

Crown Pastoral Land Tenure Review

Lease name : SILVER HILL

Lease number : PT 103

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.

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SILVER HILL
PASTORAL LEASE



CONSERVATION RESOURCES
REPORT

DEPARTMENT OF CONSERVATION

OCTOBER 2007

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PART 1 INTRODUCTION

Silver Hill Pastoral Lease (1141 ha) is located on the southeast flank of the Albury Range in South Canterbury. The property covers moderately steep southeast-facing slopes and deeply incised gullies on the Albury Range and gentler lower-altitude country along the Tengawai River. The property ranges in altitude from 320 m at its eastern boundary beside the Tengawai River to 1150 m on the crest of the Albury Range. It is drained by the Tengawai River and its tributaries including, on the northern property boundary, Tramway Stream.

Silver Hill Pastoral Lease lies in the Hunters Ecological District (ED), within Pareora Ecological Region (McEwen, 1987). Hunters ED has not been surveyed as part of the Protected Natural Areas Programme. One area of forest, alongside Tramway Stream on the northern part of the property, is listed as a Site of Special Wildlife Interest (SSWI).

The property adjoins Chetwynd Pastoral Lease to the north, Manahune Pastoral Lease to the west and south, and freehold land to the east. The main access to the property is from State Highway 8 near Albury via Cricklewood Road and a formed legal road across the adjoining farm.

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

- Silver Hill Pastoral Lease Landscape Assessment, Alan Petrie, December 2006, 6p + photos + maps.
- Plant Communities of Silver Hill Pastoral Lease and Recommendations for Protection, Mike Harding, February 2007, 17p + photos + maps.
- Assessment of the Bat, Bird and Lizard Values of Silver Hill Pastoral Lease, South Canterbury, Marieke Lettink, February 2007, 19p including photos + maps.
- Silver Hill Pastoral Lease, A Report on the Aquatic Fauna Surveys, Scott Bowie, March 2007, 9p + photos + maps.
- Silver Hill Pastoral Lease Tenure Review, Assessment of Invertebrate Values and Recommendations for their Protection, Rowan Emberson and Pauline Syrett, January 2007, 16p + photos + maps.

Note

In this report, the local name 'Cherry Tree Stream' is used to describe the large bush-clad valley through the middle of the property. It drains east from a high point (spot height 1145) on the crest of the Albury Range down to the main vehicle ford at the Tengawai River.

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

2.1 LANDSCAPE

2.1.1 Landscape Context

The Albury Range, upon which Silver Hill Pastoral Lease is located, is part of a chain of low mountains and high hills that form the visual and physical boundary between the downlands and outwash plains of coastal Canterbury and the inland basins and ranges of the Mackenzie Country. The central ridge crest of the non-glaciated Albury Range is typically of low relief and punctuated occasionally by rounded summits. Deeply incised gullies are prominent on the flanks of the range. These low rangelands were not identified as regionally significant in the Canterbury Regional Landscape Study (Boffa Miskell and Lucas Associates, 1993).

The property is characterized by a sequence of long rounded ridges separated by deep gullies that drain into the Tengawai River. The vegetative cover is widely modified grassland and scrub at lower altitudes, mixed hardwood forest in the incised gullies and tussockland on upper slopes.

2.1.2 Landscape Description

For the purposes of this landscape assessment Silver Hill 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, Tramway Stream

This unit covers the northern part of the property in the catchment of Tramway Stream. The unit comprises two sub-units: the upper southern tributary of Tramway Stream and the lower section of Tramway Stream valley. The hill slopes in the lower sub-unit descend at a constant steep grade towards Tramway Stream. The stream flows within a rock-bound channel that features short stretches of white water and pools. Vegetation cover is influenced by aspect and physical relief, with a large proportion of the steeper slopes clad in mixed hardwood forest, bordered above by matagouri/*Coprosma* shrubland and occasional woody weeds. The upper slopes are covered in pasture grasses and scattered fescue tussock.

The head basin of the upper sub-unit has smooth rounded landforms with moderately steep hill slopes and a narrow gully with a waterfall. Vegetation cover is depleted tussockland with scattered

inaka, golden speargrass, matagouri and wilding pines. A notable feature of the upper sub-unit is the scattered trees of mountain ribbonwood along the stream and on south-facing slopes.

Landscape Values

The lower sub-unit makes a significant contribution to the natural character of Tramway Stream. The forest and shrubland on this part of the property complement the forested areas on the adjoining Chetwynd Pastoral Lease. The upper sub-unit, apart from the waterfall, has no notable landscape values and is similar to other parts of the Albury Range.

Potential Vulnerability to Change

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

- Erection of fences.
- Decline in the ecological health of the remnant hardwood forest.
- Further spread of wilding pines.
- Burning.

Landscape Unit 2, Cherry Tree Stream

This unit covers the catchment of Cherry Tree Stream and the smaller low-altitude gullies to the northeast and southwest. The unit is bounded to the north by the Tramway Stream catchment (Unit 1), to the southwest by a large forested catchment (Unit 3), and to the southeast by the Tengawai River. The unit is dominated by the prominent side-ridges of the Albury Range, the steep rocky slopes of the incised Cherry Tree Stream and the gentler low-altitude ridge crests and smaller gullies. This unit includes the rolling foothills and flats on the property, which have been widely converted to productive farmland.

The lower and mid slopes of Cherry Tree Stream support mixed hardwood forest, principally within the northern tributary of the catchment. Other slopes support mixed shrubland, scrub and fernland. The gentler ridges and lower slopes are covered in pasture grasses and extensive patches of manuka scrub. Maori onion is common on the lower slopes and there are extensive fields of cotton daisy on upper slopes. Narrow-leaved snow-tussock becomes more common at higher altitudes. Scattered wilding pines are also present on upper slopes.

Landscape Values

The lower section and the northern tributary of Cherry Tree Stream have significant inherent landscape values due to the extent and intactness of the mixed hardwood forest and scrub. The natural character of the gully would be enhanced if continued regeneration of the shrubland occurs. The existing forest represents the indigenous landscape character of the Albury Range that has been widely modified elsewhere. The mid-slopes and side-ridges have moderate landscape values attributable to the extent to which the original ground cover has been replaced by introduced grassland.

Potential Vulnerability to Change

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

- Introduction of mono-cultural land uses such as plantation forestry.
- Insensitive track construction and earth works, especially across steep slopes and on drier ridges.
- Further spread of wilding pines.

Landscape Unit 3, Tengawai River Gorge

This unit encompasses the western slopes of the gorge of the Tengawai River, forming the southern part of the property. The western boundary of the unit is the ridge crest of the Albury Range, the northern boundary is the side-ridge south of Cherry Tree Stream and the southern boundary is the property boundary. The slopes above the Tengawai River gorge have several small forested gullies and one large forested gully with steep sides and localized areas of exposed rock.

The main gullies support mixed hardwood forest and, at higher altitudes, inaka scrub. Other slopes and side-ridges are covered in grassland and manuka scrub. Depleted tussockland is present on mid-altitude slopes and denser tussockland is present nearer the range crest. Native plant communities, depleted in places, dominate the ground cover over the central ridge crest. Intact remnants of narrow-leaved snow-tussock still exist in the northern part of the unit and inaka shrubland is present on the southern part of the ridge. Wilding pines are scattered over mid and upper slopes.

Landscape Values

This unit conveys significant inherent landscape values attributable to the highly natural character of the Tengawai River gorge and the uninterrupted altitudinal sequence of indigenous plant communities. The values of this unit are complemented by areas of indigenous vegetation on freehold land on the opposite side of the Tengawai River.

Potential Vulnerability to Change

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

- Erection of structures on prominent points.
- Introduction of mono-cultural land uses such as plantation forestry.
- Further spread of wilding pines.
- Insensitive track construction and earth works, especially across steep slopes and on drier ridges.

2.1.3 Visual Values

The Albury Range augments the visual character of the front rangelands of South Canterbury. These low mountains also form the visual lead-in to the South Canterbury high country. Silver Hill Pastoral Lease possesses moderately high visual resource values. The mid and upper slopes on the property are visible from many parts of the surrounding valley floor and intermittently from parts of State Highway 8. The most prominent landforms on the property include the central ridge crest of the Albury Range and the main side ridges. The intervening gullies are incised and generally inconspicuous though add mystery and character to the property.

Significance of Landscape Values

Silver Hill Pastoral Lease is typical of other properties on the eastern side of the relatively low and non-glaciated Albury Range. The uniform topography of the main ridge crest and hill slopes is similar to that on other parts of the range. The deeply incised gullies, which are more prominent on the property than on other parts of the Albury Range, and the steep-sided gorge of the Tengawai River are significant landscape features. The relatively extensive areas of indigenous woody vegetation in these gullies, regenerating woody vegetation on adjoining slopes and remnant shrubland and tussockland at higher altitudes complement the significant inherent values of these landforms.

2.2 GEOLOGY, LANDFORMS AND SOILS

2.2.1 Geology

The basement rocks of Silver Hill Pastoral Lease are moderately-indurated greywacke and argillite of the Torlesse Group (Chlorite Subzone D). A small area of valley floor (river terrace) at the southeast corner of the property has deposits of till and outwash gravels of the Burnham Formation. More recent sedimentary deposits (limestone, greensand and siltstone) are present southeast of the property on the south side of the Tengawai River gorge (Gair, 1967). Hill slopes are mantled with deposits of loess (wind-deposited sediments).

2.2.2 Landforms

Two distinct landforms are present on Silver Hill Pastoral Lease: the moderately steep but even-contoured ridge crest and side slopes of the Albury Range, and the deeply incised steep-sided gullies. The ridge crests and gentler slopes are mantled in loess and are uniform in appearance except for occasional small summits, knobs and rock outcrops. The gullies are steep-sided, rocky and well vegetated. The small streams in these gullies flow southeast to the Tengawai River. The landforms on the property are typical of those on other parts of the Albury Range, except that the gullies appear more deeply incised and support more extensive areas of indigenous vegetation. There are no geopreservation sites listed for the property.

2.2.3 Soils

The highest slopes in the north-west corner of the lease have Kaikoura steepland soils. Mid-altitude slopes have Hurunui stony and sandy loams. Opuha silt loams occur on the eastern slopes of the lower Tramway Stream and the eroding terrace on the banks of the Tengawai River are very stony Mayfield silt loams.

Significance of Geology, Landforms and Soils

The most significant features of Silver Hill Pastoral Lease are the deeply incised gullies and the steep-sided gorge of the Tengawai River. These features are characteristic of the Albury Range, though better developed here than elsewhere.

2.3 CLIMATE

Silver Hill 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 are relatively common and snow can affect all parts of the property and lie on upper slopes for several weeks in winter. Annual rainfall ranges from 800 to 1200 mm (Tomlinson, 1976). The climate of the area is influenced by the sheltering effects of the Southern Alps, resulting in drier conditions than occur in some of New Zealand's other mountain environments.

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.

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 One 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

Significance of Land Environments

On Silver Hill Pastoral Lease, areas on the eastern property boundary in the Tramway Stream valley are “acutely threatened”. Gentle low-altitude areas at the southeast edge of the property along the Tengawai River are “at risk”. All other lower and mid slopes (below approximately 950 m) are “critically under-protected”. Higher-altitude parts of the property on the Albury Range have no threat category.

2.5 VEGETATION

2.5.1 Ecological Context

Silver Hill Pastoral Lease lies in the Hunters Ecological District, within Pareora Ecological Region (McEwen, 1987). The original (pre-human) vegetation of Hunters Ecological District was probably podocarp and podocarp-hardwood forest at lower altitudes and scrub and tall tussock at higher altitudes (McEwen, 1987; Andersen, 1916). The extent to which the area has been affected by natural fires is unclear but it is likely that such fires had an influence, particularly on drier slopes.

In their analysis of the property, Leathwick *et al* (2003) propose that 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. Higher-altitude slopes are described as originally supporting mountain totara-mountain toatoa forest. Small areas of low-altitude sites are described as originally supporting podocarp forest. This data should be interpreted with caution, as the predicted extent and suggested vegetation types have been extrapolated from limited field data. Furthermore, these data are insufficiently precise to recognise plant communities occupying small discrete areas, such as those on rocky slopes on the gully-sides.

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 Silver Hill 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 manuka scrub. Steeper slopes in the main incised valleys on the property are more intact. These gullies are dominated by indigenous woody vegetation, much of which appears to have regenerated following earlier disturbance. Small areas of rockland vegetation are present on bluffs and rocky slopes in these gullies. Tall tussockland and inaka shrubland are present at higher altitudes on the ridge crest of the Albury Range. These indigenous plant communities are described below for the three main landform types on the property.

Lower-altitude ridges and gentler slopes

This area covers the lower-altitude ridges and slopes on the property, comprising the gentler and generally more modified country below approximately 900 m altitude. Hill slopes and valleys within this area have gentle relief and only minor occurrences of exposed rock.

Vegetation over this part of the property is predominantly over-sown pasture (and cultivated pasture in places) with substantial areas of manuka scrub at lower altitudes. Other species commonly present within the pasture community are silver tussock, fescue tussock, Maori onion, woolly moss, cotton daisy, snowberry and scattered indigenous herbs. Woody species occasionally present in the grassland and manuka scrub are tauhinu, mingimingi, *Coprosma* sp. 't', *Olearia bullata* and gorse and, on rocky areas, porcupine shrub.

At higher altitudes, narrow-leaved snow-tussock becomes increasingly common in the grassland communities. In the main gullies, pasture and manuka scrub grade to shrubland, scrub and forest communities on the steeper and/or less-modified slopes. These indigenous woody plant communities are described below.

Lower-altitude incised valleys, steeper slopes and riverbanks

This area covers the lower-altitude incised valleys and steeper slopes and stream sides on the property, below approximately 900 m altitude. Three large and several small valleys bisect the gentler slopes on the property, flowing southeast to the Tengawai River on the property boundary. These valleys support tracts of indigenous hardwood forest with occasional podocarps (predominantly totara) and areas of scrub and shrubland. Small areas of bluff (rockland) and rock talus (boulderfield) are present. Areas dominated by indigenous vegetation are described separately below.

Tramway Stream

Tramway Stream forms the northeast boundary of the property. Three main areas of indigenous vegetation are present in the valley.

The lowermost area, on river terraces of Tramway Stream just above its confluence with the Tengawai River, supports shrubland with scattered trees along the stream. The shrubland is dominated by matagouri, mingimingi and scrub pohuehue. Also present are porcupine shrub, *Coprosma virescens* (locally uncommon), *C. rigida*, *C. sp. 't'*, native broom, korokio, *Olearia bullata*, mountain wineberry, manuka, pohuehue, European barberry, lawyer, native jasmine, *Clematis marata*, prickly shield fern, bittersweet, male fern, and single rowan and wilding pine trees. Other species present along the stream or on terrace scarps are kowhai, mountain akeake, cabbage tree, broadleaf, kanuka, kohuhu, lancewood, koromiko, tutu, *Blechnum minus*, *B. penna-marina*, gorse and elderberry. Areas of pasture amongst the shrubland also support silver tussock, bracken, woolly mullein, foxglove, horehound, Californian thistle, nodding thistle, and patches of rautahi. Some rocky streamside areas have denser patches of gorse and broom.

The mid section covers steep slopes either side of the stream in its lower gorge. The upper slopes are dominated by manuka and/or gorse scrub. This dense community grades downslope to regenerating hardwood forest and scrub dominated by kohuhu, cabbage tree, mountain ribbonwood, kowhai, fuchsia, broadleaf, lancewood and mapou. Other species commonly present are mingimingi, *Coprosma sp. 't'*, bracken, *Olearia bullata*, mountain kiokio, mountain akeake, bush lawyer, mountain flax, *Calystegia tuguriorum*, pohuehue and prickly shield fern. Present along the stream are koromiko, tutu and gorse. Scattered trees of mountain totara and five-finger are also present.

The upper section of the valley covers steep north-facing slopes and supports areas of hardwood forest and scrub. Forest here is dominated by broadleaf, kohuhu, mapou, kowhai, lowland ribbonwood, mountain totara and mountain akeake. Other species present are cabbage tree, lancewood, five-finger, pohuehue, lemonwood, fuchsia, marbleleaf, yellowwood and a large matai tree. Low-stature forest and scrub on the upper slopes is dominated by matagouri, mingimingi and scrub pohuehue. Other species present are kohuhu, porcupine shrub, mapou, cabbage tree, broadleaf, lemonwood, *Coprosma crassifolia*, *C. sp. 't'*, *C. rigida*, *Helichrysum lanceolatum*, native broom, korokio, *Olearia bullata*, weeping mapou, lawyer, bush lawyer, native jasmine, *Calystegia tuguriorum*, *Clematis sp.*, silver tussock, blue tussock, bracken, hound's tongue fern, necklace fern and *Asplenium richardii*. Forest on the opposite (south-facing) slopes lies within Chetwynd Pastoral Lease. All this area of forest on both sides of the stream is listed as an SSWI.

Cherry Tree Stream

Cherry Tree Stream supports a long narrow tract of forest along the lower to mid section of the valley, scattered patches of forest above and below this tract, and low-stature scrub and regenerating forest on the upper valley sides.

The main area of forest in the central valley is dominated by kowhai, kohuhu, mapou, broadleaf, lowland ribbonwood, narrow-leaved lacebark, mountain ribbonwood, lemonwood, five-finger and

fuchsia. Other species present are cabbage tree, kanuka, wineberry, yellowwood, marbleleaf, lancewood, mountain akeake and pohuehue. Understorey species present include *Coprosma rotundifolia*, *C. crassifolia*, *C. rhamnoides*, *C. rigida*, *Melicytus* "blondin", *Raukaua anomalus*, weeping mapou, korokio, pate, *Aristolelia serrata* X *fruticosa*, *Melicope simplex*, horopito, scrambling fuchsia, bush lawyer, lawyer, native jasmine, *Clematis marata*, *Calystegia tuguriorum*, bush lily, prickly shield fern, *Polystichum richardii*, hound's tongue fern, hen and chickens fern, necklace fern, *Asplenium appendiculatum*, *A. hookerianum*, *Blechnum fluviatile*, *B. penna-marina*, *Pellaea rotundifolia*, thousand-leaved fern, male fern, bidibid, common pennywort and nettle. Also present along the stream are koromiko, *Coprosma rugosa*, mountain kiokio and *Blechnum chambersii*. The abundance of the locally-uncommon understorey shrub, *Raukaua anomalus*, is a notable feature of this area of forest.

The main forest community grades through shrubland to pasture on the valley sides. This shrubland community is dominated by mingimingi, *Coprosma* sp. 't', kohuhu and cabbage tree. Other species present are porcupine shrub, weeping mapou, matagouri, korokio, native broom, manuka, bush lawyer, *Calystegia tuguriorum*, pohuehue, tutu, bracken, hound's tongue fern, *Blechnum penna-marina*, *Asplenium appendiculatum*, golden speargrass and patotara, with emergent lancewood, broadleaf, marbleleaf, wineberry, yellowwood, kanuka and kowhai. Also present on the shrubland margins are silver tussock, fescue tussock and occasional gorse and broom. Scrub margins on south-facing slopes are dominated by cotton daisy with mountain flax, mountain kiokio, narrow-leaved snow-tussock, mingimingi and *Coprosma* sp. 't', with emergent lancewood and broadleaf.

Smaller stands of forest in the lower valley are similar to that described above, though with the addition of tauhinu, toatoa, bittersweet, elderberry, barberry, European barberry and a single sycamore tree on the forest margins.

In the upper reaches of Cherry Tree Stream, forest is confined to smaller patches along the stream and on south-facing slopes. This forest is dominated by broadleaf, lancewood, mountain ribbonwood, kowhai, yellowwood, fuchsia and kohuhu. It grades to a shrubland-fernland community dominated by mountain flax, mountain kiokio, prickly shield fern, mingimingi, *Coprosma rugosa*, *C. sp. 't'*, *C. rigida*, *Olearia bullata*, cotton daisy, bush lawyer, silver tussock and narrow-leaved snow-tussock. Other species present are horopito, *Olearia cymbifolia*, weeping mapou, feathery tutu, scrub pohuehue, pohuehue, thousand-leaved fern, hound's tongue fern, *Blechnum chambersii*, *B. penna-marina*, and occasional emergent mountain totara.

Tengawai River Gorge

This area covers the largest and most deeply incised valley on the property and the associated areas along the main gorge of the Tengawai River.

The forest community in the main valley is dominated by broadleaf, lancewood, mountain ribbonwood, kowhai, five-finger, marbleleaf, kohuhu, fuchsia, cabbage tree and scattered mountain totara. This community grades on the upper shaded slopes to shrubland-fernland-flaxland dominated by inaka, mountain flax, mountain kiokio and narrow-leaved snow-tussock, and on sunny slopes to shrubland dominated by mingimingi, *Coprosma* sp. 't', golden speargrass, porcupine shrub, bracken and scrub pohuehue. Other species present on these sunny slopes are narrow-leaved snow-tussock, silver tussock, native broom, matagouri, bush lawyer, mountain flax, mountain kiokio, prickly shield fern, thousand-leaved fern, hound's tongue fern, *Asplenium appendiculatum* and cotton daisy.

The lower-altitude part of this area, along the gorge of the Tengawai River, is dominated by broadleaf, lowland ribbonwood and kowhai, with yellowwood, lancewood, wineberry, kanuka, mountain ribbonwood, narrow-leaved lacebark, kohuhu, marbleleaf, fuchsia, cabbage tree and pohuehue. Other species present are weeping mapou, *Aristolelia serrata* X *fruticosa*, mountain wineberry, scrambling fuchsia, *Melicope simplex*, lawyer, horopito, korokio, *Helichrysum lanceolatum*, native broom, *Coprosma rotundifolia*, *Olearia bullata*, bush lily, prickly shield fern,

Asplenium appendiculatum, male fern, native jasmine and elderberry. Additional species along the forest margin are mingimingi, *Coprosma rigida*, *C. crassifolia*, *C. rugosa*, mountain akeake, koromiko, inaka, toatoa, mountain kiokio, *Blechnum penna-marina*, mountain flax, leather-leaf fern and *Gingidia montana*. Present on the rocky riverbanks within the flood zone are crack willow, grey willow, alder, gorse, broom, tutu, stonecrop, creeping pohuehue and mint.

A population of the threatened shrub *Teucrium parvifolium* (gradual decline) is present in a shrubland dominated by *Coprosma virescens*, *Raukaua anomalus*, mountain wineberry, lancewood and lawyer, at the up-valley (southern) end of the area.

Southern Gully

This small gully at the southern boundary of the property supports indigenous forest on the steep sides of a small gorge. The forest canopy is dominated by broadleaf and kowhai, with lemonwood, lowland ribbonwood, three-finger, lancewood, mountain ribbonwood, yellowwood, kohuhu, cabbage tree, mapou, fuchsia and mountain totara. Other species present are koromiko, horopito, *Coprosma rhamnoides*, mountain tree fern, *Raukaua simplex*, mountain akeake, scrambling fuchsia, bush lawyer, bush lily, prickly shield fern and mountain kiokio. Additional species on the forest margin are narrow-leaved snow-tussock, inaka, mapou, manuka, *Coprosma* sp. 't', *C. crassifolia*, *C. rigida*, *Olearia bullata*, mountain flax, bush snowberry, tutu, hound's tongue fern and gorse. Patches of mountain totara, including strongly regenerating young trees, are present on the rocky valley sides.

Tengawai River Bend

This area covers areas of indigenous vegetation on a hilly peninsula and adjoining terrace within a bend of the Tengawai River below the main gorge. The small hills on the peninsula support mixed kanuka-hardwood forest dominated by kanuka, broadleaf and kohuhu. Other canopy species are lancewood, mountain akeake, cabbage tree, kowhai and yellowwood. Lower-stature vegetation on the forest margins is dominated by mingimingi, *Coprosma* sp. 't', *C. rugosa* and matagouri. Other species present are korokio, mountain wineberry, *Coprosma rigida*, lawyer, scrub pohuehue, pohuehue and bracken.

Riverbank vegetation in this area is dominated by kanuka and mountain akeake. Other species present are broadleaf, kohuhu, *Coprosma* sp. 't', *C. rigida*, korokio, *Olearia bullata*, bush snowberry, cabbage tree, kowhai, lawyer, native jasmine and tutu. Gorse and matagouri are present on the pasture margin. This riverbank vegetation lies largely within the marginal strip along the Tengawai River, adjacent to the property.

Lower Tengawai River Banks

This area covers the river banks and terrace edge of the Tengawai River downstream from the peninsula to the property boundary at the confluence of Tramway Stream. Indigenous vegetation in this area lies on the property boundary and probably mostly within the riparian strip along the Tengawai River.

The upstream (southwest) part of this area supports a narrow strip of indigenous forest and scrub on a terrace scarp. Trees present are kowhai, broadleaf, narrow-leaved lacebark, mountain ribbonwood, kohuhu and crack willow. Also present are pohuehue, mingimingi, *Coprosma* sp. 't', *C. rigida*, mountain wineberry, *Aristotelia serrata* X *fruticosa*, mountain akeake, manuka, elderberry, tauhinu, porcupine shrub, scrambling fuchsia, koromiko, lawyer, *Calystegia tuguriorum*, scrub pohuehue, tutu, prickly shield fern, gorse and broom. Two trees of Canterbury tree broom (range restricted) are present in this area.

The downstream (eastern) part of this area (east of the vehicle ford across the Tengawai River) supports shrubland and pasture. Species present are mingimingi, *Coprosma rigida*, broom, tauhinu,

matagouri, porcupine shrub, *Olearia bullata*, koromiko, mountain akeake, broadleaf, weeping mapou, kohuhu, lancewood, elderberry, European barberry, cabbage tree, crack willow, lawyer and scrub pohuehue. Other species present include silver tussock, prickly shield fern, rautahi, tutu and blackberry. Two large bushes of *Olearia lineata* (sparse) are present in this area.

Higher-altitude slopes (Albury Range)

This area covers the higher-altitude parts of the property, above approximately 900 m altitude, on the crest of the Albury Range. It is characterised by relatively gentle country on the ridge crest and moderately steep country on the upper slopes, with a few scattered small rock outcrops. Vegetation over this part of the property is predominantly narrow-leaved snow-tussock, though areas of modified tussockland/pasture and small areas of wetland vegetation are present on the ridge crest. Scattered wilding larch and pine trees are present in places.

On the upper slopes (900 to 1000 m) the tussocklands are dominated by narrow-leaved snow-tussock, with a canopy cover between 30 and 40%. Other dominant species are golden speargrass, cotton daisy, snowberry, sweet vernal, woolly moss and catsear. Also present are fescue tussock, blue tussock, *Pentachondra pumila*, *Raoulia subsericea*, *Celmisia gracilenta*, *Blechnum penna-marina*, *Coprosma cheesemanii* and red woodrush. Other species occasionally present are *Gaultheria crassa*, creeping mapou, *Lycopodium fastigiatum*, *Anisotome aromatica*, *Scleranthus uniflorus*, matagouri, *Coprosma petriei*, inaka, mountain kiokio, *Leucopogon suaveolens*, turpentine shrub and *Celmisia lyallii*.

At higher altitudes (above c.1000 m), narrow-leaved snow tussock forms a denser cover (40 to 50%) in places. Other dominant species are sweet vernal, browntop, mouse-ear hawkweed, woolly moss and other moss species. Also present in this tussockland are golden speargrass, snowberry, *Anisotome aromatica*, *Coprosma petriei*, patotara, *Celmisia gracilenta*, catsear, *Ranunculus multiscapus*, *Leucopogon suaveolens*, red woodrush, *Lycopodium fastigiatum*, comb sedge, wire moss, blue tussock, Maori onion, *Helichrysum bellidioides* and harebell. Plants of coral broom (gradual decline) are scattered through this area. Other species present at rocky sites on the ridge crest are porcupine shrub, *Pimelea oreophila*, *Myrsine nummularia*, mountain flax, *Gaultheria crassa*, *Blechnum penna-marina* and inaka.

Upper slopes in the southern part of this area, notably the head of the main valley on the property support areas of scattered to dense inaka shrubland. These shrublands are dominated by inaka (up to 40% cover), narrow-leaved snow-tussock (up to 25% cover), bare ground/rock (up to 10% cover) and woolly moss. Other important species present are golden speargrass, Maori onion, cotton daisy, mouse-ear hawkweed, wire moss, patotara, *Pentachondra pumila*, *Lycopodium fastigiatum*, coral broom, *Blechnum penna-marina*, *Raoulia subsericea*, catsear and creeping mapou. Occasionally present are tutu, mountain kiokio, *Gaultheria crassa*, wilding pines and a small patch of gorse.

Small wetlands (seepages) are also present on or near the ridge crest, the largest of which is in the southern part of the area. This seepage is dominated by red tussock, rautahi and sphagnum moss. Other important species present are rushes (*Juncus* sp.), sedges (*Carex* sp.), wire moss, Maori onion, *Helichrysum bellidioides*, native violet, monkey musk and *Blechnum penna-marina*.

Notable Flora

Notable plant species recorded on the property are listed in Table 1 below. Threat categories are those proposed by Hitchmough *et al.* (2007).

Table 1 Notable plant species, Silver Hill Pastoral Lease.

Plant species	Threat status	Distribution on property
<i>Teucrium parvifolium</i>	Gradual decline.	At one location in scrub adjacent to the Tengawai River.
<i>Carmichaelia torulosa</i> (Canterbury tree broom)	Range restricted.	At one location on a terrace scarp of the Tengawai River.
<i>Olearia lineata</i>	Sparse.	At one location on a terrace scarp of the Tengawai River.
<i>Cyathea colensoi</i> (mountain tree fern)	Not threatened; locally uncommon.	Present in forest in the small southern gully.
<i>Coprosma virescens</i>	Not threatened; locally uncommon	In Tramway Stream and Tengawai Gorge
<i>Raukaua anomalus</i>	Not threatened; locally uncommon.	A common under storey plant in Cherry Tree Stream.
<i>Raukaua simplex</i>	Not threatened; locally uncommon.	Present in forest in the small southern gully.

The presence of mountain totara, and in Tramway Stream matai and totara, add considerable value to the areas of indigenous forest on the property, as these species represent remnants of the original forest communities of the area.

Significance of Vegetation and Flora

Indigenous plant communities on higher-altitude parts of Silver Hill Pastoral Lease (generally above 900 m) and on steeper slopes and incised valleys have significant inherent values. High-altitude areas of tussockland and wetland are representative, or have components that are representative, of the original vegetation, have high naturalness values and support populations of a threatened plant species (coral broom). Steeper slopes and incised gullies support indigenous woody vegetation that is representative of the original vegetation, including remnant old trees (matai and totara), support a threatened species (*Teucrium parvifolium*) and support good populations of locally uncommon species (mountain tree fern, *Raukaua anomalus* and *Raukaua simplex*). Terrace scarps of the Tengawai River, on the property boundary, support populations of threatened species (Canterbury tree broom and *Olearia lineata*). Collectively, areas of indigenous woody vegetation on the property represent one of the more extensive areas of indigenous forest and scrub remaining in this part of South Canterbury.

2.5.3 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 for which containment or control are probably impractical, such as mouse-ear hawkweed and pasture grasses, are not discussed here but are listed in the vegetation descriptions.

Gorse

Infestations of gorse are present on the banks of the Tengawai River on and adjacent to the property and at scattered locations elsewhere. An infestation of gorse at the head of the main valley on the property poses the greatest threat to indigenous plant communities. Elsewhere, at lower altitudes, gorse does not pose a significant long-term threat.

Broom

Infestations of broom are present on the banks of the Tengawai River on and adjacent to the property and at scattered locations elsewhere. Broom may pose a threat to conservation values at some, especially higher-altitude, locations.

Wilding larches and pines

Scattered wilding trees of larch and pine are present at higher altitudes on the property. These trees pose a significant threat to higher altitude low-stature plant communities. Considerable effort would be required to remove trees from upper slopes on the property, and ongoing monitoring and control would be necessary to keep higher-altitude parts of the property free of wilding tree spread.

Elderberry

Elderberry trees are present at scattered locations on lower-altitude parts of the property. Elderberry fruits are readily dispersed by birds, threatening indigenous vegetation on other parts of the property.

European barberry (*Berberis vulgaris*) and barberry (*B. glaucocarpa*)

European barberry bushes are present at and within forest and scrub margins on lower-altitude parts of the property. Barberry is present in lower Cherry Tree Stream. Fruits of these trees are readily dispersed by birds, threatening indigenous vegetation on other parts of the property.

Crack willow, grey willow, alder and poplar

These species are present adjacent to the Tengawai River, on the property boundary. They do not pose a significant threat to indigenous plant communities on the property.

Sycamore

One sycamore tree was observed in lower Cherry Tree Stream. Sycamore poses a significant threat to indigenous forest.

Rowan

One moderate-sized rowan tree was observed in lower Tramway Stream and a small rowan tree was observed in the upper part of Tramway Stream. Rowan fruits are readily dispersed by birds, threatening indigenous vegetation on other parts of the property.

2.6 FAUNA

2.6.1 Bats, Birds and Lizards

South Island long-tailed bat is known from a number of sites in South Canterbury (O'Donnell, 2000), the closest of which is the Tengawai River on the adjacent Manahune Pastoral Lease (Sedgeley, 2002). Bat foraging and roosting habitats include indigenous forest, shrubland remnants and riparian zones (Sedgeley and O'Donnell, 2004).

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, shrubland and forest habitats.

Indigenous bird species recorded from neighbouring Manahune and Chetwynd pastoral leases are Australasian harrier, bellbird, grey warbler, New Zealand kingfisher, New Zealand pigeon, New Zealand pipit, paradise shelduck, Australasian pied stilt, silvereye, South Island fantail, South Island pied oystercatcher, South Island tomtit, southern black-backed gull, spur-winged plover, welcome swallow and white-faced heron (Sedgeley, 2002; Sedgeley, 2003). One of these species, New Zealand pigeon, is considered threatened (gradual decline) by Hitchmough *et al.* (2007).

Southern Alps gecko and an unidentified species of skink (either common skink or McCann's skink) were recorded from Manahune and Chetwynd pastoral leases (Sedgeley, 2002; Sedgeley, 2003). A gecko, presumably Southern Alps gecko, has been recorded in Tramway Bush (Loh, 1982).

Areas of forest on the property in Tramway Stream are listed as a Site of Special Wildlife Interest (SSWI). The site is notable for its regenerating mixed podocarp/hardwood forest and associated value for birds.

Bat, bird and lizard species observed on Silver Hill Pastoral Lease are described for five geographic areas of the property.

Lower Tramway Stream Catchment

This area covers the north- and east-facing slopes of the mid- and lower-reaches of Tramway Stream, on the northeast part of the property. The mid reaches contain a diverse podocarp-hardwood forest remnant. The lower reaches contain tussockland, manuka shrubland, pasture and, on the lower terraces, mixed-species indigenous shrubland.

South Island long-tailed bat (one bat pass) were recorded at one station in the lower Tramway Stream immediately above its confluence with the Tengawai River. Suitable habitats for bats in this vicinity are the riparian vegetation, indigenous shrubland (including extensive manuka shrubland) and forest associated with Tramway Stream and the Tengawai River. The limestone scarp south of this area (but not on the property) may provide roosting habitat.

Indigenous bird species recorded from this area were Australasian harrier, bellbird, brown creeper, South Island fantail, grey warbler, New Zealand pigeon (gradual decline), New Zealand kingfisher, paradise shelduck, silvereye, shining cuckoo, South Island pied oystercatcher, southern black-backed gull, spur-winged plover and welcome swallow. Naturalized bird species observed were blackbird, California quail, dunnock, goldfinch, greenfinch, redpoll, skylark, song thrush, starling and yellowhammer.

Southern Alps gecko were recorded (14 sightings) from rocky areas and outcrops above Tramway Stream, and from rocky areas in the bed of lower Tramway Stream.

Upper Tramway Stream Catchment

This small area includes the upper southern tributary of Tramway Stream. This sub-catchment is steep and rocky. Vegetation at higher altitudes is predominantly tussockland and shrubland with smaller areas of rockland.

Indigenous bird species recorded from this area were Australasian harrier and southern black-backed gull. The only naturalized bird species observed was skylark.

Southern Alps gecko were recorded (four sightings) from rocky areas and outcrops in the vicinity of the four-wheel-drive track.

Northeast Catchment

This area is flanked by the lower Tramway Stream catchment to the northeast and the Cherry Tree Stream catchment to the southwest. Lower slopes contain exotic pasture and manuka shrubland. Depleted tussockland is present at higher altitudes.

No bats were recorded from a recording station beside the Tengawai River in this area.

Indigenous bird species recorded from this area were Australasian harrier, southern black-backed gull and spur-winged plover. Naturalized bird species observed were Australian magpie, mallard, skylark and yellowhammer.

No lizards were recorded from this area. Whistling tree frog were heard from the bank of the Tengawai River.

Cherry Tree Stream Catchment

This area contains low- to mid-altitude slopes and catchments in the middle section of the property. The main gully (Cherry Tree Stream) contains a significant area of hardwood forest. Non-forested low altitude slopes are dominated by exotic pasture and manuka shrubland. At higher altitudes, tussockland and scattered shrubland are present. Rock outcrops and rocky areas are scattered throughout.

No bats were recorded from four recording stations beside the Tengawai River in this area.

Indigenous bird species recorded from this area were Australasian harrier, bellbird, black shag (sparse), grey warbler, New Zealand falcon (gradual decline), New Zealand pigeon (gradual decline), New Zealand pipit, silvereye, shining cuckoo, spur-winged plover and white-faced heron. Naturalized bird species observed were blackbird, California quail, chaffinch, dunnock, house sparrow, Australian magpie, skylark, song thrush, redpoll and yellowhammer.

Southern Alps gecko were recorded from rock outcrops at a range of altitudes (seven sightings), and from rocky streambeds and shrubland at lower altitudes (three sightings).

Southwest Catchments

This area contains low- to mid-altitude slopes and catchments on the southwest part of the property. It adjoins Manahune Pastoral Lease to the southwest and the Tengawai River to the east. A significant area of podocarp-hardwood forest and shrubland occupies the lower half of the main

catchment, extending to the Tengawai River. Vegetation at higher altitudes includes tussockland, shrubland and rockland. Lower slopes contain pasture grasses with areas of manuka scrub. Small rock outcrops and rocky areas are scattered throughout.

This area was not sampled for bat activity. Habitats likely to be used by South Island long-tailed bat are the Tengawai River, surrounding riparian vegetation, indigenous shrublands and forest.

Indigenous bird species recorded from this area were Australasian harrier, bellbird, black shag (sparse), grey warbler, New Zealand pipit, silvereve, South Island tomtit and welcome swallow. Black shag were sighted at two locations along the Tengawai River. One of these sightings was a breeding colony consisting of at least five adults and four nests in the canopy of two kowhai trees. Naturalized bird species observed were blackbird, California quail, chaffinch, goldfinch, skylark, song thrush, redpoll and yellowhammer.

Southern Alps gecko were recorded (seven sightings) from rock outcrops at a range of altitudes.

Bats Recorded

South Island long-tailed bat (nationally endangered) were recorded at one location in the Tramway Stream valley just above its confluence with the Tengawai River.

Bird Species Recorded

Thirty-three bird species were recorded on Silver Hill Pastoral Lease during this inspection: 19 indigenous species (Table 2) and 14 naturalized species.

Table 2 Indigenous bird species recorded from Silver Hill Pastoral Lease, December 2006.

Bird species	Threat status	Distribution on property
Australasian harrier	Not threatened	Throughout.
bellbird	Not threatened	Forested areas throughout.
black shag	Sparse	Tengawai River.
brown creeper	Not threatened	Forest in Tramway Stream.
grey warbler	Not threatened	Indigenous shrubland and forest throughout.
New Zealand falcon (eastern)	Gradual decline	Cherry Tree Stream catchment.
New Zealand kingfisher	Not threatened	Lower Tramway Stream catchment.
New Zealand pigeon	Gradual decline	Forest in lower Tramway Stream and Cherry Tree Stream catchments.
New Zealand pipit	Not threatened	Higher altitudes.
paradise shelduck	Not threatened	Lower Tramway Stream catchment.
shining cuckoo	Not threatened	Cherry Tree Stream and lower Tramway Stream catchments.
silvereve	Not threatened	Indigenous shrubland and forest throughout.
southern black-backed gull	Not threatened	Throughout.
South Island fantail	Not threatened	Forest in Tramway Stream catchment.
South Island pied oystercatcher	Not threatened	Lower Tramway Stream catchment.
South Island tomtit	Not threatened	Forest in southwest catchments.
spur-winged plover	Not threatened	Throughout.
welcome swallow	Not threatened	Southwest and Lower Tramway Stream catchments.
white-faced heron	Not threatened	Cherry Tree Stream catchment.

Naturalised bird species observed on the property were Australian magpie, blackbird, California quail, chaffinch, dunnoek, goldfinch, greenfinch, house sparrow, mallard, redpoll, skylark, song thrush, starling and yellowhammer.

Lizard species recorded

Southern Alps gecko were recorded (35 sightings) from 26 sites throughout the property. Although not recorded during this survey, common skink and/or McCann's skink may also be present due to their presence on adjoining properties.

Significance of the Bat, Bird and Lizard Fauna

Silver Hill Pastoral Lease provides feeding and breeding habitat for one 'acutely-threatened' species: South Island long-tailed bat (nationally endangered), two 'chronically threatened' species: New Zealand falcon and New Zealand pigeon (both gradual decline) and one 'at risk' species: black shag (sparse). A black shag breeding colony (containing four nests and at least five adults at the time of survey) is present alongside the Tengawai River at the lower end of the gorge. The property also provides extensive feeding and breeding habitats for nine non-threatened indigenous species: bellbird, brown creeper, grey warbler, New Zealand pipit, shining cuckoo, silvereeye, South Island fantail, South Island tomtit and Southern Alps gecko.

2.6.2 Freshwater Fauna (fish and invertebrates)

Silver Hill Pastoral Lease is drained by tributaries of the Tengawai River, including Tramway Stream and the locally-named Cherry Tree Stream. The Tengawai River flows along the southeast boundary of the property and is itself a tributary of the Opihi River. A distinguishing feature of the Opihi River is the lack of 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 (at 8th of March 2007). No fish have previously been recorded from the property. Fish species recorded from the Opihi River catchment near the property are shortfin eel, koaro, banded kokopu, Canterbury galaxias, upland bully, common bully and brown trout. These records are all from outside the property boundaries on Manahune Pastoral Lease (Bowie, 2003). Banded kokopu are an uncommon species in South Canterbury (R.M. McDowall, *pers. comm.*, 2003).

The property comprises two main areas of freshwater habitat: the Tengawai River, and the smaller tributary streams of the Tengawai River. These habitats and the fish and macro-invertebrate species recorded are described below.

Tengawai River

This area incorporates the parts of the property adjacent to the Tengawai River. Freshwater habitats include the large river on the property boundary, several permanent streams, an area of palustrine wetland and several small ephemeral streams. Riparian vegetation is predominantly grassland and shrubland, except along the Tengawai River gorge where forest and scrub are present. The wetland has grasses, sedges (*Carex* spp.), rushes (*Juncus* spp.) and adjoining areas of manuka scrub. Some of the stream channels have monkey musk present. Broom is present along the margins of the Tengawai River. Stock and wild animal access is unrestricted, though the steeper forested gorge sides are less accessible. Vehicle tracks cross several of the waterways in this area. An old dam

occurs at the lower end of the Tengawai River gorge, adjacent to the river terraces on the eastern part of the property.

The Tengawai River varies in width from about 15 metres near the upstream property boundary to about 20 metres near the downstream boundary. The tributary streams are between 700 mm and five metres wide where they join the Tengawai River. The wetland is about 200 metres long and about 50 metres wide. The Tengawai River is generally between 200 and 300 mm deep, with occasional pools over two metres deep. The tributary streams are between 100 and 400 mm in depth, with occasional pools over one metre deep. The wetland is a seepage area with very little standing water. The ephemeral streams appear to carry less than 100 mm of water during rain events. The Tengawai River substrates are bedrock, boulders, and cobbles, with mainly bedrock in the gorge. The stream substrates are mainly boulders and cobbles, with areas of mud and silt. The wetland and many of the ephemeral streams have substrates of earth and silt.

Eight sites were electro-fished in this area. Canterbury galaxias, upland bully and brown trout were recorded. At two sites, no fish were recorded. Additional species recorded in the NZFFD from further up the Tengawai River are shortfin eel, banded kokopu, koaro, common bully and brown trout (Bowie 2003).

Macro-invertebrates observed in this area were mayflies (*Ameletopsis perscitus*, *Coloburiscus humeralis*, *Deleatidium lillii*-group, *Deleatidium myzobranchia*-group and *Nesameletus* 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 fly (*Austrosimulium* sp.), damselflies and dragonflies (*Anisoptera* spp. and *Zygoptera* spp.), flatworm (*Cura* sp.) and worm (*Oligochaete* sp.). The diverse macro-invertebrate fauna present indicates that these habitats are in good condition.

Tengawai River Tributaries

This area incorporates all of the property except for the area close to the Tengawai River (described above). Freshwater habitats are the upper reaches of several permanent streams, including Tramway Stream, and several ephemeral streams. These streams flow through grassland, shrubland, scrub, forest and at higher altitudes, tussockland. Forest occurs in four main areas: a large area adjacent to the Tengawai River gorge, Cherry Tree Stream, in the valley immediately east of Cherry Tree Stream and in Tramway Stream. Monkey musk is present along some of the permanent streams. Stock and wild animals have access to all streams, though access is restricted in the steeper gorges. Vehicle tracks cross some streams.

The streams vary in width from four metres in Tramway Stream to less than one and a half metres in other streams. Most of the permanent streams were approximately 300 mm deep at the time of the survey, although pools of over one and a half metres deep were present in Tramway Stream and up to 600 mm deep in the other streams. All ephemeral streams appear to be no deeper than 100 mm following rain. The substrates of all permanent streams are mainly boulders and cobbles, with areas of bedrock and silt. The ephemeral stream substrates are mainly silt with areas of bedrock and boulders.

One site was electro-fished and two sites were hand-netted in this area. Canterbury galaxias was the only fish species found, occurring at only one site in the catchment between Cherry Tree Stream and Tramway Stream. There are no other fish records from this area in the NZFFD.

Macro-invertebrates observed in this area were: mayflies (*Coloburiscus humeralis*, *Deleatidium lillii*-group, *Deleatidium myzobranchia*-group, *Nesameletus* sp. and *Oniscigaster* sp.), stoneflies (*Megaleptoperla grandis*, *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 fly (*Hexatomini* sp.),

flatworm (*Cura* sp.) and worm (*Oligochaete* sp.). Many of these species were found at one site in the Tramway Stream Gorge. The diverse macro-invertebrate fauna present indicates that these habitats are in good condition.

Species Recorded

Three fish species were recorded during this survey of Silver Hill Pastoral Lease. Diverse macro-invertebrate communities were observed, reflecting the mosaics of freshwater habitats present on the property.

Table 3 Fish species recorded from Silver Hill Pastoral Lease, December 2006.

Fish Species	Threat Status	Known Distribution on Property
brown trout	Introduced	Tengawai River and lower Tramway Stream.
Canterbury galaxias	Not threatened	Most waterways, except Tramway Stream.
upland bully	Not threatened	Tengawai River and some small streams.

Significance of the Freshwater Fauna

No threatened fish species were recorded in freshwater habitats on the property, though the diverse macro-invertebrate fauna present indicates that these habitats are in good condition.

2.6.3 Terrestrial Invertebrates

Silver Hill Pastoral Lease adjoins Chetwynd Pastoral Lease to the north and Manahune Pastoral Lease to the west. One notable invertebrate species was recorded from above 1200 m altitude on Chetwynd Pastoral Lease by Chinn (2003): a large flightless weevil (*Anagotus* sp.). A significant area of fauna habitat on the northern boundary of the property is recognised as an SSWI (Tramway Bush).

Invertebrates of Silver Hill Pastoral Lease are described below for the four distinct parts of the property.

Northern Catchments

This area covers the part of the lease that drains into Tramway Stream and the first side-stream of the Tengawai River to the southwest. The upper part of the Tramway Stream catchment above 1000 m is excluded.

The lower reaches of Tramway Stream are characterised by scattered indigenous trees and shrubs with woody weeds and exotic grasses. A diverse beetle fauna was beaten from shrubby vegetation and darkling beetles, including *Mimopeus impressifrons*, not previously collected in South Canterbury, were found under rocks.

The middle region of Tramway Stream is steeply gorged and retains remnant podocarp-hardwood forest. This area yielded a rich and diverse beetle fauna from 16 different families, including eight different weevil (Curculionidae) species, three longhorn species and two borer beetles. Thirty-two percent of beetle species (37 species) recorded on the property were collected from two sites in the middle reaches of Tramway Stream. The rare Austral weevil, *Rhichnobelus aenescens*, and the straight-horned weevil, *Rhinorhynchus rufulus*, both podocarp specialists, were collected here. Another unusual beetle collected here is an un-described species from an un-described genus of puppet beetle, rare in collections. A litter sample collected from this area yielded a diverse and characteristic forest fauna including five species of weevils, six species of rove beetles and two

species of small carrion beetles (Leiodidae). At the same site, two species of bark mould beetles, a family not previously collected, were beaten from vegetation, as well as a flat bug, *Aneurys browni*. Extensive stands of manuka were heavily attacked by the manuka blight scale as well as by two species of manuka beetles that were also common on other shrubs.

Cherry Tree Stream Catchment

This area contains the whole catchment of Cherry Tree Stream. The upper parts comprise steep tussock-covered hillsides with some rocky outcrops and deeply incised streams; the lower parts contain extensive areas of shrubland and forest. The main invertebrate values in this area were associated with the woody vegetation.

A Malaise trap, sited among shrubland, collected a diverse beetle fauna including a clam beetle, *Sphaerotherax suffusus*. The fungus weevil, *Hoherius meinertzhageni*, was beaten from mountain ribbonwood and the straight-horned weevil, *Rhinorhynchus rufulus*, was beaten from mountain totara. The nationally endangered ground beetle, *Megadromus crassalis*, was collected from the mouth of its burrow, under a log in manuka scrub. A rich and diverse beetle fauna was beaten from shrubs and trees at several sites within this area. A soldier beetle, *Neoontelus* sp., a pintail beetle, *Mordela detracta*, two bark mould beetles, *Salpingus* spp., and a rough-mould beetle, *Tarphiomimus wollastoni*, represent families of beetles usually associated with forest.

Beating shrubs by the stream high up in the catchment (at 900 m) yielded four species of marsh beetles. Dark brown, speckled leaf-veined slugs (Athoracophoridae) were numerous under rocks at this site. Three species of native butterfly, the southern blue, the common copper and the tussock butterfly, were observed flying over the area. The only true forest dwelling pentatomoid, the stink bug, *Oncacantias vittatus*, (Larivière, 1995) was beaten from shrubs in this area.

Tengawai River Gorge Catchments

This area includes all parts of the property southwest of the Cherry Tree Stream catchment. It contains the largest area of contiguous forest on the property and a smaller forested gully on the southern boundary of the lease. A steep-sided, broad ridge at low altitude, enclosed in a loop of the Tengawai River, supports patches of diverse shrubland. The upper part of the area comprises tussock-covered slopes with extensive areas of inaka, dissected by steep rocky gorges.

An un-described genus and species of puppet beetle was beaten from shrubs by the Tengawai River, a streamside fauna of ground beetles, including *Bembidion parviceps* was collected from the gorge, and a range-restricted darkling beetle, *Zeadelium femorale*, previously known only from Central Otago and Southland, was found under a rock at the bush edge. A host-specific weevil, *Aneuma* sp., was collected from kohuhu together with a diverse fauna of other beetles collected near the Tengawai River. Leaf litter collected from the forest edge at mid-altitude yielded a diverse beetle fauna including four species of weevils not found elsewhere on the property, a flightless longhorn beetle, *Ptinostoma* sp., a hooded beetle, *Holopsis* sp., and three species of rove beetles. A host-specific weevil, *Peristoreus maorinus*, was collected from inaka at higher altitudes. The boulder and common coppers, tussock butterfly and the magpie moth were observed flying over this area. Two species of short-horned grasshoppers (*Sigauss australis* and *S. campestris*) were widespread in tussocklands.

Albury Range

The local ground beetle, *Megadromus temukensis*, a darkling beetle, *Zeadelium* sp., and cockroaches, *Celatoblatta* sp., were collected under rocks near the ridge crest. However, the large, flightless weevil, *Anagotus* sp., recorded from neighbouring Chetwynd Pastoral Lease (Chinn, 2003), was not found here, possibly because the ridge does not go as high here as on Chetwynd.

Species Recorded

During this survey, 138 species of insects were collected or observed from 37 sites on the property. All but 13 were identified at least to tribe, and most to genus or species. There were 116 beetle (Coleoptera) species from 32 families, including seven naturalized species. This is an unusually high number of beetle species and families from a property of this size, and reflects the inclusion of forest-inhabiting taxa supported by the significant areas of remnant lowland podocarp-hardwood forest. Nine notable species were recorded: one is nationally endangered, one is range restricted, two were judged to be sparse, and five represent extensions of their known range.

Table 4 Notable invertebrate species recorded from Silver Hill Pastoral Lease, December 2006.

Species	Significance	Distribution on Property
Threatened		
<i>Megadromus crassalis</i> (Broun)	Known only from 12 to 20 specimens, listed as nationally endangered*.	Ridge south of Cherry Tree Stream.
<i>Zeadelium femorale</i> (Broun)	Previously recorded only from Central Otago and Southland. Range Restricted*.	Ridge above Tengawai River gorge.
Significant		
<i>Aderidae</i> gen. et sp. nov.	Un-described species from un-described genus, rare in collections, judged to be sparse.	Tramway Stream; Tengawai River.
<i>Bembidion parviceps</i> Bates	Not recorded from South Canterbury or Mackenzie (Larochelle and Larivière, 2001).	Under stones beside the Tengawai River.
<i>Hoherius meinertzhageni</i> (Broun)	Not known south of the Rakaia except for one collection from Otara, Southland (Holloway, 1982).	Cherry Tree Stream.
<i>Mimopeus impressifrons</i> (Bates)	Previously known only from Mackenzie and Central Otago. Not Threatened*.	Lower Tramway Stream; lower Tengawai River.
<i>Rhichobelus aenescens</i> (Broun)	Known from only 15 specimens (Kuschel, 2003) and five specimens collected on an earlier survey, not previously recorded from South Canterbury, judged to be sparse.	Tramway Stream.
<i>Rhinorhynchus rufulus</i> (Broun)	Not previously recorded from South Canterbury.	Tramway Stream; Cherry Tree Stream.
<i>Sphaerotherax suffusus</i> (Broun)	Not previously recorded from Canterbury.	Lower Cherry Tree Stream.

*Threat status from Hitchmough and Bull (*in press*).

Significance of the Invertebrate Fauna

Nine notable invertebrate species were recorded on the property: a ground beetle, *Megadromus crassalis*, (nationally endangered), a darkling beetle, *Zeadelium femorale*, (range restricted), a puppet beetle, *Aderidae* gen. et sp. nov. and the Austral weevil, *Rhichobelus aenescens*, (both judged to be sparse), and five species outside their previously known range. Significant inherent invertebrate values are concentrated in one large and three small areas of podocarp-hardwood forest and adjacent shrubland on the property.

2.6.4 Problem Animals

Rabbits, hares, possums, fallow deer, red deer and wallabies were observed on the property. Collectively, these introduced herbivores browse native vegetation, exacerbating the effect of sheep and cattle on native vegetation. Feral cats, mustelids (ferrets, stoats and weasels) and rodents were not encountered during this survey but at least some of these species are almost certainly present. These predators include native birds and lizards in their diets and pose a significant threat to invertebrates, especially the larger, flightless species. Hedgehogs were abundant on the property and have an adverse effect on invertebrate populations.

2.7 HISTORIC

2.7.1 European Heritage Values

Silver Hill Pastoral Lease was originally part of one of South Canterbury's best-known properties, the Levels Run. Land on the Albury Range (Run 416) was divided from the Levels Run in 1855 after surveys showed that the run comprised more land than allowed. The area was further divided in 1867 to form part of the Albury Estate (Andersen, 1916). Leases on the Albury Range were bought by the Bank of New Zealand in 1889 and then parts of the area let by the Crown as small grazing runs in 1894. In 1897, 4276 ha of the Albury Estate was sold as leasehold blocks, the boundaries of which remained unchanged to 1969 (Pinney, 1981).

No sites of historic interest are known from the property.

Significance of Historic Resources

No significant historic resources are known from the property.

2.8 PUBLIC RECREATION

2.8.1 Physical Characteristics

Silver Hill Pastoral Lease lies on the Albury Range, distant from any high-use recreation destinations in South Canterbury. The property can be divided into three main recreation settings.

Albury Range

This recreation setting covers the higher-altitude parts of the property, including the broad crest of the Albury Range, the steeper upper slopes and the headwaters of Tramway, Cherry Tree and other smaller streams. Vegetation is predominantly open tussockland and scattered shrubland on upper slopes with areas of shrubland, scrub, forest and rockland in the headwaters of the incised stream valleys. The range crest and upper slopes are open, offering expansive views of the South Canterbury ranges. It can be traversed relatively easily on foot, though upper slopes are snow-covered during winter months. Vehicle tracks are present on the range crest and main side ridges.

Mid-Altitude Slopes

This recreation setting covers the mid-altitude parts of the property. It comprises relatively gentle rounded ridges separated by deeply incised valleys. Vegetation is predominantly sparse tussockland, pasture and manuka scrub on the ridges and regenerating podocarp-hardwood forest, scrub, rockland

and fernland in the valleys. Recreation access on the ridges is easy and aided by the presence of vehicle tracks in places. Access in the valleys is difficult, as the valleys are incised with the streams flowing through small narrow gorges, and the vegetation surrounding the streams frequently dense and untracked. The streams and the surrounding low-altitude forest and scrub are interesting features.

Tengawai River

This recreation setting covers the lower slopes along the gorge of the Tengawai River, which flows along the property boundary. The slopes in this area are moderately-steep and well vegetated with indigenous forest and scrub. While the only easy access to this area is along the river, it provides a very scenic backdrop for recreational use of the river gorge.

2.8.2 Legal Access

Roads

Unformed legal roads abut the western property boundary on the range crest, the eastern property boundary near lower Tramway Stream and the southern property boundary beside the Tengawai River. A formed legal road from Cricklewood Road provides the main vehicle access to the property at the vehicle ford across the Tengawai River at the southeast corner of the property. There are no legal roads within the property boundaries.

Use of the track on the Albury Range from the Tengawai River to the Opihi River is granted to all government departments and all leaseholders through a Land Improvement Agreement (1977) registered against the title.

Adjoining Public Conservation Land

There is no public conservation land adjacent to the property.

Marginal Strips

There are no marginal strips on the property.

2.8.3 Activities

Scenery appreciation is probably the most important existing recreational use of the property, as large parts of the property are visible from the Albury Fairlie Road and from the Tengawai River gorge. The property provides good opportunities for hunting (wallaby and deer), walking/tramping, botanising, photography and nature study. The four-wheel-drive track through the property along the range crest provides good opportunities for mountain-biking and horse-riding. Some four-wheel-drive vehicle use occurs. Lower-altitude sites have some potential for the future development of facilities for walking and picnicking. The Tengawai Gorge, adjacent to the property boundary, provides opportunities for walking and scenery appreciation.

Significance of Recreation

Significant recreation features of Silver Hill Pastoral Lease are the relatively natural recreation settings on the range crest and in the forested valleys, and the opportunities these areas provide for walking, scenery appreciation and for access to other parts of the Albury Range.

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 4th September 2006 and at Geraldine on 5th September 2006. Comments made at those meetings are summarised below.

- There are stands of native bush and shrubland on the property; the gullies appear to be well vegetated.
- Protection of the higher country and bush clad gullies is important.
- The property has soil and water conservation values.
- The four-wheel-drive tracks would be good mountain-biking routes; farm tracks provide the best practical access for recreation.
- Recreation access is needed to the ridge-crest road; the existing track would provide better access than the legal road.
- The property has Catchment Board-funded tracks which are used for access and firebreaks.
- No tramping clubs are known to use the area.
- The Fairlie Lions Club runs a four-wheel-drive event along the Albury Range.
- Small game hunting is the main hunting available on the property.
- There is a registered Environment Canterbury Land Improvement Agreement over the property which contains grazing restrictions.
- Connections are needed with Manahune and Chetwynd tenure review proposals.

3.2 DISTRICT PLANS

Silver Hill Pastoral Lease lies within the Rural Zone of the Mackenzie District. One Site of Natural Significance is present on the property:

- 80 Tramway Bush: covering the SSWI in Tramway Stream, at the northern edge of the property.

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

Silver Hill Pastoral Lease lies within the Pareora Place Unit of the Canterbury Conservancy. Relevant priority objectives for this unit listed in the CMS (Department of Conservation, 2000) are:

- 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, 10th 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. Naturalized species are indicated by an asterisk (*).

<u>Common name</u>	<u>Scientific name</u>
alder*	<i>Alnus glutinosa</i>
barberry*	<i>Berberis glaucocarpa</i>
bidibid	<i>Acaena</i> sp.
bittersweet*	<i>Solanum dulcamara</i>
blackberry*	<i>Rubus fruticosus</i>
blue tussock	<i>Poa colensoi</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>
bush lily	<i>Astelia</i> sp.
bush snowberry	<i>Gaultheria antipoda</i>
cabbage tree/ti rakau	<i>Cordyline australis</i>
Californian thistle*	<i>Cirsium arvense</i>
Canterbury tree broom	<i>Carmichaelia torulosa</i>
catsear*	<i>Hypochoeris radicata</i>
comb sedge	<i>Oreobolus pectinatus</i>
coral broom.....	<i>Carmichaelia crassicaule</i>
cotton daisy/tikumumu	<i>Celmisia spectabilis</i>
crack willow*	<i>Salix fragilis</i>
creeping mapou.....	<i>Myrsine nummularia</i>
creeping pohuehue	<i>Muehlenbeckia axillaris</i>
elderberry*	<i>Sambucus nigra</i>
European barberry*	<i>Berberis vulgaris</i>
feathery tutu	<i>Coriaria plumosa</i>
fescue tussock	<i>Festuca novae-zelandiae</i>
five-finger	<i>Pseudopanax arboreus</i>
flax/harakeke.....	<i>Phormium tenax</i>
foxglove*	<i>Digitalis purpurea</i>
fuchsia/kotukutuku	<i>Fuchsia excorticata</i>
golden speargrass/taramea	<i>Aciphylla aurea</i>
gorse*	<i>Ulex europaeus</i>
grey willow*	<i>Salix cinerea</i>

harebell	<i>Wahlenbergia albomarginata</i>
hen and chickens fern	<i>Asplenium bulbiferum</i>
horehound*	<i>Marrubium vulgare</i>
horopito.....	<i>Pseudowintera colorata</i>
hound's tongue.....	<i>Microsorium pustulatum</i>
inaka.....	<i>Dracophyllum longifolium</i>
kahikatea	<i>Dacrycarpus dacrydioides</i>
kanuka.....	<i>Kunzea ericoides</i>
kohuhu	<i>Pittosporum tenuifolium</i>
korokio.....	<i>Corokia cotoneaster</i>
koromiko.....	<i>Hebe salicifolia</i>
kowhai.....	<i>Sophora microphylla</i>
lancewood	<i>Pseudopanax crassifolius</i>
larch*	<i>Larix decidua</i>
lawyer	<i>Rubus schmidelioides</i>
lemonwood/tarata	<i>Pittosporum eugeniioides</i>
leather-leaf fern.....	<i>Pyrrhosia eleagnifolia</i>
lowland ribbonwood	<i>Plagianthus regius</i>
male fern*	<i>Dryopteris filix-mas</i>
manuka.....	<i>Leptospermum scoparium</i>
Maori onion	<i>Bulbinella angustifolia</i>
mapou	<i>Myrsine australis</i>
marbleleaf	<i>Carpodetus serratus</i>
matagouri	<i>Discaria toumatou</i>
matai	<i>Prumnopitys taxifolia</i>
mingimingi.....	<i>Coprosma propinqua</i>
mint*	<i>Mentha spicata</i>
monkey musk*	<i>Mimulus guttatus</i>
mountain akeake	<i>Olearia avicenniifolia</i>
mountain flax/wharariki.....	<i>Phormium cookianum</i>
mountain kiokio	<i>Blechnum montanum</i>
mountain ribbonwood/houhi.....	<i>Hoheria lyallii</i>
mountain toatoa	<i>Phyllocladus alpinus</i>
mountain totara	<i>Podocarpus hallii</i>
mountain tree fern.....	<i>Cyathea colensoi</i>
mountain wineberry	<i>Aristotelia fruticosa</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>
native jasmine	<i>Parsonsia</i> sp.
native violet	<i>Viola cunninghamii</i>
necklace fern.....	<i>Asplenium flabellifolium</i>
nettle*	<i>Urtica</i> sp.
nodding thistle*	<i>Carduus nutans</i>
pate.....	<i>Schefflera digitata</i>
patotara	<i>Leucopogon fraseri</i>
pohuehue.....	<i>Muehlenbeckia australis</i>
pokaka.....	<i>Elaeocarpus hookerianus</i>
poplar*	<i>Populus</i> sp.
porcupine shrub	<i>Melicypus alpinus</i>
prickly shield fern	<i>Polystichum vestitum</i>
rautahi	<i>Carex coriacea</i>
red tussock	<i>Chionochloa rubra</i>
red woodrush	<i>Luzula rufa</i>

rowan*	<i>Sorbus aucuparia</i>
scrambling fuchsia	<i>Fuchsia perscandens</i>
scrub pohuehue	<i>Muehlenbeckia complexa</i>
snowberry	<i>Gaultheria depressa</i>
sphagnum moss	<i>Sphagnum cristatum</i>
stonecrop*	<i>Sedum acre</i>
sweet vernal*	<i>Anthoxanthum odoratum</i>
sycamore*	<i>Acer pseudoplatanus</i>
tauhinu	<i>Ozothamnus leptophyllus</i>
thousand-leaved fern	<i>Hypolepis millefolium</i>
three-finger	<i>Pseudopanax colensoi</i>
toatoa	<i>Haloragis erecta</i>
totara	<i>Podocarpus totara</i>
turpentine shrub	<i>Dracophyllum uniflorum</i>
tutu	<i>Coriaria sarmentosa</i>
weeping mapou	<i>Myrsine divaricata</i>
wineberry	<i>Aristotelia serrata</i>
wire moss	<i>Polytrichum juniperinum</i>
woolly moss	<i>Racomitrium pruinosum</i>
woolly mullein*	<i>Verbascum thapsus</i>
yellowwood	<i>Coprosma linariifolia</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. Naturalized species are indicated by an asterisk (*).

<u>Common name</u>	<u>Scientific name</u>
Australasian harrier/kahu	<i>Circus approximans</i>
Australasian pied stilt/poaka	<i>Himantopus himantopus leucocephalus</i>
Australian magpie*	<i>Gymnorhina tibicen</i>
banded kokopu	<i>Galaxias fasciatus</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>
brown creeper	<i>Mohoua novaeseelandiae</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>
Campbell's cicada	<i>Maoricicada campbelli</i>
Canterbury galaxias	<i>Galaxias vulgaris</i>
cat*	see house cat
chaffinch*	<i>Fringilla coelebs</i>
common bully	<i>Gobiomorphus cotidianus</i>
common copper	<i>Lycaena rauparaha</i>
common skink	<i>Oligosoma nigriplantare polychroma</i>

dunnock*	<i>Prunella modularis</i>
European hedgehog*	<i>Erinaceus europaeus occidentalis</i>
European rabbit*	<i>Oryctolagus cuniculus cuniculus</i>
fallow deer*	<i>Dama dama dama</i>
feral cat* (house cat)	<i>Felis catus</i>
ferret*	<i>Mustela furo</i>
goldfinch*	<i>Carduelis carduelis</i>
greenfinch*	<i>Carduelis chloris</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>
koaro	<i>Galaxias brevipinnis</i>
long-toed skink	<i>Oligosoma longipes</i>
lowland longjaw galaxias	<i>Galaxias cobitinus</i>
McCann's skink	<i>Oligosoma maccanni</i>
magpie moth/mokarakara	<i>Nyctemera annulata</i>
mallard*	<i>Anas platyrhynchos platyrhynchos</i>
New Zealand falcon/karearea	<i>Falco novaeseelandiae</i>
New Zealand kingfisher/kotare	<i>Halcyon sancta vagans</i>
New Zealand pigeon/kereru	<i>Hemiphaga novaeseelandiae novaeseelandiae</i>
New Zealand pipit/pihoihoi	<i>Anthus novaeseelandiae novaeseelandiae</i>
paradise shelduck/putakitaki	<i>Tadorna variegata</i>
possum*	see brushtail possum
rabbit*	see European rabbit
red deer*	<i>Cervus elaphus scoticus</i>
redpoll*	<i>Carduelis flammea</i>
scree skink	<i>Oligosoma waimatense</i>
shining cuckoo/pipiwharau	<i>Chrysococcyx lucidus lucidus</i>
shortfin eel/tuna	<i>Anguilla australis</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>
southern blue	<i>Zizina labradus oxleyi</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>
South Island tomtit/miromiro	<i>Petroica macrocephala macrocephala</i>
spotted skink	<i>Oligosoma lineocellatum</i>
spur-winged plover	<i>Vanellus miles novaehollandiae</i>
starling*	<i>Sturnus vulgaris</i>
stoat*	<i>Mustela erminea</i>
strawberry root weevil*	<i>Otiorhynchus ovatus</i>
tussock butterfly	<i>Argyrophenaga</i> sp.
upland bully	<i>Gobiomorphus breviceps</i>
wallaby*	see Bennett's wallaby
weasel*	<i>Mustela nivalis vulgaris</i>
welcome swallow	<i>Hirundo tahitica neoxena</i>
whistling tree frog*	<i>Litoria ewingi</i>
white-faced heron	<i>Ardea novaehollandiae novaehollandiae</i>
yellowhammer*	<i>Emberiza cintrenella</i>

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