

# **Crown Pastoral Land Tenure Review**

**Lease name : BLUE MOUNTAIN**

**Lease number : PT 031**

## **Conservation Resources Report - Part 1**

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

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

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

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# BLUE MOUNTAIN PASTORAL LEASE



## CONSERVATION RESOURCES REPORT

Department of Conservation

November  
2005

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## PART 1 INTRODUCTION

This report describes the significant inherent values present on Blue Mountain Pastoral Lease. Blue Mountain Pastoral Lease covers an area of approximately 9435 ha in the upper Orari River catchment in South Canterbury. Most of the property comprises moderately steep hill and mountain country, lying between approximately 350 m altitude beside the Orari River and over 1600 m on the Four Peaks Range. It includes the summits of Tripps Peak (1653 m), Blue Mountain (1642 m) and Mt Catherine (1264 m) on the northern Four Peaks Range, and Mt Frances (1025 m), Mt Edith (1089 m) and Grants Top (1010 m) between the Four Peaks Range and the Orari River. The property includes small areas of flat to gently-sloping country at lower altitudes in the east alongside The Orari River and in the main valleys. Most of the property is drained by The Orari River and its tributaries (Mowbray River, Bernard Stream and Andrews Stream), with a small area in the south drained by the Waihi River (see attached map).

Blue Mountain Pastoral Lease adjoins Lochaber Pastoral Lease across the Orari River to the northeast, privately-owned land to the south and southwest, and privately-owned parts of Blue Mountain Station to the north and east. The freehold parts of Blue Mountain Station adjoin Dry Creek Pastoral Lease to the northwest, Lochaber Pastoral Lease to the north and The Gorge Pastoral Lease to the east.

Blue Mountain Pastoral Lease lies within the Orari Ecological District, within Pareora Ecological Region. Orari Ecological District has not been surveyed as part of the Protected Natural Areas Programme. Two areas on the property are listed in the Proposed Mackenzie District Plan. Bernard Stream is listed as a Site of Natural Significance, and an area of patterned ground on Mt Edith is listed as a Geopreservation Site.

### **This report has been compiled from the following field survey reports:**

- Blue Mountain Pastoral Lease Landscape Assessment, Alan Petrie, November 2004, 9p + photographs + map.
- Blue Mountain Vegetation Report, Mark Davis, April 2005, 18p + map + appendices.
- Assessment of the Fauna Values of Blue Mountain Pastoral Lease, Jane Sedgely, April 2005, 18p + photographs + maps.
- Blue Mountain Pastoral Lease, A Report on the Aquatic Fauna Survey, Scott Bowie, April 2005, 13p + map.
- Blue Mountain Pastoral Lease Assessment of Entomological Values, Rowan Emberson and Pauline Syrett, March 2005, 8p + appendices + map + photographs.

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

### **2.1 LANDSCAPE**

#### **2.1.1 Landscape Context**

Blue Mountain Pastoral Lease is located on and around the Four Peaks Range, which is a complex of moderately-steep mountains overlooking the Canterbury Plains. The property spans a wide altitudinal and topographical sequence from 350 m in the southeast to 1653 m at Tripps Peak in the southwest on the Four Peaks Range. The main structural components of Blue Mountain Pastoral Lease are the north-south axis of the Four Peaks Range in the west and the lower Mt Edith ridge in the east. These ranges bisect the property. The western sides of the ranges are typically rounded in form, while the corresponding eastern faces are steeper and more dissected. The Four Peaks Range has significant visual resource values as it is clearly visible from the populated plains of South Canterbury.

#### **2.1.2 Landscape Description**

For the purposes of this landscape assessment Blue Mountain Pastoral Lease is divided into five landscape units (see attached map), principally reflecting changes in slope, aspect and ground cover. The criteria used to assess and evaluate the landscape values of each unit are based on the following attributes:

1. Naturalness: an expression of the indigenous content of the vegetative cover and the extent of human intervention.
2. Legibility: an expression of the clarity of the formative processes and how striking these processes are.
3. Aesthetic value: the memorability and naturalness of the area, including factors which can make a landscape vivid, such as simplicity in landform, muted colours and fine-textured ground cover.

Finally, visual values, which are a sub-set of landscape values and relate to the visibility of a particular landscape or natural feature as seen from key viewing points, are also assessed.

#### **Landscape Unit 1**

This unit covers the west-facing slopes of the Four Peaks Range. The lower limit to the unit follows the property boundary across Totara Spur and up the Mowbray River. The unit includes the narrow alluvial terraces alongside the river, which has its origins at Blue Mountain Pass. The dominant physical components of the unit are rounded ridges shaped by a deep mantle of colluvium, with intervening concave swale gullies. The upper slopes are slightly more dissected with patches of rock protruding on narrower ridges. In the south, the two basin-like valleys of Mathias and Eyre streams are steep in relief and asymmetrical in profile. Notable features are the streams, which have cut down through the colluvium.

The dominant vegetation of the unit is tall tussockland with short tussockland, golden speargrass and matagouri. Scree and mountain ribbonwood are present at the toe of the basins, and cushionfield is present near the crest of the Four Peaks Range. Modified grassland and pasture are present at lower altitudes and at stock-camps on spurs.

#### Landscape Values

The mid and upper sections of the unit (approximately south of the vertical fence line and above the musterers' hut in Totara Stream) have significant inherent landscape values attributable to the uniformity and simplicity of the tall tussockland over the rounded landform. In aesthetic terms the unit conveys a strong sense of visual coherence owing to the constant fine texture and monochromatic tonal range of the tall tussockland. The lower country that overlooks the upper Orari Valley has moderately high landscape values due to the gradual merging of the native and exotic vegetation.

#### Visual Values

This unit has high visual resource values as the upper slopes, and especially Mt Catherine, are clearly visible from Lochaber Road.

#### Potential Vulnerability to Change

Land uses and activities that have the potential to affect this unit include:

- Further spread of wilding pines.
- Introduction of blocks of forestry.
- Further subdivision fencing, which would lead to fragmentation of the existing coherent tall tussockland.

### **Landscape Unit 2**

This unit comprises the lower and mid slopes in the Bernard Stream valley at the northern end of the Four Peaks Range. The lower limit of the unit follows the property boundary. The unit is dominated by rounded topography resulting from the deep deposits of colluvium. Gentle side ridges of the Four Peaks Range are convex and separated by swale gullies.

The vegetation is mostly modified short tussockland with a higher proportion of native species on shadier slopes. Below 800 m there is a rapid transformation to improved pasture with spasmodic tussock cover. The lower country has been subdivided into a number of smaller grazing blocks with pasture. The unit contains the main access track to the Four Peaks Range.

#### Landscape Values

The unit has only moderate inherent landscape values due to the extent to which the original vegetation has been modified. A degree of naturalness still exists below the summit of Mt Catherine, which helps to protect the landscape integrity of the Four Peaks Range crest line.

#### Visual Values

The unit has a high visual resource values, as the main crest of the Four Peaks Range is clearly visible from along Lochaber Road.

#### Potential Vulnerability to Change

Land uses and activities that have the potential to affect this unit include:

- The introduction of large-scale geometric land uses such as plantation forestry.
- The erection of structures or excavation of tracks along the Four Peaks Range.

### **Landscape Unit 3**

This unit encompasses a large block in the centre of the property, defined in the west by the crest of the Four Peaks Range, in the east by Howards and McNaughtons Streams, in the north by a prominent fenced spur, and in the south by the property boundary along the upper Waihi River. The main physical features of the unit are long constant slopes dissected by small streams draining to Howards Stream. The upper slopes have stable scree faces and small rock outcrops, while the toe slopes are more convex due to the deep deposits of colluvium.

Lower and mid slopes are clad in short-stature snow tussock, with silver tussock, fescue tussock, matagouri and small-leaved *Coprosma* shrubs common near the toe of the slopes. Scree, cushionfield, sparse short tussock and stone pavement are present on the crest of the range. Southern slopes support shrubland and mountain ribbonwood.

#### Landscape Values

This unit has significant inherent landscape values due to the high degree of naturalness and few signs of human intervention. A notable feature is the legibility of the weathering processes on the scree faces. In aesthetic terms, the repetitive pattern of scree and inaka shrubland contrasts strikingly with the tussock-clad mid and lower slopes. This unit is a large tract of high country with remote and semi-wilderness qualities.

#### Visual Values

The unit has significant visual resource values. Tripps Peak is a prominent landmark that can be viewed from many public vantage points on the Canterbury Plains, including State Highway 1.

#### Potential Vulnerability to Change

Land uses and activities that have the potential to affect this unit include:

- Reduction of natural qualities by the introduction of structures.
- Unnecessary earth disturbances, such as the formation of tracks or bulldozed fence lines.

### **Landscape Unit 4**

This unit covers the west-facing slopes overlooking Bernard Stream in the north and Howards Stream in the south. The upper boundary of the unit follows the crest of the Mt Edith-Grants Top ridge. The northern and southern limits are the property boundaries. A distinctive natural feature is the planar slope in the central segment of the unit. This even-graded slope is slightly indented by watercourses and lacks any significant rock outcrops. The ends of the unit are characterized by undulating slopes dissected by irregular gullies.

Both the planar slope and the southern undulating country are clad in short-stature snow tussock with a wide distribution of silver tussock and fescue tussock. The ground cover becomes increasingly modified in the north with a higher proportion of introduced grasses.

#### Landscape Values

The central portion of this unit conveys significant inherent landscape values owing to the simplicity of the vegetative cover over the subdued topography. The lack of pattern and texture stands out from the surrounding undulating topography. In aesthetic terms, the unvarying nature of the tussockland provides the landscape with a coherence that is reinforced by the limited gold to copper colour range. The end sections of the unit are representative of the surrounding mid-altitude country.

### Visual Values

This unit has only moderate visual resource values as it is obscured from view from accessible public viewing points by the Four Peaks Range and high hills to the east.

### Potential Vulnerability to Change

Land uses and activities that have the potential to affect this unit include:

- Fragmentation of the tussockland through subdivision and intensification of land use.
- Spread of wilding pines.
- Erection of structures at inappropriate locations.

## **Landscape Unit 5**

This unit covers the large block of dissected hill country between the Mt Edith-Grants Top ridge and the Orari River. A complex of narrow ridgelines and irregular deep V-shaped valleys dominates the unit. The valley slopes frequently feature short steep spurs that accentuate the broken nature of the terrain. Many of the permanent streams radiate out from Mt Frances (1025 m), which is a prominent feature of the unit. In the north, McLeods and Hat spurs feature craggy rock formations.

The vegetation is generally modified short grasslands. Along the steep faces that overlook the Orari River there are continuous ribbons of mixed native shrubland and low forest, with pockets of broadleaf, kowhai and mountain ribbonwood. Alder is well established along the river edge.

### Landscape Values

The low foothills of the unit are representative of the adjoining hill country and form the physical setting to the deep rock-cut gorge of the Orari River. This river gorge conveys wild and scenic values owing to the spectacular rocky bluffs, swirling pools and whitewater torrents. The indigenous vegetation along the gorge helps reinforce the naturalness qualities of this special landscape feature.

### Visual Values

This unit has moderate visual resource values. Parts of it are clearly visible from readily-accessible public vantage points in the Orari Gorge (especially the public road to Andrews Stream) and from the popular track to Little Mt Peel. The vehicle track up the Orari Valley also provides good views of the unit.

### Potential Vulnerability to Change

Land uses and activities that have the potential to affect this unit include:

- Spread of wilding pines.
- Further loss of native shrublands along the edges of the Orari River.
- Further loss of shrubland remnants within the wider context of the Orari River gorge.

## **SUMMARY**

Blue Mountain Pastoral Lease makes an important contribution to the natural landscape character of the South Island high country. The property contains large tracts of tall tussockland over a wide assemblage of landforms and extending to a relatively low altitude. This provides an opportunity to protect an extensive natural landscape sequence centred on the Four Peaks Range. Limited development has meant the property retains an overall sense of semi-remoteness, one of the key characteristics of the South Island high country. Special features are the legibility of the processes that have created the landforms, especially the Orari Gorge, and the prominence of parts of the property from the Canterbury Plains, Orari Gorge, Mt Peel Range and Lochaber Road.



## 2.2 LANDFORMS AND GEOLOGY

The majority of Blue Mountain Pastoral Lease comprises moderately-steep slopes and summits of the Four Peaks Range, the Mt Edith-Grants Top ridge and Mt Frances. The property is characterised by broad tussock-covered slopes, exposed summit ridges, and small areas of lower-altitude valley floor and terrace. Blue Mountain Pastoral Lease includes the prominent summits of Tripps Peak (1653 m), Blue Mountain (1642 m) and Mt Catherine (1264 m) on the northern Four Peaks Range, and Mt Frances (1025 m), Mt Edith (1089 m) and Grants Top (1010 m) further east. Rock outcrops, bluffs and scree slopes are relatively uncommon, though gorges are present along some sections of river. Most of the property is drained by tributaries of the Orari River, with a small area south of Tripps Peak drained by the Waihi River.

Basement rocks of the property are mostly moderately-indurated greywacke and argillite of the Torlesse Group rocks, with an area of Tertiary sediments (marine greensand, siltstone and limestone) in Bernard Stream (Gair, 1967). The relatively small areas of flat or gently-sloping land at the edges of the property comprise fluvioglacial outwash deposits of the Otira Glaciation and recent alluvial deposits. A prominent fault-line runs approximately north-south through Bernard Stream valley. One geopreservation site is present in Bernard Stream: Mt Edith patterned ground is an extremely well-defined landform of scientific and educational value (Kenny and Hayward, 1998).

## 2.3 CLIMATE

Blue Mountain Pastoral Lease has a sub-humid hill country climate with cool to cold winters and mild dry summers. Annual rainfall in the area is between 800 and 1200 mm with snow lying at higher altitudes in winter. Predominant winds are from the northwest, though strong cold southerlies also affect the property (Tomlinson, 1976). The area experiences low annual and winter solar radiation and low rainfall deficits (Leathwick *et al*, 2003).

## 2.4 VEGETATION

### 2.4.1 Ecological Context

Blue Mountain Pastoral Lease is located within the Orari Ecological District, which is part of the Pareora Ecological Region (McEwen, 1987). Pre-human vegetation of the area was probably hardwood forest in low to mid altitude valleys with some podocarps in the upper Waihi, Andrews and lower Orari valleys. Mountain totara would have been more common in the past. Mountain beech may have been present, though it appears to have been rather limited in this area (Wardle, 2002). The forests would have given way to turpentine shrubland and tall tussockland on upper slopes. Dwarf inaka shrubland would have been associated with bluffs and other exposed sites, but was probably less common in the past. Cushionfield and herbfield would have been restricted to exposed high altitude sites and they too were probably less common in the past. Tall tussockland and short tussockland would have been much less extensive as they have been induced following the removal of forest. Wetlands would have been more extensive in the past.

The vegetation of adjacent properties is contiguous and of similar character. There are no protected areas on the property, and no Protected Natural Areas Programme surveys have been undertaken in the ecological district.

In their analysis of the Level II Land Environments on the property Leathwick *et al* (2003) propose that Land Environment Q1, covering higher-altitude parts of the property (c.39% of the property), originally supported low mountain totara-mountain toatoa forest. Land Environment Q2, covering mid-altitude slopes (c.53% of the property), is described as originally supporting podocarp-hardwood forest dominated by matai, totara, kahikatea, broadleaf, pokaka, lemonwood, narrow-leaved lacebark and lowland ribbonwood. Land Environment E3, covering gentler lower slopes in the central Bernard Stream-Howards Stream part of the property (c.7% of the property), is described as originally supporting forest dominated by mountain beech or mountain totara. Small areas of Land Environments K3 and Q3 (each <1%) are present at lower altitudes.

These data should be interpreted with caution, as the predicted extent and suggested vegetation types for each Land Environment have been extrapolated from limited field data. For example, the upper extent of mountain totara-mountain toatoa forest proposed by Leathwick *et al* (2003) (to the higher summits at over 1600 m) is unlikely, and the proposed extent of podocarp-hardwood forest (more than half the property) is also debatable.

Analysis of the extent to which the Land Environments of the property are represented within existing protected natural areas indicates that approximately 33% of Land Environment Q1, 8% of Land Environment Q2, 2.5% of Land Environment E3, 5% of Land Environment K3 and 25% of Land Environment Q3 are protected (Department of Conservation, *unpublished data*, 2004).

## 2.4.2 Plant Communities

Tall tussockland dominates much of the property. It is widespread on mid and upper slopes, extending down to lower slopes in the upper Waihi, Eyre and Mathias valleys. Short tussockland occurs on mid to lower slopes, though exotic grassland is often dominant there. Some lower valleys support small hardwood forest remnants, while the upper Waihi contains the only mountain totara seen on the property. Grey shrubland is associated with alluvial fans and terraces, stream sides, bluffs and rocky slopes, but is only extensive in the east. Rockland, cushionfield and herbfield are restricted to the high peaks of the Four Peaks Range, though talus patches occur throughout. Wetlands are largely restricted to seepages, except for a small terrace wetland adjacent to the Orari River.

Indigenous plant communities are described below for each of the four distinct parts of Blue Mountain Pastoral Lease.

### Four Peaks Range

This area has the greatest altitudinal range and contains examples of most plant communities on the property. It is dominated by tall tussockland, with narrow-leaved snow tussock on most mid to upper slopes, and slim snow tussock around Blue Mountain and Tripps Peak. Short tussockland and exotic grassland are prominent on lower slopes, fans and terraces. Small areas of shrubland and scrub occur in a number of stream valleys, the only hardwood forest remnant seen was in the upper Waihi Valley. Grey shrubland often occurs around rock outcrops, mountain foot-slopes, fans and terraces. Cushionfield, stonefield and rockland are associated with the higher peaks, though large rock outcrops are common in the upper Totara Stream valley. Wetlands are uncommon and restricted to small seepages on mountain slopes and fans.

Short tussockland

Lower slopes support short tussockland, except on the southwest side of the range where snow tussock predominates. Fescue tussock cover is less than 10%. Other species present are browntop, sweet vernal, mouse-ear hawkweed, catsear, blue tussock, cotton daisy, snowberry, tall oat grass, patotara, matagouri, *Pimelea oreophila*, mountain oat grass, bracken and harebell. Naturalness is low-medium, or low in areas dominated by exotic grasses. Silver tussock is characteristic of fans and stream terraces.

Tall tussockland

Most mid to upper mountain slopes are dominated by narrow-leaved snow tussockland, with snow tussock cover varying from 20% to 50%. Other prominent species are mouse-ear hawkweed, cotton daisy, fescue tussock, blue tussock, *Pimelea oreophila*, browntop, sweet vernal, *Raoulia subsericea*, snowberry, *Pentachondra pumila*, *Pimelea pseudo-lyallii* (threat status: sparse), lichens, mosses, king devil hawkweed, *Rytidosperma unarede*, red woodrush, mountain clubmoss, *Carex breviculmis*, harebell, tumble grass, *Luzula traversii*, *Leucopogon colensoi*, *Viola cunninghamii*, turpentine shrub and sun orchid. Naturalness is usually medium. In the lower reaches of Eyre Stream, snow tussock extends onto river terraces at altitudes between 700 and 800 m. Tussock cover is around 30% and naturalness is low-medium to medium. The presence of this community at this altitude is significant. It also contributes, with the plant communities above, to an important vegetation sequence.

Narrow-leaved snow tussock grades into slim snow tussock at about 1500 m on sunny slopes, and at lower altitudes on shady slopes. On western slopes below Tripps Peak, slim snow tussock has a cover of 30% to 40% though this includes hybrids with narrow-leaved snow tussock. Other species include false speargrass, cotton daisy, blue tussock, mouse-ear hawkweed, *Luzula traversii*, *Epilobium glabellum*, red woodrush, mountain oat grass, *Anisotome flexuosa* and patotara. Naturalness is medium to medium-high. On south-facing slopes a similar community is present, though tussock cover is greater at 60%. Additional species include snow daisy, *Raoulia grandiflora*, mountain clubmoss, *Rytidosperma pumilum*, dwarf speargrass and kopoti. Sheep tracks are common and there is grazing damage to slim snow tussock and false speargrass. Both communities are representative of the original slim snow tussockland, although their extent and naturalness have been reduced by burning and grazing.

The upper east branch of Totara Stream supports riparian vegetation of narrow-leaved snow tussock, cotton daisy, Maori onion, *Anisotome filifolia*, golden speargrass, bog rush, *Hebe odora*, creeping mapou, everlasting daisy, little hard fern, mouse-ear hawkweed, *Pimelea pseudo-lyallii*, lily of the valley shrub, dainty daisy, mosses, tumble grass, exotic grasses, *Astelia nervosa*, mountain flax, prickly shield fern, mountain kiokio, thousand-leaved fern and Canterbury broom (threat status: range restricted). Naturalness is medium to medium-high. Ninety-eight Canterbury broom and five coral broom plants (threat status: gradual decline) were recorded here and additional plants were seen in the distance. The lower reaches of Totara Stream support riparian shrublands of mingimingi, matagouri, mountain ribbonwood, tutu, giant speargrass, golden speargrass, mountain kiokio, prickly shield fern, narrow-leaved snow tussock, thousand-leaved fern, mountain clubmoss and cotton daisy. At least four Canterbury broom plants were seen here.

Cushionfield and herbfield

On gentle high spurs, severe degradation of slim snow tussockland has resulted in increased areas of cushionfield and herbfield. Slim snow tussock is reduced to 15% to 20% cover and mouse-ear hawkweed is up to 50% cover. Other species are blue tussock, sheep's sorrel, *Raoulia subsericea*, *R. petriensis* (threat status: range restricted), *R. australis*, *R. grandiflora*, *Kelleria dieffenbachii*, *Phyllachne colensoi*, *Carex breviculmis*, mosses, red woodrush, *Anisotome flexuosa*, *Agrostis subulata* (threat status: range restricted),

*Colobanthus acicularis*, *Colobanthus strictus?*, *Stellaria gracilentia*, *Celmisia sessiliflora* and dainty daisy. The naturalness of these communities is low-medium to medium.

#### Rockland

Rock outcrops are scattered through the area, boulderfield occurs on gentle summit slopes and talus patches are scattered throughout. They support an extensive lichen cover but few other plants, with the exception of shrublands on their margins at lower altitudes.

Large rock outcrops are widespread in the east branch of Totara Stream. Associated plants are turpentine shrub, cotton daisy, narrow-leaved snow tussock, *Helichrysum intermedium*, *Pimelea traversii*, *Hebe amplexicaulis* (threat status: range restricted), *H. pinguifolia*, blue tussock, *Anisotome flexuosa*, *A. filifolia*, *Rytidosperma pumilum*, *R. buchananii*, *Colobanthus acicularis*, mosses, lichens, *Brachyscome radicata*, creeping mapou, *Pentachondra pumila*, patotara, mountain oat grass, *Stellaria gracilentia*, mouse-ear hawkweed and king devil hawkweed. Naturalness is medium-high, or medium in areas accessible to stock. Adjacent rubbly talus supports additional species including golden speargrass, *Acaena novae-zelandiae*, *Hebe amplexicaulis*, blue wheatgrass and white fuzzweed. Naturalness is again medium-high. Both represent original communities, especially on rock outcrops.

Erosion gullies and rock slides support a sparse but distinctive community. Plants observed on a northern slope below Tripps Peak were *Hebe amplexicaulis*, *Helichrysum plumeum* (threat status: range restricted), *H. intermedium*, white fuzzweed, *Chrysanthemum leucanthemum*, *Myosotis australis?*, *Myosotis* sp "broadleaf", harebell and *Euchiton luteoalbum*.

#### Shrubland and scrub

Shady lower slopes in the Waihi Valley support regenerating shrubland in side gullies and adjacent to the river. Common plants are matagouri, mingimingi, three finger, broadleaf, *Coprosma ciliata*, *C. rugosa*, *C. serrulata*, mountain ribbonwood, mountain akeake, koromiko, prickly shield fern and mountain kiokio. Mountain totara is present in the main area of scrub. The naturalness of shrublands visited is medium-high. The Mathias Valley has a scattered riparian shrubland of mountain wineberry, korokio, mingimingi, *Coprosma ciliata*, matagouri, mountain ribbonwood, Canterbury broom, giant speargrass and golden speargrass. *Helichrysum intermedium* and *Hebe amplexicaulis* are common on adjacent bluffs, and naturalness is medium to medium-high.

Turpentine shrubland occurs on mid altitude shady slopes, such as northeast of Tripps Peak, where turpentine shrub cover is 25% to 50%. Other species are narrow-leaved snow tussock, mountain kiokio, prickly shield fern, giant speargrass, *Coprosma ciliata* and mountain flax. The ground surface is dominated by cotton daisy, mosses, fescue tussock, lichens, turpentine shrub, narrow-leaved snow tussock, mouse-ear hawkweed and browntop. Naturalness is medium, but it would be higher in denser shrublands where there is less space for exotic plants.

Steep southern slopes of Tripps Peak support a prostrate shrubland dominated by dwarf turpentine shrub, which has a cover of more than 50%. Other species include *Celmisia viscosa*, blue tussock, slim snow tussock, lichens, mountain clubmoss, dwarf speargrass, snow daisy, *Raoulia grandiflora*, *Kelleria dieffenbachii* and *Carex breviculmis*. Naturalness is medium-high, despite grazing damage to slim snow tussock. A similar community occurs on shattered rock outcrops, additional species being *Brachyglottis bellidioides*, *Anisotome flexuosa*, false speargrass, *Celmisia haastii?*, *Schizeilema hydrocotyloides*, *Rytidosperma pumilum*, mosses, edelweiss, *Phyllachne colensoi*, *Chionohebe pulvinaris*, *Euphrasia zelandica* agg. and mouse-ear hawkweed. Naturalness is medium-high to high, with minor

stock disturbance and grazing impacts. These communities are representative of original prostrate shrublands.

Talus margins among narrow-leaved snow tussockland support shrubland. At a site in the upper Mowbray Valley, the main species are matagouri, mingimingi, mountain ribbonwood, *Coprosma ciliata*, *Hebe subalpina*, *H. traversii*, porcupine shrub, bracken, golden speargrass, prickly shield fern, common broom, scrub pohuehue, native jasmine, lawyer, thousand-leaved fern, little hard fern, narrow-leaved snow tussock and exotic grasses. Three gooseberry plants were seen. Naturalness is only medium due to stock damage and the presence of exotic plants. These shrublands represent elements of original woody communities, but they are less extensive and some species are likely to be absent.

#### Fernland

In the Waihi Valley, fernland is extensive on lower slopes adjacent to shrubland and tall tussockland. Mountain kiokio has a cover of 75% to 80%. Other species are turpentine shrub, inaka, mosses, mountain flax, narrow-leaved snow tussock, emergent broadleaf, *Hebe odora* and *Astelia nervosa*. Additional species nearby include *Chionochloa conspicua*, *Coprosma serrulata*, three finger, creeping mapou, *Hebe tetrasticha*, mountain clubmoss, golden speargrass, prickly shield fern, lily of the valley shrub, cotton daisy, *Celmisia coriacea*, *Rubus cissoides* and occasional coral broom. Naturalness is high. This fernland is largely induced by burning and is now returning to woody vegetation.

#### **Edith Ridge**

This northwest-southeast trending ridge is dominated by snow tussock, with small seepages. Small rock outcrops and talus patches sometimes support scattered shrubs.

On western slopes narrow-leaved snow tussock has a cover of 25% to 50%. Additional species are cotton daisy, browntop, sweet vernal, mouse-ear hawkweed, catsear, *Euphrasia zelandica* agg., wire moss, *Raoulia subsericea*, *Brachyglottis bellidioides*, harebell, *Pimelea oreophila*, patotara, matagouri, Yorkshire fog, white clover, *Carex breviculmis*, mosses and *Ranunculus multiscapus*. Naturalness is low-medium, though in gullies and on shady slopes, where tussock density is greater, naturalness is medium. On eastern slopes tussock cover is up to 60%. Other prominent species are mouse-ear hawkweed, *Raoulia subsericea*, browntop, sweet vernal, mountain oat grass, red woodrush, patotara, harebell, sun orchid, purging flax, golden speargrass, bracken, fescue tussock, cotton daisy, *Pimelea oreophila*, blue tussock and snow gentian. Naturalness is medium. Adjoining shady slopes have a tussock cover of 70% to 90% and naturalness of medium to medium-high as there is less hawkweed. Tall tussock communities on foot-slopes are more modified and cover is sparse. On an eastern slope, these tussocks have a cover class of approximately 25% and naturalness is low-medium, or less in more open patches.

Rock outcrops and talus patches are scattered across the area. Some support very small and open patches of grey shrubland. On upper slopes west of Mt Edith, a pile of large angular rocks supports abundant mosses and lichens, mountain ribbonwood, mingimingi, prickly shield fern, thousand-leaved fern, mountain flax, giant speargrass, cotton daisy, narrow-leaved snow tussock, and a range of exotic and indigenous grasses. Naturalness is medium to medium-high. This shrubland represents elements of original woody communities which would have been much more common in the past.

Substantial seepages occur on rolling tops southwest of Mt Edith. They are dominated by red tussock and narrow-leaved snow tussock hybrids, which have a total cover of 50% to 70%. Other species are mosses, bog rush, browntop, Yorkshire fog, catsear, mouse-ear hawkweed, *Euphrasia zelandica* agg., cutty grass, cotton daisy, small grassland orchid,

fescue tussock, kopoti, *Viola cunninghamii*, *Pimelea pseudo-lyallii*, Maori onion and dainty daisy. Naturalness varies from low-medium to medium-high. These seepages extend downhill onto steeper shady slopes. On lower western slopes near the stone hut, smaller seepages have a patchy tussock cover and more exotic species. Their naturalness is low-medium or medium.

### Northeast Valleys

This area supports widespread exotic grassland on mid to lower slopes, merging into tall tussockland on the upper slopes of Hat Spur and Mt Frances. Grey shrubland is common on slopes above the Orari River and on rocky terraces, but is smaller and scattered west of Hat Spur. Gullies and shady slopes below Mt Frances support hardwood forest remnants. The largest lowland wetland on the property occurs on a terrace beside the Orari River, and small seepages occur among tall tussockland. The Orari River margins support a weedy riverbed community.

The Orari River margins are characterised by colonising plants such as browntop, white clover, haresfoot trefoil, *Acaena inermis*, monkey musk, bog rush, creeping pohuehue, mouse-ear hawkweed, silvery hair grass, *Raoulia tenuicaulis*, *R. hookeri?*, scabweed, selfheal, lotus, *Epilobium* spp., patotara, yarrow, sheep's sorrel, pearlwort and matagouri. Alder seedlings are abundant and naturalness is low-medium. This community contains elements of original riparian communities, but plant succession is disrupted by exotic plants.

Exotic grassland dominates lower and mid slopes, including the Orari River terraces. Browntop is dominant. Other species are sweet vernal, tall oat grass, thistles (Californian, Scotch and nodding), catsear, onion-leaved orchid, silver tussock, low matagouri, mingimingi, sweet brier, common broom and sparse fescue tussock. The mat daisy *Raoulia glabra* was found on a terrace riser in this area. Browntop-dominated grassland is also common between patches of narrow-leaved snow tussockland on the top of Hat Spur. On drier eastern and northern slopes plants include mouse-ear hawkweed, fescue tussock, blue tussock, patotara, porcupine shrub, mingimingi, woolly mullein, viper's bugloss, bracken, matagouri, nodding thistle and grasses. The naturalness of the grassland is low or low-medium. It poorly represents the original grassland as most areas have been induced and are dominated by exotics.

The upper slopes on Mt Frances and the western side of Hat Spur are dominated by narrow-leaved snow tussockland, with a tussock cover between 40% and 60%. Other species include browntop, matagouri, sweet vernal, mouse-ear hawkweed, golden speargrass, fescue tussock, wire moss, Yorkshire fog, blue wheatgrass, harebell, *Viola cunninghamii*, *Pimelea pseudo-lyallii*, patotara, white clover, cotton daisy, mosses, lichens, blue tussock, catsear, matagouri, bracken, *Carex breviculmis*, tumble grass, *Luzula traversii*, everlasting daisy and mountain oat grass. Naturalness is medium, declining to low-medium on summit ridges and lower sunny slopes where tussock cover is less.

Grey shrubland supports matagouri, porcupine shrub, mingimingi, korokio, mountain wineberry, sweet brier, common broom, lawyer and scrub pohuehue. Kanuka, mountain akeake, broadleaf and tauhinu occur less commonly, while *Hebe amplexicaulis* and *Helichrysum intermedium* are found on rock outcrops. Two large willows, exotic broom and Himalayan honeysuckle were seen in or near riparian shrubland by the Orari River. Talus slopes are dominated by mingimingi, with less matagouri, bracken, mountain wineberry, porcupine shrub, scrub pohuehue, lawyer and sweet brier. Two cabbage trees and one broadleaf tree were also seen. The understorey and margins support tall oat grass, browntop, sweet vernal, mouse-ear hawkweed, blue tussock, blue wheatgrass and bracken. The naturalness of these shrublands is low-medium to medium-high.

A scrub community in the upper shady slopes of a catchment immediately east of Mt Frances, contains mountain flax, emergent broadleaf, mountain ribbonwood and grey shrubs. Hardwoods such as broadleaf, mountain ribbonwood, kohuhu and three finger become prominent near the forks. This is probably one of the larger scrub remnants on the property, though the lower portion is outside the pastoral lease. The shrub daisy *Olearia fragrantissima* (threat status: sparse) is present at two locations on the southeast slopes of Mt Frances (DOC database).

The wetland on the Orari River terrace at 370 m altitude is the largest lowland wetland on the property. It is approximately 300-400m x 30-50m and is classed as a marsh. Its taller vegetation is dominated by bog rush, sparse pukio, *Carex virgata* and scattered mingimingi. The pedestals support sweet vernal, little hard fern, Yorkshire fog, cocksfoot and crested dogstail. Areas of shallow water support a diversity of species such as retoreto, mosses, *Myriophyllum propinquum*, *Ranunculus amphitrichus*, monkey musk, lotus, glaucous sweetgrass, jointed rush, cutty grass, *Epilobium macropus*, *E. brunnescens*, spike sedge, soft rush, *Microseris scapigera*, watercress, water forget-me-not, *Eleocharis gracilis?* and selfheal. Plants of the drier margins include exotic grasses, cutty grass, *Juncus gregiflorus*, bog rush, lotus, jointed rush, white clover, *Microseris scapigera* and Scotch thistle. Naturalness is low-medium to medium. This wetland represents an original community, though hydrological and successional processes have been compromised.

Hat Spur supports a number of small seepages, the best one being immediately below the vehicle track at the south end of the spur. Common plants present are mosses, *Gonocarpus micranthus*, *Hypsela rivalis*, *Euchiton mackayi*, *Ranunculus maculatus*, slender spike sedge, *Juncus antarcticus* and dainty daisy. Bog rush, soft rush, browntop and sweet vernal dominate the margins. Naturalness is medium to medium-high as exotic plants and grazing impacts are limited. Most of the other seepages on Hat Spur appear to be dominated by exotic plants, especially browntop.

### Andrews Stream Catchment

Exotic grassland dominates this area. Within this, snow tussock is found on some upper slopes and small areas of shrubland and hardwood forest occupy some lower riparian slopes and gullies. A modified riverbed community occurs on the margins of Andrews Stream.

The grassland is dominated by browntop (>50% cover). Other species are fescue tussock, sweet vernal, prickly shield fern, cotton daisy, thistles, matagouri and mingimingi. Naturalness and representativeness are low. On higher slopes grassland merges into sparse narrow-leaved snow tussockland, with continuous snow tussock being restricted to Mt Frances. On western slopes of Mt Frances, snow tussock cover is around 50%. Other species are mosses, *Raoulia subsericea*, browntop, snowberry, cotton daisy, mouse-ear hawkweed, lichens, *Euphrasia zelandica* agg., *Carex breviculmis*, *Rytidosperma buchananii*, little hard fern, patotara, white clover, *Gonocarpus montanus*, harebell, catsear, *Kelleria dieffenbachii*, mountain kiokio, blue tussock, fescue tussock and matagouri. Naturalness is medium. Southern slopes have a higher tussock cover of 50% to 80%. Tussock cover is patchy on northern slopes. Summit ridges and spurs are more modified with fescue tussock, browntop, sweet vernal and mouse-ear hawkweed dominant. Overall, the tall tussockland here is typically of medium naturalness and low representativeness.

Small areas of shrubland and scrub occur on lower slopes above Andrews Stream, especially where bedrock is present. They support matagouri, mountain wineberry, porcupine shrub, mingimingi, *Coprosma rigida*, *C. ciliata*, broadleaf, mountain ribbonwood, *Fuchsia perscandens*, mountain kiokio, prickly shield fern, thousand-leaved fern, scrub pohuehue, lawyer, native jasmine, exotic grasses and foxglove. Less common are lily of the valley

shrub, weeping mapou, mountain akeake and kohuhu. Elderberry is scattered through these remnants and can be locally common. Naturalness is typically medium.

Lowland hardwood forest remnants are present in the valley south of Mt Frances close to Andrews Stream especially on western slopes where it extends further up the valley. The main species present are broadleaf, mountain ribbonwood and fuchsia, with less wineberry, kohuhu, three finger, kowhai and rare cabbage trees. The forest margins and open areas support mingimingi, *Coprosma rugosa*, *C. rigida*, mountain wineberry, weeping mapou, fuchsia, koromiko, *Melicope simplex*, *Fuchsia perscandens*, pohuehue, scrub pohuehue and lawyer. The largest trees are broadleaf and kowhai at around 6 to 8 m high. Beneath the open canopy, rubbly ground surfaces are dominated by prickly shield fern and wall lettuce, with abundant leaf litter. Other species include thousand-leaved fern, foxglove and *Cardamine debilis*. The forest is patchy on eastern slopes with a zone of prickly shield fern and mountain kiokio extending to the open grasslands above.

In the same valley, ephemeral stream margins support exotic grasses, mosses, monkey musk, *Pratia angulata* agg., wall lettuce, *Fuchsia perscandens*, fuchsia, mingimingi, *Coprosma rugosa*, *Acaena fissistipula*, tutu, silver tussock, selfheal, mountain akeake, broadleaf, koromiko, foxglove, prickly shield fern, mountain kiokio, little hard fern, thousand-leaved fern and rare Himalayan honeysuckle. Woody plant regeneration is greater here than in the forest. Overall naturalness is medium, reflecting the presence of many exotic plants and cattle damage. This remnant contains important elements of the original forests, though its structure and species composition has changed.

The stony edges of Andrews Stream support colonising plants such as white clover, exotic grasses, lotus, *Acaena inermis*, creeping buttercup, Californian thistle, *Epilobium* spp, pearlwort, tutu, silvery hair grass, willow weed and foxglove. Occasional grey willow, gorse, Himalayan honeysuckle and bittersweet are also present. Rocky sidewalls support broadleaf, mountain akeake, koromiko, mingimingi, *Fuchsia perscandens*, lily of the valley shrub, matagouri, *Carmichaelia angustata*, lawyer, blue tussock, tutu, mosses, lichens, exotic grasses, *Lagenifera petiolata*, harebell, prickly shield fern, mountain kiokio, necklace fern and sometimes Canterbury broom. Overall, the stream corridor is of medium naturalness and it represents important elements of the original communities.

## SUMMARY

- High-altitude tall tussockland is widespread on the Four Peaks Range, and is generally in moderate condition. It includes original slim snow tussockland and limited original narrow-leaved snow tussockland.
- Subalpine narrow-leaved snow tussockland is extensive on the Four Peaks Range, on the upper slopes of the Mt Edith ridge and Mt Frances. It is generally in moderate condition and has largely been induced. Montane snow tussockland occurs on the lower slopes of the Mt Edith ridge, the west side of Hat Spur and below Mt Frances. It tends to be more modified.
- Short tussock grassland is less widespread in lowland, montane and subalpine areas, and it is of lower naturalness. It is mostly induced except on recent surfaces such as floodplains, terraces and fans.
- Rockland supports original shrubland, sparse herbs and grasses in very good or moderate condition on the Four Peaks Range where rock outcrops, talus and cushionfield are widespread. Some near summit ridges have been damaged by stock and grazing. The Orari River and Andrews Stream corridors have some rock outcrops and talus, and talus patches also occur on the Mt Edith ridge. Plant communities associated with these are usually in moderate condition.



- Riverbed communities of the Orari River and Andrews Stream are modified due to exotic plants. They represent elements of original communities but plant succession is compromised, most notably by alder along the Orari River.
- A subalpine red tussock seepage occurs near Mt Edith and smaller seepages are scattered through the tall tussockland. Some are in moderate condition, but others are more modified. The only lowland wetland of any size is on a terrace of the Orari River, and it is quite strongly modified. All wetlands retain elements of the original communities.
- Shrubland occurs in gullies and on lower slopes of the Four Peaks Range, and above the Orari River and Andrews Stream. It includes matagouri, grey shrubland and regenerating hardwoods, and is usually in moderate condition. Hardwood scrub is restricted to the upper Waihi Valley and valleys below Mt Frances, including some lowland examples. Mountain totara is also found in the upper Waihi Valley. These communities represent the original pre-human woody vegetation.
- There are many altitudinal sequences across the property, but those on the eastern side are more limited and more modified.
- Attached map shows areas of important botanical value on the lease.

### 2.4.3 Notable Flora

Notable plant species recorded from Blue Mountain Pastoral Lease are listed in Table 1 below. Threat categories\* are those proposed by de Lange *et al* (2004).

**Table 1** Notable plant species, Blue Mountain Pastoral Lease.

Plant Species	Known Distribution on Property
<b>Gradual Decline*</b>	
<i>Carmichaelia crassicaule</i> (coral broom)	Most abundant in upper Eyre valley; and scattered through the Waihi River, Mathias and Totara Stream catchments.
<b>Sparse*</b>	
<i>Aciphylla subflabellata</i>	Near Mt Frances; and two localities adjacent to McLeod Spur.
<i>Olearia fragrantissima</i>	Southeast slopes of Mt Frances.
<i>Pimelea pseudo-lyallii</i>	Five localities among snow tussock on Four Peaks Range; and one on Hat Spur.
<i>Ranunculus maculatus</i>	Orari terrace wetland.
<b>Range Restricted*</b>	
<i>Agrostis subulata</i>	Blue Mountain summit.
<i>Carmichaelia torulosa</i> (Canterbury broom)	Found in six river valleys or gullies; and likely to occur in other gorge habitats. The largest population is in Totara Stream catchment.
<i>Hebe amplexicaulis</i>	Rock outcrops and bluffs in Totara Stream; near Mathias Stream; the Orari River; in a gully northeast of Tripps Peak; and at the bottom of Hat Spur.
<i>Helichrysum plumeum</i>	Shattered bedrock/rubble in Totara Stream; and in gully northeast of Tripps Peak.
<i>Raoulia petriensis</i>	Tripps Peak summit cushionfield.
<b>Data Deficient*</b>	
<i>Vittadinia australis</i> agg.	On shattered bedrock and fine rubble at a number of localities across the property.
<b>Original woody species, now much reduced in extent.</b>	
<i>Podocarpus hallii</i> (mountain totara)	Upper Waihi River Valley among scrub.

## 2.4.4 Problem Plants

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

### Wilding pines

Wilding pines are scattered across the property in many localities. They appear to be mostly *Pinus radiata* but Douglas fir and *Pinus contorta* are also present. There are mature conifers around the huts at Andrews Stream and three trees at Totara Stream hut. A silver birch is also present at the Totara Stream hut. *Pinus contorta* is spreading near the confluence of Mathias and Eyre streams. No attempt has been made to list wilding localities as they are too numerous and likely to be present in areas that were not visited. They need to be removed from any areas that become protected, and should be controlled elsewhere.

### Alder

Alder is abundant in the Orari River corridor, adjacent to the property. The upstream infestation is severe, though some control has been undertaken. The potential for further spread is serious and further control is urgently needed to prevent further spread and degradation of riparian margins.

### Grey willow

A grey willow seedling was removed from a rubbly gully northeast of Tripps Peak, two were removed from the Waihi River headwaters and several were seen on the margins of lower Totara Stream. Grey willow is also present in Andrews Stream and along the Orari River. Grey willow should be removed while its numbers are low.

### Gorse

A single gorse plant was seen on a bulldozed fenceline near Blue Mountain Pass. Gorse is also present in Andrews Stream near the confluence of Pinckney Stream. These plants should be removed from any areas that become protected.

### Spanish heath

One small patch was recorded on the east slopes of Tripps Peak. This infestation should be removed.

### False tamarisk:

One plant of false tamarisk was pulled from the riverbed on the property boundary in the Upper Waihi River. This area should be monitored for further infestations, and all new infestations promptly removed.

Elderberry and Himalayan honeysuckle are present in the Andrews Stream corridor. Three gooseberry plants were seen among talus shrubland on western slopes above the Mowbray River. Infestations of elderberry and gooseberry should be removed to prevent further spread.

## 2.5 FAUNA

### 2.5.1 Birds

Blue Mountain Pastoral Lease lies within a wider area that provides important remnant habitat for forest birds and in a catchment that provides important habitat for riverine birds. New Zealand pigeon (threat status: gradual decline), New Zealand falcon (gradual decline) and blue duck (nationally endangered) have been recorded just east of the property on Lochaber Pastoral Lease and just south of the property in the upper Waihi Valley (Mike Harding, 2005, *unpublished data*). The Orari River is listed as a Site of Special Wildlife Interest. Bird species recorded on the river include banded dotterel (gradual decline), black-fronted tern (nationally endangered), black-billed gull (serious decline) and blue duck.

Blue Mountain Pastoral Lease contains rivers and streams that are likely to be significant for blue duck. There are records from Bernard, Howards and Eyre streams on the property, the Mowbray and Orari rivers immediately adjacent to the property, and Pickaxe, Coopers and Black Birch streams near the property, (DOC database; O'Donnell, 2000). A recent (2005) survey of river tributaries in South Canterbury confirmed the presence of blue duck in three locations in the wider area: Lynn Stream, Saddle Hut Creek and the upper Waihi River (Mike Harding, *unpublished data*). The rivers and streams in the vicinity of Blue Mountain Pastoral Lease provide important habitat for this remnant population of a nationally-endangered species.

Birds observed on Blue Mountain Pastoral Lease are described below for the eight main locations surveyed, and are listed in Table 2 and Table 3.

#### **Left branch Basin Stream/McLeods Spur**

This area extends south from Basin Stream Hut along the left branch of Basin Stream, west of McLeods Spur. Dominant habitats are grazed pasture, short-tussockland, and matagouri-dominated shrubland. Small areas of outcropping rock are present on hill-slopes and stream banks, and large willows grow on the banks of Basin Stream near the hut. The shrubland provides habitat for several bird species. Silvereve and grey warbler were present throughout. Also recorded were welcome swallow, Australasian harrier and southern black-backed gull. Welcome swallows were numerous around the hut and are likely to be nesting or roosting inside. Yellowhammers were abundant, and blackbird and goldfinch were also recorded.

#### **Orari River and wetland**

At the base of the eastern slopes of Hat Spur adjacent to the Orari River in the northeast part of the property is a small marsh. Shrubland is present on the western side of the marsh and extends up onto the hill slopes. Rock outcrops and areas of talus are present on higher slopes. The marsh is a mosaic of rushes, sedges, lotus and pasture. In its current state the wetland does not appear to be particularly suitable for wetland birds such as marsh crake. The banks of the Orari River adjacent to the property are bluffed and well-vegetated with indigenous vegetation and thickets of alder. The river banks and areas of shrubland provide ample roosting, feeding and nesting habitat for birds.

Silvereve, grey warbler, South Island fantail, welcome swallow and a number of introduced passerines (redpoll, chaffinch, blackbird and song thrush) were recorded in the indigenous shrubland and alder thickets. Spur-winged plover and Australasian harrier were recorded in the wetter areas, and white-faced heron and black shag on the river banks. Approximately nine black shags (sparse) were seen roosting together on the rock outcrops and in cabbage

trees. The presence of such a large number of individuals suggests black shags are breeding nearby.

### **Rock outcrop and shrubland, Hat Spur**

A large rock outcrop and areas of shrubland at the bottom of Hat Spur in the northeast of the property provide feeding, roosting and nesting habitat for birds. Silvereeye and grey warbler were present in the shrublands. Two New Zealand falcons were observed attacking an Australasian harrier. The rock outcrop may provide suitable nesting habitat for falcon.

### **Bernard Stream and Howards Stream**

These two streams run through the centre of the property. Bird habitat along the streams varies. Habitats along Bernard Stream are relatively developed and dominated by pasture, a few tussocks and scattered matagouri shrubland. For a small section in its mid-reaches Bernard Stream runs through a well-vegetated rocky gorge, with snow tussock and toetoe. Near the saddle between Bernard Stream and Howards Stream there is an area with small screes and mountain ribbonwood.

Grey warbler and silvereeye were present in the shrublands. Paradise shelduck and New Zealand pipit were observed in the grasslands along the streams. Introduced birds present included yellowhammer, dunnoek, chaffinch and skylark. No blue duck faecal sign was found in the small stretches of streams searched during daytime. However, both streams, and Bernard Stream in particular, appear to contain habitat suitable for blue duck.

### **Totara Stream and shrublands**

Totara Stream is located on the western side of the property east of Totara Spur. The area assessed extends downstream from an old stone hut at the end of the vehicle track. The stream banks are well vegetated and particularly diverse in the upper reaches, with mountain ribbonwood, grey shrubland, *Olearia* shrubland, grassland and rock outcrops. Grey warbler and silvereeye were recorded throughout the shrubland. Welcome swallow was also present. Introduced passerines were abundant. No blue duck faecal sign was found in the small stretch of stream searched during daytime. However, Totara Stream appears to contain habitat suitable for blue duck.

### **Mowbray River and shrublands**

Mowbray River and the east-facing hill-slopes along the southeast edge of the property were assessed. Tussocks are taller and denser, particularly on slopes above Mathias and Eyre streams. Forest remnants and shrublands on the lower slopes include mountain ribbonwood and cabbage tree. Grey warbler and silvereeye were common throughout the shrubland. Welcome swallow and paradise shelduck were also recorded. Numerous introduced passerines were present. No blue duck faecal sign was found in the small stretch of river searched during daytime. However, the river appears to contain habitat suitable for blue duck.

### **Andrews Stream and Pinckney Stream**

Andrews Stream flows along the southeast boundary of the property. The central part of Andrews Stream above Pinckney Stream and the lower part of Pinckney Stream were assessed. Habitats include pasture, tussockland, shrubland and remnants of forest. Grey warbler, silvereeye, South Island fantail and welcome swallow were recorded in the shrubland, and white-faced heron and black shag along the river. No blue duck faecal sign

was found in the small stretches of streams searched during daytime. However, both streams appear to contain habitat suitable for blue duck.

**Uplands: Mt Catherine, Blue Mountain, Tripps Peak, Mt Edith and Mt Frances**

The high altitude areas of the property assessed were Mt Catherine, Blue Mountain and Tripps Peak in the Four Peaks Range, and Mt Edith and Mt Frances in the eastern part of the property. Habitats mainly consist of varied rockland including outcrops, scree, talus and fellfield. New Zealand pipit, Australasian harrier, southern black-backed gull and New Zealand falcon were recorded in these habitats. A falcon was seen perched on a rock outcrop between Mt Catherine and Blue Mountain. Australian magpie occurred up to fairly high altitudes, and chukor was also heard.

**Table 2** Indigenous bird species recorded from Blue Mountain Pastoral Lease.

<b>Bird species</b> Common name	Scientific name	<b>Known Distribution on Property</b>
Australasian harrier black shag	<i>Circus approximans</i> <i>Phalacrocorax carbo novaehollandiae</i>	Shrublands throughout. Orari River; Andrews Stream.
blue duck*	<i>Hymenolaimus malacorhynchos</i>	Upper Waihi River.
grey warbler	<i>Gerygone igata</i>	Shrublands throughout.
New Zealand falcon	<i>Falco novaeseelandiae "eastern"</i>	Four Peaks Range, Hat Spur.
New Zealand pipit	<i>Anthus novaeseelandiae</i>	Uplands; Bernard Stream.
paradise shelduck	<i>Tadorna variegata</i>	Bernard Stream; Mowbray River.
silvereve	<i>Zosterops lateralis lateralis</i>	Shrublands throughout.
southern black-backed gull	<i>Larus dominicanus dominicanus</i>	McLeods Spur
South Island fantail	<i>Rhipidura fuliginosa fuliginosa</i>	Shrublands, Andrews Stream.
spur-winged plover	<i>Vanellus miles novaehollandiae</i>	Orari River wetland.
welcome swallow	<i>Hirundo tahitica neoxena</i>	Shrublands throughout.
white-faced heron	<i>Ardea novaehollandiae</i>	Orari wetland; Andrews Stream

\* Blue duck have been previously recorded at a number of other locations on and adjacent to the property. The presence of blue duck on the property boundary in the headwaters of the Waihi River indicates that blue duck may still be present at other locations on the property. Blue duck are a cryptic species and specialist surveys are often necessary to confirm their presence.

**Table 3** Introduced bird species recorded from Blue Mountain Pastoral Lease, March 2005.

<b>Bird species</b>	
Common name	Scientific name
Australian magpie	<i>Gymnorhina tibicen</i>
blackbird	<i>Turdus merula</i>
chaffinch	<i>Fringilla coelebs</i>
chukor	<i>Alectoris chukar</i>
dunnock	<i>Prunella modularis</i>
goldfinch	<i>Carduelis carduelis</i>
greenfinch	<i>Carduelis chloris</i>
house sparrow	<i>Passer domesticus</i>
redpoll	<i>Carduelis flammea</i>
skylark	<i>Alauda arvensis</i>
song thrush	<i>Turdus philomelos</i>
starling	<i>Sturnus vulgaris</i>
yellowhammer	<i>Emberiza citrinella</i>

## SUMMARY

Twenty-five bird species were recorded on Blue Mountain Pastoral Lease during this survey: 12 indigenous species (five endemic and seven native) (Table 2) and 13 introduced species (Table 3). Three threatened bird species were recorded (Table 5): black shag (sparse), New Zealand falcon (gradual decline) and blue duck (nationally endangered). The group of nine black shags observed on the property is notable because groups of this size are now rarely seen in New Zealand. The presence of such large numbers suggests black shags are breeding nearby. The behaviour of New Zealand falcon on the property indicates they are likely to be nesting on the property. A map attached shows the areas considered to be of important bird and lizard values on the lease.

## 2.5.2 Lizards

Several lizard species have previously been recorded from the region, though none closer than five kilometres from the property. Jewelled gecko (threat status: gradual decline) and an unconfirmed sighting of a forest gecko have been recorded in Peel Forest. Common skink, McCann's skink and unconfirmed reports of Canterbury gecko (gradual decline) and common gecko have been recorded in the ecological district. Scree skink (gradual decline), long-toed skink (sparse), Southern Alps gecko and the newly-discovered Rangitata skink (range restricted) have all been recorded to the north of the property in the Harper Range and Pudding Valley. Spotted skink (gradual decline) has been recorded in two locations between the north and south branches of the Hinds River. There are no records of lizards on Blue Mountains Pastoral Lease in the Herpetofauna Database.

Lizards observed on Blue Mountain Pastoral Lease during the survey are described below for the seven locations surveyed, and are listed in Table 4.

### **Left branch Basin Stream/McLeods Spur**

This area extends south from Basin Stream Hut along the left branch of Basin Stream west of McLeods Spur. Dominant habitats are grazed pasture, short-tussockland, and matagouri-dominated shrubland. Small areas of outcropping rock are present on hill-slopes and stream banks, and large willows grow on the banks of Basin Stream near the hut. Common skink, McCann's skink and Southern Alps gecko were found in three locations under rocks close to the left branch of Basin Stream. The rock outcrops close to Basin Stream Hut provides habitat for two lizard species: Southern Alps gecko and common skink. Eighteen geckos, two gecko skins and three common skinks were found in half an hour of searching.

### **Orari River and wetland**

At the base of the eastern slopes of Hat Spur and adjacent to the Orari River in the north-eastern part of the property is a small marsh. Shrubland on the western side of the marsh and on lower slopes and rock outcrops and talus on higher slopes provide lizard habitat. Five adult Southern Alps geckos were found under rocks on the Orari terraces after a search time of half an hour. No lizards were found in the shrubland, though conditions were not favourable for searching.

### **Large rock outcrop and shrubland, bottom of Hat Spur**

This large rock outcrop is located at the bottom of Hat Spur in the northeast of the property. Lizard habitat is provided by rock outcrops containing crevices and loose rocks, talus, scree and shrubland. Three Southern Alps geckos were found under rocks and one McCann's skink on the talus. The rockland habitats appear very suitable for other lizard species including long-toed skink, spotted skink and possibly scree skink. No lizards were found in the shrubland, though conditions were not favourable for searching.

### **Bernard Stream Valley**

Bernard Stream runs through the centre of the property. Lizard habitats along the stream vary from developed pasture in the lower reaches to eroding terraces, talus, scattered matagouri shrubland and a small section of well-vegetated rocky gorge in the mid-reaches. Eight unidentified skinks (common or McCann's skinks) and two Southern Alps geckos were seen in the area of eroding stream terrace at the northern tip of the property. Three common skinks were also caught in the pitfall traps. Three adult Southern Alps geckos were found in the rock outcrop after approximately 10 minutes of searching.

### **Totara Stream and shrublands**

Totara Stream is located on the western side of the property east of Totara Spur. The area assessed extends downstream from an old stone hut at the end of the vehicle track. The stream banks are well vegetated and particularly diverse in the upper reaches, with mountain ribbonwood, grey shrubland, *Olearia* shrubland, grassland and rock outcrops. An unidentified skink, either common skink or McCann's skink, was recorded on the stream bank close to the hut. One juvenile Southern Alps gecko and lots of lizard droppings were found among the rock outcrops.

### **Mowbray River Valley**

Mowbray River and the east-facing hill-slopes along the southeast edge of the property were assessed. The Mowbray River Valley does not appear to be as heavily grazed as Bernard and Totara Streams. Tussocks are taller and denser, particularly on slopes above Mathias

and Eyre Streams. Forest remnants and shrublands on the lower slopes include mountain ribbonwood and cabbage tree. Three Southern Alps geckos and three unidentified skinks (common or McCann's) were found in the talus and forest remnants, and three common skinks were found in an area of eroding terrace.

**Uplands: Mt Catherine, Blue Mountain, Tripps Peak, Mt Edith and Mt Frances**

The high altitude areas of the property assessed were Mt Catherine, Blue Mountain and Tripps Peak in the Four Peaks Range, and Mt Edith and Mt Frances in the eastern part of the property. Habitats mainly consist of varied rockland including outcrops, scree, talus and fellfield. Four species of lizards were recorded in these upland habitats. Two gecko skins were found under rocks and a common skink was found under an Artificial Cover Object on Mt Catherine. A McCann's skink was found on Blue Mountain and a large green skink, possibly spotted skink, was found on Tripps Peak during an earlier (November) visit. Two Southern Alps geckos and two gecko skins were found among rock tors on Mt Edith. Numerous lizard droppings were found on Mt Frances.

**Table 4** Lizard species recorded from Blue Mountain Pastoral Lease, March 2005.

Lizard species		Known Distribution on Property
Common name	Scientific name	
common skink	<i>Oligosoma nigriplantare polychroma</i>	Basin Stream; Bernard Stream; Mowbray River; Mt Catherine.
McCann's skink	<i>Oligosoma maccanni</i>	Totara Stream; Bernard Stream; Mowbray River; base of Hat Spur.
Southern Alps gecko	<i>Hoplodactylus</i> aff. <i>maculatus</i> "Southern Alps"	Basin Stream; Orari River; Mowbray River; Bernard Stream; base of Hut Spur; Totara Stream; Mt Edith
spotted skink?	<i>Oligosoma lineoocellatum</i>	Tripps Peak.

**SUMMARY**

Blue Mountain Pastoral Lease contains abundant lizard habitat including indigenous shrubland and a variety of rockland habitats (rock outcrop, talus, scree and eroding river terrace). Four endemic lizard species were found during this inspection: common skink, McCann's skink, Southern Alps gecko and a large unidentified green skink which is most probably a spotted skink (threat status: gradual decline) (Table 4). Some of the indigenous shrublands appear suitable for the threatened jewelled gecko (e.g. Hat Spur shrubland) and some of the eroding river terraces appear suitable for long-toed skink. Any spotted skink population found in Canterbury is likely to be important, because all seem restricted in distribution.



### 2.5.3 Fish

Blue Mountain Pastoral Lease lies in the catchment of the Orari River. The property is drained by the Mowbray River and its tributaries (Mathias and Eyre Streams) and Totara Stream in the northwest, Bernard Stream in the north, Andrews Stream and its tributaries (McNaughtons, Howards and Pinckney Streams) in the south, small tributaries that flow directly to the Orari River in the east (including Basin and Moa Streams), and the Waihi River in the south. All these rivers and streams (except the Waihi River) eventually drain to the Orari River.

One of the distinguishing features of the Orari River is the absence of dams. This has two effects on the fish communities. The first is that the fish communities are more likely to have diadromous species present (species with a sea phase in their lifecycle). The second effect is that fish are able to migrate between streams, allowing colonisation of previously dewatered streams. The New Zealand Freshwater Fish Database contains 14 records (at 6<sup>th</sup> April 2005) from the Orari River catchment (McDowall and Richardson, 1983). Species recorded from streams near the property are Canterbury galaxias, alpine galaxias, upland bully and brown trout. Longfin eel have been recorded nearby in the Waihi and Rangitata Rivers.

Five freshwater habitats, classified by size and physical character, were surveyed on the property. These habitats and the fish species recorded are described below.

#### Rivers

Four rivers flow along the property boundaries: Andrews Stream and the Mowbray, Orari and Waihi Rivers. Tussockland and grassland (pasture) are the predominant riparian plant communities, though areas of native and introduced woody vegetation are also present. All river margins appear to be accessible to stock and wild animals, except where steep terrain restricts access along some sections of Andrews Stream and the Orari and Waihi rivers. The rivers are generally between five and 15 metres wide and between 100 and 300 mm deep with occasional deeper pools. River substrates are predominantly boulders with bedrock, cobbles and smaller gravels also present.

Four sites in the Mowbray River and Andrews Stream were surveyed. Upland bullies were present at all sites, Canterbury galaxias at three sites, alpine galaxias at two sites and brown trout at one site. Upland bullies were also observed in the Orari River and the river is commonly fished for brown trout.

#### Large Streams

Large stream habitat is present on the property in parts of Totara, Mathias, Eyre, Bernard, McNaughtons, Howards, Pinckney and Basin Streams. Tussockland and grassland (including pasture) are the predominant riparian plant communities, though areas of native shrubland, scrub and forest are present, especially on the southern side of the property. All are accessible to stock and wild animals, except where access is restricted by steep terrain such as waterfalls. Most large streams on the property are crossed by vehicle tracks. The large streams are generally between one and a half and five metres wide and between 100 and 400 mm deep with occasional deeper pools. Large stream substrates are predominantly boulders with some cobbles and smaller gravels.

Thirteen sites of this habitat type were electro-fished. Canterbury galaxias were recorded at all sites, upland bully at nine sites, brown trout at four sites and alpine galaxias at one site.

## Small Streams

The small stream habitat is present throughout the property, forming tributaries of the large streams and rivers. Small streams normally have steep gradients and occasional gentler sections. Most flow through tussockland, grassland or shrubland, some flow through gorges with overhanging vegetation and others flow through more open bluff plant communities. All are accessible to stock and wild animals, except where access is restricted by topography, though higher-altitude areas are not grazed during winter. Small streams are generally up to one and a half metres wide and less than 200 mm deep, although a few have pools up to 500 mm deep. Substrates are usually gravel, with a few boulders and cobbles, though many also contain silt.

Twelve sites were surveyed for fish. Canterbury galaxias were found at all sites, upland bully at two sites and brown trout at one site. Brown trout and upland bully were present at sites near larger waterways.

## Seepages

Seepages were observed in only a few places on the property: along the tops of the ranges, in Totara Stream and in some small tributaries of Basin Stream. They are mostly in tussockland, with speargrass, *Celmisia* sp., rushes and sedges occasionally present. All seepages are accessible to stock and wild animals for much of the year, except those at high altitudes that are not grazed during winter. Seepages are normally up to 50 m<sup>2</sup> in size, but occasionally up to 100 m<sup>2</sup>. Some seepages flow into streams which are considered part of the seepage habitat. The size of these streams depends on the size of the seepage, but is usually less than half a metre wide and 100 mm deep. Seepage streams generally have a gravel base with some silt. One seepage stream was surveyed for fish, though none were found.

## Wetlands

One wetland is present in the northeast of the property, on a terrace beside the Orari River. It supports rushland, sedgeland, shrubland and pasture. The wetland is accessible to stock and wild animals throughout the year. Cattle were present at the time of the survey. The area of the wetland appears to exceed one hectare but a smaller area was found to be wet during the survey. Water depth is between 100 and 200 mm, with a muddy substrate. The wetland appears to be quite degraded, and heavily used by cattle. It also appears likely that the wetland is slowly drying out. No fish were recorded despite a thorough search.

## SUMMARY

Freshwater fish communities were surveyed at 30 sites on Blue Mountain Pastoral Lease. Four fish species were recorded: Canterbury galaxias, alpine galaxias, upland bully and brown trout. Brown trout and upland bully are present at lower altitudes, with upland bully also present in smaller streams. Canterbury galaxias are more widely distributed. Alpine galaxias were found only in the Mowbray catchment. The limited occurrence of alpine galaxias may be due to scarcity of swift-flowing riffle habitat on the property. The map attached shows the areas considered to be of important aquatic values on the lease.

## 2.5.4 Invertebrates

The only entomological information readily available for the area, prior to the survey was the invertebrate assessment of Lochaber Pastoral Lease (Morris, 2002), which adjoins Blue Mountain Pastoral Lease to the northeast. The two properties share a section of the Orari River as their common boundary. The local endemic ground beetle, *Megadromus temukensis*, was collected from Little Mt Peel at 1300 m. Five species of grasshopper were recorded, mostly from the alpine and sub-alpine areas of the Lochaber property.

A number of insect species, including the tussock butterfly, white butterfly, two species of short-horned grasshopper and the cicada, *Kikihia angusta*, were seen widely over Blue Mountain Station. Cotton daisy commonly displayed heavy feeding damage, probably from a weevil, and was also being attacked by a scale insect, *Eriococcus montanus*, which resulted in extensive infestation of the plants by a black sooty mould. Invertebrate communities of separate parts of the property are described below.

### South of Tripps Peak and McNaughtons Stream

This area comprises some of the least modified vegetation on the property with extensive areas of shrubland and a significant remnant of forest with mountain totara. Grassland areas are dominated by tall tussock with native herbs, ferns and sub-shrubs. This area supports a rich and representative insect fauna with alpine grasshoppers and scree wetas on the top of Tripps Peak, and a diverse range of beetle species associated with the shrublands. The forest remnant, although unsurveyed, appears intact and is expected to support a typical mixed forest fauna. The scale insect feeding on cotton daisy was especially prevalent in this area. A nest of the native bee, *Hylaeus capitosus*, was found in a speargrass flower stalk. The notable weevil, *Anagotus* sp., otherwise represented in the Lincoln University collection by only a single specimen from Mt Peel, was collected beside the Waihi River. A series of tiny corylophid beetles of an undescribed species, belonging to a genus and tribe that has not been recorded previously from New Zealand, was collected under mountain ribbonwood bark. Only two exotic beetle species were recorded from this area. Based on its high degree of naturalness, its representativeness and diversity, and the presence of four notable species, this area is rated high for its significant inherent entomological values.

### West of the Four Peaks Range

The western slopes of the Four Peaks Range are dissected by many small streams. The vegetation retains a strong native character with tall tussock on the slopes and mixed shrubby vegetation in many of the gullies. The shrubs in the lower reaches of the Mathias and Eyre streams yielded a representative beetle fauna and streamside ground beetles, *Bembidion parviceps*, were found beside Eyre Stream. A large, locally endemic ground beetle, *Megadromus temukensis*, was found under rocks along the top of the ridge. Another large ground beetle, *Mecodema fulgidum*, was collected from the head of Totara Stream and the large dragonfly, *Uropetala* sp., was observed flying in the valley of this stream. Based on its naturalness, its diverse and representative beetle fauna, and the presence of two notable species, one at its southern limit, this area is rated medium-high for its significant inherent entomological values.

### Mt Catherine and the eastern slopes of the Four Peaks Range

The slopes of Mt Catherine and the western slopes above the valleys of Bernard and Howards Streams are highly modified by grazing. However, the upper, steep slopes between Blue Mountain and Tripps Peak support remnant streamside vegetation and tall tussock that provides good habitat for invertebrates. Tiger beetle (*Neocicindela* sp.) larval

burrows were seen in a sandy cutting along the main track by Howards Stream. This whole area was poorly sampled but, based on its modified state most of the area is rated low for its significant inherent entomological values. However, the upper, steep slopes between Blue Mountain and Tripps Peak are rated medium-high.

### **Western slopes of Mt Edith**

A small, representative fauna was collected around rocky tors on the low-angled tussock-covered slopes of Mt Edith. A typical, but not especially diverse, fauna was beaten from shrubby vegetation beside Howards Stream. The area is rated low-medium for its significant inherent entomological values.

### **Eastern slopes of Mt Edith and Basin Stream**

This area is generally heavily modified although there are patches of tall tussock in good condition and shrub communities in some stream gullies. In spite of the high incidence of exotic plants, streamside vegetation in the gully immediately to the north of the huts on Andrews Stream yielded a diverse and representative native beetle fauna. Two species of streamside ground beetles were collected under stones beside Andrews Stream. The wetland area at the foot of the eastern slopes of Hat Spur has suffered significant cattle trampling so currently retains only moderate entomological values. A large diving beetle, *Rhantus suturalis*, was collected here, and both the red damselfly, *Xanthocnemis zealandica*, and the blue damselfly, *Austrolestes colenisonis*, were observed flying over the wetland. The ribbonwood anthribid, *Hoherius meinertzhageni*, a notable species, was beaten from mountain ribbonwood. Based on its beetle diversity, this area is rated medium for its significant inherent entomological values.

### **Mt Frances and Andrews Stream**

As with the other high points on the property, the insect fauna on the top of Mt Frances was depauperate because the environment is degraded by persistent sheep camps. Although much of this area has been heavily modified by grazing it retains patches of valuable shrubland and remnant forest with their associated faunas. For example, a single, large broadleaf tree in mainly exotic grassland with scattered scrub, provided refuge for a number of beetle species found nowhere else on the property. One of these, a chalcid, is typically found only in mature forest. Three other notable species, the ribbonwood anthribid, *Hoherius meinertzhageni*, the weevil, *Stephanorhynchus costifer*, and the hydrophilid, *Tormus nitidus*, were also collected in this area. This area is rated medium-high for its significant inherent entomological values.

### **Species**

The bizarre ribbonwood anthribid, *Hoherius meinertzhageni*, was beaten from mountain ribbonwood at four sites on the property. This is the first record of this species south of the Rakaia River except for one collection from Otara in Southland. The anthribid is specifically associated with ribbonwoods and lacebarks and has no known close relatives (Holloway, 1982). It is the only species in the genus. Also collected were at least three relatively common and widespread species that have not previously been recorded from South Canterbury: *Acritelater barbatus* (Candèze), *Artystona obscura* Sharp, and *Bembidion parviceps* Bates. This is most likely because of inadequate collecting in this area.

## Freshwater Habitats

Macro-invertebrates recorded from rivers were the mayflies *Olinga feredayi*, *Deleatidium* spp. and *Nesameletus* sp., the dobsonfly *Archichauliodes diversus*, and the caddisfly *Pycnocentria* sp. Large streams have very good water quality, evident from the occurrence of *Olinga feredayi*, *Pycnocentria* sp., *Deleatidium* spp., *Coloburiscus humeralis* and *Nesameletus* sp., the stonefly *Stenoperla prasina*, the dobsonfly *A. diversus*, the caddisfly *Helicopsyche* sp., and net-winged midge larvae *Neocurupira hudsoni*-group. Two small stream sites surveyed supported the mayflies *Deleatidium* spp., the caddisfly *Hydrobiosis* sp. and aquatic snails *Potamopyrgus* spp. Species recorded in the wetland at the foot of Hat Spur were the water boatman *Sigara* sp., the backswimmer *Anisops* sp., dragonflies (*Anisoptera*), damselfly larvae (*Zygoptera*) and the diving beetle *Rhantus suturalis*.

## SUMMARY

During the entomological assessment of Blue Mountain Pastoral Lease 109 insect species were collected or observed from 33 collection sites across the property. All were identified at least to sub-family and nearly all to genus or species. Eighty beetle species from 26 different families were collected, eight of which are naturalised species including one purposely introduced for biological control of nodding thistles. Nine notable species were recorded: one is a previously unknown and undescribed species, two are local endemics, one is at the southern limit of its distribution, one is a range extension, one is a relict survivor and three are rare in collections. The map attached shows areas considered to be of important invertebrate value on the lease.