

## **Crown Pastoral Land Tenure Review**

**Lease name : SHENLEY**

**Lease number : PT 026**

### **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.

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

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

**January 09**

**SHENLEY**  
**PASTORAL LEASE**



**CONSERVATION RESOURCES**  
**REPORT**

**DEPARTMENT OF CONSERVATION**

**SEPTEMBER 2007**

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## PART 1 INTRODUCTION

Shenley Pastoral Lease (hereafter called “the property”) is a 3,233 ha property located at the northern end of The Hunters Hills in South Canterbury. The property covers moderately steep west facing slopes in the upper Hakataramea River and Lockharts Stream valleys, north and east facing slopes and gentler valley floors in the Exe Stream valley, and a small area of east-facing hill country in the Blainslie Stream catchment. It ranges in altitude from 480 m at its southeast corner by the homestead to 1268 m on the main ridge crest. The property is drained by the Hakataramea River and Lockharts Stream in the west, and Exe and Blainslie streams in the east. Lockharts, Exe and Blainslie streams flow into the Tengawai River, in the Opihi River catchment. The Hakataramea River flows into the lower Waitaki River.

Shenley Pastoral Lease lies in Hunters Ecological District (ED), within Pareora Ecological Region. Hunters ED has not been surveyed as part of the Protected Natural Areas Programme. No Sites of Special Wildlife Importance (SSWI) are listed for the property.

The property adjoins Mt Dalgety Pastoral Lease and Mt Dalgety Conservation Area to the west across the Hakataramea River and Lockharts Stream, and freehold land on all other boundaries. Access to the property is from State Highway 8 at Albury, via Chamberlain Road. Unformed legal roads are present along the west, east and southeast boundaries of the property.

The tenure review inspection of the property was undertaken during November 2006 and January 2007 by a range of specialists. These specialists’ reports (listed below) form the basis of this Conservation Resources Report.

- Shenley Pastoral Lease Landscape Assessment, Alan Petrie, January 2007, 6p + photos + map.
- Plant Communities of Shenley Pastoral Lease and Recommendations for Protection, Mike Harding, February 2007, 11p + map.
- Shenley Pastoral Lease, A Report on the Bird and Lizard Fauna Surveys, Scott Bowie, April 2007, 9p + map.
- Shenley Pastoral Lease, A Report on the Aquatic Fauna Surveys, Scott Bowie, April 2007, 11p including photos + maps.
- Shenley Pastoral Lease Tenure Review, Assessment of Invertebrate Values, Warren Chinn, March 2007, 8p + map + appendices.



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

### **2.1 LANDSCAPE**

#### **2.1.1 Landscape Context**

Shenley Pastoral Lease is sandwiched between the Dalgety Range in the west and the block of high rolling hills that overlook the Opihi River valley in the east. The main physical component of Shenley is the spine-like ridge crest that trends in a north-south direction on the western side of the property. The highest point along the ridge crest (1268 m altitude) is at the southern end of the property. The balance of the property comprises an assemblage of long lateral ridges, side gullies, a dish-shaped valley and rolling hill country. The terrain on the property is slightly tilted towards the north.

Shenley Pastoral Lease has a complex drainage pattern. A low saddle midway along the western boundary of the property forms the watershed between the Hakataramea River in the Waitaki catchment and Lockharts Stream in the Opihi catchment. Exe Stream is parallel to the eastern boundary of the property and has its headwaters in a basin just south of the property. Blainslie Stream drains the rolling hill country in the eastern part of the property. The shape of the property is nearly rectangular with a narrow section connecting to the eastern hill country. The homestead and auxiliary buildings are nestled amongst a parkland setting of trees at the end of Chamberlain Road.

#### **2.1.2 Landscape Description**

For the purposes of this landscape assessment Shenley Pastoral Lease is divided into three landscape units, principally based on stream catchments. The criteria used to assess and evaluate the landscape values of each unit are based on the following attributes:

- Naturalness: an expression of the indigenous content of the vegetative cover and the extent of human intervention.
- Legibility: an expression of the clarity of the formative processes and how striking these processes are.
- 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.
- Visual values: a sub-set of landscape values which relate to the visibility of a particular landscape or natural feature as seen from public vantage points.

#### **Landscape Unit 1, Blainslie Stream Catchment**

This elongated unit covers the southeast corner of the property that falls towards the eastern downlands. The unit is defined in the west by a low ridge that forms the watershed between Blainslie Stream and Exe Stream. It is defined to the north and south by the property boundaries on side ridges that converge in the east at the homestead.

The primary landforms within this unit are flat-topped spurs and V-shaped gullies. The side slopes of the gullies are slightly indented by hollows. Small watercourses that have their origins below the main ridge wind around the toe slopes of the interlocking spurs.

The vegetative cover is influenced by altitude, aspect and farm management. Much of the lower country on this part of the property is covered in pasture grasses and has been subdivided into paddocks sheltered by well-maintained deciduous trees. Above about 700 m altitude the pasture grades to mixed grassland. Introduced pasture species such as browntop and sweet vernal are still dominant on the ridges, while the slopes have modified tussockland interspersed with patches of matagouri shrubland.

#### Landscape Values

This unit conveys moderate inherent landscape values owing to the degree to which the original cover has been converted into productive farmland.

#### Potential Vulnerability to Change

Land uses that have the potential to adversely affect this unit are:

- Development that may lead to the loss of areas of tussockland or shrubland.

### **Landscape Unit 2, Exe Valley**

This substantial unit incorporates all of the east-facing slopes and floor of the Exe valley on the property. The unit is bounded in the west by the ridge that forms the watershed between Exe Stream and both Lockharts Stream and the Hakataramea River. It is bounded to the east by the valley floor, except in the southeast corner where the unit includes a block of rolling hill country. To the north and south the unit is defined by ridgelines and straight property boundaries.

The overall rounded appearance of the landforms is the result of a deep mantle of colluvium that covers the mid and lower slopes. The landscape does not convey any recognizable signs of glaciation. Its low undulating relief is characterized by the main ridge crest, which has occasional dome-shaped high points. Stemming out from the ridge crest is a series of long lateral ridges, which gradually descend to the east where they fold into the valley floor. Rounded knolls typify the ridges. Between each of the ridges a gully cuts deeply into the main ridge crest. Swales that often contain small ephemeral watercourses indent the slopes of these side gullies. The largest of the side gullies contains Kennaway Stream, which flows into Exe Stream in the central section of the valley floor. The profile of the valley floor is slightly dishd with the gentle rolling terrain sloping down to the north.

The vegetative cover is dictated by climate, aspect and previous land management practices. Due to its orientation the main valley is affected by the drainage of cold air, which restricts growth rates. This is illustrated by the stunted height of several exotic tree species including silver birch and willow that were planted during the late 1940s. The valley floor is covered in a mosaic of pasture grasses, tufts of short tussock, patches of sedges and remnants of tall tussock. There are several short rows of coniferous shelter planting located on the valley floor. The toe and mid slopes of the side gullies possess thickets of matagouri and porcupine shrubland supplemented by patches of pasture grasses and residual areas of short tussock. Cleared swathes through the shrublands have been established principally to provide stock access to the higher grasslands. The riparian vegetation that lines the permanent watercourses is commonly more diverse and includes *Coprosma* shrubs, speargrass and prickly shield fern.

Between 850 and 900 m altitude the broad band of more modified vegetation rapidly grades into tussockland dominated by narrow-leaved snow-tussock. The vegetative cover along the main ridge crest is sparser and stable boulderfields are present. Further north, where the ridge crest begins to widen and fall in elevation, the tall tussockland is more modified.

A gravel road connects the homestead at the end of Chamberlain Road with the shearing shed and yards, which are located at the northern end of this unit. Access to the main ridge crest is via a four-wheel-drive track.

### Landscape Values

This unit conveys moderate inherent landscape values attributable to the extent to which the natural landscape patterns and ecological processes have been modified, resulting in a fragmented landscape. Above about 850 m altitude there is a rapid transition to more intact vegetation, which provides the ridge crest with a coherent and natural appearance.

### Potential Vulnerability to Change

Land uses that have the potential to adversely affect this unit are:

- Fragmentation of tall tussockland above 850 m altitude.
- Spread of wilding trees.
- Further spread of opportunist species such as hawkweed on drier ridges.

## **Landscape Unit 3, Lockharts and Hakataramea Valleys**

This unit covers all of the west-facing slopes on the property overlooking Lockharts Stream and the headwaters of the Hakataramea River. Combined with similar terrain on the neighbouring Mt Dalgety Pastoral Lease, these slopes are an integral component of an impressive backcountry valley. The upper limits of the unit follow the main ridge crest that gradually descends to the north. The lower boundary follows the margins of Lockharts Stream and the Hakataramea River. To the north and south the property boundaries define the unit.

The primary landform within the unit is the constant steep-graded slopes that are indented by narrow gullies. Erosion is not evident on the slopes except for the occasional area of slope failure. Along the upper slopes, slabs of bedrock form small outcrops.

The vegetative cover is influenced by both altitude and aspect with a wide band of tall tussockland covering the mid and upper slopes. Near the main ridge snow-tussock becomes quite depleted and is replaced by boulderfield, rock outcrops, blue tussock, low-stature shrubland and patches of grassland. Grey woolly moss spreads out over the rubble fields and lichen coats the rock outcrops. At the drier north end of the ridge, mats of hawkweed become conspicuous. The lower and toe slopes are covered in short grasslands with thickets of matagouri which also extend into the gullies. Towards the north, bordering the margins of the Lockharts Stream, an assortment of exotic trees has been planted to help trap gravel and silt.

### Landscape Values

This unit conveys significant inherent landscape values due to the overall impression of coherence and uniformity of the tall tussocklands over the constant-graded topography. This unit also forms part of the natural setting of both the Hakataramea and Lockharts valleys. This unit forms the edge to the country that possesses the recognizable inherent traits that are typically associated with the high country, such as continuous tussocklands.

### Potential Vulnerability to Change

Land uses that have the potential to adversely affect this unit are:

- Subdivision and farming intensification that would adversely affect the existing coherent qualities of the tussocklands.
- Spread of wilding pines.
- Potential spread of exotic trees from the gravel trap plantings.
- Earth disturbance, which would allow opportunist species such as hawkweed to spread.





### **2.1.3 Visual Values**

Shenley Pastoral Lease does not contain any prominent natural features. The property has limited visual resource values due to the fact that a large proportion of the property, except for the front country within Landscape Unit 1, is visually contained by surrounding ranges. Inward views of the property are more important than the distant outward views.

### **Significance of Landscape Values**

The inherent landscape values of Shenley Pastoral Lease reflect its low altitude and easy access, with much of the rolling front country (Blainslie valley) and the main central valley (Exe valley) having been converted into productive farmland and semi-intensive grazing blocks. Gradually towards the western ridge crest, inherent landscape values begin to become more prominent with intact tall tussockland grading in at about 850 m altitude. This tussockland envelops the property to its western limits, defined by the Hakataramea River and Lockharts Stream. Within this context the western landscape makes an important contribution to the natural character of these two valleys and also forms the edge of the block of high country that extends towards the Mackenzie Basin.

## **2.2 GEOLOGY, LANDFORMS AND SOILS**

### **2.2.1 Geology**

The basement rocks of the property comprise sandstone (greywacke) and mudstone (argillite) of medium induration (Chlorite Subzone I) of the Torlesse Group (Gair, 1967). Minor areas of marine siltstone and sandstone are present in the Blainslie Stream area at the southeast corner of the property. Hill slopes are mostly mantled with deposits of loess (wind-deposited sediments). Recent alluvial deposits are present along lower-altitude streams. Clear faults with surface features are present along the western property boundary (along Lockharts Stream and the Hakataramea River), along Exe Stream and at the southeast corner of the property. The latter fault is the boundary between the Torlesse Group rocks and more recent sediments (Gair, 1967).

### **2.2.2 Landforms**

Shenley Pastoral Lease is dominated by the ridge that forms the northern extent of The Hunters Hills. This broad ridge falls gently from an altitude of almost 1300 m at the southern property boundary to 1000 m at the northern boundary. The western slopes of this ridge, in the Hakataramea and Lockharts valleys is moderately-steep and shallowly dissected by small stream gullies. The eastern slopes of this ridge are gentler and dissected by larger stream valleys. The lower eastern slopes and floor of Exe valley are rounded and gently sloping. A small area of slightly steeper country is present at the southeast corner of the property in the headwaters of Blainslie Stream. The property is well-vegetated, with only minor areas of exposed rock on the main ridge and in some gullies. Landforms on the property have been clearly influenced by movement along fault lines. An interesting feature is a small stream valley just south of the airstrip in the Exe valley that appears to have been offset by land movement. There are no geopreservation sites listed for the property.

### 2.2.3 Soils

Higher-altitude parts of the property on the main ridge have Kaikoura steepland soils. Lower slopes in Lockharts valley have Tengawai steepland soils. The lower slopes and valley-floor in Exe valley have Tengawai hill soils. Hill country at the head of Blainslie Stream has Hurunui soils and gentler slopes further east along Blainslie Stream have Omarama steepland soils.

### Significance of Geology, Landforms and Soils

The property covers the ridge that forms the northern extent of The Hunters Hills. This prominent South Canterbury range is an important local feature, though the property itself is largely hidden from public vantage points. The main valleys of Lockharts Stream and the upper Hakataramea River on the western boundary of the property define the eastern edge of the block of high country that forms the eastern boundary of the Mackenzie Basin. The only significant landform feature on the property is the small offset stream just south of the airstrip in the Exe Stream valley.

## 2.3 CLIMATE

Shenley Pastoral Lease has a sub-humid hill country climate with cool to cold winters and mild dry summers. The area experiences low monthly water balance ratios and slight to low annual water deficits (Leathwick *et al.*, 2003). Predominant winds are from the northwest with occasional gales. Cool southerlies and easterlies are relatively common and snow can affect all parts of the property and lie on upper slopes for several weeks in winter. Annual rainfall probably ranges from 800 to 1200 mm (Tomlinson, 1976). Western parts of the property appear drier than eastern slopes, as they are too distant from the Southern Alps to receive significant rain from westerly winds, and are in the lee of moist easterly winds.

## 2.4 LAND ENVIRONMENTS OF NEW ZEALAND (LENZ)

LENZ is, as described by Leathwick *et al.* (2003), “a classification of New Zealand’s landscapes using a comprehensive set of climate, landform and soil variables chosen for their role in driving geographic variation in biological patterns.” The classification units of LENZ, termed land environments by Leathwick *et al.* (2003), aim to “identify areas of land having similar environmental conditions regardless of where they occur in New Zealand.” Therefore “LENZ provides a framework that allows prediction of a range of biological and environmental attributes. These include the character of natural ecosystems, the vulnerability of environments to human activity, and the potential spread or productivity of new organisms” (Leathwick *et al.*, 2003). Leathwick *et al.* (2003) present the LENZ information at four levels of detail, with Level I containing 20 environments, Level II containing 100 environments, Level III containing 200 environments and Level IV containing 500 environments. These LENZ classes are presented nationally to assist use at a range of scales; however, this data should be interpreted with caution, as the predicted extent and suggested vegetation types for each Land Environment (Leathwick *et al.*, 2003) have been extrapolated from limited field data.

In an analysis of the LENZ Level IV data, with consideration of the remaining indigenous vegetation cover and the legal protection of these environments, Walker *et al.* (2005) proposed a threat classification for the remaining indigenous biodiversity in New Zealand’s environments based on the two components of vulnerability (likelihood of loss): poor legal protection and risk of loss. This threat classification (Table 1) has become the recognised benchmark for the promotion of threatened LENZ conservation.



**Table 1** LENZ threat categories and definitions (Walker *et al.*, 2005)

Category	Criterion
Acutely Threatened	<10% indigenous cover remaining
Chronically Threatened	10-20% indigenous cover remaining
At Risk	20-30% indigenous cover remaining
Critically Under-protected	>30% indigenous cover remaining <10% legally protected
Under-protected	>30% indigenous cover remaining 10-20% legally protected
No Threat Category	>30% indigenous cover remaining >20% legally protected

On Shenley Pastoral Lease, a small area at the confluence of Kennaway Stream and Exe Stream, in the central Exe Stream valley, and a small area at the southeast corner of the property at the homestead lie within “acutely threatened” land environments. Small low-altitude areas at the northeast and southeast corners of the property are within a “chronically threatened” land environment. These small low-altitude areas are highly modified. All other parts of the property, except for areas above approximately 1000 m altitude on the main ridge lie within a “critically under-protected” land environment. Higher-altitude parts of the property have no threat category.

### Significance of Land Environments

Small highly-modified areas of lower-altitude country on Shenley Pastoral Lease are classified as “much reduced” (acutely or chronically-threatened) land environments. These land environments have less than 3% of their total areas legally protected. These areas of “much reduced” environments on Shenley Pastoral Lease are highly modified. Mid-altitude parts of the property are within a “critically under-protected” land environment, with less than 10% of its total area legally protected.

## 2.5 VEGETATION

Common names are used in the text unless there is no common name, in which case the scientific name is used. Threat categories are those proposed by Hitchmough *et al.* (2007).

### 2.5.1 Ecological Context

Shenley Pastoral Lease lies in the Hunters Ecological District, within Pareora Ecological Region (McEwen, 1987). The original (pre-human) vegetation of the Hunters Ecological District was probably podocarp and podocarp-hardwood forest at lower altitudes and low-stature forest, scrub and tall tussock at higher altitudes (McEwen, 1987; McGlone, 2001). Following the extensive fires associated with early human activity, the area is likely to have supported extensive tussocklands (McEwen, 1987). The area may also have been affected by infrequent natural fires (McGlone, 2001), which would also have had the effect of removing woody plant communities and favouring tussockland communities.

In their analysis of the Level IV Land Environments on the property Leathwick *et al.* (2003) propose that all mid-altitude parts of the property, originally supported podocarp-hardwood forest dominated by matai, totara, kahikatea, broadleaf, pokaka, lemonwood, narrow-leaved lacebark and lowland ribbonwood; while higher-altitude slopes originally supported mountain totara-mountain toatoa forest. At the time of European settlement, vegetation over most parts of these land environments had been converted by fire to tussockland. Small low-altitude parts of the property are described as originally supporting podocarp forest, with a small section of the valley-floor described as supporting red tussockland and sedgeland communities. This data should be interpreted with

caution, as the predicted extent and suggested vegetation types for each Land Environment (Leathwick *et al*, 2003) have been extrapolated from limited field data.

It is likely that the original vegetation of the property was a mosaic of taller forest at lower altitudes, low-stature forest, scrub and tussockland on upper slopes and ridge crests, and tall tussockland on drier (fire-prone) western slopes (Hakataramea and Lockharts valleys) and on poorly-drained valley floors (Exe Stream). The relative extent of these plant communities at the time of human arrival would have been influenced by the frequency and extent of any recent natural fires.

Hunters Ecological District has not been surveyed as part of the Protected Natural Areas Programme.

## 2.5.2 Vegetation and Flora

The original indigenous plant communities of Shenley Pastoral Lease are substantially depleted on most gentle slopes and ridges on the property. These areas now support plant communities dominated by introduced pasture species or low matagouri scrub. Steeper upper slopes near the main ridge crest and in the Hakataramea and Lockharts valleys support scattered to dense tall tussockland and scattered turpentine-shrub shrubland. Very small areas of forest are present on a south-facing slope in an upper tributary of Exe Stream and in a small tributary of Lockharts Stream. These indigenous plant communities are described below for the three main valleys and the intervening ridge crest on the property.

### Exe Valley and Blainslie Valley

This area covers the lower-altitude valley floors and slopes on the property in Exe valley and on the east-facing slopes of Blainslie valley. It comprises the gentler and generally more modified country below approximately 900 m altitude. Hill slopes and valleys within this area have relatively gentle relief and only minor occurrences of exposed rock.

Vegetation over this part of the property is predominantly grassland dominated by exotic pasture species. Prominent indigenous species occasionally present or locally common on lower slopes are matagouri, fescue tussock, narrow-leaved snow-tussock, blue tussock, golden speargrass, *Raoulia subsericea* and, at rocky sites, porcupine shrub and scrub pohuehue.

Dense low-stature matagouri scrub is present on some low-altitude slopes. Other indigenous species present in or associated with this plant community are mingimingi, *Coprosma crassifolia*, native broom, lawyer, pohuehue, scrub pohuehue, bracken, silver tussock, fescue tussock, blue tussock, narrow-leaved snow-tussock, bidibid, occasional coral broom (threat status: gradual decline) and, at rocky sites, porcupine shrub, creeping pohuehue and *Asplenium appendiculatum*. Other species present along stream sides at lower altitudes are *Coprosma rugosa*, *Olearia bullata*, mountain flax, mountain kiokio, tutu, feathery tutu, Maori onion and occasionally koromiko, cotton daisy, turpentine shrub and *Blechnum penna-marina*. One small patch of *Coprosma intertexta* (threat status: sparse) is present alongside lower Kennaway Stream. Isolated plants of *Aciphylla subflabellata* (threat status: sparse) are also present on valley floors.

Small areas of open riverbed are present in upper Exe Stream. These stonefield/gravelfield communities are dominated by creeping pohuehue and white clover. Other species present are *Raoulia tenuicaulis*, silver tussock, *Acaena inermis*, sheep's sorrel, Yorkshire fog, sweet vernal, suckling clover, mouse-ear hawkweed, catsear, yarrow and, at the water's edge, monkey musk. Planted trees of willow, alder and poplar are present on the valley floor.

A number of seepages (wetlands) are present on the valley floors. These are mostly small and modified. Indigenous species commonly present are bog rush, *Gnaphalium paludosum*, rautahi and occasionally pukio. Larger areas of red tussockland are present on damper slopes and poorly-drained valley floor sites in the Exe valley. The largest and most intact of these is on a small saddle beside the main vehicle track. This area is dominated by tall red tussock. Inter-tussock spaces are dominated by pasture. Other species present are bog rush, soft rush, *Carex kaloides*, *Olearia bullata*, Maori onion, wire moss, *Ranunculus glabrifolius*, Yorkshire fog and white clover.

At higher altitudes, narrow-leaved snow-tussock becomes increasingly common in the grassland communities. Other important indigenous species present are turpentine shrub, mountain flax, golden speargrass, *Astelia nervosa*, *Gaultheria crassa*, *Coprosma cheesemanii*, *Leucopogon suaveolens*, blue tussock, fescue tussock, wire moss, *Raoulia subsericea* and *Blechnum penna-marina*. Tussockland communities extend down to lower altitudes in the stream gullies. Other species commonly present in these upper gullies are turpentine shrub, mountain flax, mountain kiokio, cotton daisy, *Astelia nervosa*, prickly shield fern, *Gaultheria crassa*, toetoe, giant speargrass, mingimingi, *Hebe rakaiensis* and tauhinu.

Only one area of taller woody indigenous vegetation is present on this part of the property, in an upper tributary of Exe Stream. This small patch of forest is dominated by several large old broadleaf trees, regenerating forest and scrub, and a small stand of silver beech originating from trees planted at the site (Rit Fisher, *pers comm.*). Understorey and ground-cover species within the broadleaf and beech forest are mingimingi, bush lawyer, thousand-leaved fern, nettle, *Blechnum penna-marina* and *Asplenium hookerianum*. The younger forest/scrub on the slopes above the older broadleaf and silver beech trees is dominated by *Coprosma rugosa*, broadleaf, mingimingi, *Olearia cymbifolia*, tutu and mountain kiokio. Other species present are porcupine shrub, matagouri, *Olearia bullata*, turpentine shrub, bush lawyer, scrub pohuehue, mountain flax, koromiko, *Astelia nervosa*, thousand-leaved fern, prickly shield fern, *Blechnum fluviatile*, and occasional elderberry and Himalayan honeysuckle.

This forest/scrub community grades upslope to scrub and shrubland dominated by matagouri, with *Coprosma rugosa*, native broom, *Olearia bullata*, mountain flax, thousand-leaved fern, prickly shield fern, golden speargrass and narrow-leaved snow-tussock. Adjoining the forest community along the stream is a shrubland dominated by matagouri and pasture. Other species present here are *Coprosma rugosa*, tutu, feathery tutu, bracken, scrub pohuehue, mountain kiokio, patches of rautahi and, less-commonly, koromiko, Maori onion, pukio and *Blechnum penna-marina*.

## Ridge Crest

The ridge crest between the Exe valley and the Hakataramea and Lockharts valleys forms the northernmost part of The Hunters Hills and generally lies between 1000 and 1250 m altitude. Plant communities present are tussockland, tussockland/shrubland, tussockland/herbfield and grassland. Smaller areas of seepage, mossfield and rockland are present.

Tussockland communities are dominated by narrow-leaved snow-tussock, forming a canopy cover of up to 70% in places. In tussockland/shrubland communities, other important species present are turpentine shrub, golden speargrass, mouse-ear hawkweed, sweet vernal, *Gaultheria crassa*, *Celmisia densiflora* and woolly moss. In tussockland/herbfield communities, other important species are blue tussock, fescue tussock, silver tussock, *Celmisia sessiliflora*, sweet vernal, woolly moss, *Phyllachne colensoi*, mouse-ear hawkweed, wire moss and *Anisotome aromatica*. Other species commonly or occasionally present in these plant communities are mingimingi, *Pimelea oreophila*, patotara, *Celmisia gracilentata*, *Ranunculus multiscapus*, snowberry, *Raoulia subsericea*, *Geranium sessiliflorum*, *Cyathodes dealbata*, *Pentachondra pumila*, *Coprosma perpusilla*, *C. "alpina"*, red woodrush, *Brachyglottis lagopus*, *Helichrysum bellidioides*, *Kelleria dieffenbachii*, *Lycopodium fastigiatum*, *Carex* sp., comb sedge, harebell, browntop, catsear, sheep's sorrel, lotus, white clover and mouse-ear chickweed.

Additional species present at higher-altitudes are *Hebe lycopodioides*, *Luzula pumila*, *Anisotome flexuosus*, *Celmisia angustifolia* and *Dracophyllum pronum*. Additional species present at rock outcrops are *Blechnum penna-marina*, *Geum leiospermum*, *Scleranthus uniflorus*, *Leucopogon suaveolens*, creeping mapou, *Anisotome flexuosus*, *Brachyglottis haastii*, *Celmisia lyallii*, *Pimelea traversii*, *Gonocarpus incanus*, *Helichrysum intermedium*, porcupine shrub and coral broom.

Seepage areas are present at two main locations. These wetlands are substantially modified by introduced species and trampling. Indigenous species present are red tussock, wire moss, bog rush, comb sedge, *Celmisia gracilentia*, *Gnaphalium paludosum* and king devil.

Parts of the ridge crest are dominated by pasture grasses, notably the upper parts of the west-facing spurs. At the time of survey there was a marked difference in vegetation on either side of the ridge-crest fence on the southern section of the ridge, with denser taller tussockland present east of the fence.

### Lockharts Valley

This area covers the west-facing slopes in the upper Lockharts valley, in the northwest corner of the property. It comprises moderately-steep upper slopes, gentler lower slopes and a number of small gullies, incised in their lower reaches.

Upper and mid-slopes in the northern part of this area support tall tussockland dominated by narrow-leaved snow-tussock. Other important species are blue tussock, fescue tussock, sweet vernal, browntop, mouse-ear hawkweed, woolly moss, *Raoulia subsericea*, snowberry, comb sedge, *Pentachondra pumila*, golden speargrass, *Coprosma cheesemanii*, mountain flax and scattered low matagouri.

Narrow-leaved snow-tussock is denser and taller, and matagouri and mountain flax are more common in the gullies. Other species present in the gullies are mountain kiokio, *Gaultheria crassa*, giant speargrass, cotton daisy, native broom, feathery tutu, tutu and koromiko. Additional species present on stream sides in the lower gullies are mingimingi, prickly shield fern, *Blechnum penna-marina*, male fern, lawyer and scrub pohuehue.

The largest incised lower gully (near the gravel trap in Lockharts Stream) supports a small remnant of forest dominated by kowhai. Other species present in and adjacent to the kowhai remnant are *Helichrysum lanceolatum*, korokio, scrub pohuehue, lawyer, bush lawyer, mingimingi, *Hebe rakaiensis*, native broom, yellowwood and hound's tongue fern. This forest community grades, on sunny slopes, to shrubland dominated by mingimingi, matagouri, korokio and young kowhai trees. Other species present are native broom, *Hebe rakaiensis*, *Helichrysum lanceolatum*, porcupine shrub, *Olearia nummulariifolia*, *Haloragis erecta*, mouse-ear hawkweed, *Oxalis* sp., *Geranium sessiliflorum*, *Gaultheria crassa*, *Leucopogon suaveolens*, narrow-leaved snow-tussock, blue tussock, fescue tussock, sweet vernal, golden speargrass, scrub pohuehue, tutu, hound's tongue fern and *Asplenium appendiculatum*. Additional species present on exposed rock above the forest and shrubland are *Helichrysum intermedium*, *Helichrysum intermedium* X *Raoulia glabra* (hybrid) and *Parahebe decora*.

Opposite, south-facing, slopes within this incised gully are dominated by narrow-leaved snow-tussock, mingimingi, matagouri, *Hebe rakaiensis*, mountain flax, native broom, mountain kiokio, cotton daisy, giant speargrass, tutu and *Astelia nervosa*. Additional species present alongside the stream are *Parahebe lyallii*, prickly shield fern, monkey musk, male fern, silver tussock, koromiko, feathery tutu, *Blechnum penna-marina* and, in the lower reaches, scattered broom.

An area of boulderfield (talus) on the lower hill slopes, just south of the incised gully described above, supports dense shrubland dominated by mingimingi, matagouri and lawyer. Other species



present are narrow-leaved snow-tussock, golden speargrass, scrub pohuehue, blue tussock, native broom, porcupine shrub, bracken, sheep's sorrel, bidibid, *Coprosma* sp. 't' and mountain wineberry.

The slopes at the head of Lockharts Stream support denser and taller narrow-leaved snow-tussock (up to 60% canopy cover). Other important species are golden speargrass, low-stature matagouri, *Gaultheria crassa*, mountain flax, fescue tussock, sweet vernal, *Coprosma cheesemaniae* and tutu. Occasionally present are mingimingi, patotara, *Leucopogon suaveolens*, harebell, mouse-ear hawkweed, *Olearia bullata* and bracken.

Gentler slopes adjacent to the lower reaches of Lockharts Stream, at the northwest corner of the property, are dominated by pasture. Gravelfield/stonefield on the open riverbed in this area is dominated by *Epilobium melanocaulon*. Other riverbed species present are *Acaena inermis*, *Geranium sessiliflorum*, *Raoulia tenuicaulis*, sweet vernal, sheep's sorrel, mouse-ear chickweed, woolly mullein, creeping pohuehue, *Haloragis montanus*, white clover, haresfoot trefoil, mouse-ear hawkweed, Yorkshire fog and tutu. Grey willow and poplar are present at the river margins. Dense stands of catchment-protection plantings are also present, forming a gravel-trap in the bed of Lockharts Stream.

The intactness of the vegetation cover in this area is an important component for soil and water conservation, as well as maintaining water yield.

### **Hakataramea Valley**

This area covers the west-facing slopes in upper Hakataramea valley, in the southwest corner of the property. It comprises moderately-steep slopes and a number of small gullies, incised in their lower reaches. This area is dominated by tall tussockland, except for localised areas of grassland dominated by pasture species on the upper spurs and areas of turpentine-shrub shrubland on lower slopes.

On damp shaded slopes the tussockland is dominated by narrow-leaved snow-tussock, turpentine shrub, golden speargrass, *Coprosma cheesemaniae* and wire moss. Other species present are woolly moss, *Celmisia densiflora*, mountain flax, giant speargrass, native broom, mouse-ear hawkweed, *Anisotome aromatica* and occasional toetoe, *Olearia bullata*, *Hebe rakaiensis* and coral broom.

On drier slopes the tussockland is dominated by narrow-leaved snow-tussock, golden speargrass, *Gaultheria crassa*, mouse-ear hawkweed and woolly moss. Other species present are *Celmisia lyallii*, *Leucopogon suaveolens*, *Raoulia subsericea*, *Lycopodium fastigiatum*, red woodrush, turpentine shrub, *Pentachondra pumila*, fescue tussock, sweet vernal, patotara and occasional matagouri, creeping mapou and *Celmisia densiflora*.

Additional species present along stream sides or on the banks of the Hakataramea River are *Celmisia semicordata*, porcupine shrub, *Helichrysum intermedium* and feathery tutu.

The intactness of the vegetation cover in this area is an important component for soil and water conservation, as well as maintaining water yield and mitigating flooding to areas downstream.



## Notable Flora

Notable plant species recorded on the property are listed in Table 2 below. Threat categories are those proposed by Hitchmough et al. (2007).

**Table 2** Notable plant species, Shenley Pastoral Lease.

Plant Species	Threat Status	Distribution on Property
<i>Aciphylla subflabellata</i>	Sparse.	Occasional scattered plants at lower altitudes in Exe valley.
<i>Carmichaelia crassicaule</i> (coral broom)	Gradual decline.	Scattered at higher altitudes and on western slopes.
<i>Coprosma intertexta</i>	Sparse.	A small population in lower Kennaway Stream.

Old kowhai trees in Lockharts valley and old broadleaf trees in upper Exe valley are notable remnants of the original vegetation of the area.

## Significance of Vegetation and Flora

Tussocklands on western slopes and higher-altitude parts of the main ridge crest on Shenley Pastoral Lease have significant inherent values. These tussocklands, though modified, are representative of the indigenous vegetation that is likely to have prevailed in these areas during at least some periods prior to human settlement. Three other small localised areas on the property have significant inherent values: the broadleaf forest remnant on lower south-facing slopes in upper Exe valley, red tussockland on a poorly-drained saddle in Exe valley, and a small kowhai forest remnant and associated shrubland in and adjacent to a small tributary of Lockharts Stream. The two forest/shrubland remnants are representative of the original vegetation of the area. The red tussockland appears to have been induced or at least influenced by farm management, but is representative of the original vegetation that was probably present at poorly-drained valley-floor sites. Three threatened species are present on the property: coral broom (gradual decline), *Aciphylla subflabellata* (sparse) and *Coprosma intertexta* (sparse), though their presence in small and/or very scattered populations limits the merit of and opportunities for formal protection.

The intactness of the vegetation cover in Lockharts and Hakataramea valleys play an important role in soil and water conservation, as well as maintaining water yield and mitigating flooding to areas downstream.

### 2.5.3 Problem Plants

Shenley Pastoral Lease is relatively free of significant plant pests. A small scattered infestation of broom is present along the stream below the kowhai forest remnant in the small tributary of Lockharts Stream. A few small elderberry trees and one Himalayan honeysuckle bush are present in the broadleaf forest remnant in upper Exe valley. Grey willow and poplar are present on or adjacent to the river beds in Lockharts valley, and crack willow and alder are present along Exe Stream. Wilding trees (pines and larch) are present as a widely scattered infestation on upper and western slopes, and near the farm buildings at the northeast corner of the property in Exe valley.

## 2.6 FAUNA

No Sites of Special Wildlife Importance (SSWI) are listed for the property.

### 2.6.1 Bats

Short-tailed bats have not been recorded in Canterbury since the arrival of Europeans. A small population of South Island long-tailed bat is present in South Canterbury. The closest bat records to Shenley Pastoral Lease are from the Tengawai River (Sedgeley, 2002). The property was not surveyed for bats because bat roosting and feeding habitats (forest and mature shrubland) are not present in the area.

### 2.6.2 Birds and Lizards

In pre-human times, the bird fauna of the inland South Canterbury downlands contained at least 87 species (Worthy, 1997). This large diversity of birds, relative to other parts of New Zealand, has been attributed to the survival of grassland-shrubland mosaics into the late Holocene period. This complex ecosystem is now almost totally destroyed. The present bird fauna of the area is characterized by species that inhabit open country, farmland, riverbed and shrubland habitats.

Indigenous bird species recorded from the adjacent Mt Dalgety Pastoral Lease are Australasian harrier, grey warbler, New Zealand falcon, New Zealand pipit, silvereye, southern black-backed gull, spur-winged plover and welcome swallow (Lettink, 2007). One of these species, New Zealand falcon, is considered threatened (gradual decline) by Hitchmough *et al.* (2007).

Lizard species previously recorded from the Hunters ED are Southern Alps gecko, McCann's skink and an unidentified species of skink that is likely to be either common skink or McCann's skink. Threatened species of lizards recorded from adjacent ecological districts include jewelled gecko (gradual decline), long-toed skink (sparse), scree skink (gradual decline) and spotted skink (gradual decline). Nearest localities for these species are Hakataramea Pass and Cave (jewelled gecko), Tekapo River (long-toed skink), the upper Tekapo River (spotted skink), and Sawdon and Curraghmore pastoral leases (scree skink).

Bird and lizard species observed on Shenley Pastoral Lease are described for two geographic areas of the property.

#### **Southeast Corner (Blainslie Valley and eastern Exe Valley)**

This area covers the Blainslie Stream catchment, the low ridge between Blainslie Stream and Exe Stream, and the eastern (right branch) headwater tributary valley of Exe Stream. Habitats in this area mostly comprise developed grassland, with smaller areas of exotic trees near the homestead in Blainslie Stream and red tussockland in Exe valley. Occasional scattered native shrubs and rock outcrops are present.

Native birds observed in this area were Australasian harrier and spur-winged plover. Introduced birds observed were Australian magpie, blackbird, chaffinch, goldfinch, house sparrow, skylark, song thrush, starling and wild turkey.

The only lizard observed in this area was one McCann's skink near the main channel of Exe Stream.

### Central and Western Areas (Exe, Hakataramea and Lockharts valleys)

This area covers the main part of the property, comprising most of Exe valley, the main ridge, and the western slopes in Hakataramea and Lockharts valleys. The main habitats in this area are modified grassland at lower altitudes and tall tussockland at higher altitudes. Other habitats present are matagouri scrub and shrubland (especially in Exe valley), turpentine-shrub scrub and shrubland (in western areas), red tussockland on valley floors, and small areas of rockland, stonefield, cushionfield and seepage on or near the ridge crest.

Native birds observed in this area were Australasian harrier, bellbird, black shag (Hakataramea valley) southern black-backed gull, grey duck (upper left branch of Exe Valley), grey warbler, New Zealand falcon (Lockharts valley), New Zealand pipit, paradise shelduck, silvereve, South Island fantail, South Island pied oystercatcher, spur-winged plover and welcome swallow. Three of these species are considered threatened by Hitchmough *et al* (2007): black shag (sparse), grey duck (nationally endangered) and New Zealand falcon (gradual decline). Introduced birds observed were Australian magpie, blackbird, California quail, chaffinch, goldfinch, house sparrow, peafowl, skylark, song thrush, starling, wild turkey and yellowhammer.

Lizards observed in this area were McCann's skink (four sightings) and Southern Alps gecko (14 sightings). Lizards were found mainly along the ridge crest and in the stream gullies. Rocky outcrops and other typical lizard habitats in this unit are patchy, although larger concentrations of rock outcrops are present along the crest of the ridge than in the side gullies.

### Bird Species Recorded

Twenty-six bird species were recorded on Shenley Pastoral Lease during this survey: 14 native species (Table 3) and 12 introduced species. Introduced bird species recorded were Australian magpie, blackbird, California quail, chaffinch, goldfinch, house sparrow, peafowl, skylark, song thrush, starling, wild turkey and yellowhammer.

**Table 3** Native bird species recorded from Shenley Pastoral Lease.

Bird species	Threat status	Distribution on property
Australasian harrier	Not threatened	Throughout.
bellbird	Not threatened	Shrublands in Exe Stream valley.
black shag	Sparse	Hakataramea River.
grey duck	Nationally endangered	Upper left branch of Exe Stream.
grey warbler	Not threatened	Shrublands throughout.
New Zealand falcon (eastern)	Gradual decline	Lockharts Stream valley.
New Zealand pipit	Not threatened	Ridge crest.
paradise shelduck	Not threatened	Exe Stream valley and terraces.
silvereve	Not threatened	Shrublands in Exe Stream valley.
southern black-backed gull	Not threatened	Exe Stream valley and terraces.
South Island fantail	Not threatened	Shrublands in Exe Stream valley.
South Island pied oystercatcher	Not threatened	Exe Stream valley and terraces.
spur-winged plover	Not threatened	Throughout.
welcome swallow	Not threatened	Exe Stream valley.

### Lizard species recorded

Nineteen lizards representing two species were recorded on the property: five McCann's skinks and 14 Southern Alps geckos.

### **Significance of the Bird and Lizard Fauna**

Shenley Pastoral Lease provides habitat for one 'acutely-threatened' species, grey duck (nationally endangered), one 'chronically threatened' species, New Zealand falcon (gradual decline) and one 'at risk' species, black shag (sparse). All are likely to be temporary visitors to the property, making limited use of the habitats, although New Zealand falcon may be supporting a regular nesting habitat. The property also provides habitat for eleven non-threatened native bird and two non-threatened native lizard species. Habitats are valley-floor riverbed and red tussockland in the upper left branch of Exe valley, shrubland and forest remnants in Exe valley (though very limited in extent), and tall tussockland and rockland habitats in western parts of the property.



### 2.6.3 Freshwater Fauna (fish and invertebrates)

Shenley Pastoral Lease lies within two river catchments, the Opihi and the Waitaki. Most parts of the property are drained by tributaries of the Opihi River: Blainslie Stream in the southeast, Exe Stream in the northeast and Lockharts Stream in the northwest. The southwest part of the property is drained by the Hakataramea River, which flows south to join the Waitaki River below the hydro-electric dams.

A distinguishing feature of the Opihi River catchment and lower Waitaki River catchment is the absence of hydroelectric dams. This has two main effects on 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 (NZFFD) has 94 records from the Opihi River catchment and 1090 records from the Waitaki River catchment (at 23<sup>rd</sup> March 2007). No species are recorded in the NZFFD from the Opihi River tributaries or the Hakataramea River near the property, although longfin eel and lowland longjaw galaxias have been recorded from the Hakataramea River less than 15 km downstream from the property boundary. These two species are considered threatened by Hitchmough *et al.* (2007): longfin eel (gradual decline); lowland longjaw galaxias (nationally critical).

All of the Opihi, including all the catchments on this pastoral lease, are recognised as a 'Type II' in the Waters of National Importance (WONI) documentation (Chadderton *et al* 2004). 'Type II' implies that the waterway contains special features of national significance. Only sections of 'Type II' catchments are of national importance. This significance is because it contains Nationally Significant braided river birds.

The property comprises four main catchments of freshwater habitat. These habitats and the fish and macro-invertebrate species recorded are described below.

#### Blainslie Stream Catchment

This area incorporates the parts of the property that lie within the Blainslie Stream catchment. Freshwater habitats in this area are small permanent and ephemeral streams, all of which have their sources within the area. These streams flow through grassland, with occasional shrubs and stands of exotic trees. Willow trees and monkey musk are present in the streambeds. Stock access appears to be generally unrestricted. The streams vary in size, ranging from 500 mm to one metre wide and 100 to 200 mm deep, with pools up to 600 mm deep. Stream substrates are predominantly earth or silt, with gravel present in places.

Two sites were electro-fished in this area. Species recorded were upland bully and brown trout, occurring together at one site near the Shenley homestead.

Macro-invertebrates observed in this area were a snail (*Potamopyrgus* sp.), flatworm (*Cura* sp.) and worm (*Oligochaete* sp.). Such a low diversity of macro-invertebrates can be indicative of poor water quality.

#### Exe Stream Catchment

This area incorporates the parts of the Exe Stream catchment within the property including its only named tributary, Kennaway Stream. Characteristic freshwater habitats in this area are small permanent streams, ephemeral streams, palustrine wetlands and palustrine seepages. These habitats lie within grassland, tall-tussockland, red tussockland and matagouri shrubland. Willow and poplar



trees are present along some streams, and monkey musk is present in most permanent stream channels. Wetlands support red tussockland, sedges, rushes and grasses.

Stock and wild animal access is unrestricted and vehicle tracks cross many of the streams by ford or culvert. The streams vary in size to a maximum of three metres wide in Exe Stream and one and a half metres wide in the other permanent streams. The wetlands range in size from 30 metres long and 10 metres wide, to over 200 metres long and 100 metres wide. All permanent waterways are between 100 and 300 mm deep, with pools up to 800 mm deep. All ephemeral streams appear to be no more than 100 mm deep during rain events. The wetlands have areas of open water between 100 mm and 500 mm deep. Permanent stream substrates are mainly composites of boulders and cobbles; ephemeral stream and wetland substrates are generally silt.

Twelve sites were electro-fished in this area. Species recorded were Canterbury galaxias (11 sites) and upland bully (seven sites). One site had no fish species present. At all seven sites with upland bully present, Canterbury galaxias were also present.

Macro-invertebrates observed in this area were mayflies (*Ameletopsis perscitus*, *Coloburiscus humeralis*, *Deleatidium lillii*-group, *Deleatidium myzobranchia*-group, *Nesameletus* sp. and *Oniscigaster* sp.), stoneflies (*Stenoperla prasina* and *Zelandobius* sp.), caddisflies (*Aoteapsyche* sp., *Helicopsyche* sp., *Hydrobiosis* sp., *Hydropsychidae* sp., *Olinga feredayi*, *Pycnocentria* sp. and *Pycnocentroides aeris*), dobsonfly (*Archichauliodes diversus*), two-winged flies (*Aphrophila* sp. and *Austrosimulium* spp.), snail (*Potamopyrgus* sp.), flatworm (*Cura* sp.) and worm (*Oligochaete* sp.). The diverse macro-invertebrate fauna indicates high water quality.

### **Lockharts Stream Catchment**

This area incorporates the parts of the property that lie in the Lockharts Stream catchment. Characteristic freshwater habitats in this area are the permanent and ephemeral tributaries of Lockharts Stream, all of which have their sources on the property. These streams flow through tall tussockland, grassland and shrubland communities. Willow and poplar trees are present along Lockharts Stream and monkey musk is present in many stream beds. A dense stand of exotic trees is present as a gravel trap in Lockharts Stream. Stock and wild animal access is unrestricted. The streams vary in size from 500 mm to two metres wide and from 100 to 200 mm deep, with pools up to 500 mm deep. Ephemeral streams appear to be less than 100 mm deep during rain events. Ephemeral stream substrates are predominantly earth or silt; permanent stream substrates have more boulders, cobbles and bedrock.

Five sites were electro-fished in this area. Species recorded were Canterbury galaxias (two sites) and upland bully (one site). Two sites had no fish species present.

Macro-invertebrates observed in this area were mayflies (*Coloburiscus humeralis*, *Deleatidium lillii*-group, *Deleatidium myzobranchia*-group, *Nesameletus* sp. and *Oniscigaster* sp.), stoneflies (*Stenoperla prasina* and *Zelandobius* sp.), caddisflies (*Aoteapsyche* sp., *Helicopsyche* sp., *Hydrobiosis frater*, *Hydrobiosis* sp., *Hydropsychidae* sp. and *Olinga feredayi*), dobsonfly (*Archichauliodes diversus*), two-winged flies (*Austrosimulium* spp. and *Neocurupira hudsoni*-group), snail (*Potamopyrgus* sp.), flatworm (*Cura* sp.) and worm (*Oligochaete* sp.). The diverse macro-invertebrate fauna indicates high water quality.

### **Hakataramea River Catchment**

This area incorporates the parts of the property that lie in the Hakataramea River catchment. Characteristic freshwater habitats in this area are the Hakataramea River and its permanent and ephemeral tributary streams. All tributary streams have their sources within the property. These streams flow through tall tussockland and turpentine-shrub shrubland. Tutu and monkey musk are

present in the permanent stream beds. Stock and wild animal access is unrestricted. The Hakataramea River varies from two metres wide in its upper reaches to over three and a half metres wide in its lower reaches. Permanent streams are up to one metre in width. The Hakataramea River is between 100 and 300 mm deep, with pools up to two metres deep. Permanent streams are generally about 200 mm deep, with pools up to 800 mm deep. The ephemeral streams appear to be no more than 100 mm deep during rain events. Permanent stream substrates are mostly boulders and cobbles, with some bedrock in places. Ephemeral stream substrates are silt over bedrock.

Four sites were electro-fished in this area. Species recorded were rainbow trout (three sites), Canterbury galaxias (one site) and brook char (one site). Canterbury galaxias and rainbow trout were present together at one site.

Macro-invertebrates observed in this area were mayflies (*Coloburiscus humeralis*, *Deleatidium lillii*-group, *Deleatidium myzobranchia*-group, *Nesameletus* sp. and *Oniscigaster* sp.), stoneflies (*Stenoperla prasina* and *Zelandobius* sp.), caddisflies (*Aoteapsyche* sp., *Hydrobiosis* sp., *Hydropsychidae* sp. and *Olinga feredayi*), two-winged flies (*Austrosimulium* spp., *Chironominae* sp. and *Neocurupira hudsoni*-group), flatworm (*Cura* sp.) and worm (*Oligochaete* sp.). The diverse macro-invertebrate fauna indicates high water quality.

### Species Recorded

Five fish species were recorded during this survey of Shenley Pastoral Lease (see Table 4). A diverse macro-invertebrate fauna was recorded, reflecting the mosaics of freshwater habitats and high water quality in most areas.

**Table 4** Fish species recorded from Shenley Pastoral Lease.

Fish Species	Threat Status	Known Distribution on Property
brook char	Introduced	Hakataramea River catchment.
brown trout	Introduced	Blainslie Stream catchment.
Canterbury galaxias	Not threatened	Throughout in permanent streams (mostly in upper reaches).
rainbow trout	Introduced	Hakataramea River.
upland bully	Not threatened	Permanent streams throughout (mostly lower reaches).

### Significance of the Freshwater Fauna

No threatened fish species were recorded in freshwater habitats on the property, though the diverse macro-invertebrate communities present indicate that freshwater habitats in all but the Blainslie Stream catchment are in relatively good condition, especially in their upper reaches. A notable feature of the Exe Stream catchment on the property is the absence of introduced fish species. All waterways on this property are recognised as a 'Type II' Waters of National Importance (Chadderton *et al.*, 2004).



## 2.6.4 Terrestrial Invertebrates

The native invertebrate fauna of South Canterbury has numerous outstanding features. It appears that South Canterbury is a contact zone between several insect groups (P. Johns and R. Emberson, *pers. comm.*). Within the Carabidae for example, several species complexes have been identified, particularly within the genus *Megadromus*, specifically *Megadromus antarcticus*, *M. antarcticus* subspecies 1 and 2 and *M. crassalis*. South Canterbury also supports several rare beetle species, including the critically endangered Canterbury knobbed weevil *Hadramphus tuberculatus*, which was re-discovered at Burke Pass after being presumed extinct for over 60 years. The Canterbury knobbed weevil was probably once widespread throughout lowland South Canterbury but as a result of habitat loss is now severely restricted in range. Two further species of note are the giant speargrass weevils (*Lyperobius carinatus* and *L. huttoni*) whose distributions meet along The Hunters Hills.

Invertebrates of Shenley Pastoral Lease are described below for four separate parts of the property. No invertebrate specimens were collected from the southeast corner of the property (Blainslie Stream catchment), due to the extent of modification and a lack of suitable habitat for species of interest.

### Upper Exe Valley

Northeast-facing slopes in this area are divided by an unnamed tributary of Exe Stream. The headwaters of Exe Stream pass through gentle undulating terrain that is highly modified for grazing and includes an airstrip. The valley floor has several small wetlands dominated by red tussock. Higher-altitude slopes support tall tussockland and speargrass habitats, although these too are affected by grazing.

The ubiquitous water spider *Dolomedes aquaticus* was found within this area. Although *Dolomedes aquaticus* has a “data deficient” threat status, it is often found amongst the stones of riverbeds that flow through relatively modified pasture country (*pers. obs.*) as is the case in this area. An abundance of native invertebrates were present on giant speargrass flowers in this area, specifically flower beetles (*Dasytes* sp.), Eugnomini weevils, Muscid and Tachinid flies and spiders (orb web and hunting species). There was also some ‘notching’ of speargrass leaves, which is usually evidence of the giant speargrass owlet, *Graphania nullifera*, a native Noctuid moth. Also present were several leaf veined slugs (*Pseudoneitea* sp.) and an endemic stink bug (*Cermatulus nasalis*). A stick insect (*Pachymorpha* sp.) was seen (but not collected), an unusual record for a tenure review survey. Numerous darkling beetles (*Artystona obscura*) and the large Canterbury endemic ground beetle (*Megadromus antarcticus*) were found along the main ridge.

The condition and abundance of native invertebrates within this area was considerable, although populations of endemic invertebrate species were generally restricted to the native vegetation. Specific guilds of invertebrate taxa reflect specific habitats (and their condition) and this was true for the collecting area. For example, throughout the higher shadier slopes where snowgrass density is sufficient, dozens of ringlet butterflies were seen along with Crambid moths, beetles (*Pyronota festiva*) and native orb-web spiders (*Tetragnatha* sp.). The latter spin webs between the spiky leaves of golden speargrass and appear to prey on the many fly species that visit these flowers. Dragonflies and damselflies were also seen flying above the creek gullies in this area.

### Lower Exe Valley

There are three distinct tributary catchments within this area resulting in a series of gullies and spurs. At the time of inspection the north faces of these spurs appeared drier and were generally sparsely vegetated in comparison to the southern aspects. At higher altitudes narrow-leaved snow-tussock, golden speargrass, dwarf inaka and scattered cotton daisy are dominant. The mid slopes support

extensive patches of matagouri scrub while the southern aspects, particularly the damper gullies, support giant speargrass and native shrubs.

Invertebrates were well distributed throughout the area. The composition of invertebrate taxa changed in character (and increased in density) with decreasing altitude. Several invertebrate taxa of conservation interest were collected, including one data deficient species (the water spider, *Dolomedes aquaticus*) which was found in tributaries of Exe Stream. The large distinctive ground beetle *Megadromus crassalis* was found on the main ridge between Lockharts and Exe valleys. This population is isolated to South Canterbury (Johns, 2005). Another ground beetle, thought to be *Megadromus temukensis*, was also found on the main ridge between Lockharts and Exe valleys.

Native invertebrate populations appear to be in substantial numbers. The common tussock ringlet (*Argyrophenga antipodiana*), for example, was abundant above 800 m. Similarly, copper butterflies (*Lycaena salustius*) and Crambid moths were plentiful within gullies and throughout the lower tussock country. A full suite of insects were noted feeding on the pollen of speargrass flower spikes.

### **Hakataramea Valley**

The southwest-facing slopes in this area are dominated by snow-tussockland and turpentine-shrub shrubland, with some mountain flax. These habitats provide for several species of grass moth and butterfly of which the most frequently seen were Crambid and Pyralid moths along with ringlet butterflies. Cicadas (*Maoricicada clamitans*) were abundant on these slopes.

A range of invertebrates representing several feeding guilds was collected throughout this area and all of these are typical of tussockland habitats. Groups included grass stem feeders such as grasshoppers (*Sigaus australis*), katydids (*Conocephalus* sp.) and crickets (*Bobilla bigelowi*). Sap suckers and seed bugs were also common, represented in high numbers by the shield bug *Rhopaliomorpha lineolaris* and the seed bug *Rhyphodes anceps*. Several Lepidoptera of note were collected including *Dayuris transaurea* (a Geometrid) whose caterpillar feeds on *Anisotome* and one specimen of *Aletia virescens* (the greater alpine grey), a heavy Noctuid moth endemic to the South Island high country.

The condition of native invertebrate populations within this area is intact and ecologically functional. Invertebrate populations appear to be healthy and widespread throughout this area. Several large dragonflies (*Uropetala chiltoni*) were seen flying near the creeks and dozens of beetles were collected from giant speargrass flowers, most of which were *Dasytes* sp. (flower beetles) and Eugnomini weevils. In general, large mature speargrass plants tend to provide habitat for a wide diversity of invertebrates and this was true for these slopes. Large orb web spiders (*Achaeearanea* sp.) and Therid spiders (*Tetragnatha* sp.) were common on the speargrass, presumably catching the many flies associated with these plants (Syrphids, Dolichopodids and blowflies). The density of *Sigaus australis* grasshoppers was at its greatest on these slopes, at least in comparison to the ridgeline which divides the property.

### **Lockharts Valley**

At the time of inspection, these sunny northwest-facing slopes were in similar ecological condition to the Hakataramea River valley slopes (above). Patches of woody vegetation are present, including *Hebe* sp., matagouri, kowhai and *Coprosma*, particularly in the gullies. Invertebrates were also collected from a stable scree habitat which supported several large speargrass plants with lawyer and matagouri. The dominant vegetation throughout this area is short tussock and tall tussock, particularly across the open faces.

The diversity and distribution of invertebrate taxa was probably at its greatest on the property throughout this sampling area. Numerous micro-habitats were inspected and these supported

millipedes (*Eumastigonus* sp.), several species of spider including orb web spinners (Theridiidae) and ground spiders (Lycosidae and Zoropsidae) as well as a common New Zealand endemic sheetweb spider, *Cambridgea antipodiana*.

At one site a single specimen of *Inophloeus sucifer* was collected. These large South Island endemic weevils are obligate speargrass feeders. Being slow moving, these beetles would be easy prey for predators were it not for the difficulty of negotiating the sharp speargrass leaves, and it is probably for that reason that the weevil is still present. Habitat loss (through fire, cultivation and steady grazing) is perhaps the most serious threat to these weevils. Additional beetles of interest collected in the area were two species of tiger beetle (*Neocicindela austromontana* and *N. latecincta*).

Several mountain stone weta (*Hemideina maori*) were noted amongst rocky outcrops. These large insects are usually a good indicator of low predator presence and competition. An abundance of native cockroaches was present at the transition between talus and tussockland, a typical habitat for most sub-alpine cockroach taxa. At one site three species of cockroach were found: *Celatoblatta anisoptera*, *C. vulgaris* and *Parellipsidion inaculeatum*. Dragonflies and damselflies were well represented throughout this area, with numerous sightings of the large mountain giant dragonfly (*Uropetala chiltoni*) and the smaller but faster-flying ranger dragonfly (*Procordulia smithii*). The native red damselfly (*Xanthocnemis zealandica*) was also seen along creek channels and near damp areas close to Lockharts Stream.

Invertebrate population size and community condition within this area were similar to that on the Hakataramea valley slopes. The slopes above Lockharts Stream support a comparatively intact and ecologically functional suite of invertebrate taxa whose populations appear in good condition. Few introduced species were seen.

## Species Recorded

During this survey, 60 invertebrate species were identified: 97% of which are native, with 40% of these endemic to the South Island. Notable invertebrates are listed in Table 5.

**Table 5** Notable invertebrate species collected from Shenley Pastoral Lease.

Species	Significance	Distribution on Property
<i>Dolomedes aquaticus</i> (water spider)	Listed as data deficient.	Tributaries of Exe Stream.
<i>Megadromus crassalis</i>	A local endemic with an isolated population; poorly studied (Johns, 2005).	Main ridge between Lockharts and Exe valleys.
<i>Megadromus</i> sp. ( <i>M. temukensis</i> ?)	A local endemic; conservation status unclear (Johns, 2005).	Main ridge between Lockharts and Exe valleys.

## Significance of the Invertebrate Fauna

Sixty invertebrate species were identified during this survey, of which 97% are native, (40% are endemic either to the South Island or the South Canterbury region) and 3% are introduced. Invertebrates of the highest conservation interest are two species of *Megadromus* beetle. One data-deficient species was also found on the property (the water spider, *Dolomedes aquaticus*). One area with ecologically intact and diverse invertebrate populations in the northwest part of the property (Lockharts valley area) represents the best area of significant invertebrate habitat on the property.



## **2.6.5 Problem Animals**

Fallow deer, Bennett's wallaby, hares, rabbits and possums, or their sign, were observed on the property. Collectively, these introduced herbivores browse native vegetation, exacerbating damage caused by stock. Predators such as feral cats, hedgehogs, mustelids (ferrets, stoats and weasels) and rodents are likely to be present. These animals include native birds and lizards in their diets and pose a significant threat to invertebrates, especially the larger flightless species.

## **2.7 HISTORIC**

### **2.7.1 European Heritage Values**

Shenley Pastoral Lease appears to have originally been part of the Opawa Run, between Mount Nessing Run to the south and the Levels Run to the north. The run was first taken up by Kennaway and Delamain in 1859. Opawa was sold to Isaac Brentnall Sheath in 1862 and then to FG Dalgety in 1869. John and Robert Rutherford purchased the property from Dalgety in 1870. Over the years substantial parts of the Opawa Run were freeholded, leaving leasehold land only in the upper Tengawai tributaries (Pinney, 1981). The subsequent history of this area is unclear although it appears to have passed hands several times before ending up with the current leasees grandfather.

Part of the current homestead, and some of the buildings at the northern end of the pastoral lease, appear to have been built before 1900. These buildings are therefore of historic interest due to this early construction.

No other sites of historic significance are known from the property.

### **Significance of Historic Resources**

Shenley Pastoral Lease appears to have originally been part of the Opawa Run. Some of the existing farm buildings and the current homestead are of historic interest; however, no other sites of historic significance are known from the property.

## **2.8 PUBLIC RECREATION**

### **2.8.1 Physical Characteristics**

Lower-altitude eastern parts of the property in the Blainslie and Exe valleys are mostly highly modified and characterized by extensive pasture, fences and farm tracks. The recreation setting is predominantly cultural, due to the influence of farming. Higher-altitude western parts of the property on the main ridge that forms the northernmost extension of The Hunters Hills, and separates Exe valley from the Hakataramea and Lockharts valleys, are less modified. This area is characterized by extensive tussocklands on steeper slopes and is transitional in character between the farmed downs and hills of South Canterbury and the Mackenzie Basin high country. The recreation setting here ranges from cultural/semi-natural in the Exe valley to semi-natural and natural in the valleys to the west. A farm track traverses the main ridge and one of the main spurs. There is also a vehicle track adjacent to the property boundary in the Lockharts and Hakataramea valleys. The saddle between these two valleys (Lockharts Saddle) provides easy access between the Tengawai River in the Opihi catchment and the Hakataramea River in the Waitaki catchment and access to the northern end of The Hunters Hills.



## **2.8.2 Legal Access**

### **Roads**

Vehicle access within the property is mainly along farm tracks which generally do not follow formed legal roads. An unformed extension of Chamberlain Road runs along the southern boundary of the property. Another unformed legal road runs north-south up the Exe valley, along part of the eastern boundary of the property. An unformed legal road runs along the western property boundary in the Lockharts and the Hakataramea valleys. Another unformed legal road runs northeast from Lockharts Saddle, to a point just west of the crest of the main ridge on the property.

### **Adjoining Crown and Public Conservation Land**

Mt Dalgety Conservation Area adjoins part of the western boundary of the property, just north of Lockharts Saddle. A gravel reserve vested in the Mackenzie District Council is present on the southeast boundary of the property, on Chamberlain Road.

### **Marginal Strips**

There are no marginal strips along streams on or within the property boundary. A marginal strip exists on the northwest boundary of the property in Lockharts Stream.

## **2.8.3 Activities**

There is a current recreation permit for hiking, walking, mountain-biking, horse-trekking, four-wheel driving, safari, orienteering, hunting and shooting, ski and snow touring. The main activity carried out on the pastoral lease is hunting. There do not appear to be any regularly used public walking or tramping routes on the property. The vehicle track through the Lockharts and Hakataramea valleys across Lockharts Saddle is presently used by the public for a variety of recreational activities. This route provides good access between the two valleys. The main ridge provides impressive scenic viewing prospects (the Dalgety Range, the northern part of The Hunters Hills and the South Canterbury downlands) and opportunities for recreational access to the northern end of The Hunters Hills.

### **Significance of Recreation**

Western parts of the property provide semi-natural to natural settings for recreational purposes, notably the main ridge that forms the northernmost extension of The Hunters Hills and the west-facing slopes in Lockharts and Hakataramea valleys. The main ridge provides opportunities for scenic views of the Dalgety Range, the northern part of The Hunters Hills and the South Canterbury downlands. This ridge provides good access to the northern end of The Hunters Hills from Lockharts Saddle, between Lockharts and Hakataramea valleys.

## PART 3 OTHER RELEVANT MATTERS AND PLANS

### 3.1 CONSULTATION

Information-gathering meetings were held with representatives of non-governmental organisations (NGOs) at Christchurch on 4<sup>th</sup> September 2006 and at Geraldine on 5<sup>th</sup> September 2006. Comments made at those meetings are summarised below.

- The property has extensive snow tussock and short tussock grasslands. Importance must be put on looking at water catchment areas and ecosystem services.
- Alpine vegetation is present.
- The Eastern Mackenzie landscape study lists the area as an outstanding landscape.
- There is Class VII land and Class VIII land present.
- The tussock grassland has previously been de-stocked (there is presently no de-stocked area on the property)
- In May 1999 the soil and water conservation agreement expired and wasn't renewed.
- The catchment areas are in good condition.
- Pine tree removal work has been done in Lockharts Stream.
- There is a gravel trap in Lockharts Stream.
- The farm tracks through the property would be excellent for mountain-biking. Make sure the existing tracks are available for access.
- There is access up Lockharts Stream and over the saddle to the Hakataramea River.
- There is a good walk up Lockharts Stream from the bridge on Mackenzie Pass Road.

### 3.2 DISTRICT PLANS

Shenley Pastoral Lease lies within the Rural Zone of the Mackenzie District. One Site of Natural Significance is present by the western property boundary on the adjoining Mt Dalgety Pastoral Lease:

- 48: a small fenced totara reserve in Lockharts Stream valley (Grampians RAP 4).

The Mackenzie District Plan contains a number of rules relating to land use activities within sites of natural significance, within riparian areas and in high altitude areas (i.e. areas above 900 m).

### 3.3 CONSERVATION MANAGEMENT STRATEGIES

Western parts of Shenley Pastoral Lease lie within the Waitaki Place Unit and eastern parts lie within the Pareora Place Unit of the Canterbury Conservancy. Relevant priority objectives for these units listed in the CMS (Department of Conservation, 2000) are:

#### Waitaki Place Unit

- To identify, maintain and seek to enhance the natural landscapes and natural landscape values of the Waitaki Unit.
- To identify the significant indigenous vegetation and threatened species of the Waitaki Unit.
- To use a range of effective methods to protect the indigenous biodiversity of the Waitaki Unit.

- To protect and enhance the viability of priority threatened species populations and their habitat(s) in the Waitaki Unit.
- To improve the range of viable riparian habitats for indigenous species in the Mackenzie Basin.
- To prevent the loss of natural and landscape values from wilding trees on land managed by the Department.
- To liaise with land managers and regulatory agencies to control and contain wilding trees.
- To reduce and maintain rabbit and thar densities to levels that ensure their adverse effects on natural values are minimised.
- To provide new recreational facilities and opportunities by the Department and other organisations and concessionaires where natural and historic values are not compromised.
- To liaise with adjacent landholders to resolve conflicts over access for recreation to land managed by the Department.
- To increase public awareness of the natural and historic values of the Waitaki.

#### Pareora Place Unit

- To identify the significant indigenous vegetation and threatened plant and animal species of the Pareora Unit.
- To use a range of effective methods to protect the indigenous biodiversity of the Pareora Unit.
- To protect and enhance the viability of priority threatened species populations and their habitats in the Pareora Unit.
- To survey, monitor and control wallaby densities on land managed by the Department to levels that minimise their adverse effects on indigenous vegetation.

### **3.4 NEW ZEALAND BIODIVERSITY STRATEGY**

The New Zealand Government is a signatory to the Convention on Biological Diversity. In February 2000, Government released the New Zealand Biodiversity Strategy. This strategy is a blueprint for managing the country's diversity of species and habitats. It sets a number of goals to achieve this aim. Of particular relevance to tenure review is Goal 3, which states:

- Maintain and restore a full range of remaining natural habitats and ecosystems to a healthy functioning state, enhance critically scarce habitats, and sustain the more modified systems in production and urban environments, and do what is necessary to:
- Maintain and restore viable populations of all indigenous species across their natural range and maintain their genetic diversity.

## PART 4 ATTACHMENTS

### 4.1 ADDITIONAL INFORMATION

#### 4.1.1 Scientific Names of Species

##### Plant Species referred to in text

Species names follow those in the published volumes of New Zealand Flora and the name changes listed in A Checklist of Indigenous Vascular Plants of New Zealand, 10<sup>th</sup> Revision (*Unpublished Document*, S. Courtney, Department of Conservation, Nelson). Maori names are included for taonga species listed in Schedule 97 of the Ngai Tahu Claims Settlement Act 1998. Naturalised species are indicated by an asterisk (\*).

<u>Common name</u>	<u>Scientific name</u>
alder*	<i>Alnus glutinosa</i>
bidibid	<i>Acaena</i> sp.
blue tussock	<i>Poa colensoi</i>
bog rush	<i>Schoenus pauciflorus</i>
bracken	<i>Pteridium esculentum</i>
broadleaf/kapuka	<i>Griselinia littoralis</i>
broom*	<i>Cytisus scoparius</i>
browntop*	<i>Agrostis capillaris</i>
bush lawyer	<i>Rubus cissoides</i>
catsear*	<i>Hypochoeris radicata</i>
comb sedge	<i>Oreobolus pectinatus</i>
coral broom	<i>Carmichaelia crassicaule</i>
cotton daisy/tikumu	<i>Celmisia spectabilis</i>
crack willow*	<i>Salix fragilis</i>
creeping mapou	<i>Myrsine nummularia</i>
creeping pohuehue	<i>Muehlenbeckia axillaris</i>
dwarf inaka	<i>Dracophyllum pronum</i>
elderberry*	<i>Sambucus nigra</i>
feathery tutu	<i>Coriaria plumosa</i>
fescue tussock	<i>Festuca novae-zelandiae</i>
giant speargrass/taramea	<i>Aciphylla scott-thomsonii</i>
golden speargrass/taramea	<i>Aciphylla aurea</i>
grey willow*	<i>Salix cinerea</i>
harebell	<i>Wahlenbergia albomarginata</i>
haresfoot trefoil*	<i>Trifolium arvense</i>
Himalayan honeysuckle*	<i>Leycesteria formosa</i>
hound's tongue fern	<i>Microsorium pustulatum</i>
kahikatea	<i>Dacrycarpus dacrydioides</i>
king devil*	<i>Hieracium praealtum</i>
korokio	<i>Corokia cotoneaster</i>
koromiko	<i>Hebe salicifolia</i>
kowhai	<i>Sophora microphylla</i>
larch*	<i>Larix decidua</i>

lawyer.....	<i>Rubus schmidelioides</i>
lemonwood/tarata.....	<i>Pittosporum eugenioides</i>
lotus*.....	<i>Lotus</i> sp.
lowland ribbonwood.....	<i>Plagianthus regius</i>
male fern*.....	<i>Dryopteris filix-mas</i>
Maori onion.....	<i>Bulbinella angustifolia</i>
matagouri.....	<i>Discaria toumatou</i>
matai.....	<i>Prumnopitys taxifolia</i>
mingimingi.....	<i>Coprosma propinqua</i>
monkey musk*.....	<i>Mimulus guttatus</i>
mountain flax/wharariki.....	<i>Phormium cookianum</i>
mountain kiokio.....	<i>Blechnum montanum</i>
mountain toatoa.....	<i>Phyllocladus alpinus</i>
mountain totara.....	<i>Podocarpus hallii</i>
mountain wineberry.....	<i>Aristotelia fruticosa</i>
mouse-ear chickweed*.....	<i>Cerastium fontanum</i>
mouse-ear hawkweed*.....	<i>Hieracium pilosella</i>
narrow-leaved lacebark.....	<i>Hoheria angustifolia</i>
narrow-leaved snow-tussock.....	<i>Chionochloa rigida</i>
native broom.....	<i>Carmichaelia australis</i>
nettle*.....	<i>Urtica</i> sp.
patotara.....	<i>Leucopogon fraseri</i>
pohuehue.....	<i>Muehlenbeckia australis</i>
pokaka.....	<i>Elaeocarpus hookerianus</i>
poplar*.....	<i>Populus</i> sp.
porcupine shrub.....	<i>Melicytus alpinus</i>
prickly shield fern.....	<i>Polystichum vestitum</i>
pukio.....	<i>Carex secta</i>
rautahi.....	<i>Carex coriacea</i>
red tussock.....	<i>Chionochloa rubra</i> ssp. <i>cuprea</i>
red woodrush.....	<i>Luzula rufa</i>
scrub pohuehue.....	<i>Muehlenbeckia complexa</i>
sheep's sorrel*.....	<i>Rumex acetosella</i>
silver beech.....	<i>Nothofagus menziesii</i>
silver tussock/wi.....	<i>Poa cita</i>
snowberry.....	<i>Gaultheria depressa</i>
soft rush*.....	<i>Juncus effusus</i>
suckling clover*.....	<i>Trifolium dubium</i>
sweet vernal*.....	<i>Anthoxanthum odoratum</i>
tauhinu.....	<i>Ozothamnus leptophyllus</i>
thistle*.....	<i>Cirsium</i> sp.
thousand-leaved fern.....	<i>Hypolepis millefolium</i>
toetoe.....	<i>Cortaderia richardii</i>
totara.....	<i>Podocarpus totara</i>
turpentine shrub.....	<i>Dracophyllum uniflorum</i>
tutu.....	<i>Coriaria sarmentosa</i>
white clover*.....	<i>Trifolium repens</i>
willow*.....	<i>Salix</i> sp.
wire moss.....	<i>Polytrichum juniperinum</i>
woolly moss.....	<i>Racomitrium pruinosum</i>
woolly mullein*.....	<i>Verbascum thapsus</i>
yarrow*.....	<i>Achillea millefolium</i>
yellowwood.....	<i>Coprosma linariifolia</i>
Yorkshire fog*.....	<i>Holcus lanatus</i>

## Animal Species referred to in text

Species names follow King (1990) for mammals, the June 2003 version of the New Zealand Recognized Bird Names list (compiled by C.J.R. Robertson and D.G. Medway for the Ornithological Society of New Zealand Inc.) for birds, Whitaker (1998) for lizards and McDowall (2000) for fish. Common names for invertebrates are those listed in the Entomological Society of New Zealand's Handbook of New Zealand Insect Names (Scott and Emberson, 1999). Maori names are included for taonga species listed in Schedule 97 of the Ngai Tahu Claims Settlement Act 1998. Naturalised species are indicated by an asterisk (\*).

<u>Common name</u>	<u>Scientific name</u>
Australasian harrier/kahu .....	<i>Circus approximans</i>
Australian magpie* .....	<i>Gymnorhina tibicen</i>
bat .....	see South Island long-tailed bat
bellbird/korimako .....	<i>Anthornis melanura melanura</i>
Bennett's wallaby* .....	<i>Macropus rufogriseus rufogriseus</i>
blackbird* .....	<i>Turdus merula</i>
black shag/koau .....	<i>Phalacrocorax carbo novaehollandiae</i>
brook char* .....	<i>Salvelinus fontinalis</i>
brown hare* .....	<i>Lepus europaeus occidentalis</i>
brown trout* .....	<i>Salmo trutta</i>
brush-tail possum* .....	<i>Trichosurus vulpecula</i>
California quail* .....	<i>Callipepla californica brunnescens</i>
Canterbury galaxias .....	<i>Galaxias vulgaris</i>
chaffinch* .....	<i>Fringilla coelebs</i>
common skink .....	<i>Oligosoma nigriplantare polychroma</i>
European hedgehog* .....	<i>Erinaceus europaeus occidentalis</i>
European rabbit* .....	<i>Oryctolagus cuniculus cuniculus</i>
fallow deer .....	<i>Dama d .dama</i>
feral cat* (house cat) .....	<i>Felis catus</i>
ferret* .....	<i>Mustela furo</i>
goldfinch* .....	<i>Carduelis carduelis</i>
grey duck/parera .....	<i>Anas superciliosa superciliosa</i>
grey warbler/riroriro .....	<i>Gerygone igata</i>
hare* .....	see brown hare
hedgehog* .....	see European hedgehog
house cat* .....	<i>Felis catus</i>
house sparrow* .....	<i>Passer domesticus</i>
jewelled gecko .....	<i>Naultinus gemmeus</i>
longfin eel/tuna .....	<i>Anguilla dieffenbachii</i>
long-toed skink .....	<i>Oligosoma longipes</i>
lowland longjaw galaxias .....	<i>Galaxias cobitinus</i>
McCann's skink .....	<i>Oligosoma maccanni</i>
New Zealand falcon/karearea .....	<i>Falco novaeseelandiae</i>
New Zealand pipit/pihoihoi .....	<i>Anthus novaeseelandiae novaeseelandiae</i>
paradise shelduck/putakitaki .....	<i>Tadorna variegata</i>
peafowl* .....	<i>Pavo cristatus</i>
possum* .....	see brush-tail possum
rabbit* .....	see European rabbit
rainbow trout* .....	<i>Oncorhynchus mykiss</i>
red deer* .....	<i>Cervus elaphus scoticus</i>
scree skink .....	<i>Oligosoma waimatense</i>
short-tailed bat .....	<i>Mystacina tuberculata</i>
silveryeye .....	<i>Zosterops lateralis lateralis</i>

skylark*	<i>Alauda arvensis</i>
song thrush*	<i>Turdus philomelos</i>
Southern Alps gecko	<i>Hoplodactylus</i> aff. <i>maculatus</i> “Southern Alps”
southern black-backed gull/karoro	<i>Larus dominicanus dominicanus</i>
South Island fantail/piwakawaka	<i>Rhipidura fuliginosa fuliginosa</i>
South Island long-tailed bat	<i>Chalinolobus tuberculatus</i>
South Island pied oystercatcher	<i>Haematopus ostralegus finschi</i>
spotted skink	<i>Oligosoma lineoocellatum</i>
spur-winged plover	<i>Vanellus miles novaehollandiae</i>
starling*	<i>Sturnus vulgaris</i>
stoat*	<i>Mustela erminea</i>
upland bully	<i>Gobiomorphus breviceps</i>
wallaby*	see Bennett’s wallaby
weasel*	<i>Mustela nivalis vulgaris</i>
welcome swallow	<i>Hirundo tahitica neoxena</i>
wild turkey*	<i>Meleagris gallapavo</i>
yellowhammer*	<i>Emberiza cintrenella</i>

#### 4.1.2 References Cited

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