSTRALIA