

Crown Pastoral Land Tenure Review

Lease name : GLEN NEVIS

Lease number : PO 201

Conservation Resources Report - Part 1

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

They are released under the Official information Act 1982.

April

05

**DOC REPORT TO THE COMMISSIONER
OF CROWN LANDS ON THE TENURE REVIEW
OF GLEN NEVIS PASTORAL LEASE**

PART 1

INTRODUCTION

The lessee of Glen Nevis Pastoral Lease has applied to the Commissioner of Crown Lands for a review of tenure. The property has been inspected and reported on by relevant DOC staff and their assessments have been incorporated in to this conservation resources report.

The DOC inspection occurred in February 1996. No Protected Natural Area survey has been undertaken of the Remarkables Ecological District in which the property is located.

Glen Nevis is a medium sized property covering 6697 ha. The property straddles the southern Hector Mountains and extends from Kingston at the southern end of Lake Wakatipu, across the range to the Nevis River. The homestead is located off the Lumsden-Queenstown highway, some 48 km from Queenstown. Access to the Nevis end of the property is available from the Garston/Nevis Road.

PART 2

CONSERVATION RESOURCE DESCRIPTION AND ASSESSMENT OF SIGNIFICANCE

1 LANDSCAPE VALUES

The property was inspected in February 1996. An aerial overview was undertaken on the 21.2.96 followed by a ground inspection of the Nevis Flats.

For the purposes of this report the property has been divided into four topographic units.

- 1 Lake face (below 1100 metres)
- 2 Upper mountain slopes (above 1100 metres)
- 3 Nevis Slopes
- 4 Nevis Flats

Lake Face

Landscape character description

- Land - typically lumpy, ripply landform with scattered rock outcrops.
- old lake terraces and colluvial slopes at the foot of the slope.

- Landcover - lower slopes are highly modified. Shrubland remnants occur in incised gullies.
- hard and blue tussock form a dense band with other natives at around 900 metres. Scattered snow tussock gradually becomes dominant cover above the top fenceline.

- Historic/ cultural factors - farming has modified vegetation.
- fenced. Farm tracks and exotic pasture reflect the degree of farm development.

Landscape assessment

- Intactness - moderately low. Vegetation modified especially on lower slopes.
- Coherence - medium
- Distinctiveness - low. Not dissimilar to other slopes around the Wakatipu Basin.
- Visibility - moderate. Partly visible from the highway. Forms part of Lake Wakatipu visual catchment.
- Detractors - nil.

Evaluation

High level of modification. Though significant in terms of the Lake visual catchment, landscape management is most appropriate through District plan provisions.

b Upper Mountain Slopes and Summit

Landscape character description

- Land - upper slopes and summit are broadly undulating slopes
- Upper Nevis tributaries have strongly glaciated features with steep headwalls and cirque basins.

- Landcover - scattered snow tussock, extensive areas of short tussock, cushionfield, herbfield, snowbank and stony ground.
- Historic/cultural factors - vegetation modification through burning and grazing apparent.
- Other characteristics - expansive views to west and east.

Landscape Assessment

- Intactness - high
- Coherence - high
- Distinctiveness - moderate
- Visibility - moderately high
- Detractors - nil

Evaluation

Overall this unit has high inherent values. Forms the skyline ridge and visual link between the Remarkables and Hector's Ranges.

c Nevis Slopes

Landscape character description

Landform - distinct series of long ridge and gully systems with rippled slump topography and scattered rock outcrops. Drummond Creek and Wrights Creek are the main tributaries.

Landcover - uniform tussock cover over most of the slope. Narrow leaved snow tussock fades into hard tussock at about 1100 metres with an increasing exotic component as the valley floor is reached.

Snow tussock remains a component of the cover to the valley floor although it is sparse in places. Dracophyllum forms distinctive dark brown patches on ridges visible from the valley floor.

- .storic/cultural factors - disused water-races are a feature at the foot of the slope.
- Other characteristics - valley sides are important to containment and enclosure of the Upper Nevis Flats.

Landscape Assessment

- Intactness - moderate. Appears as a tussock grassland.
- Coherence - moderate. Good condition of tussock cover contributes to coherence.
- Distinctiveness - moderately low.
- Visibility - moderate. Significant in terms of Upper Nevis Flats.
- Detractors - no tracking or other earthworks.

Evaluation

Good condition of vegetation contributes to relatively high rating. Primary landscape value is in terms of providing context and visual enclosure to Nevis Valley.

d Nevis Flats (Refers to Upper Nevis Valley)

Landscape character description

- Landform - Gently sloping old fan and alluvial valley floor. Small terraces and hillocks are characteristic along the west side of the valley. Variety of landform contributed to rich mosaic of vegetation patterns. Wetlands in low-lying areas. Nevis River forms the east boundary.
- Landcover - Terraces and hillocks contain a mix of exotic and native grassland. Snow tussock occurs as scattered patches along with blue and hard tussock, browntop and sweet vernal. Speargrass is also extensive on dryer ground. Tall red tussock covers most of the wet areas on poorly drained soil and extends over broad areas. Red tussock strongly contributes to existing landscape character. Hebe shrubland occurs in drifts along south faces of hillocks and terraces.
- Historic/cultural factors - Upper Nevis Flats have a prominent cultural character. Many historic sites and features remain, eg. dredge tailings, old

sluicings and ponds, equipment, old power house and water races. The road through to Garston is a strong cultural feature.

- Other characteristics - The enclosed, remote, relatively isolated nature of the Upper Nevis Flats and low levels of modification are important to present day character.
Sky and weather patterns are also significant.

Landscape Assessment

- Intactness - high
- Coherence - high
- Distinctiveness - high
- Visibility - high
- Detractors - hieracium spread on drier flats

Evaluation

The Upper Nevis Flats within Glen Nevis Pastoral Lease contain very high landscape values. They form part of the Upper and Lower Nevis Valley which is considered at least of regional significance.

Significance of the Landscape

The most significant natural landscape units based on the above evaluation, in order of priority are:

- a Nevis Flats
- b Nevis Slopes
- c Upper Mountain Slopes and Summit

2 LANDFORMS AND GEOLOGY

The property varies in altitude from 395 metres to 1678 metres at its highest point on the Hector Mountains. Lorn Peak is the only named peak on the property, located on its southern boundary. The Nevis Valley floor is approximately 800 metres asl.

a Geology

Basement rock is comprised of strongly deformed quartzo-feldspathic schists and chlorite schists. Chlorite subzone IV - coarsely foliated schist. Along the western terraces of the Nevis Valley is an

ea of very weathered rusty brown schist gravels and moraines. This is the only such area mapped in the Ecological District.

Major glaciations have shaped the landscape, notably the formation of Lake Wakatipu which is dammed by the Kingston Moraines. The Wakatipu Glacier was a major feature of the Pleistocene glacial advance and it was up to 914 metres thick at its eastern end. There is debate over whether the Nevis Valley was ever occupied by a glacier but general agreement on evidence of resultant glacier patterns.

b Landform

The lower slopes of the Hector Range have smooth outlines from the lake shore up to 610 metres. This smooth zone becomes narrower nearer Kingston and almost merges into the Kingston Moraine.

An extensive area of Kingston formation outwash gravels, morainic deposits and fan talus, generally contemporaneous with the Albert Town glacial advance, occurs along the south eastern edge of Lake Wakatipu.

Cirques occur along the Hector Range.

Extensive natural vegetated slumps (landslides) occur along the lower eastern slopes of the Hector Range.

The Nevis River is fault controlled south of Nevis Crossing.

Manuherikia Landforms and Soils - Nevis Formation

In-faulted Manuherikia strata occur in the Nevis Basin. Miocene beds described as the Nevis Formation contain in conformable succession upwards, the Coal Measure Member, the Oil Shale Member, and the Dell Sandstone Member (Williams 1974). They are mapped in detail in the Lower Nevis Basin (Williams 1974), but less so in the upper Nevis Basin. Both the Oil Shale and Dell Sandstone Member occur in upper Nevis Basin. They appear as rounded hummocks concentrated on the true left of the Nevis River and have suffered some truncation from 19th century gold mining. Their position on the basin floor has resulted in the formation of backwater wetlands, supporting diverse plant communities as they interrupt drainage from the bordering Hector Mountains.

There are two Geopreservation Inventory site records located on the property, ie

Record ID No. DEF118

Name: Nevis Fault - Baileys Hill
 District: Southland
 Importance: C
 Locality: Upper Nevis Basin - Baileys Hill (north end of basin)
 Landform: Alluvial surface
 Map: F42
 Easting: 889
 Northing: 368
 Date: 1984
 Hazards: Future mining, burning, overstocking
 Significance: Good exposures and late Quaternary traces of the Nevis Fault system. Young gravels overthrust by weathered Manuherikia sediments along low angle contact.
 Ownership: Crown
 Status:
 Exposure: Quarry, trench, natural
 Type: Fault scarp
 Vulnerability: 3
 Contacts: Beanland, S

References:

Beanland, S; Barrow, S A; 1984 : Trenching investigations of active faulting in the Upper Nevis Basin, Central Otago. EDS Immediate Report 84/004. NZ Geological Survey.

Beanland, S; Barrow, S A; 1984b : Geology of the Upper Nevis Basin in relation to active tectonics. EDS Immediate Report 84/005. NZ Geological Survey.

Beanland S; Barrow, S A 1984c : Quaternary geology and the late Quaternary tectonic deformation of the Upper Nevis Basin, Central Otago. EDS Immediate Report 84/006, NZ Geological Survey.

Record ID No. DEF119

Name: Nevis Fault - Drummond Creek
 District: Southland

Importance: C
 Locality: Upper Nevis Basin, c. 0.6 km west of junction with Nevis River
 Landform: Alluvial surface
 Map: F42
 Easting: 867
 Northing: 333
 Date: 1984
 Hazards: Burning, overstocking
 Significance: Good exposure and late Quaternary trace of the Nevis Fault.
 Young gravels overthrust by weathered Manuherikia sediments along moderately steep angle contact.
 Ownership: Crown
 Status: -
 Exposure: Trench and altered natural
 Type: Fault scarp
 Vulnerability: 3
 Contacts: Beanland, S

References:

Beanland, S; Barrow, S A; 1984 : Trenching investigations of active faulting in the Upper Nevis Basin, Central Otago. EDS Immediate Report 84/004. NZ Geological Survey.

Beanland, S; Barrow, S A; 1984b : Geology of the Upper Nevis Basin in relation to active tectonics. EDS Immediate Report 84/005. NZ Geological Survey.

Beanland, S; Barrow, S A; 1984c : Quaternary geology and the late Quaternary tectonic deformation of the Upper Nevis Basin, Central Otago. EDS Immediate Report 84/006, NZ Geological Survey.

Rankings are defined as :

Importance = C - Regional. Important at the regional level as a site of scientific, educational or historical value

Vulnerability = 3 - Unlikely to be damaged by humans

c Soils

Soil types located on the Hector Mountains are described as :

- (i) Alpine Steepland Soils - above 1500 metres, consisting of bare rock, scree and rock waste.
- (ii) Upland and High Country Hygrous Yellow Brown Earths - weakly weathered and strongly leached especially at higher altitudes.
- (iii) Dunstan Steepland Soils - on the midslopes and tops of the Hector Mountains, formed on colluvium and schist loess on steep to moderately steep slopes.
- (iv) Nevis Soils - sandy loams, fine sandy loams and stoney loams occurring on flat to sloping terraces and fans in the Nevis Valley. They are formed on fine texture alluvium from schist over coarse schist gravels.
- (v) Arrow Steepland Soils - (loams to sandy loams) located on foothills, formed on colluvium covered steep to moderately steep slopes and some rolling low ridges.

Significance of the Landform

Evidence of glaciation, eg cirque basins and major earth deformation activity, eg natural landslides, are features of the property. The Nevis Valley, a major valley largely unmodified by human impacts is a significant feature. The Manuherikia landforms and soils are scientifically important.

3 CLIMATE

Rainfall means recorded at Kingston are 765-995 mm pa. Climatic conditions in the uplands are wetter and colder. Snow lies for several months during winter at higher altitudes. The Nevis Valley is drier than the Wakatipu faces. Frosts are frequent and the winters are relatively long. Summers can be hot and dry, eg in the Nevis which experiences a Central Otago weather pattern. Lake Wakatipu exerts a moderating influence on the western faces.

4 VEGETATION

Introduction

At the end of the Hector mountains the land slopes relatively gently to the east, a series of long ridges descending towards the Nevis Valley. The equally gentle upper western slopes steepen towards the lake where ancient glaciers have shaved. The overall vegetative cover is very good with little bare ground. Snow tussock is the dominant plant cover over about 75% of the property above 900 m with slim-leaved snow tussock replacing narrow-leaved above about 1500 m. Extensive cushionfields are found along exposed ridge tops on much of the higher land. Shrublands, boulderfields, rock outcrops and tors, bogs and flush areas, snowbanks and water courses ensure a good diversity of plant species overall.

his southern end of the Hector mountains is lower (1678 m) than further north and it is wetter having conditions more akin to the Garvie mountains opposite than to the adjoining Remarkable range. This is reflected in some of the species found here. These include the tiny Otago endemic *Geum pusillum*, a fairly rare alpine plant, the wetland aciphylla *Aciphylla pinnatifida* and a tiny herb *Euphrasia*. Adventive species are only a minor component of plant communities above about 900 m on both sides of the range, except in some wet places up to about 1000 m, where species such as browntop can be prominent.

The Vegetation

As mentioned already, snow tussock is the dominant vegetation on Glen Nevis. Slim-leaved snow tussock gives way to narrow-leaved snow tussock at about 1500 m. Below about 900 m on the western side, at the snow fence line, there is a marked change. Narrow-leaved snow tussock becomes sporadic in its distribution and is replaced by hard tussock. This forms a thick cover with blue tussock and a good range of other native species. This continues to about 850 m where exotic species become much more prominent forming at least 50% of the cover. In the incised streams at this altitude are small remnants of shrubland which include matagouri, *Coprosma* species, native broom, willow-leaved hebe, mountain ribbonwood and the fine, bluish *Aciphylla glaucescens*.

On the Nevis side of the range, narrow-leaved snow tussock fades into hard tussock at about 1000 m with also an increasing exotic component as the valley floor is reached although the exotic species form only a minor part of the communities except for a few minor areas. Narrow-leaved snow tussock continues out onto the old fan surface and valley knobs but only sporadically. The valley floor is a gently sloping, old fan with small terraces and hillocks which are responsible for a mosaic of vegetation patterns. Poorly drained ground and hollows contain red tussock and bog communities while the well drained sites have hard tussock with exotic grasses and scattered or patches of narrow-leaved snow tussock. Old drainage channels in the Wrights Creek/Kingston Creek area hide a few rare plants, where they have not dried out fully and been choked by weeds. A rare buttercup, *Ranunculus ternatifolius* can be found in the wetter red tussock community.

The top of the range contains a mosaic of plant communities. Gentle undulating slopes to the west contain short blue tussock grassland interspersed with areas of slim-leaved snow tussock on deeper soils, small bog communities in hollows and stony ground with herbfield and minor snowbank communities. Many small cirque basins line the east side of the range with steeper head walls and outcropping rock. Herbfield, fellfield and snowbank communities predominate with extensive cushionfields along the tops of the long ridges running towards the Nevis Valley. A large and botanically important semi-circular bog is found at the head of the tributary of Drummond Creek between points 1612 m and 1678 m. Above this is an interesting snowbank partly destroyed by extensive animal tracking. Large areas of the orange rush *Marsippospermum gracile* and the blue-green *Celmisia viscosa* adjoin the snowbank. Small boulderfields and patches of snow tussock

complete the mosaic. Few exotic species are found. A brief description of these communities follows.

Slim-leaved snow tussock

Along the summit area this forms an open community with 60-70% cover and 5-15% bare ground. Blue tussock up to 25% cover, *Rytidosperma pumila* up to 15% and *Raoulia subsericea* to 25% are the main plants. A few shrubs of *Dracophyllum uniflorum* and tauhinu occur. Lower, the snow tussock cover is thicker and slightly taller to about 80 cm and with little bare ground. Many small plants occupy the inter tussock spaces.

Narrow-leaved snow tussock

This species is dominant below about 1500 m with a general cover of 60-80% but in sheltered hollows and parts of the broad ridge above Kingston Creek, the cover is up to 100% and 1.5 m tall (but average height about 1.2 m). There is much litter and a range of smaller native grasses, sedges, rushes, herbs and ferns. A few larger shrubs such as *Hebe anomala*, tauhinu, a native broom *Corallospartium crassicaule* var *crassicaule* and *Dracophyllum uniflorum* are found and several small shrubs of snowberry, native daphne and patotara. Sheep's sorrel and cat's ear are the only common exotic species.

Blue tussock grassland

This community covers large areas of the undulating summit area, particularly of the western side. It forms part of the complex of plant communities found here. The ground is fairly open with some bare areas and scattered throughout, large patches of celmisias, *Celmisia haastii*, *C. hectori*, *C. viscosa* and *C. densiflora*. There are small clumps of *Celmisia brevifolia* and round dark-green cushions of *Kellaria childii*. Gentians were quite prominent being in full flower. *Raoulia grandiflora* and the tiny grass *Rytidosperma pumila* were also prominent.

Cushionfields

These generally formed very lumpy ground. *Dracophyllum muscoides* and blue tussock formed the main cover with typically *Kellaria childii*, *Chionohebe densiflora*, *Agrostis muscosa*, *Abrotanella inconspicua*, *Raoulia grandiflora*, *Hectorella caespitosa* and *Gentiana divisa*. They covered the exposed ridge tops of the summit area and eastern ridges.

ard tussock grassland

It occurs at lower levels on both sides of the property. Below the western fence line at about 900 m down to 850 m where it is increasingly taken over by exotic grasses, and as an increasing component in the narrow-leaved snow tussock community of the eastern flanks below about 1020 m and extending to the bottom at 860 m. Blue tussock is often important and narrow-leaved snow tussocks remains a minor component with numerous other herbs and grasses. Exotic grasses, brown top and sweet vernal, become more prominent in the Nevis Valley.

Snowbanks

Major species included *Raoulia grandiflora*, *R. subulata*, *Luzula pumila*, *Abrotanella inconspicua*, *Carex pterocarpa* and *Gaultheria nubicola*. More than 50 species of native plants are found in this niche. Of particular interest was the tiny *Geum pusillum* an Otago endemic and rare on the Old Man, Garvie and Hector mountains.

Stony ground and fellfield

A variety of plants are found here including several of those already mentioned. Others include *Craspedia lanata*, *Ranunculus pachyrhizus*, *Aciphylla lecomtei*, *Brachyscome* sp. (*B. montana*), *Leptinella goyenii*, *Phyllachne rubra*, *Carex pterocarpa*, *Epilobium tasmanicum*, *Polystichum cystostegia* and *Scleranthus uniflorus*.

Rock outcrops and tors

These often shelter a number of shrubs such as *Myrsine nummularia*, *Olearia cymbifolia* and *Melicactus alpinus*, as well as herbs and grasses such as *Acaena beauverdii* and South Island edelweiss. Some of the shrubs have disappeared from the tussock grassland due to burning.

Bogs and flushes and other wet areas

Mosses and sedges are prominent together with comb sedge, bog gentian, bladderwort and marsh marigold. Other plants of note are *Rostkovia magellanica*, *Gentiana grisebachii*, *Ranunculus cheesemanii*, *Lagenifera barkeri*, bog aciphylla and bog dracophyllum. *Euphrasia* cf. *dyeri* formed small, bright-green cushions raised slightly above the mosses in which it grew. It was covered in tiny mauve and yellow blotched flowers. In places *Schoenus pauciflorus* is the dominant plant with other rushes and sedges. The small shrubs *Hebe pauciramosa* and *Gaultheria parvula* and succulent orange fruited *Nertera balfouriana* are common plants in these places. Sphagnum moss can form large patches. At lower altitudes, below about 1000 m, more exotic species appear including rushes, musk, clover, browntop and Yorkshire fog. But native species still dominate.

Hebe shrubland

This community is confined to relatively small areas of some of the lower south faces between 1150 m and 900 m on the eastern side of the Hectors but was probably once much more widespread and probably represents some of the original vegetation of this area. *Hebe anomala* forms up to 50% of the cover with *Dracophyllum pronum* up to 30%. *Hebe propinqua* forms about 15% cover with *D. uniflorum*, tauhinu and *Aciphylla aurea* also present.

Dracophyllum shrubland

Large areas of *Dracophyllum pronum* occur on all the eastward projecting ridges on rocky spurs and south faces. It is often covered with creamy coloured lichen (*Usnea sp.*) which appears quite striking from a distance. The dracophyllum tends to form an almost pure community with few other species present. It lies between about the 1400 m and 1150 m contours. *Dracophyllum* has been restricted by burning over much of the mid-altitude zone.

Nevis Valley Fan and Valley Complex

Dry ground and ridges have various combinations of exotic and native grassland communities. Narrow-leaved snow tussock grows as scattered patches amidst often thick browntop with sweet vernal, hard and blue tussock. Hard tussock dominates large areas but with exotic grasses and herbs as well as other native species. *Uncinia purpurata*, on the threatened plants list as status unknown, grows here. Stony ground can contain areas of golden speargrass growing thickly with extensive ground cover of patotara, browntop, cats ear and sheep's sorrel. Wet areas contain small sections of typical bog plants with exotic species. Tall red tussock covers most of the wet areas on poorly drained soil. Exotic rushes (*Juncus spp.*), sedges and grasses such as Yorkshire fog, with a few native herbs such as *Ranunculus gracillipes*, *R. glabrifolius* and *Gentiana griesbachii*. The rare *Ranunculus ternatifolius*, a vulnerable species in the threatened plants list, can occasionally be found growing at the base of red tussock where not swamped by exotic species - ie where the tussock is thicker and wetter.

Away from the hill slopes, old, meandering water courses can be found. Many of these are filled with browntop and other exotic species but where these channels are deeper and still damp, a few

Interesting small native herbs can still be found. They are *Tetrachondra hamiltonii*, *Gnaphalium ensifer* and *Carex sp.* "Nevis", a possible new species of sedge.

Hieracium pilosella is present as a component of the valley floor vegetation at about 5% cover overall.

Some level of controlled grazing by sheep may be necessary to reduce the competition by adventive species in the valley floor vegetation.

Significance of the Vegetation

The Nevis Valley is a special area as a whole and the Glen Nevis run forms part of this. Although there are numerous exotic species present on the valley floor and often dominating, the native communities and plant species present here also are important with a number of unusual and rare plants.

Significant Communities include:

- * Upper slopes and tops with their varied plant communities including the slim-leaved snow tussock, snow banks, cushion plants, alpine bogs and wet lands, fellfield and boulderfields, bluffs and tors.
- * The narrow-leaved snow tussockland of the mid slopes to about 900 m.
- * The dracophyllum and hebe shrublands of the mid and lower slopes respectively.
- * The mosaic of valley floor grasslands and their associated communities.

Significant Species include :

Plants on Glen Nevis listed on the Threatened Plants List 1995

Name	Classification	Where Found
<i>Ranunculus ternatifolius</i>	Vulnerable	Wet red tussock
<i>Deschampsia caespitosa</i> (a grass)	Vulnerable	Swamp or wet areas
<i>Tetrachondra hamiltonii</i>	Local	Damp stream channel
<i>Geum pusillum</i>	Local	Snowbanks
<i>Uncinia purpurata</i>	Insufficiently known	Tussock grassland

Explanations of Classifications are as used in the New Zealand Botanical Society Threatened and Local Plants Lists (1995 Revision) namely :

Vulnerable

Taxa believed likely to move into the Endangered Category in the near future if the causal factors continue operating. Included are taxa of which most or all of the populations are decreasing because of over-exploitation, extensive habitat destruction or other environmental disturbance; taxa with populations that have become seriously depleted and whose ultimate security is not yet assured; and taxa with populations that are still abundant but are under threat from serious adverse factors throughout their range.

Local

It may include taxa which occupy habitats potentially threatened in the future, and those found in sensitive habitats which are prone to damage.

Insufficiently Known

Taxa that are suspected but not definitely known to belong to any of the following categories - Endangered, Vulnerable or Rare.

Deschampia caespitosa and *Ranunculus ternatifolius* are both listed as Category C species for conservation (ie third priority status for conservation) in Molloy and Davis, "Setting Priorities for the Conservation of New Zealand's Threatened Plants and Animals", 1994 edition.

Other plants of special interest - uncommon in Otago or in Ecological District

* <i>Carex</i> sp. "Nevis"	only in Nevis Valley (local)	old water channels
* <i>Elaeocharis gracilis</i>	uncommon	edge of open water
<i>Euphrasia dyeri</i>	uncommon	alpine bogs
* <i>Gnaphalium ensifer</i>	on very rare habitat	old water channels
* <i>Leptinella maniatoto</i>	on very rare habitat	old water channels
* <i>Myosotis uniflora</i>	very rare 2 sites only recorded	open stony ground
<i>Ranunculus berggrennii</i>	(<i>R. enysii</i> var.) on wet Otago Mountains only	upper open tussock grassland

* indicates species that are nationally rare or threatened and likely to be restricted to the property in the Remarkables Ecological District. Local abundance of valley floor dwellers will be present but uncommon on the property, eg *G. ensifer*, *L. maniatoto*, *M. uniflora* and *C. sp. "Nevis"*. Other species which are alpine, are expected to be patchily distributed along the crest of the range, eg *E. dyeri* and *R. berggrennii* (*R. enysii* var.).

FAUNA

a Invertebrate Fauna

i Mountain Lands

An extensive array of native insect species matched the diversity of mountain habitats, including : fell field, snow tussocks, *Cassinia* spp. and *Dracophyllum* spp. shrubs, wetlands and rock tors were found throughout. Ground weta (*Hemiandrus* sp.) and carabid beetles (*Megadromus sandageri*, etc), are among the species that are rare in intensively grazed environments. Fragments of a flightless chafer beetle (*Prodontria pinguis*) were found in the head of Drummond Creek under rocks. Adult dispersal time is spring/early summer. At the time of survey (February) few or no adults would be expected to be found. Larvae would be small and found underground feeding on plant roots. This is the southern edge of the range for this species which is restricted to the Hector Mountains (M Foord, personal communication). A second invertebrate class was represented by an individual peripatus. This was found below a bluff at 1550 m (Head of Drummond Creek). Peripatus are known from elsewhere in the region including the Nevis Valley. However, the record may represent an isolated population at an unusually high elevation.

A range of diurnal moths, flies and bugs are a significant element of the alpine cushionfields, grasslands and shrublands.

The large black bug *Cermatulus nasalis* and the moths *Tauroscopa gorgopis*, *Notoreas paradelpa* and *Dasyuris austrina* are conspicuous elements of these communities on this mountain range.

In general terms the alpine insect fauna is widespread in such habitats across Otago but this particular pastoral lease contains significant populations because of the range and quality of the various ecosystems.

ii Valley Floor

Together with a good range of typical grassland native insects are several species of significance. The survey identified three. Two other insects species are beetles. Firstly a very large brown and black carabid *Mecodema chiltoni* that is ranked as category C in Molloy and Davis's list of endangered species. The species has a restricted distribution through the forests and grasslands between the Eyre Mountains and Nevis Valley with evidence that it has declined in both extent and abundance over the last four decades. There are two recent records from this part of the Nevis Valley floor.

Secondly, a new and undescribed flightless chafer in the genus *Prodontria* has been found in this part of the Nevis Valley (including the neighbouring property to the south) and nowhere else. No live animals have been caught yet but the dead pieces have been examined by experts and determined as a distinct new species.

Additionally, the wetlands contain a population of the moths *Asaphades oraria* and *Orocrambus catacaustus* that are significant because they reflect both the altitude of the wetlands and their quality. Both are species of local occurrence.

Comment

This valley-floor system is on the border between the Old Man and Remarkables Ecological Districts of two different Ecological Regions. This overlapping of two quite different floral and faunal regions underpins the importance of the Nevis Valley for native flora and fauna and to some extent this brief survey supports the boundaries.

The alpine and high-alpine insect fauna is of conservation importance because of the range of species present reflecting the wetter habitats present, compared to further north on the Hector Mountains. A richer fauna is present here including a southern Hector Mountains endemic the flightless chafer *Prodontria pinguis*. The diverse shrublands are important for insects also.

The valley floor fauna is intact in the wetlands and in reasonable condition in the surrounding grasslands. This fauna is important for its biogeographical position - lying at the intersection of two ecological districts. The aquatic insect fauna is important for its richness in stoneflies of the genus *Zelandobius* - five species were found in the many streams crossing the valley floor, two of which have restricted distributions.

b Aquatic Vertebrate Fauna

Previous NIWA freshwater fish database records indicate brown trout, brook char and an unidentified galaxiid species are present in the Nevis River tributaries. No fisheries information was available for Lake Wakatipu tributaries on Glen Nevis pastoral lease.

Freshwater surveys were undertaken in both Nevis River tributaries and Lake Wakatipu tributaries. Three un-named tributaries of Lake Wakatipu were fished. In the Nevis Valley, Drummond Creek, Kingston Creek, Wrights Creek and an un-named stream were fished.

Lake Wakatipu Tributaries

i Un-named tributary 1 (NZMS 260 F42 764 336)

Brown trout were abundant in this stream and there was occasional koaro (*Galaxias brevipinnis*).

- ii Un-named tributary 2 (NZMS 260 F42 772 352)
Koaro were common in this stream.
- iii Un-named tributary 3 (NZMS 260 F42 772 353)
Koaro were common in this stream.

Nevis River Tributaries

i Wrights Creek

Brown trout and brook char were common in the stream from the Nevis - Garston Road upstream to the old mining tailings (NZMS 260 F42 834 317). Upstream of this point the stream gradient increases and brown trout and brook char are excluded from the upper reaches. An unrecognised non-migratory galaxiid occurs in Wrights Creek from the first cascade section above the tailings and upstream.

ii Kingston Creek

Brown trout and brook char were common at the one site fished at the ford on the Nevis Garston Road.

iii Drummond Creek

Brown trout were common in lower Drummond Creek, and brook char occurred occasionally in this area. Both the trout and char are limited to the lower reaches by cascade sections amongst and directly upstream of the old mining tailings (NZMS 260 F42 846 344). An unrecognised non-migratory galaxiid occurs in Drummond Creek from the lower flats (NZMS 260 F42 863 336) upstream. The galaxiids appear to occur in the highest densities in stream areas where brown trout and brook char are not present.

iv Un-named Stream (NZMS 260 F42 853 305)

Brown trout were common in this stream at the Nevis Garston Road ford.

Upstream limits for the galaxiids in Wrights and Drummond Creeks was not determined. Similar species extend upstream past the 1100 metre mark and it is reasonable to expect the galaxiids in these creeks also extend up to and probably beyond this altitude.

Vertebrate Terrestrial Fauna

No detailed bird survey has been undertaken however the following species were recorded during the inspection :

- Blackback gulls - alpine zone
- Banded dotterel - alpine short tussocklands
- Paradise Shelduck - dredge ponds, alpine zone
- Pipit - valley floor
- Australasian Harrier - valley floor
- Kea - alpine zone

Significance of the Fauna

Native plant communities are diverse intact and extensive which means a good variety and good populations of invertebrate fauna occur especially above the snowline fence on the western faces and extending across the range and down onto the Nevis Valley floor.

Records of species such as *Prodontria pinguis*, *Mecodema chiltonii* (a Category C species for conservation) and a new undescribed species of flightless *Prodontria* are significant. Aquatic fauna of significance include *koaro* (a Category C species for conservation) and an unrecognised *galaxiid* part of the Category I Otago *galaxiid* group. These species are of high conservation value.

Reference:

- Molloy and Davis - "Setting Priorities for the Conservation of New Zealand's Threatened Plants and Animals", 2nd edition, 1994.
- Category C ranking - Third priority threatened species
- Category I ranking - Species about which little information exists, but based on existing evidence, are considered to be threatened.

6 HISTORIC VALUES

Short Neop... del

Archaeological and Historic Features

There are no archaeological Maori sites recorded on Glen Nevis.

Runholders moved into the Upper Nevis in the 1870s when Masters tried and failed to farm in the valley. He and subsequent runholders supplemented their income by actively mining for gold. The homestead of stone buildings, consisting of a large house, a dairy and hut with some struggling trees around them, was built by the O'Connell family some time after 1881. It was occupied, mostly by mining families until about 1948 when the corrugated iron roofing was moved. When the original Glen Nevis and Staircase runs were subdivided at the beginning of the century, the farmstead on a separate small section went into Loch Linnhe. There are no structures specifically associated with nineteenth century farming on the present day Glen Nevis pastoral lease.

All the historic sites described in this report are gold mining sites. Mining began in the 1860s and continued off and on into the 1990s. There is active mining at present in the valley along Drummond Creek. The early and late periods are poorly documented, but there is relatively good documentation from 1892 to 1940. It has not been possible to identify any particular sites as belonging to the 1860-70s period.

The earliest site that can be identified is the Pactolus Race which has gained some notoriety for its futility (Hood 1990). It starts in the Nevis River, just above the Roaring Lion confluence and runs across the flats and then along the terrace edge to the Pactolus Claim. Built in 1892 to carry 60 heads of water to only 70 feet above the claim, it would have taken 134 man years for it to carry out the work at the claim equivalent to the work that went into building it. It demonstrates the effects of ignorance about hydraulics.

Around the turn of the century there were four large sluicing claims which can be identified as being located on Glen Nevis - Joe Parks at Drummonds Creek, Ed McMillan and Robert Macdonald at the Pactolus Claim and Baileys Hill, and Graham and O'Connell in Whittens Creek. All these sites are linked by systems of races out of the Nevis itself (the Pactolus Race), and out of Wrights, Drummonds and Whittens Creeks. Nearly all the races run northwards. Walking the races would have provided more information on how the races related to the sites but in the time available this was not possible. The earliest races from Drummonds Creek, with priorities dated to 1866 and 1869, are likely to be the lower races, since the accounts of new races built from about 1902 emphasise that they are high races coming in up to 375 feet above the claims. The lower races would have been adequate for ground sluicing in the 1860s and 1870s.

The workings in Drummonds Creek are large scale heavy tailings below relatively low sluice faces. The largest group of tailings of heavy schist slabs have been carefully stacked in mounds 2-6 metres high, with many paved wheel barrow tracks along the tops of the mounds. There are three wide

and partially revetted tail races winding down through them, with a recently occupied and intact hut at the mouth of one of them. The hut is an interesting mixture of modern hut design and old materials. No owner for it has been located. There are the remains of a line of hut ruins and small enclosures, about 12 in all, running down the true right of the creek mostly above the sluice faces. North of the Drummonds Creek there are extensive shallow sluicings in a short creek coming down off the range at GR865338. These workings are identified as Joe Parks', because he was described as working near and at Drummonds Creek from 1899 to 1908 by hydraulic sluicing three acres and 56 acres, but with no indication that he ever put in an elevator. These are the only workings of large enough scale with no elevator holes to fit the description of his workings.

In 1893 Edward McMillan took up four acres on the north side of Drummonds Creek and eight acres at Camerons Creek in 1899. In 1902 he is described as using a race with a head of 50 feet which sounds like the Pactolus Race and would put him on the Pactolus Claim. Robert McDonald was also becoming a major player in the Nevis from 1896 onwards. In 1899 he went into partnership with the Ellis family, sheep farmers in Southland and Victoria, Australia, and between them they accumulated licenses to nearly all the races out of Drummonds Creek. The descriptions provided by the Mines inspectors suggest that both men mined at the Pactolus Claim, Camerons Creek behind the Claim and at Baileys Hill at various times between 1899 and 1910. They certainly shared the water supplies.

In 1903 McMillan built a high level race bringing six heads of water from Wrights Creek and two heads from Drummonds Creek. When the race systems high in Drummonds Creek were examined, one of the race systems quite clearly showed this pattern, the water from Wrights crossing Drummonds Creek in a pipe and a branch from higher in Drummonds bringing the extra water in.

The workings at the Pactolus Claim are distinguished by some of the most attractive ruins of stone cottages in Central Otago. Two large stone huts with their chimneys still rising to almost full height stand on a bare knoll beside a deep elevator pond. There are amorphous mounds of tailings around them, as well as sluice faces of lightly banded orange gravels about 12 metres high. There is a more sheltered living site within the mouth of the valley with the remains of sod walls, a sod hut (8 x 5.5 m), and two enclosures which from their position are more likely to be gardens than reservoirs. Tucked away further up the valley again is a small modern house of corrugated iron belonging to the Williamsons and then the Mcleans. Shallow workings and tailings run up Camerons Creek in a similar pattern to the creek immediately to the south. There are interesting similarities and differences in the settlement pattern at the Pactolus compared to that at Baileys Hill (see below).

North of the Pactolus Claim the flats widen and are densely covered with tailings and complex ponds left by two dredges. Though they form most attractive patterns when seen from above, these ponds are the signature of failure. They were formed by a coal-fired dredge working for only two

at of six years (1902-1908) and a large electric dredge struggling for seven years (1927-1934). The electric dredge brought in to the valley by Sydney Fache was famous. It had been the Earnsclough No. 3 dredge, which produced much gold and some of the lines of massive tailings in the Earnsclough Reserve. The historic reports indicate that in the upper Nevis it was never able to work to its capacity. The dredge tailings in the Upper Nevis are low, amorphous and generally well vegetated, with occasional dumps of unusual rubbish from the machinery.

The electric dredge pontoons were 138 feet long and 35 feet wide. Just as in the Arrow Gorge, where Hannan and Rance's Leyland trucks were the first heavy trucks on the Macetown Road, they were also the first trucks to drive over Duffers Saddle in the process of carting in the Earnsclough No.3 dredge. The larger sections had to be taken round via Garston. The foundations of the power station set up for it, using two of the generators and a pelton wheel from Fraser River power station, are visible on a low peninsula near the middle of the flats. Nearby is a round concrete pad for a diesel storage tank, used when a diesel generator was installed early in 1934, and used for only four or five months. The hard cemented wash was too hard, and the company gave up in May 1934. The dredge itself went to the West Coast and the electrical equipment was bought by local miners. The large dredge ponds and low amorphous tailings of the Nevis can be compared with the small ponds and massive rows of tailings of successful dredging in the Earnsclough Reserve.

Baileys Hill is the most prominent mining site in the valley, with large orange brown sluice faces, 30 m high, visible from some miles away. The hill itself is a knob about 200 m long, linked to the main range by a level ridge 800 m long. All the races from Drummonds and Whittens Creeks to the sluicings on the knob have to run out along the ridge which also carries two reservoirs. The south end of the sluicing breaks into pinnacles at the foot of which the McLeans drove an adit into the lower levels of the gravels. Near the adit there are the remains of a sluice box, a compressor to drive air into the mine and parts of an electricity generation system, based on the diesel engine of a Fordson tractor. There is a modern Swedish transformer on a pair of power poles, and a power line of three wires runs up the valley past the power house foundations to the Pactolus Claim. The three power sources could all have been linked up into a mini-grid. Around the main mine there are about six small sheds and cribs in various stages of maintenance, three of which are in good repair and still used as by the McLean family as holiday houses.

It is likely that there has been mining here off and on for at least 100 years and certainly by the McLeans until the 1970s. The only site suggestive of earlier mining nearby is the remains of a sod cottage on the hillside to the west of the claim. Large outwash fans spread away from the knob towards the river and to the south. It is likely that several hundred metres of the knob have been washed away. Two deep pools left by elevators are tucked between the sluice faces and high mounds of tailings.

Both the Pactolus Claim and Baileys Hill have a sluiced ridge of orange brown gravels running parallel to the river and linked by an intact ridge to the main range. Each has two elevator ponds, an electricity generator with a power source, and concealed 1930s houses belonging to the McLean family. Baileys Hill has large stone buildings for the farmstead on its north side (Whittens Creek) and the Pactolus Claim has the next largest stone buildings in the valley on its south side. This similarity though is illusory, in that the buildings at Baileys Hill were built as part of a farmstead and the houses at the Pactolus Claim have no links to pastoralism.

Statutory and legal matters

The Nevis Valley is covered mostly by pastoral leases, with a marginal strip along both sides of the Nevis River. The Garston Nevis Road appears to follow the legal road line, and there is a paper road running east west through Glen Nevis from the formed road, over the Hector Mountains close to Trig F, to Kingston.

There are several race licenses still held as operative by the Otago Regional Council and at least one race on the ridge at Baileys Hill is being maintained. Though still listed, it is likely that most if not all of these licenses have lapsed. L and M Mining Co still have licenses in Whittens Creek which have not expired. The houses in the vicinity of Baileys Hill and one at Camerons Creek are owned by descendants of Ian McLean who mined there from the 1930s to 1991, but none have legal tenure to the land they are on (Correspondence DOC file P201, July 1984). The claim licenses have lapsed and it is likely that the legal owner of all mining equipment may now be the Crown.

Only the Pactolus Race can be identified as certainly pre 1900 and protected under the Historic Places Act 1993. The three races with priorities dating to the 1860s cannot be identified for certain, and it is highly likely that they were cleaned out to beyond the old profile in the 1930s. The *line* of the lowest races from Drummonds Creek to Baileys Hill could be accepted as protected under the Act, but the higher races were more likely to have been formed after 1900.

The DOC Otago Conservancy Draft Conservation Management Strategy (CMS) includes the Nevis Valley within Special Place 26 Remarkables. The remote character of the Nevis Valley is noted, and it is described as a supreme example of a little modified and virtually treeless Central Otago landscape with one of the most intact goldfields' landscapes remaining in Otago. Among the CMS objectives is the protection of the high historic values and remoteness of parts of this Special Place.

gnificance of the Historic Values

Like the Lower Nevis, the Upper Nevis contains a wide range of relatively intact mining sites in an even less modified setting than the Lower Nevis. There are no permanently occupied buildings in the upper valley, and the buildings present are small and mostly inconspicuous. Unlike the lower Nevis, there are no fences or cultivated paddocks between the road and the sites. The sites are significant because they are undisturbed representations of ground sluicing, elevating and hydraulic sluicing, with intact head races and reservoirs, especially for the period 1890 to 1910, and lie in an unmodified and attractive remote setting. The sites are easy to understand and clearly visible under grassland with few woody weeds, and so are more accessible to visitors than many lowland sites in Otago. (Otago sites in general are far better preserved and easier to visit than sites on the other two big goldfields of New Zealand - the West Coast and Coromandel.) Other high altitude sites such as the Serpentine, Criffel and Lämmerlaws do not have such good road access. Safety issues are minor. Documentation for the main period of workings is adequate.

7 EXISTING LAND STATUS

a Legal Roads

Glen Nevis pastoral lease adjoins State Highway 6 north of Kingston, along the south-east shoreline of Lake Wakatipu. This road is the major tourist road link between Queenstown, Te Anau and Milford Sound and carries heavy tourist traffic. An unformed legal road branches off the highway immediately north of Kingston and crosses the Hector Mountains near Trig F before descending to join with the Garston Nevis formed road at Drummond Creek.

The Garston Nevis road is 4WD only due to the many deep fords. This road is closed over the winter months due to snow risk and public safety concerns.

b Marginal Strips

A marginal strip exists along the pastoral lease frontage with Lake Wakatipu. There is also a marginal strip along the Nevis river frontage of the property and on Drummond Creek.

c District Plans

The property is located within two districts, namely Central Otago District (Nevis Valley) and Queenstown Lakes District (Wakatipu Faces). The respective district plans contain the following relevant statements :

(i) Central Otago District Transitional Plan (Vincent Section)

The relevant zoning is Rural 1. This zone recognises landscape amenity as one of the criteria for formulating rural zoning policies. There are no operative landscape policies in place.

(ii) Queenstown Lakes Transitional Plan (Lakes Section)

The relevant zoning is mostly Rural B extensive pastoral farming. The zone is described as providing a scenic backdrop to the Rural A zone. The predominant permitted activity is commercial forestry, recreation and a number of other activities compatible to extensive pastoral farming are provided for as controlled or discretionary activities. A recent plan change has also given Council a greater degree of control over the effects of accessory activities to a permitted activity have on landscape amenity.

(iii) Queenstown Lakes Provisional Plan

That part of the pastoral lease within Queenstown Lakes District is situated on the western flank of the Hector Mountains at their southern end, and extends from the rest of the mountain range to the shore of Lake Wakatipu. The pastoral lease is zoned Rural Uplands and the area from the lakeshore to around the 1000 m - 1200 m contours is identified as an “Area of Landscape Importance”.

The plan recognises certain aspects of the natural environment, and the landscape and visual amenity of the district as being of significance, both in terms of their intrinsic values and in terms of their value in maintaining the social and economic well-being of the district. The zone establishes site standards which include matters addressing indigenous vegetation, areas of landscape importance, significant nature conservation values (which are identified and included in the plan) and the alpine environment (land with an altitude higher than 1070 m). These matters are also included as matters the Council will have regard to when assessing resource consent applications and are of special interest to the department.

Part of the pastoral lease is identified in the plan as an “Area of Landscape Importance”. The main implications of this lie in situations where a landowner is undertaking building activities or wishes to subdivide. Both tend to be discretionary or non-complying activities depending on the scale, nature or intensity of their likely effects.

Significant nature conservation values are specifically identified in the plan and the potential for an activity to affect those values will determine what extent Council will have an involvement in ensuring their associated values are protected.

In submissions, the department has suggested that the list of sites may be outdated and should be checked. The department has also suggested a criteria for determining significance that could be included. However, at this stage, significant nature conservation values are only those identified in the plan. The only way to get new areas included would be by way of a plan change. Currently there are no significant nature conservation values identified on Glen Nevis that are included in the proposed plan.

d Other Interests

(i) Mining Licences

There are two current mining licences held by Dunstan Creek Mining Company located in Whittens Creek and Drummond Creek.

(ii) Water Race Licences

There are several operative licences according to the Otago Regional Council. These are all located in the Nevis Valley.

(iii) Houses

There are several houses located near Baileys Hill and at Camerons Creek which have no legal occupation. Their existence dates back to earlier mining residences except for the small stone hut in Drummond Creek which was built several years ago. Ownership of the early dwellings appears to lie with descendants of original mining families, notably the Maclean family and they appear to be used as holiday cribs.

8 RECREATION/ACCESS

a Access

The Nevis Garston road provides good 4WD summer only access for recreation opportunities in the Nevis Valley. State Highway 6 adjoining the pastoral lease provides access at several points to the

like Wakatipu shoreline. Recreation opportunities at these locations occur outside of the pastoral lease.

The unformed legal road over the Hector Mountains does not appear to be used for any past or current recreational use.

The marginal strip along the lease frontage with Lake Wakatipu may be used for angling access or occasionally by boaties. The Nevis River marginal strip is used by anglers and for recreational gold mining.

b Use

The Hector Mountains attract limited and sporadic tramping activity, and most destinations are north of Glen Nevis. Some limited ski touring and heliskiing during winter occurs, subject to snow conditions. There is some terrain suitable for nordic skiing. The eastern side of the Hector Mountains comprises moderately steep cirque basins more suited to alpine ski touring. In good years, it is possible to ski from the Garston Nevis road at the southern end of the range. Southland Ski Club has a base hut located near the saddle between the Mataura and Nevis catchments. Some parapenting occurs from near Lorn Peak, with helicopter support. Recreational mining occurs in the Nevis Valley.

The Nevis Valley is popular in summer with 4WD enthusiasts and increasingly mountain bikers. The Nevis River is a popular and renowned brown trout flyfishing river and anglers would use the pastoral lease to gain access for fishing. Some associated camping occurs. The river is also used for kayaking.

The best fishing is downstream of Glen Nevis. The Nevis fishery is known for its "double fish experience" ie, many fish are large, exceeding 10 lbs. There are small numbers of fish of impressive size in the lower part of the river with an increasing number of fish which are smaller, upstream in the gorges. More than 90% of fish caught are released.

The Nevis River is protected as part of the National Water Conservation Order on the Kawarau River. The Nevis River was recognised as possessing important recreational fishing and having scenic qualities. Increasing numbers of overseas anglers now fish the Nevis.

Potential exists for a variety of additional recreation uses namely short walks exploring historic goldmining areas in the Nevis, horse trekking through the Nevis Valley and a crossing of the Hector Range from Kingston to the Nevis Valley using parts of the old pack track via the saddle near Lorn Peak.

EXISTING MANAGEMENT

a Wild Animals

The Hector Mountains do not harbour many wild animals. Red deer in small numbers are present and goats are found on adjoining properties on the lower lake faces, notably in Staircase Creek on Loch Linnhe Station. These animals will colonise any area that is undisturbed by hunters/farmers, musters, etc. Because of the openness of the country, red deer are not expected to present a management problem.

Goats do represent a problem especially if they become established in the bluffy country in the Drummond Creek catchment. Control would be easily gained and eradication possible using helicopter search and destroy operations, covering adjoining properties also.

There is a slight risk of pigs colonising the Hectors from the nearby Garvies/Old Woman ranges.

No chamois have been seen in the southern Hectors.

b Animal Pests

Rabbits are the main animal pest and have colonised the lower lake faces. The large flats in the Nevis Valley contain only a few rabbits.

However, the Nevis population was not considered to be a major problem and it appears that rabbits are in localised groups and in low numbers. It is suggested that the altitude and the long cold winters helps control numbers as well as the area is only lightly modified for agriculture.

Control measures might be needed on small localised populations in the Nevis but it is thought that this would not involve any large expensive operations. Monitoring will be required.

If grazing ceased, it is possible that the increased vegetation cover would deny rabbits areas for favourable habitat.

Possums inhabit the whole area with a preference for the lake faces. The Nevis Valley has only a light population and there is little favourable habitat.

The Lake faces hold quite high numbers but recent control measures on these faces by The Ministry of Agriculture and The Otago Regional Council has reduced these numbers. The indications of TB in the Kingston area has prompted MAF and ORC to control possums. The whole Lower Kingston/Wakatipu Lake region has very favourable possum habitat and over the years there has

en a cycle of very high populations. Possums will live on the high alpine fields in summer and damage to vegetation has been noticed.

However at this stage it is very unlikely that specific control of possums in the Hector Mountains, to protect conservation values would be required.

Hares are throughout The Remarkables and Hector Ranges in medium to high numbers.

They are well established and can survive at high altitudes all year. It is thought that environmental and climatic factors help control populations. There is also some predation by hawks, mustelids and cats. However very little is known about the influences hares have on the Central Otago tussock and alpine areas.

Control, if needed, can be successfully carried out by helicopter search and destroy type operations.

The usual introduced predators are common throughout, mainly centred around the rabbit populations.

Ferrets, stoats and cats have been observed on the lake faces and in low numbers in the Nevis. At this stage they are not considered a problem. Ferrets are being targeted by MAF in conjunction with their TB programme.

c Domestic Stock

The side boundary fence with Loch Linnhe is non existent and the side boundary fence with Kingston Station is in a derelict state ~~at the top~~. Domestic stock from both properties mix with Glen Nevis stock.

d Weeds

The property is relatively free of introduced weeds. In the Nevis there is little weed invasion in the tussock grasslands. Broom, briar and gorse are present on the lake faces, and the Nevis Valley appears to have very limited briar with no broom and gorse. However with a public road through the Nevis side and with gold mining activities the possibility of introduced weeds becoming established is very real and regular monitoring would need to be carried out. Hieracium sp. are present through out the Nevis catchment and are especially prominent on the true right of the Nevis River.

The biggest weed problem in The Hectors is wilding tree invasion. Pines were noticed throughout the lower tussock areas and on the lake faces. There appears to be two or three types of pines involved, (P. Contorta, P. Radiata, P. Nigra) with Douglas fir and some deciduous species. In the

cent Remarkables/Hectors wilding tree control operation, P. Contorta were cut down at about 1600 m (4600'). This places a considerable amount of Glen Nevis Station under threat of colonisation by wilding trees.

Only a few wilding trees were noticed on this station in the Nevis Valley and these appeared to be seeding into the rolling tussock grasslands. These trees should be removed as soon as possible.

The creek and riverbeds are generally free of willows except for Drummond and Wrights Creeks and at the Pactolus Claim and to preserve natural landscape and stream conditions any trees of these species found should be eradicated and regrowth monitored and eradicated. These willows do not appear to be spreading.

Wilding pines present the most pressing management issue for this station as far as protection of the natural features is concerned and should be removed before spreading further.

e Fire

Fire is mainly a threat on the Nevis Valley side with tussock and grass areas right up to the public road. The area is very dry in summer and would rate in the high to extreme fire risk on the fire weather index in the mid summer months. Also as the area is relatively isolated, any wild fire that was ignited in this valley would have considerable potential to become a major fire requiring extensive resources to control and extinguish. On the lake faces the fire risk is lowered by having a large buffer zone of agricultural land on the lower lake faces.

Rural fire authorities are the Queenstown Lakes District Council for the Lake faces part of the property and Central Otago District Council for the Nevis Valley area.

PART 3

Consultation

The property was discussed briefly with NGO representatives at a meeting on 14 September 1995. There were no particular issues flagged at that meeting.

PART 4

Justification and Recommendations

Glen Nevis forms part of Special Place No. 26, Remarkables as described in the Otago Conservancy Draft Conservation Management Strategy.

The following areas of high conservation value on Glen Nevis warranting protection are :

1 Summer Country

This protection proposal is justified on the following conservation values :

a Landscape

The area includes the three significant landscape units, ie

- Nevis Flats
- Nevis Slopes
- Upper Mountain Slopes and Summit

These landscape units collectively encompass the high quality natural landscapes present on the property as well as the dominant cultural elements of the historic gold mining features on the Nevis Flats and Nevis Slopes. The Nevis Flats unit is the unit most vulnerable to change and is the most critical unit requiring protection.

b Landform

The Hector Mountains contain evidence of glaciation, eg cirque basins. The Nevis Valley is largely unmodified by human impacts. The Manuherikia landforms and soils dating from the Miocene are scientifically important.

c Vegetation

Significant vegetation communities found in this area include :

- the slim leaved snow tussockland, snowbank and cushionfields, alpine bogs, wetlands, fellfields, boulderfields, bluffs and tors, on the upper slopes and tops.
- the narrow-leaved snow tussockland and transition to short tussockland of the mid slopes to about 900 metres.

- the *Dracophyllum* and *Hebe* shrublands of the mid and lower slopes respectively.
- the mosaic of valley floor grasslands and their associated communities.

Significant species include several species listed on the Threatened Plants List 1995, ie :

<i>Ranunculus ternatifolius</i>	-	vulnerable
<i>Deschampsia caespitosa</i>	-	vulnerable
<i>Tetrachondra hamiltonii</i>	-	local
<i>Geum pusillum</i>	-	local
<i>Uncinia purpurata</i>	-	insufficiently known

Deschampsia caespitosa and *Ranunculus ternatifolius* are both Category C species for conservation.

There are several additional species present, notably alpine or valley floor species that are of special interest being either uncommon in Otago or in the ecological district.

The valley floor grasslands are amongst the best valley floor short tussock grasslands remaining in Otago and hence have very high conservation value. Their association with expanses of wetland and red tussockland in excellent condition is particularly noteworthy. Whilst the botanical values on the Hector Range are good, the Nevis Valley floor is much more important and the opportunities to protect ecosystems of this type are extremely limited, even in a national context.

d Fauna

A diverse variety with good populations of invertebrate species typify this property as a direct result of the quality and diversity of native plant communities and species present.

Significant invertebrate fauna species present include *Prodontria pinguis*, *Mecodema chiltonii* (a Category C species for conservation) and a new undescribed species of flightless *Prodontria*.

Significant aquatic fauna include the presence of the unrecognised galaxiid in the Nevis River tributaries. Protection of this species is of high priority and is best achieved by protection of this habitat, ie stream beds and riparian margins in the areas of old tailings and upstream.

e Historic

Over 80% of the historic sites in the entire Nevis Valley are located on Glen Nevis and there is the opportunity here to establish controls which will maintain the valley as a remote historic landscape.

Within New Zealand, this concept can only be applied in Otago and in a few select number of locations. The Nevis Valley ranks highly as such an opportunity.

The sites contain a wide range of relatively intact gold mining features within a landscape which has seen little change from the days of early European occupation. The sites are undisturbed, relatively accessible and cover the full extent of mining activity that occurred. They are eminently suited for public interpretation and safety issues are minor.

f Recreation

The mountain lands have considerable potential for tramping, nordic skiing and ski touring, as part of expeditions extending northwards along the Hector Mountains and into the Remarkables Range. Parapenting with helicopter support is an established pursuit.

The Nevis Valley is popular in summer for activities motorised and non-motorised recreational touring along the Garston Nevis Road. The Nevis river is a trophy brown trout fly fishery attracting increasing numbers of anglers, including overseas anglers who seek a quality fishery in a natural landscape setting. Access to the river involves crossing the pastoral lease.

There is considerable potential for a variety of activities such as short walks exploring historic gold mining features and possibly horse trekking.

Land Status Sought

Retention in Crown ownership and transfer to DOC as a conservation area. A vehicle access easement for DOC management purposes is required up the central farm access track. A S67(2) Land Act special lease should be used to formalise sheep grazing only on the valley floor. An easement over conservation land for stock movement between the special lease and the lake faces will be required via the saddle north of Lorn Peak.

Management/Boundary Notes

(i) Boundaries

The western boundary that has been adopted is the existing snowline fence which appears to be located at about 1100 metres at its northern end and descends to about 900 metres at the southern end. There is a small loss of conservation values as a consequence, but the cost of refencing totally along the 900 m contour cannot be justified. Almost half of the transition zone from tall tussock to short tussock will be included in the conservation land by adopting the existing fenceline as the boundary. Land use in the balance of the 900 - 1100 m zone to be freeholded is not expected to

Range and landscape and botanical values are likely to remain largely unaffected by the change in tenure.

The conservation land could eventually be linked to other conservation land in the Remarkables/Northern Hector Ranges through other tenure reviews and collectively become the Remarkables Conservation Park.

The Glen Nevis tenure review is one of the few opportunities to extend the boundaries of this essentially alpine park proposal to include part of a mid altitude valley floor, ie the Nevis Valley part of the property.

(ii) Grazing

The proposed special lease for grazing is to provide for continued sheep grazing only at the current stocking level, of the valley floor with no pasture development or burning. Cattle grazing will not be allowed because of their impacts on the fragile wetlands and damage to historic sites.

The uphill boundary of the lease should not be fenced as this could create adverse landscape impacts. With a likely change in the breed of sheep on the property it is considered that grazing will be preferred on the valley floor, especially if stock numbers are kept at conservative levels. Some stock drift uphill will occur however and there will be a need to monitor grazing patterns. Some stock drift may continue from adjoining properties onto higher parts of the property due to the lack of effective fencing. The cost of replacement fencing or impracticality of fencing common boundaries suggests that some stock drift from the adjoining properties has to be accepted until those properties are assessed for tenure review. Alternatively block limits may need to be reviewed on these properties.

(iii) Stock Access Easement

Some restricted burning of tussock may need to be provided for along the stock access easement. The easement should be tied to the special lease.

(iv) Old Miners Cottages

Tenure of these dwellings should be formalised by way of a lease or licence, in recognition of the Maclean family associations with past mining activities that exist in the valley. The dwellings should be maintained in the same style as they were built.

(v) **Wilding Trees**

Nevis tributaries streambeds need to be kept clear of willows to protect native fish habitat. All other wilding trees in these catchments and adjoining tussocklands should be removed, whilst the level of infestation remains low.

(vi) **Animal Pests**

Rabbits and goats populations will need to be monitored periodically.

(vii) **Fire Risk**

Public awareness should be attended to along the Nevis Valley road corridor.

(viii) **Vegetation Burning**

This activity should not be provided for within the proposed lease.

2 **Riparian Protection**

The unnamed Wakatipu tributary 3 (NZMS 260 F42 772353) contains a population of *koaro* worthy of riparian protection. No marginal strip currently exists along this waterway.

Land Status Sought

Marginal strip under Part IVA Conservation Act is warranted along the section of the stream between the highway and the lower boundary of the small riparian beech forest remnant. A Conservation area (2 x 20 m strips) along the remainder of the waterway up to the fence across the catchment at about the 680 m contour is required.

Management / Boundary Notes

The lower section of the creek between the highway and the beech remnant is likely to move its course over time. A marginal strip will move with any change that occurs.

The creek may not however be of sufficient width to warrant a marginal strip. This is particularly so with the upper part of the waterway. If this is the case then conservation area (2 x 20 metre strips) should be land off along the full required length of the waterway. It is not intended to fence the riparian protection zone at this stage and normal farm use can continue.

Some periodic monitoring of the *koaro* population should be undertaken.

Summary of Recommendations (Refer to Map 3)

- 1 That the pastoral lease tenure review negotiations on Glen Nevis Station proceed on the basis that the Crown seeks to retain ownership and transfer to DOC for conservation purposes all that land hatched black.
- 2 That a section 67(2) Land Act special lease be issued over the Nevis Valley Flats up to approximately the 1000 metre contour. The lease to provide for continued sheep grazing only with monitoring of effects of grazing and adjustments of stock numbers as necessary. There is to be no provision for pasture development, vegetation burning and no requirement for fencing of the uphill boundary unless the breed of sheep being run results in significant stock drift and unacceptable grazing effects resulting.
- 3 A stock access easement be issued under the Conservation Act to provide access across the ungrazed uplands conservation land to the special lease area. The easement is to be tied to the special lease. Some very limited vegetation burning may need to be provided for to maintain stock access.
- 4 Riparian protection be created using a mix of marginal strip and conservation area (2 x 20 metre strips) along the margins of the unnamed Wakatipu tributary. Alternatively, if a marginal strip cannot be applied, then conservation area status should be used.
- 5 A vehicle access easement for DOC management purposes be created under section 7(2) Conservation Act extending along the farm access track from the legal road near the homestead to the western boundary the conservation land referred to in recommendation 1 above.

PART 5

Attachments

1 Appendices

J Hamel Power in the Upper Nevis. Historic Sites on Glen Nevis. Department of Conservation Report August 1996.

2 Photos of Conservation Interest on Glen Nevis Pastoral Lease

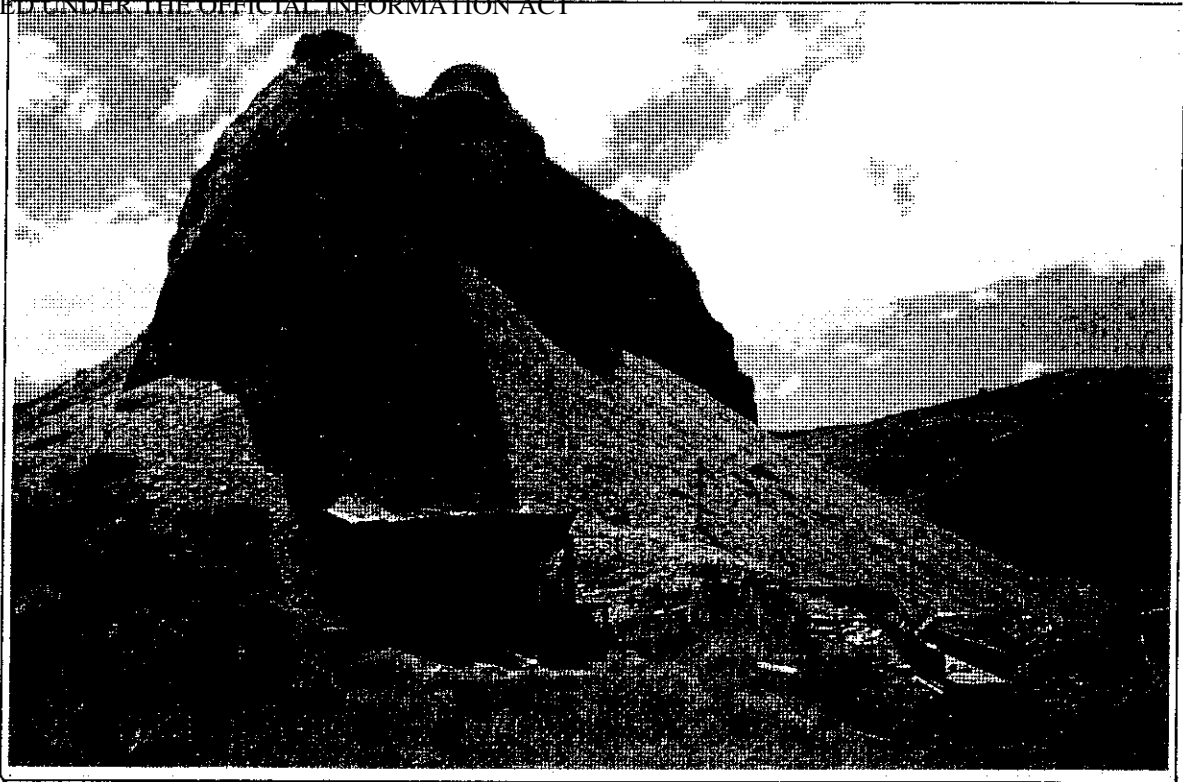
3 Illustrative Maps

Map 1 - Cadastral Map

Map 2 - Topographic Map - Conservation Values

Map 2a - Historic Sites

Map 3 - Topographic Map - Recommendations



Power in the Upper Nevis

Jill Hamel

Power in the Upper Nevis

Historic sites on Glen Nevis

Jill Hamel, August 1996

**This report to the Department of Conservation is part of a series
on historic values on pastoral leases
in the Central Otago high country**

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Otago Conservancy.**

Power in the Upper Nevis

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- Figure 5. Details of the heavy tailings in Drummonds Creek and the line of huts and enclosures.
- Figure 6. Views of Drummonds Creek and vicinity
- Figure 7. Workings along a small creek south of the Pactolus Claim and the end of the Pactolus Race.
- Figure 8 Views around the Pactolus Claim.
- Figure 9 Sketch plan of the Pactolus Claim.
- Figure 10 Sketch plan of Power House Flat.
- Figure 11 The outlines of the concrete foundations of the power house.
- Figure 12. Views of the Power House flats.
- Figure 13 Sketch plan of Baileys Hill and the workings on the south end.
- Figure 14 Sketch plan of the ridge full of races and reservoirs running to Baileys Hill.
- Figure 15 Views of Baileys Hill.

Introduction

Glen Nevis Station is sharply divided by the Hector Mountains into the western faces with no significant historic values and the Upper Nevis Valley where even late twentieth century efforts by miners look historic (Fig.1). Though there has been a road through the valley to Garston since 1891, there have never been any power lines in the valley attached to the national grid. The miners were not prepared to go without electricity once its value had been proved at Bullendale in 1886. The valley is unusual in having retained evidence of the independent power generation units built between 1906 and the 1950s.

There have been two archaeological surveys in the valley, the first passing quickly through the whole valley in 1989 when Nokomai Station was considered as part of the Protected Natural Areas Programme (Hamel 1989) and the second in February 1996 over just the Glen Nevis section. Both were foot surveys lasting only one or two days. There has also been an study of the Pactolus claim for an Honours dissertation (Hood 1990). There was no survey for historic sites on the Wakatipu faces of the run, and it is unlikely that there are important European sites on the run outside of the Upper Nevis Valley. Grid references apply to NZMS 260 F42.

Maori occupation

Unlike the lower Nevis Valley (Hamel 1994), there are no reported Maori sites in the Upper Nevis. Though it was probably used as a direct route between Lake Wanaka and the Southland Plains during good weather, it would not have been as attractive as the route down Lake Wakatipu.

European history

Even the first hardy runholders of the area, such as Donald Cameron of Nokomai, recoiled when they discovered how difficult the Upper Nevis Valley would be to farm. The original run in the valley was Lorn Peak, Run 354, and on the lake shore Staircase Run 331. Sheep were brought to both runs with great difficulty in 1860, but were largely withdrawn from the upper Nevis during the 1860s, partly because of problems with wild dogs (Hamel 1989). After 1874 the run was farmed by a succession of people including the Masters and O'Connell families, who were also miners. William Williams Masters brought a bride back from Adelaide in 1870 and is listed in the electoral rolls as runholder, Glen Nevis, from 1878 to 1881. Bad years killed his flocks and he became a miner in the lower Nevis. The O'Connells farmed and mined in the valley until at least 1910. W O'Connell built a farmstead, described by Parcell (1976:272) as between Whittens and Drummonds Creeks (Fig 2). There are the ruins of a large house, a dairy and most of the very few trees that have been established in the valley on a small freehold section at the mouth of Whittens Creek owned by Loch Linnhe (Fig.2a). These are identified by local informants as the farmstead for the valley (Noel McMillan: pers.comm.). There are no signs of structures specifically associated with nineteenth century farming on the present day Glen Nevis pastoral lease. When the runs were divided up, Glen Nevis and Staircase were divided north south, so that each run had both summer country in the Nevis and winter country on the warmer slopes facing into Lake



Figure 1 Topographic map showing boundaries of Glen Nevis Station

0 1 2 kilometres
scale 1:50 000

File Ref : P 201, Map Ref : F 42

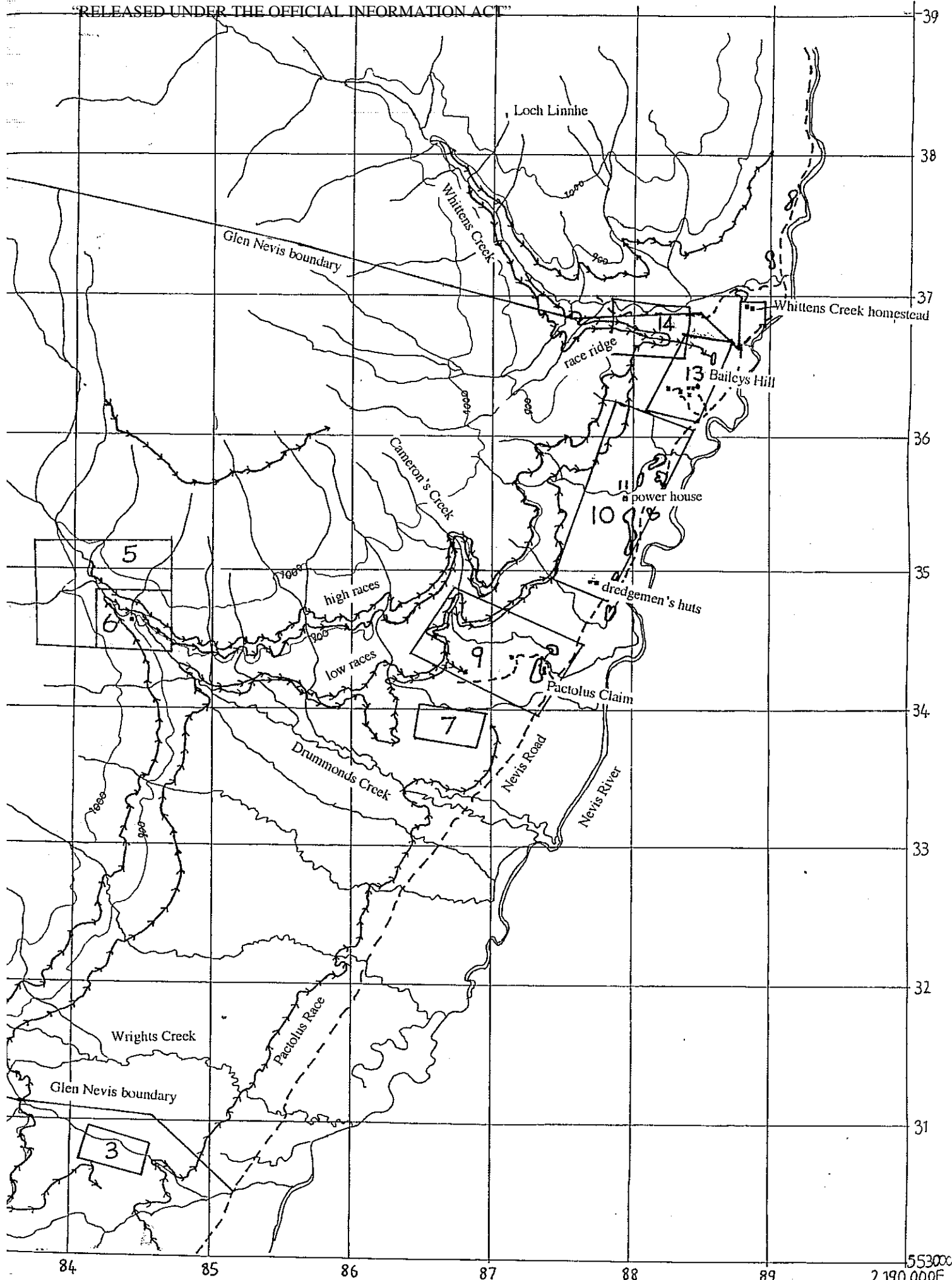


Figure 2 Topographic map showing races and sites in the Upper Nevis (from NZMS 270 F42C topoplot). The numbered squares indicate the positions of other sketch maps.

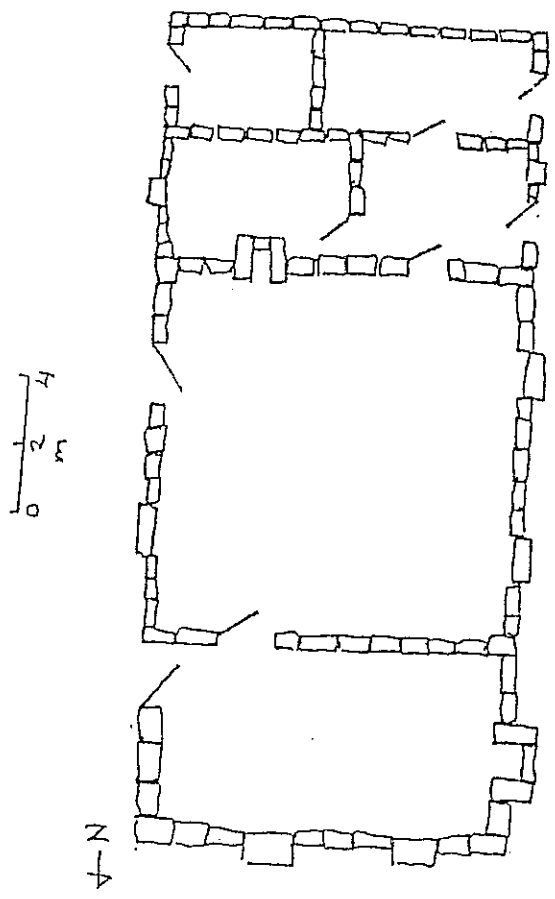
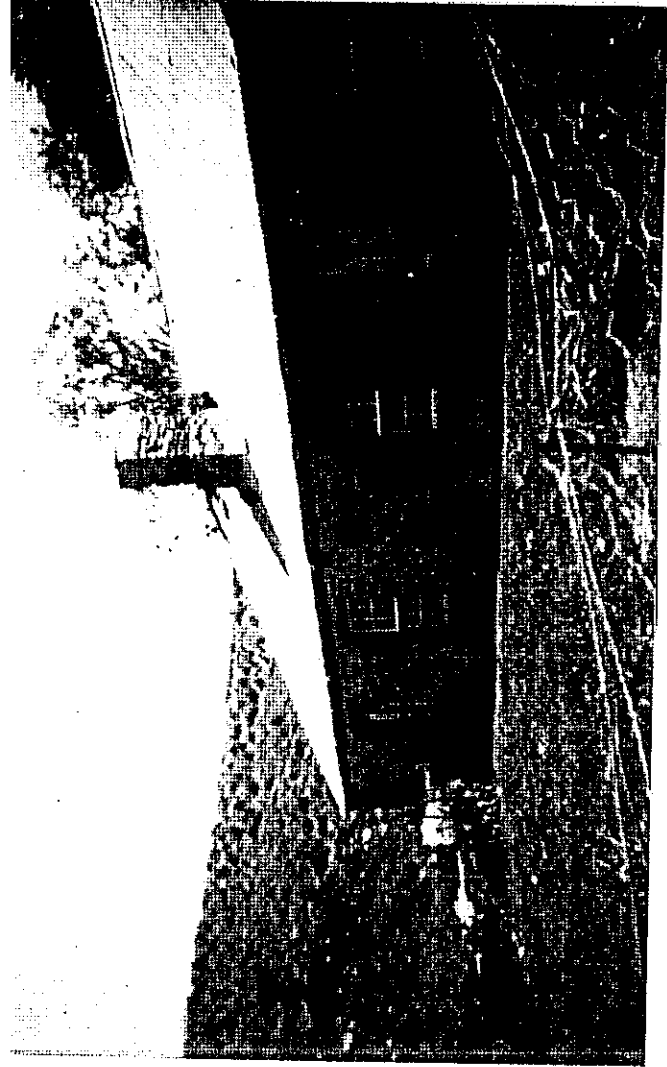
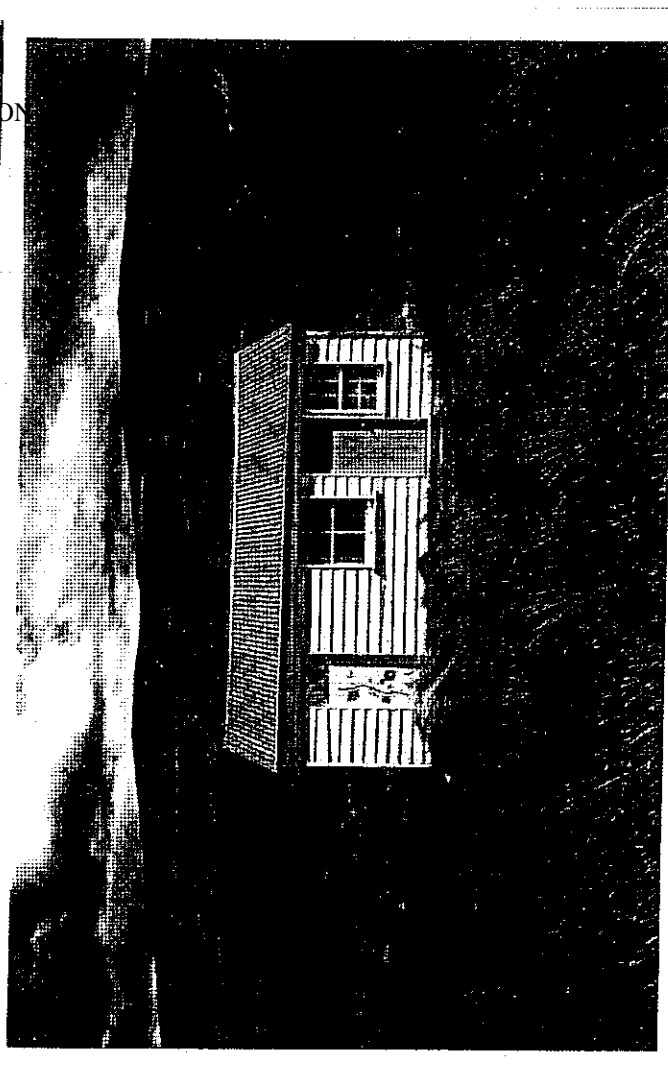
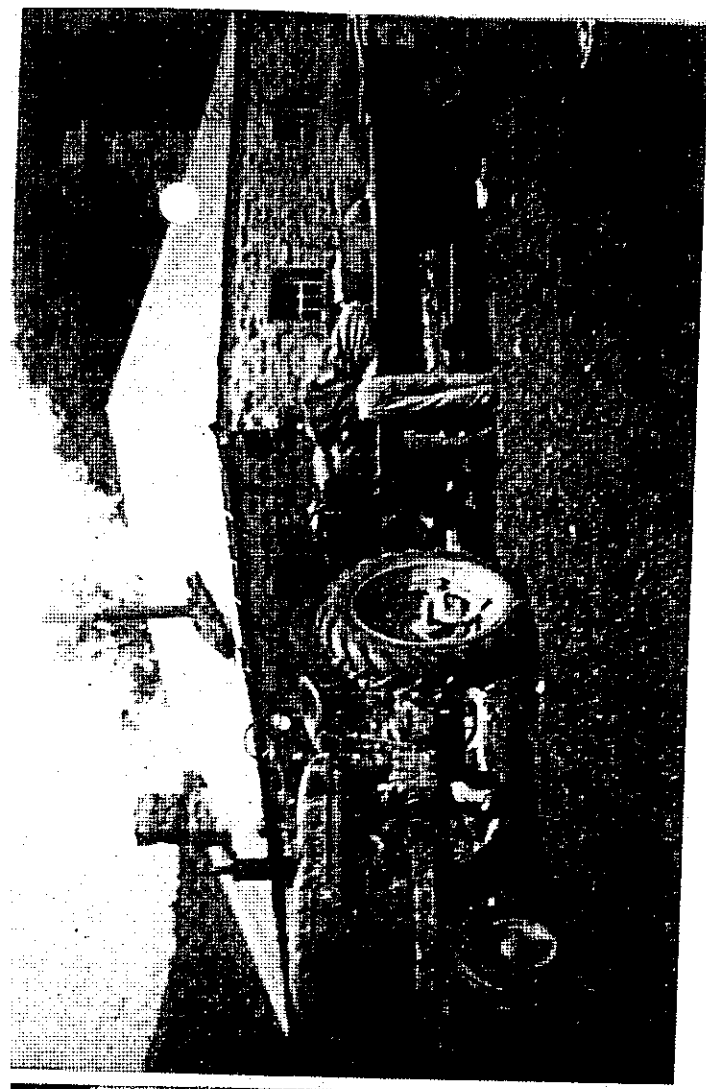


Figure 2a Ancient and Modern. Above: two views of the Whitten Creek farmstead house about 1949 (Photographs from Noel McMillan, Garston.) Below left: plan of the Whittens Creek house in 1989. Below right: a 20th century hut at Baileys Hill with old windows and modern paint work.

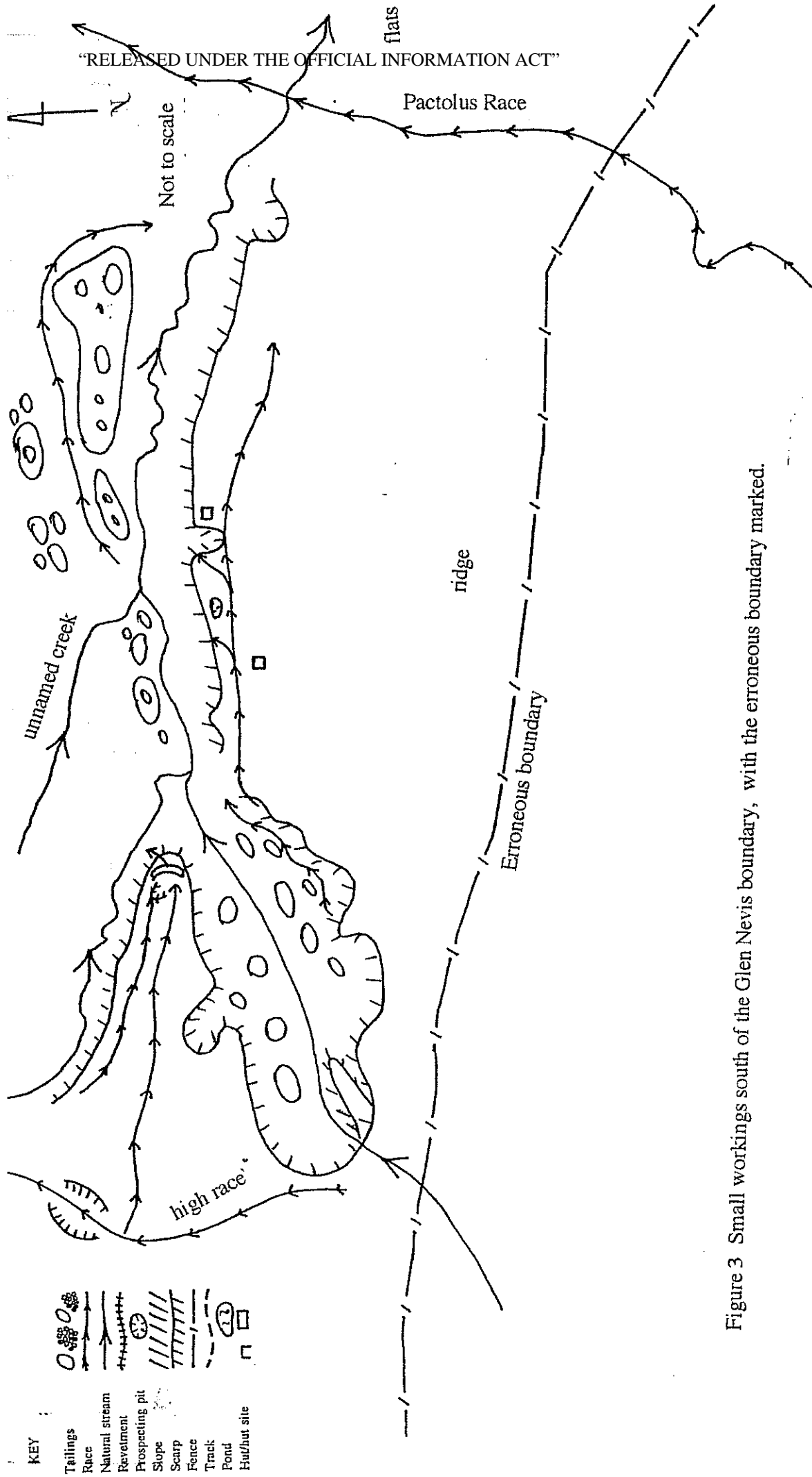


Figure 3 Small workings south of the Glen Nevis boundary, with the erroneous boundary marked.

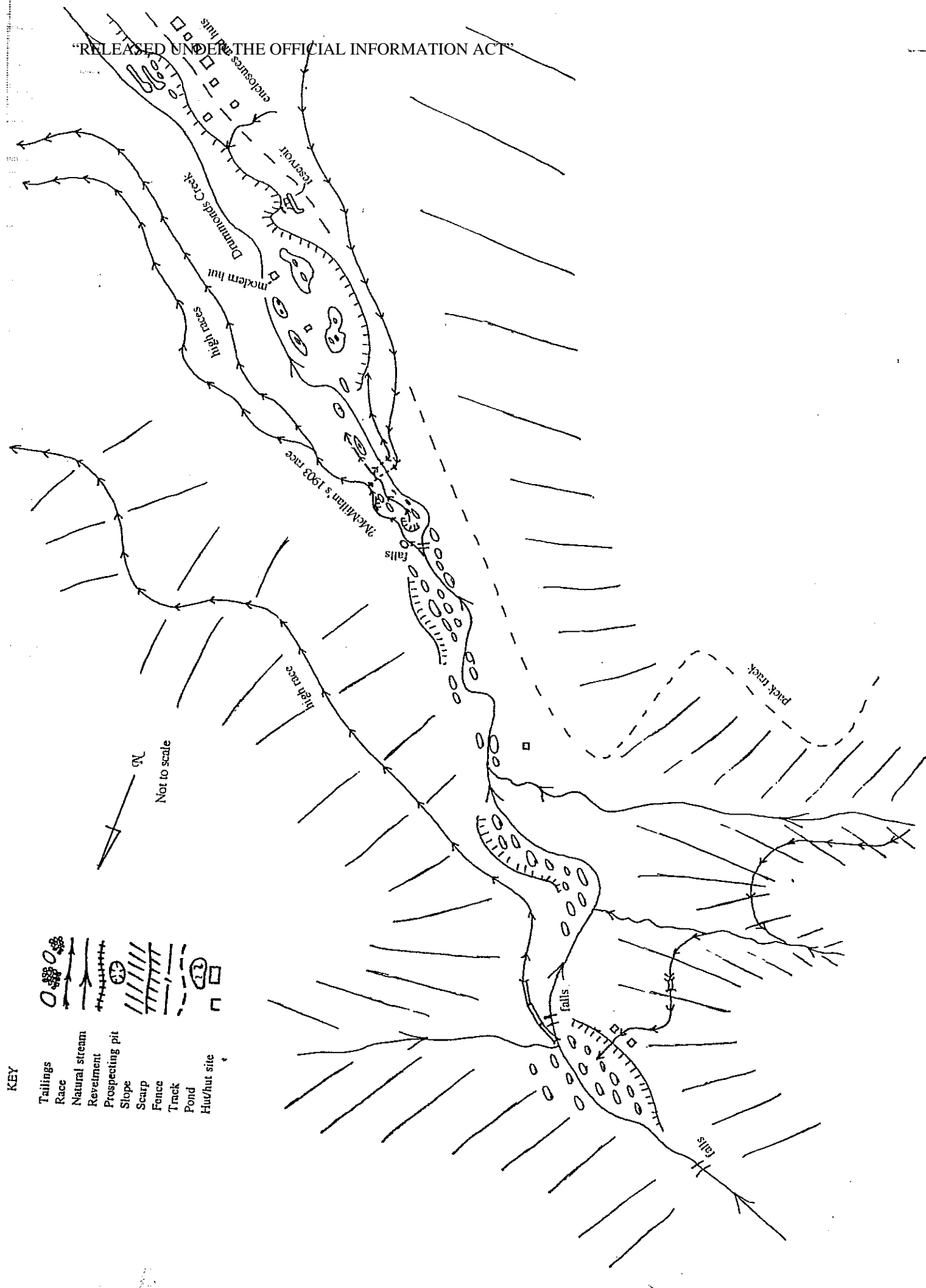


Figure 4. Drummonds Creek workings. Most of the races have been taken from the Topoplot map.