

Crown Pastoral Land Tenure Review

Lease name : PISGAH DOWN

Lease number : PO 248

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.

Note: Plans which form part of the Conservation Resources Report are published separately.

These documents are all released under the Official information Act 1982.

March 05

**DOC CONSERVATION RESOURCES REPORT
ON TENURE REVIEW OF PISGAH DOWNS
PASTORAL LEASE (P 248) UNDER PART 2 OF
THE CROWN PASTORAL LAND ACT 1998.**



TABLE OF CONTENTS

PART 1 1

INTRODUCTION 1

 1.1 Background..... 1

 1.2 Ecological Setting 1

PART 2 2

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

 2.1 Landscape 2

 2.1.1 (LU 1)- Pisgah..... 3

 2.1.2 (LU 2)- Upper South Branch Maerewhenua River..... 4

 2.1.3 (LU 3)- Middles 5

 2.1.4 (LU 4) Lower South Branch Maerewhenua River..... 6

 2.1.5 Significance of the Landscape 7

 2.2 Landforms, Geology & Soils 7

 2.2.1 Significance of the Landform and Geology..... 8

 2.3 Climate..... 8

 2.4 Vegetation 8

 2.4.1 Exotic pasture..... 9

 2.4.2 Short tussock grassland..... 9

 2.4.3 Snow tussock grassland 9

 2.4.4 Rock outcrop vegetation 10

 2.4.5 Shrublands..... 11

 2.4.6 Broadleaved forest 12

 2.4.7 Problem Plants 12

 2.4.8 Significance of Vegetation..... 13

 2.5 Fauna..... 14

 2.5.1 Invertebrate Fauna 14

 2.5.2 Significance of the Invertebrate Fauna and Habitats 16

 2.5.3 Herpetofauna..... 17

 2.5.4 Significance of the herpetofauna 19

 2.5.5 Avifauna..... 19

 2.5.6 Significance of Avifauna 20

 2.5.7 Aquatic Fauna 20

 2.5.8 Significance of Aquatic Fauna..... 21

 2.5.9 Problem Animals 22

 2.6 Historic..... 22

 2.6.1 Sites..... 22

 2.6.2 Significance of Historic Sites..... 23

 2.7 Public Recreation 23

 2.7.1 Physical Characteristics 23

 2.7.2 Legal Access 24

 2.7.3 Activities 24

PART 3 24

OTHER RELEVANT MATTERS & PLANS..... 24

 3.1 Involvement of Umbrella Groups etc 24

 3.2 Regional Policy Statements & Plans..... 26

 3.3 District Plans 26

 3.4 Conservation Management Strategies & Plans..... 27

3.5	Other Strategies and Plans	27
3.5.1	New Zealand Biodiversity Strategy	27
PART 4	28
MAPS ETC.	28
4.1	Additional information.....	28
4.1.1	References.....	28
4.1.2	Appendices.....	29
4.2	Illustrative Maps	31
4.3	Photographs.....	32

**DOC CONSERVATION RESOURCES REPORT ON TENURE REVIEW OF
PISGAH DOWNS PASTORAL LEASE (P 248) UNDER PART 2 OF THE CROWN
PASTORAL LAND ACT 1998.**

PART 1

INTRODUCTION

1.1 Background

The lessee of the Pisgah Downs Pastoral Lease (the Lease) has applied to the Commissioner of Crown Lands for a review of the property's pastoral lease tenure.

The Lease is leased by Pisgah Downs Limited. This 4280 ha property lies on a northeast/southwest axis, with the homestead being located at the lease's northern end, 40 minutes west of Oamaru. The lease rises from approximately 450 m on the northern boundary to 1643 m (Mt Pisgah) on the southern boundary.

The tenure review inspection of the lease was conducted by a multi-disciplinary team of 10 people from 8-10 December 2003.

1.2 Ecological Setting

The lease is within the Danseys Ecological District (ED), one of the three districts that make up the Kakanui Ecological Region. The ED of approximately 97,600 ha, covers the Kakanui Mountains and several northeast trending spurs that are separated by a number of streams which drain into the Maerewhenua and Kakanui Rivers. The landscape is mountainous with tussocklands being prominent, though areas of podocarp-broadleaf forest remain in steep gullies and other refugia. The climate is subhumid with cool winters and mild summers. Annual rainfall is 600-800 mm on the lowlands, rising to 1400 mm on the upper slopes of the Kakanui Mountains, while snow often lies on the tops for up to several weeks during winter (McEwen, 1987).

The ED was surveyed as part of the Protected Natural Areas Programme (PNAP) in the summer of 1989/90. An area within the lease was identified as a Recommended Area for Protection (RAP), being RAP 7: Pisgah. This RAP is approximately 1980 ha (of which approximately 690 ha is within the lease) of predominantly snow tussocklands and shrublands. The relevant extract from the Danseys ED PNAP Survey is attached as Appendix 1.

Marginal strips have been laid off along two sections of the South Branch Maerewhenua River (SBMR) which forms two sections of the lease's boundary; the first being part of the northern boundary, the second is part of the western boundary. Another marginal strip has also been laid off along Springs Creek (local name), a tributary of the SBMR.

The LENZ¹ (Land Environments of New Zealand) environments occurring on the lease (Q1.1, Q2.1, N3.1, Q1.2 and E3.1) are shown on table 1 in order of decreasing size.

Table 1: LENZ environments occurring on the lease

Environment	Area nationally (hectares)	Area in public protected land nationally (hectares)	% of area nationally in public protected land
Q1.1	662313	149285	22.5%
Q2.1	409,287	27,160	6.6%
N3.1	456,106	2778	0.6%
Q1.2	253,050	127,324	50%
E3.1	31550	791	2.5%

PART 2

INHERENT VALUES: DESCRIPTION OF CONSERVATION RESOURCES AND ASSESSMENT OF SIGNIFICANCE

2.1 Landscape

Methodology

The lease was divided into four landscape units; their boundaries are shown on plan 4.2.2. Assessment criteria were applied to each unit to help determine its distinctive character and landscape values with the overall appearance of each landscape unit being assessed by common descriptive terms which included landform, land cover and land use. The criteria used to assess and evaluate each unit’s landscape value were based on the following attributes.

- Naturalness –an expression of the degree of indigenous content of the vegetative cover and the extent of human intervention.
- Legibility –an expression of the clarity of the formative processes and how striking these physical processes are.
- Aesthetic values – which includes the concepts of memorability and naturalness. Aesthetic factors, which can make a particular landscape vivid, include simplicity in landform, muted colours and fine-textured ground cover.

A description of visual values is given and an assessment of each landscape unit’s vulnerability to change is made.

¹ LENZ, which is administered by the Ministry for the Environment, is a classification of New Zealand’s landscapes. LENZ uses a comprehensive set of climate, landform and soil variables chosen for their role in driving geographic variation in biological patterns. The LENZ classification units, termed *environments*, identify areas of land having similar environmental conditions regardless of where they occur in New Zealand.

Finally, visual values (a subset of landscape values that relate to the visibility of a particular landscape or natural feature as seen from key public viewing points) have also been assessed.

2.1.1 (LU 1)- Pisgah

Description

LU 1 encompasses the two head basins that penetrate into the main axis of the Kakanui Mountains. These two basins form the upper catchment of the SBMR and also include the highest peak (Mt Pisgah, 1,643m) along the mountain range.

Towards the west, LU 1 is bounded by the irregular ridge crest of the mountain chain. The southern boundary follows the top section of the Pisgah Spur, which is a prominent back slope projecting out from the Kakanui Mountains main axis to descend gradually towards the eastern downlands. LU 1 is defined in the north by a secondary (unnamed) spur that dips down towards the SBMR. The upper catchment area of the SBMR forms the eastern limits to the unit.

The unit's altitudinal range extends from 1,643m down to 750m.asl (in-stream channel of the SBMR) and includes the entire Pisgah grazing block. All the leases grazing blocks are identified on Map 4.2.4.

The two landforms that physically dominate LU 1 are the ridge crest of the Kakanui Mountains and the Pisgah Spur, with the latter featuring long planar side slopes that descend at a constant grade to the base of the Spur. A notable feature of the side slopes is the expansive areas of stable scree and deep erosion; in places strips of the scree extend to the base of the slopes. The lower section of the unit is typified by rock outcropping, particularly on the darker aspect slopes.

A well-formed and maintained access track leads to the summit of the Kakanuis and extends northwards along the summit to the adjoining Ben Ledi pastoral lease.

The composition and quality of the vegetation is strongly influenced by the stability of the underlying geology, harshness of the alpine environment and aspect. The dominant high alpine species is slim snow tussock that conveys varying stature and density depending on localized environmental conditions. The narrow-leaved snow tussock grades in within the subalpine zone and tends to become more abundant on the mid sunnier slopes. Secondary species that are strongly represented within the tussocklands include false spaniard, little blue tussock and a dwarf snowberry.

The majority of LU 1 was identified during the Danseys ED PNA survey as RAP 7: Pisgah.

Landscape Values

LU 1 has high inherent landscape values attributable to the domination of natural landscape patterns and physical processes. The natural weathering processes that have helped to shape the existing high and subalpine environment are clearly expressed in the form of stable scree faces; each scree conveying its own individual

visual outline. It is important that LU 1, in particular the area identified as RAP 7: Pisgah, is not assessed in isolation but is looked upon as an integral part of a coherent tract of high country that extends along the main axis of the Kakanui Mountains.

In aesthetic terms, the tonal range of the vegetation and weathered rock is limited to greys and browns, with the golden sheen of tussock cover appearing more prominently in the subalpine zone. The upper limits of the tussock cover generally have a “ragged” appearance that reflects the harshness of the climatic conditions.

Visual Values

LU 1 has a high visual resource value as it contains the Kakanui Mountains highest peak. Mt Pisgah is recognized as one of North Otago’s most outstanding natural features and is visually accessible from a number of vantage points including the full extent of the Kakanui Valley, coastal downlands and the eastern section of the Shag Valley.

Potential Vulnerability to Change

LU 1 has the potential to be adversely affected by changes in land use and activities, including the following:

- Spread of wilding pines.
- Further fragmentation of the existing land cover pattern, e.g. concentrated grazing patterns.
- Insensitive earthworks associated with bulldozed tracking and fence lines.
- The siting of communication installations within visually sensitive areas such as along crest lines.
- Disturbance to the fragile summit by uncontrolled access of 4WDs.

2.1.2 (LU 2)- Upper South Branch Maerewhenua River

Description

LU 2 incorporates the top section of the lateral spur and valleys that stem out from the head basins (defined in LU1). LU 2’s southern boundary is defined by the mid section of the Pisgah Spur (high point 1,478m), while the corresponding northern limit is the upper reaches of the SBMR. The unit’s western extent is the watershed of the SBMR, while its eastern limits follow an arbitrary line that basically follows the access track which crosses the lease close to the old hut site. LU 2 includes the majority of the Siphon and Hut blocks.

A typical cross-section of the unit is an alternating pattern of long planar sunnier slopes and steeper shady slopes, the latter featuring more hummocky terrain and rock outcropping. Prominent blocks of rock and patches of loose scree feature along the lateral spur’s crest. The drainage is representative of the watercourses that flow out from the eastern flanks of the Kakanui Mountains with the larger watercourses such as Spring Creek being contained within an incised channel that winds around the interlocking side spurs. The origins of many of these watercourses are the finger bogs that are located just below the ridgeline crests.

The vegetative cover is strongly influenced by variations in both altitude and aspect, with the sunnier slopes being clad in predominantly narrow-leaved snow tussock in association with ubiquitous golden spaniard, false spaniard and blue tussock. The alternating darker faces are clad in snow tussock of greater density and stature, and with more intertussock species.

LU 2's southwestern corner includes part of RAP 7: Pisgah, while a cultural feature is a series of old water-races, many of which have their headworks in both the SBMR and Spring Creek.

Landscape Values

LU 2 conveys high inherent landscape values attributable to the overall intactness of the tall tussocklands, with this overall sense of uniformity and subtle variations in tussock associations grading into the lower section of LU 1. The subtle changes in colour and texture of the tussock grasslands create a harmonious high country landscape.

The lower section of LU 2 forms a part of the transitional zone between the intact natural areas of the subalpine zone and the more modified tussocklands that have been progressively altered for production purposes.

Visual Values

LU 2 has only moderate visual resource value being obscured from public vantage points due to the parallel spurs and the undulating foothills.

Potential Vulnerability to Change

Changes in land use and activities, including the following, have the potential to adversely affect LU 2.

- Further fragmentation and modification to the tall tussock grasslands.
- Over-sowing and top dressing.
- Periodic burn-offs.
- Spread of wilding pines.

2.1.3 (LU 3)- Middles

Description

LU 3 includes the rolling hill country that forms the "middle ground" of the lease. The eastern boundary to the unit follows the crest of the lower and less distinguishable section of the Pisgah Spur, while in the west the limits follow the crest of the bottom section of the lateral spur (the upper section of which is described in LU 2). The north and south boundaries of the unit are relatively arbitrary and largely following gradual changes in the composition of the grasslands. This unit includes the majority of the Snowy and Stony blocks.

The landform within LU 3 generally represents the transformation from the mid altitude high hills to the more subdued physical relief of the foothills. The main physical components include a series of flat-top hills separated by concave gullies

which feature colluvial slopes that are regularly indented by depressions. A notable feature is the lack of exposed rock.

Similar to LU 2, old water races follow the contours around the mid slopes.

Much of the vegetative cover of LU 3 is low stature narrow-leaved snow tussock in association with short tussock and other intertussock species, especially golden spaniard. On the sunnier slopes, exotic grasses such as browntop and sweet vernal have replaced the secondary native species, while hawkweed is relatively conspicuous over the drier crests and upper side slopes.

Landscape Values

LU 3 has moderately high inherent landscape values, particularly within the upper and mid sections of the Stony and Snowy blocks. These still convey an overall visual impression of being clad in tall tussock, which results in a coherent landscape expressed by a simplicity and uniformity in the vegetation patterns. This pattern decreases with altitude, given the corresponding decrease in tussock.

Therefore, this “middle ground” can be described as the transitional zone between the high country that contains intact coherent values and the lower country where land development is most prominent.

Visual Values

As only localized views of its landform components are obtainable, LU 3 has only limited value as a visual resource.

Potential Vulnerability to Change

Changes in land use and activities, including the following, could adversely affect LU 3.

- Shelter planting.
- A high impact monoculture land use, e.g. plantation forestry.
- Spread of wilding pines.
- Burn-offs that have the potential to kill off the tussock.
- Further subdivision and land use intensification that would create unnatural geometric patterns, thereby affecting the existing strong sense of homogeneity.

2.1.4 (LU 4) Lower South Branch Maerewhenua River

Description

This unit comprises the portion of the lease to the northeast of LU 3. The landform is characterized by a complexity of flattened hilltops that are separated by twisting gullies. A notable natural feature includes the rocky gorge that contains the SBMR and a narrow craggy spur which forms a distinctive confluence between the river and a short tributary. The lack of physical relief is demonstrated by this unit’s narrow altitudinal range that extends from 850m (at the top yards within the Bogside grazing block) to 520m along the eastern boundary of the lease.

The vegetative cover gradually changes, with the upper sections of Bogside and Jacks grazing blocks still containing a wide distribution of tussock. The presence of tussocks becomes less conspicuous in the lower altitude country as farming practices intensify. Some of the lower tributaries that feed into the SBMR still contain mixed broadleaved shrublands. LU 4 is accessible by McKenzies Road, which once entering the lease changes into the all-weather access track that leads to the summit of the Kakanui Mountains.

Landscape Values

Overall LU 4 has moderately low landscape values owing to the extensive conversion of the original cover into improved pasture. However, the steep dissected gullies that contain regenerating broadleaf shrublands are visually dramatic and clearly indicate the formative legible processes that have created this hewn landscape.

Visual Values

LU 4 has a limited visual resource value owing to the lack of physical relief of the rolling hill country.

Potential Vulnerability to Change

Further grazing of remnant shrublands, especially the removal of palatable species has the potential to adversely affect this unit.

2.1.5 Significance of the Landscape

Both LU 1 and LU 2 interconnect with the wider recognizable character of the eastern flanks of the Kakanui Mountains, which are represented in an altitudinal sequence of landforms that include a section of the main mountain axis (including Mt Pisgah) followed by a block of dissected high hills (including Pisgah Spur) which merge with the lower rolling hill country.

Mt Pisgah and the extensive bare areas are outstanding natural features; the peak being a prominent landmark within North Otago, while the screes each have their own individual outline and signature.

LU 3 makes a positive contribution to the landscape character of the eastern flank of the Kakanui Mountains due to the overall impression of intact tall tussocklands, which serve as a buffer for LU 1 and 2. From a scenic perspective which relates to aesthetic appeal, the subtle variations between the tussock communities are a memorable feature of the lease.

The steep dissected gullies that contain regenerating broadleaf shrublands are visually spectacular.

2.2 Landforms, Geology & Soils

Landforms and Geology

The Kakanui Mountains, one of several uplifted and tilted fault blocks in Central Otago, were formed by reverse faulting along the NW-SE trending Waihemo fault

system (Cotton 1917). Pisgah Downs is part of the gently inclined backslope descending gradually eastward towards the Waitaki River. This backslope is believed to be a surface formed under periglacial climatic conditions and may in places be parallel to a much lower, former stripped Cretaceous peneplain surface. Deeply incised streams have formed steep mountain slopes.

The topography of the lease has been influenced by the north-eastern trending faults of the Maerewhenua and Danseys Pass faults (Bishop 1974). Bedrock is mainly moderately to highly metamorphosed schists (Bishop 1979; Mutch 1963).

Soils

The lease contains part of Geopreservation Site, being No. 299 Pisgah. The boundary of this site corresponds to that of RAP 7: Pisgah. The portion of Geopreservation site No. 299 within the lease is characterised steep colluvial mountain slopes with broad intervening ridges, extensive coarse screes and large slumps. The soils are upland yellow-brown earths (Kaikoura) (Arand *et al.*, 1991).

2.2.1 Significance of the Landform and Geology

The portion of Geopreservation site No. 299 contained on the lease is of national importance as it has a considerable diversity of upland yellow-brown earth/vegetation associations and the most extensive area of scree and alpine fellfield in the ED (Arand *et al.*, 1991). Appendix 2 contains a comprehensive description of Pisgah (299) (Arand *et al.* 1991, p.87).

2.3 Climate

Pisgah Downs has a continental type climate with hot summers and cold winters. Rainfall per annum varies from approximately 550 mm at the northern boundary to approximately 1000 mm on the southern boundary. Summer droughts are frequent, and winters are typically long and cold with severe frosts and snow. Snow often lies above 900m during winter. Fogs from coastal easterly winds are a feature of the area (MacDonald, 1970).

2.4 Vegetation

Vegetation and habitat descriptions

Six main vegetation and habitat types were recognised, being:

- a) exotic pasture;
- b) short tussock grassland;
- c) tall tussock grassland;
- d) rock outcrops;
- e) shrubland; and
- f) broadleaved forest.

A list of the recorded vascular plant species is provided in Appendix 3.

2.4.1 Exotic pasture

Pasture dominated by exotic grasses, herbs and rushes is widespread over the northern areas of the lease at lower elevations, particularly in the Maerewhenua and 500 Acre blocks. Pasture vegetation forms a mosaic with areas of short tussock grassland. Narrow-leaved snow tussock (*Chionochloa rigida*) plants are present locally. Occasional rocky areas support mixed shrubland communities and stands of the shrub *Olearia bullata* are often present in moist gullies. Dry, sunny aspects on moderate slopes tend to be dominated by mouse-ear hawkweed (*Hieracium pilosella*). As altitude increases, exotic pasture intergrades with tussock grassland.

2.4.2 Short tussock grassland

The short tussock grasslands are sometimes extensive within areas otherwise dominated by exotic pasture, most commonly on broad, flat-topped interfluvies between 700-800 m. The dominant short tussock species are hard tussock (*Festuca novae-zelandiae*) and silver tussock (*Poa cita*). These two species segregate to some extent along a fertility gradient, with silver tussock dominating more fertile and heavily grazed sites, but mixtures of the two are common in intermediate sites. The presence of occasional remnants of narrow-leaved snow tussock suggest that these short tussock grasslands have been induced following degradation of tall tussock grassland. Intertussock areas are dominated by exotic grasses and herbs, but small native herbs are common, particularly *Anisotome aromatica* and *Celmisia gracilentia*.

2.4.3 Snow tussock grassland

Tall tussock grassland dominated by narrow-leaved snow tussock becomes more or less continuous above 800 m, descending to lower altitudes on shady aspects. Hard tussock is a common intertussock species, with silver tussock localised on more fertile sites. The tall tussock cover has become locally denuded in some areas, notably in the Hut block near the boundary with Snowy. These grasslands become more diverse in gullies, with occasional *Olearia bullata*, subshrubs of *Gaultheria macrostigma* and *G. crassa*, and a range of herbaceous species, including *Anemone tenuicaulis*, *Oxalis magellanica*, *Viola cunninghamii*, *Celmisia gracilentia*, *Geum leiospermum*, *Anisotome aromatica*, *Acaena caesiiglauca*, *Astelia nervosa* and golden spaniard (*Aciphylla aurea*). Mid-elevation seepages within these grasslands are characterised by *Shoenus pauciflorus*, *Carex coriacea*, *Juncus gregiflorus* and *J. planifolius* with the occasional exotics musk (*Mimulus moschatus*) and bog stitchwort (*Stellaria alsine*). Many small herbs are also present, including *Celmisia gracilentia*, *C. graminea*, *Galium perpusillum*, *Gentianella grisebachii*, *Euchiton traversii*, *Ophioglossum coriaceum*, *Ranunculus multiscapus*, and *Viola cunninghamii*. On the drier margins of these seepages, *Anisotome aromatica*, *Pentachondra pumila*, *Herpilirion novae-zelandiae*, and *Kelleria dieffenbachii* are common.

At altitudes above 1,300 m, tussock grassland is dominated by slim snow tussock (*Chionochloa macra*). Intertussock plants include golden spaniard, blue tussock (*Poa colensoi*), *Brachyscome sinclairi*, *Pimelea sericeo-villosa*, *Lycopodium fastigiatum*, *Ranunculus multiscapus*, *Kelleria dieffenbachii*, *Celmisia sessiliflora*, *Taraxacum magellanicum*, and the shrub *Ozothamnus leptophyllus*. Above 1,400 m, *Ozothamnus leptophyllus* becomes less frequent, with turpentine shrub (*Dracophyllum uniflorum*) increasing in abundance. Prominent herbs are the false spaniard *Celmisia lyallii*, *Celmisia viscosa* and *Ourisia sessilifolia*. Small cushion bogs and seepages in these grasslands contain many species including *Acaena saccaticupula*, *A. tesca*, *Oreobolus pectinatus*, *Psycrophila obtusa*, *Plantago lanigera*, *Anisotome imbricata*, *Cardamine corymbosa*, and *Ranunculus multiscapus*. The exotic grass sweet vernal (*Anthoxanthum odoratum*) and mouse ear hawkweed are present in these cushion areas, but at low abundance. Local areas of scree are common, and become more extensive as elevation increases. The scree buttercup *Ranunculus haastii* is locally abundant on some fine screes, descending to 1,200 m. Comrie (1992) recorded this species in Dansey RAP 7, associated with Mt Pisgah, but not elsewhere in the ED. Blocky screes below rock outcrops support a distinctive vegetation in which *Blechnum penna-marina*, *Myrsine nummularia*, *Polystichum cystostegia*, *Coprosma cheesemaniae*, porcupine scrub (*Melicactus alpinus*), and *Acaena caesiiglauca* are prominent.

2.4.4 Rock outcrop vegetation

Rock outcrops add an important element of habitat diversity to the lease. Outcrops are less common at low elevations but become prominent in tussock grasslands as altitude increases.

At low elevations, occasional rocky areas in pasture and short tussock grassland are fire and grazing refugia supporting mixed shrub communities comprising kowhai (*Sophora microphylla*), *Coprosma rigida*, *C. crassifolia*, *C. propinqua*, porcupine shrub, matagouri (*Discaria toumatou*), lawyer (*Rubus schmidelioides*), *Muehlenbeckia complexa*, bracken (*Pteridium esculentum*), golden spaniard, narrow-leaved snow tussock and hard and blue tussock.

At mid elevations (800-1,000 m), low rock outcrops on spurs provide habitat for many small plants, including the subshrubs *Gaultheria crassa*, *Pimelea oreophila*, and *Leucopogon colensoi*, the herbs *Geum leiospermum*, *Anisotome flexuosa*, *Raoulia glabra*, *Anaphalioides bellidioides*, and *Colobanthus strictus*, the sedges *Carex breviculmis* and *Luzula banksiana*, and the grasses blue tussock and *Poa lindsayi*.

Higher up (1,100-1,400 m), tall rock outcrops provide habitat for larger shrubs, including the turpentine shrubs *Dracophyllum longifolium* and *D. uniflorum*, *Coprosma pseudocuneata*, and porcupine shrub. On one large outcrop at the top of Siphon block a single tree of *Phyllocladus alpinus* was seen. This record is significant in that it represents the presence of a former vegetation type that has largely been eradicated by historic fires. Several subshrubs are also present on these outcrops, including *Hebe buechananii*, *Kelleria dieffenbachii*, *Leucopogon fraseri*, *Pimelea oreophila*, *P. traversii* and *Dracophyllum pronum*. Herbaceous turfs comprise a diverse flora including *Anisotome aromatica*, *Carex wakatipu*, *Schizeilema*

hydrocotyloides, *Raoulia grandiflora*, *Celmisia prorepens*, *Phyllachne colensoi*, *Neopaxia sessiliflora*, *Craspedia lanata*, and *Ranunculus multiscapus*, the small ferns *Blechnum penna-marina* and *Hymenophyllum multifidum*, and the grasses blue tussock, *Poa kirkii* and *Koeleria novo-zelandica*. The exotic king devil hawkweed (*Hieracium praealtum*) is also present on these outcrops.

2.4.5 Shrublands

Shrublands on the lease consist of open shrublands on steep, dry faces at low altitudes, closed shrublands associated with broadleaved forest remnants, riparian shrublands in montane tussock grassland, and patches of high elevation shrubland that occur in gullies just above the probable former treeline.

Dry, open shrublands are restricted to steep, sunny faces above the SBMR, extending discontinuously from the northern boundary of the lease upriver for 2-3 km, where moister conditions cause a transition to closed shrubland and broadleaved forest. Dry shrublands are best represented on the face centred on grid reference (GR) I41 128762. Matagouri and *Coprosma propinqua* are the dominant shrubs, but many other shrub species are present at lower abundance, including *Carmichaelia petriei*, *Helichrysum aggregatum*, porcupine shrub, *Coprosma crassifolia*, *C. virescens*, kowhai, tutu (*Coriaria arborea*) and *Haloragis erecta*. Several lianes, namely *Muehlenbeckia complexa*, *Rubus schmidelioides*, *R. squarrosus*, and *Calystegia turguriorum* are present. Distinctive dryland ferns include *Cheilanthes sieberi*, *Asplenium flabellifolium*, *Pellaea rotundifolia*, and *Polystichum*. Herbaceous plants (*Lepidium desvauxii* [not conclusively identified], *Dichondra brevifolia*, *Einadia allanii*, *Oxalis exilis*, *Acaena juvenca*, *A. novae-zelandiae*, *Epilobium cinerium*, *Geranium sessiliflorum*, *Urtica incisa*, *Anisotome brevistylis*, *Juncus distegus*, and grasses (hard tussock, blue tussock, silver tussock, *Rytidosperma unarede*) are scattered among the shrubs. Exotic species include Himalayan honeysuckle (*Leycesteria formosa*), nodding thistle (*Carduus nutans*) and horehound (*Marrubium vulgare*).

In places, domestic stock have intensively used these dry shrublands (such as GR I41 139770), resulting in accelerated soil erosion and much bare ground. None-the-less, these shrublands still retain the expected range of native shrubs and trees, native herbs and grasses and ferns are diverse, if sparsely distributed. Groves of mature kowhai occur locally.

Moistening conditions allow a transition to closed shrublands, often flanking remnants of broadleaved forest. *Coprosma rugosa*, *C. propinqua*, *C. rubra*, tutu (*Coriaria arborea*), *Fuchsia perscandens*, *Hebe salicifolia*, *Carmichaelia australis*, *Olearia bullata*, and occasional *Olearia lineata* are common shrubs. Saplings and small trees of the forest species kowhai, *Coprosma linariifolia*, marble leaf (*Carpodetus serratus*) and kohuhu (*Pittosporum tenuifolium*) are also common. These reflect a succession to broadleaved forest. Herbaceous species include *Anisotome brevistylis*, *Acaena anserinifolia*, *Cardamine corymbosa*, *Oreomyrrhis ramosa*, *Aciphylla scott-thompsonii*, *Libertia ixioides*, *Corybas macranthus*, toetoe, (*Cortaderia richardii*), *Carex breviculmis*, *C. dipsacea*, maori onion (*Bulbinella angustifolia*), bush flax (*Astelia fragrans*), and the ferns *Blechnum novae-zelandiae*,

B. chambersii, *B. penna-marina*, hounds tongue fern (*Microsorium pustulatum*), prickly shield fern (*Polystichum vestitum*), *Asplenium richardii*, and hen and chicken fern (*A. bulbiferum*). Lianes in these shrublands include *Rubus cissoides*, *R. schmidelioides*, *Scandia geniculata*, *Parsonsia capsularis*, *Muehlenbeckia complexa* and *Clematis foetida*. Tussock hawkweed (*Hieracium lepidulum*) is common within these shrublands.

Linear riparian shrublands are commonly found in both exotic pasture and tussock grassland. Typical species are *Coprosma rugosa* and *C. propinqua*, *Olearia bullata*, *Rubus cissoides*, golden spaniard, *Aciphylla scott-thompsonii*, *Anisotome brevistylis*, *Coriaria sarmentosa*, mountain flax (*Phormium cookianum*), the grasses toetoe, blue tussock, and *Chionochloa conspicua*, and the ferns *Asplenium richardii*, prickly shield fern, and kiokio (*Blechnum novae-zelandiae*).

High elevation shrublands are found in the basins below Mt Pisgah, generally on the faces of gullies at elevations of 1,000 - 1,200 m. They often occur below the blocky lower margins of screes. These shrublands occur on relatively fertile sites and are very diverse. Snow totara (*Podocarpus nivalis*), porcupine shrub, *Hebe odora*, *H. buchananii*, *H. rakaiensis*, *Ozothamnus leptophyllus*, *Brachyglottis cassinioides*, *Coprosma depressa*, and *C. cheesemanii* are commonly represented, along with occasional *Olearia cymbifolia*. Golden spaniard and *Aciphylla scott-thompsonii* are prominent, the latter particularly so in gully bottoms. *Astelia nervosa* is locally abundant in sites where stock access is limited. *Hebe pauciramosa*, *Schoenus pauciflorus*, *Ranunculus enysii* and *Dolichoglottis lyallii* occur on wet areas within these shrublands. The exotics *Hieracium praealtum*, white clover (*Trifolium repens*) and sweet vernal are common in the vicinity of these shrublands. On drier, rocky areas, *Dracophyllum longifolium* is prominent, with mountain flax and golden spaniard.

2.4.6 Broadleaved forest

Remnants of broadleaved forest are restricted to steep, moist faces associated with tributaries of the SBMR. These remnants form a near-continuous riparian strip of varying width, along several kilometres of river face, and are associated with similar vegetation on the true left bank of the river in Ben Ledi pastoral lease (Allen 2002). Broadleaf (*Griselinia littoralis*) is present in all remnants, with lancewood (*Pseudopanax crassifolium*), kohuhu, cabbage tree (*Cordyline australis*), marble leaf, kowhai, and lemonwood (*Pittosporum eugenioides*) also locally present in the canopy. Totara (*Podocarpus hallii*) trees are occasionally emergent in these forests and represent a podocarp component that would formerly have been much more abundant. Many closed shrubland species (see above) are present as understory and ground cover species within these forest remnants. Within the ED, indigenous forest is very rare north of the Kauru River (Comrie 1992).

2.4.7 Problem Plants

Woody species

The lease is remarkably free of woody weeds. Brier (*Rosa rubiginosa*) and Himalayan honeysuckle (*Leycesteria formosa*) are present at low abundances in dry shrublands

above the SBMR. Gorse (*Ulex europaeus*) and wilding pine trees (species unknown) are rare at mid elevations in tussock grassland. The current low abundances of these species enhance the prospects of eradication if control was undertaken promptly, although monitoring may show that the former two species do not present an imminent threat.

Herbaceous species

Mouse-ear hawkweed (*Hieracium pilosella*), king devil hawkweed (*H. praealtum*) and tussock hawkweed (*H. lepidulum*) are all common on the lease. The former is prominent on sunny aspects at low altitudes in snow tussock grassland, while tussock hawkweed is present in moist shrublands and king devil at higher altitudes. Pasture weeds such as nodding thistle (*Carduus nutans*) and horehound (*Marrubium vulgare*) are also present, but do not threaten ecological values. It is not feasible at present to eradicate *Hieracium* species, but the abundance of these and other herbaceous weeds could be limited by management that maintains or increases vegetation stature and density. The exception is the presence of king devil hawkweed on rock outcrops, which will not be greatly affected by such management.

2.4.8 Significance of Vegetation

The lease contains an extensive tract of relatively unmodified tall tussock grassland that covers a wide altitudinal range and supports a variety of habitats for indigenous species. These grasslands form part of RAP 7 identified by Comrie (1992) and ranked highly for all PNAP criteria, barring a moderate susceptibility to fire.

The dry, open shrublands on faces of the SBMR appear to be very rare within the ED, as this vegetation type was not recognised in the PNAP report of Comrie (1992). These shrublands contain a number of distinctive dryland species. Shrublands such as these are probably more typical of montane areas of the Duntroon and St Mary Ecological Districts, but these areas have now been subject to considerable modification by agricultural practices and invasion of exotic shrubs, hence native shrublands have become severely restricted even in these two EDs.

Also present are remnants of indigenous forest that were formerly more extensive but are now extremely limited within the ED, as, in general, indigenous shrubland and forest habitats are very restricted within the North Otago region, particularly dry shrublands and forest remnants containing podocarps. These form a semi-continuous tract of forested faces above several kilometres of waterways and are very significant in retaining forest ecosystem processes within the ED.

The grasslands, shrublands, and forests provide habitat for several threatened and uncommon species as well as several that are at their distribution limits.

The following species recorded on the lease shown on table 2 below are listed by Hitchmough (2002) as being nationally threatened.

Table 2: Nationally threatened plant species recorded on the lease

Threat of extinction classification	Species	Detail
Sparse	<i>Anemone tenuicaulis</i>	Herb- recorded in moist gullies in middle portion of the lease.
	<i>Olearia bullata</i>	Shrub- recorded extensively in moist areas.
	<i>Olearia lineata</i>	Tree- recorded in fire refugia at the northern portion of the lease
Range restricted	<i>Acaena tesca</i>	Bidibidi- recorded in association with high altitude cushion bogs and seepages.
	<i>Hebe buchananii</i>	Shrub- recorded in high elevation shrublands
Data deficient	<i>Lepidium desvauxii</i> [not conclusively identified]	Herb- recorded in dry shrublands in northern portion of the lease.

The native bidibids *Acaena tesca* and *A. saccaticupula* have not been previously recorded from the Kakanui Mountains and extend the southeastern limits of both species. The nearest known populations of both species are approximately 20 km westward, on the Ida Range.

The scree buttercup *Ranunculus haastii* reaches a southeastern limit in the Kakanui Mountains, and may be restricted to the Mt Pisgah area (Comrie 1992), while the native broom *Carmichaelia australis* has been recorded infrequently from the Kakanui Mountains, where it reaches its southern limit on the east coast.

The podocarps Hall’s and snow totara (*Podocarpus hallii* and *P. Nivalis* respectively); and mountain toatoa (*Phyllocadus alpinus*) were historically widespread but are now very rare in the ED.

2.5 Fauna

2.5.1 Invertebrate Fauna

Weather during the survey varied from foggy through fine and sunny to heavily overcast and the evenings were cool.

Invertebrates were predominantly hand-collected during the survey, though a night-time collection was made at a UV light beside a creek at the start of a small rocky gorge in the lower part of Bushy block (GR I41 130 751). This was in an area with riparian woody vegetation and shady rockfaces, with pasture some distance away.

Faunal setting

Vegetation on the lease reflects that of the ED generally, with formerly widespread tussockland increasingly overtaken from lower to upper-mid altitudes by introduced pasture species. Wet flushes and/or seepage zones occur at some sites. Forest, which once probably covered much of the lease except at the highest altitudes, is largely restricted to remnants along riparian zones, in gorges and on steep slopes falling to streams. Bare rock faces occur sporadically throughout the lease, as outcrops and small tors on ridges and spurs and small bluffs and gorges in the gullies. Screes of both fine and coarser material are present, especially at higher altitudes, and there are rock pavements and a small rubbly fell field north of Mt Pisgah's summit.

Patrick (1991) recorded one species, the spider *Hexathele ramsayi*, having its type locality within the ED (at Mt Dasher pastoral lease approximately 10 km to the southeast). He also states that several undescribed Lepidoptera were first recognised on Dansey material. The ED may therefore now be the type locality for some of these species. Patrick considered the ED to have a rich invertebrate fauna.

Invertebrate habitats

Tussocklands are the most widespread natural to semi-natural habitat on the lease. Through much of the Pisgah block the tussocklands have a diversity of indigenous inter-tussock plant species, creating ideal habitats for a diverse indigenous grasslands fauna. Adventive plant species are largely absent from the better quality sites, but become rapidly more conspicuous at lower altitudes. A rich diurnal invertebrate fauna was apparent through the tussocklands when conditions were warm and/or sunny. This included the tussock butterflies *Argyrophenega janitae* and *A. antipodum*, a range of moth species, grasshoppers and many Diptera and Hymenoptera.

Rocky habitats are scattered through the lease. Along the higher sections of Pisgah Spur and around Mt Pisgah itself are numerous rocky areas ranging from moderately extensive pavements being actively eroded by frost action to small, well-vegetated outcrops. There is also a small fell-field of large blocks. Lower down, rock outcrops form small tors, especially notable on the boundary of Pisgah and Hut blocks and along the upper part of the Hut/Siphon boundary. A more isolated outcrop with a good mix of habitats occurs near the road at the top of Snowy block. Schist outcrops, occasionally rising to tors, are scattered through many of the lesser spurs and ridges also. The outcrops provide habitat for mosses and lichens, and often have a mixture of herbs and small woody species around their bases or rooted in cracks. In addition, rockfaces occur on some of the steep slopes falling to the more deeply incised creeks and several creeks have small rocky gorges. Small screes are scattered through the higher altitudes, especially close to the higher sections of Pisgah Spur and around Mt Pisgah. The screes range in composition from fine to quite coarse materials.

The fauna reflects these rocky habitats, from the scree and pavement inhabiting grasshopper *Brachaspis nivalis* to those specialist moth species whose larvae feed on mosses or lichens on rockfaces.

Small wet seeps and flushes occur in a number of places through the lease. An extensive seepage/flush zone, presumed to be caused by bedrock lying close to the soil surface, occurs at the top of Bogside block. This large area of wet vegetation

adds significant invertebrate habitat diversity to the tussocklands.

Woody vegetation and bush remnants along riparian zones, in gorges and on steep slopes falling to creeks provide refuges for a range of invertebrate species which would once have been more widespread through the area.

Invertebrate fauna

Invertebrate specimens collected during the survey and identified by Otago Museum staff are listed in Appendix 5. The fauna sampled is representative of both the area (with a mixture of southeastern South Island endemics and more widely distributed species) and the range of habitats on the lease.

Although just 24 species of moths were collected, compared with 258 species listed by Patrick (1991) for the Danseys ED, at least four species do not appear on Patrick's list. Three of these, being *Wiseana fuliginea*, the plutellid "*Plutella*" *psammochroa*, the gelechiid *Isochasta paradesma* are rare in the ED. The fourth, being the geometrid *Helastia plumbea*, represents a new record for the ED.

W. fuliginea and possibly "*P.*" *psammochroa* are associated with wet grasslands and the larvae of *Isochasta paradesma* are found in galls on *Coprosma* species. *Helastia plumbea* occurs widely in rocky areas of the South Island where its larvae feed on mosses on rockfaces. This species is normally more western in its distribution. A fifth species, the plutellid *Orthences semifaciata* is also absent from Patrick's list, but the specimen was not entirely separable from the similar species *O. similis*, which Patrick had recorded from the ED. Both species are widespread but very localised, occurring in low subalpine shrublands where their larvae feed on *Dracophyllum*. Both species are considered to be good finds for the survey.

In addition to the specimens listed in Appendix 5, many other species were observed but not collected or not identified. For example, creeks with good riparian vegetation (such as in Spring Creek block) were observed to have large numbers of adult caddis, mayflies and other aquatic taxa representing several species. Large dragonflies of the genus *Uropetala* were often seen. In the tussocklands two species of tussock butterfly, *Argyrophenga antipodum* and *A. janitae* were present and butterflies of the common copper complex noted. A diurnal geometrid moth, probably *Paramotoreas* sp., eluded capture near the summit of Pisgah block. A female scree weta was found near Mt Pisgah, where Patrick (1991) describes them as 'locally common'. Diptera which were seen and/or captured but not identifiable included robberflies, tachinids, muscids, picture-wing flies and other groups.

There was no sign (including feeding sign) of either of the two species of speargrass weevils found further south in the ED by Patrick (1991), however, it might have been too early in the season for these species to be active.

2.5.2 Significance of the Invertebrate Fauna and Habitats

The higher part of the leasehold fine examples of the range of habitats occurring at higher altitudes in the Kakanui Mountains. These include extensive tussocklands with

indigenous inter-tussock plant species, rock outcrops and tors, pavements and fellfield, screes of variable particle size, and small seeps and flushes associated with the heads of streams. These habitats are home to the expected large range of indigenous invertebrate species.

In the mid-altitudes good tussock habitat is found also in much of the Snowy and Tussock blocks and the upper part of Bogside. In the latter, this is associated with a large seepage zone or flush, which adds significant invertebrate habitat diversity.

Riparian zones combining good streamside habitat with plant diversity occur along the main stream in Hut block, especially above the track, and along the same stream in Spring Creek and Yoemans blocks. The stream itself provides a good mix of habitats for aquatic fauna, there is good plant diversity and a range of streamside microhabitats along the riparian zone. These areas provide habitat for a range of plant specialists and for many species which require sheltered, moist habitats.

Remnant shrublands/woodlands associated with incised stream gullies and gorges occur in lower Bushy block and Maerewhenua block. The large stand along the gully in the latter block holds a good diversity of tree and shrub species and is likely to be a refuge for a fauna which was once much more widespread in the ED.

Habitats like the sunny faces at the northern end of the lease with remnant grey scrub/kowhai communities are often significant for a rich range of invertebrates, and, accordingly are given a high conservation status here.

Wiseana fuliginea, the plutellid "*Plutella*" *psammochroa*, the gelechiid *Isochasta paradesima* are rare in the ED. *Helastia plumbea* was not recorded by Patrick during his more extensive surveys of the ED and this record therefore represents a range extension.

2.5.3 Herpetofauna

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

The lease was surveyed for lizards over three days. Overall temperatures were warm whilst conditions varied from fine, to foggy, to overcast. Good coverage was achieved through tussock grassland and scree habitat. Shrubland searches were not as comprehensive due to access and weather constraints.

No previous lizard surveys on the lease are known. A search of records on the

herpetofauna database found that common skinks (*Oligosoma nigriplantare polychroma*) and McCann's skinks (*Oligosoma maccanni*) have been recorded along the Maerewhenua Spur, 0.5 to 2.5 kilometres from the lease boundary. Records for these two species are also present on the southwestern slopes of the Kakanui Range 2.5 km downslope from Mount Pisgah. The gecko *Hoplodactylus maculatus sl* and green skink (*Oligosoma chloronoton*) have also been found at these sites.

The lizard populations on the lease are subject to predation by the full suite of introduced mammalian predators including feral cats, mustelids, rodents and hedgehogs. Predation and habitat modification represent the greatest threats to the herpetofauna on mainland New Zealand.

Historically, a lizard community of up to eight species may have been present on the lease (Whitaker *et al.* 2002). The following three species were found during the tenure review inspection: McCann's skinks (*Oligosoma maccanni*), Common skinks (*O. nigriplantare polychroma*) and a gecko within the *Hoplodactylus maculatus* complex. All records are recorded in Appendix 6.

McCann's skinks were seen out a range of altitudes on the lease, inhabiting both tall- and short-tussock areas, including more modified sites. Common skinks were less common but similarly distributed. An analysis of these records and those from neighbouring properties indicates that both of these species are likely to be widely distributed throughout the lease, but less abundant at more modified locations.

The gecko within the *Hoplodactylus maculatus* complex is believed to be *H. maculatus* "Otago/Southland Large" (Hitchmough 1997, Whitaker *et al.* 2002). They were found throughout the lease in suitable retreat sites, from ridge crests to valley floors. The exception is in the lower north eastern third of the lease where none were found (Appendix 6). It is likely this is due to greater habitat modification, although they are likely to be present at less modified microsites.

Given the relatively high lizard activity in those species found and the variety of remaining intact habitat on the lease the likelihood of other species being present is reasonably high. Consideration is given to these remaining species below.

The jewelled gecko (*Naultinus gemmeus*) has been recorded 20 km to the south in the Waianakarua catchment. Suitable jewelled gecko habitat was recorded adjoining the lease boundary with the main course of the SBMR, and also in the main tributary running through the lease. The presence of this gecko on the lease is therefore probable, but uncertain.

The green skink (*O. chloronoton*) is known from approximately 2 km west of the lease (herpetofauna database). At these locations, green skinks inhabit rocky slopes and boulder banks within grassland and shrubland. This habitat is common on the lease, however no green skinks were found. The presence of this skink on the lease therefore is probable, but uncertain.

Cryptic skinks (*Oligosoma inconspicuum*) usually inhabit damp microsites in grassland, herbfield or open shrubland (Whitaker *et al.* 2002). The nearest known record is approximately 15km (near Kokonga, Whitaker *e. al.* 2002). Suitable habitat was common in the bottom of gullies throughout most of the lease. None of these

skinks were seen during the inspection so their presence on the lease remains uncertain.

Another skink to be considered is the scree skink (*O. waimatense*). In Otago, scree skinks are only known from active greywacke scree in montane tussock grasslands between 800-1250 m (Whitaker *et al.* 2002). Although apparently suitable habitat is present throughout much of the Kakanui Mountains the nearest known scree skink sites to the lease are approximately 30 km to the northwest in the Ida Range (currently the southern and eastern distributional limit for this species). Suitable habitat is present on the lease, however, no scree skinks were seen.

A gecko within the *H. granulatus* complex may possibly occur in subalpine environments on the Kakanui Mountains (Whitaker *et al.* 2002). However, these geckos have not yet been recorded in eastern Otago. Given that no individuals were found during this inspection the presence of this gecko on this lease remains improbable.

2.5.4 Significance of the herpetofauna

McCann’s skink (*Oligosoma maccanni*) and common skink (*Oligosoma nigriplantare polychroma*) are common through the ED and beyond. Both are listed as “Not Threatened” in Hitchmough (2002) and of “Low” conservation status in Otago (Whitaker *et al.* 2002).

Hoplodactylus “Otago/Southland Large” is listed as “5 Gradual Decline” in Hitchmough (2002), and of “Moderate” conservation status in Otago (Whitaker *et al.* 2002). The Kakanui Mountains and Horse Range are the northern distributional limit for this species. The need for the habitat protection at key northern populations is recognised to secure the limits of range (Whitaker *et al.* 2002).

2.5.5 Avifauna

Ten indigenous bird species were observed during the lease inspection (Table 1). A black backed gull colony is located near the Maerewhenua River at GR I41 123761. New Zealand falcon and black shag were observed utilising forest and riparian areas respectively associated with the Maerewhenua River and its tributaries. Fernbirds were observed in high elevation shrublands.

Table 3: Indigenous bird species recorded on the lease.

Species	Common name
<i>Anthornis melanura</i>	Bellbird
<i>Anthus novaeseelandiae</i>	New Zealand pipit
<i>Bowdleria punctata</i>	Fernbird
<i>Falco novaeseelandiae</i>	New Zealand falcon (eastern)
<i>Gerygone igata</i>	Grey warbler
<i>Haematopus ostralegus</i>	South Island pied oystercatcher
<i>Larus dominicanus</i>	Black backed gull
<i>Phalacrocorax carbo</i>	Black shag

<i>Tadorna variegata</i>	Paradise shelduck
<i>Zosterops lateralis</i>	Silvereye

Significance of Avifauna

The following species (table 4) recorded on the lease are listed by Hitchmough (2002) as being nationally threatened.

Table 4: Nationally threatened bird species recorded on the lease

Threat of extinction classification	Species	Detail
Gradual decline	<i>Falco novaeseelandiae</i> - eastern falcon	Recorded utilising riparian shrubland/forest areas in northern portion of the lease
Sparse	<i>Phalacrocorax carbo</i> - black shag	Recorded utilising riparian areas in northern portion of the lease.
	<i>Bowdleria punctata</i> - fernbird	Recorded in high elevation shrublands

2.5.7 Aquatic Fauna

The New Zealand Freshwater Fish Database was searched and contains no fish records for the lease.

All the streams within the lease flow are either a branch or a tributary of the Maerewhenua River, which itself is a tributary of the Waitaki River.

Each site was sampled in accordance with Allibone (1999) using a Kainga 300 backpack electric fishing machine. The ideal is to sample each tributary at three locations (upper, lower and middle), however, access to many of the middle sites was impractical.

The sites selected contained both riffle/run and pool habitat. Sampling at all sites involved fishing a minimum of 50 m in length or 100 m² in area. The width, depth, temperature and conductivity of the water were recorded. Substrate/riparian composition were visually estimated according to a Freshwater Fish Database form format. The location was recorded using a Global Positioning System (GPS) unit.

In-stream invertebrates were noted and given an MCI value² when they could be

² The MCI is a commonly used indicator of water quality in stony streams. In its simplest, non-quantitative form the index is calculated by summing the tolerance scores of all taxa collected at site graded from 1-10, dividing by the number of scoring taxa, and multiplying this average value by 20. No attempt was made to give site scores due to the difficulty in identifying some species of invertebrates.

identified during electric fishing surveys or by searching under rocks, but no “kick” sampling undertaken.

Notably, only two populations of Canterbury galaxias (*Galaxias vulgaris*) were recorded on the lease. These were found at GR I41 078 720 and GR 141 119 756 respectively. A population of *Paranephrops zealandicus* (koura) was also found at GR 141 119 756.

Overall the water quality was very good throughout the lease. Thirteen taxa of invertebrates (refer to Appendix 4) were located within the lease. Most of these had high MCI values, which indicated high water quality. Only one stream, located at GR I41 109 729, was showing signs of enrichment where the pools were covered in an alga which was smothering the bed.

2.5.8 Significance of Aquatic Fauna

Although currently not listed by Hitchmough (2002) as a species of conservation concern, recent work has shown that the distribution of Canterbury galaxias is more restricted than previously thought. It was previously considered to be widespread throughout the north of the South Island but this now is being questioned. The galaxias is common in the eastern South Island and is typically found as far south as the Waitaki River and along the coast to the Kakanui Mountains. However, even within this eastern group significant genetic variations have been found. Given the significant genetic reclassifications that are taking place in the non-migratory Galaxiid complexes of Otago and Canterbury the value of these populations should not be under-rated.

The record of koura is significant as this is only the second known record for the Waitaki Basin. This population, therefore, is either a geographical outlier or a remnant of a historic range. At present there are two species of koura found in New Zealand; *P. planiformis* and *P. zealandicus*. *P. planiformis* is widespread throughout the North Island and into the northern/western of the South Island. *P. zealandicus* is found in the eastern/southern parts of the South Island, the two species separation being aligned with the mountain ranges of the South Island.

Recent work by R.M. McDowall (paper in print) questions the taxonomic diversity of the koura, as their taxonomy dates back to the 1970s and was entirely based on morphological characters. Over the last decade, within the *Galaxias vulgaris* complex, molecular and ecological studies have provoked a distinctly changed perspective on the taxonomy of species. McDowall postulates that similar molecular and ecological studies on koura could give an analogous result, which would lead to significant genetic reclassifications of the koura complex.

The complete absence of any fish in the majority of the streams is important, as together with the clean, loosely-compacted, cobble size substrate these streams are a potential translocation site for the threatened lowland longjaw galaxias (*Galaxias cobintinis*, ranked Nationally Critical (Hitchmough 2002)). *G. cobintinis* is only known from the middle and lower Waitaki catchment and in the nearby Kauru and Kakanui Rivers.

2.5.9 Problem Animals

Sign of pig rooting was widespread on the lease, particularly in moist sites in tussock grassland. The large spaniard (*Aciphylla scott-thompsonii*) was noticeably targeted by pigs, with half of the plants in some locations killed. Disturbance by pigs also exacerbates the invasion of exotic weeds. Pigs should be controlled if ecological values are to be maintained and enhanced.

Evidence of possum control was observed at lower altitudes in forest and shrubland. A typical suite of other vertebrate pest species (such as rabbits, hares, mice, rats, cats and mustelids) are almost certainly present on the lease.

2.6 Historic

2.6.1 Sites

Maori sites

There are no recorded Maori sites on the lease.

European history and sites

Pisgah Downs was originally part of the Maerewhenua run occupied by Borton and McMaster which stretched from the Waitaki River across the Kakanui Mountains to the Kyeburn. Their partnership was dissolved in 1878 and what is now Pisgah Downs was part of runs 301 and 302 which continued to be leased by McMaster until his death in 1892. The leases then reverted to the Crown and made into small grazing runs (Pinney 1981: 120 -123).

In 1869 part of the Borton and McMaster's run was declared a goldfield. This comprised alluvial diggings on both sides of the Maerewhenua River with the Livingstone field on the south side of the river the larger of the two. The area was not a particularly rich field but provided a steady income for a population of about 70 miners. The major problem for the miners was a shortage of water. A system of water races was constructed to bring water from the headwaters of the Maerewhenua to the Livingstone field. Most of this race system is contained within the lease.

In general, most of the races are in fair condition although in some places sections have been modified for use as farm tracks. There is a superb example of mining dams and water control in a major gully on the lower part of the lease (GR I41 132 745). Here the miners have made use of a hair pin bend in the creek to construct two stone dams which ultimately fed water into a race. The lower dam wall is about 20 m long and about 4 m high. It still holds water which spills over a concrete sill. When in use the water was directed into a tunnel on the true right then emerged from the tunnel and entered the water race. The control valve on the outlet was underground in the tunnel and was operated via a turn cock located at the top of a separate shaft.

The upper dam is about 15 m long and 5 m high. It only retains less than 20% of its

original capacity. As with the lower dam the outlet was via a tunnel, in this case it was driven through a spur of bedrock. Despite the partial collapse of the tunnel entrance water still flows through it to re-enter the creek just above the lower dam. Associated with the dams are the sites of at least 2 huts, areas of quarried schist and a small area of sluicing. Given the construction of these dams in stone which has been mortared with concrete they probably date to the later period of mining at Livingstone.

2.6.2 Significance of Historic Sites

Water races were an essential part of the gold mining industry and the system on the lease is an excellent example. The stone dams are exceptional illustrations of the engineering feats that were undertaken by the miners to obtain a reliable water supply.

2.7 Public Recreation

2.7.1 Physical Characteristics

In 1992 DoC compiled a Recreation Opportunity Spectrum for the entire Otago Conservancy whereby all areas, regardless of land tenure, were classified and mapped according to setting, activity and recreational experience characteristics (Harper, 1992).

The majority of the lease is zoned ‘back-country walk-in’ and ‘backcountry 4x4 drive-in’. These areas are 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 and nature appreciation. These portions of the lease are characterised by a transition from incised forest and shrub clad gorges, pasture and modified tussockland at lower altitudes to extensive tall tussockland, screes and cushion field at higher altitudes. Views from the upper ridge are expansive and spectacular, enhanced by the distinctive volcanic landforms of the Hector's Plateau complex to the south, the Maniototo to the west and the Maerewhenua Spur and St Marys Range to the north. The exposed ridges and summits are similar in character to the broad ranges of Central Otago and, while not as extensive, are still subject to the extreme weather conditions that affect those ranges.

The ‘back-country walk-in’ recreational settings are the parts of the main valleys and the ridges not traversed by vehicle tracks. These settings are characterised by modified tall tussockland at low altitudes to extensive tall tussockland and rock outcrops at higher altitudes. The valleys and untracked ridges are both of moderate relief and are readily accessible on foot. The summits are dominated by the Pisgah and Maerewhenua Spurs to the south and north respectively, and the main ridge of the Kakanui Mountains to the southwest.

The four wheel drive track up Pisgah Spur provides relatively easy access to the southern boundary of the lease, lying on the main axis of the Kakanui Mountains.

This track provides access to areas to the north also. Side tracks branch off the Pisgah Spur track, providing passage to the centre and northwestern parts of the lease. These tracks are generally well-formed, though not easily negotiable in wet conditions.

The northeastern extremity of the lease is zoned 'Backcountry drive-in'. This area has good access via Mackenzie Road which allows visitors into a rural corridor affording a sense of relative remoteness.

2.7.2 Legal Access

Mckenzie Road, a partially formed legal road, enters and leaves the lease at approximately GR I41 152 763 and GR I41 148 753 respectively. This road re-enters the lease again at GR I41 137 739 and exits the lease at GR I41 125 722 (refer to Map 4.2.1). Waitaki District Council regularly maintain Mackenzie Road up to the Dome Hills yards (GR I41 146 750) and irregularly maintain the segment of the road between this point and the airstrip (centred on GR I41 136 733) to 2WD gravel standard. Above the airstrip the roads standard declines progressively to natural 4WD standard.

Marginal strips have been laid off along two sections of the SBMR and an unnamed tributary. The lower section of marginal strip (along the tributary and SBMR) is between GR I41 088 712 and GR I41 140 771 respectively, while the upper section is between GR I41 059 697 and GR I41 074 720 respectively.

2.7.3 Activities

Significant recreation routes are shown on map 4.2.3.

Historically Pisgah Downs has been used for horse trekking and 4WD driving and occasional hunting, mainly for wild pigs. The range crest of the Kakanui Mountains has also been traversed by skiers when snow conditions allow.

In the future, if there is a large area of public land resulting from the tenure review of Ben Ledi and other properties on the Kakanui Range, there is significant potential for public recreation; in particular hunting, tramping, mountain biking and appreciation of the areas grandeur.

PART 3

OTHER RELEVANT MATTERS & PLANS

3.1 *Involvement of Umbrella Groups etc*

The lease was discussed at an NGO early warning meeting on 24th September 2003 and the following points were made.

Forest and Bird (F & B) and Public Access New Zealand (PANZ)

- Access to Mt Pisgah is via a formed track that is predominantly on the legal road. This is an essential public route that must be secured.

PANZ

- The upper catchment is relatively undeveloped.

North Otago Deerstalkers

- Good pig hunting on the lease and the extensive water races provide good foot access.

North Otago Fish and Game

- South Branch Kakanui contains spawning trout, good populations of invertebrates and has high water quality. It is not well fished due to its size.

High Country Landscape Group

- The lease is part of the broader Dansey Pass landscape experience. The upper basins have significant landscape values while the water races have significant cultural value.

Federated Mountain Club

- The area from Point D upwards to the southern boundary has good conservation value.

The lease was again discussed at a DOC/NGO report-back warning meeting on 12th May 2004 and the following points were made.

PANZ

- Block plans should be made available at future NGO/DOC meetings.
- Pisgah Spur is a key access route and secure public access over it should be secured through the tenure review. The best method of achieving this would be via the legalisation of the existing formation to the boundary of any area retained in full Crown ownership, as easements are not providing adequate public access.

F&B

- Notes that the formed legal road passes closely by the Dome Hills homestead and through the Dome Hills yards. Queries how suitable this arrangement would be to both the owner of Dome Hills and the public in the future.

Central Otago 4WD Club

- The Dunedin and North Otago 4WD clubs use the lease and the right to such use should continue in the future.

Federated Mountain Club (FMC) and the New Zealand Deer Stalkers Association have also produced written submissions. Full copies of these are attached as Appendix 7 and 8 respectively. FMC's key recommendations are listed below.

- Much of the higher land on the main spur and on the higher, steep slopes should be returned to full Crown ownership and protected as a conservation area.
- Appropriate areas of shrubland in gullies should be returned to full Crown ownership and protected as a conservation area.
- The hut situated at approximately 800 m should be included in a conservation area.
- A representative section of the historic water races in the Maerewhenua catchment should be protected.
- Confirmation of the legal road along Pisgah Spur, and where necessary, formally recognising the formation as the legal alignment.
- Confirmation of that part of the legal road along the main ridge crest from Mt Nobbler to Mt Pisgah, and where necessary, formally recognising the formation as the legal alignment.
- The tenure reviews of leases in the Kakanui Mountains should all be considered collectively, with a view to improving the recreational opportunities in North Otago, and aid in the creation of a new conservation park on the Kakanui Mountains.

The New Zealand Deerstalkers Association key recommendations are listed below.

- As DOC benefits from hunters having secure and free access to the DOC estate, securing such access through tenure review is important.
- In addition, securing vehicle access to and through the DOC estate via tenure review is also important as this allows hunters extra time to hunt.
- NZ Deerstalkers Association members have the added benefit of a \$5 million public liability insurance cover which includes fire suppression.

3.2 Regional Policy Statements & Plans

Under the Canterbury Regional Land Plan (Vegetation Burning) any burning would be subject to performance standards relating to topdressing and spelling from grazing. The burning of wetland vegetation is not permitted.

3.3 District Plans

The lease is located within the Rural Scenic zone of the Waitaki District Plan. In general, the proposed Waitaki District Plan (amended to incorporate Council decisions) does not act as a trigger for the protection of tussock grasslands and smaller wetlands and forest areas. No indigenous vegetation clearance or exotic tree planting

is allowed within 20m of a water body or in any wetland. There are effectively no provisions that protect scenic values.

There are no registered archaeological sites, or areas of significant indigenous vegetation and habitat of significant indigenous fauna as set out in the appendices of the plan. Protection is limited to the controls set out above.

3.4 Conservation Management Strategies & Plans

The Otago Conservancy of DOC has prepared a Conservation Management Strategy (CMS) which was approved by the Minister of Conservation in August 1998.

The CMS identifies 41 special places of conservation interest in Otago Conservancy. Pisgah Downs Pastoral Lease lies within the Kakanui Special Place.

The CMS objective for the Kakanui Special Place relevant to Pisgah Downs is:

To maintain the natural resources contained within the existing protected areas on the Kakanui Mountains while taking opportunities that may arise through pastoral lease tenure review to negotiate protection of and access to areas of high natural and recreational value.

The key implementation methods relevant to Pisgah Downs are:

- Foot access negotiated at key points for the public to areas managed by the department, with public vehicular access having a lower priority.
- Resource information that assists management of existing areas administered by the department or assists pastoral lease tenure review discussions will be gathered.
- Protection of key areas for natural and historic resources will be sought through pastoral lease tenure review negotiation opportunities.

Priorities for the Kakanui Special Place are:

“In this Special Place, tenure review negotiations and wilding tree control will be the priority method for implementing the objective during the course of this CMS”.

3.5 Other Strategies and Plans

3.5.1 New Zealand Biodiversity Strategy

The New Zealand Government is a signatory to the Convention on Biological

Diversity. In February 2000, Government released the New Zealand Biodiversity Strategy, which is a blueprint for managing the country's diversity of species and habitats and sets a number of goals to achieve this aim. Of particular relevance to tenure review, is goal three which states:

-Maintain and restore a full range of remaining natural habitats and ecosystems to a healthy functioning state, enhance critically scarce habitats, and sustain the more modified ecosystems in production and urban environments, and do what is necessary to: -

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

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

PART 4

MAPS ETC.

4.1 Additional information

4.1.1 References

Allen, R. B. 2002. Ben Ledi PL – Botanical values. Contract report 475a, Wildland Consultants, Dunedin.

Allibone, R. 1999. Monitoring Strategy for the Non-Migratory Otago Galaxias. NIWA Client Report: DOC 90277.

Arand, J.; Basher, L.; McIntosh, P.; Heads, M. 1991. Inventory of New Zealand Soil Sites of International, National and Regional Importance. Part 1- South Island and Southern Offshore Islands (1st Edition). New Zealand Society of Soil Science Occasional Publication 1.

Bishop, D G 1974. Stratigraphic, structural and metamorphic relationships in the Danseys Pass area, Otago, New Zealand. New Zealand Journal of Geology and Geophysics 17 (2) : 301 –35.

Comrie, J. 1992: Dansey Ecological District- Survey report for the Protected Natural Areas Programme. Department of Conservation, Wellington. Report no. 23.

Cotton, C. A. 1917. Block Mountains of New Zealand. American Journal of Science, 44 (4th series): 249-293.

Harper, R.K. 1992. Otago Recreation Opportunity Spectrum. Department of Conservation, Otago Conservancy, Miscellaneous Series No. 10.

Hitchmough, R. 2002: New Zealand Threat Classification System lists. Department of Conservation, Wellington.

Leathwick, J.; Morgan, F.; Wilson, G.; Rutledge, D.; McLeod, M. and Johnston, K. (2002). Land Environments of New Zealand. A technical guide. Ministry for the Environment, Wellington.

MacDonald et al; Soil and Water Conservation Plan No 12, Waitaki Catchment Commission.

McEwen, M. (editor) 1987. Ecological Regions and Districts of New Zealand. *New Zealand Biological Resources Centre Publication 5*. Department of Conservation, Wellington. 4 parts.

Mutch, A. R. 1963. Sheet 23 Oamaru. Geological map of New Zealand 1:250,000. Department of Scientific and Industrial Research, Wellington.

Patrick, B., M, 1982. Lepidoptera of Danseys Pass, Otago. New Zealand Entomologist 7: 332-336

Patrick, B., M, 1991. Insects of the Dansey Ecological District. Department of Conservation, Wellington. Science and Research Series. No. 23. 21pp.

Pinney, P 1981: *Early Northern Otago Runs*. Collins, Auckland.

Whitaker, A., Tocher, M. and Blair, T. 2002. *Conservation of Lizards in Otago Conservancy 2002-2007*. Department of Conservation, Wellington.

4.1.2 Appendices

Appendix 1: Descriptions of RAP 7: Pisgah. From Comrie, J. 1992., Dansey Ecological District: survey report for the Protected Natural Areas Programme. Department of Conservation, Wellington. No. 23. October 1992. 106pp.

Appendix 2: Geopreservation site No. 299 Pisgah. Excerpt from Arand, J.; Basher, L.; McIntosh, P.; Heads, M. 1991. Inventory of New Zealand Soil Sites of International, National and Regional Importance. Part 1- South Island and Southern Offshore Islands (1st Edition). New Zealand Society of Soil Science Occasional Publication 1.

Appendix 3: Vascular plant list

Appendix 4: Site details and records for aquatic fauna

Appendix 5: Invertebrate species list

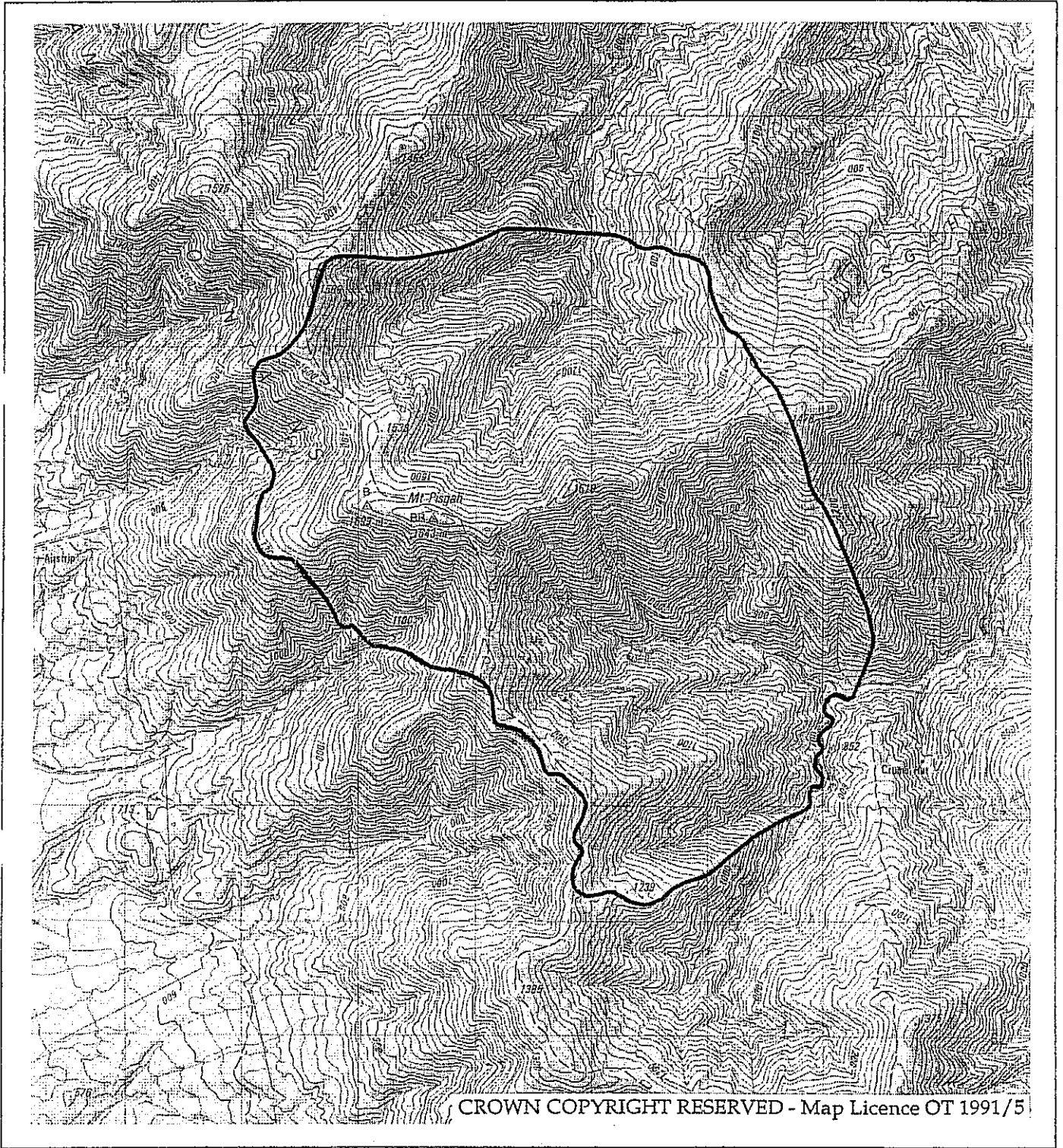
Appendix 6: Lizard records, totalling only actual sightings, not other signs of presence e.g. droppings, movement and skin sheds.

Appendix 7: FMC submission

Appendix 8: New Zealand Deerstalkers Association submission

Appendix 1: Descriptions of RAP 7: Pisgah. From Comrie, J. 1992, Dansey Ecological District: survey report for the Protected Natural Areas Programme. Department of Conservation, Wellington. No. 23. October 1992. 106pp.

Dansey RAP 7 - Pisgah



GR Centre: NZMS 260 141 060660
 Area 1980 ha
 Altitude Range 700-1640m
 Tenure Pastoral Lease (Dome Hills, Pisgah Downs, Sunset Farm, Clover Flats)

Sample Sites: ~~KAK 03, 07, 16, 20~~ & PIS 01, 02

Dansey RAP 7 : PISGAH

Ecological units

TWINSPAN vegetation group (no.) name and landform	Plots
(01) High-altitude cushionfield on debris mantled top	PIS11
(01) High-altitude cushionfield on debris mantled slope	PIS10
(02) Shrubland on debris mantled slope	KAK17
(03) Slim snow tussockland on debris mantled slopes	KAK06, 07, 12, 16, 18, 19, 20 PIS01, 02, 06, 08
(03) Scree	PIS12
(04) Narrow-leaved snow tussockland on debris mantled slope	PIS03, 05, 07, 09, KAK03, 04, 05

Landform and soils

This RAP covers part of the headwaters of the South Branch Maerewhenua River and the North Branch Kakanui River. It also includes the western end of Pisgah Spur, Mt Pisgah and part of the western slopes of the central Kakanui Mountains.

The RAP comprises generally planar and steep (25-30°) mountain slopes with broad, rounded intervening ridges. Extensive coarse scree occur on the steeper northern and southern aspects of Pisgah Spur and on the western face of the main range. Along the flattened summit ridge, particularly north of Mt Pisgah, there are extensive patches of stone pavement where frost action has upended thin slabs of schist as "gravestones" and locally sorted the stones by size. There are prominent slumps at the head of both catchments and on the eastern boundary ridge in the Maerewhenua River catchment, most probably activated by past fault movement. A small area of alluvial terrace occurs within the RAP in the lower reaches of the Kakanui River headwaters.

Bedrock is strongly foliated schist. Soils on the steep mountain slopes are mapped in the Kaikoura set, and on the rolling ridge tops of the main Kakanui Range they are mapped in the Puketeraki set (Marshall 1977). Within the Puketeraki set one soil under an area of patterned ground along the main summit ridge, was examined and identified as a high country yellow-brown earth (Hewitt 1990). Within areas mapped in the Kaikoura set, four soils were examined. A recent soil was identified under scree on the northern slopes of Pisgah Spur. High country yellow-brown earths were identified on a well-drained slump scarp within an area of large earth hummocks in the Maerewhenua River catchment, under small snowbank areas; and where soils have formed earth stripes on scree slopes (Hewitt 1990).

Vegetation and flora

Snow tussockland and shrub-tussocklands are the predominant vegetation types throughout the RAP. Slim snow tussock (*Chionochloa macra*) (TWINSPAN group 03) is extensive on higher altitude slopes down to mid altitudes (1000 m) on shady aspects, and on west facing slopes in the Maerewhenua catchment. Narrow-leaved snow tussock (*C. rigida*) (TWINSPAN group 04) is abundant at mid to low altitudes, and on sunny aspects.

Inter-tussock species diversity, for both slim and narrow-leaved snow tussocklands, typically decreases as the cover of snow tussock increases. False spaniard (*Celmisia lyallii*) and blue tussock (*Poa colensoi*) are the most common subdominants. Where the snow tussock cover is relatively sparse, for example, on the west-facing slopes of the Maerewhenua catchment, there is a much higher diversity of species, including *Gaultheria depressa* var. *novae-zelandiae*, *Pentachondra pumila*, *Helichrysum bellidioides*, *Leucopogon jraseri* and *Raoulia subsericea*.

Shrubs are abundant in the tussocklands. Scattered mountain tauhinu (*Cassinia leptophylla*) is widespread on the west-facing slopes of the Maerewhenua catchment, increasing in dominance in damp hollows and flushes, and accompanied mainly by hog rush (*Schoenus paucijlorus*) and mosses. On the south-facing slopes of Pisgah Spur extending into the Kakanui catchment, turpentine scrub (*Dracophyllum unijlorum*) and, to a lesser extent, inaka (*D. longijolium*) are characteristic of the tussocklands below about 1300m. Mountain flax (*Phormium cookianum*) and prickly shield fern (*Polystichum vestitum*) also contribute to the cover on these slopes, particularly in gullies and hollows. Small areas of similar vegetation occur on south-facing, low altitude, bluffed slopes in the Maerewhenua catchment.

Shrublands (TWINSPAN group 02) are also associated with isolated blockfields at mid altitude. The shrubs here are mainly *Coprosma ciliata* and *Hebe rakaiensis*, but snow totara (*Podocarpus nivalis*) and turpentine scrub are also present along with lesser amounts of prickly shield fern and thousand-leaved fern (*Hypolepis millejolium*).

In the Kakanui catchment, dense mixed shrubland covers steepened streambanks and terrace risers. Shrubs are mainly needle-leaved *Coprosma* (*C. rugosa*), turpentine scrub, inaka, scarlet snowberry (*Gaultheria crassa*), the occasional broadleaf (*Griselinia littoralis*), *Coprosma serrulata*, koromiko (*Hebe salicifolia*) and mountain three-finger (*Pseudopanax colensoi* var. *tematum*) with abundant mountain kiokio (*Blechnum* sp. 2). Tussocklands of fescue (*Festuca novae-zelandiae*) and narrow-leaved snow tussock cover the terrace treads, with areas of bog rush where drainage is impeded.

On Pisgah Spur, the tussock cover is broken by extensive screes (TWINSPAN group 03). Coarse screes are predominant and are mainly non-vegetated except for small patches of shrubland on mid to lower slopes that have remained protected from burning between scree patches. In the Maerewhenua catchment the shrubs are mainly *Coprosma ciliata*, *Hebe rakaiensis*, snow totara and *Brachyglottis cassinioides*. In the Kakanui catchment, soil patches between screes are covered in strips of low shrubland of *Dracophyllum prunum*, scattered *Hebe hectorii*, slim snow tussock, and *Celmisia ramulosa*, *C. angustijolia*, *C. varicijolia* and *C. viscosa*.

On finer gravels, confined mainly to small areas above 1300m on north facing slopes, there occur grasses such as *Poa buchananii*, *P. novae-zelandiae* and *Agrostis muelleriana* and occasional plants of the scree buttercup *Ranunculus haastii*. Occasional plants of *Hebe epacridea* are also found on these finer gravels on the south facing-slopes of Mt Pisgah. The scree buttercup, *Poa buchananii* and *Hebe epacridea* are restricted to scree habitats and were only found in this RAP.

62

Where soil has developed between scree tongues at higher altitudes, there are patches of cushionfield and sparse tussocklands dominated by *Dracophyllum pronum*, *D. museoides*, *Celmisia viseosa*, *C. sessiliflora* and slim snow tussock. These patches have developed, in places, into small lobes or earth stripes extending downslope sometimes up to distances of 150 m. The vegetation cover and the soil development suggest, however, these stripes are not active.

Much of the main Kakanui Mountain ridge and rocky crest of Pisgah Spur is exposed rock and gravelfield with small patches of cushion vegetation, consisting primarily of *Luzula pumila*, *Dracophyllum museoides*, *Chionohebe thomsonii* and *Phyllachne eolensoi*. On north-east facing slopes under Mt Pisgah there are small shallow hollows with snowbank vegetation including *Kelleria ehildii*, *Pernettya alpina*, *Ourisia glandulosa* and *Celmisia sessiliflora*. These small snowbank hollows were only found in one other area in the District (RAP 9). Consequently, the plants characteristic of this habitat are restricted in their distribution within the District.

Because of the sheltering effect of the scree tongues and the type of substrate many plants were found only here ...

Fauna

Both pipit and falcon were seen around the rocky summits of Pisgah Spur and on the roadside.

Several significant moth species that were not found elsewhere in the District were found in this RAP, notably, the diurnal species of *Dasyuris heetori*, *Notoreas isehnocyma* and a new species of *Gelophaula*. The giant weta *Deinaerida eonneetens* has its only known population in the District within this RAP. High alpine grasshoppers and cicada species are features of Pisgah Spur, and the black mountain butterfly (*Perenodaimon merula*) occurs here also.

Discussion

This RAP contains the greatest diversity of vegetation types of any of the RAPs in Dansey Ecological District, a reflection of the range in elevation, aspect and landform. The cover of the vegetation is generally dense, with few adventive species.

This RAP has the most extensive area of scree and alpine fellfield in the District. Scree is rare on the Otago schist mountains, except in the Kakanui Mountains. In this RAP they exist on north, south and west facing slopes.

The inclusion of areas at comparatively low elevation (< 800 m) has meant that this RAP contains plant species such as broadleaf and mountain three-finger normally found only in the forest remnant RAPs: i.e. Maerewhenua (RAP 8), Hectors (RAP 4), Hughie (RAP 3) and Longbob (RAP 2).

Pisgah RAP also includes alluvial terraces with distinctive associated vegetation on the tread surface and the risers. This is the only substantial area of alluvial terrace recommended for

protection in the District. Much smaller terrace areas are recommended for protection in Benledi (RAP 9).

The high-alpine cushionfield/fellfields of Mt Pisgah have been identified by Patrick (1991) as a key site for the conservation of insects.

Criteria summary

Representativeness	H	representative of mid to high altitude plant communities
Diversity	H	species rich, high diversity of plant communities
Naturalness	H	low number of exotic species, relatively little modified although variable.
Special features	H	scree rare in Otago, contains giant weta species and the largest area of scree and alpine fellfield in the District.
Viability	H	large intact area.
Buffering	H	adjacent to semi-natural areas, and area retired from grazing.
Threat	LM	fire.

Appendix 2: Geopreservation site No. 299 Pisgah. Excerpt from Arand, J.; Basher, L.; McIntosh, P.; Heads, M. 1991. Inventory of New Zealand Soil Sites of International, National and Regional Importance. Part 1- South Island and Southern Offshore Islands (1st Edition). New Zealand Society of Soil Science Occasional Publication 1.

(299) Pisgah

REGIONAL/CITY COUNCIL(S): Otago ECOLOGICAL DISTRICTS(S): 65-02 Dansey

LOCALITY and GRID REFERENCE: 45 km W of Oamam 141 060660

AREA(ha): 1980 ALTITUDE(m): 700-1640 RAINFALL(mm): 1200-1400

TOPOGRAPHY: steep colluvial mountain slopes with broad intervening ridges; extensive coarse scree; large slumps; alluvial terrace PARENT MATERIAL: schist and derived colluvium and alluvium VEGETATION: snow tussock grassland; Dracophyllum-snow tussock shrubland; broadleaved shrubland; short tussock grassland; rushland; gravelfield SOILS: upland yellow-brown earths (Kaikoura Kirkliston)

IMPORTANCE: 2 SIGNIFICANCE: (i) contains the greatest diversity of upland yellow-brown earth - vegetation associations of any recommended area for protection in Dansey Ecological District. (ii) contains the only substantial example of alluvial terrace soils under native vegetation in the ecological district (soils not differentiated).

VULNERABILITY: 2 MODIFICATIONS/THREATS: 4WD roads

TENURE: pastoral lease, recommended area for protection OWNER/MANAGER: Dome Hills Station, Pisgah Downs Station, Sunset Farm Station, Clover Flats Station

CONTACT PERSON: Alan Hewitt DATE OF INFORMATION: July 1991

REFERENCES: Comrie (1991) Hewitt (1990)

(300) Stalker Plateau

REGIONAL/CITY COUNCIL(S): Otago ECOLOGICAL DISTRICTS(S): 65-02 Dansey

LOCALITY and GRID REFERENCE: 30 km SW of Oamaru 142245525

AREA(ha): 240 ALTITUDE(m): 640-860 RAINFALL(mm): 800-1200

TOPOGRAPHY: broad, largely flat and poorly drained mountain top; low relief ridges and hollows PARENT MATERIAL: greywacke and subschist VEGETATION: red tussock grassland; snow tussock grassland; broadleaved shrubland

SOILS: upland yellow-brown earths (Kirkliston), lowland yellow-brown earths (Kakahu)

IMPORTANCE: 3 SIGNIFICANCE: (i) contains the most extensive and relatively unmodified upland yellow-brown earth - red tussock grassland and lowland yellow-brown earth - snow tussock grassland associations in the ecological district (below 800 m).

VULNERABILITY: 2 MODIFICATIONS/THREATS: introduced plants (browntop, catsear and white clover); road; hut

TENURE: pastoral lease, recommended area for protection OWNER/MANAGER: Mt Stalker Station

CONTACT PERSON: Alan Hewitt DATE OF INFORMATION: July 1991

REFERENCES: Comrie (1991) Hewitt (1990)

(301) Trotters Gorge Scenic Reserve

REGIONAL/CITY COUNCIL(S): Otago ECOLOGICAL DISTRICTS(S): 65-03 Waianakarua

LOCALITY and GRID REFERENCE: 8.5 km NE of Palmerston J42 358315

AREA(ha): 152 ALTITUDE(m): 30-180 RAINFALL(mm): 625

TOPOGRAPHY: colluvial hillslopes and deep gorges PARENT MATERIAL: colluvium from a variety of Tertiary materialS VEGETATION: kanuka/manuka scrub; kanuka forest; gorse-fern scrub; rockland

SOILS: yellow-grey - yellow-brown earths intergrade (Kakahu Kaitangata), lowland yellow-brown earths (Tararua Hurunui)

IMPORTANCE: 3 SIGNIFICANCE: (i) contains a variety of soils on colluvium from Tertiary parent rocks, under native vegetation.

VULNERABILITY: 3 MODIFICATIONS/THREATS: parts have been burned and grazed; pig rooting; picnic area, University of Otago hut

TENURE: scenic reserve OWNER/MANAGER: Department of Conservation

CONTACT PERSON: Peter McIntosh DATE OF INFORMATION: April 1990

NOTES: Called "Trotter's Creek Domain" in Allen (1978).

REFERENCES: Department of Lands and Survey (1984) Campbell (1977) Allen (1978)

(302) Waianakarua Scenic Reserve

REGIONAL/CITY COUNCIL(S): Otago ECOLOGICAL DISTRICTS(S): 65-03 Waianakarua

LOCALITY and GRID REFERENCE: Big Kuri Creek, 6.5 km W of Hampden J42316391

AREA(ha): 128 ALTITUDE(m): 150-554 RAINFALL(mm): 622

TOPOGRAPHY: steep colluvial hillslopes PARENT MATERIAL: schist and derived colluvium VEGETATION: podocarp-broadleaved forest; manuka scrub; introduced grassland

SOILS: yellow-grey - yellow-brown earths intergrade (Kakahu), lowland yellow-brown earths (Hurunui Tuapeka)

IMPORTANCE: 3 SIGNIFICANCE: (i) contains a moderate variety of soils at near coastal site.

VULNERABILITY: 3 MODIFICATIONS/THREATS: heavily grazed (in 1976)

TENURE: scenic reserve OWNER/MANAGER: Department of Conservation

CONTACT PERSON: Peter McIntosh DATE OF INFORMATION: April 1990

REFERENCES: Department of Lands and Survey (1984) Allen (1978) McCaskill (1975b)

Appendix 3: Vascular plant list

VASCULAR PLANTS RECORDED ON PISGAH DOWNS PL

Exotic species are denoted with an asterisk (*).

Species	Common name	Plant type
<i>Acaena agnipila</i> *	Australian sheep's burr	Dicot herb
<i>Acaena anserinifolia</i>	Bidibidi	Dicot herb
<i>Acaena caesiiglauca</i>	Bidibidi	Dicot herb
<i>Acaena inermis</i>	Bidibidi	Dicot herb
<i>Acaena juvenca</i>	Bidibidi	Dicot herb
<i>Acaena novae-zelandiae</i>	Bidibidi	Dicot herb
<i>Acaena profundeincisa</i>	Bidibidi	Dicot herb
<i>Acaena saccaticupula</i>	Bidibidi	Dicot herb
<i>Acaena tesca</i>	Bidibidi	Dicot herb
<i>Aciphylla aurea</i>	Golden Spaniard	Dicot herb
<i>Aciphylla scott-thomsonii</i>	Spaniard	Dicot herb
<i>Agrostis capillaris</i> *	Browntop	Grass
<i>Anaphalioides bellidiodes</i>		Dicot herb
<i>Anemone tenuicaulis</i>		Dicot herb
<i>Anisotome brevistylis</i>		Dicot herb
<i>Anisotome flexuosa</i>		Dicot herb
<i>Anisotome imbricata</i>		Dicot herb
<i>Anthoxanthum odoratum</i> *	Sweet vernal	Grass
<i>Aristotelia serrata</i>	Wineberry	Tree
<i>Asplenium bulbiferum</i>	Hen and chicken fern	Fern
<i>Asplenium flabellifolium</i>		Fern
<i>Asplenium richardii</i>		Fern
<i>Astelia fragrans</i>		Monocot herb
<i>Astelia nervosa</i>		Monocot herb
<i>Blechnum chambersii</i>		Fern
<i>Blechnum novae-zelandiae</i>	Kiokio	Fern
<i>Blechnum penna-marina</i>		Fern
<i>Brachyglottis cassinioides</i>		Shrub
<i>Brachyscome sinclairii</i>		Dicot herb
<i>Bulbinella angustifolia</i>	Maori onion	Monocot herb
<i>Calystegia turguriorum</i>		Vine
<i>Cardamine debilis</i>		Dicot herb
<i>Carduus nutans</i> *	Nodding thistle	Dicot herb
<i>Carex breviculmis</i>		Sedge
<i>Carex coriacea</i>		Sedge
<i>Carex dipsacea</i>		Sedge
<i>Carex wakatipu</i>		Sedge
<i>Carmichaelia australis</i>	Native broom	Shrub
<i>Carmichaelia petriei</i>	Native broom	Shrub
<i>Carpodetus serratus</i>	Marble leaf	Tree
<i>Celmisia gracilentia</i>		Dicot herb
<i>Celmisia graminea</i>		Dicot herb
<i>Celmisia lyallii</i>	False spaniard	Dicot herb
<i>Celmisia prorepens</i>		Dicot herb
<i>Celmisia viscosa</i>		Dicot herb
<i>Cerastium fontanum</i> *	Mouse-eared chickweed	Dicot herb
<i>Cheilanthes sieberi</i>		Fern
<i>Chionochloa conspicua</i>		Grass
<i>Chionochloa macra</i>	Slim snow tussock	Grass
<i>Chionochloa rigida</i>	Narrow-leaved snow tussock	Grass
<i>Chionochloa rubra</i>	Red tussock	Grass

Species	Common name	Plant type
<i>Clematis foetida</i>		Vine
<i>Colobanthus strictus</i>		Dicot herb
<i>Coprosma cheesemanii</i>		Shrub
<i>Coprosma crassifolia</i>		Shrub
<i>Coprosma depressa</i>		Shrub
<i>Coprosma linariifolia</i>		Tree
<i>Coprosma propinqua</i>	Mikimiki	Shrub
<i>Coprosma pseudocuneata</i>		Shrub
<i>Coprosma rugosa</i>		Shrub
<i>Coprosma virescens</i>		Shrub
<i>Cordylina australis</i>	Cabbage tree	Tree
<i>Coriaria arborea</i>	Tutu	Shrub
<i>Coriaria sarmentosa</i>	Feathery tutu	Shrub
<i>Cortaderia richardii</i>	Toetoe	Tussock grass
<i>Corybas macranthus</i>		Orchid
<i>Craspedia lanata</i>		Dicot herb
<i>Crassula</i> sp.		Dicot herb
<i>Dactylis glomerata</i> *	Cocksfoot	Grass
<i>Dichondra brevifolia</i>		Dicot herb
<i>Discaria toumatou</i>	Matagouri	Shrub
<i>Dracophyllum prunum</i>		Subshrub
<i>Dracophyllum longifolium</i>	Turpentine shrub	Shrub
<i>Dracophyllum uniflorum</i>	Turpentine shrub	Shrub
<i>Einadia allanii</i>		Dicot herb
<i>Elymus solandri</i>		Grass
<i>Elymus</i> sp.		Grass
<i>Epilobium cinerium</i>		Dicot herb
<i>Festuca novae-zelandiae</i>	Hard tussock	Grass
<i>Fuchsia perscandens</i>		Vine
<i>Galium perpusillum</i>		Dicot herb
<i>Gaultheria crassa</i>		Shrub
<i>Gaultheria macrostigma</i>		Subshrub
<i>Gentianella</i> sp.	Gentian	Dicot herb
<i>Geranium sessiliflorum</i>		Dicot herb
<i>Geum leiospermum</i>		Dicot herb
<i>Gingidia decipiens</i>		Dicot herb
<i>Gnaphalium traversii</i>		Dicot herb
<i>Gonocarpus micranthus</i>		Dicot herb
<i>Griselinia littoralis</i>	Broadleaf	Tree
<i>Haloragis erecta</i>		Shrub
<i>Hebe buchananii</i>		Shrub
<i>Hebe odora</i>		Shrub
<i>Hebe pauciramosa</i>		Shrub
<i>Hebe rakaiensis</i>		Shrub
<i>Hebe salicifolia</i>	Koromiko	Shrub
<i>Helichrysum aggregatum</i>		Shrub
<i>Herpolirion novae-zelandiae</i>		Monocot herb
<i>Hieracium lepidulum</i> *	Tussock hawkweed	Dicot herb
<i>Hieracium pilosella</i> *	Mouse-eared hawkweed	Dicot herb
<i>Hieracium praealtum</i> *	King devil hawkweed	Dicot herb
<i>Holcus lanatus</i> *	Yorkshire fog	Grass
<i>Hydrocotyle moschata</i>		Dicot herb
<i>Hymenophyllum multifidum</i>		Fern
<i>Hypochaeris radicata</i> *	Catsear	Dicot herb
<i>Hypolepis millefolium</i>		Fern
<i>Juncus distegus</i>		Rush

Species	Common name	Plant type
<i>Juncus gregiflorus</i>		Rush
<i>Juncus planifolius</i>		Rush
<i>Kelleria dieffenbachii</i>		Dicot herb
<i>Koeleria novo-zelandica</i>		Grass
<i>Lagenifera cuneata</i>		Dicot herb
<i>Lepidium desvauxii</i>		Dicot herb
<i>Leucopogon colensoi</i>		Subshrub
<i>Leucopogon fraseri</i>	Patotara	Subshrub
<i>Leycesteria formosa*</i>		Shrub
<i>Libertia ixioides</i>		Monocot herb
<i>Luzula banksiana</i>		Woodrush
<i>Luzula pumila</i>		Woodrush
<i>Lycopodium fastigiatum</i>		Fern
<i>Melicytus alpinus</i>	Porcupine shrub	Shrub
<i>Melicytus ramiflorus</i>	Mahoe	Tree
<i>Microsorium pustulatum</i>	Hounds tongue fern	Fern
<i>Microtis unifolia</i>	Onion orchid	Orchid
<i>Mimulus moschatus*</i>	Musk	Dicot herb
<i>Muehlenbeckia australis</i>	Pohuehue	Vine
<i>Muehlenbeckia axillaris</i>	Creeping pohuehue	Subshrub
<i>Muehlenbeckia complexa</i>	Pohuehue	Vine
<i>Myrsine nummularia</i>		Subshrub
<i>Neopaxia australasica</i>		Dicot herb
<i>Olearia bullata</i>		Shrub
<i>Olearia cymbifolia</i>		Shrub
<i>Olearia lineata</i>		Tree
<i>Oreomyrrhis colensoi</i>		Dicot herb
<i>Ourisia sessilifolia</i>		Dicot herb
<i>Oxalis exilis</i>		Dicot herb
<i>Oxalis magellanica</i>		Dicot herb
<i>Ozothamnus leptophyllus</i>	Tauhinu	Shrub
<i>Pellaea rotundifolia</i>		Fern
<i>Pentachondra pumila</i>		Subshrub
<i>Phormium cookianum</i>	Mountain flax	Tussock herb
<i>Phyllachne colensoi</i>		Dicot herb
<i>Pimelea sericeo-villosa</i>		Subshrub
<i>Pimelea traversii</i>		Shrub
<i>Pimelia oreophila</i>		Subshrub
<i>Pinus sp.</i>		Tree
<i>Pittosporum eugenioides</i>	Lemonwood	Tree
<i>Pittosporum tenuifolium</i>	Kohuhu	Tree
<i>Plantago lanigera</i>		Dicot herb
<i>Poa annua*</i>	Annual poa	Grass
<i>Poa cita</i>	Silver tussock	Grass
<i>Poa colensoi</i>	Blue tussock	Grass
<i>Poa kirkii</i>		Grass
<i>Poa lindsayi</i>		Grass
<i>Podocarpus hallii</i>	Halls totara	Tree
<i>Podocarpus nivalis</i>	Snow totara	Shrub
<i>Polystichum cystostegia</i>		Fern
<i>Polystichum richardii</i>		Fern
<i>Polystichum vestitum</i>	Prickly shield fern	Fern
<i>Pseudognaphalium luteoalbum</i>		Dicot herb
<i>Pseudopanax crassifolium</i>	Lancewood	Tree
<i>Psychrophila obtusa</i>		Dicot herb
<i>Pteridium esculentum</i>	Bracken	Fern

Species	Common name	Plant type
<i>Ranunculus ensysii</i>	Buttercup	Dicot herb
<i>Ranunculus glabrifolius</i>	Buttercup	Dicot herb
<i>Ranunculus haastii</i>	Scree buttercup	Dicot herb
<i>Ranunculus multiscapus</i>	Buttercup	Dicot herb
<i>Raoulia glabra</i>		Dicot herb
<i>Raoulia tenuicaulis</i>		Dicot herb
<i>Rosa rubiginosa*</i>	Brier	Shrub
<i>Rubus cissoides</i>	Lawyer	Vine
<i>Rubus schmidelioides</i>	Lawyer	Vine
<i>Rubus squarrosus</i>	Leafless lawyer	Vine
<i>Rytidosperma unarede</i>		Grass
<i>Scandia geniculata</i>		Vine
<i>Schizeilema hydrocotyloides</i>		Dicot herb
<i>Schoenus pauciflorus</i>		Sedge
<i>Scleranthus uniflora</i>		Dicot herb
<i>Senecio glomeratus</i>		Dicot herb
<i>Sophora microphylla</i>	Kowhai	Tree
<i>Stellaria alsine*</i>	Bog stitchwort	Dicot herb
<i>Taraxacum magellanicum</i>	Native dandelion	Dicot herb
<i>Thelymitra</i> sp.	Sun orchid	Orchid
<i>Trifolium repens*</i>	White clover	Dicot herb
<i>Urtica ferox</i>	Tree nettle	Shrub
<i>Urtica incisa</i>	Nettle	Dicot herb
<i>Viola cunninghamii</i>		Dicot herb
<i>Wahlenbergia albomarginata</i>	Harebell	Dicot herb

Appendix 4: Site details and records for aquatic fauna

Location	Water	Fish species	Invertebrates	Notes
2307806/5572075	Yes	Canterbury galaxias (<i>Galaxias vulgaris</i>)	Stoneflies; <i>Megaleptoperla</i> , <i>Zelandoperla</i> Mayflies; <i>Coloburiscus</i> , <i>Nesameletus</i> , <i>Deleatidium</i>	Galaxiid larvae present
2308093/5571899	Yes	No fish	Mayflies; <i>Nesameletus</i> , <i>Deleatidium</i> Caddisflies; <i>Aoteapsyche</i>	
2308827/5571107	Yes	No fish	Stoneflies; <i>Zelandobious</i> Mayflies; <i>Coloburiscus</i> , <i>Nesameletus</i> , <i>Deleatidium</i> Caddisflies; <i>Aoteapsyche</i>	
2308934/5570838	Yes	No fish	Mayflies; <i>Nesameletus</i> , <i>Deleatidium</i>	Filamentous algae present
2305902/5569517	Yes	No fish	Stoneflies; <i>Megaleptoperla</i> , <i>Stenoperla</i> Mayflies; <i>Coloburiscus</i> , <i>Nesameletus</i> , <i>Deleatidium</i> , <i>Omicigaster</i> Caddisflies; <i>Aoteapsyche</i> , <i>Pycnocentroides</i>	Invertebrates abundant
2310711/5574692	Yes	No fish	Stoneflies; <i>Stenoperla</i> Mayflies; <i>Coloburiscus</i> , <i>Nesameletus</i> , <i>Deleatidium</i> , <i>Ameletopsis</i> Caddisflies; <i>Aoteapsyche</i> , <i>Pycnocentroides</i> Miscellaneous; <i>Potamopyrgus</i> , <i>Oligobate</i>	
2310929/5572965	Yes	No fish	Mayflies; <i>Deleatidium</i> , <i>Ameletopsis</i> Miscellaneous; <i>Potamopyrgus</i>	Pools covered in algae which was smothering the bed
2216000/5575800	No			Creek dammed forming a series of ponds
2212800/5574500	No			
2212100/5573000	No			No flowing water
2211200/5573200	Ephemeral ?	No fish	No invertebrates observed	
2211200/5573300	Yes	No fish	Mayflies; <i>Coloburiscus</i> , <i>Deleatidium</i>	Low number of invertebrates
2211200/5573500	Yes	No fish	Mayflies; <i>Ameletopsis</i> Caddisflies; <i>Aoteapsyche</i> Miscellaneous; <i>Potamopyrgus</i>	
2211900/5575600	Yes	Canterbury galaxias (<i>Galaxias vulgaris</i>)	Mayflies; <i>Coloburiscus</i> , <i>Nesameletus</i> , <i>Deleatidium</i> , <i>Omicigaster</i> Miscellaneous; <i>Paranephrops</i>	

MCI Scores

The MCI is commonly used as an indicator of water quality in New Zealand stony streams. In its simplest, non-quantitative form the index is calculated by summing the tolerance scores of all taxa collected at the site, dividing by the number of scoring taxa, and multiplying this average value by 20.

Stoneflies (Plecoptera)

<i>Megaleptoperla</i>	9
<i>Zelandoperla</i>	10
<i>Stenoperla</i>	10

Mayflies (Ephemeroptera)

<i>Nesameletus</i>	9
<i>Deleatidium</i>	8
<i>Coloburiscus</i>	9
<i>Ameletopsis</i>	9
<i>Onicigaster</i>	10

Caddisflies (Tricoptera)

<i>Aoleapsyche</i>	4
<i>Pycnocentroides</i>	5

Mollusca (Snails)

<i>Potamopyrgus</i>	4
<i>Oligobatea</i>	1

Crustacea

<i>Paranephrops</i>	5
---------------------	---

Appendix 5: Invertebrate species list

Collected specimens identified by Otago Museum

Order/Family	Genus & species	common name	significance, distribution	biological information
Lepidoptera		(moths/butterflies)		
Hepialidae	<i>Wiseana umbraculata</i>	swamp porina	widespread and common to montane	subterranean larvae in wet grassl.
	<i>Wiseana fuliginea</i>	porina	not well known or collected – excellent find	similar to above. Type locality Dui
Geometridae	<i>Aponotoreas insignis</i>	diurnal moth	widespread and common to alpine grasslands	larvae on Chionochloa
	<i>Austrocidaria similata</i>	carpet moth	widespread and common to montane zone	larvae on Coprosma species
	<i>Hydriomena rixata</i>	carpet moth	widespread and common to montane zone	larvae on seepage herbs
	<i>Declana junctilinea</i>		widespread and common to montane zone	larvae on various shrubs
	<i>Helastia corcularia</i>	slate moth	widespread and common to montane zone	larvae on mosses on rock faces
	<i>Helastia christinae</i>	rockface moth	localised species of rocky South Is areas to montane zone	larvae on mosses on rock faces
	<i>Helastia plumbea</i>	rockface moth	localised species of rocky South Is areas to montane zone; mostly western	larvae on mosses on rock faces
	<i>Xanthorhoe semifissata</i>	cress moth	widespread and common to montane zone	larvae on cresses eg Cardamine
	<i>Asaphodes chlamydota</i>	clematis moth	widespread but local; shrubland to montane zone	larvae on Clematis spp.
	<i>Pasiphila bilineolata</i>	hebe pug	widespread but local; shrubland to montane zone	larvae on Hebe/ Leonohebe spp.
	<i>Ischalis fortinata</i>	fern moth	widespread and common to montane zone/ forest/ shrublands	larvae on Polystichum
Noctuidae	<i>Rictonis comma</i>	comma cutworm	widespread and common to montane zone	larvae on grasses/ herbs
Crambidae	<i>Orocrambus flexuosellus</i>	grassmoth	very common & widespread to montane zone	larvae in native & exotic grassland
	<i>Eudonia organaea</i>	diurnal moth	local in low alpine & montane grasslands/ shrublands	good find/ mostly sthn NZ
	<i>Scoparia rotuella</i>		fairly common & widespread in mainly lowlands	larvae on Epiulobium - forest/ shr edge
	<i>Eudonia submarginalis</i>	sod webworm	very common & widespread to montane zone	larvae in mosses in damp areas
	<i>Glaucocharis interrupta</i>		local in forest/ shrublands to montane zone	larvae in mosses on trunks
	<i>Eudonia philerga</i>		common in forest/ shrublands to montane zone	associated with Carex secta in wetlands?
Plutellidae	" <i>Plutella</i> " <i>psammochroa</i>		widespread but uncommon, to low alpine zone; good find	

	<i>Orthenches semifaciata?</i>		widespread but local in low alpine shrublands; good find	larvae on <i>Dracophyllum</i> sp
Gelechiidae	<i>Isochasta paradesma</i>		local species of shrubland/ forest to montane zone; good find	larvae in galls on <i>Coprosma</i>
Noctuidae	<i>Graphania mutans</i>	common cutworm	v common and widespread to montane zone	larvae on herbs
Orthoptera		(crickets/grasshoppers)		
Acrididae	<i>Brachaspis nivalis</i>	scree grasshopper	common on scree alpine areas of Canterbury/ Nth Otago	
	<i>Sigauss australis</i>	alpine grasshopper	common and widespread in montane-alpine grasslands	
Plecoptera		(stoneflies/stoners)		
	<i>Stenoperla maclellani</i>	upland green stoner	common in upland streams of southern NZ	
	<i>Megaleptoperla diminuta</i>		common in lowland to montane streams	
Coleoptera		(beetles)		
Carabidae	<i>Megadromus meritus</i>	ground beetle	common to montane zone Otago	
	<i>Oregus aureus</i>	ground beetle	widespread and common to low alpine zone	
Curculionidae	<i>Anagotus latirostris</i>	weevil	widespread but local in high alpine Otago	areas of high naturalness
Scarabaeidae	<i>Pyronota punctata</i>	manuka beetle	widespread and fairly common in montane grasslands	
	<i>Odontria striata</i>	chafer beetle	widespread and very common to montane zone	
Hemiptera		(true bugs)		
Lygaeidae	<i>Hudsona anceps</i>		widespread & common to montane zone	endemic species has become per
	<i>Nysius huttoni</i>		widespread & common to alpine zone	endemic species has become per
Blattodea		(cockroaches)		
	<i>Celatoblatta</i>	alpine cockroach	widespread on alpine zone Otago - often common	
	<i>quinquemaculata</i>			
Hymenoptera		(bees, wasps, ants)		
Ichneumonidae	<i>Degathina</i> species	ichneumonid	widespread species to montane zone	

RELEASED UNDER THE OFFICIAL INFORMATION ACT

Appendix 6: Lizard records, totalling only actual sightings, not other signs of presence e.g. droppings, movement and skin sheds.

Lizard records on Pisgah Downs pastoral lease during the tenure review inspection of 8-10 December 2003. Records include only actual sightings, not other signs of presence such as droppings, movement and skin sheds.

Date	Easting	Northing	Species	No. seen
8/12/03	2305100	5566800	<i>O. maccanni</i>	1
9/10/03	2308900	5570800	<i>H. "Otago/southland large"</i>	3
9/10/03	2308900	5570800	<i>O. maccanni</i>	3
9/10/03	2308700	5570800	<i>O. nigriplantare polychroma</i>	1
9/10/03	2310300	5572000	<i>H. "Otago/southland large"</i>	2
9/10/03	2310300	5572000	<i>O. nigriplantare polychroma</i>	1
9/10/03	2310600	5573200	<i>H. "Otago/southland large"</i>	1
10/10/03	2310200	5570500	<i>O. maccanni</i>	1
10/10/03	2310200	5570600	<i>H. "Otago/southland large"</i>	1
10/10/03	2307500	5567800	<i>O. maccanni</i>	2
10/10/03	2307500	5567800	<i>O. nigriplantare polychroma</i>	1

Appendix 7: FMC submission

**HIGH COUNTRY
CONSULTANCY**

Dr Mike Floate, SH 8 Tarras, Central Otago, New Zealand
Teleplhone 03-445 2829, Fax 03-445 2038
Email: mike.floate@xtra.co.nz

PASTORAL LEASE TENURE REVIEW

Preliminary Report on
Recreational and Related Significant Inherent Values

PISGAH DOWNS

March 2004

Compiled for Federated Mountain Clubs (FMC) ofNZ (Inc.)
by Dr Michael J S Floate, High Country Consultancy,

**RECREATIONAL AND RELATED SIGNIFICANT INHERENT
VALVES ON PISGAH DOWNS**

**A Preliminary Report to FMC based on field inspection
and other research to assist in the Tenure Review Process**

March 2004

CONTENTS

Contents	page
List of Figures	2
Introduction	4
Methods of survey and assessment	5
General description of Pisgah Downs..	5
Land Resources of Pisgah Downs	5
Recreational use and potential new opportunities ..	6
Pisgah Downs in the context of the wider Kakanui area	6
Significant inherent values and their importance for recreation	7
Areas to be protected	9
Access requirements	10
Conservation Management Strategy for Otago	10
Conclusions	10
Acknowledgements	11
Map showing the provisional allocation of public conservation land and freehold land (green and red outlines respectively) and important recreational access routes (yellow)	
Figures ..	Follow page 11

LIST OF FIGURES

Fig. 1 The Kakanui Mountains are seen here from Clover Flat on the Pigroot with the highest point (Mt Pisgah at 1,643m) in the centre of this view. The range is more prominent from this (south western) side as there is a relatively steep escarpment rising 600 to 900m from the Shag Valley floor and Maniototo Plain. Recreational journeys along the crest of the range are likely to become increasingly popular in the future so it is opportune to make adequate provision for access during tenure review.

Fig. 2 The north eastern slopes of the Kakanuis are more gentle, and at the eastern end are interrupted by the volcanic intrusions of Siberia Hill (S) and Mt Dasher (D). These volcanic features are known destinations for trampers and others and are likely to increase in popularity in future as they become better known and access is improved through tenure review.

Fig. 3 McKenzies Road serves both Dome Hills and Pisgah Downs homesteads and is seen here in the foreground at about 600m. On the skyline is the Maerewhenna Spur on Ben Ledi Station which is situated to the north of Pisgah Downs. Out of sight in the middle distance is the deeply incised Maerewhenua River with its convoluted system of water races which were used to sluice the gold out of the Liwlgstone Diggings

Fig. 4 The southern east face of Pisgah Spur is seen here from Dome Hills pastoral lease. The track follows the skyline (and the boundary between Dome Hills and Pisgah Downs) and climbs steadily from right to left to reach the crest of the range at Mt Pisgah. The track, which closely follows a paper road, is a very important recreational route to the Kakanui Mountains. The most important issue in this tenure review will be to confirm secure public access by recognising the road formation as the legal road.

Fig. 5 McKenzies Road wends across the lower slopes of Pisgah Downs pastoral lease before climbing Pisgah Spur, seen here on the left, and rising to 1,643m at the summit of Mt Pisgah on the crest of the Kakanui Range. The alignment of this legal road needs to be confirmed during tenure review as it is one of the most important access routes to the range crest, and thence north to Danseys Pass or south to the Horse Range

Fig. 6 The delightful Pisgah Downs homestead is situated on McKenzies Road at about 500m, among well established trees in a sheltered spot on the northern boundary of the property.

Fig. 7 The northern and lowest end of Pisgah Downs is approached by McKenzies Road which passes the homestead in the trees (P), the woolshed (W), and Dome Hills homestead (D) before gradually climbing the Pisgah Spur (skyline centre) which forms the boundary between Pisgah Downs and Dome Hills.

Fig. 8 This view from Mt Alexander (at the northern end of the Kakanuis) shows part of the track climbing over a smaller knob at 1,300m and on to Mt Nobbler (on the skyline at the left). This route has been used in the past for ski touring but it is likely to be more frequently used in future by mountain bike enthusiasts. The traverse of the Kakanui range is likely to become a classic trip in the not too distant future so long as appropriate provisions are made during tenure reviews of properties along the range.

Fig. 9 There are opportunities for extended tramping and skiing trips along the length of the Kakanuis. Trampers are seen here traversing the southern end of the range between Kakanui Peak and Obi, on the edge of Mt Dasher Station. This highlights the importance of considering the outcomes of this tenure review in the light of an emerging network of recreational opportunities on neighbouring properties, and in the wider context of the whole Kakanui Mountain range.

Fig. 10 The lower slopes on Pisgah Downs are characterised by the Lowland Yellow Brown Earth soils, classified LUC Class VI which, with appropriate fertiliser use to maintain nutrient balance, should be capable of ecologically sustainable pastoral farming. As such, these lower slopes appear to be suitable for freeholding. Ben Ledi Station and Mt Domet can be seen in the middle distance and far distance respectively.

Fig. 11 Within the upper reaches of both the north and south arms of the Maerewhenna River South Branch, there is an extensive and convoluted system of paired water races. These are notable because they cover many kilometers on the valley sides and because of their historical significance. They deserve to be protected either within the new conservation area, or as a designated historic reserve. The Maerewhenua Spur and the Kakanui Mountains (K) can be seen on the skyline.

Fig. 12 The Maerewhenua water races provided the water which was the main driving force for the Livingstone Diggings. Although the main diggings and workings were further north towards Livingstone, significant evidence of sluicing can be seen adjacent to McKenzies Road close to the boundary of Pisgah Downs.

INTRODUCTION

This Report has been prepared following the Early Warning Meeting in September 2003 at which the properties entering the tenure review process in 2003 were introduced. Federated Māori Clubs of NZ (FMC) offered a few notes about Pisgah Downs at that time and this Report is a more detailed account of the recreational and related inherent values of the property. It is offered as a contribution to the statutory consultation process undertaken by the Department of Conservation.

This Report focuses on those features of the property which are known to be important for public recreational interests. It should be noted that while some of this interest focuses on access, the natural and historical values and landscapes of the areas concerned have a fundamental impact on the recreational value of the property and greatly influence the quality of recreational experience enjoyed. It is for this reason that reference is also made to the natural, historical and landscape values in this Report.

Mason (1988) has described the general area of the Kakanui Mountains as follows:- *"The range is a moderately dissected peneplain dipping into the Waitaki, Kakanui and Waianakarua catchments to the north with a relatively steep escarpment rising 600 to 900m from the Shag Valley and Maniototo Plain to the south. [Fig. 1] Elevation increases steadily from 600 to 800m on the outlying Horse Range, to the main Kakanui crest at over 1,600m. Danseys Pass (900m) lies at the north-western end of the range.*

The geology of the greater area consists of faulted greywackes, argillites and semi schists. At Mt Dasher and Siberia Hill isolated caps of basaltic lava protrude above the 'Hectors Plateau'. [Fig. 2]. These are steep columnar formations which cut through semi-schist by as much as 60m on Kattohlyst. There are also great tongues of black volcanic rock, in contrast to the prevailing landforms of the region.

Many upper back-slopes are razor-edged, with deeply incised stream patterns and rugged gullies. As altitude decreases the ridge tops broaden and the land becomes rolling before blending into the North Otago downlands".

Pisgah Downs covers a little more than 4,000ha and extends from 1,643m at Mt Pisgah, the highest point on the Kakanui Mountains, to about 500m at the homestead at the northern end of the property. It is bounded by Ben Ledi to the north west (Fig. 3) and Dome Hills to the south east (Fig. 4).

Pisgah Downs is important in the tenure review process because of its close proximity to several other properties under review. These include Dome Hills, Mt Dasher, The Dasher and Mt Stalker to the south, Islay Downs and Shingley Creek to the west, and Ben Ledi and Mt Alexander to the north. It is thus surrounded on three sides by neighbouring properties undergoing tenure review simultaneously. Indeed most of the pastoral leases along the range are currently under review.

The government has recently declared as one of its new objectives for the high country: *"to progressively establish a network of high country parks and reserves"* (EDC Min (03) 5/3; CAB Min (03) 1/5). This has now been further qualified by the Cabinet Business Committee which noted "that DOC has identified 15 to 20 areas in the high country that could be recategorised as conservation parks in the long term." It was further noted that *"the area generally should be at least 10,000ha in size."* (CBC Min (03) 10/3). This is noted in this Report because it seems very likely that The Kakanui Mountains could be considered as one such conservation park, and that collectively all the leases under review could easily contribute an area of appropriate size.

It is important that a broad view of the overall outcomes of tenure review should be taken as each lease is reviewed. Consideration should be given to the emerging network of recreation opportunities, and outcomes should be considered collectively rather than individually. Recreational use in the future will depend on decisions made now, and decisions should be made to allow round trips as well as access to the main Māori range. It is important therefore, that adequate provision is made for public access during the tenure review of Pisgah Downs and the neighbouring properties. Similarly, it is also important that outcomes regarding potential new conservation parks should be considered collectively rather than individually.

The most important recreational issue in this tenure review is to ensure that secure public access is guaranteed up the Pisgah Spur to the Kakanui Mountains (Figs. 4 and 5).

METHODS OF SURVEY AND ASSESSMENT

A site visit and field inspection was carried out in February 2004. This report is based on the field inspection and also on information gathered from other sources. The other sources include studies of topographical and Land Use Capability (LUC) maps, consultation with recreational user groups and a knowledge of the landscapes acquired from other tramping trips on the Kakanui Range. A study of "Outdoor Recreation in Otago" was undertaken by Mason (1988) and published by FMC. Reference is made to this Recreation Plan for Otago below. The Conservation Management Strategy for Otago has also been used as a source of reference.

GENERAL DESCRIPTION OF PISGAH DOWNS

Pisgah Downs is a small to medium sized pastoral lease (4,279ha) situated on the eastern flanks of the main Kakanui range and dominated by the Pisgah Spur leading to Mt Pisgah at 1,643m above sea level (Fig. 5). The property extends from about 500m at the delightful old homestead situated on McKenzies Road at the northern end (Fig. 6), to the highest point on the Kakanui Mountains at Mt Pisgah. It is approached from Livingstone via McKenzies Road which passes close to the Pisgah Downs homestead and woolshed as well as Dome Hills homestead, before starting to climb Pisgah Spur en route to the Kakanui Mountains (Fig. 7). It includes virtually the entire catchment of the southern arm of the South Branch of the Maerewhenua River. The other arm of the South Branch drains Ben Ledi Station to the north (Fig. 3).

The continuation of McKenzies Road, sometimes known as Pisgah Spur Road, leads to Mt Pisgah and is on, or close to, a legal road all the way to Mt Pisgah (Fig. 5). This is an important recreational access to the main range of the Kakanui Mountains and for trips heading north towards Danseys Pass and south towards the Horse Range.

LAND RESOURCES OF PISGAH DOWNS

There is land which appears to be capable of supporting ecologically sustainable pastoral use in the lower reaches of the South Branch of the Maerewhenua River. Up to about 900m, this is land mainly characterised by Hunnui Steepland Lowland Yellow Brown Earth soils which have been classified as Land Use Capability (LUC) Class VI, implying moderate suitability for pastoral use. This land is likely to be suitable for freeholding.

The higher and steeper slopes above about 1,000m are mainly Dunstan Steepland High Collingwood Yellow Brown Earth soils classified LUC Class VII with severe limitations due to erosion and climate (Fig. 4). The highest part of Pisgah Spur and about 600ha of land just below the back boundary has been classified LUC Class VIII, totally unsuited to pastoral use.

Some of the lower slopes in the range 1,000 to 1,100m may be capable of supporting pastoral use with appropriate maintenance but the higher Collingwood is unlikely to be capable of ecologically sustainable pastoral use for reasons which are explained below. To be managed in a way that is ecologically sustainable in the long term, as required by the Crown Pastoral Land (CPL) Act 1998, any losses of essential nutrients in animal products (meat and wool), and losses during burning due to smoke and volatilisation, must be replenished. The alternative is that sooner or later the ecosystem will be depleted and degraded. LUC Class VII land may not be capable of being managed in a way that is ecologically sustainable because it may not be economically justifiable to replenish (in the form of fertiliser) the nutrients (especially sulphur) which are lost through grazing and burning. On lower country where pasture growth rates are higher, topdressing is worthwhile, but at higher altitudes (above about 1,000m), pasture growth and hence response to fertiliser is limited by climate.

Under these circumstances conservation values need to be assessed and considered as an alternative to unsustainable pastoral use. There is no doubt that with the cessation of burning and grazing there would be an improvement in the vigour of the tussock grassland and a recovery in shrublands in gullies and sheltered

“RELEASED UNDER THE OFFICIAL INFORMATION ACT”

areas. Because of this it may be appropriate for such land to be returned to full Crown ownership and control to be managed for conservation and recreational purposes.

RECREATIONAL USE AND POTENTIAL NEW OPPORTUNITIES

The recreational significance of the property lies in its situation including a major spur leading to the main crest of the Kakanui Mountains (Fig. 5). This is particularly important as it leads to the central section of the crest between Mt Nobbler to the north and Kakanui Peak to the south, and in fact to the highest point on the range.

Mason (1988) has reported that: - "Tramping activity tends to be centred on the forested Waianakarua catchment with its deeply dissected ridge and valley system

Over the greater area of tussock grasslands of the Kakanui Mountains there is less frequent tramping activity. Features such as the volcanic caps of Siberia Hill and Kattothrust, and the high points of Kakanui Peak and Mt Pisgah are the more usual attractions. Winter snow cover provides another dimension, particularly for ridge climbs from the Pigroot. It appears that the range is in a snow shadow relative to most other Otago ranges, and therefore cannot be relied upon to provide skiable conditions. When snow cover is sufficient however, extended tours on varied terrain are possible from Obi in the south, along the main crest to Danseys Pass. The crest is suitable for both cross country and alpine ski touring in the right conditions. The 'Hector's Plateau' is particularly suitable for cross country skiing"

More recently, mountain bike use has become an increasingly common recreational activity in the high country. Very often the same terrain which is suitable for extended ski touring is also suitable for mountain bike use, especially if there are existing 4WD tracks. Some use is currently being made of the Kakannis by mountain bike enthusiasts, and there is potential for greater use with improved public access.

Public access on foot and mountain bike, and possibly also horse are the main priorities for recreation in this tenure review. The main access route which should be confirmed for public use through this tenure review is the legal road up Pisgah Spur to the Kakanui crest, and along the main crest of the Kakanui Mountains to the head of the Maerewhenua Spur. The actual alignment of the road formation on the ground should be compared with the legal alignment on the cadastral map, and if there are any differences, the actual formation should be formally recognised as the legal road. This would satisfy the requirement of the CPL Act 1998 as it would provide secure public access to the crest of the Kakanui Mountains and to any new conservation land which may be created out of the upper part of Pisgah Downs pastoral lease.

It is understood that a legal road extends from the high point on the Danseys Pass Road over Mt Alexander and on southwards to Mt Nobbler and Mt Pisgah. When public access up Pisgah Spur is confirmed it will link with the track along the crest of the range and open a range of recreational opportunities for both summer and winter activities.

A grand traverse of the Kakanui Mountains emerges as a challenge for both summer and winter trips (Figs 8 and 9). This should be considered in relation to the tenure reviews of other pastoral leases on the Kakanui Mountains including Mt Dasher, the Dasher, Shingley Creek, Balmoral, Dome Hills, Ben Ledi, and Mt Alexander, all of which are at various stages of tenure review, and could eventually provide continuous access along the range to Danseys Pass in the north and the Horse Range in the south.

It will also be appropriate through neighbouring tenure reviews, to ensure public use of the legal road south of Mt Pisgah leading to Kakanui Peak, Obi (Fig. 9) and eventually the Pigroot or the Waitaki Valley, and the legal road over Mt Nobbler and Mt Alexander (Fig. 8) to Danseys Pass. This underlines the need to consider the whole network of emerging recreational opportunities as tenure reviews on all the Kakanui pastoral leases proceeds.

PISGAH DOWNS IN THE CONTEXT OF THE WIDER KAKANUI AREA

It is important that, as a matter of principle, a broad view of the overall outcomes be taken as each pastoral lease is reviewed and that consideration is given to a possible conservation park and to the emerging network of recreation opportunities. Recreational use in the future will depend on decisions made now, so it is

“RELEASED UNDER THE OFFICIAL INFORMATION ACT”

important that adequate provision is made for recreation and public access. This case was made by FMC in the report on the Recreational and Related Significant Inherent values of Mt Stalker (February 2002).

FMC has earlier submitted on the desirable outcomes from the proposed tenure review of Islay Downs (1997). This property lies on the Pigroot side of the Kakanui Mountains and includes the ridge from Kakanui Peak (1528m) to Obi (1425m, Fig. 9). FMC recommendations included the following:- *"There are very high recreation and landscape values along the tops from Kakanui Peak to Obi, and on the steep faces east and west of the main ridge. Much of the steep land is LUC Class VII and VIII which cannot sustain pastoral use and should be transferred to DOC"*

FMC has recently reported in relation to Shingley Creek (April 2003) that: *"Public access to and over Shingley Creek is also important because the outcomes of these other tenure reviews are likely to provide opportunities to plan for through trips from the Pigroot to Danseys Pass and the Kakanui valley in the foreseeable future. This tenure review of Shingley Creek needs to bear in mind all these possible future possible options, and to make appropriate decisions to facilitate recreational opportunities for the future"*.

The above commentary and recommendations well illustrate the need to consider the wider implications of tenure review on one property and set the review of Pisgah Downs in the wider context of the Kakanui Mountains and North Otago generally.

The recreational significance of Pisgah Downs should be assessed not only on its present usage but also on its potential. This is because current usage is much less than its potential for a number of reasons. Because of the current land tenure under pastoral lease, and because access to some parts of the range has not been easy in the past, the recreational use of Pisgah Downs may have been less than it might have been if these impediments did not exist. There is significant potential for greater use and it is the full range of possibilities which should be considered during this tenure review.

In summary, this assessment indicates that there is considerable scope in the wider Kakanui area for extended tramping or mountain bike and winter ski touring trips on the Kakanui Mountains. It is envisaged that in time the traverse along the range from Danseys Pass to Mt Pisgah, Kakanui Peak, Obi, the Mt Dasher/Mt Stalker country and the Waianakmua catchment or the Pigroot will become a classic trip. Access to the central part of the Kakanui Mountains via the Pisgah Spur opens up a much wider range of options than just traversing the ridge from end to end; in combination with routes on neighbouring properties, a number of old trip options are emerging. It is recommended that public access for all these activities should be secured as an outcome of tenure review.

SIGNIFICANT INHERENT VALUES AND THEIR IMPORTANCE FOR RECREATION

This report focuses on those features of Pisgah Downs which are known to be important for public recreational interests. It should be noted that while some of this interest focuses on access, the natural and historic values and landscapes, and views to be had from the many vantage points have a fundamental impact on the recreational value of the back country and greatly influence the quality of recreational experience enjoyed. It is for this reason that reference is also made to natural, historic and landscape values of this property.

It was noted above that the lower slopes of Pisgah Downs have been oversown, topped and improved for pastoral use. These improvements, together with the effects of grazing, and burning in some places, have significantly modified the native vegetation. (Fig. 10). This was largely tussock grassland but with remnant shrublands and forest in sheltered gullies and gorges. At higher elevations the impact of pastoral farming has been significantly less and consequently the vegetation is less modified.

Protected Natural Area surveys in 1989/90 recognised an area which included Mt Pisgah as a Recommended Area for Protection (Dansey RAP 7 : Pisgah). This area was described as follows:-

"This RAP covers 1,980 ha and ranges in altitude from 700 to 1,640m. It covers part of the headwaters of the South Branch Maerewhenua River and the North Branch Kakanui River. It also includes the western end of Pisgah Spur, Mt Pisgah, and part of the western slopes of the central Kakanui Mountains. The nonh-

“RELEASED UNDER THE OFFICIAL INFORMATION ACT”

filcing upper slopes and spurs above about 900m in the head of the South Branch Maraewhenua River catchment are located on Pisgah Downs pastoral lease. ”

“The RAP comprises generally planar and steep mountain slopes with broad, rounded intervening ridges. Extensive coarse scree occurs on the steeper northern and southern aspects of Pisgah Spur and on the western face of the main range. Along the flattened summit ridge, particularly north of Mt Pisgah, there are extensive patches of stone pavement where frost action has upended thin slabs of schist as “gravestones” and locally sorted the stones by size. There are prominent slumps at the head of both catchments and on the eastern boundary ridge in the Maerewhenua River catchment, most probably activated by past fault movement. ”

“Snow tussockland and shrub-tussocklands are the predominant vegetation types throughout the RAP. Slim snow tussock is extensive on higher altitude slopes down to mid altitudes (1,000 m) on shady aspects, and on west-facing slopes in the Maerewhenua catchment. Narrow-leaved snow tussock is abundant at mid to low altitudes, and on sunny aspects.

Inter-tussock species diversity, for both slim and narrow-leaved snow tussocklands, typically decreases as the cover of snow tussock increases. False Spaniard and blue tussock are the most common subdominants. Where the snow tussock cover is relatively sparse, for example, on the west-facing slopes of the Maerewhenua catchment, there is a much higher diversity of species, including Gaultheria, Pentachondra, Helichrysum, Leucopogon and Raoulia.

Shrubs are abundant in the tussocklands. Scattered mountain tauhinu is widespread on the west-facing slopes of the Maerewhenua catchment, increasing in dominance in damp hollows and flushes, and accompanied mainly by bog rush and mosses. On the south-facing slopes of Pisgah Spur extending into the Kakanui catchment, turpentine scrub is characteristic of the tussocklands below about 1300m. Mountain flax and prickly shieldfern also contribute to the cover on these slopes, particularly in gullies and hollows. Small areas of similar vegetation occur on south-facing, low altitude, bluffed slopes in the Maerewhenua catchment.

Shrublands are also associated with isolated blockfields at mid altitude. The shrubs here are mainly Coprosma and Hebe, but snow totara and turpentine scrub are also present along with lesser amounts of prickly shieldfern and thousand-leavedfern. ”

“On Pisgah Spur, the tussock cover is broken by extensive scree. Coarse scree is predominant and is mainly non-vegetated except for small patches of shrubland on mid to lower slopes that have remained protected from burning between scree patches. In the Maerewhenua catchment the shrubs are mainly Coprosma, Hebe, snow totara and Brachyglottis.

On finer gravels, confined mainly to small areas above 1300m on north-facing slopes, there occur grasses and occasional plants of the scree bucket. Occasional plants of Hebe are also found on these finer gravels on the south-facing slopes of Mt Pisgah.

Where soil has developed between scree tongues at higher altitudes, there are patches of cushionfield and sparse tussocklands dominated by Dracophyllum and Celmisia and slim snow tussock. These patches have developed, in places, into small lobes or earthen stripes extending downslope sometimes up to distances of 150m. The vegetation cover and the soil development suggest, however, these stripes are not active.

Much of the main Kakanui Mountain ridge and rocky crest of Pisgah Spur is exposed rock and grass/field with small patches of cushion vegetation, consisting primarily of Luzula, Dracophyllum, Chionohebe and Phyllachne. On north-east-facing slopes under Mt Pisgah there are small shallow hollows with snowbank vegetation including Kellera, Pernettya, Ourisia and Celmisia. These small snowbank hollows were only found in one other area in the District. Consequently, the plants characteristic of this habitat are restricted in their distribution within the District.

Because of the sheltering effect of the scree tongues and the type of substrate many plants were found only here. ”

“RELEASED UNDER THE OFFICIAL INFORMATION ACT”

The PNA survey team concluded that this RAP contains the greatest diversity of vegetation types of any of the RAPs in Dansey Ecological District, a reflection of the range in elevation, aspect and landform. The cover of the vegetation is generally dense, with few adventive species.

This RAP also has the most extensive area of scree and alpine fellfield in the District. Scree is rare on the Otago schist mountains, except in the Kakanui Mountains. In this RAP they exist on north, south and west facing slopes.

The inclusion of areas at comparatively low elevation (< 800 m) has meant that this RAP contains plant species such as broadleaf and mountain three-finger, normally found only in the forest reliant RAPs.

The high-alpine cushionfield/fellfields of Mt Pisgah have been identified as a key site for the conservation of insects.

This RAP was ranked High for the following six important criteria - Representativeness (representative of mid to high altitude plant communities), Diversity (species rich, high diversity of plant communities), Naturalness (low number of exotic species, relatively little modified although variable). Special features (scree rare in Otago, contains giant weta species and the largest area of scree and alpine fellfield in the District), Viability (large intact area), Buffering (adjacent to semi-natural areas, and area retired from grazing). The only threat which was recognised was fire, and this was ranked Low to Medium.

For all these reasons identified by the PNA survey, to comply with the NZ Biodiversity Strategy, and to meet the recently declared government objectives for the South Island high country, this area should be returned to full Crown ownership and control and managed for conservation and recreation.

There are historic values of considerable interest in the Maerewhenua valley. There is an extensive network of paired water races which start in the upper reaches of the northern arm of the South Branch of the Maerewhenua River before it flows into Ben Ledi Station. These races cross the ridge between the north and south arms of the South Branch at about 800m and follow a convoluted course through Pisgah Downs (Fig. 11) towards the Livingston diggings where the water was extensively used for sluicing gold out of the gravels (Fig. 12). One glance at the map shows that there were many kilometers of these races, most of which are on Pisgah Downs pastoral lease. They could be protected within the new conservation area, or as an historic reserve within the freehold. If the surrounding land does become freehold, it should be possible to allow continued grazing so long as the grazing pressure is controlled and damage does not occur.

AREAS TO BE PROTECTED

On the basis of the descriptions above it is considered that much of the higher land on the main spur and on the higher, steep slopes is unlikely to be suitable for freeholding. On the other hand, it is highly probable that in the absence of burning and grazing, the former highly significant inherent values of tussock grasslands, sub-alpine dwarf shrub and cushionfield communities will recover. The natural values observed in the RAP (Dansey RAP 7 : Pisgah) are an indication of this potential. Consideration should therefore be given to the potential for the recovery of the high mountain vegetation types and also shrublands in gullies if such areas were returned to full Crown ownership through tenure review, and an appropriate area identified for this purpose.

Because it was not possible to inspect these high altitude areas at the time of the FMC inspection in February, only provisional lines are drawn on the map. From a recreational perspective it would be helpful if the hut situated at about 800m could be included within the conservation area. It appears possible to achieve this, and at the same time make use of existing fence lines to separate conservation land from freehold.

A representative section of the historic water races in the Maerewhenua catchment should be protected. If the area to become conservation land includes a sufficiently large part of the upper reaches of both the north and south arms of the South Branch, a representative section of water races will be included. If on the other hand, only a small area becomes conservation land, this may be insufficient to include a representative section of water races. In this case it will be necessary to protect a representative section of water races as an historic reserve. It may be possible to allow controlled grazing within the historic reserve.

ACCESS REQUIREMENTS

The following access provisions will be required:-

Confirmation of the legal road along Pisgah Spur, and where necessary, formally recognising the formation of the ground as the legal alignment if there are any discrepancies between actual and legal alignments.

Confirmation of that part of the legal road along the main ridge crest from Mt Nobbler to Mt Pisgah, which runs along the back boundary of Pisgah Downs pastoral lease. Again, if there is any discrepancy between the legal road and the actual formation, then the actual formation should be formally recognised as the legal road through tenure review.

CONSERVATION MANAGEMENT STRATEGY FOR OTAGO

The Kakanui Mountains area has been recognised as one of 41 Special Places in Otago which have been identified in the Conservation Management Strategy (CMS) for Otago. The objectives for the Kakanui Mountains Special Place include:- *“To maintain the natural resources contained within the existing protected areas on the Kakanui Mountains while taking opportunities that may arise through pastoral lease tenure review to negotiate protection of, and access to, areas of high natural and recreational value.”*

It should be further noted that the CMS states that: *“foot access [will be] negotiated at key points for the public to areas managed by the department, with public vehicular access having a lower priority.”*

Furthermore, it is important to note that the priority for Kakanui Mountains is:- *“In this Special Place, tenure review negotiations and wilding tree control will be the priority method for implementing the objective during the course of this CMS.”*

The objective, implementation statement and priority stated for the Kakanui Mountains thus accord very closely with the recommendations made in the present report.

CONCLUSIONS

The most important recreational issue in this tenure review is guaranteed secure public access up the Pisgah Spur to the Kakanui Mountains.

The tenure review of Pisgah Downs is important as it provides an opportunity to enhance the recreational opportunities and use of the Kakanui Mountains and opportunities generally available in North Otago. In the main this will be achieved by providing secure public access but also by ensuring that some tussock grassland and high altitude plant communities may be given a chance to recover their former glory if they are protected from burning and grazing within a new conservation area. At the very least, this should include RAP 7: Pisgah. There is also an opportunity to add to the recreational interest of the area by including some of the extensive system of water races which once fed the Livingstone diggings. Tenure review offers an opportunity to improve the quality of recreational experience on those lands by recognising and protecting the significant natural and historic values described above.

Additions to the public conservation land in the area, for example through tenure review on the neighbouring properties Dome Hills and Ben Ledi, and the other pastoral leases which are further away, but also on the Kakanui Mountains, should all be considered collectively, with a view to improving the recreational opportunities available in North Otago. Ultimately, this should provide improved public recreational access over the Kakanui Mountains, and provide a range of walking, riding and skiing opportunities along the crest of the range with options for a variety of alternatives by using the Pisgah Spur, and aid in the creation of a new Conservation Park on the Kakanui Mountains.

The outcome of the tenure review of Pisgah Downs, if it includes the important recreation and conservation recommendations included in this Report, could contribute significantly to the achievement of the objectives declared for the Kakanui Mountains Special Place in the Conservation Management Strategy for Otago.

ACKNOWLEDGEMENTS

FMC is grateful for assistance from Opus International Consultants for making the assessment possible. The site inspection was carried out in February 2004 and FMC is very grateful to the nmholder Jack McKenzie for his co-operation and granting permission for access and use of fann tracks on the property.

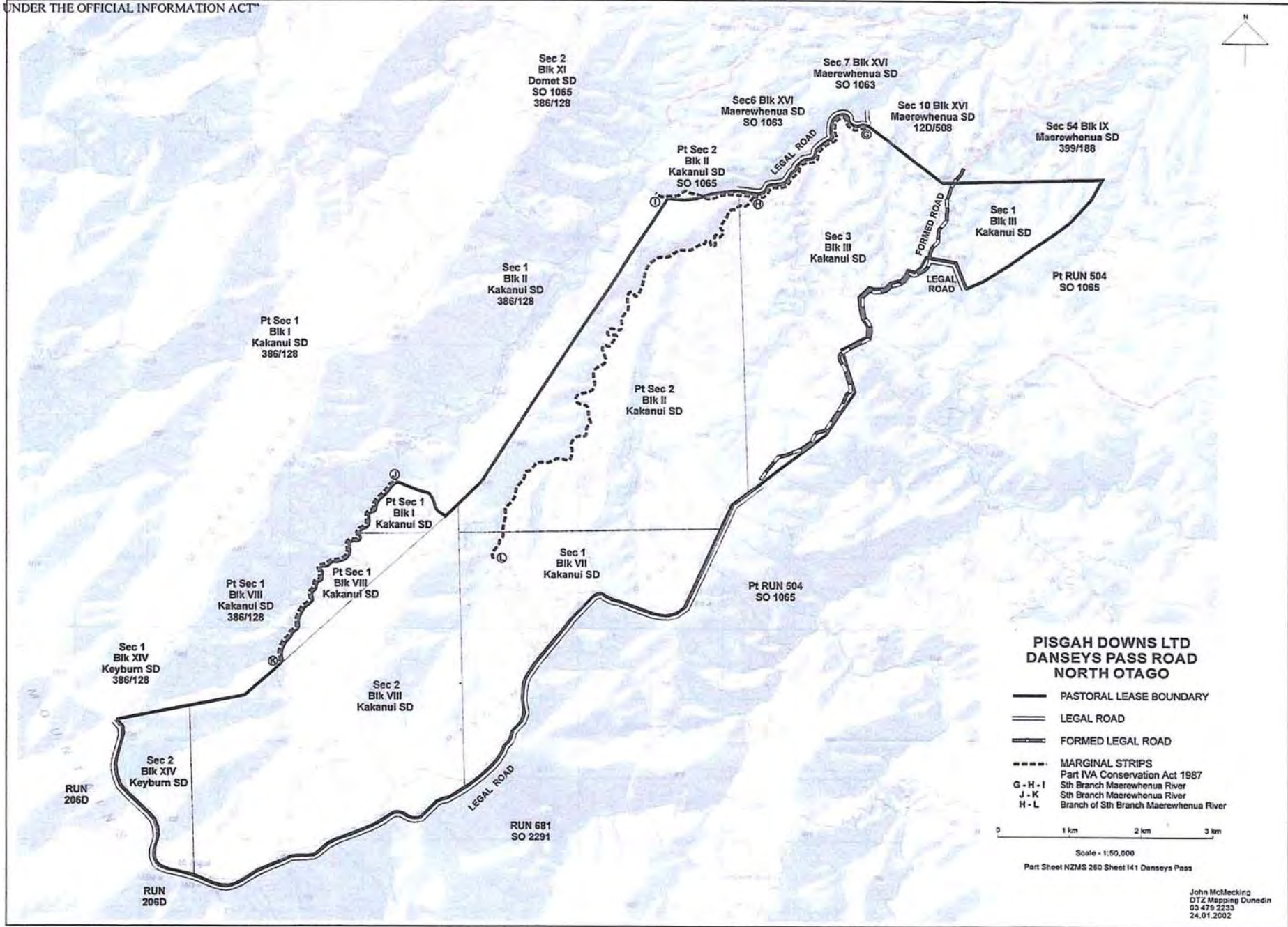




Fig. 1 The Kakanui Mountains are seen here from Clover Flat on the Pigroot with the highest point (Mt Pisgah at 1,643m) in the centre of this view. The range is more prominent from this (south western) side as there is a relatively steep escarpment rising 600 to 900m from the Shag Valley floor and the Maniototo Plain. Recreational journeys along the crest of the range are likely to become increasingly popular in the future so it is opportune to make adequate provision for access during tenure review.

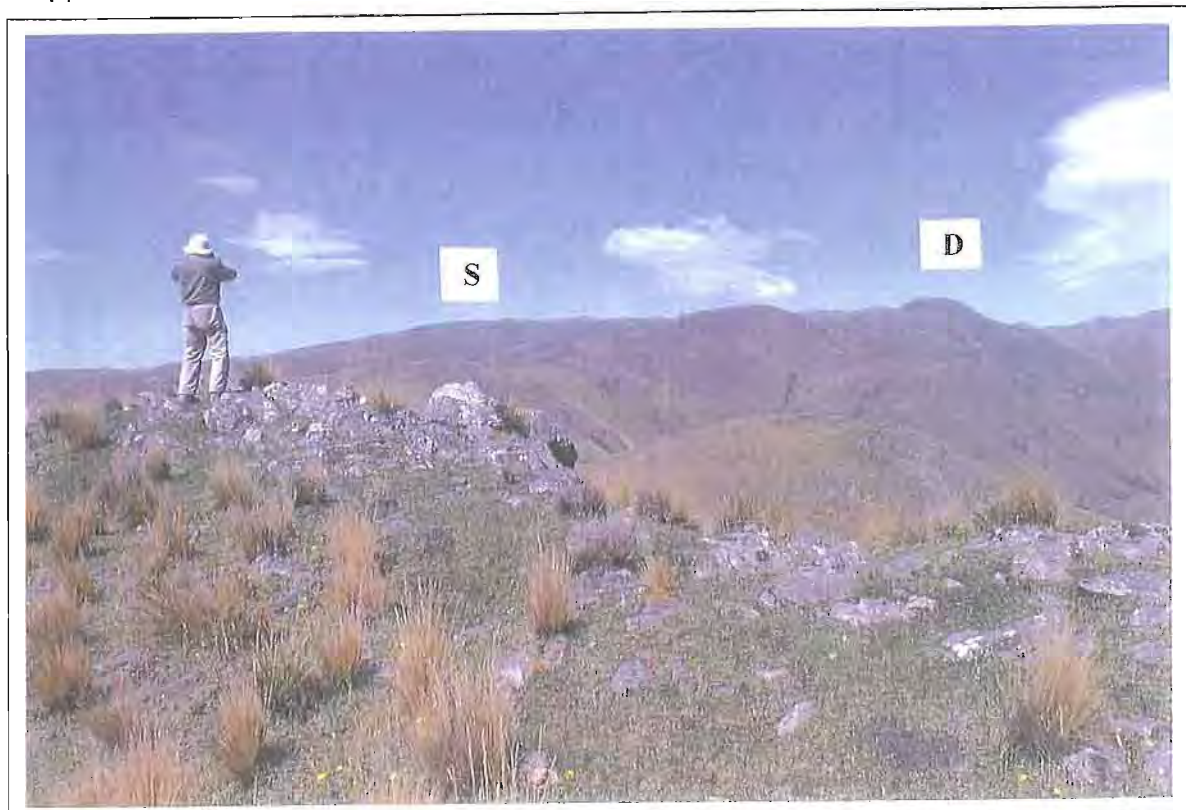


Fig. 2 The north eastern slopes of the Kakanuis are more gentle, and at the eastern end are interrupted by the volcanic intrusions of Siberia Hill (S) and Mt Dasher (D). These volcanic features are known destinations for trampers and others, and are likely to increase in popularity in future as they become better known and access is improved through tenure review.

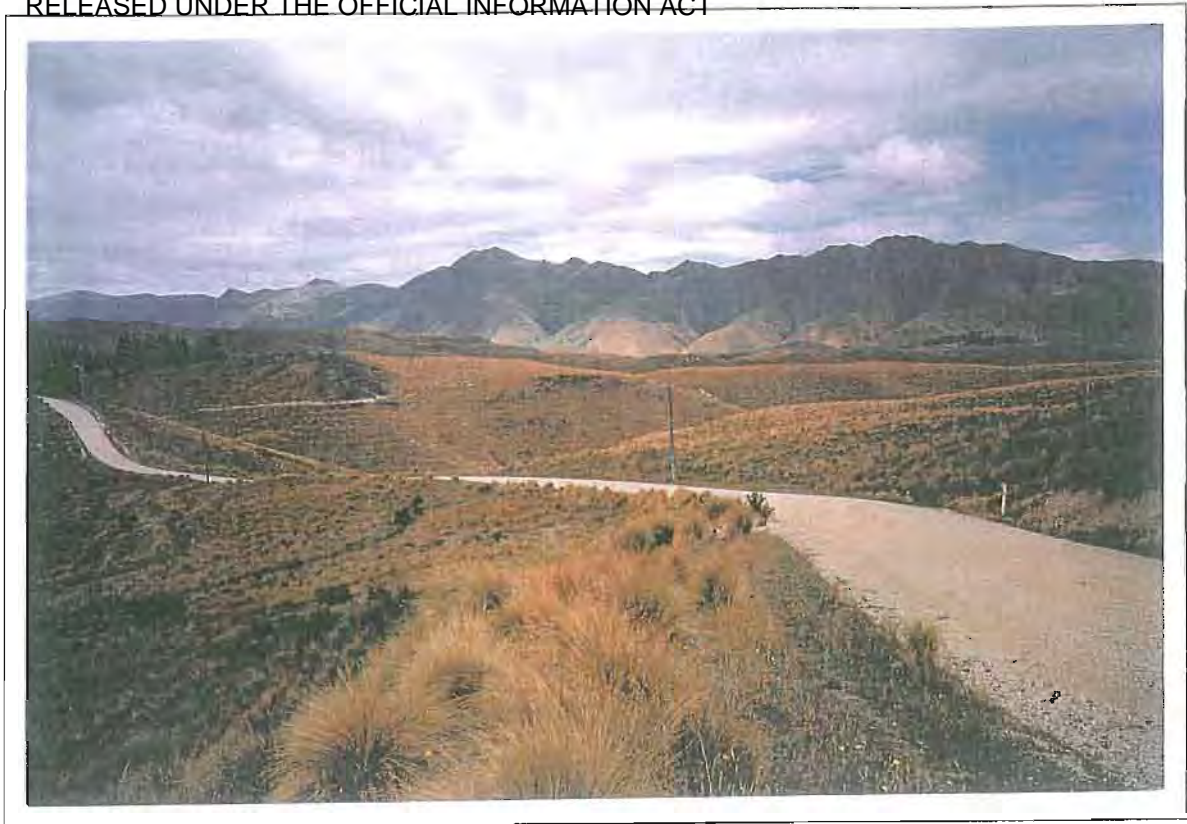


Fig. 3 McKenzie's Road serves both Dome Hills and Pisgah Downs homesteads and is seen here in the foreground at about 600m. On the skyline is the Maerewhenua Spur on Ben Ledi Station which is situated to the north of Pisgah Downs. Out of sight in the middle distance is the deeply incised Maerewhenua River with its convoluted system of water races which were used to sluice the gold out of the Livingstone Diggings.



Fig. 4 The south east face of Pisgah Spur is seen here from Dome Hills pastoral lease. The track follows the skyline (and the boundary between Dome Hills and Pisgah Downs) and climbs steadily from right to left to reach the crest of the range at Mt Pisgah. The track, which closely follows a paper road, is a very important recreational route to the Kakanui Mountains. The most important issue in this tenure review will be to confirm secure public access by recognising the road formation as the legal road.



Fig. 5 McKenzies Road wends across the lower slopes of Pisgah Downs pastoral lease before climbing Pisgah Spur, seen here on the left, and rising to 1,643m at the summit of Mt Pisgah on the crest of the Kakanui Range. The alignment of this legal road needs to be confirmed during tenure review as it is one of the most important access routes to the range crest, and thence north to Danseys Pass or south to the Horse Range.



Fig. 6 The delightful Pisgah Downs homestead is situated on McKenzies Road at about 500m, among well established trees in a sheltered spot on the northern boundary of the property.

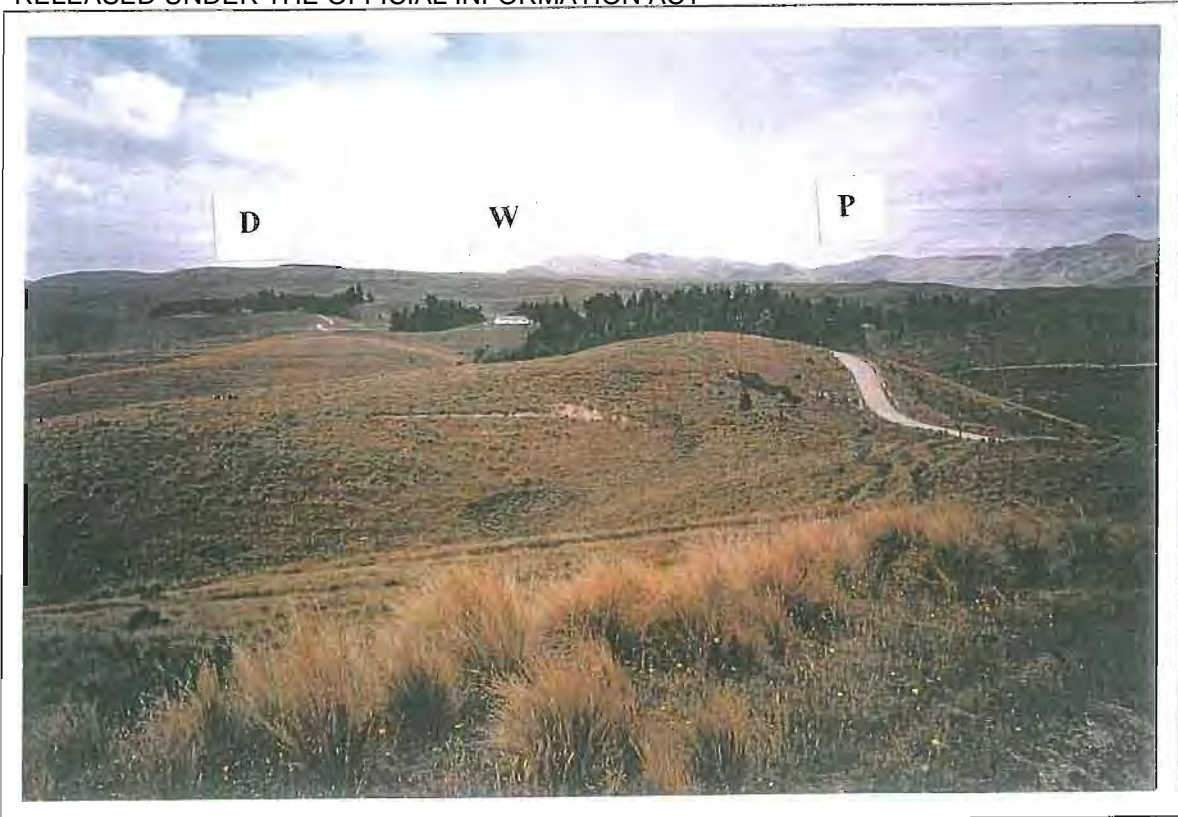


Fig. 7 The northern and lowest end of Pisgah Downs is approached by McKenzies Road which passes the homestead (P) in the trees, the woolshed (W), and Dome Hills homestead (D) before gradually climbing the Pisgah Spur (skyline centre) which forms the boundary between Pisgah Downs and Dome Hills.



Fig. 8 This view from Mt Alexander (at the northern end of the Kakanuis) shows part of the track climbing over a smaller knob at 1,300m and on to Mt Nobbler (on the skyline at the left). This route has been used in the past for ski touring but it is likely to be more frequently used in future by mountain bike enthusiasts. The traverse of the Kakanui range is likely to become a classic trip in the not too distant future so long as appropriate provisions are made during tenure reviews of properties along the range.



Fig. 9 There are opportunities for extended tramping and skiing trips along the length of the Kakanuis. Trampers are seen here traversing the southern end of the range between Kakanui Peak and Obi, on the edge of Mt Dasher Station. This highlights the importance of considering the outcomes of this tenure review in the light of an emerging network of recreational opportunities on neighbouring properties, and in the wider context of the whole Kakanui Mountain range.



Fig. 10 The lower slopes on Pisgah Downs are characterised by Hurunui Lowland Yellow Brown Earth soils, classified LUC Class VI which, with appropriate fertiliser use to maintain nutrient balance, should be capable of ecologically sustainable pastoral farming. As such, these lower slopes appear to be suitable for freeholding. Ben Ledi Station and Mt Domet can be seen in the middle distance and far distance respectively.



Fig. 11 Within the upper reaches of both the north and south arms of the Maerewhenua River South Branch, there is an extensive and convoluted system of paired water races. These are notable because they cover many kilometers on the valley sides and because of their historical significance. They deserve to be protected either within the new conservation area, or as a designated historic reserve. The Maerewhenua Spur and the Kakanui Mountains (K) can be seen on the skyline.



Fig. 12 The Maerewhenua water races provided the water which was the main driving force for the Livingstone Diggings. Although the main diggings and workings were further north towards Livingstone, significant evidence of sluicing can be seen adjacent to McKenzies Road close to the boundary of Pisgah Downs.