

Crown Pastoral Land Tenure Review

Lease name :Glenthorne

Lease number :PC 049

Conservation resources report

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

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

Copied October 2002

GLENTHORNE PASTORAL LEASE



CONSERVATION RESOURCES REPORT

Released under the
Official Information Act

PART 1 INTRODUCTION

This report describes the significant inherent values present on Glenthorne Pastoral Lease. Glenthorne Pastoral Lease covers an area of 10,396 hectares between the Wilberforce and Harper Rivers in Canterbury. The property lies in a transitional zone between the wetter western mountains of the main divide of the Southern Alps, and the foothill ranges of inland Canterbury.

The lease covers the southern part of the Birdwood Range, including the outlying summits of Castle Hill, Gargarus and Mt Fitzwilliam at the southern end of the range. The eastern boundary follows the Avoca River; the southern boundary the Harper River; the western boundary the Wilberforce River (except for two enclaves of public conservation land in Fanghill and Boundary streams); and, the northern boundary follows the southern side of Bristed Stream, then along the crest of the Birdwood Range, and then along Triangle Creek to the Avoca River (see Topographical/Cadastral map later in this report).

Glenthorne Pastoral Lease largely comprises steep mountainous country lying between approximately 500m altitude at the Wilberforce-Harper confluence, and 2140m on the Birdwood Range. Gentler slopes and flats are present along the Wilberforce and Harper rivers, and between Gargarus and Mt Fitzwilliam (around Lake Lilian). The property is drained by Fanghill Stream, Boundary Stream, Glenthorne Stream, Lilian Creek, Triangle Creek, and numerous smaller streams.

The property adjoins Craigieburn Conservation Park to the north and east, and shares a short boundary with the Central Southern Alps and Wilberforce Conservation Area to the north. The enclaves of public conservation land in Fanghill and Boundary streams and areas to the west across the Wilberforce River are also part of Craigieburn Conservation Park. To the west the Wilberforce River forms the boundary between the Glenthorne and Mt Algidus properties, and to the south the Harper River forms the boundary between the Glenthorne and Lake Coleridge properties. There are small enclaves of freehold land within the pastoral lease in the vicinity of Glenthorne Homestead. Roads and intake structures for the Coleridge Hydroelectric Power Scheme are present at the southwest corner of the property.

Glenthorne straddles three ecological districts: Coleridge and Craigieburn Ecological Districts within the Puketeraki Ecological Region; and Browning Ecological District within the D'Archiac Ecological Region. Parts of the property within the Puketeraki Ecological Region were surveyed as part of the Protected Natural Areas Programme (PNAP) during 1987 and 1988 (Shanks *et al*, 1990). An area based between Gargarus Saddle and Gargarus was recommended for protection (Coleridge RAP 28: Gargarus).

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

2.1 LANDSCAPE

Glenthorne Pastoral Lease forms part of a large high country landscape with significant scenic value. It is a dynamic landscape where the physical processes are apparent in the landforms and vegetation patterns. The landscape of the area represents a great degree of similarity due to homogeneity in rock type, vegetative cover, level of development and the type of land management. Within the various valleys there are unique qualities giving each valley inherent identity and value. Overall the landscape is sensitive to development and change, due to its visibility and the fragile nature of land form and land cover.

The landscape of Glenthorne is very simple in configuration, with the following components:

- It is bordered by three river valleys: Wilberforce, Harper and Avoca.
- The Birdwood Range runs continuously in a north-south axis from beyond the northern boundary to Gargarus Saddle. Several peaks reach 2000m.
- The glaciated pyramidal forms of Gargarus and Mt Fitzwilliam are distinct from the mountain range.
- Lake Lilian and associated wetlands and streams.
- The incised valleys of Fanghill Stream, Boundary Stream and smaller west-facing gullies.
- The roche moutonnée of Castle Hill.
- The valley flats and fans along the Harper, Wilberforce and Avoca rivers.

The main cultural components of Glenthorne Station are:

- The farm homestead and associated farm dwellings on the western slopes of the Birdwood Range near Gargarus Stream.
- A derelict hut at the confluence of Avoca River and Triangle Creek.
- A musterers' hut at Fanghill Stream.
- Farm fences throughout.
- Four-wheel-drive-vehicle tracks in the Wilberforce, Harper and Avoca river valleys and on Castle Hill.
- The Wilberforce (Coleridge Power Scheme) diversion canal and head-pond.
- Shelterbelts on flats at the confluence of the Wilberforce and Harper rivers.

For this landscape assessment, the property is divided into five landscape units, determined by topography such as ridgelines and river valleys. Each unit represents a visual catchment, where all or most of the unit can be seen within the enclosure formed by the surrounding landforms. The character of each unit has been described according to landform, land cover and land use while the landscape quality of each unit is then assessed according to its

naturalness, rarity, coherence and visibility. The five landscape units are described and assessed below.

Landscape Unit 1: Gargarus

Landform: This unit consists of the pyramidal mountain, Gargarus, and the Harper and Wilberforce river flats. Gargarus is the dominating landform with its symmetrical form and flat top. Rocky bluffs near the confluence of the Avoca and Harper rivers divide this unit from the Avoca Valley.

Land Cover: Scree, herbfield and regenerating forest on Gargarus, shrubland at the toe slope of Gargarus, and short tussock, matagouri and sweet brier on the Harper River flats. An altitudinal sequence of plant communities from beech forest to alpine herbfield is present on Gargarus. Areas of irrigated exotic grassland and coniferous shelter belts are present at the confluence of the Wilberforce and Harper rivers.

Land Use: Sheep-grazing, fences, farm roads, shelter belts, the Wilberforce River diversion canals and head-ponds, all occur on the river flats in this unit. Some grazing occurs on the southeast side of Gargarus, pines have been planted on the southwest side, and willow trees planted for river protection along the Harper River.

Naturalness: There is a high degree of naturalness in the landscape of Gargarus and on the Harper River flats east of the irrigated flats. There is a moderate to low degree of naturalness on the irrigated river flats at the confluence of the Wilberforce and Harper rivers.

Rarity: The river flats are of low rarity value due to the presence of this type of landscape elsewhere in the Canterbury high country. However, the isolated pyramidal and flat-topped form of Gargarus is regionally significant. Most pyramidal landforms in the Craigieburn-Coleridge area are more conical with pointed summits.

Visibility: This is a very visible landscape unit, especially from the approach along Harper Road on the south side of the Harper River. The whole landscape unit, and especially the dominant landform of Gargarus, can be viewed from this elevated point.

Evaluation:

This landscape unit is dominated by Gargarus. This landform, with its flat summit and altitudinal sequence of indigenous vegetation, is a significant landscape feature. The more modified river flats, dominated by pasture, shelterbelts and areas of matagouri shrubland, do not have significant inherent landscape value.

Threats:

Threats to this landscape unit include grazing, wilding pine spread, land disturbance (e.g. tracking) and pasture improvement (e.g. fertilising).

Landscape Unit 2: Avoca

Landform: The pyramidal form of Mt Fitzwilliam, the braided Avoca River, river bluffs and the angular lines of the spurs are all present within this unit. There are river flats and terraces, and an area of wetland, at the confluence of the Harper and Avoca rivers, connecting this unit to Gargarus.

Land Cover: The river flats support short tussock grassland and matagouri scrub. In the damp area near the confluence of the Harper and Avoca rivers there is a large area of red tussock and matagouri. Grassland covers the slopes of Mt Fitzwilliam and the associated terraces. Erosion is very evident

on the northeast slopes of Mt Fitzwilliam. There are isolated patches of beech forest on the northwest slopes of Mt Fitzwilliam and on bluffs near along the Avoca River. Exotic trees of Douglas fir, larch and pine are located near Lilian Creek at the "Retreat".

Land Use: Sheep-grazing, fences, farm tracks, and a dilapidated hut all occur in this unit.

Naturalness: There is a high degree of naturalness throughout this landscape unit with few intrusions other than grazing. Farm tracks are not obvious.

Rarity: Although there are some landform features of note, such as the wide river flats and Mt Fitzwilliam and The Spurs, this is a high country landscape typical of Canterbury.

Visibility: This landscape unit is remote, with access by foot or four-wheel-drive vehicle. It cannot be viewed from a single viewing point, and Triangle Creek is even less visible.

Coherency: There is a high degree of coherency in this unit due to the intactness of the natural components of the landscape. There are no adverse visible intrusions.

Evaluation:

This landscape unit is a typical high country river valley with pyramidal and angular landforms, and high peaks. The Avoca River flats and terraces at the confluence of the Harper River are expansive and impressive in formation. The red tussock area on the river flats has significant inherent landscape value.

Threats:

Threats to this landscape unit include pasture improvement, grazing, tracking, wetland drainage and wilding tree spread.

Landscape Unit 3: Lilian

Landform: This landscape unit has the most diverse range of landform features of any landscape unit on the property. It contains: the pyramidal forms of Mt Fitzwilliam and Gargarus; the broad Gargarus and Lilian saddles; Lake Lilian (itself not part of the lease); the bush clad Lilian Creek from the lake to the "Retreat"; and, the wetland and pond between Lake Lilian and the Avoca River. It is a well-contained unit due to the surrounding high mountains of The Spurs and Gargarus. The unit exhibits the effects of glaciation in the pyramidal forms of Gargarus and Mt Fitzwilliam, and the relatively wide valley that separates them.

Land Cover: Land cover is predominantly tussock grassland on the valley floor and lower slopes, beech forest and shrubland on the lower to mid slopes, and scree slopes and herbfield at higher altitudes. Wetland vegetation, including red tussock, is present on the broad saddles.

Land Use: Sheep-grazing and fences are the predominant signs of land use. No roads or other human-induced features are readily discernable.

Naturalness: There is a high degree of naturalness in this landscape unit due to the lack of obvious development. The unit is also representative of several types of landform and land cover.

Coherency: A high degree of harmony exists due to a very intact landscape and well-defined boundaries.

Rarity: A medium to high degree of rarity exists because this landscape unit exhibits a number of landscape and vegetation types. Although outside the lease, the mountain lake is the key element, setting this landscape apart from the rest of the property.

Visibility: The unit is not readily visible because of its separation from the main river valley, its elevated location, and the lack of easy access.

Evaluation:

This is a well defined landscape unit and unique to the property because of the sequence of mountain-lake-fan-saddle landforms and the vegetation associations. It has high visual values and very significant natural values worthy of protection.

Threats:

Threats to this landscape unit include grazing, fertiliser run-off into lakes and wetlands, and land disturbance.

Landscape Unit 4: Birdwood

Landform: This landscape unit is bounded by the crest of the Birdwood Range and the Wilberforce River. Glaciated landforms are dominant: the wide braided river valley; steep-sided mountains; large terraces and fans; and, the deeply-incised side valleys of Boundary, Fanghill and Bristed streams. There is a distinct change in landform from the random pattern reflected in the ridge and valley system, to the river fans and terraces on the lower slopes of the Birdwood Range, and to the broad bed of the Wilberforce River.

Land Cover: Beech forest is more prevalent in this landscape unit than any other on the property. It covers much of the mid slopes of the Birdwood Range, especially the large side valleys. Scree and rock dominate at higher altitudes. Grassland and matagouri shrubland are present on the lower slopes and flats.

Land Use: Grazing is the main land use at lower altitudes. Fences and farm tracks are present on the flats and terraces. There is a musterers' hut at Fanghill Stream.

Naturalness: There is a high degree of naturalness in this unit, which increases away from the farm buildings and fences near the homestead.

Visibility: This landscape unit is relatively visible, but also remote. It is readily accessible only to trampers and hunters.

Rarity: This unit represents a typical high country landscape with a wide braided river, steep and high mountains, and incised bush-clad side-valleys.

Coherency: There is a high degree of coherency due to the intactness of the natural components. The only intrusions are fences and farm tracks on the lower slopes and flats.

Evaluation:

This landscape unit is dominated by the high peaks of the Birdwood Range, the well-vegetated valley-sides, and the wide braided Wilberforce River. It is a landscape with significant inherent value, though typical of the mountain landscapes of the upper Wilberforce Valley.

Threats:

Threats to this landscape unit include grazing, wilding tree spread and land disturbance.

Landscape Unit 5: Castle Hill

Landform: This unit is dominated by the roche moutonnée, Castle Hill, between the Wilberforce River and Gargarus. The small valley of Glenthorne Stream separates Castle Hill from Gargarus. Castle Hill is the only roche

moutonnée on Glenthorne. It is small in size and height compared with the surrounding mountains, but is given prominence by its glaciated form.

Land Cover: The dominant vegetative cover of this rocky landform is grassland, with areas of manuka and matagouri scrub.

Land Use: The predominant land use in the unit is extensive grazing. Farm tracks and fences are obvious within the unit.

Naturalness: There is a moderate degree of naturalness provided by the landform, rock outcrops and regenerating native vegetation, but this naturalness is reduced by the presence of grazing, fences and an obvious farm track on the southern side.

Rarity: This glacial landform is the only one of its type on Glenthorne Pastoral Lease. However, it is not a rare landform in the Coleridge Ecological District.

Coherency: The shape of the dominant Castle Hill landform and its separation from the surrounding mountains, make this a coherent landscape unit.

Visibility: This landscape unit is one of the more visible on the property. Castle Hill is visible from Harper Road, the Wilberforce River, Boundary Stream, and the homestead. Its visibility is even more pronounced because of its isolation from the adjacent landforms.

Evaluation:

This landscape unit is centred on a landform feature that is significant on the property, but represented elsewhere in the district. It contributes to the diversity of landforms on the property. The most impressive features are the glacially-formed rocky outcrops. The inherent value of this landscape unit is reduced by the extent to which the vegetative cover is modified.

Threats:

Threats to this landscape unit include further fencing, land disturbance, and wilding tree spread.

2.2 LANDFORMS AND GEOLOGY

Landforms of Glenthorne Pastoral Lease owe much of their present form to earlier advances of glaciers in the Wilberforce and Harper-Avoca valleys. The wide valleys and ice-carved mountain slopes have been subsequently modified by continued uplift, erosion and deposition. Steep valley sides have been incised by streams, lower slopes covered by colluvial deposits, and valley floors formed by the deposition of alluvial material.

The underlying geology comprises strongly-indurated greywacke and argillite of the Torlesse Group (Warren, 1967; Gregg, 1964). These bedded sandstones and mudstones are exposed on rock bluffs and shattered alpine ridges and summits. Significant deposits of recent river gravel are present in the main Wilberforce, Harper and Avoca valleys, forming the river flats that support most of the developed farmland. Areas of moraine, from the Acheron advance of the Wilberforce Glacier, are present on the broad saddle between Mt Fitzwilliam and Gargarus (Shanks *et al*, 1990).

Topography of the property is dominated by the Birdwood Range, from Fang Hill (1909m) in the northwest to The Spurs (1985m) in the southeast. Gargarus, Castle Hill and Mt Fitzwilliam form outlying summits at the southern end of the Birdwood Range, carved and smoothed by glaciers. The most-dramatically carved summit is that of Castle Hill, which exhibits the form of a

roche moutonnée. A major part of the property lies above 650m altitude and is dominated by steep slopes, incised side valleys and rocky summits.

Landforms and geology of Glenthorne Pastoral Lease are typical of those present east of the main divide of the Southern Alps. However, the diversity of landforms on the property is perhaps greater than on similar-sized properties, because of its position at the convergence of two glacier valleys. This diversity of landforms is reflected in the presence of boundaries between three ecological districts on the property.

Warren (1967) records a fossil locality (not in place) in lower Boundary Stream.

2.3 CLIMATE

Glenthorne Pastoral Lease is in a transitional zone between the cool wet climate of the main divide mountains and the warmer drier climate of the inter-montane basins of the eastern Southern Alps. Precipitation ranges between approximately 2500mm and 1000mm per annum, falling as snow at higher altitudes. Predominant winds and the majority of the precipitation are from the northwest, though southwest and southerly storms are not uncommon. Strong winds and rain are most common in the spring and autumn.

Mean monthly temperatures at Lake Coleridge Power Station range from 3.5°C in July to 15.3°C in January; and at Craigieburn temperatures range from 2.0°C to 13.2°C (Shanks *et al*, 1990). Winter frosts are common and frequently severe.

2.4 VEGETATION

2.4.1 Original Vegetation

Shanks *et al* (1990) describe the original (pre-human) vegetation of this part of the Coleridge and Craigieburn ecological districts as predominantly mountain beech, with some mountain totara and broadleaf in lower-altitude forests. Kowhai and broadleaf were present in riparian areas and kanuka on very dry sites. River terraces and fans were dominated by fescue tussock and matagouri. Wetlands supported red tussock, *Schoenus pauciflorus* and raupo. Subalpine and alpine vegetation (shrublands, tussocklands, scree and fellfield vegetation) occurred above the timber line.

Widespread fires following the arrival of humans removed forest from many dry and exposed sites. Further burning associated with the establishment of grazing runs approximately 150 years ago is likely to have resulted in the loss of further areas of forest and scrub. Regeneration of the former forest cover is now occurring at many sites.

2.4.2 Indigenous Plant Communities

The plant communities of Glenthorne Pastoral Lease can be summarised as follows:

- Forest
- Shrubland
- Adventive and short tussock grasslands

- Red tussock
- Tall tussock grassland
- Alpine plant communities
- Scree and rock outcrops

These plant communities are described below.

Forest:

Remnants of formerly more-extensive mountain beech forests cover the lower western slopes of the property. Pockets of mountain beech are also scattered around the lower flanks of Gargarus, Mt Fitzwilliam, The Spurs and the Birdwood Range. Mountain beech is also present alongside the Avoca River. Although the extent of the mountain beech forest is much reduced from pre-human times it is apparent that mountain beech is re-colonising scrub and tussock grassland. Stands of mountain beech with different aged margins are obvious at many sites. The mountain beech forest behind the homestead is regenerating and spreading into kanuka scrub on the west face of Gargarus. Kanuka scrub represents a stage in the process of succession which will eventually result in the re-establishment of mountain beech forest.

The mountain beech forest in Gargarus and Fisher valleys has a rich understorey, especially near the stream. Species in the understorey include *Coprosma propinqua*, prickly mingimingi, *Pittosporum divaricatum*, bush lawyer (*Rubus schmidelloides*), *Acaena anserinifolia*, *Mycelis muralis*, korokio, lancewood, *Coprosma microcarpa* and *Uncinia uncinata*.

Most of the steep western slopes above the Wilberforce River are scrub-covered faces dissected by scree, with patches of mountain beech, and with mountain totara and mountain ribbonwood above Boundary Creek. Low mountain totara-broadleaf forest grows on a steep glacier-scraped face above the Fanghill Stream fan. This face supports a diverse range of trees and shrubs including mountain toatoa, mountain ribbonwood, kohuhu, manuka, *Olearia avicenniifolia*, *Coprosma propinqua*, *Coprosma intertexta*, *Melicytus alpinus*, *Dracophyllum acerosum*, *Clematis forsteri*, *Rubus cissoides* and mountain flax. Mountain beech was noticeably absent from this site although it completely dominates the nearby warmer and drier Fanghill Valley.

The west-facing slopes on the true left of Fanghill Stream support a mixed hardwood forest of kowhai and broadleaf with mountain ribbonwood, mountain wineberry and kohuhu. Between Boundary Creek and Fanghill Stream a long shingle slide supports some tall mountain totara. Associated species include broadleaf (many young trees), mountain ribbonwood, mountain toatoa, *Olearia avicenniifolia*, *Coprosma propinqua*, and *Coprosma intertexta*. Ground-cover species on the semi-stable scree include *Blechnum penna-marina*, snowberry, *Gaultheria crassa*, *Carmichaelia odorata*, *Parahebe decora* and tutu.

A single mountain totara tree was recorded amongst kanuka on the eastern slopes of Castle Hill. Although not sighted during the field visit, mountain totara was recorded in the beech forest behind Glenthorne Homestead during the PNAP survey (Shanks *et al.*, 1990).

Although much reduced in extent, both the mountain beech and the mixed hardwood forest are representative of an earlier forest cover where mountain

beech would have extended up to the natural tree-line at about 1400m and mixed hardwood forest would have occupied lower sunny aspects.

Shrubland and Scrub:

Most of the shrubland and scrub on hill slopes below the natural treeline (about 1400m) is likely to have been induced by fire. Shrublands are more extensive on southwest-facing slopes where moister conditions allow more rapid succession from grassland after fire. Often shrublands are being colonised by trees, such as on the western foot-slopes of the Birdwood Range where mountain ribbonwood and broadleaf emerging through *Coprosma propinqua* and matagouri. Kanuka is emergent over *Coprosma propinqua*, matagouri and korokio scrub on the western slopes of Gargarus. On the south side of Gargarus, mountain beech and kohuhu are emerging over a shrubland of *Coprosma propinqua*, matagouri, mountain wineberry, korokio, *Melicetyus alpinus* and koromiko.

Subalpine tussock-shrubland was originally confined to a zone between beech forest and the alpine tussockland. Burning has enabled the subalpine shrub species to descend down into the montane zone. Mountain beech is slowly reinvading these shrublands. The best example of these shrublands is on the spur above the beech forest on the true right of Gargarus Stream. Here slopes are dominated by *Dracophyllum uniflorum* with *Leucopogon colensoi*, tauhinu, snowberry, cotton daisy, *Lycopodium fastigiatum*, *Raoulia subsericea* and woolly moss. This shrubland is entirely native with no exotic plants.

Most of the steep western foot-slopes of the Birdwood Range in the Wilberforce Valley are covered by an induced shrubland of matagouri, *Dracophyllum uniflorum* and scattered mountain beech. There are also patches of emergent mountain ribbonwood and kowhai, and occasionally mountain totara on screes. This mixed shrubland-treeland merges into a band of pure *Dracophyllum uniflorum* scrub which extends to the tall tussock grasslands above.

Manuka shrubland on Gargarus Saddle is being rapidly invaded by mountain beech. Manuka shrubland is uncommon elsewhere in Coleridge District (Shanks *et al*, 1990).

The gently-sloping fans of Fanghill and Boundary streams are vegetated with tall matagouri and fescue tussock. Large areas of matagouri have obtained the stature of trees (up to 3m tall). These areas support the tallest and oldest matagouri on the property, and probably in the district. Other areas with shorter matagouri (e.g. Harper River terraces) have probably been burnt more recently. The tall matagouri in fescue tussock grassland is representative of the original vegetation that existed on the fans and river flats in the Wilberforce Valley.

Adventive and short tussock grasslands:

Most of the lower north- and east-facing slopes on the property support short tussock grassland dominated by fescue tussock and browntop with scattered mountain beech and small pockets of shrubland. The main inter-tussock species are woolly moss, *Raoulia subsericea*, *Leucopogon fraseri*, *L. colensoi*, *Luzula rufa*, *Coprosma petriei*, *Brachyglottis bellidiodes*, *Gentiana serotina*, *Ophioglossum coriaceum*, blue tussock, *Elymus solandri*, *Deyeuxia avenoides* and snowberry.

Small boulderfields or scree edges support *Corokia cotoneaster*, mountain wineberry, matagouri, *Melicytus alpinus*, snow totara, *Pimelea traversii*, *Hebe venustula*, bracken, *Hypolepis ambigua*, and *Blechnum penna-marina*. Browntop, sweet vernal and occasional mouse-ear hawkweed are the only adventives in this predominantly native grassland. The best grasslands of this type occupy the lower eastern flank of The Spurs, the Avoca River flats above Mt Fitzwilliam, and the lower northern flank of Gargarus.

On disturbed areas near the base of shingle slides there is some silver tussock (*Poa cita*) with associated *Raoulia subsericea*, *Geranium sessiliflorum*, korokio, fescue tussock, *Dichelachne crinita* and *Elymus solandri*.

South of Boundary Stream there is an extensive area of cotton daisy herbfield-grassland. Although this is an induced plant community the diverse range of native herbs and grasses provide a complete ground cover. Of note is the complete lack of mouse-ear hawkweed, a weed commonly dominant in short tussock grassland. Cotton daisy dominates with snowberry, fescue tussock, woolly moss, blue tussock, *Deyeuxia avenoides*, *Rytidosperma pumila*, *Lycopodium fastigiatum* and small scattered shrubs of matagouri, *Dracophyllum uniflorum*, korokio, *Pimelea oreophila* and *Gaultheria crassa*.

The well-vegetated fan south of Fanghill Stream has a short tussock grassland cover with clusters of matagouri (1-2m high) throughout. Important species include matagouri, fescue tussock, blue tussock, cotton daisy, *Leucopogon fraseri*, *Gaultheria macrostigma*. There is some browntop and sweet vernal but no mouse-ear hawkweed. The lack of mouse-ear hawkweed is an important feature of the short tussock grassland communities on the fans on the western side of the property.

Red tussock grassland:

Red tussock grassland occurs in the head of Gargarus Stream, above Lake Lilian, and in the valley between Mt Fitzwilliam and The Spurs. There are other areas of red tussock on the river flats near the Harper-Avoca confluence and near the Wilberforce diversion canal. The red tussock near the diversion has drainage ditches surrounding the tussock and is considerably modified. The other areas of red tussock are in excellent condition with few exotic species and little stock damage.

Lake Lilian is the only lake on the property and is of outstanding wildlife value because of the number of waterbirds it attracts. A band of raupo borders the north-west end of the lake with *Carex secta* sedgeland and red tussock swamp extending up valley for some distance. Inter-tussock species include the sedges *Schoenus pauciflorus*, *Carex diandra* and *Schoenoplectus pungens*. *Gunnera dentata* grows on the lake margin and an uncommon ephemeral herb (*Iphigenia novae-zelandiae*) occurs in the exposed subsoil hollows on drier ground (Shanks *et al*, 1990).

The tarns on Gargarus Saddle have peat bottoms (Shanks *et al*, 1990) and are surrounded by red tussock which extends upslope to merge with mixed short tussock-shrubland and mountain beech forest.

The red tussock in the valley between The Spurs and Mt Fitzwilliam has *Carex secta* near the outlet where a narrow, deep quietly-flowing creek exits

the wetland. *Schoenus pauciflorus* and *Carex sinclairii* are the main inter-tussock sedges. A group of willows at the lower end of the wetland and some browntop growing in the red tussock on drier ground are the main exotic intrusions. A fence at the top of the wetland marks the end of red tussock and the start of more modified browntop and sweet vernal grassland.

Lilian Creek flows through the red tussock swamp on the river flats near the Harper-Avoca confluence. This wetland has flowing and standing water and contains the sedges *Schoenus pauciflorus*, *Carex coriacea*, *Juncus articulatus*, *Eleocharis acuta* and an occasional *Carex secta*. Some browntop and Yorkshire fog and an occasional sick-looking sweet brier are the main adventives present.

Tall tussock grassland:

Tall tussock grassland provides the main cover above mixed mountain beech-shrubland-short tussock grassland. Slim snow-tussock (*Chionochloa macra*) provides the main tall tussock cover with broad-leaved snow-tussock (*Chionochloa flavescentis*) often associated with snow totara on the edges of shingle slides. Sparse slim snow tussock extends from near Gargarus Saddle to the summit of Gargarus, where scattered plants mix with the alpine tussock-herbfield. Slim snow tussock is particularly palatable to stock and plants near the top of Gargarus tend to be heavily browsed.

Alpine fellfield and tussock herbfield:

The flat summit of Gargarus was the only alpine plant community visited. The exposed top supports a sparse tussock-herbfield vegetation of *Dracophyllum prunum*, *Celmisia angustifolia*, *Pratia macrodon*, *Anisotome flexuosa*, *Kelleria dieffenbachii* and the cushion plants *Chionohebe pulvinaris* and *Phyllachne colensoi*. Slim snow tussock plants are scattered throughout, and small hollows support *Chionochloa oreophila*. A large component of the upper slopes and top of Gargarus is bare ground, rock and rubble.

Scree and rock outcrop:

Unlike the smooth rounded top of Gargarus, the peaks and ridges of The Spurs and the Birdwood Range are steep, jagged and broken and provide the source of the long screes that descend down to the valleys. These steep screes are likely to support scattered specialised scree plants including *Ranunculus haastii*, penwiper (*Notothlaspi rosulatum*) and *Stellaria roughii*. Patches of snow totara and broad-leaved snow-tussock occur on the semi stabilised scree margins. *Helichrysum intermedium* occurs on rock outcrops.

2.4.3 Flora

The following notable plant species were observed on the property:

<u>Plant species</u>	<u>Known distribution in area</u>
Vulnerable (de Lange et al, 1999)	
<i>Iphigenia novae-zelandiae</i>	in red tussock near Lake Lilian
Naturally Uncommon (de Lange et al, 1999)	
<i>Coprosma intertexta</i>	footslopes near Fanghill Stream
Notable	
<i>Sophora microphylla</i>	observed only near Fanghill Stream

Schoenoplectus pungens
Pittosporum divaricatum

in sedgeland at head of Lake Lilian
present in beech forest in Gargarus Stream

Species at distributional limits (Wilson 1991)

Hebe venustula at southern distributional limit

The distributional limit of beech forest and the transition to mountain totara forest in this area occurs on the property between Fanghill and Bristed streams (Burrows, 1977).

2.4.4 Problem Plants

There is a large infestation of broom near Glenthorne Stream, and areas of wilding tree spread (Douglas fir and sycamore) near the homestead. Also, planted exotic trees that may generate wilding spread are recorded at The Retreat alongside Lilian Creek. Crack willow is present alongside some wetlands and streams, notably beside the stream draining the wetland on the saddle between The Spurs and Mt Fitzwilliam. Sweet brier is also recorded at some locations.

2.5 FAUNA

2.5.1 Birds

Species observed on Glenthorne include: black swan (*Cygnus atratus*), paradise shelduck (*Tadorna variegata*), Canada goose (*Branta canadensis*), NZ scaup (*Aythya novaeseelandiae*), South Island Robin (*Petroica australis*), silvereye (*Zosteralis lateralis*), and rifleman (*Acanthisitta chloris*). Kea (*Nestor notabilis*), a Category B species for conservation action (Molloy *et al*, 1994), were observed in the Wilberforce Valley.

It is also likely that other Category B species are present on the property, including kowhiowhio/blue duck (*Hymenolaimus malacorhynchos*) and karearea/NZ falcon (*Falco novaeseelandiae*). Kowhiowhio/blue duck have been recorded in Gargarus Stream (1980), the Avoca River (1986) and the Wilberforce River (1983) (Cunningham, 1991). Blue duck are still present in the headwater tributaries of the Rakaia River and may be present in tributaries in the vicinity of Glenthorne Pastoral Lease. A systematic survey would be required to clarify the present distribution of this endangered species.

Lake Lilian is described as 'outstanding' for wildlife in the PNAP report (Shanks *et al*, 1990) due to the numbers of water birds that use the lake and the presence of Australasian crested grebe (*Podiceps cristatus*). The Rakaia River system and its major tributaries (Wilberforce, Harper and Avoca) are of 'outstanding' value for wildlife (O'Donnell and Moore, 1983). These areas of open riverbed adjoin Glenthorne Pastoral Lease.

2.5.2 Reptiles

Common skink and grey geckos have been found in the lease. Populations of the uncommon *Oligosoma longipes* and *Oligosoma chloronotum* have been found in adjoining properties and could be expected to be found on Glenthorne.

2.5.3 Freshwater Fish

Shanks *et al* (1990) note the presence of long-finned eel, upland bully and freshwater mussels at Lake Lilian. The upland bully has been recorded in Lilian Creek and the common bully in Triangle Creek. The Wilberforce River tributaries contain Canterbury galaxies and alpine galaxies and kaoro has been noted in Avoca River tributaries.

Brown trout are found in Lake Lilian, Lilian Creek and Triangle Creek while rainbow trout have been noted also in Avoca River tributaries.

2.5.4 Invertebrates

There are numerous invertebrate habitats present on Glenthorne Pastoral Lease, including stream, river, open grassland, tussock grassland, shrubland, forest, and alpine habitats. Invertebrates observed in each of the main habitats are described below.

Alpine and Sub-alpine zones:

Four species of grasshoppers are found on the Birdwood Range above 1300m: *Brachaspis nivalis*, *Paprides 'furcifer'*, *Sigauss australis* and *Sigauss villosus*. The grasshopper *Sigauss villosus* was found only above 1900m and is at its western distributional limit in this area. It is only the second time in nearly forty years that it has been recorded outside the few mountain ranges where it has been commonly recorded. Many common high-alpine invertebrates were observed on the range, including weevils, cicadas, tussock butterflies, black mountain ringlets, spider-wasps, diurnal moths, and the New Zealand brown blowfly. Four species of grasshopper were found below 1300m on the Birdwood Range: *Brachaspis nivalis*, *Paprides 'furcifer'*, *Phaulacridium marginale* and *Sigauss australis*.

Grassland and Shrubland:

Species observed in areas of grassland and shrubland include the tussock ringlet butterfly, common copper butterfly, several species of robber fly, and the grasshopper *Phaulacridium marginale*. The rare grasshopper *Brachaspis 'lowland'* was found at two sites, Fanghill Stream and Boundary Stream. This species is listed in the Department of Conservation's Short-horned Grasshopper Recovery Plan (Walker, *in prep.*).

Wetland Complexes and River Systems:

The main area sampled was a large tussockland-shrubland-wetland complex located around Lilian Creek. This area has a high diversity of invertebrate species, as it comprises several large areas of habitat. Especially notable is the diverse crane fly (Tipulidae) fauna present in the red tussockland.

Forest:

Invertebrate communities varied throughout the property depending on the age and condition of the forest. Ground-cover within older forest remnants is in excellent condition, providing deep leaf litter and suitable habitat for ground-dwelling invertebrates. Stag beetles were present in older remnants, and cave wetas observed in the mid-age forest remnants. The ground cover within the other forest remnants is generally in good condition.

Other invertebrates observed within forest communities include ground beetles, darkling beetles, weevils, springtails, spiders, slaters, isopods,

woodlice, centipedes, millipedes, slugs, and larvae of numerous wood-boring invertebrates. An un-named species of flatworm (*Arthurdendyus*) was recorded in forest behind the homestead. This species has been previously recorded from only three other areas: the Deception River (Arthur's Pass National Park), Murchison and Karamaea.

2.5.5 Problem Animals

There is a big population of hares on the property while rabbits have been noted at medium density. There are some stoats, ferrets and wild cats. Goats, pigs, red deer, chamois and thar have been noted at low levels. Large flocks of Canada Geese are present, usually associated with tarns, wetlands and Lake Lillian.

2.6 HISTORIC RESOURCES

An important Maori track up the Wilberforce to the West Coast via Browning's Pass passed through Glenthorne. First used around 1700 this route was principally used by warring parties, rather than trading parties, because of the severe nature of the Pass.

The lease was taken up as four runs between 1859 and 1864 by Major Henry Arthur Scott. In 1872 Major Scott sold the lease to Captain Stephen Fisher who farmed "Beckenham" near Christchurch. There were a number of managers on the property including one of Fisher's sons. Fisher sold Glenthorne to John Finlayson in 1894 who transferred it to Mrs J. Murchison of Lake Coleridge in 1902. The farm was run in conjunction with Lake Coleridge until the 1970s when it was purchased by Bob and Val Brown, the current lessees.

Fanghill Hut was built around 1910 and is made of concrete, timber and tin. It is still in very good condition and should continue to be maintained as an historic site as well as a good base for activities in the area. Fitzwilliam Hut, near The Retreat, is also still in good condition.

2.7 PUBLIC RECREATION

2.7.1 Physical Characteristics

Glenthorne Pastoral Lease lies partly within the 'remote' recreation opportunity class and partly within the 'pastoral' recreation opportunity class in the Recreation Strategy for Canterbury Conservancy (Department of Conservation, 1994). Within the property, three main recreation settings can be described.

High Mountains:

This recreation setting covers the high altitude country along the Birdwood Range. The area is contiguous with the high mountain ranges of the central Southern Alps and has similar physical characteristics for recreation. It comprises extensive areas of steep broken rock, with sparse vegetation on upper slopes and denser tussock and scrub on sub-alpine slopes especially in the northwest. Range crests are snow-covered for part of the year and lower slopes may be snow-covered during the winter months. The mountain range becomes higher and more broken towards the main divide, though the whole

area within the property is relatively accessible to climbers and back-country trampers.

Lower Slopes and Saddles:

This recreation setting covers the lower-altitude slopes and at the southeast end of the property. It includes the summits of The Spurs, Mt Fitzwilliam and Gargarus, and the broad saddles that separate these summits. This country is gentler and more accessible than that within the High Mountains Recreation Setting. It is also more modified and more intensively grazed. However, there are few tracks and fences, and the area provides a predominantly natural setting for recreation. This area is relatively accessible to trampers and walkers and, in places, to four-wheel-drive vehicles.

Valley Floors:

This recreation setting covers the lower altitude parts of the property along the Wilberforce, Harper and Avoca rivers. It comprises river flats and the broad gently-sloping fans of the major tributary streams. This recreation setting is the most modified of the three settings: the predominant vegetation is induced grassland or pasture; it contains all the buildings on the property; and, it is traversed by vehicle tracks and fences. It is very accessible and can be, for the most part, traversed by vehicle. It adjoins extensive areas of Crown Land in the open river beds and is frequently unfenced along that boundary.

2.7.2 Legal Access

The Harper Road provides legal access to the southern boundary of the property at the Harper River. A legal formed road provides access through the southwest corner of the property between Castle Hill and Gargarus, though the present road formation appears to stray from the legal alignment in places. This road provides vehicle access to the homestead and to the upper Wilberforce River beyond. Other low-altitude parts of the property are readily accessible from Crown Land in the riverbeds that border the property to the east, south and west. Legal access to higher altitude parts of the property along the Birdwood Range is available from Craigieburn Forest Park and the Central Southern Alps and Wilberforce Conservation Area to the north.

2.7.3 Activities

The most important recreational use of the property, in terms of visitor numbers, is probably scenery appreciation. The southern part of the property is visible from the Lake Coleridge basin, and the Harper Road provides easy access to the property boundary for visitors to the area. Areas of riverbed adjoining the property are used for fishing, four-wheel-drive-vehicle use, and for tramping access to the upper valleys.

Parts of the property have obvious potential for tramping, hunting, fishing, walking, picnicking, mountain-biking, horse-riding, and nature study.

PART 3 OTHER RELEVANT MATTERS AND PLANS

3.1 CONSULTATION

At meetings held with non-government organisations in Christchurch on 25 September 2001 and in Timaru on 26 September 2001 the following comments and recommendations were made:

- Fanghill Hut used as tramping base.
- Grazing should be removed from Forest Park.
- Transalpine crossings of Bristed Stream and Fang Hill important.
- Property has high conservation values, except some of the lower areas.
- Wetlands between Gargarus and Lake Lillian important for botanical values.
- Dracophylum shrubland important.
- Broom a potential problem in Fanghill Stream.
- Vehicle access wanted up Harper Valley and up to the Basin's Hut
- No problem with \$20 charge for vehicle access.
- Continued foot access up The Spurs, Boundary Stream and Gargarus wanted.
- Good area for mountainbikes.
- Traditional access through Ryton Station now costs \$3. Access up the Harper River should be ensured.
- Legal foot access to Lake Lillian needed.
- Good tramping trip to Casey Tarn from triangle Creek and return via The Spurs and Basin Creek.
- All country in Wilberforce from Boundary Creek upwards should be protected.
- Access to the Wilberforce River at Harper River confluence needed.

Written submissions were also received from the NZ Deerstarkers Association (South Canterbury Branch), the Peninsula Tramping Club, The NZ Alpine Club (South Canterbury Section) and the combined South Canterbury Tramping Club and Temuka Tramping Club. As well as points covered above these submissions called for the legalising of the access up the Wilberforce and provision of a camping and picnicking area adjacent to the road.

3.2 DISTRICT PLANS

Glenthorne is in the Selwyn District. The District Plan for Selwyn was notified in September 2001 and submissions have been lodged. The lease is within the High Country Area of the Rural Zone and higher parts of the lease are also within the Area of Outstanding Landscape.

As well as the general rules applying to the High Country Area of the Rural Zone there are specific rules relating to the Area of Outstanding Landscape including:

- Earthworks are limited to the maintenance and repair of existing roads or tracks, post holes, or other earthworks provided that the volume of earth disturbed, removed or deposited does not exceed 150m³ per project.

- The formation of any road or accessway is limited to the maintenance of existing roads or accessways.
- Any utility structure erected does not exceed a gross floor area of 40m², a height of 4m and a reflectance of 37%.
- Erection of signs is limited to any sign depicting the name of, or information about, a place which is erected on the site to which the name or information relates; directional signs for traffic or pedestrians; signs indicating private property, fire restrictions, wandering stock, public reserves or public access; and any sign required under other legislation.

3.3 CONSERVATION MANAGEMENT STRATEGIES AND PLANS

Glenthorne Pastoral Lease is within the Waimakariri Unit of the Canterbury Conservation Management Strategy. Relevant objectives for this unit are listed as:

- To protect a representative range of indigenous biodiversity (for ecosystems and species).
- To protect and enhance the viability of priority threatened species populations and their habitat(s) (for ecosystems and species).
- To encourage recreational usage compatible with the protection and enhancement of indigenous species and habitats (for lakes and wetlands).
- To support land management practices that will maintain natural ecosystems, landscape and indigenous species populations (for lakes and wetlands).

PART 4 ATTACHMENTS

4.1 ADDITIONAL INFORMATION

4.1.1 Scientific Names of Plant Species Cited in the Text

<u>Common Name</u>	<u>Scientific name</u>
blue tussock	<i>Poa colensoi</i>
bracken	<i>Pteridium esculentum</i>
broadleaf	<i>Griselinia littoralis</i>
broad-leaved snow-tussock	<i>Chionochloa flavescens</i>
broom*	<i>Cytisus scoparius</i>
browntop*	<i>Agrostis tenuis</i>
cotton daisy	<i>Celmisia spectabilis</i>
Douglas fir	<i>Pseudotsuga menziesii</i>
fescue tussock	<i>Festuca</i> sp.
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>
manuka.....	<i>Leptospermum scoparium</i>
matagouri	<i>Discaria toumatou</i>
mountain beech	<i>Nothofagus solandri</i> var. <i>cliffortioides</i>
mountain flax	<i>Phormium cookianum</i>
mountain ribbonwood	<i>Hoheria lyallii</i>
mountain toatoa.....	<i>Phyllocladus alpinus</i>
mountain totara.....	<i>Podocarpus hallii</i>
mountain wineberry	<i>Aristotelia fruticosa</i>
mouse-ear hawkweed*	<i>Hieracium pilosella</i>
penwiper.....	<i>Notothlaspi rosulatum</i>
prickly mingimingi	<i>Cyathodes juniperina</i>
raupo	<i>Typha orientalis</i>
red tussock	<i>Chionochloa rubra</i>
silver tussock.....	<i>Poa cita</i>
slim snow-tussock.....	<i>Chionochloa macra</i>
snowberry.....	<i>Gaultheria depressa</i> var. <i>novae-</i>
<i>zelandiae</i>	
snow totara.....	<i>Podocarpus nivalis</i>
sweet brier*.....	<i>Rosa rubiginosa</i>
sweet vernal*.....	<i>Anthoxanthum odoratum</i>
tauhinu.....	<i>Ozothamnus leptophylla</i>
tutu	<i>Coriaria sarmentosa</i>
willow.....	<i>Salix</i> sp.
woolly moss.....	<i>Racomitrium lanuginosum</i>
Yorkshire fog*	<i>Holcus lanatus</i>

(* = naturalised species)

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4.2 MAPS

4.2.1 Landscape Units (attached)

4.2.2 Topographic/Cadastral (attached)

4.2.3 Values (attached)

4.3 ACKNOWLEDGEMENTS

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