



## **Crown Pastoral Land Tenure Review**

**Lease name : The Dasher**

**Lease number : Po 022**

### **Conservation Resources Report**

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

They are released under the Official information Act 1982.

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**DOC CONSERVATION RESOURCES  
REPORT ON TENURE REVIEW OF  
THE DASHER PASTORAL LEASE  
UNDER PART 2 OF THE CROWN PASTORAL  
LAND ACT 1998**

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PART 1: INTRODUCTION

1.1

The lessees of The Dasher Pastoral Lease have applied to the Commissioner of Crown Lands for a review of the property's pastoral lease tenure.

The Dasher is leased by the A.H. Macdonald Family Trust. The 6224-hectare property is situated in coastal Otago on the eastern Kakanui Mountains, along the northern slopes of the upper Kauru River. The homestead is located approximately 20 kilometres from Maheno.

The property rises from 250 m asl. within the Mackerras Creek streambed, located at the eastern end of the property, which dissects the rolling downs. The property then extends in a westerly direction to a maximum of 1425 m at Obi.

The property lies within the Kakanui Ecological Region and Dansey Ecological District, for which a Protected Natural Areas Programme (PNAP) survey has been carried out (Comrie, 1992) which included flora and invertebrate surveys. Two areas were recommended for protection on The Dasher Pastoral Lease. RAP3: Hughie is an area of broadleaved forest, manuka shrubland and tussockland, while RAP5: Dasher is part of an extensive gently inclined volcanic mountaintop, which supports tussocklands, wetlands, boulderfields and shrublands.

No parts of the lease are currently subject to protection for conservation purposes.

At the south-western corner of The Dasher pastoral lease, there is a small area of Crown land allocated to the Department of Conservation pursuant to section 62 of the Conservation Act 1987 (refer Map 4.2.1). This Stewardship Land is referred to in the Otago Conservation Management Strategy Land Inventory as "142 056 Horse Range - Morrisons".

There are nine parcels of Crown land along parts of the Kauru River which are s.58 marginal strips.

The tenure review inspection of The Dasher Pastoral Lease was undertaken 24-28<sup>th</sup> February 2003 by a range of specialists.



Landscape Unit 1 (LU 1) - MacKerras Creek catchment and land to its east

Character Description

This unit incorporates all of the eastern front country of the pastoral lease. The western boundary of the unit follows the Kauru River, while in the south it is bound by the Mt Stalker pastoral lease. In the north the unit borders onto the Mt Dasher pastoral lease.

The landforms within this unit can be divided into two separate components. Along the eastern side, the physical relief is undulating hill country with a light indented drainage pattern. Here the small streams feed into the Kauru River outside the property. Further to the west the primary landform is the entire catchment of the Mackerras Creek that drains into the Kauru River close to the boundary with Mt Dasher. The side slopes of the creek's catchment are typically incised with over-steepened short gullies extending into the crest of the surrounding rolling hill country. A geological feature of note is the exposed seam of slate, once mined and utilised as a roofing material.

The Kauru River is confined within a narrow winding valley, with the river frequently being bordered by single terraces that alternate on either side of the channel. A distinctive in-stream feature is the large water-worn boulders, which create localised areas of white water.

The vegetative cover within this unit has been extensively altered into production pasture with a large proportion of the rolling hill country being cultivated into intensive farmland. Areas that are inherently difficult to cultivate have been retained in tussock grassland. Extensive shelter plantings surround the homestead, farm facilities and local paddocks. The Mackerras Creek catchment has been heavily modified with the vegetation conveying a fragmented pattern due to a strong natural trend for woody species to recruit the darker and damper side slopes. A concerted effort has been made to control the infestation of gorse by periodic burning, which subsequently has had an adverse effect on the broadleaf shrublands that still occupy some of the larger gullies. On some slopes, reversion to shrub tutu is taking place. A distinctive feature is the wide scattering of cabbage trees that extend over the full altitudinal range of the catchment.

The entire catchment has a serious weed problem with a wide distribution of secondary gorse, thistles, Himalayan honeysuckle and clumps of *Cotoneaster*. The narrow terraces abutting the Kauru River are generally clad in introduced grasses with the spasmodic remnants of *Coprosma* shrublands.

Landscape Values

The unit contains only moderate landscape values attributable to the modified and disjointed nature of the vegetation. Furthermore, this unit does not contain any notable natural features or landforms. The altitudinal range at which this unit is located could be described as within the transitional zone between the lower semi-

**PART 2: INHERENT VALUES: DESCRIPTION OF CONSERVATION  
RESOURCES AND ASSESSMENT OF IMPORTANCE**

**2.1 LANDSCAPE**

Methodology

The Dasher Pastoral Lease has been divided into four landscape units as listed below (refer Map 4.2.2). Their boundaries are defined principally by changes in topography, aspect and groundcover.

- Mackerras Creek catchment and land to its east (LU1).
- Steep catchments draining south from Hector's Plateau and Mount Difficulty into Kauru River (LU 2).
- Hector's Plateau surrounding Siberia Hill and Trig Island (LU 3).
- Western catchments flowing into North Branch Waianakarua River, west of Cayenne Spur (LU 4).

Each landscape unit is defined, and a description of landscape character in terms of landform, land cover and land use is given. An assessment of landscape values is made using the following criteria:

- Naturalness – the level of naturalness of vegetation, and extent of human intervention.
- Legibility – the clarity of formative processes and how striking these physical processes are.
- Aesthetic values – these include 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.
- Historical values – areas containing high heritage importance.

A description of visual values is given. An assessment of each landscape unit's vulnerability to change is made.

intensive farmland and the high country, where there is frequently an inter-grading between land uses. The exposed seam of slate has some historic importance.

#### Visual Values

This unit has limited visual resource value owing to the rolling hill country merging with similar hill country in the district. Mackerras Creek gully can only be viewed from a local level.

#### Potential Vulnerability to Change

This unit is moderately vulnerable to change with the threats including:

- The decline in area and condition of the remnants of tussock that occupy the inherently unproductive areas such as steep slopes and along creeks.
- The decline in area and composition of remnants of mixed broadleaf shrublands due to intensive grazing and burning.
- Loss of shrubland diversity through competition from woody weeds such as gorse and Himalayan honeysuckle.
- Riparian damage caused by cattle grazing and pugging.
- Inappropriate land use, e.g. pine plantations.

#### **Landscape Unit 2 (LU2) – Steep catchments draining south from Hectors Plateau and Mount Difficulty into Kauru River**

##### Character Description

This extensive landscape unit incorporates the south facing slopes that overlook the Kauru River catchment and extends as far west as Cayenne Spur. The top boundary of the unit is defined by a distinguishable change in the topography from the gentle relief of the upland Hectors Plateau (LU3) to the heavily dissected side slopes. The unit also includes the dome-shaped peak of Mount Difficulty (775m.asl.), which is located along the northern limits of the property. The side slopes that flank the river are frequently characterised by narrow-crested spurs that project out from the upland plateau at various angles. The spur crests contain small shafts of parent rock or stable scree. Separating the spurs are deeply-incised gullies that often contain a head basin. The side slopes become increasingly constricted in the mid and lower sections of these gullies before joining the Kauru River valley. In places the Kauru River is enclosed within a sheer-sided gorge that is defined along the top edge by a rounded shoulder.

The headwaters of the Kauru River are contained within a winding incised valley. The series of spurs, which jut out from Hectors Plateau, are typically razor-edged and descend rapidly. Cayenne Spur in the south-west is prominent. Its slopes are generally less precipitous, with intermittent rock formations protruding from the more rounded colluvial slopes.

Vegetation cover is characterised by low stature narrow-leaved snow tussock on sunny faces and spur crests, while darker faces have a stronger tussock cover and a significant component of turpentine scrub, dwarf snowberry and *Celmisia* spp. Where protected from fire, mountain flax is increasing in abundance. The gully floors and the lower Kauru River gorge faces are covered in mixed divaricating shrubs, koromiko, mountain flax, prickly shield fern and manuka.

The catchment locally named "Mount Gully" which drains Mount Difficulty to the east of Hughie Stream, is of interest as it contains a diverse assemblage of landforms. These include an angulated head basin that is dominated by over-steepened craggy spurs and the occasional stable boulderfield. The mid-section of the gully is v-shaped and similar to the corresponding gullies and becomes more constricted near the confluence with the Kauru River. The vegetation within this gully is strongly influenced by aspect and burning, with the darker, colder faces being vigorously recruited by narrow-leaved snow tussock and mountain flax. The gully floor is covered in a mixture of mature broadleaf, lemonwood and adult lancewood. The sunny slopes are clothed in light fescue and silver tussock with the darker depressions being occupied by *Olearia-Coprosma* shrublands. The occasional mature broadleaf and lemonwood is present on the sunnier slopes.

#### Landscape Values

Along the Kauru River corridor this unit conveys high landscape values. Over the last decade inherent values have markedly increased along the fringes of the river with shrublands recruiting the darker faces (pers. comm. Alan Petrie). This has provided the river with a setting that is predominantly natural in character and reinforces its wild and scenic qualities.

The naturalness of the river's corridor is complemented by the expanding mixed broadleaf forest and shrublands that extend up a number of the major side gullies which drain Mount Difficulty.

The head basin of the Kauru River contains high landscape values owing to the visual legibility of the weathering processes that help to form this striking landscape. Of particular note are the series of razorback spurs and the overall precipitous nature of the terrain.

In places landscape values have been compromised by the extent and type of tracking that has been developed. However, due to the stable terrain and rapid recovery of the vegetation the original earth disturbances associated with this activity have become minimal.

#### Visual Values

This unit has only a local visual resource value owing to the Kauru River conveying a strong sense of containment, with most views being channelled down the river's corridor. Mount Difficulty is a prominent landmark that can be viewed from many vantage points within the lower Kakanui Valley.

### Potential Vulnerability to Change

This unit is relatively highly vulnerable to change with threats including:

- Increased grazing pressure on the tussockland, especially over the sunnier slopes that would allow opportunist species such as hawkweed to fully establish.
- The decline in area and composition of mixed broadleaf forest and shrubland due to grazing and burning.
- Loss of riparian habitat along the Kauru River and side streams.
- Wilding pine and woody weed spread.
- Earth disturbances associated with insensitive tracking.

### **Landscape Unit 3 (LU 3) – Hectors Plateau surrounding Siberia Hill and Trig Island**

#### Character Description

This unit includes the entire expansive plateau that tilts from Cayenne Spur eastwards to Siberia Hill (1,286m.asl), down to the more undulating hill country that encircles Mount Difficulty (775m.asl.) further east. The physical relief of the plateau (commonly referred to as Hectors plateau) is normally subdued with the occasional undulation and dome-shaped high point. The most prominent of these high points is Trig Island (985m.asl.), while further to the east are Three Brothers Rocks, which form a noticeable natural feature when viewed from both within and outside the property.

The drainage pattern is superimposed over the low-relief ground surface with the head basin of numerous streams penetrating the sides of the plateau. These streams connect and flow either into the Kauru River or South Branch Kakanui River.

Siberia Hill contains an assemblage of distinctive volcanic elements such as the jumbled blocks of basalt and the boulder streams that typically "flow" down the side slopes of Siberia Hill and intermittently stretch out across the wider plateau. Around the crest of Siberia Hill there is the occasional small-truncated cone.

The vegetative cover is dictated by the micro-topography and drainage patterns with the natural depressions being covered in relatively intact copper tussockland with sphagnum moss, comb sedge and several *Carex* spp among the intertussock species. The drier knolls and gentle slopes are covered in a mixture of narrow-leaved snow tussock and "chewed" slim snow tussock, with the inter-tussock cover frequently being exotic grasses. There is the occasional hard edge in the composition of the vegetation due to various grazing pressures. The plateau was being utilised as a summer grazing block for cattle at the time of survey.

### Landscape Values

The unit has high landscape values owing to the natural elements and processes associated with volcanism. In more specific terms, the attributes that make a contribution to this unit's Importance in a landscape context include:

- The overall impression of uniformity with the subtleties of the various grassland communities being overlaid on a distinctive landform.
- The near-monochromatic tonal range of the various grassland communities.
- The vivid contrasts in colour and texture between the tussockland and the basal boulderfields.
- The vivid legibility of the volcanic activity in the form of boulderfields and streams that "flow" down from Siberia Hill.
- The strong sense of remoteness owing to limited tracking and fencing. The occasional low-key hut is considered to be a traditional man-made element within the South Island high country.

### Visual Values

This unit has a relatively high visual resource value due to the strong sense of openness and limitless boundaries, with parts of the plateau and distinctive landforms being seen from the Kakanui Valley.

### Potential Vulnerability to Change

This unit is highly vulnerable to change due to the subtle traits of the tussock grasslands. Activities that would adversely affect existing landscape values include:

- Fragmentation of the tussockland by subdivision and intensive farming.
- Change of water table within the copper tussockland communities.
- Further depletion of native inter-tussock species.
- Further tracking that would form corridors for opportunist species to establish.
- Wilding pine and woody weed spread.
- Loss of wilderness qualities due to unsympathetic siting, colours and design of structures.

## **Landscape Unit 4 (LU 4) – Western catchments flowing into North Branch Waianakarua River west of Cayenne Spur**

### Character Description

This unit incorporates three dissected catchments to the west of Cayenne Spur, including Waddells Creek and the head of Jimmys Creek. Obi (1425m asl.), the highest point on the property, is located at the head of Waddells Creek. The catchment immediately west of Cayenne Spur falls rapidly towards the south from a prominent

saddle, while the other two catchments extend out from the western limits of the plateau.

The gully that descends from the Cayenne Spur saddle is deeply eroded and weathered, with evidence of erosion both in the form of debris chutes and wind erosion. This erosion is most prevalent on the sunnier slopes with thinner soils. Similarly, the head of the Jimmys Creek catchment is prone to erosion with weathered spurs extending down to the floor of the valley. The mid slopes exhibit large bluffs of parent rock. Below approximately 1000m.asl. there is a gradual change in landform, from deeply dissected hill country into gentler colluvial slopes that are lightly indented. Further to the west, Waddells Creek catchment is typified by broken terrain with bluff outcrops being a natural feature.

### Landscape Values

Above 1000m.asl. this unit has high landscape values that are attributable to the intactness of the native vegetation on the darker faces within the dissected head basins. This unit has no distinctive features, except for the heavily weathered spurs. However, the upper sections of these catchments make a positive contribution to the landscape character of the district, primarily due to the repetitiveness of the elements that are commonly found in the band of dissected hill country between the Kakanui Mountains and the Horse Range.

### Visual Values

This unit has only moderate visual resource value due to its being obscured from other parts of the district by the front ridges and slopes of the Horse Range.

### Potential Vulnerability to Change

This unit is moderately vulnerable to change, with the threats including:

- Intensive grazing on erosion-susceptible slopes.
- Burn-offs over sparsely clad sunny slopes.
- Wilding pine and woody weed spread.
- Insensitive zigzag tracking and all earth disturbances on thinner soils.

## **Importance of Landscape Values**

The Dasher Pastoral Lease contains a wide spectrum of natural landscapes and features that are distinctive to the southern Kakanui Mountains. These special traits include the expansive Hector's Plateau characterised by elements associated with volcanic activity such as dome peaks and truncated cones. The boulderfields and streams are a memorable landscape element.

The Kauru River is located within a setting which is predominantly natural in character and which reinforces its wild and scenic qualities. The naturalness of the river's corridor is complimented by the expanding broadleaved shrubland, while the strong visual legibility of weathering processes in its head basin help to form a striking landscape.

The strongly dissected catchments to the west of Cayenne Spur make an important contribution to the landscape character of the district, primarily due to the repetitiveness of the elements that are commonly found in the band of dissected hill country between the Kakanui Mountains and the Horse Range.

## 2.2 LANDFORMS, GEOLOGY & SOILS

### a) 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). This fault block comprises a steep front or scarp descending into the Shag Valley and Maniototo Plain, and a gently inclined backslope descending gradually eastward towards the Waitaki River. This gently inclined backslope is believed to be a surface formed under the periglacial climatic conditions and may in places be parallel, but much lower, to a former stripped Cretaceous peneplain surface.

The western end of the property is characterised by an extensive gently inclined mountaintop. Bedrock is primarily low-grade schist overlain in places by a cap of volcanic rock, tuff, breccia and lava. Siberia Hill is an eruptive centre (Brown, 1955). The volcanic rock is evident today as rock outcrops and as "streams" of uncemented boulders. The formation of these boulderfields into 'streams' is characteristic outcome of cryogenic processes such as frost wedging and heaving (Rae, 1990). As the altitude decreases eastwards, the ridgetops become more rounded, and the land becomes rolling before blending into the North Otago downlands.

Basement rocks on the property are greywackes and semi schists of the Chlorite II and III subclasses. The eastern parts of the property are predominantly subclass III schist, while a broad band of the less stable subclass II schist runs in a north-south direction through the middle of the property. The schists have been overlain by Palaeocene mud and sandstones, evident along the northern boundary from the rear of the property to the Three Brothers Rocks in the east and around Mount Difficulty. Pliocene volcanic rocks have capped them.

Over the balance of the property degradation has left the basement schists exposed, with some vertically foliated schist exposed in Mackerras Creek, providing a source for slate. At the front of the property no substantial streams have been present to degrade through the schist, resulting in the rolling downs topography.

A mantle of loess provides the parent material for most of the present day soils.



**b) Soils**

Intergrade yellow-grey to yellow-brown earth soils are the most widespread soil types on The Dasher. Hurunui Stony Steepland soils have developed over shattered greywacke, loess and colluvium. These soils support short tussockland and broadleaved-podocarp forest remnants. On high altitude rolling hills and easy slopes, Kirkliston Hill and Saddle Hill soils have formed over basalt. Kakahu soils have formed from greywacke loess on the highest and coldest parts of the downs.

Yellow-brown earths are also present, and include Kaikoura soils, which have developed over greywacke on steep slopes.

Two geopreservation sites are present, No 296 Dasher and No. 297 Hughie. No. 296 Dasher, located at RAP5: Dasher, is characterised by a gently sloping broad mountain top with steep colluvial mountain tops and slopes, and boulderfields, which support snow and copper tussocklands, rushland, cushionfield, scrub and shrublands (Arand et al, 1991. See Appendix 1 and Map 4.2.1). This site contains a moderately wide range of relatively unmodified soils and soil-vegetation associations, with soils derived from volcanic rock. The associated vegetation cover is relatively unmodified. Together, these attributes are uncommon in the South Island.

The geopreservation site No. 297 is located at RAP3: Hughie, and is characterised by having steep colluvial mountain slopes dissected by small creeks separated by rounded ridges, which support broadleaved forest and shrublands. This site contains the largest remnants of lowland yellow-brown earths under manuka shrubland and broadleaved forest in the ecological district.

**Importance of landform, geology and soils**

Siberia Hill is one of the largest volcanic masses of the Dunedin Volcanic Group outside of the Dunedin volcano. Siberia Hill is also one of the exceptions of the East Otago peripheral vents in that it has chemically distinct lava flows overlying one another.

The occurrence of some vertically foliated schist exposed in Mackerras Creek, providing a source for slate is moderately important.

The geopreservation site at RAP5: Dasher is of regional importance as it contains a moderately wide range of relatively unmodified soils and soil-vegetation associations; soils derived from volcanic rock and a relatively unmodified vegetation cover which are uncommon in the South Island (Arand et al, 1991).

The geopreservation site at RAP3: Hughie is of regional importance as it contains the largest remnants of lowland yellow-brown earths under manuka shrubland and broadleaved forest in the ecological district (Arand et al, 1991).

### 2.3 CLIMATE

Annual rainfall is approximately 600 mm at the front of the property, increasing to about 900mm at the back, part of which is contributed by frequent north-easterly fog conditions. There is a high degree of variability between years, resulting in summer droughts at lower altitudes. Even though December and January are often the wettest months, the effectiveness of the rainfall is decreased because of the very high rates of evapotranspiration caused by high sunshine hours and warm drying north-westerly winds at this time of year.

Summers are very warm, with cold winters and frequent frosts. Snowfalls are common, with patches persisting on some of the dark faces for most of the winter.

### 2.4 VEGETATION

Comrie (1992) previously described two RAPs, in the Protected Natural Areas Programme Survey Report for the Dansey Ecological District, which are relevant to The Dasher Pastoral Lease. RAP3: Hughie comprises the catchment of Hughie Stream, and RAP5: Dasher encompasses part of the volcanic plateau and the adjacent catchments of the Kauru River. The details of these RAPs are outlined in Appendix Two.

A list of vascular plant species recorded on the property is given in Appendix Three.

Six geographically distinct areas are identified for the purpose of describing the vegetation. These are:

- Western catchments flowing into the North Branch Waianakarua River west of Cayenne Spur
- Hectors Plateau surrounding Siberia Hill and Trig Island
- Steep catchments draining south from the Hectors Plateau into the Kauru River
- Two catchments flanking Mount Difficulty
- Steep hillslopes on south side of lower Kauru River
- Mackerras Creek catchment and land to its east

#### **Western catchments flowing into the North Branch Waianakarua River, west of Cayenne Spur**

Rock outcrops and stone pavement and deflation surfaces in the upper catchments carry a mixture of sparse narrow-leaved snow tussock (*Chionochloa rigida*) and low shrubland dominated by turpentine shrub (*Dracophyllum uniflorum*). Associated species include patotara (*Leucopogon fraseri*), *Pentachondra pumila*, *Helichrysum intermedium*, *Gaultheria depressa*, *G. crassa*, *Raoullia subsericea*, golden Spaniard (*Aciphylla aurea*), false spaniard (*Celmisia lyallii*), *Pimelea pseudolyallii*, *Celmisia densiflora*, *C. hookeri*, and mouse-eared hawkweed (*Hieracium pilosella*). *Hebe lycopodioides* and tauhinu (*Ozothamnus leptophyllus*) are less common. Grey *Racomitrium* moss is prominent as ground cover. A single plant of the low sprawling shrub *Exocarpus bidwillii* was recorded here, along with a few plants of *Gentiana*

*patula*. The rare *Hebe buchananti* was recorded on rock outcrops around the highest points of the ridges.

Upper slopes between rock outcrops carry dense narrow-leaved snow tussock, often with co-dominant turpentine shrub, or scattered shrubs and patches of tauhinu. Mountain flax (*Phormium cookianum*) is common with narrow-leaved snow tussock in incised gullies and on shady faces almost to the spur summits. *Coprosma ciliata* is the characteristic dominant shrub of screes. Several large areas of natural sheet erosion at mid-elevation are bare of vegetation. Many wilding plants of radiata pine (*Pinus radiata*) and Corsican pine (*Pinus nigra*) are established on mid and upper slopes.

Lower slopes carry tussockland of narrow-leaved snow tussock, hard tussock (*Festuca novae-zelandiae*) and silver tussock (*Poa cita*), with intertussock vegetation dominated by browntop (*Agrostis capillaris*) and sweet vernal (*Anthoxanthum odoratum*). Lower gullies and gully floors contain shrubland comprising scattered plants to dense stands of matagouri (*Discaria toumatou*), mikimiki (*Coprosma propinqua*), *Olearia bullata*, mountain flax, and *Coprosma rugosa*, interspersed with bracken (*Pteridium esculentum*), scattered small trees of broadleaf (*Griselinia littoralis*), and exotic herbaceous species. Talus heaps on shady footslopes are characterised by expanses of fernland with *Blechnum procerum*, *Hypolepis millefolium*, and prickly shield fern (*Polystichum vestitum*), under and surrounding sparse to dense shrubs and small trees of broadleaf, often with shrubby fringes of turpentine shrub, *Olearia bullata*, *Coprosma* species, and occasional inaka (*Dracophyllum longifolium*).

### **Hectors Plateau surrounding Siberia Hill and Trig Island**

The western end of this landform was included in RAP 5 Dasher by Comrie (1992), and earlier described by Allen *et al.* (1988).

Large expanses of tall, dense, copper tussockland (*Chionochloa rubra* var. *cuprea*) typify wetlands that occupy much of the plateau. Commonly associated species include bog rush (*Schoenus pauciflorus*) and rautahi (*Carex cortacea*), and there are frequent patches of *Sphagnum* moss.

Upland flushes and bogs are common, particularly on and around Siberia Hill, where there are also occasional tarns. Comb sedge (*Oreobolus pectinatus*) is prominent, along with several *Carex* species and *Juncus novae-zelandiae*. Sundew (*Drosera arcturi*), willowherbs (*Epilobium* species), waxweed (*Hydrocotyle novae-zelandiae* var. *montana*), *Ranunculus multiscapus*, and *Celmisia gracilentia* are amongst several herbs that are characteristic of these wetlands.

Well-drained slopes around the summits and along the broad summit ridge carry tussockland dominated by slim snow tussock (*Chionochloa macra*) at the highest elevations, and elsewhere narrow-leaved snow tussock that varies from almost continuous cover near boulderfields, to very sparse on stock camps. Silver and hard tussock are prominent where snow tussock cover is sparse, and intertussock vegetation here is mainly exotic pasture grasses and patchy mouse-eared hawkweed.

Similar vegetation covers most of the upper slopes of Mount Difficulty, some 2 km east of the main plateau.

The boulderfields of volcanic rock that surround the summit of Siberia Hill and cover parts of the slopes below are generally devoid of vascular plants. However, there are isolated stands of dense narrow-leaved tussock, and occasional patches of shrubland dominated by *Coprosma cillata* and to a lesser extent snow totara (*Podocarpus nivalis*). *Hebe pinguifolia* grows on rocky sites around Siberia Hill. At lower altitudes, such as on Mount Difficulty, particularly on moist ground, *Coprosma rugosa* and *Olearia bullata* are associated with patches and 'streams' of volcanic boulders, accompanied by *Hypolepis millefolium* and prickly shield fern.

### **Steep catchments draining south from Hector's Plateau into the Kauru River**

Upper slopes and rounded spurs carry relatively dense narrow-leaved snow tussockland. A mosaic of shrubland and tussockland communities occurs on bluffs and talus slopes, similar to that described for the catchments west of Cayenne Spur. Snow tussock thins out on the mid-slopes, increasingly so eastwards, and is replaced by introduced pasture grasses with variable densities of hard and silver tussock. Scattered Corsican pine and broom are present in the vicinity of the vehicle track on the eastern side of Cayenne Spur.

The lower reaches of gullies and the slopes immediately above the Kauru River carry mainly shrubland of mikimiki, *Coprosma rugosa*, *Olearia bullata*, and occasional matagouri, with scattered individuals and clumps of cabbage tree (*Cordyline australis*), kohuhu (*Pittosporum tenuifolium*), broadleaf, and marble leaf (*Carpodetus serratus*). These are interspersed with patches of manuka (*Leptospermum scoparium*), tutu (*Coriaria sarmentosa*), prickly shield fern, bracken (*Pteridium esculentum*), and *Blechnum procerum*.

### **Catchments flanking Mount Difficulty**

Almost all of the catchment of Hughie Stream is included in RAP 3 Hughie (Comrie 1992), and has also been described by Bruce (1986).

Slopes around the top of the catchment carry narrow-leaved snow tussockland similar to that of the more western catchments, increasingly replaced by exotic pasture species, hard tussock, and silver tussock at lower elevations on lateral spurs.

Gully heads have snow tussock and shrubland containing mountain flax and *Coprosma rugosa*, with copper tussock and *Olearia bullata* indicating moist ground. Shrubland grades into broadleaved forest with decreasing elevation. The forest canopy comprises trees of broadleaf, lemonwood (*Pittosporum eugenioides*), and marble leaf, with fewer lancewood (*Pseudopanax crassifolius*), three finger (*P. colensoi*), and kohuhu, and occasional kowhai (*Sophora microphylla*) a few Hall's totara (*Podocarpus hallii*) and narrow-leaved lacebark (*Hoheria angustifolia*). Bruce (1986) noted that the small group of tall trees present were in poor health, but juveniles were present. Comrie (1992) also recorded young matai (*Prumnopitys taxifolia*) plants. The

open understorey comprises shrub species including *Coprosma linariifolia*, *C. crassifolia*, *C. rotundifolia*, mapou (*Myrsine australis*) and nettle (*Urtica incisa* and *U. ferox*). Ground cover is sparse, and is mainly prickly shield fern and hound's tongue fern (*Microsorium pustulatum*).

Stands of manuka are interspersed with the broadleaved forest and shrubland, and young manuka plants surround these in adjacent grassland.

Though not as extensive, a similar suite of vegetation communities is present in the catchment to the east of Hughie Stream, locally known as Mount Gully.

A single plant of the rare *Teucrium parvifolium* was found at the margins of the Kauru River (GR. 2325400 5558380), within low forest comprised of narrow-leaved lacebark, marble leaf, broadleaf, kowhai, manuka, matagouri and *Coprosma* spp.

#### **Steep hillslopes on south side of Kauru River**

Steep, relatively dry, slopes on the true right of the Kauru River carry patches of depleted snow tussockland, *Coprosma* and matagouri shrubland, and sparse broadleaved forest, interspersed with rock outcrops and debris supporting bracken, cabbage trees, and isolated patches of gorse.

#### **Mackerras Creek Catchment and land to its east**

Except where the land has been cultivated, the upper sunny faces and much of the upper shady faces here carry highly modified tussockland dominated by exotic pasture species. The only prominent native species are scattered silver tussock, hard tussock, and narrow-leaved snow tussock, although there are patches of matagouri shrubland on the lower slopes, some with bracken, occasional cabbage trees, broadleaf, mikimiki, and other common species of woody vegetation.

Gorse (*Ulex europaeus*) is abundant and frequently dense in the main stem of Mackerras Creek, and has been burnt occasionally. In its absence, the vegetation varies from low tutu and bracken, to matagouri shrubland, broadleaved low forest in tributary gullies, and, on upper shady slopes, reasonably intact narrow-leaved snow tussockland. Nodding thistle is abundant over much of the gully.

#### **PROBLEM PLANTS**

Gorse is the main threat to natural values of tussockland on The Dasher Pastoral Lease. At present it is largely confined to Mackerras Creek, and a large patch below Mount Hut. However, single plants were recorded and destroyed at high elevations, and there is high potential for its spread along vehicle tracks.

Broom was recorded as a few single plants up to about 900m asl. Any broom plants should be promptly eradicated, as broom seed is long-lived and easily transported by stock and vehicles.

Wilding conifers are common in the western catchments, with individuals also present above Mackerras Creek and beside Mount Hut. Given the rapid increase of conifer plantings to the west of the Kakanui Mountains, wilding establishment will be a continuing problem. The present wildings are radiata and Corsican pine, and none were seen to have produced seeds, so their prompt eradication will prevent the establishment of a second and more prolific generation.

Elderberry, cotoneaster and Himalayan honeysuckle are present in Mackerras Creek, the latter being abundant on neighbouring land. These weeds have the potential to be spread by birds into all moderately shady gullies up to six or seven hundred metres elevation, where they can exclude many native shrub species and substantially alter the composition of woody vegetation that will replace seral grassland.

Mouse-eared hawkweed (*Hieracium pilosella*), king devil (*H. praealtum*), and tussock hawkweed (*H. lepidulum*) are distributed throughout the tussockland vegetation, but only mouse-eared hawkweed presently reaches densities where it competes with or excludes native species, mainly on dry saddles, tracks, and stock camps.

Several agricultural herbaceous weeds, including nodding thistle (*Carduus nutans*) and Californian thistle (*Cirsium arvense*), along with minor weeds such as sheep's sorrel (*Rumex acetosella*) and foxglove (*Digitalis purpurea*), are present throughout the predominantly pastoral vegetation of many lower slopes, but none appear to threaten natural values of the predominantly native vegetation at higher elevations.

### Importance of Vegetation

Map 4.2.3 outlines the ecological values on The Dasher Pastoral Lease.

#### Western catchments flowing into the North Branch Waianakarua River, west of Cayenne Spur

Tussockland and associated vegetation in the mid- to upper catchments west of Cayenne Spur is in excellent condition and is clearly representative of the Dansey Ecological District. Its ecological values are enhanced by its continuity with similar vegetation in the upper catchment of Shingley Creek Pastoral Lease to the west, the catchment below Mt Stalker on Mt Stalker Pastoral Lease to the south, and with RAP 5 Dasher on Siberia Hill. It is also linked through copper and snow tussockland via Trig Island to RAP3 Hughie. Shrublands in the lower catchments are also representative of the ecological district, and are spreading to replace the substantially modified tussocklands that surround them.

*Exocarpus bidwillii* is an important find, having only been previously recorded at one other site within the Ecological District (Comrie, 1992). This finding represents a range extension, and is present at its southern distributional limit. *Hebe buchananii*

was rare on rock outcrops around the highest points of the ridges, and is ranked as "range restricted" (Hitchmough, 2002).

### **Hectors Plateau surrounding Siberia Hill and Trig Island**

The importance of vegetation on the Hectors Plateau has been well established by Allen *et al.* (1988) and Comrie (1992). The Siberia Hill volcanic plateau supports vegetation that is of national importance. This is the only extensive area of copper tussockland present in the Kakanui Ecological Region, and is present here because of the wet, fertile volcanic soils (Allen *et al.* 1988). The wetlands present on the plateau are the most extensive and diverse (in terms of communities) of those found within the ecological district (Comrie, 1992). The present survey confirmed this importance.

The copper and snow tussocklands that occupy the plateau to the east of Siberia Hill are important for their diversity of tussockland, wetland, and boulderfield communities, as well as for linking RAP 5 Dasher and RAP 3 Hughie.

The presence of the highly palatable slim snow tussockland (*Chionochloa macra*) on well-drained slopes around the summits is notable. These grasslands were once extensively widespread within Otago but have undergone a substantial retreat following pastoralism.

Snow totara (*Podocarpus nivalis*) and *Hebe pinguifolia* are of restricted distribution in the ecological district.

### **Steep catchments draining south from Hectors Plateau into the Kauru River**

Adjacent to the Kauru River, good quality snow tussockland reaches some of its lowest elevations (c. 400 m) in the ecological region. Here, a more or less continuous band of native vegetation comprising alternating tussockland, fernland, shrubland, and low forest communities, occupies variations in the diverse topography. The long corridor of the Kauru River has important intrinsic values as well as providing a significant ecological link between the uplands at the western end of the property and the lowlands towards Kauru Hill at the eastern end of the Pastoral Lease.

### **Two catchments flanking Mount Difficulty**

The present survey confirmed the importance of forest and shrubland in the catchment of Hughie Stream, earlier described by Bruce (1986) and Comrie (1992) and detailed below.

The forest and shrubland communities within RAP3: Hughie of Hughie Stream are considered to be important, being representative of podocarp-broadleaved forest and manuka shrubland (Comrie, 1992). This catchment contains the largest area of manuka shrubland with associated broadleaved forest in the Dansey Ecological District. Extensive manuka shrublands are presently uncommon in the District.

The Mount Gully catchment contains tussockland, shrubland and forest communities similar to, although not as extensive as, those of RAP3: Hughie. They have similar ecological values to those of RAP3.

### Steep hillslopes on south side of lower Kauru River

A history of disturbance by fire and grazing has resulted in the mosaic of depleted snow tussockland, shrubland, broadleaved forest and rocky outcrops which support gorse, fern and cabbage trees. This vegetation is probably the most representative of low elevation sunny faces found on the property.

### Summary

Overall, The Dasher Pastoral Lease carries a diversity of native vegetation types and plant species spanning an elevational and latitudinal gradient unmatched elsewhere in the Dansey Ecological District. In the relatively drier east, broadleaved forest characteristic of coastal Otago occupies two main catchments and, with a mosaic of shrubland communities, forms a corridor along much of the Kauru River. The central part of the property encompasses much of the volcanics of the Kakanui Mountains, including topography sufficiently diverse to support extensive slow-draining wetlands on a peneplain remnant overlain with volcanic rock, and almost subalpine vegetation on metamorphic rock outcrops in precipitous valleys. In the west, the topography and climate are more reminiscent of Central Otago, and the vegetation takes on some of the characteristics of semi-arid tussockland and shrubland. In conjunction with adjacent areas of high ecological value on Shingley Creek, Mt Dasher, and Mt Stalker pastoral leases, The Dasher Pastoral Lease represents an almost complete transverse section of the topography, geology, and vegetation of the Kakanui Mountains.

Several species were recorded which are threatened or have a restricted distribution (Table 1).

Plant Species	Threat of extinction classification (Hitchmough, 2002)	Details
<i>Teucrium parvifolium</i>	Gradual Decline	Single plant found though further habitat present, by Kauru River below Hughie Stream confluence.
<i>Olearia bullata</i>	Sparse	Present throughout property in moist tussockland and shrubland.
<i>Pimelea pseudolyallii</i>	Sparse	In upper catchments to west of Cayenne Spur on rock outcrops and stone pavement surfaces.
<i>Celmisia hookeri</i>	Sparse	On rocky outcrops throughout property from Kauru-Maokerras Creek confluence westward to Cayenne Spur.
<i>Hebe buechananii</i>	Range Restricted	On alpine rocky outcrops in west of property.



## 2.5 FAUNA

### 2.5.1 Invertebrates

#### *Previous Survey*

Following an insect survey of the Dansey Ecological District (Patrick, 1991), the extensive wetlands on Siberia Hill were identified as a key site for the conservation of insects. Appendix Four outlines some of the invertebrate records relevant to The Dasher Pastoral Lease.

#### *Current Survey*

Invertebrates were hand collected or collected at night by an ultraviolet light. The weather was dry, fine and warm with nights clear and cooling rapidly.

#### **Invertebrate Fauna Description**

An inventory of 146 species of invertebrates was made (see Appendix Five) including 101 moths that characterise a broad range of habitats, some of which are nationally important. The invertebrate fauna are described in terms of five main land units:

- Western catchments flowing into the North Branch of the Waianakarua River, west of Cayenne Spur
- Hectors Plateau surrounding Siberia Hill and Trig Island
- Steep Catchments draining south from the Plateau and, the Kauru River above Mackerras Creek confluence (250 m)
- Catchments flanking upper slopes of Mount Difficulty
- Mackerras Creek Catchment and land to its east

#### **Western catchments flowing into the North Branch of the Waianakarua River, west of Cayenne Spur**

The western catchments span an altitude of over 1400 m along the spurs and faces of Obi down to ~540 m in the Kauru River headwaters. Two large speargrass weevils *Lyperobius barbarae* and *L. patricki* are of very local distribution. They were found at their southeastern limit on Cayenne Spur feeding on *Aciphylla montana* var. *gracilis*. Cayenne Spur (from 980-1240 m) is also the Type Locality for *L. patricki*.

Another two insects similarly centred on mountains to the north and in South Canterbury region are black cicada *Maoricicada clamitans* and *Maoricicada phaeoptera*. Both are at the southeastern limit of their known range here. They inhabit open low shrubland and herbfield areas.

The mountain stone weta *Hemideina maori* and moth *Dichromodes* sp. are found among rock bluffs. The moths *Orocrambus apicellus* and *Glyphipterix metasticta* are typical of wet flush vegetation. *Phylorheithrus agilis* reaches its southern limit on the

lease in the headwaters of Jimmys Creek (at 1300 m). These species, together with the range of day active moths and grasshoppers found, are indicative of Central Otago mountain land areas that retain significant natural character.

### **Hectors Plateau surrounding Siberia Hill and Trig Island**

The basalt plateau forms unique habitats of gentle slopes, boulderfields, boulder streams and emergent boulder debris in tussockland-shrubland. Very extensive mosaics of wetland are present and include wet cushion/turf, sphagnum and marshy sedge areas, extensive patches of wet copper tussock, gleyed/peaty flushes on gentle slopes and a few small tarns. Of note are the flowing water habitats, where the water can be heard tumbling deep inside black basalt 'boulder streams'. These may have some characteristics of cave stream ecosystems. At these sites, light and coarse organic material are excluded from the flowing water and invertebrate assemblages are likely to include many fine detritus feeding crustacea and insects characteristic of aquatic cave fauna. Representative of Otago upland wetlands are four moths *Asaphodes nephelias*, *Glyphipterix metasticta*, *Orocrambus scoparoides*, and *O. lectus*. This last species is endemic to Central Otago. A number of other insects typically found in wet grasses and shrubs include alpine caddis *Hudsonema alienum* and long jaw spider *Tetragnatha* species. The aquatic beetle *Liodessus deflectus* and red coat damsel *Xanthicnemis zealandicus* are representative of tarn insect fauna.

A diverse range of day active insects dwell in open herb and pavement areas, tall tussockland rich in inter-tussock herbs and scattered shrubs. An additional thirteen moths and butterflies are recorded, as well as grasshoppers, cicada, bees and beetles (see Appendix Five). The following species are found basking in reflected heat from road cuts, on dry ground and on basalt boulder surfaces: moth *Dasyuris anceps*, tiger beetle *Neocicindela laticincta* and grasshopper *Sigaus* nsp. aff. *campestris*.

### **Steep Catchments draining south from Hectors Plateau and Kauru River above Mackerras Creek confluence (250 m)**

The Kauru River is fed by extensive spur top and plateau wetlands that provide continuity of flow. The riverbed is mostly well armoured with rounded boulders, many of them dense basalt. There are also many areas of bedrock. This, and the constrained channel morphology with little room for meander or floodplain, indicate high stream power during storm flows. Stream faunas are likely to be naturally dynamic through time with filter feeding and stone surface grazer communities developing during stable flows. The eighteen caddis, three mayfly and two stonefly species recorded are typical of stony streams.

A sand-cased caddis *Philorheithrus agilis* reaches its southern limit on the lease in the lower Kauru River. *P. agilis* is common elsewhere in the Dansey Ecological District.

Invertebrates representative of tree and shrub elements, including those inhabiting dead wood, litter, lichens and mosses are noted (see Appendix Five). Two species of nettle are common as larval hosts for red and yellow admiral butterflies and moth

*Udea marmorata*. These are associated with disturbed and moderately fertile shrubland.

Fragmented forest and shrubland clearly retain their invertebrate fauna. Features include velvet worm *Peripatus* ngen. nsp., and carabid beetle *Mecodema haplopus*. Both are endemic to the Waianakarua and Dansoy Ecological Districts with *M. haplopus* at the edge of its known western range. Patches of the wetland shrub *Olearia bullata* are a common feature in sloping wetland habitats, and support the moth larva *Pasiphila* nsp. The moth *Meterana levis* is not often recorded. Here, its larva feed on the trees of *Hoheria* or *Plagianthus*.

Insects that inhabit dry tussockland and rocks are a feature well represented in the upper Kauru River valley above 500 m. The rubbly bedrock benches and scarps, and the shallow gorges have natural fringing vegetation including many herbs and sedges, silver tussock (*Poa cita*) and flood washed shrubland communities. The communities have many natural elements but have expanded considerably in colonial history. Moths *Orocrambus vulgaris* and *O. vitellus* are present in grasses here and elsewhere. The moth *Xyridacma alectorata* has larvae on *Pseudopanax* here, while the moth *Phaeosaces apocrypta* has larvae on lichens.

The moth *Tmetolophota sulcana* and aquatic moth *Hygraula nitens* inhabit small areas of *Carex secta* swamp.

#### Catchments flanking upper slopes of Mount Difficulty

On the mid and upper slopes of Mount Difficulty, silver tussock is a common element among exotic grasses, clover, creeping pohuehue vine (*Muehlenbeckia axillaris*) and scattered boulders. Three butterflies are common here - tussock ringlet butterfly *Argyrophenga antipodum*, blue butterfly *Zizina oxleyi* with larvae feeding on clovers (in the absence of native prostrate brooms) and copper butterfly *Antipodolycaena* nsp. (larvae on *M. axillaris*). The cicada *Kikihia angusta* is very abundant. The large weevil *Anagotis lewisi* eats the tiller bases of *Chionochloa* tussock here. On boulder streams a range of vegetation elements including shrubs, vines and herbs also retain an interesting fauna characterised by stick insect *Mimarchus* species (in shrubs and vines), case moth *Gymnobathra sarcoxantha* (litter under low shrubs) and carabid beetle *Megadromus haplopus* (under stones).

#### Mackerras Creek Catchment and land to its east

In the upper parts of the Mackerras Creek, areas of riparian seepage and flush habitats retain some naturalness and are representative of streams in the rolling lands of the region. Some upper slopes have tall tussock and short tussockland associations that support widespread native grassland insect faunal assemblages.

In steep shaded areas and in the valley floor, faunal habitats associated with woody vegetation are considerably fragmented and invaded by woody weeds. The fauna within the Mackerras Creek is likely to retain significant natural character as it remains extensively buffered from intensive agriculture. The lower reaches of

vertically foliated schist bedrock and schist slab particles are a distinct habitat compared with the Kauru River.

### Summary

The invertebrates noted reflect the analysis of Patrick (1991) suggesting a species rich fauna that includes elements characteristic of Central Otago, south Canterbury and in part, Waianakarua Catchment. Wetland insect records made throughout the lease signal the extent and diversity of wet habitats. Eleven moths in the genus *Orocrambus* and another fifteen species in the Pyralid moth family are an indication of the richness and natural character of open habitats of wetlands and grasslands with mosses and herbs. Faunas representative of non-forest habitats continue to very low altitude (250 m) reflecting the presence of rocky habitats including bluffs, gorges, riparian floodways and extensive stable tallus.

At lower altitude, native insect elements reflect grasslands that are widely induced, although some are natural in wet or steep eroded sites. Vegetation cover at induced sites can be sparse, with short tussock species and herbs (both native and exotic) being present with exotic pasture grasses. These places include natural areas that are small in extent and are invaded by exotic grasses, but retain important invertebrate populations (e.g. *Orocrambus* and *Eudonia* spp. moths).

The fauna of shrub and hardwood vegetation is highly representative of the Kakanui Ecological Region.

### Importance of the Invertebrate Fauna

Of national importance are the extensive tall tussockland and wetland ecosystems of the plateau linked with gully flushes and seepages on the southern margins. This area is large and inclusive of varied habitats and sequences and is highly representative of the Dansey Ecological District. The boulder streams and boulder stream creeks are distinctive habitats. The area includes rich faunal associations, distinctive assemblages of insects with regionally endemic insects and some insects of limited or isolated distribution. This investigation supports the finding of Patrick (1991) that extensive wetlands on Siberia Hill are a key site in the Dansey Ecological District for the conservation of insects.

The Kauru River and its feeding valleys down to the Mackerras Creek confluence have important ecosystems for the Otago region. The catchment includes extensive linkages from valley floor below 500 m to the adjacent Mount Difficulty and upland plateau beyond. It also includes an extensive riparian corridor spanning more than nine kilometres below 500 m. The riparian zone and adjacent slopes retain complexes of disturbed vegetation of high intrinsic value and natural character for invertebrate assemblages. Many invertebrates associated with wetland, shrubland, hardwood forest and rock bluff, are well represented along the river and gullies. The area includes regionally endemic species inhabiting ecosystems that have disappeared from much of the Kakanui Ecological Region at low and montane altitude. Also of note, many insects associated with grassland, fernland and regenerating shrubland are often

natural colonisers of disturbed sites and have intrinsic value even though a result of pastoralism.

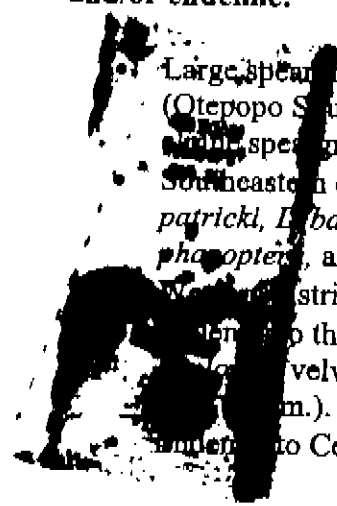
The mountain lands of Cayenne Spur and western catchments are inhabited by a characteristic Central Otago insect fauna that additionally includes elements more typical of south Canterbury mountains. Four alpine insects are recorded at their south-eastern limit here. This investigation supports the finding of Patrick (1991) that steep rock bluffs of Cayenne Spur are a key site in the Dansey Ecological District for the conservation of insects.

In the upper slopes of the Mackerras Creek catchment, some patches of wetland and tall tussock grassland are of local importance for invertebrate fauna. These have significance because of the loss of lower altitude wetlands and uncultivated areas of vegetation on low altitude soils in the region and eastern South Island generally.

**Invertebrates ranked as threatened with extinction (Molloy et al 2002, Hitchmough 2002) present on the lease:**

- Carabid beetle *Megadromus haplopus* (Sparse), inhabits hardwood forest and montane shrubland-grassland in the Eastern Kakanui Ecological District.

**Type localities of species, and species which are at their distributional limits and/or endemic:**



Large spear grass weevil *Lyperobius patricki* – Type Locality, Cayenne Spur (Otepopo Spur) 1240 metres, Kakanui Mountains (Craw 1999). Inhabits small alpine spear grasses such as *Aciphylla montana* var. *gracilis*.  
 Southeastern distribution limit on the lease: speargrass weevils *Lyperobius patricki*, *L. barbarae*, alpine black cicada *Maoricicada clamitans*, *M. phaeoptera*, and caddis *Philorhelthrus agilis*.  
 Western distribution limit on the lease: Carabid beetle *Megadromus haplopus*.  
 Eastern limit to the Kakanui Ecological Region: Carabid beetle *Megadromus haplopus*, velvet worm Onychophora: peripatopsidae ngen. nsp. (D. Gleeson n. sp.).  
 Limit to Central Otago: moth *Ocrambus lectus*.

## 2.5.2 Herpetofauna

### Previous Survey

The Dansey Ecological District PNA survey (Comrie, 1992) did not include a lizard survey.

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### *Current Survey*

A survey for lizards was carried out on January 27-29th 2003. Weather conditions ranged from good to marginal, with frequent strong winds and occasional rain.

Lizard numbers on the property are low. Two species of lizard are identified on the lease: the gecko *Hoplodactylus* sp. 'Otago' form 'Kakanui/Horse Range' (Hitchmough, 1997) and the skink *Oligosoma nigriplantare polychroma*. In general, lizards were extremely scarce on the lease and are likely to have undergone a dramatic decline in abundance (and presumably diversity).

### **East of Cayenne Spur**

East of Cayenne Spur, both geckos and skinks survive only as occasional isolated remnant populations and these were almost all in extremely low abundance. Many areas of currently suitable habitat within this zone appeared to be altogether devoid of lizards, which is presumably the result of severe burn-offs in the past.

### **West of Cayenne Spur**

From Cayenne Spur westwards, skinks in particular were encountered more readily. Skinks were very abundant on the spur to the east of the Upper Waddells Creek, the head of Cayenne Spur and along Otepopo Spur.

Although not recorded on The Dasher Pastoral Lease during this survey, other species are likely to be present, having been sighted during tenure review visits on nearby properties: green skink *Oligosoma chloronoton* (Shingley Creek Pastoral Lease) and McCann's skink *Oligosoma maccanni* (Shingley Creek and Mt Stalker Pastoral Leases) grey gecko *Hoplodactylus maculatus* (Mt Stalker Pastoral Lease) and jewelled gecko *Naultinus gemmeus* (Glencoe Pastoral Lease). This latter species is easily overlooked during brief surveys as it is extremely cryptic.

### **Importance of Herpetofauna**

The two lizard species which were found on the lease are widespread and, in many locations, abundant in Otago and Southland. The form of *Hoplodactylus* sp. 'Otago' which is found on The Dasher Pastoral Lease is known only from the Kakanui Mountains, and so the populations on this property are representative of a geographically restricted variation on the species.

While no jewelled gecko (*Naultinus gemmeus*) were found on The Dasher during the survey, it may be present in shrubland habitats in the Kauru River. It has been found in the nearby catchment of North Branch Waianakarua River on Glencoe Station. The jewelled gecko is classified as being in "gradual decline" (Hitchmough, 2002). Should jewelled geckos reside on The Dasher, they would form an important outlying population of the Waianakarua River- Glencoe Pastoral Lease jewelled gecko population. Outlying populations are crucial in maintaining core populations of a species over a fragmented landscape.

### 2.5.3 Avifauna

#### *Previous Survey*

The following birds were recorded during the PNAP Survey (Comrie 1992) in broadleaved forest at Hughie Stream: grey warbler (*Gerygone igata*), brown creeper (*Finnschla novaeseelandiae*), silvereye (*Zosterops lateralis*), fantail (*Rhipidura fuliginosa*), blackbird (*Turdus merula*) and thrush (*Turdus philomelos*). New Zealand pipit (*Anthus novaeseelandiae*), falcon (*Falco novaeseelandiae*) and paradise shelduck (*Tadorna variegata*) were recorded around the flat topped summit of Siberia Hill, while a group of adult Southern black-backed gull (*Larus dominicanus dominicanus*) and young were nesting adjacent to the ponds there (Comrie, 1992).

#### *Current Survey*

Birds seen or heard during this survey of The Dasher Pastoral Lease were black-backed gull (*Larus dominicanus*), harrier (*Circus approximans*), pipit (*Anthus novaeseelandiae*), fernbird (*Bowdleria punctata punctata*), Paradise shelduck (*Tadorna variegata*), white-faced heron (*Ardea novaehollandiae*), blackbird (*Turdus merula*), bellbird (*Anthornis melanura*), chaffinch (*Fringilla coelebs*), falcon (*Falco novaeseelandiae*) and black shag (*Phalacrocorax carbo*).

### Importance of Birds

The following bird species recorded on The Dasher are listed as threatened species (Hitchmough, 2002):

Bird Species	Threat Category as described in Hitchmough (2002)	Comments
New Zealand Falcon	Gradual decline	Near Mackerras Creek- Kauru River confluence.
Black Shag	Sparse	Near Mackerras Creek- Kauru River confluence
South Island Fernbird	Sparse	In scrub in a gully at western end of Hughie Stream.

### 2.5.4 Aquatic Fauna

#### *Previous Survey*

There are no freshwater fish records on the New Zealand Freshwater Fish Database (NZFFD) for The Dasher Pastoral Lease. A previous distribution survey for lowland long-jaw galaxias (*Galaxias cobitinus*) in the district found none of this rare species on the property, although it is present downstream (Dungey, 2001).

### *Current Survey*

Kauru River and Mackerras Creek were sampled during 24-25th February 2003. Each site was sampled using a backpack electric fishing machine using defined criteria (Allibone, in prep.). Habitat measurements were taken and recorded as set out on the NZFFD form. In-stream invertebrates were noted when they could be identified during electric fishing survey but no collection undertaken. Site and species details are included in Appendix Six.

### **Kauru River Catchment**

Stream conditions were low and stable at the time of sampling. This typically allows some build up of stone surface organic layers and filamentous algae in low to moderately enriched streams without shade.

Native Canterbury galaxias (*Galaxias vulgaris*) and upland bully (*Gobiomorphus breviceps*), together with the introduced brown trout (*Salmo trutta*) are in the main stem of Kauru River. However, only Canterbury galaxias were recorded in its headwaters to the east of Cayenne Spur. No fish are recorded in the upper reaches of a tributary of Hughie Stream.

The main stem of the Kauru River has a reasonably steep gradient and confined channel. It flows through bedrock in parts, and has a well armoured bed composed of rounded boulders including basalt. Riparian margins area overall in good condition, especially in the gorge sections of the river.

There are high abundances of invertebrate species that have high scores for Macro-invertebrate Community Index (MCI), and therefore indicating natural and representative stony stream habitat. Invertebrates noted were mayflies (including *Nesameletus*, *Deletidium* spp.). Also present were caddis (*Aoteapsyche* spp., *Olinga feredayi*, *Helicopsyche albiceps*) and stone flies (*Zealandobius* spp. and *Austroperla cyrene*).

### **Mackerras Creek**

Mackerras Creek is a low altitude second order stream, fed by steep short tributaries (most of which are seasonally dry). Areas of associated flush are common in the upper reaches on the Pastoral Lease, and also further upstream. Parts of the bed near a slate quarry are bedrock, or have an abundance of 'slab' shaped particles more akin to the Kye Burn in the north of the District than other local streams.

There are high numbers of Canterbury galaxias present. There are also filamentous algae present which suggests some form of nutrient input.

An un-named seepage tributary coming out of a tussock catchment has little in-stream value, although amphipods were recorded. This group of invertebrates can tolerate moderate water qualities.



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## Importance of Aquatic Fauna

The Kakanui Mountains and Horse Range down to the coast generally separate non-migratory fish species of Central Otago and Taieri River from species of fish inhabiting North Otago and Canterbury Streams. The Waianakarua River is the southern most catchment for Canterbury galaxias (*Galaxias vulgaris*). On the property, *G. vulgaris* inhabits the headwaters of the Kauru River and might be present in the head of the North Branch of Waianakarua River on the property at either Waddells Creek or Jimmys Creek. The presence of *G. vulgaris* in a trout free stream ecosystem at part of the southern margin of its distribution is notable. The lack of invasion of streams on the property by sea migratory fishes including eel (*Anguilla dieffenbachi*) and koaro (*Galaxias brevipinnis*) is notable and likely associated with periodic drying of the Kauru River downstream of the property.

Swift bouldery reaches of the Kauru River on the lease are not apparently suitable habitat for the lowland longjaw galaxias (*Galaxias cobitinis*) (threat of extinction status, Nationally Critical, Hitchmough 2002, Molloy et al. 2002). However, the Kauru River catchment on the lease contributes the flow regime, water quantity and water quality for the threatened *G. cobitinis* present in reaches downstream (Dungey, 2001).

### 2.5.5 Problem Animals

Pig rooting is widespread on The Dasher Pastoral Lease, and is particularly damaging on and around upland wetlands. Little possum sign was seen, possibly because of recent poisoning with bagged 1080. Rabbits were seen in the upper catchment of Waddells Creek in the far west of the property, and are probably present elsewhere. Hares, feral cats, ferrets, stoats, hedgehogs, and rats are also probably present throughout the property, and feral goats and perhaps deer in the forest and shrubland areas.

## 2.6 HISTORIC

### 2.6.1 Maori cultural values

There are no known Maori sites recorded on The Dasher Pastoral Lease.

### 2.6.2 Heritage values

The principle historic site on The Dasher Pastoral Lease is the slate quarry variously known as the Otago Slate Company and the Otepopo Slate Company. This is the only slate quarry to have been operated commercially in Otago. The quarry extends for 300 – 400 m along Mackerras Creek (MacKerras was a share holder in the original company). The site consists of one large work face and two smaller work faces with associated spoil heaps and tram lines.

Archibald McInnes, who brought out family members from slate quarries at Ballachulish in Scotland to work the quarry, opened the quarry in 1874. In 1876 there were reported to be 40 people living at the quarry. The first shipment of 11000 slates left the port of Oamaru in April 1876. Material from the quarry was said to be able to be producing 16 slates to the inch. Slates from the quarry were used to roof Knox Church (Dunedin) and St Luke's, Oamaru as well as several large homes. Access to the quarry was always difficult and the company was wound up in 1880 (see Scotter 1948: 41- 42).

There are some stone hut ruins near Three Brothers Rock on the Hector's Plateau. In addition, there are old musterers huts on Cayenne Spur (Cayenne Hut), Hector's Plateau (Grays Hut) and near Mount Difficulty (Mount Hut).

## Importance of Heritage Values

As the only slate quarry in Otago, the quarry is of some importance.

### 2.7 PUBLIC RECREATION

#### 2.7.1 Physical Characteristics

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

The western part of the property is zoned *Winter Backcountry Walk In* where the opportunity is characterised by a feeling of relative remoteness from populated areas. The highly natural setting is a valued part of the experience and may be associated with motivations of "escape from town", education, exercise and/or a sense of being close to nature. Access, although relatively close to visitor centre developments, is only possible on foot and is often associated with tramping tracks or routes. In winter a number of opportunities for cross-country skiing are possible with access to range tops possible only by walk-in.

The balance of the property is zoned *Backcountry Four Wheel Drive In* which "is characterised by a feeling of relative remoteness from populated areas". "The highly natural setting is a valued part of the experience and may be associated with motivations of "escape from town", education and nature appreciation". "Four wheel drive vehicles are desirable to give access to high country tussocklands and block mountains and more rugged remote areas."

A Federated Mountain Clubs publication titled "Outdoor Recreation in Otago - A Recreation Plan" (Mason 1989) zoned the upland plateau between Obi, Siberia Hill and Trig Island as "Natural Experience". FMC recommended that for recreational purposes no approvals be given for further fire breaking or vehicle access tracking within the alpine natural experience zone; and that the 'Hectors Plateau' reserve

investigation take into account landscape considerations, and incorporate Class 8 and severely eroded Class 7 land from pastoral leases.

The balance of the property lying east of Mount Difficulty is zoned "Open Space". According to this document management of this zone requires "public foot access easements be provided at convenient locations across the open space zone to future reserves, and surrendered high country."

## 2.7.2 Legal Access

Map 4.2.1 shows where marginal strips and legal roads exist on The Dasher Pastoral Lease.

### a) Roads

There are four sections of legal road on The Dasher Pastoral Lease.

The metalled The Dasher Road provides legal access from the Kakanui Valley to The Dasher farmstead. However, in places, the formed road is not exactly aligned with the legal road. The legal road continues through The Dasher's farmyard, down Mackerras Creek and crosses the Kauru River before rising towards Mount Difficulty and round to the Mount Hut. The legal road continues westwards across Hectors Plateau towards Siberia Hill and Obi, before heading southwards along the property boundary with Shingley Creek pastoral lease. The farm track present is approximately aligned with the legal road as far as Mount Hut. However, beyond this point, the track can be between 200- 750m off the alignment of the legal road. The farm track is unsuitable for 4WD use west of the Mount Hut, where it traverses the Hectors Plateau. Both the alignment of the legal road and the formed farm track cross into Mt Dasher and Shingley Creek pastoral leases in places, although in the vicinity of Mount Difficulty, they are fenced within The Dasher Pastoral Lease.

A second legal road is located along Cayenne Spur, linking "The Dasher Road" with "Tullimet Road" on Mt Stalker pastoral lease. This legal road is, in places aligned with an existing farm track.

A third legal road branches off the "The Dasher Road" on the high altitude mountain plateau just west of Trig Island, and continues across Mt Dasher pastoral lease where it is, in places, aligned to an existing formed track.

A fourth legal road branches off The Dasher Road at the homestead, heading southwards for a short distance before following the property boundary with Mt Stalker Station, south-eastwards. This legal road is aligned to within 50m of a formed farm track.

### b) Marginal Strips

No marginal strips are present along any of the rivers or creeks within The Dasher Pastoral Lease. There are, however, s58 strips along parts of the Kauru River (see Map 4.2.1a).

### 2.7.3 Activities

Important recreational routes are shown on Map 4.2.3.

The Dasher Road offers opportunities for four-wheel driving, walking, mountain biking and horse riding as far as Mount Hut, just west of Mount Difficulty. Beyond this, the track is unsuitable for most vehicles, but there are opportunities for longer mountain bike, horse trekking and tramping trips e.g. to Siberia Hill and Obi, as well as further afield on the Kakanui Mountains (to outlying features such as Mt Dasher, Kattothyrst, Kakanui Peak, and Mt Pisgah).

When snow cover is sufficient, there are opportunities for backcountry ski touring trips along the crest of the Kakanui Mountains.

There are opportunities for pig and deer hunting.

There are no trout present in the North Branch Waianakarua River or upper Kauru River catchments. The brown trout elsewhere in the Kauru River are small and are of little interest to anglers.

**PART 3: OTHER RELEVANT MATTERS & PLANS**

**3.1 CONSULTATION**

The property was discussed at an NGO early warning meeting held in Alexandra on October 8<sup>th</sup> 2001. The following points were made by NGOs:

- Legal roads to, and through, The Dasher, need to be researched and retained as year round access to land returned to the Crown, and as a start to a walking route from the bottom end of Kakanui Mountains through to Dansey's Pass (Forest & Bird)
- Considerable interest in the geological formation in and around Siberia Hill (Forest & Bird)
- East lying country below Trig B and down the Otepopo/Cayenne Spur and back across to Siberia Hill to be retained by the Crown. (Forest & Bird; Alan Mark).
- RAP centred on Mount Difficulty (i.e. RAP3: Hughie) should be protected (Alan Mark).

A further NGO meeting was held in Alexandra on 22<sup>nd</sup> May 2003, at which these points were made:

- The slate quarry may be the earliest slate quarry in New Zealand (Historic Places Trust).
- Hectors Plateau is a special place with many special features, especially geographic and geological values. The lease contains extensive natural values and DOC should recommend that the maximum of these be restored to full Crown ownership. (PANZ)
- Legal roads (in particular the road up the Cayenne Spur): where they haven't been defined then the formed track should be the legal access. (PANZ)
- The eroded area to the west of Cayenne Spur is a special area and should be protected. (Forest and Bird)
- The Importance of the two RAPs on the lease should be seriously considered by DOC. (Alan Mark)

Full written submissions from Federated Mountain Clubs and Royal Forest and Bird Protection Society are provided in Appendices Seven and Eight respectively.

**3.2 REGIONAL POLICY STATEMENTS & PLANS**

(a) **Regional Policy Statement.** The Regional Policy Statement for Otago provides a policy framework for all of Otago's significant regional resource management issues.

It does not contain rules. District Plans shall not be inconsistent with the Regional Policy Statement.

In respect of natural values the Regional Policy Statement includes the following policy and method:

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

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

In respect of landscapes and natural features it includes the following policy and method:

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

Method: "Prepare in conjunction with relevant agencies and in consultation with the community and affected landowners, and inventory of outstanding features and landscapes that are regionally significant."

### 3.3 DISTRICT PLANS

The property is located within the Rural Scenic and Rural General zones 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. The Dasher Pastoral Lease lies within the Kakanui Special Place.

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

*To maintain the natural resources contained within the existing protected areas of 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 The Dasher 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 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

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**Rac, A.J. 1990:** Geochemistry of the Siberia Hill volcanics and the ultramafic inclusions, Siberia Hill, East Otago, New Zealand. Unpublished MSc geology thesis, University of Otago, Dunedin.

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#### **4.1.2 Appendices**

**APPENDIX ONE:** Geopreservation site nos. 296: Dasher and 297: Hughie - Excerpt from Arand, J.; Basher, L; McIntosh, P.; Heads, M. 1991. Inventory of New Zealand soils sites of International, National and Regional Importance. Part 1: South Island and Southern Offshore Islands (1<sup>st</sup> Edition). New Zealand Society of Soil Science Occasional Publication 1.

**APPENDIX TWO:** Descriptions of RAP3: Hughie and RAP5: Dasher. 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 THREE:** Vascular Plant Species List for The Dasher Pastoral Lease

**APPENDIX FOUR:** Invertebrate List for The Dasher Pastoral Lease. 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 FIVE:** Invertebrate Survey List for The Dasher Pastoral Lease (24-27<sup>th</sup> Feb 2003)

**APPENDIX SIX:** Site details for Aquatic Fauna Survey.

**APPENDIX SEVEN:** Recreational and Related Important Inherent Values- The Dasher. Federated Mountain Clubs

**APPENDIX EIGHT:** Written submission from Royal Forest and Bird Protection Society

**APPENDIX NINE:** Photos

APPENDIX 1: Geopreservation site nos. 296: Dasher and 297: Hughie - Excerpt from Arand, J.; Basher, L.; McIntosh, P.; Heads, M. 1991. Inventory of New Zealand soils sites of International, National and Regional Importance. Part 1: South Island and Southern Offshore Islands (1<sup>st</sup> Edition). New Zealand Society of Soil Science Occasional Publication 1.

**(296) Dasher**

REGIONAL/CITY COUNCIL(S): Otago ECOLOGICAL DISTRICTS(S): 65-02 Dansey  
LOCALITY and GRID REFERENCE: 40 km WSW of Oamaru 142 145578  
AREA(ha): 1620 ALTITUDE(m): 700-1300 RAINFALL(mm): 1200-1600  
TOPOGRAPHY: gently-sloping broad mountain top; steep colluvial mountain slopes and tops; boulderfields PARENT MATERIAL: schist and various volcanic rocks and derived colluvium VEGETATION: snow tussock grassland; re tussock grassland; rushland; sedgeland; cushionfield; broadleaved scrub; fern-shrubland  
SOILS: upland yellow-brown earths (Kalkoura Kirkliston), brown granular loams and clays (Saddle), gley soils, organic soils  
IMPORTANCE: 3 SIGNIFICANCE: (i) contains a moderately wide range of relatively unmodified soils and soil-vegetation associations. (ii) soils derived from volcanic rock and having a relatively unmodified vegetation cover are uncommon in the South Island.  
VULNERABILITY: 2 MODIFICATIONS/THREATS: introduced plants; 4WD road; huts  
TENURE: pastoral lease, recommended area for protection OWNER/MANAGER: The Dasher Station and Mt Dasher Station  
CONTACT PERSON: Alan Hewitt DATE OF INFORMATION: July 1991  
REFERENCES: Comrie (1991) Hewitt (1990)

**(297) Hughie**

REGIONAL/CITY COUNCIL(S): Otago ECOLOGICAL DISTRICTS(S): 65-02 Dansey  
LOCALITY and GRID REFERENCE: 30 km WSW of Oamaru 142 225580  
AREA(ha): 370 ALTITUDE(m): 450-700 RAINFALL(mm): 800-1200  
TOPOGRAPHY: steep colluvial mountain slopes dissected by small creeks separated by rounded ridges PARENT MATERIAL: schist and derived colluvium VEGETATION: broadleaved forest; broadleaved shrubland; manuka shrubland  
SOILS: lowland yellow-brown earths (Silver-Peaks)  
IMPORTANCE: 3 SIGNIFICANCE: (i) contains the largest remnants of lowland yellow-brown earths under manuka shrubland and broadleaved forest in the ecological district.  
VULNERABILITY: 2 MODIFICATIONS/THREATS: grazed by stock; possums, introduced plants (browntop, Hieracium pilosella, catsear)  
TENURE: pastoral lease, recommended area for protection OWNER/MANAGER: Mt Dasher Station  
CONTACT PERSON: Alan Hewitt DATE OF INFORMATION: July 1991  
REFERENCES: Comrie (1991) Hewitt (1990)

APPENDIX TWO: Descriptions of RAP3: Hughie and RAP5: Dasher. From Comrie J. 1993. Dansey Ecological District, survey report for the Protected Natural Areas Programme. Department of Conservation, Wellington. No. 23. October 1992. 106pp.



GR Centre : NZAMS 260 142 225580  
 Area : 370 ha  
 Altitude Range : 450 - 700m  
 Tenure : Pastoral Lease (Mt Dasher)  
 Sample Sites : HUCG 01 - 04

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Dansey RAP 3 : HUGHIE

Ecological units

TWINSPAN vegetation group (no.) name and location	Flora
(90) Broadleaved forest on debris mantled slopes	HUCG02, 04
(95) <i>Mnaska</i> shrubland on debris mantled slopes	HUCG03
(95) Modified broadleaved on debris mantled slopes	HUCG01

Less than one hectare

Hughie Stream drains a steep V-shaped valley cut into the broad gently sloping surface of the 'Kaituma volcanic plateau'. The catchment is dissected by a number of small creeks separated by rounded ridges. Slopes are generally planar.

Bedrock is mainly semi-schist, with a small area of gneiss on the southern side of the main stream.

Soils in this RAP are mapped as part of the Horwani set (Adams 1977). However, this is unlikely to be accurate as the soils are formed on a debris mantle derived from schist, rather than gneiss. They fit more closely the attributes of the Silver Peaks set.

Vegetation and flora

The gullies and lower slopes of Hughie Stream are covered in natural broadleaved forest (TWINSPAN group 06). The main canopy species are broadleaf (*Curtetia hirsuta*), matakahi (*Carpodacus torrensii*), kameroo (*Phytolobum cymoides*) and lacewood (*Phoradendron cratichneumon*). Less common are koruhā (*Coprosma microphylla*), Hall's fern (*Polystichum hallii*), *Mnaska* (*Phytolobum tenuifolium*), vineberry (*Aristocelia serrata*), and three finger (*Phacelium colmanii* var. *terreum*). The understorey is generally open and dominated by *Cyrtospora linearifolia*, *C. crassifolia* and sedge (*Myrica aspera*). Ground cover is typically sparse (< 20%). It includes patchy shield fern (*Polystichum varicosum*), *Asplenium speciosum*, horned's tongue fern (*Phymatosorus atherifolius*) and hooked sedge (*Phacelia* spp.). A group of mistle (*Phymatosorus tenuifolia*) seedlings were also recorded. This was the only mistle recorded during the FVA survey, but it has been noted in the Elected Stream catchment by the DSIR (Brace 1986). *Asella fragrans* commonly occurs on the footslopes.

*Mnaska* (*Cyrtospora asperifolia*) shrubland (TWINSPAN group 05) is extensive on ridges and hilltops above and between the forest stands. The canopy cover and height are variable with some stands reaching 3 m. Various seral communities are represented with scattered young forest trees such as broadleaf and lacewood common in parts of the RAP. The most common plants growing with the *Mnaska* are broadleaf fern (*Polystichum asplenoides*), fernie tussock (*Pteris soredio-zealandica*), silver tussock (*Poa cava*), brownstop (*Agrostis capillaris*), cakra (*Rhynchospora radicans*), white clover (*Trifolium repens*) and mouse-ear hawkweed (*Elaeagnus plicata*).

At stream heads, particularly in the upper catchment, the shrubland is dominated by *Coprosma propinqua*, *Coprosma* sp. 'Y', *C. nigosa*, mountain-flax (*Phormium cookianum*) and birch (*Corticea sarneseana*). Ferns: tussockland (TWINSPAN group 05) is extensive on the side ridges and above the forest and shrubland. The insect-trapnet flora is dominated by adventive species, particularly bromeliad, sweet vernal (*Hydrocotyle-oleronum*) and clover. There are small areas of summer-flowered moss tussockland (*Chamaecrista rigidula*), mostly on steeper faces close to the forest remnants. Adventive species tend to be abundant here as well.

#### Fauna

Birds recorded were grey warbler, brown creeper, wheroke, fantail, blackbird and thrush. All occur within the forest patches or surrounding shrublands. The insect fauna were not surveyed in this RAP.

#### Discussion

Highly RAP contains the largest area of *manuka* shrubland with associated broadleaved forest in the District. Extensive *manuka* shrublands are presently uncommon in the Bay of Plenty District. They occur mostly in small patches associated with broadleaved forest and are more abundant in the south of the District. In some places young forest trees and shrubs within the forest are killed because of stock access and pressure.

#### Criteria summary

Representativeness	MH	representative of podocarp-broadleaved forest and <i>manuka</i> shrubland.
Diversity	M	medium species diversity, low number of communities.
Neotronics	M	high in forest areas, lower in surrounding shrubland and tussockland.
Special features	L	
Viability	M	relatively large, intact area.
Buffering	M	catchment boundary; gradual transition from forest through surrounding shrublands to tussockland, with spread of forest species within shrublands.
Threat	M	fire, stock ingress, pressure.

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GR Centre : NZIMS 260 142 145578  
 Area : 1620 ha  
 Altitude Range : 700 - 1300m  
 Tenure : Pastoral Lease (The Dasher and Mt Dasher)  
 Sample Sites : DAS 01 - 27, & KAU 06 - 08

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Dansey RAP 5 : DASHERR

*Ecological notes*

TRUSSMAN vegetation group (no.) name and location	Flora
(02) Scrubland on bench boulderfield	DAS02, 04, 07, 10, 14, 19, 25
(02) Scrubland on steep shaded slope	DAS01, 08, KAUD6
(03) Steep slope scrubland on steep shaded slope	DAS13, 24, 26
(03) Heath-shrub scrubland on bedrock banks	KAUD07
(04) Native-herb sward scrubland on steep shaded slopes	DAS01, 08, 11, KAUD08
(05) Native-herb scrubland on steep shaded slopes	DAS05, 06, 21
(06) Red scrubland on moderate slope	DAS27
(06) Red scrubland on moderate slope	DAS20, 21
(07) Oakland bog and redgumland on flat moderate slope	DAS16, 17
(07) Oakland bog and redgumland on steep shaded slopes	DAS23

*Landforms and soils*

This RAP covers part of an extensive gently inclined mosaic top situated to the east of the main range of the Kaitiaki Mountains. Bedrock is primarily low grade schist overlain in places by a cap of volcanic rock, tuffs, breccia and lava. The three assumed eruptive centres are Mt Dasher (1304 m), Siberia Hill (1272 m) and Mt Karanodyrost (1293 m) (Brown 1955). All except Siberia Hill are plug remnants resting on the schist bedrock. Siberia Hill consists of a series of flows of varying rock types that rest upon Tertiary sediments (Rae 1990).

The schist bedrock dips very steeply (50-70°) to the north-east forming prominent NW-SE strike ridges where streams have cut deeply into the plateau surface and exposed the underlying structure. This is particularly evident in Deep Creek, the rock bluffs of Cayenne Spur and the head of the Karua River.

The volcanic rock is evident today as rock outcrops and as "streams" of uncemented boulders. The formation of these boulderfields into "streams" is a characteristic outcome of cryogenic processes such as frost wedging and heaving (Trochim pers. comm., Rae 1990). The boulderfields are particularly spectacular around Mt Dasher where they extend in places almost to the valley floor (800 m).

The soils on Mt Dasher, Karanodyrost and the flat tops around Siberia Hill are mapped within the Saddle Hill set. Soils of the Kaitiaki set are mapped on the steep colluvial schist slopes in the headwaters of Deep Creek, the Karua River and the rock bluffs of Cayenne Spur, with a small area of Kaitiaki soils at the top of Cayenne Spur where the ridge tops are predominantly gently sloping (Marshall 1977).

Bewin (1990) inspected areas mapped as the Saddle Hill set and noted the soils strongly reflected the degree of weathering and drainage conditions. Recent soils occur under boulderfields, brown granular soils are associated with ridge crests, stonier and well-drained slopes and grey soils occur in hollows and drainage-ways on upper slopes and under wetlands on saddles and lower slopes. Organic soils occur in association with wetlands dominated by comb sedge (*Oreobolus pectinatus*).

## Vegetation and Flora

Tussockland of thin snow tussock (*Chamaecrista nuttallii*, summer-leaved snow tussock (*C. rigida*) and hybrids between the two, are extensive on the around-gulch slopes of the volcanic plateau, particularly on ridge crests and upper slopes (TWINSPAN groups 03 and 04). The tussock is predominantly under 1 m tall with a dense inter-tussock cover of small herbs and grasses. The introduced species *Leontodon* (*Leontodon* spp.), sweet vernal (*Anemone pulsatilla*) and mouse-ear hawkweed (*Achillea millefolium*) are well established in places, particularly on the drier, flatter areas where snow tend to camp. The cover of snow tussock and the number of native inter-tussock species is generally higher on the steeper slopes of Mt. Deaker, where boulderfields appear to have inhibited much of the tussockland from fire and intensive grazing.

Wetland (TWINSPAN group 07) occurs over much of the gently sloping area between Siberia Hill and Kaitiaki; at mid-slope scarp-like sites or where drainage is impeded on the ground. Within these wet sites, subtle changes in drainage have marked effects on the vegetation patterns. Small patches of red tussockland (*Chamaecrista nuttallii* ssp. *capitata*) (TWINSPAN group 06) are common throughout, and bog mats (*Scheuchzeria palustris*) is extensive, particularly at mid slope. More extensive red tussocklands occur on the gently inclined east-facing slopes at the northern end of Ceyenne Spur and in depressions to the south and east of Mafekalis Hut. Associated with these more extensive areas of red tussockland are sphagnum moss, *Utricularia* (*Carex confertifolia*), *C. gonoloboides*, *Leontodon* and, around Ceyenne Spur, the fern *Cheilanthes hololepis*.

The wetlands on the flat top of Siberia Hill and on the saddle between Iron saddlebush comprise large areas of cushion bog and *Carex*-dominated wetland. Cushion sedge (*Oenothera pedunculata*) is widespread, with associated species being mainly *Abundantia* (*Cheilanthes*, *Luzula hypolepis*, *Carex gonoloboides*, *C. theobaldii*, *C. ciliolata*, *Juncus acrocarpa*, *Cheilanthes*, *Cheilanthes* ssp. and *Sphagnum* ssp. (*Sphagnum cristatum*).

The extensive heath boulderfields on the slopes of Mt. Deaker and Siberia Hill, have little vegetation apart from *Epilobium* and mosses. However, shrublands (TWINSPAN group 02) are common on the margins and in sheltered places between the boulder streams. Common shrubs are snow hovers (*Protopopulus rivinii*), *Corynephorus ciliatus* and *Bede rubicundus*. There are occasional small patches of mountain tussock (*Phyllocladus alpinus*) on both Mt. Deaker and Siberia Hill, and the locally distributed *Dracopis* (*Cheilanthes hololepis*) on the southern slopes of Siberia Hill. The shrub *Dracopis* (*Cheilanthes hololepis*) was noted by Allan et al. (1988) during a previous survey of this area, but it was not recorded during the VNA Programme survey.

The boundaries of the RAP extend into the headwaters of the Kauru River and the most bluffs of Ceyenne Spur to include an area of steep colateral slopes and extensive rocky bedrock outcrops. The vegetation on the colateral slopes is mainly snow tussockland on the many faces and semi-shrubs of *Corynephorus ciliatus*, with patchy shield fern (*Polystichum vestitum*) and mosses-leaved fern (*Polypodium scolopendrium*), on the upper steeply faces. The extensive bedrock outcrops and bluffs are sparsely vegetated with an assemblage of herbs and ferns that includes *Autostroma flexuosum*, *A. arvense*, *Polygonum spensei*, *Colobrytes*

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(*Epilobium grandifolium*) and *Cheilanthes hololepis*. Turpentine scrub (*Dracopis hololepis* ssp. *capitata*), with snow tussock, sedge meadow (*Cheilanthes hololepis*) and mountain flax (*Phormium tenax*), occurs on the steep colateral slopes between the outcrops.

A number of the plants occurring in this RAP are mentioned in distribution within the District. Mountain tussock and *Dracopis* (*Cheilanthes hololepis*) were only found in sheltered sites in one other locality in the District outside of this RAP. Both these plants seem to grow only in areas, either on steep rocky rock faces, or between boulderfields - areas isolated from past fires. Similarly, *Cheilanthes hololepis*, a fern restricted in distribution to Otago and northern Southland, now only occurs in inaccessible rocky sites in the eastern part of the Dansey Biological District.

*Bede rubicundus*, a low growing shrub (<0.5m high) also occurred scattered amongst the boulderfields and on the rocky top of Mt. Deaker. This shrub is more commonly found from Mafekalis to South Canterbury, and in northern Southland, and was only noted on rocky sites in the northern part of the Dansey Biological District, particularly associated with areas of volcanic parent material.

## Flora

Pink, salmon, and parallel striated were recorded around the flat topped summit of Siberia Hill and Mt. Deaker. A group of adult black-backed gull and several young were nesting adjacent to the ponds on Siberia Hill.

Two waterbird great swallows in the genus *Lycopodium* were found on Ceyenne Spur and another site in the district, while the wetlands on Siberia Hill have a diverse fauna of ground moths. These wetlands also contained the most diverse and abundant aquatic invertebrates in the Biological District (see Section 4.4.4). The invertebrates collected included a number of very small crustacea, a spider and insect larvae.

## Discussion

The combination of relatively unmodified vegetation and volcanic landforms makes the Deaker RAP one of the most valuable natural areas in Dansey Biological District.

Siberia Hill is one of the largest volcanic masses of the Danedon Volcanic Group outside of the Danedon volcano. (The group included a major shield volcano, the Danedon volcano, and numerous outlying short lived cones active from around 21 million years ago (Coombes et al. 1980)). Siberia Hill is also one of the exceptions of the East Otago peripheral vents in that it has topographically and chemically distinct lava flows overlying one another. The small, monogenic vent of Kaitiaki is more typical of the outlying vents in this group (Pace 1990).

Wetlands are uncommon in Dansey Biological District, occurring only in two other catchments outside of this RAP (both being tributary streams of the North Branch Mafekalis River). The Deaker RAP contains the most extensive and diverse (in terms of communities) of these wetlands.

The RAP also includes areas of red tanoakland at relatively high elevation (1100 - 1200 m), a vegetation type substantially reduced from its original extent and now uncommon at this locale in the District.

Boulderfields are a feature of several other volcanic outcrops in eastern Oregon, but the ones in this RAP, particularly those on Mt. Deaker, are virtually spectacular. In addition, in the Deaker RAP, there are subalpine shrub species not found in other east Oregon boulderfields (Allen *et al.* 1985) such as mountain heaton and *Brachyglottis occidentalis*.

Patrick (1991) has identified the wetlands of Spacia Hill and the rock bluffs of Cypress Spur as key sites for the conservation of insects.

Criteria summary

Representativeness	H	representative range of vegetation and landforms on volcanic and other substrate.
Diversity	H	diverse vegetation groups, landforms, plant and faunal species.
Naturalness	MH	high naturalness in shrublands and wetlands, variable in boulderfields.
Special features	H	volcanic boulderfields, plant species uncommon in District, two undisturbed giant woodrat species on Cypress Spur.
Viability	MH	large intact area.
Bedding	H	surrounding landscape largely natural.
Turner	ML	increased stock pressure, aerial overgrazing, fire.

APPENDIX THREE: Vascular Plant Species List for The Dasher Pastoral Lease

\* indicates exotic species.

<sup>1</sup> indicates additional species recorded by Bruce (1986).

<sup>2</sup> indicates additional species recorded by Comrie (1992).

Species	Common name	Plant type
<i>Abrotanella caespitosa</i>		Dicot herb
<i>Acaena anserinifolia</i>	Bidibidi	Dicot herb
<i>Acaena caesiiglauca</i>	Bidibidi	Dicot herb
<i>Achillea millefolium</i> *	Yarrow	Dicot herb
<i>Aciphylla aurea</i>	Golden Spaniard	Dicot herb
<i>Aciphylla montana</i> var. <i>gracilis</i>	Spaniard	Dicot herb
<i>Aciphylla scott-thomsonii</i>	Spaniard	Dicot herb
<i>Agrostis capillaris</i> *	Browntop	Grass
<i>Agrostis stolonifera</i> *	Creeping bent	Grass
<i>Anaphalotodes bellidioides</i>		Dicot herb
<i>Anisotome aromatica</i>		Dicot herb
<i>Anisotome flexuosa</i>		Dicot herb
<i>Anthoxanthum odoratum</i> *	Sweet vernal	Grass
<i>Aristotelia fruticosa</i>		Shrub
<i>Aristotelia serrata</i> <sup>1</sup>	Wineberry	Tree
<i>Asplenium bulbiferum</i> <sup>1</sup>	Hen and chickens fern	Fern
<i>Asplenium flabellifolium</i> <sup>1</sup>	Necklace fern	Fern
<i>Asplenium flaccidum</i> <sup>1</sup>	Hanging spleenwort	Fern
<i>Asplenium hookertanum</i> <sup>1</sup>		Fern
<i>Asplenium richardii</i>		Fern
<i>Asplenium terrestre</i> <sup>1</sup>		Fern
<i>Astella fragrans</i> <sup>2</sup>	Bush flax	Tussock herb
<i>Astella nervosa</i>		Tussock herb
<i>Bellis perennis</i> *	Lawn daisy	Dicot herb
<i>Blechnum chamberii</i> <sup>1</sup>		Fern
<i>Blechnum fluviatile</i> <sup>1</sup>		Fern
<i>Blechnum montanum</i>	Kiokio	Fern
<i>Blechnum novae-zelandiae</i>	Kiokio	Fern
<i>Blechnum penna-marina</i>		Fern
<i>Blechnum vulcanicum</i> <sup>1</sup>		Fern
<i>Brachycome</i> cf. <i>sinclairii</i>		Dicot herb
<i>Brachyglottis bellidioides</i>		Dicot herb
<i>Callitriche stagnalis</i> *	Starwort	Dicot herb
<i>Calystegia tuguriorum</i>		Vine
<i>Carduus nutans</i> *	Nodding thistle	Dicot herb
<i>Carex breviculmis</i>		Sedge
<i>Carex coriacea</i>	Rautahi	Sedge
<i>Carex echinata</i>		Sedge
<i>Carex gaudichaudiana</i>		Sedge
<i>Carex ovalis</i> *		Sedge
<i>Carex secta</i>	Purei	Tussock sedge
<i>Carex virgata</i>		Tussock sedge
<i>Carmichaelia australis</i>	Native broom	Shrub
<i>Carmichaelia petriei</i>	Native broom	Shrub
<i>Carpodetus serratus</i>	Marble leaf	Tree
<i>Celmisia densiflora</i>		Dicot herb
<i>Celmisia gracilentia</i>		Dicot herb
<i>Celmisia haastii</i>		Dicot herb
<i>Celmisia hookeri</i>		Dicot herb
<i>Celmisia lyallii</i>	False Spaniard	Dicot herb



Species	Common name	Plant type
<i>Celmisia viscosa</i>		Dicot herb
<i>Celmisia brevifolia</i>		Dicot herb
<i>Cerastium fontanum</i> *	Mouse-eared chickweed	Dicot herb
<i>Chionochloa macra</i>	Slim snow tussock	Tussock grass
<i>Chionochloa rigida</i>	Narrow-leaved snow tussock	Tussock grass
<i>Chionochloa rubra</i> var. <i>cuprea</i>	Red tussock	Tussock grass
<i>Cirsium arvense</i> *	Californian thistle	Dicot herb
<i>Cirsium vulgare</i> *	Scotch thistle	Dicot herb
<i>Clematis paniculata</i> <sup>1</sup>	Clematis	Vine
<i>Colobanthus acicularis</i>		Dicot herb
<i>Coprosma atropurpurea</i>		Shrub
<i>Coprosma cheesemanii</i>		Shrub
<i>Coprosma ciliata</i>		Shrub
<i>Coprosma colensoi</i> <sup>1</sup>		Shrub
<i>Coprosma crassifolia</i> <sup>1</sup>		Shrub
<i>Coprosma linartifolia</i> <sup>1</sup>		Shrub
<i>Coprosma parviflora</i> var. <i>dumosa</i>		Tree
<i>Coprosma perpusilla</i>		Shrub
<i>Coprosma propinqua</i>	Mikimiki	Shrub
<i>Coprosma rhamnoides</i> <sup>1</sup>		Shrub
<i>Coprosma rigida</i>		Shrub
<i>Coprosma rotundifolia</i>		Shrub
<i>Coprosma rubra</i>		Shrub
<i>Coprosma rugosa</i>		Shrub
<i>Coprosma</i> sp. aff. <i>pseudocuneata</i>		Shrub
<i>Cordyline australis</i>	Cabbage tree	Tree
<i>Coriaria plumose</i>	Tutu	Shrub
<i>Coriaria sarmentosa</i>	Tutu	Shrub
<i>Corakia cotoneaster</i> <sup>1</sup>		Shrub
<i>Cortaderia richardii</i>	Toetoe	Tussock grass
<i>Cotoneaster simonsii</i> *	Khasia berry	Shrub
<i>Craspedia uniflora</i>		Dicot herb
<i>Crepis capillaris</i> *	Hawksbeard	Dicot herb
<i>Criticism murinum</i> *	Barley grass	Grass
<i>Cytisus scoparius</i> *	Broom	Shrub
<i>Dactylis glomerata</i> *	Cocksfoot	Grass
<i>Digitalis purpurea</i> *	Foxglove	Dicot herb
<i>Discaria toumatou</i>	Matigouri	Shrub
<i>Dracophyllum longifolium</i>	Inaka	Shrub
<i>Dracophyllum muscoides</i>		Shrub
<i>Dracophyllum uniflorum</i>	Turpentine shrub	Shrub
<i>Drosera arcturi</i>	Sundew	Dicot herb
<i>Dryopteris filix-mas</i> <sup>1</sup>	Male fern	Fern
<i>Epilobium alsinoides</i> subsp. <i>atriplicifolium</i>	Willowherb	Dicot herb
<i>Epilobium brunnescens</i>	Willowherb	Dicot herb
<i>Epilobium nummularifolium</i>	Willowherb	Dicot herb
<i>Exocarpus bidwillii</i>		Shrub
<i>Festuca novae-zelandiae</i>	Hard tussock	Tussock grass
<i>Fuchsia excorticata</i> <sup>1</sup>	Tree fuchsia	Tree
<i>Fuchsia perscandens</i>		Vine
<i>Gallium perpusillum</i>		Dicot herb
<i>Gaultheria antipoda</i> <sup>1</sup>	False beech	Shrub
<i>Gaultheria crassa</i>		Shrub
<i>Gaultheria depressa</i>		Shrub
<i>Gaultheria macrostigma</i>		Shrub
<i>Gentiana grisebachii</i>	Gentian	Dicot herb

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Species	Common name	Plant type
<i>Gentiana patula</i>	Gentian	Dicot herb
<i>Geranium microphyllum</i>		Dicot herb
<i>Geum leiospermum</i>		Dicot herb
<i>Gonocarpus aggregatus</i>		Dicot herb
<i>Griselinia littoralis</i>	Broadleaf	Tree
<i>Haloragis erecta</i> <sup>1</sup>		Shrub
<i>Hebe buechananii</i>		Shrub
<i>Hebe hectori</i>		Shrub
<i>Hebe lycopodioides</i>		Shrub
<i>Hebe odora</i>		Shrub
<i>Hebe pinguiifolia</i>		Shrub
<i>Hebe rakatensis</i>		Shrub
<i>Hebe salticifolia</i>	Koromiko	Shrub
<i>Helichrysum aggregatum</i> <sup>1</sup>		Shrub
<i>Helichrysum filicaule</i>		Dicot herb
<i>Helichrysum intermedium</i>		Shrub
<i>Hieracium lepidulum</i> *	Tussock hawkweed	Dicot herb
<i>Hieracium pilosella</i> *	Mouse-eared hawkweed	Dicot herb
<i>Hoheria angustifolia</i>	Narrow-leaved lacebark	Tree
<i>Holcus lanatus</i> *	Yorkshire fog	Grass
<i>Hydrocotyle novae-zelandiae</i> var. <i>montanum</i>	Waxweed	Dicot herb
<i>Hymenophyllum multifidum</i> <sup>1</sup>	Filmy fern	Fern
<i>Hypochoeris radicata</i> *	Catscar	Dicot herb
<i>Hypolepis millefolium</i>		Fern
<i>Juncus articulatus</i> *	Jointed rush	Rush
<i>Juncus bufonius</i> *	Toad rush	Rush
<i>Juncus distegus</i>		Rush
<i>Juncus effusus</i> *	Soft rush	Rush
<i>Juncus greggii</i> flor.		Rush
<i>Kelleria dieffenbachii</i>		Dicot herb
<i>Kelleria paludosa</i>		Dicot herb
<i>Leontodon taraxacoides</i> *	Hawkbit	Dicot herb
<i>Leptinella squalida</i>		Dicot herb
<i>Lepidospermum scoparium</i>	Manuka	Tree
<i>Leucogenes grandiceps</i>	Bidelweiss	Dicot herb
<i>Leucopogon colensoi</i>		Shrub
<i>Leucopogon frateri</i>	Patotara	Shrub
<i>Leycesteria formosa</i> *	Himalayan honeysuckle	Shrub
<i>Lotus pedunculatus</i> *	Lotus	Dicot herb
<i>Luzula pumila</i>		Sedge
<i>Luzula rufa</i>		Sedge
<i>Lycopodium fastigiatum</i>		Fern
<i>Melicope simplex</i> <sup>1</sup>		Shrub
<i>Melicope alpinus</i>	Porcupine shrub	Shrub
<i>Melicope ramiflorus</i> <sup>1</sup>	Mahoe	Tree
<i>Microrum pustulatum</i>	Hound's tongue fern	Fern
<i>Mimulus moschatius</i> *	Musk	Dicot herb
<i>Muehlenbeckia australis</i>		Vine
<i>Muehlenbeckia axillaris</i>		Vine
<i>Muehlenbeckia complexa</i>	Pohuehue	Vine
<i>Myosotis arvensis</i> *	Forget-me-not	Dicot herb
<i>Myosotis discolor</i> *	Forget-me-not	Dicot herb
<i>Myrsine australis</i> <sup>1</sup>	Mapou	Shrub
<i>Myrsine divaricata</i>		Shrub
<i>Myrsine nummularia</i>		Shrub
<i>Navarretia squarrosa</i> *	Tarweed	Dicot herb

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Species	Common name	Plant type
<i>Nertera balfouriana</i>		Dicot herb
<i>Olearia bullata</i>		Shrub
<i>Oreobolus pectinatus</i>	Comb sedge	Cushion sedge
<i>Oreomyrrhis colensoi</i>		Dicot herb
<i>Ourisia caespitosa</i> var. <i>gracilis</i>		Dicot herb
<i>Ourisia sessilifolia</i> var. <i>splendida</i>		Dicot herb
<i>Oxalis lactea</i>		Dicot herb
<i>Ozothamnus leptophyllus</i>	Tauhinu	Shrub
<i>Parsonsia heterophylla</i>	Native jasmine	Vine
<i>Pellaea</i> sp.		Fern
<i>Pennantia corymbosa</i> <sup>1</sup>	Kaikomako	Tree
<i>Pentachondra pumila</i>		Shrub
<i>Phormium cookianum</i>	Mountain flax	Tussock herb
<i>Pimelia pseudolyallii</i>		Shrub
<i>Pimelia traversii</i>		Shrub
<i>Pinus nigra</i> *	Corsican pine	Tree
<i>Pinus radiata</i> *	Radiata pine	Tree
<i>Pittosporum eugenioides</i>	Lemonwood	Tree
<i>Pittosporum tenuifolium</i>	Kohuhu	Tree
<i>Poa cita</i>	Silver tussock	Tussock grass
<i>Poa colensoi</i>	Blue tussock	Tussock grass
<i>Poa lindsayi</i>		Grass
<i>Poa pratensis</i> *	Meadow grass	Grass
<i>Podocarpus hallii</i>	Halls' totara	Tree
<i>Podocarpus nivalis</i>	Snow totara	Shrub
<i>Polystichum richardii</i> <sup>1</sup>	Shield fern	Fern
<i>Polystichum vestitum</i>	Prickly shield fern	Fern
<i>Pratia angulata</i>		Dicot herb
<i>Prumnopitys taxifolia</i> <sup>2</sup>	Matai	Tree
<i>Pseudopanax colensoi</i>	Three finger	Tree
<i>Pseudopanax crassifolius</i>	Lancewood	Tree
<i>Pteridium esculentum</i>	Bracken	Fern
<i>Ranunculus enysii</i>		Dicot herb
<i>Ranunculus multiscapus</i>		Dicot herb
<i>Ranunculus reflexus</i>		Dicot herb
<i>Ranunculus repens</i> *	Creeping buttercup	Dicot herb
<i>Raoulia glabra</i>		Dicot herb
<i>Raoulia grandiflora</i>		Dicot herb
<i>Raoulia subserticea</i>		Dicot herb
<i>Rostkovia magellanica</i>		Rush
<i>Rubus cissoides</i>	Bush lawyer	Vine
<i>Rubus schmidelioides</i>	Lawyer	Vine
<i>Rumex acetosella</i> *	Sheep's sorrel	Dicot herb
<i>Rumex crispus</i> *	Curly dock	Dicot herb
<i>Rumex obtusifolius</i> *	Dock	Dicot herb
<i>Rytidosperma australe</i>	Danthonia	Grass
<i>Rytidosperma gracile</i>	Danthonia	Grass
<i>Rytidosperma pumilum</i>	Danthonia	Grass
<i>Sagina procumbens</i> *	Pearlwort	Dicot herb
<i>Sambucus nigra</i> *	Elder	Tree
<i>Scandia geniculata</i>		Vine
<i>Schoenus pauciflorus</i>		Sedge
<i>Scleranthus uniflorus</i>		Dicot herb
<i>Sophora microphylla</i>	Kowhai	Tree
<i>Stellaria alsine</i> *	Bog stitchwort	Dicot herb
<i>Teucrium parvifolium</i>		Shrub

Species	Common name	Plant type
<i>Thelymitra</i> sp.	Sun orchid	Monocot herb
<i>Trifolium repens</i> *	White clover	Dicot herb
<i>Ulex europaeus</i> *	Gorse	Shrub
<i>Uncinia</i> sp.	Hook sedge	Sedge
<i>Urtica ferox</i>	Tree nettle	Shrub
<i>Verbascum thapsus</i> *	Woolly mullein	Dicot herb
<i>Wahlenbergia albomarginata</i>	Harebell	Dicot herb

APPENDIX FOUR: Invertebrate List from Dansey Ecological District PNAP survey (Comrie, 1992)

	Family	Species	Notes
Lepidoptera (butterflies and moths)	Hepialidae	<i>Wiseana mimica</i> (Philpott)	Siberia Hill
	Tortricidae	<i>Merophyas leucaniana</i> (Walker)	Siberia Hill wetlands
	Artlidae	<i>Metacrias strategica</i> (Hudson)	Larvae on herbs and grasses, Siberia Hill
Coleoptera (beetles)	Curculionidae	<i>Lyperobtus n. sp.</i> 1	Two undescribed giant weevils found together on Cayenne Spur at 1240m, Siberia Hill, on <i>Aciphylla graetlis</i> . Both species occur elsewhere- Mt Kyeburn; Ida Range and Grampian Mts.
		<i>Lyperobtus n. sp.</i> 2	
Trochoptera (caddisflies)		<i>Hudsonema aliena</i>	Siberia Hill

APPENDIX FIVE: Invertebrate Survey List for The Dasher Pastoral Lease (24-27<sup>th</sup> Feb 2003)

Order/Family	Taxon	Locality	Elevation	comment
Collectors: E. Edwards, B. Hill & T. Jewel				
Beetles Coleoptera				
Byrrhidae	<i>Pedilophorus</i> sp.	Otepopo Spur	850 m	larvae and adults eat moss x2. Endemic to north-east Otago hills, Malloy et al (2002) threat of extinction category - Sparse
Carabidae	<i>Megadromus haplopus</i>	Hd. Jimmys Ck.	1300 m	
	<i>Megadromus haplopus</i>	trib. Hector Stm.	760 m	
Cicindelidae	<i>Oregus aureus complex</i>	Otepopo Spur	900 m	
	<i>Noocicindela fallacincta</i>	trib. Hector Stm.	780 m	
Curculionidae	<i>Anagotis lewisi</i>	Mt. Difficulty	880 m	Larvae and adults eat <i>Chironocloa</i>
	<i>Anagotis lewisi</i>	Otepopo Spur	1000 m	
Elateridae	Elateridae	Kauru R.	250 m	
Scarabaeidae	<i>Odontria ?strigata</i>	Kauru R.	250 m	x3
	<i>Pyronota festiva</i>	Trig Island	920 m	
Tenebrionidae	<i>Artystone</i> sp.	Otepopo Spur	900 m	Larvae eat dead wood
	<i>Artystone</i> sp.	Siberia Hill	1280 m	
	<i>Mimopeus</i> sp.	Otepopo Spur	900 m	
Mayflies Ephemeroptera				
Leptophlebaeidae	<i>Deleatidium</i> sp.	Kauru R.	250 m	
Amelotopsidae	<i>Amelotopsis perscitus</i>	Kauru R.	250 m	
Bugs & cicada Hemiptera				
Lygaeidae	<i>Nysius huttoni</i>	trib. Hector Stm.	780 m	open cushion areas
Cicadidae	<i>Kikihia angusta</i>	Otepopo Spur	950 m	
	<i>Kikihia angusta</i>	Siberia Hill	1210 m	widespread on the property x2, southeastern limit of known range
Tibicenidae	<i>Maoricicada clarnitans</i>	Otepopo Spur	1000 m	southeastern limit of known range
	<i>Maoricicada phaeoptera</i>	Siberia Hill	1280 m	
Native bees Hymenoptera				
Colletidae	<i>Leloproctus</i> sp.	Siberia Hill	1280 m	x2
	<i>Leloproctus</i> sp.	trib. Hector Stm.	780 m	
	small native bee	Trig Island	920 m	
Moths and butterflies Lepidoptera				
Carposinidae	<i>Heterocrossa cryodana</i>	Kauru R.	250 m	
	<i>Heterocrossa</i> <i>gottoheimana</i>	Kauru R.	250 m	
Choreutidae	<i>Asterivora marmorata</i>	Cayenne Spur	980 m	Larvae eat <i>Calmisia gracillonta</i> complex
Crambidae	<i>Orocrambus apicellus</i>	Cayenne Spur	980 m	Wetlands
	<i>Orocrambus apicellus</i>	spur W Mackerras Ck.	800 m	Wetlands
	<i>Orocrambus cranaeus</i>	Siberia Hill	1210 m	<i>Chironocloa</i> grasslands
	<i>Orocrambus cranaeus</i>	Siberia Hill	1280 m	
	<i>Orocrambus</i> <i>anchophorus</i>	Kauru R.	250 m	
	<i>Orocrambus flexuosellus</i>	Mt. Difficulty	880 m	widespread on the property Inhabits wet grassland, a local species
	<i>Orocrambus lectus</i>	Siberia Hill	1210 m	
	<i>Orocrambus philpotti</i>	Mt. Difficulty	880 m	
	<i>Orocrambus ramosellus</i>	Cayenne Spur	980 m	Inhabits grassland
	<i>Orocrambus ramosellus</i>	Kauru R.	250 m	
	<i>Orocrambus ramosellus</i>	Mt. Difficulty	880 m	x2
	<i>Orocrambus scoparioides</i>	Siberia Hill	1210 m	Endemic to Central Otago region. Inhabit wetlands
	<i>Orocrambus</i> <i>submarginalis</i>	Cayenne Spur	980 m	

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Order/Family	Taxon	Locality	Elevation	comment
	<i>Orocrambus vitellus</i>	Kauru R.	250 m	Inhabits grassland
	<i>Orocrambus vitellus</i>	spur W Mackerras Ck.	600 m	
	<i>Orocrambus vitellus</i>	trib. Kauru R.	500 m	
	<i>Orocrambus vulgaris</i>	Cayenne Spur	980 m	Inhabits dry grasslands
	<i>Orocrambus vulgaris</i>	Kauru R.	250 m	x3, Inhabits dry grasslands
	<i>Orocrambus vulgaris</i>	Kauru R.	580 m	
Geometridae	<i>Patagoniodes farina</i>	Kauru R.	250 m	x3, ?A Canterbury species?
	<i>Aponotoreas insignis</i>	Cayenne Spur	980 m	Larvae eat <i>Chionocloa</i>
	<i>Asaphodes boata</i>	Kauru R.	260 m	x2, Larvae polyphagous on herbs
	<i>Asaphodes clarata</i>	Kauru R.	250 m	x2, Larvae eat herbs
	<i>Asaphodes clarata</i>	Mt. Difficulty	680 m	x4
	<i>Asaphodes clareta</i>	Siberia Hill	1210 m	
	<i>Asaphodes clarata</i>	trib. Hector Str.	760 m	
	<i>Asaphodes helias</i>	Siberia Hill	1280 m	x2, on herbs in open grasslands
	<i>Asaphodes nephelias</i>	Kauru R.	250 m	Inhabits wetlands
	<i>Asaphodes nephelias</i>	Siberia Hill	1210 m	x3
	<i>Asaphodes nephelias</i>	Siberia Hill	1250 m	female
	<i>Austrocidaria callichlora</i>	Kauru R.	250 m	x5, caterpillars eat small leaved <i>Coprosma</i>
	<i>Austrocidaria gobiata</i>	Kauru R.	250 m	x3, Larvae eat <i>Coprosma</i>
	<i>Austrocidaria similata</i>	Kauru R.	250 m	x8, Larvae eat <i>Coprosma</i> caterpillars on <i>Sophora</i> , <i>Pseudowintera</i> & some other trees.
	<i>Clarea scriptaria</i>	Kauru R.	260 m	Larvae eat <i>Calmisia</i> flowerheads
	<i>Clorocyatta nareis</i>	Three Brothers Rocks	680 m	
	<i>Dasyuris anceps</i>	Cayenne Spur	680 m	x2, Larvae eat <i>Anisotome</i>
	<i>Dasyuris anceps</i>	Otepopo Spur	1000 m	
	<i>Dasyuris anceps</i>	Siberia Hill	1210 m	x2
	<i>Dasyuris anceps</i>	trib. Kauru R.	500 m	
	<i>Dasyuris anceps</i>	Trig Island	920 m	x2
	<i>Declera junctilinea</i>	Kauru R.	260 m	Larvae polyphagous on trees and shrubs
	<i>Dichromodes</i> sp.	hd. Waddels Str.	1300 m	Larvae eat rock lichens. T. Jewel
	<i>Epicyme rubropunctaria</i>	Kauru R.	250 m	x2, Larvae eat <i>Haloragis</i>
	<i>Epiphyne verruculata</i>	Kauru R.	260 m	Caterpillars eat <i>Cordyline</i>
	<i>Epyaxa rosaria</i>	Kauru R.	260 m	Larvae eat herbs
	<i>Gellonia pennularia</i>	Kauru R.	250 m	
	<i>Helastia cinerearia</i>	Kauru R.	260 m	x2, Larvae eat mosses
	<i>Helastia corcularia</i>	Kauru R.	250 m	Larvae eat lichens and herbs
	<i>Helastia cryptica</i>	Kauru R.	250 m	Larvae eat dead leaves
	<i>Helastia triphragma</i>	Kauru R.	250 m	Caterpillars eat <i>Helichrysum lanceolatum</i>
	<i>Hydriomona rixata</i>	Kauru R.	250 m	polyphagous on herbs
<i>Ischalis fortunata</i>	Kauru R.	250 m	Larvae eat <i>Polystichum</i>	
<i>Paranotoreas brephosata</i>	Cayenne Spur	980 m	Larvae eat <i>Epilobium</i>	
<i>Paranotoreas brephosata</i>	Siberia Hill	1280 m	x3	
<i>Pesiphla</i> nsp.	Kauru R.	250 m	x8, Larvae eat <i>Olearia bullata</i>	
<i>Pseudocoronilla melinata</i>	Kauru R.	250 m	caterpillars eat <i>Chamichaella</i>	
<i>Rhapa scotosialis</i>	Kauru R.	250 m	Larvae litter feeding in forest and shrubland	

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Order/Family	Taxon	Locality	Elevation	Comment	
Glyphipterigidae	<i>Xanthorhoe semiflavata</i>	Kauru R.	250 m	x2, caterpillars eat Brassicaceae eg. <i>Cardamine</i>	
	<i>Xyridacma electoreia</i>	Kauru R.	250 m	caterpillars eat <i>Pseudopanax</i>	
	<i>Xyridacma electoreia</i>	Kauru R.	580 m	caterpillars eat <i>Pseudopanax</i>	
	<i>Glyphipterix clonophora</i>	Kauru R.	250 m	Larvae eat <i>Poa cita</i>	
	<i>Glyphipterix clonophora</i>	spur W Mackerras Ck.	600 m	x3, Larvae eat <i>Poa cita</i>	
	<i>Glyphipterix metasticta</i>	Cayenne Spur	980 m	Inhabits wetlands	
	<i>Glyphipterix metasticta</i>	Hd. Jimmys Ck.	1300 m		
	<i>Glyphipterix metasticta</i>	Kauru R.	250 m		
	<i>Glyphipterix metasticta</i>	Siberia Hill	1210 m	x9	
	<i>Glyphipterix metasticta</i>	Siberia Hill	1280 m		
	<i>Glyphipterix metasticta</i>	trib. Kauru R.	500 m	x3	
	<i>Glyphipterix rugata</i>	????????????		*****last in box	
	Gracillariidae	<i>Glyphipterix trisalina</i>	trib. Hector Stm.	760 m	
Homorobiidae	<i>Caloptila elaeas</i>	Kauru R.	250 m	x4, Larvae eat <i>Cortaria</i>	
Hepialidae	<i>Micromus tasmaniae</i>	Trig Island	920 m		
	<i>Wisena copularis</i>	Kauru R.	250 m	x2	
	<i>Wisena umbraculata</i>	Cayenne Spur	980 m		
Lycaenidae	<i>Wisena umbraculata</i>	Kauru R.	250 m	x3	
Lycaenidae	<i>Antipodolycaena</i> nsp.	Cayenne Spur	980 m	A copper butterfly, Larvae eat <i>Muehlenbeckia complexa</i>	
	<i>Antipodolycaena</i> nsp.	Mt. Difficulty	680 m		
	<i>Antipodolycaena</i> nsp.	Three Brothers Rocks	860 m		
	<i>Antipodolycaena</i> nsp.	trib. Hector Stm.	780 m		
	<i>Antipodolycaena</i> nsp.	trib. Kauru R.	500 m		
	<i>Boldenaria</i> nsp.	Otopopo Spur	950 m	A bolder butterfly, Larvae eat <i>Muehlenbeckia axillaris</i>	
	<i>Boldenaria</i> nsp.	Siberia Hill	1280 m		
	<i>Zizina oxleyi</i>	Spur Hughes Stm.	700 m	Blue butterfly, Larvae eat exotic clovers (& native prostrate broom)	
	<i>Zizina oxleyi</i>	trib. Hector Stm.	780 m		
	Noctuidae	<i>Aletia virescens</i>	Kauru R.	250 m	Larvae eat <i>Epifobium</i> and other herbs
<i>Graphania morosa</i>		Kauru R.	250 m	Larvae eat grasses	
<i>Graphania mutans</i>		Kauru R.	250 m	x2, Larvae eat herbs	
<i>Graphania nullifera</i>		Kauru R.	250 m	x2, Larvae eat <i>Acophylla</i>	
<i>Graphania plena</i>		Kauru R.	250 m	x4, Larvae eat herbs	
<i>Graphania tubescens</i>		Kauru R.	250 m	Larvae eat herbs	
<i>Meterana levis</i>		Kauru R.	250 m	Larvae eat <i>Plagiathanus</i> & <i>Hobbita</i>	
<i>Rictania comae</i>		Kauru R.	250 m	Larvae eat grasses and herbs	
<i>Tmetolophota atristriga</i>		Kauru R.	250 m	x3, Larvae eat herbs	
<i>Tmetolophota propria</i>		Kauru R.	250 m	Larvae eat grasses	
<i>Tmetolophota purdii</i>		Kauru R.	250 m	Larvae eat <i>Astelia</i>	
<i>Tmetolophota sulcana</i>		Kauru R.	250 m	Larvae eat <i>Carex secta</i>	
Nymphalidae		<i>Bassaris gonerilla</i>	Jimmys Ck.	300 m	Red Admiral, Larvae eat <i>Urtica incisa</i> & <i>U. fofox</i>
		<i>Bassaris itea</i>	spur W Mackerras Ck.	600 m	Yellow Admiral, Larvae eat <i>Urtica incisa</i> & <i>U. fofox</i>
Nymphulinae	<i>Hygraula nitens</i>	Kauru R.	250 m	x2, Larvae aquatic in wetlands and ponded waters	
Depressariidae	<i>Eutoma symmorphae</i>	Kauru R.	250 m	Inhabits wetland, Larvae possibly eat <i>Solliera</i>	



Order/Family	Taxon	Locality	Elevation	Comment
Oecophoridae	<i>Gymnobathra sarcoxantha</i>	trib. Hector Stn.	780 m	Cases bearing larvae, under sub-shrubs
	<i>Izatha peroneanella</i>	Kauru R.	250 m	Larvae eat dead wood
	<i>Phaeosacca apocrypta</i>	trib. Kauru R.	500 m	Larvae on lichens
	<i>Tingena</i> sp.	Kauru R.	250 m	
Psychidae	<i>Tingena</i> sp.	Trig Island	920 m	
	<i>Orophora unicolor</i>	Mt. Difficulty	880 m	Grassland case moth
Pyralidae	<i>Deana hybrasalis</i>	Kauru R.	250 m	Larvae eat <i>Ranunculus</i>
	<i>Diploseustis perfersalis</i>	Kauru R.	250 m	x2, larvae eat <i>Carex</i> spp.
	<i>Eudonia chimera</i>	Kauru R.	250 m	
	<i>Eudonia deltophora</i>	Kauru R.	250 m	x3, Inhabits grassland
	<i>Eudonia deltophora</i>	Siberia Hill	1210 m	
	<i>Eudonia feradayi</i>	Kauru R.	250 m	Inhabits open areas and shrubland
	<i>Eudonia feradayi</i>	Siberia Hill	1210 m	
	<i>Eudonia leptalea</i>	spur W Mackerras Ck.	600 m	Inhabits open areas
	<i>Eudonia manganeutis</i>	Kauru R.	250 m	larvae eat moss on rocks
	<i>Eudonia minisculella</i>	Kauru R.	250 m	Larvae eat moss on trees
	<i>Eudonia submarginalis</i>	Cayenne Spur	880 m	Inhabits grassland
	<i>Eudonia submarginalis</i>	Siberia Hill	1210 m	
	<i>Eudonia xymatias</i>	Siberia Hill	1280 m	Endemic to Central Otago region
	<i>Scoparia declivis</i>	Siberia Hill	1280 m	x2, isolated local populations
	<i>Scoparia niphospora</i>	Siberia Hill	1280 m	Inhabits uplands
	<i>Udea adversa</i>	Jimmy's Ck.	1300 m	
	<i>Udea adversa</i>	Kauru R.	250 m	
	<i>Udea flavidalis</i>	Kauru R.	250 m	
	<i>Udea flavidalis</i>	Mt. Difficulty	880 m	
	<i>Udea marmarina</i>	Kauru R.	250 m	Larvae eat <i>Urtica</i>
Satyridae	<i>Argyrophenax antipodum</i>	Mt. Difficulty	880 m	Tussock ringlet, Larvae eat <i>Poa cita</i> and other grasses
	<i>Argyrophenax antipodum</i>	Spur W Mackerras Ck.	600 m	
	<i>Argyrophenax antipodum</i>	Three Brothers Rocks	880 m	x2
	<i>Argyrophenax antipodum</i>	trib. Hector Stn.	760 m	
	<i>Argyrophenax janitae</i>	Siberia Hill	1210 m	A tussock ringlet
Tineidae	<i>Argyrophenax janitae</i>	Three Brothers Rocks	880 m	x2
	<i>Opogona comptaella</i>	Kauru R.	250 m	x2, Larvae eat deadwood
Tortricidae	<i>Apoctania conditana</i>	Kauru R.	250 m	x3
	<i>Capua semiferana</i>	Kauru R.	250 m	Larvae eat leaf litter
	<i>Cydia succedana</i>	trib. Kauru R.	500 m	Larvae eat gorse
	<i>Epichorista loxias</i>	Mt. Difficulty	880 m	x2
	<i>Epichorista siriana</i>	Kauru R.	250 m	Larvae eat grasses in damp areas
	<i>Epichorista siriana</i>	Mt. Difficulty	880 m	x4
	<i>Hemoloba scollastis</i>	Kauru R.	250 m	x3, Larvae associated with <i>Muehlenbeckia</i>
	<i>Leucotenes charactana</i>	Kauru R.	250 m	Larvae eat <i>Coprosma</i>
	<i>Tortricidae</i> ngen. nsp.	Kauru R.	250 m	x3
	<i>Pleutella antiphona</i>	spur W Mackerras Ck.	600 m	Larvae eat crucifers
Yponomeutidae	<i>Catamacta gavisana</i>	trib. Hector Stn.	760 m	
Dobsonflies toebitera	Megaloptera			
Corylidae	<i>Archicauliodes diversus</i>	Kauru R.	250 m	
Lacewings Neuroptera				
Hemeroptera	<i>Micromus tasmanicus</i>	trib. Kauru R.	500 m	
Velvet worms peripatus	Onychophora			

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Order/Family	Taxon	Locality	Elevation	Comment
Peripatopsidae	<i>Peripatus</i> ngen. nsp.	trib. Kauru R.	800 m	D. Gleeson notes peripatus taxa specific to Kakanui Ecological Region
Grasshoppers and weta	Orthoptera			
Acrididae	<i>Sigaus australis</i>	Jimmy's Ck.	300 m	
	<i>Sigaus australis</i>	Otepopo Spur	980 m	
	<i>Sigaus australis</i>	Siberia Hill	1210 m	
	<i>Sigaus australis</i>	Siberia Hill	1280 m	
	<i>Sigaus</i> nsp. aff. <i>campestris</i>	Jimmy's Ck.	300 m	S. Morris notes taxon presently only known from the Kakanui Mts. here
	<i>Sigaus</i> nsp. aff. <i>campestris</i>	Siberia Hill	1210 m	
Anostomatidae	<i>Hemideina maori</i>	Otepopo Spur	1000 m	
Stick Insects	Phasmatodea			
Phasmatidae	<i>Mimarchus</i> nsp.	SE Mt. Difficulty	-880 m	Shrubland among rocks
	<i>Mimarchus</i> nsp.	trib. Hectors Ck.	-700 m	<i>Mushlenbeckia</i> among boulder streams
Land slugs and snails	Stylonomatophora			
Athracophoridae	<i>Pseudonea papillata</i>	Kauru R.	250 m	Leaf veined slug common in broadleaved forest
Caddis Trichoptera				
Conoesucidae	<i>Beraeoptera roria</i>	Kauru R.	580 m	Small black caddis
	<i>Olinga feredayi</i>	Kauru R.	250 m	Hom. cased caddis
	<i>Pycnocentroides aedis</i>	trib. Hectors Ck.	760 m	A stony cased caddis
	<i>Pycnocentroides aedis</i>	Kauru R.	250 m	A stony cased caddis
Hydrobiosidae	<i>Gastachoronia xanthopterum</i>	Kauru R.	250 m	
	<i>Hydrobiosis parumbripennis</i>	Kauru R.	250 m	A free living caddis (no case)
	<i>Hydrobiosis soror</i>	Kauru R.	250 m	
	<i>Neurochorema confusum</i>	Kauru R.	250 m	
	<i>Neurochorema forsteri</i>	Kauru R.	250 m	
	<i>Psilochorema bidens</i>	Kauru R.	250 m	
	<i>Psilochorema leptoharpax</i>	Kauru R.	250 m	
	<i>Psilochorema macroharpax</i>	Kauru R.	250 m	
Hydroptilidae	<i>Oxyethira albiceps</i>	Kauru R.	250 m	Purse cased caddis
Leptoceridae	<i>Hudsonema allenum</i>	Siberia Hill	1210 m	A stick cased caddis
	<i>Hudsonema allenum</i>	Hd. Jimmy's Ck.	1300 m	A stick cased caddis
	<i>Tripletidos obsoletus</i>	Kauru R.	250 m	A stick cased caddis
Philopotamidae	<i>Hydrobiosella stenocerca</i>	trib. Kauru R.	500 m	Fine mesh tubes beneath stream stones
Philorhethridae	<i>Philorhethrus agilis</i>	Kauru R.	250 m	A sand cased caddis. Southern limit for the species
	<i>Philorhethrus agilis</i>	Hd. Jimmy's Ck.	1300 m	
Polycentropodidae	<i>Plectrocnemia maclochlanii</i>	Kauru R.	250 m	builds silk galleries in streams

APPENDIX SIX: Site Details for Aquatic Fauna Survey on The Dasher Pastoral Lease

Location	G.P.S Reading	Altitude (m asl.)	Species Recorded
MacKerras Creek	2326058/5557805	290m	Canterbury galaxias (Abundant)
Kauru-Catchment-tributary of Hughies Stream	2321134/5557295	780m	No fish
Kauru Catchment, near confluence with MacKerras Creek	2325579/5558664	280m	Canterbury galaxias, brown trout, upland bully
Kauru Catchment - lower Hughies Stream just above confluence with Kauru River	2324191/5556960	300m	Canterbury galaxias, brown trout, upland bully
Upper Kauru River	2316040/5554670	810m	Canterbury galaxias (rare)



FEDERATED MOUNTAIN CLUBS OF NEW ZEALAND (Inc.)  
P.O. Box 1604, Wellington.

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PASTORAL LEASE TENURE REVIEW

Preliminary Report on  
Recreational and Related Significant Inherent Values

THE DASHER

July 2003

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

RECREATIONAL AND RELATED SIGNIFICANT INHERENT VALUES  
ON THE DASHER

A Report to FMC based on map and literature research  
to assist in the Crown Pastoral Lease Tenure Review Process

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Map showing the preferred allocation of conservation and freehold land (green and red outlines respectively) and important recreational access routes (yellow)	
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- Fig. 1 The generally high, rolling landscape of the Kakanui peneplain (Hectors Plateau) includes prominent volcanic basalt outcrops such as Mt Dasher, Kattothyrst and Siberia Hill which tend to be focal points for recreation in North Otago. It will be important in the tenure review of The Dasher and other neighbouring properties to ensure public access to places of greatest interest.
- Fig. 2 The Kauru River forms the southern boundary of The Dasher pastoral lease. In its upper reaches (as seen in this view) its valley is steep and rugged while the lower reaches are typified by more gentle slopes and downlands which may be capable of supporting ecologically sustainable pastoral use. The skyline here is typical of the gently rolling surface of the Kakanui peneplain.
- Fig. 3 The Dasher pastoral lease includes the upper catchment of the North Branch of the Waianakarua River (Waddells and Jimmys Creeks). This view, from near Obi, is looking down Waddells Creek into The Dasher pastoral lease with Otepopo Spur on the left and Mt Stalker in the distance, right of centre. The property is bounded on three sides by other pastoral leases currently in the tenure review process. It is important that outcomes be considered collectively, not individually.
- Fig. 4 The Hectors Plateau is deeply dissected by the Kauru River resulting in steep slopes and an erosion-prone landscape. This gives rise to spectacular country and excellent settings for recreation and land which is characterised by Kaikoura Steepland soils of LUC Class VII which are not capable of supporting ecologically sustainable pastoral use. Instead it should be assessed for its inherent natural, landscape and recreational values.
- Fig. 5 This view from near Obi shows the track which closely follows the legal road over the Kakanuis from the Pigroot to the Dasher Road. It traverses the high ground along the northern boundary of The Dasher and over Siberia Hill. This track is an important recreational route which should be formalised as the legal alignment during tenure review.
- Fig. 6 Another potentially important recreational route, little used at present, is the track which closely follows the legal road across Mt Stalker Station and climbs Cayenne Spur on The Dasher. This view shows Cayenne Spur (centre) rising to join the peneplain surface of Hectors Plateau about half way between Obi and Siberia Hill. The ridge occupied by the track also separates the Kauru and Waianakarua drainage systems.
- Fig. 7 There are opportunities for extended tramping and skiing trips along the length of the Kakanuis. Trampers are seen here traversing between Kakanui Peak and Obi on the neighbouring Mt Dasher Station. This highlights the importance of considering the outcomes of this tenure review in the wider context of the whole Kakanui Mountain range.
- Fig. 8 It is likely that the traverse from Obi (on Mt Dasher Station) to Danseys Pass, some 30km to the north, will become a classic for trampers in summer and skiers in winter. Appropriate provision for public access needs to be made now as each of the relevant pastoral leases come up for review. From the crest of the range there are expansive views across the Maniototo to the Dunstn Mountains.
- Fig. 9 Although depleted in terms of its tussock stature, the plant community in the RAP identified during PNA surveys in the 1980s does contain a wide range of sub-alpine species including *Drachophyllum* and *Celmisia* together with other high altitude plants including *Coprosma* and *Luzula* spp. We believe these are worthy of protection by return to full crown ownership and control.
- Fig. 10 Along the back boundary the altitude increases to 1425m at Obi and on the road up to the summit there are superb natural rock gardens including such interesting plants as the southern Edelweiss. Natural features such as this certainly add to the interest and enjoyment of the recreational experience of traversing the wider environs of the Kakanui Mountains.

## RECREATIONAL AND RELATED SIGNIFICANT INHERENT VALUES

### ON THE DASHER

#### INTRODUCTION

This report has been prepared following the Early Warning Meeting in October 2001 at which the properties entering the tenure review process in 2001 were introduced. An inspection of the property was planned for January 2003 but permission was refused by the runholder. FMC was grateful that this position was eventually changed and an inspection was planned for May 2003. However, when final arrangements were being made for this inspection the runholder changed his mind again and access was not permitted. This report is therefore written without the benefit of detailed on-site knowledge, but instead is based on knowledge gained from visits to neighbouring properties, and from other sources of information as described below. The report is offered as a contribution to the statutory consultation process undertaken by the Department of Conservation.

The report focuses on those features of The Dasher which are important for public recreational interests. It should be noted that while interest focuses on access, the natural values and landscapes of the property have an important influence on its recreational value and greatly affect the quality of recreational experience enjoyed. It is for this reason that reference is also made to both natural and landscape values in this report. The landscapes and views to be had from the vantage points on The Dasher and neighbouring properties are outstanding and add greatly to the enjoyment of traversing this property. Legal roads across the property could provide access to the volcanic peaks of what Mason (1988) refers to as 'Hectors Plateau' (Fig. 1) and to the Kakanui Mountains.

The Dasher is a medium sized pastoral lease of just over 6,000ha situated on the eastern side of the Kakanui Mountains, stretching out across the 'Hectors Plateau'. The Dasher homestead is situated near the eastern end of the property, at about 500m on the North Otago downlands, not far from the Kauru River. The Kauru River (Fig. 2) forms most of the southern boundary of the property where it adjoins Mt Stalker.

The Dasher is important in the tenure review process because of its close proximity to several other properties under review. These include Mt Stalker to the South, Shingley Creek and Islay Downs to the West and Mt Dasher to the North. It is thus surrounded on three sides by neighbouring properties undergoing tenure review simultaneously (Fig. 3).

It is important that a broad view of the overall outcomes of tenure review should be taken as each lease is reviewed, and consideration should be given to the emerging network of recreation opportunities. Outcomes should be considered collectively rather than individually. Recreational use in the future will depend on decisions made now, so it is important that adequate provision is made for public access during the tenure review of The Dasher and the neighbouring properties.

#### METHODS OF SURVEY AND ASSESSMENT

It was explained above that a site inspection was planned but in the event did not prove acceptable to the runholder. It is therefore unfortunate that this report is written without the benefit of detailed on-site knowledge. Instead it is based in part on knowledge gained from visits to neighbouring properties, and in part it is based on information gathered from other sources. Those sources include publications and accounts by members of local tramping and outdoor recreation groups that have been consulted about trips undertaken in the Kakanui Mountains area. A study of "Outdoor Recreation in Otago" was undertaken by Mason (1988) and published by the Federated Mountain Clubs of New Zealand (FMC). Reference is made to this recreation plan for Otago in the recreational opportunity discussion below. Land Use Capability (LUC) maps have been used to assess the extent of soil types and topographic areas and their significance with respect to sustainable pastoral use. The Conservation Management Strategy for Otago, and the Protected Natural Area (PNA) survey report on the Dansey Ecological District have also been used as a sources of reference.

### GENERAL DESCRIPTION OF THE DASHER

The Dasher pastoral lease is located on the eastern side of the Kakanui Mountains, some 15km west of Maheno. The property covers some 6,000ha and extends from a high point at 1,425m on Obi in the Kakanui Mountains, and drops to about 300m where the Kauru River exits the property.

The northern boundary of The Dasher includes the high points of Obi (1,425m) and Siberia Hill (1,272m), while the prominent volcanic basalt features - Mt Dasher (1,304m) and Kattothyrst (1,293m) lie further north on Mt Dasher Station (Fig. 1).

Most of The Dasher pastoral lease forms the northern (or true left) half of the Kauru River catchment. This northern half drains the Hectors Plateau and includes Three Brothers Rocks and Trig Island at almost 1,000m. There is a smaller area at the western end of the property which is part of the upper catchment of the North Branch of the Waianakarua River (Fig. 3). This part of The Dasher adjoins Shingley Creek to the West. In this western part of the property, where the topography is particularly steep, the land drops from the high point on Obi to about 600m at the junction of Waddells Creek and Jimmys Creek in the Waianakarua River catchment, west of the Otepopo Spur (Fig. 3).

Most the land below about 1000m (east of Three Brothers Rocks) has been improved by fencing, oversowing and topdressing. By contrast, much of the land in the upper Waianakarua River catchment west of Cayenne Spur has not been greatly modified by farming practices and is in a more nearly semi-natural state (Fig. 3). This area is adjacent to the boundary with Shingley Creek and lies between about 1,100 and 1,300m. Similarly, the land on the penoplain sometimes known as 'Hectors Plateau' (also above about 1,000m) is still in a semi-natural state and is dominated by its natural landscape features (Figs. 1 and 3).

### LAND RESOURCES OF THE DASHER

Most of the steeper land in the upper part of the Kauru River catchment, but below about 1,000m, is characterised by Hurumui Steepland Yellow Brown Earth soils on greywacke parent materials. These soils and the Kakahu Yellow Brown Earth soils on the downlands east of Three Brothers Rocks have been classified in Land Use Capability (LUC) Class IV or VI, with high to medium suitability for pastoral use.

The higher ground in the uppermost reaches of the Kauru catchment, above about 1,000m (Figs. 2 and 4), is characterised by Kaikoura Steepland High Country Yellow Brown Earth soils on greywacke parent material. There is a similar area which extends over the Cayenne and Otepopo Spurs into the upper part of Jimmys/Waddells Creek catchment (Fig. 3) which is also mainly underlain by greywacke. These Kaikoura Steeplands have been classified LUC Class VIIe, with severe limitations for pastoral use. There is a particularly steep and eroded area between Jimmys Creek and Waddells Creek which is also characterised by Kaikoura Steepland soils but which has been classified LUC Class VIII, and is entirely unsuitable for pastoral use.

The soils of the Hectors Plateau area, including Trig Island and Siberia Hill (also generally in the range 1,000 to 1,300m), are strongly influenced by the underlying basalt volcanic rock on which the Saddle Hill Brown Granular Loam soils are developed. This area has also been classified LUC Class VIIe and also has severe limitations for pastoral use.

In order to be managed in a way that is ecologically sustainable in the long term, as required by the Crown Pastoral Land Act 1998, any losses of essential nutrients in animal products (meat and wool), and by burning, must be replenished. The alternative is that sooner or later the ecosystem will be depleted and degraded. LUC Class VIIe 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 are two such areas which are almost certainly better retained in full Crown ownership and control to be managed by the Department of Conservation for conservation and recreational purposes. These are the area of Kaikoura Steepland soils with semi-natural vegetation cover in the upper Wainakarua catchment, and the Saddle Hill soils which have all been classified LUC Class VIIe or VIII and lie above 1,000m.

It seems likely that much of the lower country on this pastoral lease, below about 1,000m in the Kauru River valley and on the downlands (except the forested catchment of Hughie Stream) is capable of being managed in a way that is ecologically sustainable. So it is therefore, probably suitable for transfer to freehold ownership.

### RECREATIONAL USE AND POTENTIAL NEW OPPORTUNITIES

The recreational importance of The Dasher lies in its situation near the southern end of the Kakanui Mountains. It straddles the range and includes parts of the Wainakarua and Kauru river systems. The northern part of the lease extends onto the Hector's Plateau including Siberia Hill and gives access to prominent volcanic features such as Kattothyrst and Mt Dasher.

Mason (1988) notes with respect to recreation in the Kakanui Mountains that "tramping activity tends to be concentrated on the forested Wainakarua catchment with its deeply dissected ridge and valley system." He also notes that "over the greater area of the Kakanui Mountains there is less frequent tramping activity. Features such as the volcanic caps of Siberia Hill and Kattothyrst, 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. When snow cover is sufficient, extended ski tours on variable terrain are possible from Obi in the south along the main crest to Dansey's Pass. This is a distance of over 35 km. The crest is relatively narrow with greater variations in gradient than is found on most Central Otago ranges. The crest is suitable for both cross-country and alpine ski touring in the right conditions."

Recreational use of The Dasher has been relatively light in the past although it has considerable potential. There is some use by local pig hunters and other users include local trampers with a focus on the Hector's Plateau which extends beyond the boundary of The Dasher, and onto Mt Dasher. With increased knowledge of the area and improved access through tenure review, it is likely that usage by walkers and mountain bike enthusiasts will increase.

There is an important legal road (Fig. 5) which roughly follows the northern boundary of The Dasher from the junction of Mackerras Creek and the Kauru River, to Obi (on the Kakanuis) and thence down to the Pigroot, via Shingley Creek. This road intersects with another important legal road down Cayenne Spur (Fig. 6) and out across Mt Stalker to Tullimet Road. The actual alignment of these formed tracks should be checked against the legal roads and where there are discrepancies, the actual formation should be formally recognised as the legal road as part of the tenure review process.

Another important (or potentially important) recreational route (although not in this case a legal road) leads along the crest of the Otepopo Spur (Fig. 3) and into the Wainakarua catchment. All these routes lead out across neighbouring properties, most of which are also in the tenure review process. This highlights the importance of considering the outcomes of this tenure review in the wider context of the whole range of Kakanui Mountains and recreation opportunities generally in North Otago (see next section).

Local tramping clubs from Dunedin, Central and North Otago also use the Kakanuis and the Hector's Plateau from time to time, with access being both from the Pigroot side and from North Otago. With tenure reviews in progress on several neighbouring properties (see those listed in the introduction and in the next section) an increasing number of through trips over and along the range (Figs. 7 and 8) are becoming possible. The area is also well suited to mountain bike and horse riding, and in some

seasons for cross country skiing and ski touring. It is likely that with increasing pressure and demand for new recreational areas, and increasing knowledge of this area, together with improved access, usage will increase following the completion of these tenure reviews.

It is argued therefore, that the recreational significance of properties under review should be assessed not only on present usage but also on 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 the Kakanui and Hector's Plateau has not been easy in the past, the recreational use of these areas is less than it might have been if access was freely available. Where there are suitable settings there is significant potential for greater use and it is the full range of possibilities which should be considered during this tenure review.

An increasing problem for people wishing to make trips involving overnight stays in the backcountry is security of car parking at road ends. Consideration should be given during the tenure review process to making provision for car parking, where possible off highways, and in the most secure places possible near the start of new easements over land which becomes freehold through tenure review. In the case of The Dasher, it would be very helpful if off-road parking could be provided near the end of The Dasher Road for cars. If parking could be provided reasonably close to the homestead, without causing undue disturbance to the owner or manager, then this would help to improve the security situation too. Because of the distances involved, parking in the vicinity of Mount Difficulty, the Mount Hut, or even Mitchell's Hut would be good for those with 4WD vehicles who have obtained permission for their use from the owner.

In summary, this assessment indicates that there is considerable scope for increased recreational use of the Kakanui Mountains (Figs 7 and 8) and the Hector's Plateau (Figs 1 and 4) if easier access over The Dasher becomes available. Predominant uses would be for tramping, mountain bike trips and horse riding, and the possible use of the Kakanui Mountains for cross country skiing or ski touring in some seasons, as well as use by local pig hunters. In the longer term, the development of a classic traverse along the range to Danseys Pass is envisaged (Fig. 8).

### THE DASHER IN THE CONTEXT OF THE WIDER KAKANUI AREA

An important part of the tenure review process which is sometimes overlooked is to consider the property in question in relation to recreational and other related public interest values and accessways on neighbouring properties. Where neighbouring properties are also undergoing tenure review, an overview should be taken of the outcome of this review in the context of the wider network of possible recreational opportunities over the entire geographic area.

The Dasher is situated in an area where a number of other tenure reviews are in progress. These include Mt Stalker to the South, Islay Downs and Shingley Creek to the West and Mt Dasher to the North. The Dasher can provide access to the Hector's Plateau and up to the Kakanui Mountains at Obi, thus allowing exploration of the interesting basalt volcanic peaks on the Hector's Plateau (Fig. 1) as well as to the main Kakanui Mountains including Obi, Kakanui Peak and Pisgah (Fig. 7). Other pastoral leases are involved along the Kakanui Mountains and these include Clover Flats and Dome Hills. A significant area, formerly part of Longlands, is now conservation land. Still further to the north but closely associated in the recreational context are 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.

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 the emerging network of recreation opportunities. Recreational use in the future will depend on decisions made now, so it is 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).

Similarly, in its commentary on the tenure review of Kinross (March 1997), FMC recommended that public access for foot and mountain bike use should be negotiated over the route along the track to Conical Peak, and on to Bells Saddle and Mt Miserable (on Glencoe). It was also recommended that public access down the track from Conical Hill to the Waianakarua ford crossing (to Mt Stalker) should be negotiated.

In the Report on Glencoe Run it was stated: *"The Waianakarua Scenic Reserve is an important recreational area for local clubs in Otago and there are walking tracks in the remnant strips of native bush in the gullies within Herbert Forest. Because of the proximity of these other opportunities, and because of the new opportunities which may emerge from the Kinross review, the recreational opportunities on the Glencoe Run take on a new perspective. For example, through trips via Bells Saddle to Conical Peak on Kinross and side trips to Prominent Peak in the Waianakarua Scenic Reserve offer interesting extensions to the trip up to Mt Miserable."*

With reference to the tenure review of Islay Downs in 1997 it was stated that: *"There are very high recreation and landscape values along the tops from Kakamui Peak to Obi, and on the steep faces east and west of the main ridge. Much of the steep land is LUC Class VIIe and VIII which cannot sustain pastoral use and should be transferred to DOC."*

FMC has recently reported in relation to Shingley Creek 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 Kakamui 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 commentaries and recommendations well illustrate the need to consider the wider implications of tenure review on one property, and set the review of The Dasher in the wider context of North Otago generally.

FMC therefore argues that ensuring public access to and across The Dasher, to the terrain on its northern boundary on the Hector's Plateau, and Kakamui Mountains beyond is the key issue in this tenure review.

### SIGNIFICANT INHERENT VALUES AND THEIR IMPORTANCE FOR RECREATION

This report focuses on those features of The Dasher which are important for public recreational interests. It should be noted that while this interest focuses on access, the natural values and landscapes of the areas concerned have a fundamental impact on the recreational value of the place and greatly influence the quality of recreational experience enjoyed. It is for this reason that reference is also made to both natural and landscape values of this pastoral lease.

In practice, a large part of The Dasher, below about 1,000m and east of Three Brothers Rocks has been much modified by pastoral farming and land development over the years. With the exception of mixed broadleaf forest in the headwaters of Hughie Stream, few areas of even semi-natural vegetation remain in this area.

By contrast, there is a significant area in the northern part of the pastoral lease including Trig Island and Siberia Hill which is still largely unmodified. This area, which lies between about 1,000 and 1,300m is strongly influenced by the underlying basalt volcanic rock on which the Saddle Hill Brown Granular Loam soils are developed. This area has been classified LUC Class VIIe, with severe limitations for pastoral use. On the other hand, its inherent natural and landscape values are high. In fact this area is part of the more extensive landscape which was identified by the Protected Natural Area (PNA) surveys of the 1980s as a Recommended Area for Protection (RAP). This will be described in more detail in the next section.

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These landscapes and geological features are of greatest interest to the public, and are indeed the very features which attract recreational users to the area.

On the higher ground in the Waianakarua catchment and adjacent to the Shingley Creek boundary (Fig. 3) both landscape and inherent natural values are also significant. This is the area characterised by Kaikoura Steepland soils developed on greywacke which is prone to erosion and carries a depleted tussock grassland. Although depleted in terms of its tussock stature, the plant community does contain a wide range of sub-alpine species including *Drachophyllum* and *Celmisia*, together with other high altitude plants including *Coprosma* and *Luzula* spp. (Fig. 9).

Along the back boundary the altitude increases to 1425m at Obi (Trig B) and on the road up to the summit there are superb natural rock gardens including such interesting plants as the southern edelweiss (Fig. 10). Natural features such as this certainly add to the value of the recreational experience of traversing the wider environs of the Kakanui Mountains.

## RECOMMENDED AREAS FOR PROTECTION (RAPs)

The PNA Programme carried out surveys of the Danseys Ecological District in the late 1980s and identified two Recommended Areas for Protection identified as RAP 3 and RAP 5.

RAP 3 has been described as follows: - "*Hughie Stream drains a steep V-shaped valley cut into the broad gently sloping surface of the 'Kakanui volcanic plateau'. The catchment is dissected by a number of small creeks separated by rounded ridges. Slopes are generally planar. Bedrock is mainly semi-schist, with a small area of greywacke on the southern side of the main stream.*"

*The gullies and lower slopes of Hughie Stream are covered in mixed broadleaved forest. The main canopy species are broadleaf marbleleaf, lemonwood and lancewood. Less common are kowhai, Hall's totara, kohuhu, wineberry and three finger. A group of matai seedlings were also recorded. This was the only matai recorded during the PNA survey, but it has been noted in the Hector's Stream catchment by the DSIR.*

*Manuka shrubland is extensive on ridgecrests and hillslopes above and between the forest stands. The canopy cover and height are variable with some stands reaching 3m. Fescue tussockland is extensive on the side ridges and above the forest and shrubland."*

Thus the 'Hughie' RAP contains the largest area of manuka shrubland with associated broadleaved forest in the District. Extensive manuka shrublands are presently uncommon in Dansey Ecological District. They occur mainly in small patches associated with broadleaved forest and are more abundant in the south of the District. In some places young forest trees and shrubs within the forest are limited because of stock access and possums.

In summary, this RAP has been ranked high for the criteria representativeness, and medium for diversity, naturalness, viability and buffering. The PNA survey thus demonstrated the significant inherent values of this area, and therefore justifies its inclusion in the area to be returned to full Crown ownership and to be protected as conservation land.

RAP 5 covers part of an extensive, gently inclined mountain top situated to the east of the main range of the Kakanui Mountains, described above as the Hector's Plateau. Bedrock is primarily schist overlain in places by a cap of volcanic rock. Siberia Hill, on the boundary between The Dasher and Mt Dasher is one of the largest volcanic masses of the Dunedin Volcanic Group outside of the Dunedin volcano. Siberia Hill is also one of the exceptions of the East Otago peripheral vents in that it has distinct lava flows overlying one another. The small vent of Kattothyrist is more typical of the outlying vents in this group.

Tussockland of slim snow tussock and narrow-leaved snow tussock is extensive on the broad gentle slopes of the volcanic plateau, particularly on ridge crests and upper slopes. The tussock is mainly

less than 1m tall with a dense inter-tussock cover of small herbs and grasses. Small patches of red tussockland are common and bog rush is extensive, particularly at mid slope. More extensive red tussocklands occur on the gently inclined east-facing slopes at the northern end of Cayenne Spur and in depressions to the south and east of Mitchells Hut. The daisy, *Celmisia haastii*, is associated with these extensive areas of red tussockland. The wetlands on the flat top of Siberia Hill and on the saddles between lava residuals comprise large areas of cushion bog and *Carex*-dominated sedgeland.

The extensive basalt boulderfields on the slopes of Mt Dasher and Siberia Hill have little vegetation apart from lichens and mosses. However, shrublands are common on the margins and in sheltered places between the boulder streams. Common shrubs are snow totara and hebe with occasional small patches of mountain toatoa on both Mt Dasher and Siberia Hill, with the locally distributed, threatened daisy *Celmisia hookeri* on the southern slopes of Siberia Hill.

The boundaries of the RAP extend into the headwaters of the Kauru River and the rock bluffs of Cayenne Spur to include an area of steep colluvial slopes and extensive schist bedrock outcrops. The vegetation on the colluvial slopes is mainly snow tussockland on the sunny faces and fern-shrublands of *Coprosma* with prickly shield on the upper shady faces. The extensive bedrock outcrops and bluffs are sparsely vegetated with an assemblage of herbs and lichens that include edelweiss (Fig. 10) and the uncommon daisy *Celmisia hookeri*.

In summary, RAP 5 has been ranked high for the criteria representativeness, diversity, naturalness, special features, viability and buffering. Threat is the only criterion which ranks medium or low so the area has very high inherent values and should be included in the area to be returned to full Crown ownership and should in future be managed for conservation purposes.

### AREAS TO BE PROTECTED

The following areas are recommended for return to full Crown ownership and control, to be managed for conservation and recreation purposes.

(i) The Hectors Plateau.... a significant part of which is situated along the northern boundary of the Dasher. This extends about 8 or 9km along the boundary from Cayenne Spur to Mount Difficulty and about 2 or 3km southwards towards the Kauru River. This area of perhaps 1,000 to 1,200ha includes Siberia Hill, Trig Island, Three Brothers Rocks and Mount Difficulty. The western part of this area was identified by the PNA Programme as a Recommended Area for Protection (RAP 5) which ranked high for all but one of the criteria used to assess its natural values.

(ii) The high country in the upper Waianakarua catchment at the head of Waddells and Jimmys Creeks, and the steeplands in the upper reaches of Kauru River. This area is characterised by Kaikoura Steepland soils classified LUC Class VIII and Vile which are almost certainly not capable of supporting ecologically sustainable pastoral use. This area would be better returned to full Crown ownership and control to be managed by the Department of Conservation for conservation and recreational purposes.

(iii) Hughie RAP was identified in the PNA programme as an area worthy of protection. It is almost completely surrounded with existing fences and could easily be added to the eastern end of the Hectors plateau area (i) above.

These areas are included within the area indicated on the map which follows page 11.

### ACCESS REQUIREMENTS

Access across The Dasher pastoral lease to the Kakanui Mountains and the volcanic features of the Hectors Plateau is the most important issue in this tenure review. There are two legal roads which are of vital importance in this regard but the actual road formations may not precisely coincide with the alignment of the legal roads, thereby making problematical their use by the general public. This

situation needs to be resolved during tenure review. The preferred solution would be formal recognition of the actual road formations as the legal alignment.

The roads concerned are as follows:-

- (i) From the end of the Dasher Road, near the junction of Mackerras Creek and the Kauru River, over Mt Difficulty and Siberia Hill to Obi (Trig B) and beyond.
- (ii) From the boundary with Mt Stalker pastoral lease near the Cayenne Hut, and up Cayenne Spur to join the road referred to in (i) above at a point about halfway between Obi and Siberia Hill.

Formal recognition does not necessarily mean their designation for vehicle use. It is however, most important that secure public access for foot, mountain bike and equestrian use be obtained as an outcome of this tenure review.

### OTAGO CONSERVATION MANAGEMENT STRATEGY

In the Otago Conservation Management Strategy for Otago (CMS), the Kakanui Mountains are recognised as a Special Place. The objectives for this Special Place are: "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 CMS states that these objectives will be implemented by methods including:

- "Foot access negotiated at key points for the public to areas managed by the Department, with public vehicular access having a lower priority.
- Protection of key areas for natural and historic resources will be sought through pastoral lease tenure review negotiation opportunities".

It should also be noted that the priority for the Kakanui Mountains Special Place is that "in this Special Place, tenure review negotiations and wilding pine control will be the priority method for implementing the objective during the course of this CMS."

It is clear from this statement of priorities that DOC is committed to achieving its objective for the Kakanui Mountains Special Place through the tenure review process, and that significant progress would be made towards the objective if these outcomes can be successfully negotiated.

### CONCLUSIONS

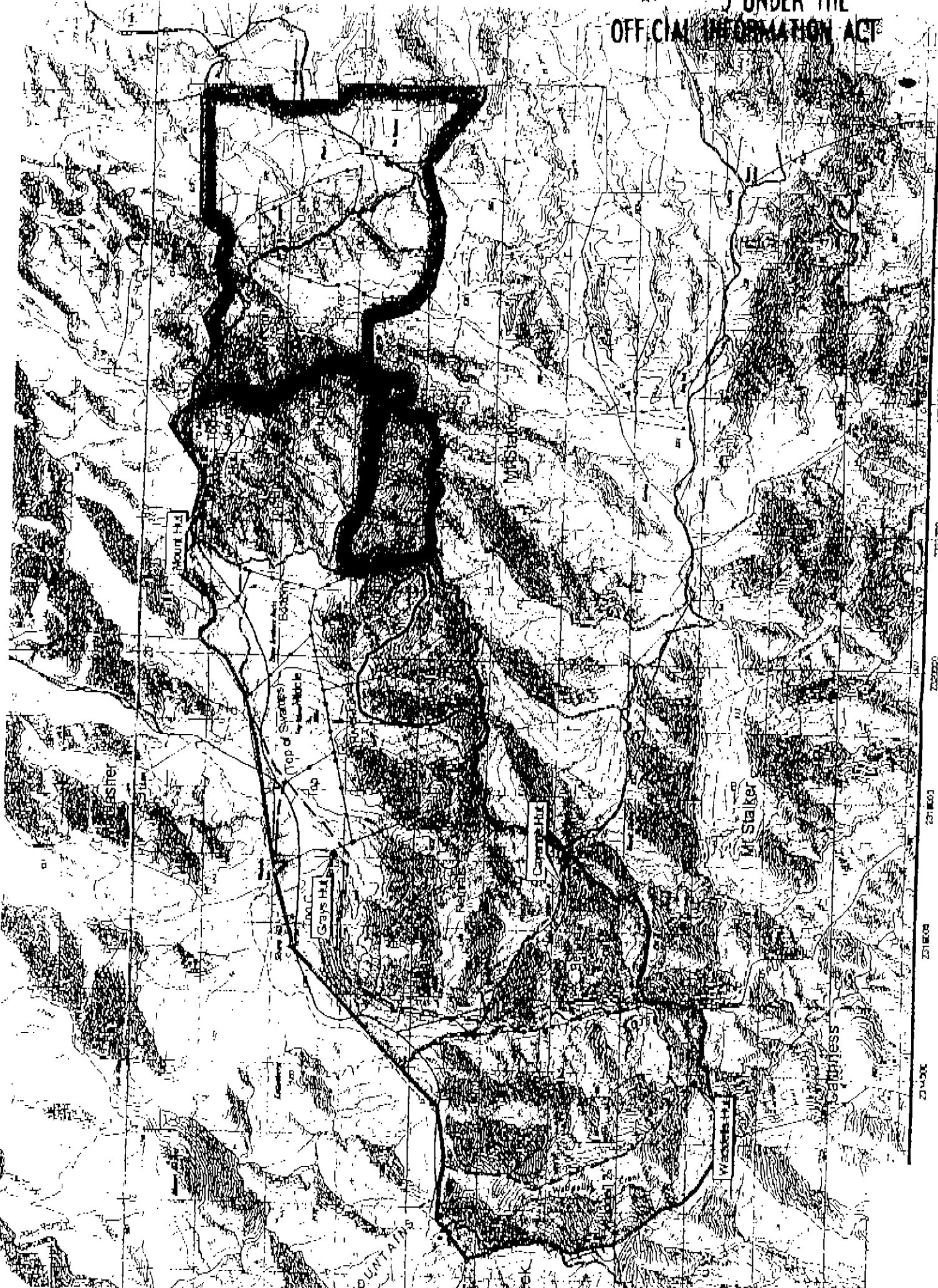
Significant conservation and recreation gains are possible outcomes of this tenure review. FMC recommendations for outcomes from this tenure review are as follows:-

1. Although the current recreational use of the Kakanui Mountains is relatively light, there is considerable potential for increasing recreational use of the range and the Hectors Plateau by trampers, mountain bike users and horse riders, also by hunters, and in some seasons in winter by skiers along the main range, perhaps as far as Danseys Pass.
2. There is a significant area of improved pasture land below about 1,000m with Hurunui Steepland and Kakahu Yellow Brown Earth soils classified as LUC Classes IV and VI on The Dasher which is probably capable of being managed in a way that is ecologically sustainable so it is therefore likely to be suitable for freeholding.
3. Formal public access to the Kakanui Mountains from the end of the Dasher Road, over Mt Difficulty and Siberia Hill to Obi needs to be established through tenure review. The preferred solution would be formal recognition of the actual road formation as the legal alignment.

4. There is a significant area in the upper Waianakarua catchment (upper reaches of Waddgills Creek and Jimmys Creek) and on the steep slopes in the Upper Kauru valley characterised by Kaikoura Steepland soils which has severe limitations for pastoral use. This area can almost certainly not be managed in a way that is ecologically sustainable, but it has significant inherent natural and landscape values which are worthy of protection. This area should be returned to full Crown ownership and control and be managed for conservation and recreational purposes.
5. Similarly, there is another significant area on the Hectors Plateau stretching some 8 or 9km along the northern boundary of the Dasher, and out towards the Kauru River, which is characterised by basalt derived soils which are classified LUC Class VIIe. This area cannot be managed sustainably but it does have unique natural and landscape values. A large part of this volcanic plateau area was recognised as an RAP in the PNA Surveys of the 1980s, so the Hectors Plateau (including the catchment of Hughie Stream, should be returned to full Crown ownership and managed for conservation and recreation purposes.
6. The tenure review of The Dasher should be carried out with full consideration given to tenure reviews proceeding on nearby properties, and the probable outcomes of those reviews. It is important that an overview is developed now for the entire network of recreational opportunities on the Kakanui Mountains and the Hectors Plateau. It is important that decisions taken for The Dasher are appropriate in relation to recreational opportunities which may become available through these other reviews.
7. The Draft CMS for Otago states that the objective for the Kakanui Mountains Special Place 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." This statement demonstrates DOC's commitment to tenure review and shows that the objective for the Kakanui Mountains Special Place could be significantly advanced by the negotiation of good outcomes on The Dasher.

#### **ACKNOWLEDGEMENTS**

It is unfortunate that despite the good offices of Opus International Consultants, it was not possible to arrange an inspection of the Dasher. The efforts of Opus staff are acknowledged. FMC is grateful to the staff of DTZ New Zealand who also provided access to LUC maps. Local tramping clubs and others were helpful in providing accounts of trips undertaken in the area.



Map showing the preferred allocation of conservation and freehold land (green and red outlines respectively) and...



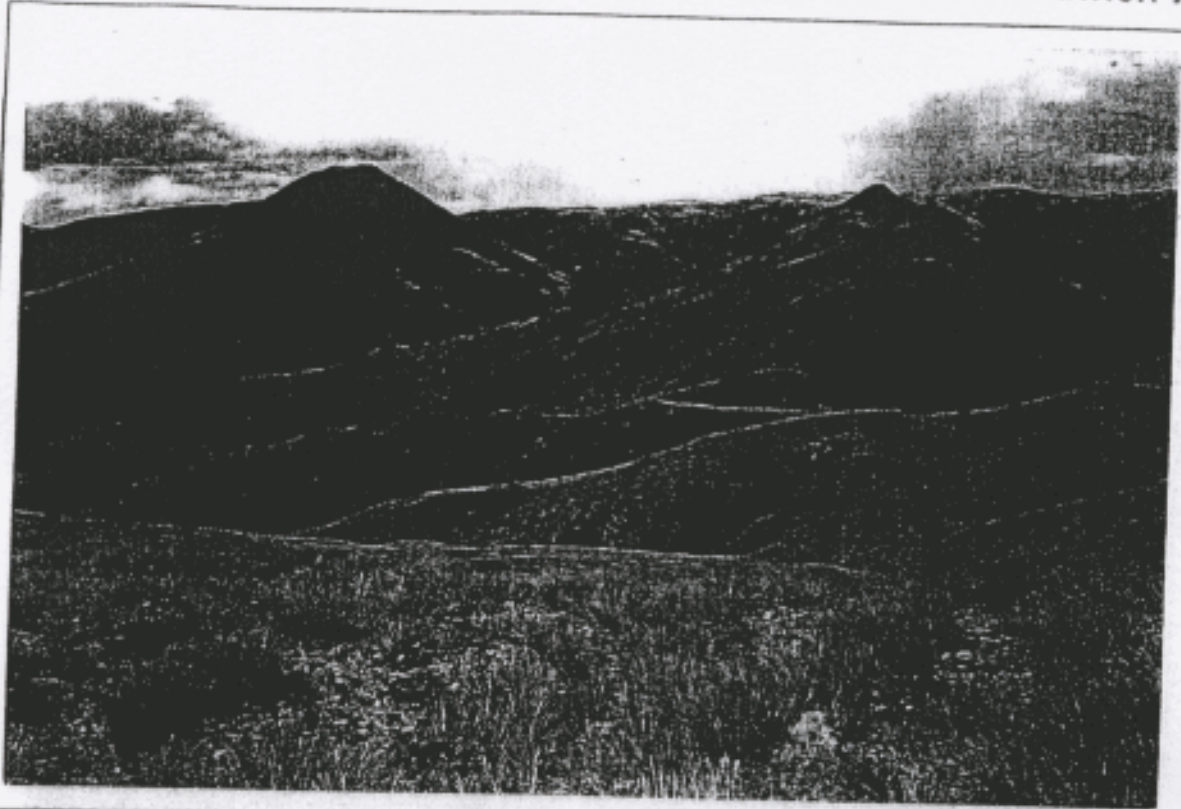


Fig. 1 The generally high, rolling landscape of the Kakanui peneplain (Hectors Plateau) includes prominent volcanic basalt outcrops such as Mt Dasher, Kattothyrst and Siberia Hill which tend to be focal points for recreation in North Otago. It will be important in the tenure review of The Dasher and other neighbouring properties to ensure public access to places of greatest interest.

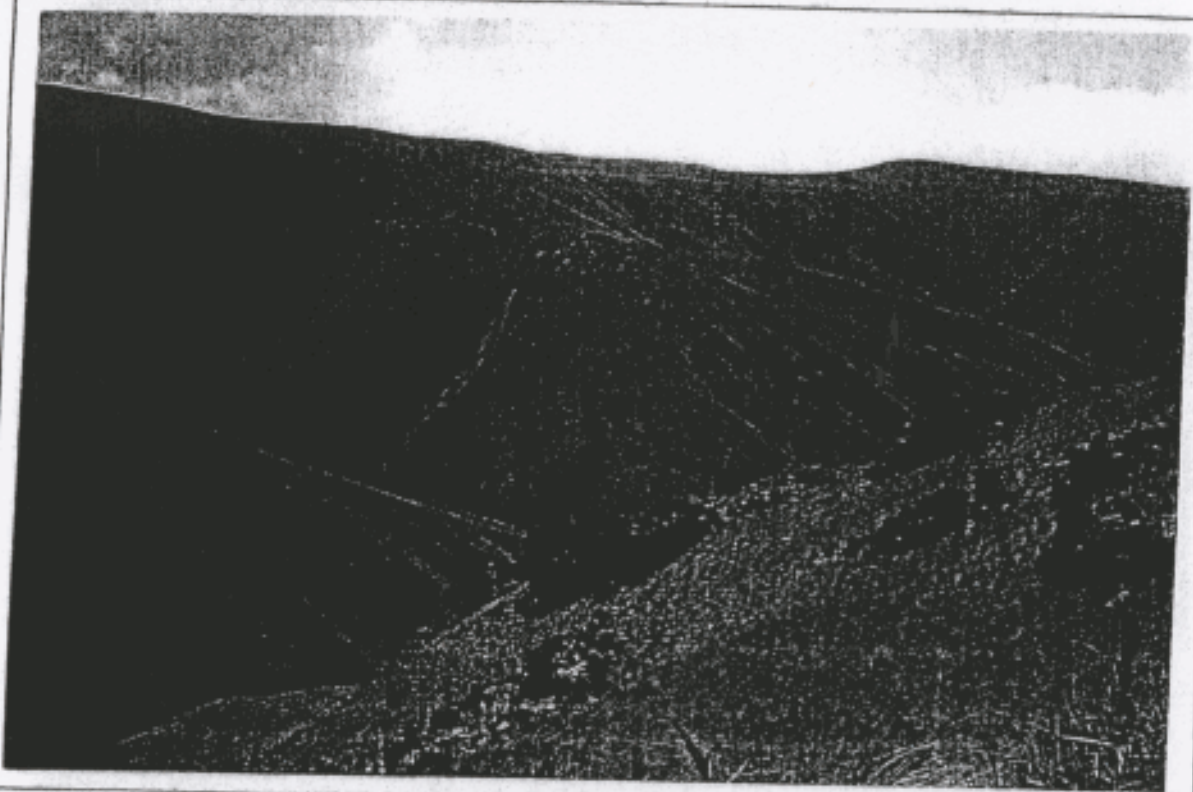


Fig. 2 The Kauru River forms the southern boundary of The Dasher pastoral lease. In its upper reaches (as seen in this view), its valley is steep and rugged while the lower reaches are typified by more gentle slopes and downlands which may be capable of supporting ecologically sustainable pastoral use. The skyline here is typical of the gently rolling surface of the Kakanui peneplain.



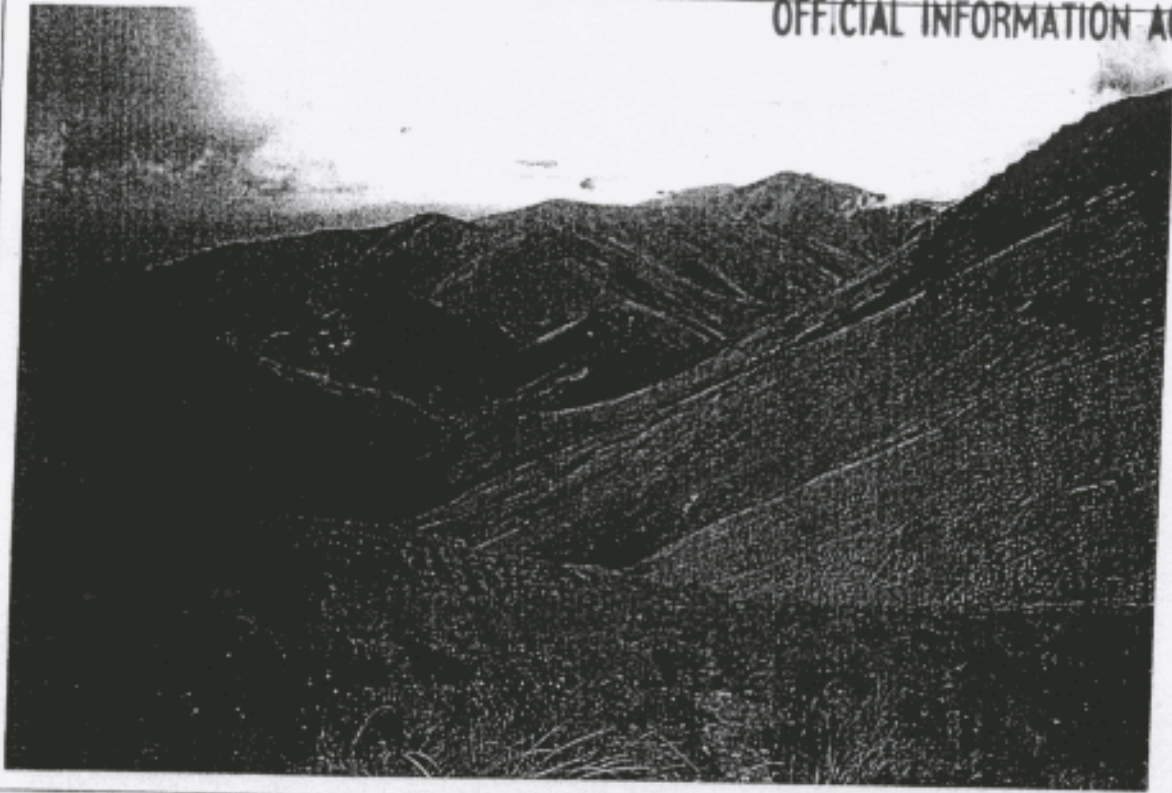


Fig. 3 The Dasher pastoral lease includes the upper catchment of the North Branch of the Waianakarua River (Waddells and Jimmys Creeks). This view, from near Obi, is looking down Waddells Creek into The Dasher pastoral lease with Otepopo Spur on the left and Mt Stalker in the distance, right of centre. This property is bounded on three sides by other pastoral leases currently in the tenure review process. It is important that outcomes be considered collectively, not individually.



Fig. 4 The Hectors Plateau is deeply dissected by the Kauru River resulting in steep slopes and an erosion-prone landscape. This gives rise to spectacular country and excellent settings for recreation, and land which is characterised by Kaikoura Steepland soils of LUC Class VII which are not capable of supporting ecologically sustainable pastoral use. Instead it should be assessed for its inherent natural, landscape and recreational values.



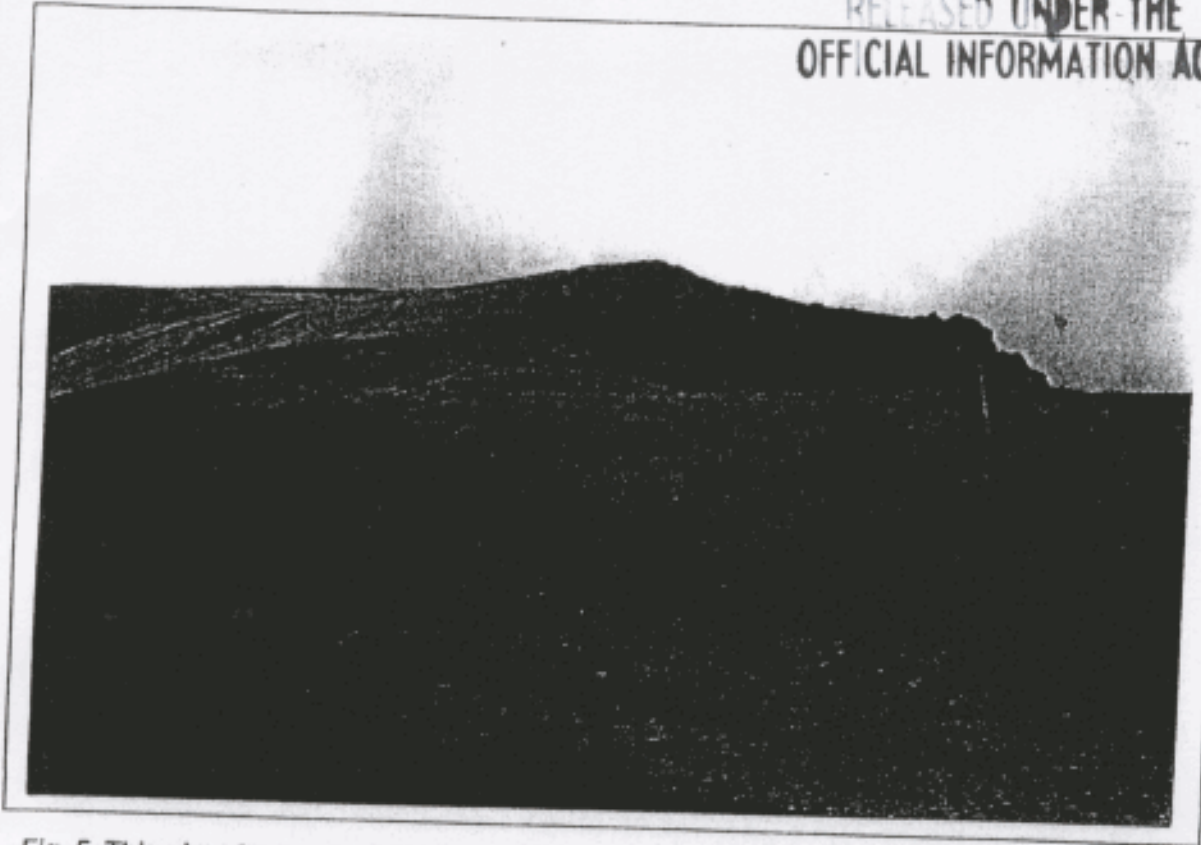


Fig. 5 This view from near Obi shows the track which closely follows the legal road over the Kakanuis from the Pigroot to the Dasher Road. It traverses the high ground along the northern boundary of The Dasher and over Siberia Hill. This track is an important recreational route which should be formalised as the legal alignment during tenure review.



Fig. 6 Another potentially important recreational route, little used at present, is the track which closely follows the legal road across Mt Stalker Station and climbs Cayenne Spur on The Dasher. This view shows Cayenne Spur (centre) rising to join the surface of the Hectors Plateau about half way between Obi and Siberia Hill. The ridge occupied by the track also separates the Kauru and Waianakarua drainage systems.



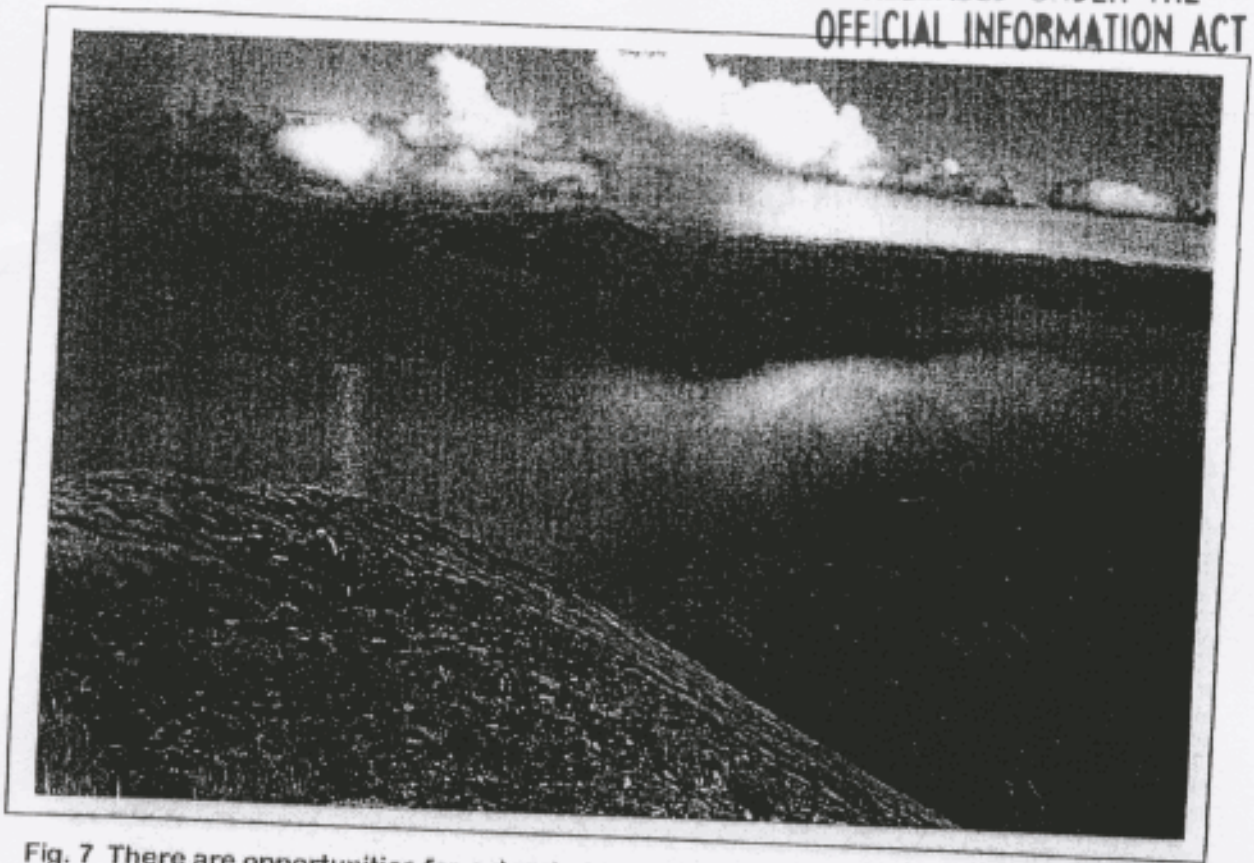


Fig. 7 There are opportunities for extended tramping and skiing trips along the length of the Kakanuis. Trampers are seen here traversing between Kakanui Peak and Obi on the neighbouring Mt Dasher Station. This highlights the importance of considering the outcomes of this tenure review in the wider context of the whole Kakanui Mountain range.

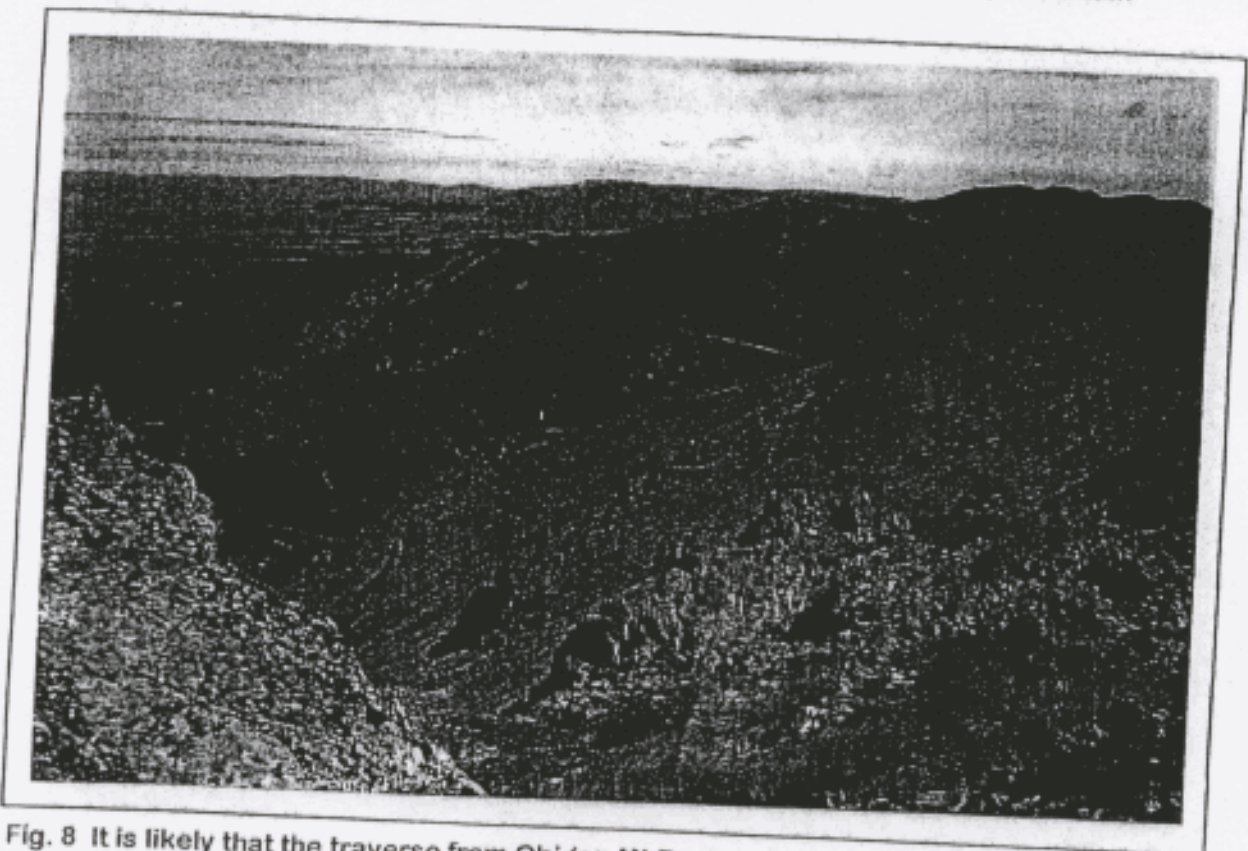


Fig. 8 It is likely that the traverse from Obi (on Mt Dasher Station) to Danseys Pass, some 30km to the north, will become a classic for trampers in summer and skiers in winter. Appropriate provision for public access needs to be made now as each of the relevant pastoral leases come up for review. From the crest of the range there are expansive views across the Maniototo to the Dunstan Mountains.



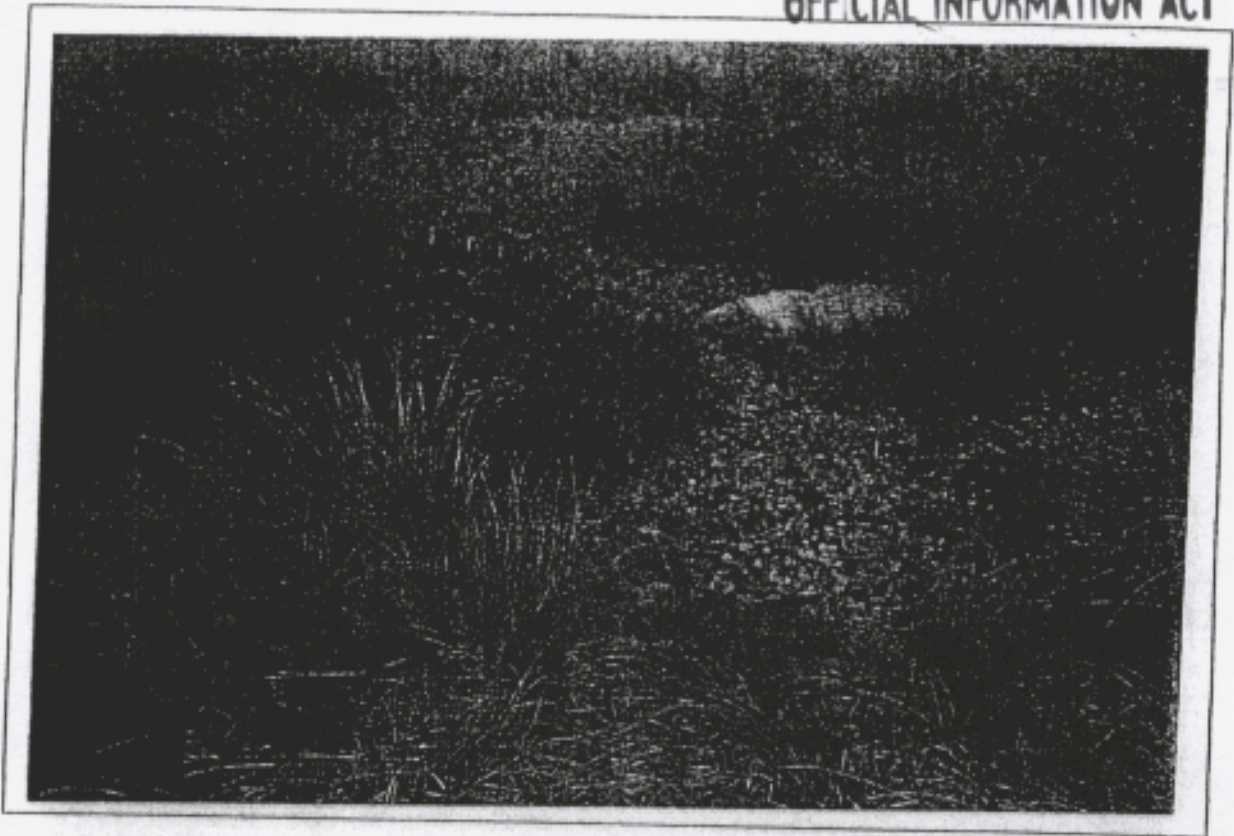


Fig. 9 Although depleted in terms of its tussock stature, the plant community in the RAP identified during PNA surveys in the 1980s does contain a wide range of sub-alpine species including *Drachophyllum* and *Celmisia* together with other high altitude plants including *Coprosma*s and *Luzula* spp. We believe these are worthy of protection by return to full crown ownership and control.



Fig. 10 Along the back boundary the altitude increases to 1425m at Obi, and on the road up to the summit there are superb natural rock gardens including such interesting plants as the southern Edelweiss. Natural features such as this certainly add to the interest and enjoyment of the recreational experience of traversing the wider environs of the Kakanui Mountains.

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ROYAL FOREST AND BIRD PROTECTION SOCIETY OF NEW ZEALAND INCORPORATED

Upper Clutha Branch

PO Box 38  
LAKE HAWEA

21<sup>ST</sup> July 2003

Mr T Perrett  
Manager  
Tenure Review Programme  
Department of Conservation  
PO Box 5244  
DUNEDIN

Dear Tony

THE Dasher – NGO Early Report for Tenure Review

This property was first introduced to us at the early warning meeting of NGOs held in Alexandra on 8<sup>th</sup> October 2001. It was further discussed on 22<sup>nd</sup> May 2003 at that NGO meeting.

We fully intended to carry out an on ground inspection of the property but our letter requesting permission to do so was never answered. We were however able to see into the western end of the run when we were inspecting Shingley Creek from the road that starts at the Pig Root on SH85 and goes up to Trig B. (This road is a legal road although we would not be surprised if the formation we were on was not on the surveyed line, see photo (1)).

For this report other information was gathered from various sources and people with knowledge of the region, including an ex musterer, and other NGOs. The Conservation Management Strategy for Otago and the Danseys Pass Ecological Report were also consulted.

1. General:

- The Dasher is situated at the southeastern end of the Kakanui Mountains where they tend to drop to the lower altitude of coastal Otago.
- This property is the centre of a group of four runs that are in the process of, or about to go through, tenure review. Mt Stalker to the south, Shingley Creek to the west and Mt Dasher to the north. These four properties combined encompass a plateau with a unique geological structure. Together with their other significant inherent conservation values they are going to form a very important conservation area in the future.
- The northern boundary of The Dasher next to Mt Dasher is part of an escarpment that drops away from Mt Dasher. This is a very visible feature that can be seen from most of northern coastal Otago. It forms part of the southwestern skyline to the North Otago district.
- The property faces south east and mostly drains into the Kauru River, except for the south western end, which makes up approximately one quarter of the total area, flows into the Waianakarua catchment.
- In the Waddells Creek catchment at the western end of the run there is an infestation of wilding trees. Which could be, *radiata* or *nigra*, see photo (2).
- Wild pigs were also seen when we were on the way down from Trig B.

-2-

2. Geology:

- The volcanic cones and boulder fields of this upland part of north Otago are significant and striking, and will be a very important addition to the DOC estate. The geology of this plateau has caused there to be enclaves, where sheep and fire have been less able to penetrate. These enclaves support a range of plants which are not represented further inland at this altitude. The volcanic landscape has also created some small wetlands that are unusual in the Kakanui Mountains.

3. Climate:

- The Kakanui Mountains lie in a northwest/southeast direction; the climate of the southeastern end of which is somewhat wetter than the inland Danseys Pass end; it is more coastal, therefore there are more days when there is low cloud or fog present. This has a bearing on the vegetation of the area and we find that the Trig B end of the run carries a greater variety of alpine vegetation (which includes edelweiss) not seen further inland. This is significant for the conservation values inherent in the vicinity of the escarpment.
- The fog and mist adds to the whole experience of those who are fortunate enough to visit the area.

4. Significant Inherent Conservation Values:

- The geological formation adds considerably to the landscape values of the whole upland area and will be one of the attractions for visitors to the area, when it becomes part of a larger conservation area.
- The recreational values for those walking through are high. On occasions when the snow conditions are right there will be cross-country skiing available as well.
- The Slate Quarry, although small and not now in use has some historical significance.
- The vegetation values are significant on the plateau around Siberia Hill (Trig C) and back to the cones on Mt Dasher. Red tussock at this altitude is becoming rare. Important shrubs present are Mountain Toatoa, Snow Totara, Brachyglottis and Hebes.
- RAP 3, Hughie (370 ha) is important with its mixed broadleaf vegetation not represented so far north in the district. Its varied vegetation contains seedling matai. Manuka is present here but is absent further north in the Danseys ecological district. An area worthy of proper protection.
- RAP 5, Dasher is a large RAP (1020 ha) approximately half of it being in Mt Dasher to the north. This is a valuable area which contains plants and wetlands that will really be the centre of the conservation area. Red tussock is present which is somewhat rare at this altitude. Other species of importance are the shrubs Brachyglottis, Coprosma, Hebe, some mountain toatoa and snow totara.
- The Conservation Management Strategy for Otago fully recognises the importance of the area as one of the 41 Special Places - we fully concur.

5. Access:

- Access will be important to the area. That the area is not used to any great extent at the moment is due in the main to lack of knowledge of the whereabouts of points of access. Also it is through private property, therefore permission has to be obtained.

-3-

- Fortunately there are already legal roads in place on this property. The main approach will be from SH85 up to Trig B.
  - After leaving Trig B going east, access should be secured to go down the Cayenne Spur and out through Mt Stalker to the coast. Or, after descending from Trig C there are two roads starting from below Mitchell's Hut, one going out through Mt Dasher to the north, or one going out through The Dasher to the northeast. These two routes should also be secured for public access.
  - In most places the formed farm tracks run on, or in the vicinity of, the surveyed legal road. This is favourable to setting up a good system of tracks for walkers.
  - Under no circumstances should any of these legal roads be closed unless they are re-surveyed on to the present road formation. This is crucial to the recreational values and the successful outcome of this tenure review.
  - We believe the central plateau area would be better off without wheeled access of any kind. Its remoteness has a value that should be kept intact.
1. Designation of Land:
- I. All that land contained in the two RAPs 3 & 5 must be returned to full Crown ownership and control.
  - II. The land west of RAP 5 contained in the Waihanakarua catchment, and west of the Cayenne Spur has significant values in its creek bed shrubs. Added to this is the fact that tussock cover is sparse and there is some erosion present, see photos (3) and (4). Therefore the question arises - *is it capable of being used in an ecologically sustainable manner?* We would think not, as it would be very doubtful if it would be economically viable to fertilise from the air, so should be returned to full Crown ownership and control.
  - III. The lower rolling tussock land of North Otago below about 1000masl, especially in the east, responds to the application of fertilizer; so should be considered economically viable, therefore ecologically sustainable and could be disposed of to the holder on a freehold basis.
- IV. We have indicated on the enclosed map our considered thoughts on the designation of the land.
6. Summary:
- We believe the outcome of this tenure review, being central to three other reviews, is critical to the formation of a Conservation area at the southeastern end of the Kakanui Mountains.
  - All the inherent conservation values are high.
  - Access will be a key ingredient to a successful outcome of this review. Access from the points we have mentioned will enable first class walking trips to be undertaken: either across the range, or as a start to a long ridge walk to Danseys Pass.
  - The landscape of the area could be threatened with unsympathetic or unnecessary roading. Wilding trees are also a threat. We have not studied the District Plans for the area but we would suggest a covenant to protect the landscape values be also put in place as District Plans are never very strong in this direction.



-4-

We attach our plan showing our recommendations for land designations and access routes.

Photo (1) Shows the ridge and fence below trig B which is the boundary between Mt Dasher and The Dasher (the Dasher to the right) and the formed road. We would suspect the legal road does not line up with this formation in many places. This photo also shows the slopes where there is a great variety of indigenous alpine vegetation.

Photo (2) Shows the Wilding tree infestation in the Waddells Creek basin.

Photo (3) Shows unsympathetic and perhaps unnecessary roading. Also shows the condition of the ground cover in Waddells Creek.

Photo (4) Another view looking further down the creek.

We thank you for allowing this input at this stage of the tenure review process.

Yours faithfully

John Turnbull and Jean McFarlane

For Upper Clutha Branch, Forest and Bird



Photo (1) Shows the ridge and fence below Trig B which is the boundary between Mt Dasher and The Dasher (The Dasher to the right) and the formed road. We would suspect the legal road does not line up with this formation in many places. This photo also shows the slopes where there is a good variety of indigenous alpine vegetation.

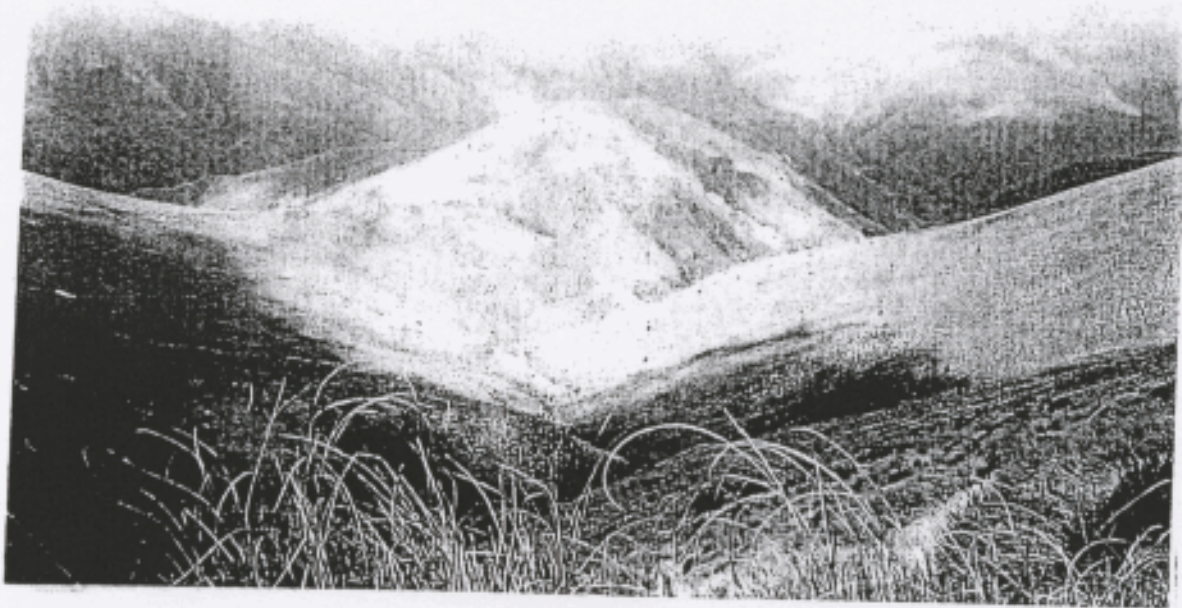


Photo (2) Shows the wilding tree infestation in the Waddells Creek basin.



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Photo (3) Shows unsympathetic and perhaps unnecessary roading. Also shows the ground cover in Waddells Creek.



Photo (4) Another view looking further down the creek.



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**THE Dasher** Legal Roads  
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Freehold  
 Conservation

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**4.2 ILLUSTRATIVE MAPS**

- 4.2.1: Topo/Cadastral**
- 4.2.2 Values - Landscape units and Landscape values**
- 4.2.3 Values- Ecological/Historic/Recreation**