

Crown Pastoral Land Tenure Review

Lease name : Mt Cook

Lease number : Pt 132

Conservation resources report

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

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

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MOUNT COOK PASTORAL LEASE



CONSERVATION RESOURCES REPORT

**Department of Conservation
May 2003**

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PART 1 INTRODUCTION

This report describes the significant inherent values present on Mount Cook Pastoral Lease. The information presented in this report is derived from field surveys undertaken between October 2002 and January 2003 and data collated between October 2002 and March 2003. Field survey reports upon which this report is based are listed below. The methodologies used for the field surveys are described in those reports, and are not outlined again in this report. This report forms part of the Mount Cook Pastoral Lease tenure review process.

Mount Cook Pastoral Lease covers an area of approximately 2462.59 hectares in the northwest Mackenzie Basin in South Canterbury. The property lies on the lower southwest flank of the Burnett Mountains, on the east side of the Tasman Valley between Gorilla Stream in the north and the Jollie River in the south. It adjoins Braemar Pastoral Lease to the southeast; Aoraki/Mount Cook National Park to the north; UCL on the bed of the Tasman River to the west; and an area of Crown land (pending gazettal as Conservation Area) on the Burnett Mountains to the northeast. The property lies across the Tasman River from Glentanner Station and Aoraki/Mount Cook National Park.

Mount Cook Pastoral Lease covers the broad glaciated flank of the Burnett Mountains, a prominent lateral moraine on the lower slopes, and a small part of the bed of the Tasman River. It lies between approximately 550 and 1300 metres altitude. The property is drained by the lower parts of Chop, Parsons and Andrews Creeks, and numerous smaller streams between Parsons Creek and the Jollie River.

The property lies in Godley Ecological District, within Tasman Ecological Region. Godley Ecological District has not been surveyed as part of the Protected Natural Areas Programme. The Tasman River bed is listed as a Site of Natural Significance in the Proposed Mackenzie District Plan, and the burial site of TD Burnett at Black Point is listed as a Heritage Item.

Field survey reports upon which this report is based:

- Mount Cook Pastoral Lease Assessment of Natural Landscape Values, Anne Steven, November 2002. 13p+maps+photographs.
- Tenure Review of Mount Cook Pastoral Lease: Assessment of the Ecological Values, Neil Simpson, Conservation Consultancy Ltd, March 2003, 7p+map+photographs.
- Report on Insects and other litter animals collected during a Tenure Review survey of Mount Cook Station, P.M. Johns, undated, 4p.
- Mount Cook Pastoral Lease, Report on Aquatic Fauna Surveys, Scott Bowie, February 2003, 8p+map+photographs.

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

2.1 LANDSCAPE

2.1.1 Landscape Context

Mount Cook Pastoral Lease is situated in the Mackenzie Basin, a large part of which has been identified as one of the most extensive outstanding natural landscapes in the Canterbury Region. The sheer scale and openness of the landscape and its natural character are unsurpassed in New Zealand (Boffa Miskell and Lucas Associates, 1993). The Burnett Range is identified as regionally significant by that study, as the major peaks of the range are a visually integral part of the Mackenzie Basin landscape.

The Burnett Mountains are part of the mountainous backdrop to the Mackenzie Basin, together with Mt Stevenson, Braemar Dome and Mt Joseph. Viewed together from State Highway 8, these mountains form an impressive backdrop to the basin landscape. The individual forms of the mountains are unusual and, when combined, form a distinctive and memorable panorama. They contribute much to the qualities and outstanding status of the Mackenzie Basin landscape.

The Burnett Mountains are particularly significant because they are an important part of one of New Zealand's iconic views: Aoraki/Mount Cook presiding over Lake Pukaki and the Tasman River bed, flanked by the Ben Ohau Range to the left and the Burnett Mountains to the right. Much of the impact in this view is due to the opposing geometric physical structures of Aoraki/Mount Cook and the Burnett Mountains. The Burnett Mountains remain highly visible and prominent in views when approaching Aoraki/Mount Cook National Park and from within the park itself.

At a more localized level, the western flank of the Burnett Mountains is an important part of the heavily-glaciated landscape of the Park. The mountain range forms one side of the "portal" to the park, lying just four to five kilometres across the Tasman River bed from State Highway 80 (Mount Cook Road). It is a significant part of the ranges that enclose the landscape experienced from Mount Cook village, Mount Cook airport and the roads within the park.

2.1.2 Landscape Description

At the broadest level, Mount Cook Pastoral Lease is within the "Intermontane Ranges and Basins Landscape Type", a band of mountain ranges, valleys and basins running the length of and parallel to the main divide of the Southern Alps (Boffa Miskell and Lucas Associates, 1993). At a district level the property lies within the "Mackenzie Basin", the largest intermontane basin.

This part of the Mackenzie Basin can be divided into three different landscape compartments: the "Jollie-Fork-Cass Landscape Compartment" comprising the large discrete mountain valleys; the "Aoraki Landscape Compartment" comprising the steep heavily-glaciated mountains; and, the "Pukaki Landscape Compartment" comprising the riverbed and flats of the Tasman Valley.

For the purposes of this landscape assessment (pastoral lease tenure review) Mount Cook Pastoral Lease is divided into three landscape units. These units are illustrated on the Landscape Unit Map on the following page, and are described below.

Landscape Unit 1, Tasman River Flats

This landscape unit comprises the wide, open, exposed river flats and alluvial fans underlain by deep greywacke gravels of the Tasman and Jollie rivers. The Jollie River has formed a large fan spreading southwest over the braided Tasman River bed. The property includes areas of active riverbed, recently-colonized riverbed with sparse short tussock and mat plants, and older stable surfaces with dense grassland and matagouri¹ shrubland. Matagouri is most common on the Jollie River fan and along the inner margin of the Tasman River flats. An intricate pattern of inter-woven braided channels, mostly ephemeral, details the surface. An intriguing line of small hummocks runs southwest across the flats near the homestead, marking the terminal of the most recent Tasman Valley glacier.

The flats south of Micks Point are fenced into large paddocks but have not been cultivated. The flats north of Micks Point are fenced off from the adjacent hillside and are grazed extensively, if at all. A four-wheel-drive vehicle track runs up the flats to Black Point and onto the riverbed beyond. A few willow trees are dotted down the main permanent stream. Wilding European larches are present on the flats near Black Point.

Most of these flats appear highly natural and intact in general appearance, with high legibility and coherence. There has been no cultivation, shelterbelt planting or subdivision into geometric paddocks as often occurs on such terrain. The grassland present is dominated by exotic species but the surface cover, which includes matagouri, is of natural appearance. The intactness and distinction of the different landform elements and the braided surface patterns left by meandering streams are the most important aspects of the flats and underlie their aesthetic value.

The densely-vegetated, older, stable surfaces near the homestead are discrete surfaces entirely within the property. The younger, more sparsely-vegetated surface north of Micks Point is an integral part of the vast Tasman River floodplain.

Vulnerability and Threats

Subdivision fencing, cultivation and shelter planting are probably the biggest threats, especially on the deeper soils. The moraine landform could be obscured by tree planting and fragmented by insensitive fencing and tracking. Gravel extraction for road maintenance and tracking may result in localized adverse effects.

Landscape Unit 2, Jollie Valley

This landscape unit comprises the lower northern (true right) side of the Jollie Valley that lies within the property. This is steep southeast facing terrain formed by glacial erosion of the Jollie Valley. It comprises two parts: the upper part is some 500-600m above the valley floor and more dissected with some scree and exposed rock; and, the lower part is only some 300m above the valley floor and with no visible scree or exposed rock except for short gravel cliffs at the base of the slope.

Inaka scrub covers the upper slopes, and grassland and grey scrub dominate elsewhere. Plantations of European larch and Douglas fir cover the slopes at the mouth of the valley and are the main source of the prolific wilding spread present upstream and across the valley on

¹ Scientific names of species are listed in Section 4.1.1

Braemar Station. The Jollie Valley as a whole is a large and impressive, highly-natural mountain valley, typical of inland Canterbury. However, the part of the Jollie Valley within Mount Cook Pastoral Lease is relatively less rugged and dramatic. It also has exotic plantations and most of the wilding spread, although the general appearance is largely natural.

Vulnerability and Threats

The biggest threat is the spread of wilding trees, which is already occurring with vigour. Broom, which is present in the valley, also presents a threat. Other threats include the construction of access tracks on the steep south-facing slopes.

Landscape Unit 3, Burnett Mountains

This landscape unit comprises the main part of the property, covering the west- to southwest-facing mid to lower slopes of the Burnett Mountains. These slopes have been heavily glaciated and the topography exhibits both ice-scouring and deposition of moraine from recent glacial advances. At least three moraine formations are present: the low hummocky moraine on the valley floor and two moraine benches on the lower slopes. The tops of these benches are rumpled or hummocky and contain small tarns. Valley sides above the moraine benches tend to be planar, scoured by the ice. Subsequent dissection by streams, which form steep-sided, sharply defined, V-shaped gullies, has formed distinctive rectilinear landforms from Parsons Gully southward. North of Parsons Gully the terrain is more rugged with exposed bedrock and scree, and the slopes fall sheer to the Tasman riverbed.

Tasman Point and Black Point are two ice-sculptured headlands of hard rock protruding into the riverbed. High rock bluffs are typical: Rock Etam at Black Point is particularly impressive and an intriguing feature when viewed from State Highway 80. The lessee's father, T D Burnett, is buried on the rounded shoulder atop this rock bluff. Tussock grassland and matagouri, manuka and inaka scrub form the dominant vegetative cover in this landscape unit. Fescue tussock, matagouri-*Coprosma* scrub and developed pasture are dominant closer to the homestead. Exotic wilding trees are a prominent and rapidly increasing element. Three small blocks of planted trees exist at Tasman Point (partly felled), Black Point and near Micks Point.

The western slopes of the Burnett Mountains form an important part of the mountainous backdrop and enclosure to Aoraki/Mount Cook National Park, particularly when viewed from State Highway 80 and Mount Cook village. The slopes have a highly natural appearance with little obvious human modification (limited to two small blocks of trees and some vehicle tracks). They appear intact with high coherence and legibility. The northern part of the range in particular is of similar character to the mountain scenery of the national park, and there is little to distinguish the leasehold area from the park.

The clearly-recognizable glacial moraines veneered across the mountainside south of Rock Etam are fascinating, and record the formative processes of the landscape. The lowest bench is particularly important as it marks the furthest extent of the most recent main valley glacier. The hummocky ice-sculptured terrain above Rock Etam also has high aesthetic value with its dells and knolls and variety of vegetation.

The Burnett Mountains Landscape Unit can be subdivided into three sub-units:

Big Hill: This area is more modified with over-sown tussock and matagouri scrub dominant. The topography is rolling to hummocky with gentler slopes and little exposed rock or scree.

Micks Creek to Oatmeal Creek: This area is steeper with rectilinear landforms and benching. More scree and exposed bedrock are present, especially in the numerous deep narrow gullies. The vegetation is more natural with tall tussock, manuka, inaka and other subalpine shrubs and speargrass dominating on the mid to upper slopes. This sub-unit includes Black and Tasman points.

Oatmeal Creek to Gorilla Stream: This area covers the northernmost section of the property closest to the Main Divide. It is precipitous rugged terrain with a lot of exposed rock and scree. Subalpine shrubland is the dominant vegetation cover.

Vulnerability and Threats

The high rainfall, light stocking-rates and absence of burning for many years have resulted in highly-natural vegetation in very good condition, especially on the northern part of the property. Future efforts to improve stock carrying capacity by fencing, burning, grazing or pasture development would have a dramatic effect on landscape character.

Existing and future plantations of exotic trees pose a major threat to this area. Small blocks of Douglas fir have already been planted along the base of the slope. Wilding trees are present in large numbers and if uncontrolled will spread with vigour, obscuring the macro-landforms from view, and the altering the natural patterns of vegetation.

2.1.3 Visual Values

Most of Mount Cook Pastoral Lease is highly visible from public places within the Mackenzie Basin, particularly State Highway 80 and Aoraki/Mount Cook National Park. It is an important part of one of New Zealand's best-known views. Only the lower slopes of the Jollie Valley and the Tasman River flats are not readily visible from public viewpoints (except from the air).

Views from State Highway 8: The Burnett Mountains are visible from sections of State Highway 8 from south of Twizel to near Dover Pass. The most important view is from where the highway skirts round the south end of Lake Pukaki. In this view, the Burnett Mountains frame the view of Aoraki/Mount Cook: one of New Zealand's best-known views. The distinctive geometric forms of the range and their relationship to the landforms of Aoraki/Mount Cook and the Ben Ohau Range underlie the special visual qualities of this view, especially when highlighted by shadows. This view and its components contribute much to the outstanding qualities of the Mackenzie Basin landscape.

Views from State Highway 80 and Aoraki/Mount Cook National Park: There are increasingly impressive views of the Burnett Mountains when driving north along the Mount Cook Road (State Highway 80). The view of the mountains of the upper Tasman Valley from Peters Lookout is just as impressive as that from the bottom of Lake Pukaki. The mountain range is visible along almost the full length of State Highway 80 in ever-changing perspective, although the section north of Black Point remains hidden from view until nearer Aoraki/Mount Cook National Park. At the point that the highway is opposite the mountain range, it is only about five kilometres away and much of the surface detail is apparent. At this point the range forms part of the "portal" to the Park. Rock Etam is a particularly prominent feature in this view.

The northern section of the Burnett Mountains, up to Gorilla Stream, is part of the Aoraki/Mount Cook National Park landscape. It forms the immediate backdrop to the airport and is in direct view when leaving the park on State Highway 80. The Jollie Valley and Tasman River flats are obliquely visible in these views.

Views from the Braemar-Mount Cook Road and the Canal Road: Views of the Burnett Mountains from these roads are similar to those from State Highway 8, but are slightly closer and more frequently blocked by topography.

2.2 LANDFORMS AND GEOLOGY

Three distinct and contrasting landforms dominate Mount Cook Pastoral Lease: the steep glaciated country of the Burnett Mountains, which makes up the bulk of the property; the broad floodplain of the Tasman River, of which only a small part is within the pastoral lease; and, the low-altitude moraines deposited on the lower slopes of the Burnett Mountains, just above the Tasman River bed. The mountainous country comprises greywacke and argillite of the Torlesse Group; the river floodplain comprises recent outwash gravel; and, the moraine country comprises glacial till of the Tekapo and Birch Hill formations (Gair, 1967).

The effects of recent glaciation and subsequent fluvial erosion are clearly illustrated by landforms on the property. High summits and ridges above the property on the Burnett Mountains are ice-steepened arêtes, surrounded by frost-shattered rock buttresses and mantled with broken talus that forms extensive scree slopes. The larger valleys are U-shaped in their upper reaches, originating from small cirque basins, and frequently narrow and incised in their lower reaches. Within the property boundary the western faces of the Burnett Mountains are truncated by glaciers, and mantled with moraine where these glaciers carved down the Tasman Valley.

Mount Cook Pastoral Lease mostly comprises moderately-steep slopes, rising to 1300m altitude on the Burnett Mountains; areas of gentle terrain are confined to a relatively small part of the property on the flats of the Tasman River and the fan of the Jollie River. Rock bluffs, carved by glaciers, are prominent on the lower slopes. The most spectacular of these are at Black Point and Tasman Point. Also prominent on the lower slopes are the deeply incised gorges where streams have cut into the bedrock, notably the Parsons Creek gorge and Parsons Waterfall.

The property is drained by the lower parts of Chop, Parsons and Andrews creeks, and numerous smaller streams between Parsons Creek and the Jollie River. All eventually drain to the Waitaki River via the Tasman River and Lake Pukaki.

Soils on the property are predominantly high country yellow-brown earths: Kaikoura soils dominate the steeplands; and, Cass and Puketeraki soils dominate the lower-altitude hill country. Recent Tasman soils are present on alluvium. Weakly developed alpine soils are present on the crest of the Burnett Mountains and in places extend down into the property.

2.3 CLIMATE

Mount Cook Pastoral Lease lies in the rain shadow of the main divide of the Southern Alps. Winds are predominantly from the northwest, are most frequent in spring and autumn and commonly strong to gale force. Summers are cool and moist; winters are cold with frequent snow and severe frosts. Snow can fall throughout the year and can lie for several months on higher-altitude parts of the property. Annual precipitation is approximately 2000mm in the Tasman Valley and probably over 5000mm at higher altitudes, especially in the north of the property (McEwen, 1987; Department of Conservation, 2001).

2.4 VEGETATION

2.4.1 Original Vegetation

McEwen (1987) described the former (pre-European) vegetation of the Godley Ecological District as tall tussockland with short tussockland and matagouri on river flats, and limited areas of mountain totara forest and silver beech forest. In this higher-rainfall part of the ecological district it is likely that forest (predominantly silver beech forest) and scrub were relatively extensive.

It appears likely that most lower-altitude (below 800m) parts of Mount Cook Pastoral Lease formerly supported silver beech forest, with areas of dense mixed inaka-*Coprosma* scrub in the upper montane and subalpine zones, and narrow-leaved snow-tussock at higher altitudes. Vegetation on the open bed of the Tasman River was probably similar to that which is present today: low, sparse vegetation dominated by mat daisies, grasses and herbs.

Large parts of the property have not been burnt for over 70 years (Donald Burnett, *pers.comm.*) so the vegetation is in very good condition, dominated in most places by native species, and appears to be becoming increasingly dominated by woody species. Vegetation on the hillslopes is in similar condition, and is largely indistinguishable from vegetation on adjoining slopes in Aoraki/Mount Cook National Park. Wilding conifers have become established on lower slopes, forming relatively dense areas of spread at some sites.

2.4.2 Indigenous Plant Communities

Overall the vegetation of Mount Cook Pastoral Lease has high significant inherent values, especially plant communities above approximately 700m altitude, north of Black Point and on the river flats. The lack of burning and the conservative grazing regime, at least during more recent times, has allowed tussockland to attain its natural stature and is allowing native shrublands to increase. Silver beech forest is rare on the property but there is potential for shrublands and eventually forest to increase along most slopes below about 1000m. The number and extent of introduced species is low, apart from European larch which is widespread on lower slopes especially in the Jollie Valley and adjacent to the relatively small plantations at Chop Creek and Lily Stream.

The river terraces below and west of the homestead are primarily introduced grassland with few inherent values although they contain patchy matagouri shrubland and some fescue tussock. However, areas of the Tasman River floodplain within the property are in good condition and support at least three threatened species. The inherent values of land around Big Hill have been severely reduced in places by the planting and/or wilding spread of European larch.

The present-day vegetation of Mount Cook Pastoral Lease is described below for the geographically distinct parts of the property.

Black Point to Oatmeal Creek

Upstream from Tasman Point steep shrubby slopes and rock faces rise from the floor of the Tasman Valley to snow tussock-covered slopes above. The Tasman River cuts right into the base of the rock faces and access along this section is difficult. It has not been grazed for many years. It has a high degree of naturalness with few introduced species present and no wilding trees.

Between Tasman Point and Lily Stream the vegetation is lush and tall, reflecting the absence of grazing for many years. Slopes above Tasman Point support a mixture of native and exotic grassland with scattered narrow-leaved snow-tussock, in places reaching to the valley floor and generally becoming denser with altitude and dominant above c.800m. Browntop, cocksfoot, sweet vernal and Yorkshire fog are locally dominant at lower levels together with silver tussock, fescue tussock, blue tussock and patches of fern (*Blechnum penna marina* and *Hypolepis millefolium*). Most of this vegetation is more than 500mm tall, with snow tussock up to shoulder height (1.5m), and with a thick layer of litter between plants.

The creeper *Clematis marata* and the native wheat grass (*Elymus solandri*) are both common, and there are scattered shrubs of matagouri and mingimingi. There are a few groups of small trees dominated by mountain ribbonwood and *Olearia odorata*, with bush lawyer *Rubus schmidelioides* present. A small remnant of silver beech forest is present alongside Parsons Creek. Occasional king devil hawkweed is present and many small native herbs, such as *Mentha cunninghamii*, *Viola cunninghamii*, *Acaena caesiiglauca* and *Celmisia gracilentia*, grow amongst the grasses.

Higher up there are patches of manuka and bracken, both quite extensive in places. A few broadleaf trees cling to bluffs or grow along the base of cliffs. Wilding European larch is spreading south across the slopes towards Black Point from old plantings at the mouth of Chop Creek. At present they are widely scattered to about 900m altitude, except along lower Chop Creek where there are denser patches. Some of these trees have been recently cut down.

Nearer Black Point the shrubland increases on the lower slopes and around rocky sites with kowhai, porcupine shrub and golden spaniard locally prominent. *Aciphylla scott thomsonii* is present along streams and in damp areas. Other shrubs present include *Coprosma cheesemanii*, *Olearia cymbifolia*, *Olearia nummulariifolia*, korokio, *Coprosma* aff. *parviflora*, *Carmichaelia australis*, *Carmichaelia vexillata*, inaka (*Dracophyllum uniflorum* and *Dracophyllum longifolium*), *Gaultheria crassa*, *Hebe subalpina*, *Hebe buechananii*, *Leucopogon suaveolens* and *Coprosma petriei*. Herbs of interest include *Acaena dumicola*, giant buttercup, *Brachyglottis haastii* and *Celmisia semicordata*, the latter three on bluffs.

Above Black Point at about 900m altitude two small tarns with surrounding wetland and bog communities are present. They are typical of several tarns that occur further south and at higher altitudes on the property. Sphagnum moss, other moss species, *Carex gaudichaudiana*, *Carex sinclairii*, *Carex echinata* and bog-rush are important plants in this community. Also present are *Oreobolus pectinatus*, *Utricularia novae-zelandiae*, *Drosera arcturi*, *Euphrasia zelandica*, *Pratia angulata*, and *Festuca rubra*. In the water *Elaeocharis acuta*, *Potamogeton cheesemanii* and *Myriophyllum triphyllum* are present. Red tussock and patches of sphagnum moss and *Carex coriacea* occur in the gully draining the tarns.

Surrounding tussocklands support *Coriaria angustifolia*, tauhinu, *Dracophyllum longifolium*, *Dracophyllum kirkii* and numerous small herbs. On rocky knobs and rockfields are *Podocarpus hallii x nivalis*, *Pseudopanax ternatus*, *Brachyglottis rotundifolia*, *Brachyglottis cassinioides*, *Hebe anomala*, *Pentachondra pumila*, mountain flax and patches of the fern *Blechnum montanum*. Koromiko, *Coprosma rugosa*, mountain ribbonwood and tutu occur along incised stream banks.

Black Point to Big Hill

From Black Point a prominent bench, an ancient lateral moraine, runs south along the mountain slope at about the 700m contour, descending gradually down-valley. This tends to form a natural demarcation between dense healthy narrow-leaved snow-tussock (up to 1.6m tall) and introduced grassland with indigenous shrubland. The vegetation above the bench is similar to that described for the Black Point to Oatmeal Creek area, but with larger areas of matagouri and

manuka shrubland and large patches of bracken towards the south end (McLeod Creek). Snow tussock is dense above and between the shrubland areas.

Below the lateral moraine bench, introduced grassland is the dominant plant community with matagouri, *Coprosma* shrubland and with patches of bracken fern of varying density, all of which appear to be increasing at the expense of the grassland under a relatively conservative grazing regime. Tauhinu, inaka, *Clematis marata*, silver tussock, snow tussock and patches of fescue tussock are occasionally present. Spreading European larch is more prominent on these lower slopes and widely scattered above (to about 1000m). A relatively recent planting of conifers is present along the lower slopes near McLeod Creek.

South of McLeod Creek and extending to Big Hill, introduced grassland is more prominent and rises to about 850m with the snow tussock being less dense and the wilding conifers more prolific. Patches of shrubland and bracken still occur, especially above about 700m.

Jollie River Face

The Jollie River face of Big Hill has the greatest concentration of European larch on the property, with dense stands growing to the top of the ridge on the lower section of the spur. Extensive areas have been cleared, though seedlings are regenerating on parts of these cleared areas. Dense to scattered wilding tree spread extends up valley along the lower slopes of Big Hill, but with only scattered trees above about 800m. In the central section wilding trees form only a relatively narrow band above the Jollie River. Tree spread appears to peter out at about Golden Gully, near the upstream boundary of the lease. Dense snow-tussock is present along the upper slopes of the Jollie Valley faces north of Big Hill with occasional mountain totara on steep talus, inaka shrubland on the spurs, and scattered matagouri/*Coprosma* shrubland on lower slopes.

Tasman Valley River Flats

Between Black Point and Micks Point part of the Tasman River floodplain lies within the pastoral lease boundary. These extensive river flats have been stable since 1954 (Donald Burnett, *pers. comm.*). Species present include native pioneer plants such as the mat daisies (*Raoulia* species: *R. australis*, *R. hookeri*, and *R. haastii*) *Poa maniatoto*, *Epilobium melanocaulon*, *Epilobium microphylla*, *Luzula albicomans*, *Luzula celata*, *Myosotis uniflora* (uncommon) and *Colobanthus strictus* together with much moss and a number of introduced species including stonecrop. Moss is often dominant on the older terraces. The threatened woodrush *Luzula celata* is widespread and common, both on young terraces along the edge of the Tasman River as well as on the 50 year-old terraces near the hill slopes. It even occurs on the vehicle tracks.

In places, particularly close to the hill slopes, matagouri and *Coprosma* shrublands are present, and scattered matagouri grows well out onto the riverbed. European larch is spreading out onto the river flats south-west of Lily Creek, mostly outside the lease boundary. Closer to Micks Point along a periodically dry stream bed where several hollows collect silt, another plant community supports the threatened succulent *Crassula multicaulis*. The farm track crosses this stream beside one of these dry hollows. South of Micks Point and extending to the Jollie River are grassy river flats with matagouri shrubland and exotic grassland.

Coxs Downs Swamp

On the freehold part of Mount Cook Station, at the northern end of Coxs Downs, there is a large *Carex secta* swamp surrounded by a plantation forest of conifers. It is situated on a terrace above the Jollie River. A few matagouri grow around the edge with numerous sedges (*Carex*

secta, *Carex gaudichaudiana*, *Carex goyenii*, *Carex flaviformis*), *Elaeocharis acuta*, bog-rush and the rare and threatened grass *Deschampsia cespitosa*.

2.4.3 Notable Flora

The following species classified as threatened by Hitchmough (2002) have been recorded from the property.

Table 1 Threatened plant species recorded from Mount Cook Pastoral Lease, January 2003.

Plant Species	Known Distribution on Property
Serious Decline <i>Luzula celata</i>	Common to relatively-abundant on older riverbed surfaces, Tasman River
Gradual Decline <i>Carmichaelia vexillata</i> <i>Deschampsia cespitosa</i>	Present on lower hillslopes Uncommon, Coxs Downs wetland (Mount Cook freehold)
Sparse <i>Clematis marata</i> <i>Crassula multicaulis</i>	Common, shrubland on lower slopes Uncommon, silty swales on Tasman River terraces
Data Deficient <i>Myosotis uniflora</i>	Uncommon, Tasman River bed

2.4.4 Problem Plants

Introduced plants that may have a significant effect on indigenous plant communities on the property, and that can be controlled or contained, are listed and discussed below. Other ubiquitous naturalised species for which containment or control are probably impractical, such as mouse-ear hawkweed and pasture grasses, are not discussed here but are listed in the vegetation descriptions.

Crack willow (*Salix fragilis*)

Planted willow trees are present in the lower Jollie River and at the edge of the Tasman River floodplain near Micks Point. These plantings do not pose a significant threat to indigenous plant communities on the property, though do threaten areas of open gravel in the Tasman River bed.

Gorse (*Ulex europaeus*)

Occasional bushes of gorse are present along the vehicle track in the Tasman River bed. Gorse is also likely to be present at other disturbed sites on the property. Gorse poses a significant threat to open and disturbed sites on the property and to the adjoining Tasman River bed. All infestations of gorse should be removed.

Broom (*Cytisus scoparius*)

Infestations of broom are present along the vehicle track to the power-scheme intake in Andrews Creek, and in the lower Jollie Valley. An isolated plant of broom was observed above the Black Point bluffs (N2381045-E5708394). Other isolated infestations are probably present. Broom poses a significant threat to open and disturbed sites on the property and to the adjoining Tasman River bed. All infestations of broom should be removed or at least contained.

Wilding pines (conifer species)

Wilding conifers, predominantly European larch (*Larix decidua*) are common to abundant at three main locations: on the lower hill-slopes south of Tasman Point; on the lower slopes between Black Point and Big Hill; and, in the lower Jollie Valley. All infestations appear to have established through wilding spread from planted stands on the property. A substantial portion of the lower altitude part of the property is affected by scattered to dense wilding conifer spread.

Wilding conifers present the most serious threat to natural values on the property. The relatively high rainfall, frequent strong down-valley winds and presence of seed sources (plantations) favour wilding conifer spread. If uncontrolled, wilding trees will eventually form a dense conifer forest across the lower western slopes of the Burnett Mountains, halting the natural succession to indigenous tussockland, scrub and forest that is occurring at present, and transforming a scenic landscape of considerable importance to tourism.

Wilding conifers should be contained and, if possible, removed from all parts of the property (and adjoining lands) north of the Jollie Valley. Removal of all trees (wilding and planted) is the preferable option, though a costly and time-consuming control programme would be required to achieve this. Part of the northern-most stand of planted trees, at Chop Creek near Tasman Point, has already been felled. Ideally, other planted or dense stands should be felled immediately, and then regular removal of all wilding trees commenced, beginning at the northern (up-valley) end of the property.

Russell lupin (*Lupinus polyphyllus*)

Small scattered infestations of Russell lupin are present on the Tasman River bed adjoining the property. These infestations pose a threat to some parts of the property, though pose a much greater threat to the open gravels of the Tasman River bed. Infestations of Russell lupin on the Tasman River bed are presently monitored and controlled by the Department of Conservation.

Dodder (*Cuscuta epithymum*)

This sprawling twining grass-like plant is common in grassland and along the vehicle track near lower Andrews Creek. It is likely to be present elsewhere on the property. Although this species appears to very aggressive, it is unclear to what extent it poses a threat to indigenous plant communities on the property. Control of this species is likely to be difficult. It is present elsewhere in the Tasman Valley.

Stonecrop (*Sedum acre*)

Stonecrop is present on the Tasman River bed. This species poses a significant threat to the open gravels of the riverbed but is unlikely to affect other parts of the property. Effective control of this species appears to be difficult.

2.5 FAUNA

2.5.1 Birds and Reptiles

Observations of fauna were made during the inspection of the property, and information about fauna within the adjoining Aoraki/Mount Cook National Park is also relevant.

Bird species observed in shrubland and scrub communities include grey warbler, rifleman and blackbird. Bird species recorded on the open riverbed include black-fronted tern, black backed gull and banded dotterel. Other common shrubland and open-country birds are likely to be present.

Other species that are likely to be present are kea, eastern falcon and possibly rock wren. All are present in Aoraki/Mount Cook National Park, and all are listed as threatened by Hitchmough (2002).

Two sites are listed wetlands of national and international significance: the Tasman River and the Jollie River Delta. The edge of the Tasman River site and a significant part of the Jollie River delta site lie within the pastoral lease boundary.

2.5.2 Freshwater Fauna

Freshwater fish species previously recorded (in the New Zealand Freshwater Fish Database) in the vicinity of Mount Cook Pastoral Lease (Tasman and Jollie rivers) are longfin eel, koaro, Canterbury galaxias (*Galaxias vulgaris*), upland longjaw galaxias, common bully, upland bully (*Gobiomorphus breviceps*), brown trout (*Salmo trutta*) and rainbow trout (*Oncorhynchus mykiss*). Koaro, Canterbury galaxias and upland bully were found in the Jollie River. Of these, longfin eel and upland longjaw galaxias are listed as threatened by Hitchmough (2002).

Freshwater fauna communities were surveyed at six sites on Mount Cook Pastoral Lease, in the Tasman and Jollie valleys. Five different fish species, including four native species, and a wide range of aquatic macro-invertebrates, including insect larvae, crustaceans, molluscs and worms, were observed on the property.

Four different aquatic habitat types are described. These are classified by water source, resistance to drying, and surrounding landform structure. Native fish were found in all habitat types. The large gentle streams had the greatest diversity of native fish, including the threatened upland longjaw galaxias (*Galaxias prognathus*). The braided rivers also had a good diversity of native fish, again including upland longjaw galaxias.

The large gentle streams also contained the highest diversity of macro-invertebrates on the property. They contained many species not present in the other aquatic habitats surveyed, and there was considerable macro-invertebrate diversity between streams.

Habitat Types

The four habitat types associated with freshwater communities on Mount Cook Pastoral Lease are described below.

Small Steep Streams

Small steep streams are uncommon on the property. These streams usually have a permanent flow but are generally less than 50cm in width, with a continual seepage along the stream bed

but very few pools. They are spread along the ridge between the Tasman and Jollie rivers, although the Jollie River streams are more often dry. These streams are generally accessible to stock. Some streams, especially those in the Jollie Valley, were previously surrounded by plantations of exotic species which have been recently harvested (clear-felled).

Large Steep Streams

Large steep streams are quite common in the Tasman Valley, draining the western slopes of the Burnett Mountains. They are generally greater than a metre wide, and are mostly accessible to stock. These streams are surrounded by exotic trees (Douglas fir, radiata pine, and European larch), native vegetation such as beech forest (Parsons Creek), matagouri scrub and tall tussockland, or pasture.

Large Gentle Streams

There are two large gentle streams on the property, both on the grazed flats bordering the Tasman River bed: the first near Micks Point; and, the second above Black Point. These streams have a gentle gradient and flow calmly across the grassed flats. Many of the large steep streams flow into these streams. All large gentle streams are accessible to stock and are surrounded by pasture, tussockland, willow trees or matagouri shrubland.

Braided Rivers

There are two braided rivers on the property: the Tasman and the Jollie. The Jollie River drains the south and east parts of the property, and the Tasman River drains the entire western part. At the time of survey, the Jollie River was flowing clear, draining predominantly rain- and spring-fed sources, whereas the Tasman River was quite milky due to its predominantly glacial origin. These rivers are less accessible to, though mostly not fenced from, stock.

Fish

A large number of koaro were observed in Power house Stream, a large steep stream indicating this habitat type supports good populations of fish. Canterbury galaxias and upland longjaw galaxias are also expected to occur in these streams.

The large gentle streams provided the most significant habitat for fish on the property, both in terms of the diversity of native fish species and the presence of the threatened upland longjaw galaxias. Other fish species recorded in these streams were koaro, Canterbury galaxias and upland bully.

Both of the braided rivers were surveyed. Koaro, Canterbury galaxias and brown trout were recorded in the Jollie River, and koaro, upland longjaw galaxias and brown trout were recorded in the Tasman River.

Aquatic macro-invertebrates

No small steep streams were surveyed because they were either dry or contained little flow. These streams are expected to contain a low diversity of macro-invertebrate species. Andrews Creek at the power house was the only large steep stream surveyed on the property. Macro-invertebrates were not particularly numerous, but a relatively diverse range of species were present.

Macro-invertebrate populations of the large gentle streams were quite diverse. Only the mayfly (*Deleatidium lillii*) and two caddisfly species (*Hydrobiosis paraumbripennis* and *H. harpidiosa*) were present in any two survey samples collected. The braided Tasman River showed the poorest macro-invertebrate diversity, with very few species and low numbers collected. The Jollie River is expected to have much higher diversity due to the clearer water.

2.5.3 Terrestrial Invertebrates

Two main invertebrate habitats are present on Mount Cook Pastoral Lease: the silty/stony river flats and terraces; and, the slopes of the Burnett Mountains. Both habitats were sampled in late January on cool to cold blustery days. There were few flying insects and those observed were common species. The ground fauna received most attention as only extreme weather conditions affect sampling under logs, stones and in the litter. Time did not allow any study of the tarns at the apex of the Burnett Mountains.

The presence of the millipede *Icosidesmus* "Mackenzie", rather than the common one that is found at Aoraki/Mount Cook National Park, is probably the most surprising and important find of the survey. This, coupled with the presence of the large ground beetle *Megadromus bullatus* and the probable new species of *Zeadelium*, both of which are found to the south, indicate that the area is a "meeting place" for two faunules. This faunal transition zone and the presence of local endemics in the lower and drier Mackenzie Basin makes the immediate area very complex.

Although the overall biodiversity (number of species) of the area appears to be similar to that in areas nearby, the components of that biodiversity are different. This makes the terminal spurs of the Burnett Mountains a site of special interest in terms of its habitats and members of its biota.

No species found during the survey is thought to be endangered, although several, including the *Holcaspis* species, are very poorly known. Some of the species are known by very few specimens. The river flats, are in very good condition compared with those further down the river, and they probably have a much fuller representation of the Mackenzie Basin riverine species than any other site in the basin.

Notable species observed on the property, or previously recorded in the area, are described below.

Ground Beetles (Coleoptera: Carabidae)

Mecodema rectolineatum

The type locality of this species is "near Dunedin" and the type locality for its synonym *M. suteri* is Mount Cook, Hermitage. It is locally common at Mount Cook in Governors Bush and at Hooker Point, and is also present on the property. The species is quite problematical as it is one of the complex comprising *M. sculpturatum*, *M. rectolineatum* and *M. huttense*. Its presence in tussock-scrub margins at McLeod Creek, 1100m, in the Burnett Mountains is somewhat surprising and probably close to its tolerable limits in the Mackenzie Basin. The *M. sculpturatum* form is present to the east at Mackenzie Pass and Fox Peak (Two Thumb Range).

Mecodema lucidum

The type locality of this species is Wanaka. It is moderately common in the Queenstown and Wanaka areas and parts of Central Otago. This species is known from Aoraki/Mount Cook National Park by one specimen. It was not seen on the property though the habitat on the slopes appears suitable.

Megadromus bullatus

The type locality for this species is Fiordland. It is abundant from Fiordland to the Ahuriri Valley, and is present in Bush Stream across the valley from the property, but apparently absent from Aoraki/Mount Cook National Park. It is present on the property, right at the border of the

national park at 1100m on the Burnett Mountains. No live specimens were seen but fresh remains were present. It is the largest beetle in the Mackenzie Basin.

***Holcaspis* species**

Holcaspis ohauensis

This species is presently known from mountain beech forest on the shores of Lake Ohau, and from tussock-*Hieracium* swards at Tekapo, Lake Pukaki, Ahuriri River and Omarama. Two specimens that may be this species were collected at the top of McLeod Creek. Thus either *H. ohauensis* is variable or this is a very isolated, new species at this site. Although rare it has no official conservation status.

Holcaspis sternalis

This is a widely distributed species from coastal Otago, west to Manapouri and northwards to the foothills of South and Mid Canterbury. One specimen was found at 1100m near the top of McLeod Creek.

Darkling Beetles (Coleoptera: Tenebrionidae)

Zeadelium sp.

This species, which appears to be un-described, is present in the Dobson Valley, Governors Bush and other sites at Mount Cook and at McLeod Creek (1100m). It is not *Zeadelium intricatum*, a species of high rainfall forests from coastal Westland; it probably belongs within the *Z. nigrifulum* complex present in the Otago Lakes/Fiordland region, and may represent yet another species within that complex.

Flatworms (Platyhelminthes: Turbellaria: Geoplanidae)

Arthurdendyus (new species)

This species is present on the river flats, in silver beech forest (Waterfall Creek) and McLeod Creek at 1100m. It fits no described species.

Newzealandia sp. cf *graffi*

The specimens of this flatworm collected on the property are almost certainly of this widespread species that is already known from many river-terraces sites in the Mackenzie Basin. It is very tolerant of human environmental modification and not surprisingly was found under larch logs lying in the sand at Tasman Point.

Newzealandia sp.

This is another similar species whose identity is unknown (it may remain so for many years as this genus is not being researched).

Caenoplana sp.

This is almost certainly a new species.

Millipedes (Myriapoda: Diplopoda: Dalodesmidae)

The millipedes of the genus *Icosidesmus* should indicate the origin of any faunule as they are small, very diverse and appear to disperse slowly. They are also subject to clinal variation, which in the case of South Canterbury may have taken place since the end of the last glaciation. Two species may be found in the area.

Icosidesmus olivaceus

This species is common in the southern part of Aoraki/Mount Cook National Park and areas to the southwest.

Icosidesmus “Mackenzie” new species.

This species is present at 1300m on the property. It is also found to the east at Mt John, Mt Hay and Fox Peak (Two Thumb Range).

2.5.4 Notable Fauna

The following species classified as threatened by Hitchmough (2002) were observed or are likely to be present on the property.

Table 2 Threatened fauna recorded from, or likely to be present on, Mount Cook Pastoral Lease.

Animal Species Common name	Scientific name	Known Distribution on Property
Nationally Endangered kea	<i>Nestor notabilis</i>	likely to be present
Nationally Vulnerable rock wren	<i>Xenicus gilviventris</i>	possibly present
Serious Decline black-fronted tern	<i>Sterna albobriata</i>	Tasman River floodplain
Gradual Decline banded dotterel	<i>Charadrius bicinctus</i>	Tasman River floodplain
eastern falcon	<i>Falco novaeseelandiae</i>	likely to be present
longfin eel	<i>Anguilla dieffenbachii</i>	likely to be present
Sparse upland longjaw galaxias	<i>Galaxias prognathus</i>	larger streams and rivers

2.5.5 Problem Animals

Introduced animals that may have a significant effect on indigenous plant communities on the property, and for which control or containment is practical, are discussed below. Other ubiquitous naturalised species are not listed.

Rabbits and hares were observed on Mount Cook Pastoral Lease. Possum, chamois and tahr are also likely to be present. Of these species, rabbits and tahr pose the greatest threat: the former in drier habitats such as the open riverbeds; and the latter in high-altitude tussocklands. Control of rabbits and tahr may be required to protect the natural values of areas set aside as public conservation land. The northeastern part of the property lies within Management Unit 3 of the Department of Conservation’s Himalayan Thar Control Plan (1993). That plan proposes a maximum population density of two tahr per km² in Management Unit 3, and presumably a zero density in southwestern parts of the property that lie outside the management units.

2.6 HISTORIC RESOURCES

Mount Cook Pastoral Lease was first taken up for grazing in May 1864 when Andrew Burnett and George McRae applied for the 5000 acre Run 498. By 1865 McRae had left the partnership and Burnett, his wife Catherine (nee MacKay) and their two children settled onto the property. In 1871 they took up two more runs (603 and 614) and by 1873 started to freehold parts of the property. By 1889 Mount Cook, re-named as Run 83, covered approximately 10,000 hectares (Pinney, 1971). Part of this area was reserved and eventually surrendered to form part of Aoraki/Mount Cook National Park.

By 1895 the eldest son Donald was managing the station for his father and there was no debt recorded upon it. Following Andrew's death in 1902 Donald took over Sawdon Station and the Burnetts' third son Thomas David (TD) succeeded to Mount Cook. He remained the leaseholder until his death in 1941. He is buried atop the bluff at Black Point (Rock Etam), within a special reserve taken from the lease. In TD Burnett's time over 60,000 trees were planted on the lease, in part to provide an alternative source of timber to the beech forest at Glentanner. The station went to TD Burnett's son and daughter following his death and is the only station in South Canterbury that has been held in unbroken tenure by the same family (Pinney, 1971).

Many of the peaks, streams and other landmarks on the property were named after family members, neighbours, shepherds and farm dogs. These remain as an historic record of early settlement. TD Burnett's grave at Black Point is also of historic significance, though this lies outside the pastoral lease. Mount Cook Station is one of the better-known high country properties, largely due to the unbroken stewardship of the Burnett family, the high profile of TD Burnett, and the location of the property adjacent to Aoraki/Mount Cook National Park.

2.7 PUBLIC RECREATION

2.7.1 Physical Characteristics

Mt Cook Station covers the lower slopes of the Burnett Mountains. Most of the pastoral lease is accessible on foot. Vehicle access is confined mainly to the Tasman River flats and access is available to Tasman Point.

According to the Department of Conservation recreation opportunity descriptors, the majority of the pastoral lease is classified as back-country accessible. The land beyond Tasman Point and along the upper pastoral lease boundary is classified as remote.

2.7.2 Legal Access

Legal access to the property can be gained by the Braemar/Mt Cook Station road to the start of the property. The homestead is on freehold land and is not linked with any legal access. The formed road departs from the legal road near the homestead area. The legal road curves NE and to the pastoral lease boundary above true right bank of the Jollie River. There is no marginal strip on the Jollie River. A legal road follows the western boundary of the pastoral lease and the freehold, adjacent to the Tasman River bed for the entire length of the property to Aoraki/Mt Cook National Park. No marginal strips exist within the property.

2.7.3 Activities

The pastoral lease use itself could be considered low when compared with the adjoining National Park. Access is primarily through the property fringes to the Jollie River or up the Tasman River. Some access occurs through the property to the Burnett Range.

PART 3 OTHER RELEVANT MATTERS AND PLANS

3.1 CONSULTATION

Early-warning consultation meetings were held in Timaru on the 10th September 2002 and in Christchurch on the 11th December 2002. Representatives of the following organisations were present at these meetings: NZ Four Wheel Drive Association; Canterbury Four Wheel Drive Association; Canterbury University Tramping Club; Canterbury Botanical Society; Peninsula Tramping Club; NZ Deerstalkers Association; Federated Farmers High Country Committee; Public Access NZ; South Canterbury Tramping Club; Temuka Tramping Club; and, Federated Mountain Clubs of NZ.

Issues raised by representatives included:

- The need to protect the northern end of the property (north of Parsons Creek).
- The need to fence and control stock.
- The need to provide practical access up the Jollie Valley. It was pointed out that the obvious route was probably through Coxs Down along the farm track over freehold land.
- There is a road alignment problem to the homestead, and it was noted that any division of the property needed to ensure access up the face above the homestead to conservation land, and possibly access up some of the creeks.

3.2 DISTRICT PLANS

Mount Cook Pastoral Lease lies within the Mackenzie District. The Proposed Mackenzie District Plan, as amended by Council decisions, was notified in September 1999. In this plan the property is zoned Rural. The Schedule of Sites of Natural Significance includes one site that covers part of the property: Site 23 Tasman River, covering the open bed of the Tasman River and the delta of the Jollie River.

Rules relating to land-use activities within Sites of Natural Significance, riparian areas and high-altitude areas (i.e. areas above 900m) are listed below:

- No clearance of indigenous vegetation (and in the case of riparian areas, any vegetation) to exceed 100m² per hectare in any continuous period of 5 years, except for declared weed pests or for the purpose of track maintenance or habitat enhancement.
- No earthworks to exceed 20m³ (volume) or 50m² (area) per hectare in any continuous period of 5 years, except for the purpose of track maintenance.
- No pastoral intensification to exceed 5% of any Site of Natural Significance, except where that activity is provided for under a consent under the Crown Pastoral Land Act, or other management plan or covenant ratified by the district council.
- No tree planting in Sites of Natural Significance or above 900m, but forestry up to a maximum of 2 hectares per Certificate of Title is a controlled activity within wetland and riparian areas.

The Schedule of Heritage Items in the Proposed Mackenzie District Plan includes two sites that are associated with the property, though both lie just outside the pastoral lease boundary: Item H52, Burial site of TD Burnett (Rock Etam); and, Item H53 Gorilla Stream Hut.

3.3 CONSERVATION MANAGEMENT STRATEGIES

Mount Cook Pastoral Lease is within the Waitaki Unit of the Canterbury Conservation Management Strategy (CMS). Key priorities for this unit are listed as:

- To identify, maintain and seek to enhance the natural landscape values of the unit through appropriate methods such as tenure review and district plans.
- To identify the significant native vegetation and threatened species of the unit and to use a range of effective methods to protect a representative range of indigenous biodiversity of the unit as well as protecting and enhancing the viability of priority threatened species populations and their habitats in the unit.
- To provide new recreational facilities and opportunities by the Department and other organisations and concessionaires where natural and historic resources and cultural values are not compromised, and to liaise with adjacent landholders to resolve conflicts over access for recreation to land managed by the Department.
- To reduce and maintain rabbit and tahr densities to levels that ensure their adverse effects on natural values are minimised.

Other conservancy-wide priorities identified in the CMS that are relevant to tenure review on this property are to undertake necessary actions to secure the conservation of category A and B species, including predator control, fencing and habitat protection. The species listed as priority include *Carmichaelia kirkii*, the robust grasshopper, scree skink, long-toed skink, black-fronted tern and banded dotterel.

PART 4 ATTACHMENTS

4.1 ADDITIONAL INFORMATION

4.1.1 Scientific Names of Plant Species Cited in the Text

Common name..... Scientific name

(* = naturalised species)

blue tussock	<i>Poa colensoi</i>
bog-rush	<i>Schoenus pauciflorus</i>
bracken.....	<i>Pteridium esculentum</i>
broadleaf	<i>Griselinia littoralis</i>
broom*	<i>Cytisus scoparius</i>
browntop*	<i>Agrostis capillaris</i>
bush lawyer.....	<i>Rubus schmidelioides</i>
cocksfoot*.....	<i>Dactylis glomerata</i>
Douglas fir*	<i>Pseudotsuga menziesii</i>
European larch*	<i>Larix decidua</i>
fescue tussock	<i>Festuca</i> sp.
giant buttercup	<i>Ranunculus lyallii</i>
golden spaniard.....	<i>Aciphylla aurea</i>
inaka.....	<i>Dracophyllum uniflorum</i>
king devil*	<i>Hieracium praealtum</i>
korokio.....	<i>Corokia cotoneaster</i>
koromiko.....	<i>Hebe salicifolia</i>
kowhai	<i>Sophora microphylla</i>
manuka.....	<i>Leptospermum scoparium</i>
mat daisies	<i>Raoulia</i> spp.
matagouri	<i>Discaria toumatou</i>
mingimingi.....	<i>Coprosma propinqua</i>
mountain flax	<i>Phormium cookianum</i>
mountain ribbonwood.....	<i>Hoheria lyallii</i>
mountain totara	<i>Podocarpus hallii</i>
mountain wineberry	<i>Aristotelia fruticosa</i>
narrow-leaved snow-tussock	<i>Chionochloa rigida</i>
porcupine shrub	<i>Melicetyus alpinus</i>
radiata pine*	<i>Pinus radiata</i>
red tussock	<i>Chionochloa rubra</i>
silver beech	<i>Nothofagus menziesii</i>
silver tussock	<i>Poa cita</i>
sphagnum.....	<i>Sphagnum cristatum</i>
stonecrop*	<i>Sedum acre</i>
sweet vernal*	<i>Anthoxanthum odoratum</i>
tauhinu	<i>Ozothamnus leptophyllus</i>
tutu	<i>Coriaria sarmentosa</i>
willow*	<i>Salix</i> spp.
Yorkshire fog*	<i>Holcus lanatus</i>

4.1.2 References Cited

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4.2 ILLUSTRATIVE MAPS

Landscape Units Map - following page 4 in the body of the report

Topo/Cadastral Map -attached

Values Map - attached