

Crown Pastoral Land Tenure Review

Lease name : Bog Roy

Lease number : Po 310

Conservation resources report

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

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

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BOG ROY PASTORAL LEASE

CONSERVATION RESOURCES REPORT

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PART 1 INTRODUCTION

This report describes the significant inherent values present on Bog Roy Pastoral Lease. Field survey reports upon which this report is based are listed below.

Bog Roy Pastoral Lease covers an area of approximately 2860 hectares in the Waitaki Valley between South Canterbury and North Otago. It lies between Lake Benmore and the Hawkdun Range, northwest of Otematata. The property is bisected by State Highway 83 (the Omarama Otematata Road): one part of the property covers hill country between the highway and Lake Benmore; the other covers part of the lower Otamatapaio Valley. It adjoins three other pastoral leases: Otamatapaio to the west; Rostrieve to the east; and, Otematata to the southeast. The DOC-administered Otamatapaio Recreation Reserve lies on the shores of Lake Benmore to the northwest, between the property and Sailors Cutting.

Bog Roy Pastoral Lease lies between approximately 360m and 890 metres altitude, though a large part of the property is below 550 metres. The property is drained by tributaries of the Otamatapaio River and small streams that drain directly to Lake Benmore, all of which eventually drain to the Waitaki River.

The property lies on the boundary of the Mackenzie and Waitaki ecological regions: the northern part (north of State Highway 83) is within Benmore Ecological District; the southern part is within Hawkdun Ecological District. The Mackenzie Ecological Region was surveyed as part of the Protected Natural Areas Programme (PNAP) in the early 1980s. No part of Bog Roy Pastoral Lease was identified as a priority natural area (PNA) for protection during that survey (Espie *et al*, 1984), though the adjoining Lake Benmore was recommended for protection as wildlife habitat (PNA 2 Lake Benmore). Hawkdun Ecological Region was surveyed as part of the PNAP in the early 1990s. One area on the property in the Otamatapaio Valley was recommended for protection (RAP) during that survey (Grove, 1994): RAP HAWK 2, Bog Roy.

Field survey reports upon which this report is based:

- Bog Roy Pastoral Lease, Assessment of Natural Landscape Values, Anne Steven, January 2003. 11p+maps+photographs.
- Tenure Review of Bog Roy Pastoral Lease, Assessment of the Ecological Values, NC Simpson, Conservation Consultancy Ltd., March 2003, 7p+map+photographs.
- Bog Roy Pastoral Lease, Report on Aquatic Fauna Surveys, Scott Bowie, February 2003, 9p+map.
- Bog Roy Pastoral Lease Invertebrate Assessment, Simon J Morris, March 2003, 9p+maps+photographs.

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

2.1 LANDSCAPE

2.1.1 Landscape Context

Bog Roy Pastoral Lease is part of the upper Waitaki Valley landscape, a well-known and distinctive landscape. It is one of the driest parts of New Zealand. The topography is dominated by high, barren-looking hills and mountain ranges. Hill and range slopes are steep and angular, and rock outcrops are a characteristic feature. The area is notable for the transition from Canterbury greywacke mountains (e.g. Benmore Range) to Otago block-faulted schist mountains (e.g. Hawkdun Range). The sparse low-stature vegetation adds to the distinctive character. The seasonal bright-green of sweet brier, and of willows and poplars along stream courses and around the lakes, contrasts vividly with the brown-grey scrub and grassland on the surrounding hills. Tussockland is patchy on lower slopes, though more dominant on cooler, moister upper slopes and summits.

The valley floor has been greatly modified through the creation of the Benmore, Aviemore and Waitaki hydro dams and lakes. These structures are now dominant features in the valley. The lakes are popular for camping and water-based recreation, and much of the valley landscape is visible from the highway or lakes.

Whilst the landscape appears natural (dominated by landforms, lakes and vegetation of natural form and pattern) and is distinctive and memorable in many places, it lacks the particular visual quality and aesthetic value of other parts of the high country such as the Mackenzie Basin. This is reflected in the findings of the Canterbury Regional Landscape Study (Boffa Miskell and Lucas Associates, 1993) which considered the lakes and their settings regionally significant, except for the narrow neck of Lake Benmore. The uppermost part of the valley west of Glen Creek and Totara Peak was considered outstanding, as it is part of the renowned Mackenzie Basin landscape. However, the majority of the Waitaki Valley was not considered either regionally outstanding or significant. The landscape has not yet been assessed at a district level; it is likely that the hill-slopes surrounding the lakes would be considered a significant natural landscape at a district level.

2.1.2 Landscape Description

Bog Roy Pastoral Lease comprises two connected blocks. The northern block (Bog Roy Hills) covers the western half of the steep dissected hills lying between State Highway 83 and Lake Benmore. The southern block (Otamatapaio) covers the alluvial plain and a portion of low hills on the east side of the Otamatapaio River at the base of the Hawkdun Range.

At the broadest level, Bog Roy Pastoral Lease lies within the Semi-Arid Ranges Landscape Type (Boffa Miskell and Lucas Associates, 1993). This is a large block of steep, rugged, barren-looking mountains lying between North Otago and Burkes Pass, sharing characteristics of both Canterbury and Otago.

At a district level, the property lies in the upper Waitaki Valley. Part of this area is included in the Mackenzie/Waitaki Basins Landscape Study (Boffa Miskell, 1992), in which it is divided into 'landscape compartments'. The Boy Roy Hills Block is part of the Lake Benmore Landscape Compartment. The Otamatapaio Block is outside the study area but is considered to be part of a different landscape compartment, described in this study as the East Hawkdun Landscape Compartment.

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

Landscape Unit 1, Bog Roy Hills

This landscape unit comprises a four kilometre-long northwest-southeast trending hard-rock hill range rising to a high point of 897m altitude at its eastern end (Trig Q). A long spur forms a narrow-necked peninsula into the lake. The range is steep and deeply dissected with numerous spurs and gullies. The north aspect comprises long slopes plunging steeply down to the lake; the southwest aspect is less steep but more dissected. A fault line runs southwest to northeast through the lower hills. Frequent rock outcrops are typical of the terrain, forming an undulating skyline punctuated by rocky knobs. Scree is not nearly as extensive as on other Canterbury mountains, but there are large patches of talus below several of the rock outcrops.

Vegetative cover on these dry rocky slopes and thin stony soils is low and sparse, comprising a mix of scrub, grasses, herbs, mat and cushion plants. Sweet brier is present on mid to lower slopes; short tussock is patchily distributed; and, snow tussock is confined to cooler aspects on higher summits. Mixed native shrublands occur around rock outcrops, and matagouri-*Coprosma* scrub is present in gullies. The hills support extensive grazing. Several vehicle tracks traverse the hills.

This unit can be subdivided into three subunits:

Peninsula: The low irregularly-shaped peninsula connected to the hills by a narrow neck.

Lake Face: The north side of the range that plunges steeply to the lake.

Southwest Hills: The southwest side of the main range.

Landscape Unit 2, Bog Roy Downlands and Valley Bottoms

This landscape unit comprises an area of low rolling spurs and hillocks, open river flats and cultivated paddocks around the homestead. It lies in the broad depression between the Bog Roy Hills Landscape Unit and the large ridge southwest of Ahuriri Pass. Vegetation cover is similar to Landscape Unit 1, although sweet brier is dense on parts of the river flats and patches of native broom are present on the low hills. State Highway 83 bisects the river flats in the southwest corner of the unit, and two power lines traverse the area.

Landscape Unit 3, Otamatapaio Flats

This landscape unit comprises the extensive river flats formed by the Otamatapaio River and Corbies Creek. These glacial outwash surfaces date from the two most recent glacial periods, the older surface forming a large remnant island several metres above the younger surface. A sparse grass cover, extensive sweet brier and an assortment of herbs and mat plants are present. Corbies Creek winds through a large *Carex* wetland and is lined with willows. A small area of flats and the airstrip paddock have been developed into irrigated paddocks; otherwise the area supports extensive grazing. The cultivated paddocks form two landscape subunits distinct from the main area of flats.

Landscape Unit 4, Corbies Hill

This landscape unit comprises the lowest slopes of the Hawkdun Range overlooking the Otamatapaio River flats and forming the southernmost part of the property. It covers low steep-sided hard-rock hills with numerous rock outcrops. Most of the area is low-grade Haast-Schist, separated by the Otematata Fault from the adjacent greywacke country. Vegetation is similar to that of the southwest Bog Roy hills and hard-rock downlands at the homestead.

2.1.3 Visual Values

The north side of the Bog Roy hills are moderately impressive for their height, steepness and barren rocky character. The towering Benmore Range across the lake is much more impressive. The numerous rock outcrops with their native shrub communities are of visual interest. There are excellent panoramic views of Lake Benmore from the summit ridge of the Bog Roy hills.

On the Otamatapaio Block, the isolated remnant 'island' of Waikaura outwash gravel is of visual interest. Rock outcrops on the hills are similarly of interest. The green Corbies Creek wetland is a vivid feature because of its contrast with the surrounding brown-grey hills.

Views from State Highway 8: The upper west side of the Bog Roy hills is distantly visible from a section of State Highway 8 between the Omarama airfield and the rocky cutting north of the Ahuriri River. The hills appear as a relatively small, discrete, convex range centrally located in the broad V of the Waitaki Valley between the much larger Benmore and St Cuthbert ranges. The irregular rocky skyline is of visual interest. The hills are also in direct view for people travelling south through the cutting.

Views from State Highway 83: The Bog Roy Hills Block is highly visible from State Highway 83 between the Chain Hills and Ahuriri Pass, over distances up to nine kilometres. The highway directly adjoins the southwest boundary of the block. The most significant views from State Highway 83 are those from the highway between the Chain Hills and Sailors Cutting. Here the Bog Roy hills form the skyline backdrop to panoramic views of Lake Benmore, increasingly dominating the view for people travelling southeast. On clear sunny days, the view is impressive: the barren-looking steep, rugged hills studded with rocky knobs; the rich blue of the lake; and, the bright green clumps of willow and poplar. These form visually striking images. The highway offers constantly changing perspectives of the hills as it passes around the southwest edge of the block and rises to Ahuriri Pass. The summit continues to present an interesting, irregular, rock studded skyline.

There is also a view up the Otamatapaio Valley from a short section of State Highway 83, though only the gully parts of the Otamatapaio Block are visible. There is a brief view of Trig Q and the true left of Boundary Creek from State Highway 83 just east of Otematata.

Views from Lake Benmore: The Bog Roy hills form over 18km of the lake's shoreline and enclose the narrow convoluted portion of the lake between West Arm and the Benmore Dam. An ever-changing perspective of the western and northern aspects of the hills is gained from the lake. The hills are visually impressive for their height and steepness and their harsh rocky character. The shoreline itself is of little visual significance due to its artificial origin and the absence of gently shelving terrain on which beaches could form. The north side of the hills is also of natural character, except the peninsula (Ram Paddock) is traversed by a pylon line and service track.

2.2 LANDFORMS AND GEOLOGY

Bog Roy Pastoral Lease covers dissected hill country and areas of valley floor in the Waitaki Valley, between the Hawkdun and Benmore ranges. The hill country comprises greywacke and argillite of the Torlesse Group with areas of semi-schistose rock of the Haast Schist Group south of the Otematata Fault in the Otamatapaio Valley. Valley floors comprise outwash gravels of glacial origin and areas of recent alluvium. A fossil locality is recorded on the property near Corbies Creek.

Approximately half the property covers broken hilly topography between State Highway 83 and Lake Benmore; the other half covers gentler outwash terraces and flats of the lower Otamatapaio Valley. The hill country is moderately steep and finely dissected. Rock outcrops and bare ground (exposed soil) cover a significant proportion of the hill-slopes. The property ranges in altitude from c.360m at the shore of Lake Benmore to 897m at Trig Q, though a large part of the property is below 550 metres. The property is drained by tributaries of the Otamatapaio River and small streams that drain directly to Lake Benmore, all of which eventually drain to the Waitaki River.

Soils on hill country parts of the property are predominantly high country Omarama yellow-grey earths and Waitaki brown-grey earths. Ranfurly and Otematata brown-grey earths are present on the rolling country and terraces. In the southern block Ranfurly and Otematata brown-grey soils are present on the plains and Eweburn recent alluvial soils dominate the fans.

2.3 CLIMATE

The climate of the Waitaki Valley and lower northeast Hawkdun Range is semi-arid, with very warm dry summers and cold winters. Predominant winds are from the northwest, funnelling down the Waitaki Valley. The property is located in one of the driest parts of the country, with an average annual rainfall of approximately 500mm. Precipitation is spread throughout the year though slightly greater in summer. Snow may settle at higher altitudes in winter, and frosts can be severe (Grove, 1994; Tomlinson, 1976).

2.4 VEGETATION

2.4.1 Original Vegetation

McEwen (1987) described the former (pre-European) vegetation of the Benmore and Hawkdun ecological districts as extensive slim and narrow-leaved snow-tussock with areas of scrub, woodland and forest in montane valleys, and herbfield and fellfield at higher altitudes. Espie *et al* (1984) described the vegetation of the Benmore Ecological District as matagouri-*Olearia* scrub and tussocklands (fescue and snow tussock), with some mountain totara forest in sheltered gullies. Grove (1994) described the original vegetation of the Hawkdun Ecological District as dry inland conifer-broadleaved forest, prior to the increased frequency of fire that accompanied human settlement.

In a recent review of the origin of indigenous grasslands, McGlone (2001) proposes that the original (pre-human) vegetation of South Canterbury and North Otago was dominated by grassland and scrub in the intermontane basins, with low-stature forest on the range slopes. Basin grasslands, he suggests, were dominated by species of *Poa*, *Festuca*, *Elymus* and *Rytidosperma*; scrub by species of *Coprosma* and *Myrsine*; and, forest by mountain toatoa and mountain totara. McGlone proposes that tall tussock (*Chionochloa* species) were generally confined to higher-altitude sites.

It appears likely that Bog Roy Pastoral Lease formerly supported a mosaic of short tussockland, scrub and low-stature forest, with wetland or turf vegetation in seepage areas, and mixed shrubland along stream sides. Areas of bare ground (rock outcrop and recently-deposited loess) were probably present. The extent of each vegetation type is likely to have depended on the frequency and severity of natural fires.

2.4.2 Indigenous Plant Communities

The very dry climate has influenced the vegetation of Bog Roy Pastoral Lease. The present vegetation is extremely depleted over much of the property, with mouse-ear hawkweed dominant over significant areas and much bare ground with scabweed especially on rounded ridge tops. Fescue tussock grassland is patchy on north and west slopes with slightly better cover on the cooler south and east slopes. At lower altitudes (below c.500m) introduced grassland is dominant and sweet brier common. Some interesting and, in some cases, rare low-growing native plants have survived on the alluvial outwash fans amongst the briar. Shrublands occur in the damper gullies, on rocky slopes and outcrops, and on some rocky spurs. In places these shrublands are quite diverse with a range of interesting plants, including threatened species. Wetlands and seepage areas are found in the lower parts of a few gullies and along the Otamatapaio Valley. The main plant communities of Bog Roy Pastoral Lease are described in detail below.

Shrubland

Sweet brier occurs as scattered plants or as relatively dense stands on many lower slopes on the property and on large areas of undeveloped flat land on both sides of State Highway 83. At higher altitudes it is much less frequent or absent.

Native shrublands occur in gullies, on rocky outcrops, rocky spurs and boulderfields. These often contain a diverse range of native plants, including threatened species. The best of these shrublands are found on the north slopes above Lake Benmore and on the small peninsula below these slopes. Populations of the threatened native broom (*Carmichaelia curta*) are present on the peninsula alongside shrublands of *Olearia odorata*, *Coprosma propinqua*, *Pimelia sericeo-villosa*, *Helichrysum intermedium*, *Hebe pimelioides*, prostrate kowhai, porcupine shrub, mountain wineberry and *Carmichaelia petriei*. Also present are *Clematis marata*, *Rubus schmidelioides*, silver tussock, blue tussock, wheat grass, plume grass (*Dichelachne crinita*), *Cheilanthes humilis* and necklace fern.

The rocky spurs and gullies below and to the north-west of Trig Q also support diverse shrublands with a similar range of species to that present on the peninsula. Other plants present include golden speargrass, *Carmichaelia crassicaule*, *Coprosma virescens*, matagouri, native jasmine, scrub pohuehue, bracken, *Asplenium terrestre*, *Pellaea calidirupium*, *Haloragis erecta*, *Raoulia monroi*, *Raoulia glabra*, *Dichondra repens* and *Geranium sessiliflorum*. Shrublands on the south faces nearer the homestead are less diverse and dominated by matagouri.

Areas of shrubland along the Otamatapaio River are dominated by matagouri, *Olearia*, *Coprosma rigida*, *Coprosma propinqua* and porcupine shrub together with sweet brier. Some of the matagouri bushes have large trunks and could be up to 300 years old. At the southern end of the property in the area previously recommended for protection (Hawkdun RAP 2) native broom (*Carmichaelia petriei*) is common, with scattered sweet brier, matagouri, *Olearia*, *Coprosma* and porcupine shrub. *Carmichaelia crassicaule* grows amongst rock outcrops. A small bluff near the Otamatapaio River also supports a diverse shrubland containing many of the species already mentioned, as well as a few plants not seen elsewhere on Bog Roy including

Acaena dumicola, *Oreomyrrhis ramosa*, *Luzula rhadina*, *Raoulia parkii*, *Carex breviculmis* and *Anisotome cauticola*.

Grasslands

Grasslands on the lower slopes (below c.500m) are dominated by introduced grasses, principally sweet vernal, with browntop and numerous herbs. There is much bare stony ground, often with large mats of scabweed and a large percentage cover of mouse-ear hawkweed that in some areas forms dense patches. Fescue tussock and sweet brier are scattered throughout this plant community. Matagouri, *Coprosma propinqua* and *Olearia odorata* are occasionally present as scattered plants. Other plants present include haresfoot trefoil, sheep's sorrel, harebell, *Stellaria gracilentia*, *Acaena agnipila*, woolly mullein, winged thistle, stonecrop, hawksbeard, viper's bugloss, *Geranium sessiliflorum*, *Vittadinia australis*, *Oxalis canaliculatus* and Chewings fescue.

Above about 500m fescue tussock becomes more dominant, especially at higher altitudes and on south- and east-facing slopes, but still with much open ground and often with large mats of scabweed. The greyish *Acaena buchananii* and cushions of *Scleranthus uniflorus* are sometimes common. Ridge-tops with skeletal soils and much bare ground have a sparse cover of scabweed with sheep's sorrel, mouse-ear hawkweed, and a few grasses such as *Rytidosperma maculatum*, fescue tussock and sweet vernal, and a number of herbs such as *Geranium sessiliflorum*, hawksbeard, and winged thistle. Silver tussock occurs along the track edges in places and the occasional narrow-leaved snow tussock is present near some ridge tops.

Much of the flat land north of State Highway 83 has been cultivated or developed. South of the highway it is in a more natural state, although often dominated by sweet brier or mouse-ear hawkweed. Fescue tussock and shrubland are scattered across these flats. There is much bare ground in places, frequently supporting the tiny threatened convolvulus (*Convolvulus verecundus*) and threatened dwarf broom (*Carmichaelia vexillata*). Other plants present include creeping pohuehue, *Poa maniototo*, *Deyeuxia crinita*, *Pimelea prostrata*, *Raoulia parkii*, *Carex breviculmis*, *Vittadinia australis*, downy brome (*Bromus tectorum*), porcupine shrub, scabweed, storksbill and other introduced herbs. The yellow popcorn-like lichen *Chondropsis semiviridis* is common on bare ground in this area.

Wetlands

There are few wetlands on the property and those that exist are generally small. The largest and most significant is near the Otamatapaio River, occupying a lower river terrace or old streambed. It supports sedgeland dominated by several *Carex* species including *Carex geminata*, *C. sinclairii*, *C. echinata*, *C. kaloides* and *C. diandra*, with *Schoenus pauciflorus*, *Juncus gregiflorus*, *Juncus effusus* and *Elaeocharis acuta*, and a number of native herbs including *Ranunculus cheesemanii*, *Epilobium brunnescens*, *Schizeilema cockaynei*, *Luzula limosa*, *Gonocarpus micranthus* and *Hydrocotyle montana*. Sweet vernal is one of the few introduced species present. A similar, smaller wetland is found adjacent to Corbies Creek at the foot of the slopes leading southwards to the Hawkdun Range.

A small flush zone surrounded by bracken fern is present on the northern slopes of Trig Q. It is dominated by the sedge *Schoenus pauciflorus*. In the nearby Boundary Gully is another small wetland dominated by *Carex secta* and *Schoenus pauciflorus*.

At the bottom of a west-draining stream, not far from the homestead, is another quite large wetland. This has been grazed by stock but still contains the rudiments of its original plant community although much modified. Species present include *Carex coriacea*, *Carex*

flagellifera, *Schoenus pauciflorus*, *Elaeocharis acuta*, *Bulbinella angustifolia*, mosses, introduced grasses and herbs.

Significance of the Vegetation

Although Bog Roy contains few (if any) original plant communities there are several interesting remnant communities and several threatened species present.

The most diverse of the shrublands are on the northern part of the property on the slopes north of Trig Q and the peninsula jutting into Lake Benmore. The best remaining fescue tussock is at the southern end of the property, where healthy blue tussock, scattered silver tussock and other native grasses including plume grass and wheat grass are also present.

An excellent small shrubland is present on the bluff on the southern part of the property. Shrublands are also found right along the stream in this area and, although there is much sweet brier here and on the hill slope above. Additionally, two threatened plants (dwarf broom and *Carmichaelia crassicaule*) are growing in reasonable numbers in this area.

Dwarf broom and *Convolvulus verecundus* occur in large populations, especially of the latter, on the flat river terrace up the Otamatapaio Valley. More than 40 convolvulus plants were counted near the road in this area. Scattered dwarf broom plants are also present. The best wetland on the property is in this area, on a lower river terrace or old river channel beside the Otamatapaio River.

2.4.3 Notable Flora

The following species listed by Hitchmough (2002) have been recorded from the property.

Table 1 Threatened plant species recorded from Bog Roy Pastoral Lease, January 2003.

Plant Species	Known Distribution on Property
Nationally Endangered	
<i>Carmichaelia curta</i>	common on the peninsula
Gradual Decline	
<i>Carmichaelia crassicaule</i>	throughout on rocky country, though more common on the southern part of the property
<i>Carmichaelia vexillata</i>	present on flats and hill-slopes in the Otamatapaio Valley
<i>Raoulia monroi</i>	sparsely distributed in depleted grasslands
<i>Raoulia parkii</i>	present on low-altitude terraces
Sparse	
<i>Clematis marata</i>	in shrubland on slopes on the northern part of the property
<i>Convolvulus verecundus</i>	present on low-altitude terraces in the Otamatapaio Valley
Data Deficient	
<i>Vittadinia australis</i>	present in low altitude grasslands

2.4.4 Problem Plants

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

Crack willow (*Salix fragilis*)

Large willow trees are present along streams in the Otamatapaio Valley and at some locations near the lake shore. Containment of willow to prevent spread may be required in places to protect conservation values.

Broom (*Cytisus scoparius*)

Broom is present at several locations along the pylon-servicing road around the shore of Lake Benmore, and also on a low bluff in the Otamatapaio Valley. These small infestations appear to have been previously treated with herbicide. Removal of these infestations will be required to protect areas set aside as public conservation land.

Wilding pines (conifer species)

Occasional wilding pines are present on the lower slopes near Lake Benmore. Removal of these trees, and monitoring and control of any further trees, should be undertaken.

Sweet brier (*Rosa rubiginosa*)

Sweet brier is common at lower-altitude sites throughout the property, and scattered elsewhere. Control of this species may be required to protect conservation values in some areas.

2.5 FAUNA

2.5.1 Birds and Reptiles

12 native and 13 introduced bird species have been recorded from the adjoining Otamatapaio Pastoral Lease. Common skink (*Oligosoma nigriplantare polychroma*) and common gecko (*Hoplodactylus* aff. *maculatus* "Southern Alps") appear to be common in the area.

2.5.2 Freshwater Fauna

Freshwater fauna communities were surveyed at five sites on Bog Roy Pastoral Lease in the Otamatapaio Valley. Four different fish species, including three native species, and a wide range of aquatic macro-invertebrates, including insect larvae, crustaceans, molluscs and worms, were observed on the property.

Four different aquatic habitat types are described. These are classified by water source, resistance to drying, and surrounding landform structure. Native fish were found in most habitat types, except for the water-race near the power-house. The Otamatapaio River was found to have the highest diversity of macro-invertebrates on the property, containing many species not recorded in the other aquatic habitats surveyed.

One of the distinguishing features of the Waitaki River and its tributaries is the hydroelectric dams that are found along its length. This has two major effects on the fish communities within the river. The first is that fish communities above the dams are generally composed of only non-diadromous species (those species without a marine phase in their lifecycle), although some exceptions do occur: some longfin eels (*Anguilla dieffenbachii*) are still present in the

river system; and, the normally diadromous common bully (*Gobiomorphus cotidianus*) and koaro (*Galaxias brevipinnis*) have become non-diadromous, substituting lakes for the sea. The second effect is that the fish communities are divided into separate populations, with little or no migration across dams. This means that any re-colonisation of previously de-watered streams can only occur within each dam catchment.

Above the Waitaki Dam, only 11 fish species are present, including five species of introduced salmonid, four species of galaxiid and two species of bully. Of these, chinook salmon (*Oncorhynchus tshawytscha*), sockeye salmon (*O. nerka*) and brook char (*Salvelinus fontinalis*) are scarce and only associated with Lake Aviemore, Lake Benmore and Lake Ohau. The other eight species are quite widely distributed in the Waitaki catchment. In the Waitaki River the only true diadromous species present is longfin eel.

Species previously recorded from the Otamatapaio River are upland longjaw galaxias (*Galaxias prognathus*), upland bully and brown trout. It is believed that the galaxies could in fact be the lowland longjaw galaxias (*G. cobitinis*) which is listed as nationally critical by Hitchmough (2002). Species previously recorded from Lake Benmore are longfin eel, koaro, common bully, upland bully, brown trout, rainbow trout, Chinook salmon and sockeye salmon. Of these, longfin eel and upland longjaw galaxias are listed as threatened by Hitchmough (2002).

Habitat Types

The four habitat types associated with freshwater communities are described below.

Large Streams and Rivers

Large streams and rivers are the most common habitat type on the property. The Otamatapaio River contains similar habitat along its length, though just downstream of the confluence of its two branches, most of the river's flow is diverted into a water-race, leaving only a small residual flow in the river. The river was dry below the water-race intake, but filamentous algae and dead fish indicated that the lower reaches of the river had recently carried water.

Small Streams

Along the edge of the lake are several open gullies that at times contain flowing water, though were dry at the time of the survey. These small streams are steep with occasional waterfalls.

Water-Races

One main water-race occurs on the property. It begins at the Otamatapaio River just below the confluence of its two main branches, flows across the flats near the power-shed and crosses the road to emerge on the property near the homestead. The water race is uniformly c.2m wide and 50 to 60cm deep, with a small-pebble substrate and weed growth.

Springs and Wetlands

Several springs and wetlands occur on the property, generally near the large streams in the Otamatapaio Valley. These all appear to be degraded by stock.

Fish

Only two species of fish were recorded in the large streams and rivers (brown trout and upland bully) although a dead fish in the lower valley appeared to be a common bully. Brown trout were abundant throughout the river habitat, whereas upland bully appeared to more patchily distributed, though still quite common. The small streams around the edge of Lake Benmore were not surveyed because they were dry, but they appear unlikely to support fish even during wet periods. The water-race contained only brown trout, though common bully and upland bully may also be present.

Wetlands and springs on the property were all closely associated with the Otamatapaio River and appear unlikely to contain any new species, with brown trout, upland bully and possibly common bully likely to be present.

2.5.3 Invertebrates

Invertebrates were sampled from three main habitats on Bog Roy Pastoral Lease: shrubland/grassland, aquatic/wetland and riverbed. Invertebrate communities on the property are described below for each of the main habitats sampled.

Shrubland/Grassland

The shrubland and grassland ecosystems on the property are very dry, and only support invertebrate species adapted to this dry habitat. Invertebrates present include species of cockroach (Blattidae), beetle and weevil (Coleoptera), fly (Diptera), spider (Araneae), grasshopper (Acrididae), wasp and ant (Hymenoptera). Only one species of grasshopper was recorded (*Phaulacridium otagoense*), though this species was common throughout the drier parts of the property. Many species of fly were observed in the drier grasslands, including blue blowfly (*Calliphora quadrimaculata*), brown blowfly (*Calliphora stygia*), and species of robberfly (Asilidae) and blowfly (Calliphoridae). Only a few diurnal moths (Lepidoptera) were observed, though these species are usually more active between October and December. Tiger beetles (*Neocicindela* sp.) were observed on small clay banks alongside shrublands.

Wetland

Two small wetland complexes are present on the property: one is located on the western boundary near State Highway 83, and the other near the southern boundary close to Corbies Creek. These areas possess very distinct habitats that are now much reduced in this ecological district. Two species of dragonfly were observed on the southern part of the property: yellow spotted dragonfly (*Procordulia grayi*) and common redcoat damselfly (*Xanthocnemis zealandica*).

Aquatic macro-invertebrates

Large streams and rivers on the property have quite high macro-invertebrate diversity. Species of caddisfly, especially cased caddisfly, were the largest invertebrate group recorded. Of these, *Olinga feredayi* was most common, but also present were *Conuxia gunni* and *Pycnocentria* sp. A few mayflies were present, mostly *Coloburiscus* sp. and *Deleatidium lillii*. Generally there were a few members of other macro-invertebrate groups present, but in low densities. The small streams around the edge of Lake Benmore were not surveyed because they were dry.

The water-race contained a diverse macro-invertebrate fauna, though not on the scale of the large streams. Again, cased caddisflies were the largest group present, but *Pycnocentria* sp. was the dominant species, rather than *Olinga feredayi*. Oligochaete worms were very abundant in this habitat and three species of mollusc, the snails *Physa* sp. and *Potamopyrgus* sp. and a bivalve (*Sphaeriid* sp.), were also present. The wetlands were not surveyed, but are likely to support cased caddisflies, snails, bivalves and Oligochaete worms.

Riverbed

Networks of shallow stony river channels are present on the western property boundary and alongside State Highway 83. These channels are primarily covered in moss, lichen, bare soil,

sweet brier and mouse-ear hawkweed. They provide suitable habitat for diurnal moths, butterflies, flies, wasps and ants. The grasshopper *P. otagoense* was found in this habitat.

2.5.4 Notable Fauna

No species listed by Hitchmough (2002) were recorded from the property. However, longfin eel (*Anguilla dieffenbachii*), upland longjaw galaxias (*Galaxias prognathus*) and possibly lowland longjaw galaxias (*Galaxias cobitinis*) have been recorded nearby in the Waitaki Valley. The property also provides excellent habitat for lizards.

2.5.5 Problem Animals

The most obvious animal that has potential to affect conservation values is the rabbit. The property provides favourable habitat for rabbits, and appears to have suffered from the effects of high numbers of rabbits in the past. Control of rabbit populations will almost certainly be required to protect areas set aside as public conservation land.

2.6 HISTORIC RESOURCES

Bog Roy Pastoral Lease was originally part of the Otematata Run (Run 160) which was first leased for grazing in 1857. In 1891, 5240 acres were separated from Otematata Run and leased to George Archibald as Bog Roy. Part of Bog Roy was flooded following the construction of the Benmore Dam in the 1960s, and further land was transferred from Otematata to Bog Roy at that time to compensate the property owners for this loss (Pinney, 1981).

2.7 PUBLIC RECREATION

2.7.1 Physical Characteristics

The lease can be divided into three areas with different physical characteristics – the steep hills rising out of Lake Benmore, the flats adjacent to the highway and running up the Otamatapio River and the rolling hills at the foot of the Hawkdun Range in the Otamatapio Valley.

The Otamatapio River flows down the western boundary of the lease and is often dry in summer months. Corbies Creek flows off the rolling hills and joins the Otamatapio River just above the water intake for the race which runs through the flats near the homestead.

Access over most of the property is easy with the exception being the steep hill country adjacent to Lake Benmore.

2.7.2 Legal Access

Legal access to the lease is provided by SH 83, the Omarama Otematata Road. A legal roadline runs off the highway to give access to and across the southern block. A formed shingle track follows this roadline in parts. There are also marginal strips up the Otamatapio River and Corbies Creek. A marginal strip also follows the edge of Lake Benmore around the edge of the lease from the Recreation Reserve.

2.7.3 Activities

There is little recreational use of the lease at present apart from landings by boat on the Lake Benmore shoreline and some access up the Otamatapio River for fishing and hunting.

PART 3 OTHER RELEVANT MATTERS AND PLANS

3.1 CONSULTATION

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

Issues raised by representatives included:

- The need to adequately protect the Lake Benmore shoreline to enable recreational use from the lake or shore.
- The protection of the peninsula into Lake Benmore as a reserve.
- Tenure review of Bog Roy provides an opportunity to provide good practical legal access up the Otamatapaio Valley. The existing paper road across the flats needs a slight extension to link it with Otamatapaio Station to provide that access.
- The marginal strips up the Otamatapaio Valley are impractical for access.
- There are some totara and *Pimelia* species at their northern limits on the property.

3.2 DISTRICT PLANS

Bog Roy Pastoral Lease lies within the Rural S (Rural Scenic) Zone of the Waitaki District. The Rural Scenic Zone contains areas which have significant scenic values: the high country; rangelands; and, inland basins. The majority of this zone lies above the 400m contour. The proposed Waitaki District Plan was publicly notified in December 1996. Following public submissions and hearings the district plan, as amended by council decisions, was released in September 1999. The plan establishes what type of activities are Permitted, Controlled, Discretionary or Non-complying. The plan also establishes Site Development Standards and Critical Zone Standards for these activities. A permitted or controlled activity that does not comply with any one or more of the Site Development Standards becomes a restricted discretionary activity.

The Plan has undergone a number of changes in the Rural Scenic Zone following Council's decisions on submissions, and a number of matters are still to be resolved. Within this zoning, at present, 20 ha subdivisions, forestry and homestay visitor accommodation are permitted as are commercial recreational activities where access is by people on foot only and the scale is limited to no more than 10 people in any one group. Earthworks are controlled while other visitor accommodation and recreational activities are discretionary.

A small part of the lease adjacent to Lake Benmore is zoned Rural Residential. Again, the Plan is subject to change but with this zoning 1 ha subdivisions and homestay visitor accommodation may be permitted while forestry and commercial recreation activities will be discretionary.

3.3 CONSERVATION MANAGEMENT STRATEGIES

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

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

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

PART 4 ATTACHMENTS

4.1 ADDITIONAL INFORMATION

4.1.1 Scientific Names of Plant Species Cited in the Text

Common name..... Scientific name

(* = naturalised species)

blue tussock	<i>Poa colensoi</i>
bracken.....	<i>Pteridium esculentum</i>
broom*	<i>Cytisus scoparius</i>
browntop*	<i>Agrostis tenuis</i>
Chewings fescue*	<i>Festuca rubra</i>
creeping pohuehue	<i>Muehlenbeckia axillaris</i>
dwarf broom	<i>Carmichaelia vexillata</i>
fescue tussock	<i>Festuca</i> sp.
golden speargrass	<i>Aciphylla aurea</i>
harebell	<i>Wahlenbergia albomarginata</i>
haresfoot trefoil*	<i>Trifolium arvense</i>
hawksbeard*	<i>Crepis capillaris</i>
matagouri	<i>Discaria toumatou</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>
narrow-leaved snow-tussock	<i>Chionochloa rigida</i>
native jasmine	<i>Parsonsia heterophylla</i>
necklace fern	<i>Asplenium flabellifolium</i>
plume grass	<i>Dichelachne crinita</i>
porcupine shrub	<i>Melicytus alpinus</i>
prostrate kowhai	<i>Sophora prostrata</i>
scabweed.....	<i>Raoulia australis</i>
scrub pohuehue	<i>Muehlenbeckia complexa</i>
sheep's sorrel*	<i>Rumex acetosella</i>
silver tussock	<i>Poa cita</i>
slim snow-tussock.....	<i>Chionochloa macra</i>
snow tussock.....	<i>Chionochloa</i> spp.
stonecrop*	<i>Sedum acre</i>
storksbill*	<i>Erodium cicutarium</i>
sweet brier*	<i>Rosa rubiginosa</i>
sweet vernal*	<i>Anthoxanthum odoratum</i>
viper's bugloss*	<i>Echium vulgare</i>
wheat grass	<i>Elymus solandri</i>
willow*	<i>Salix</i> spp.
winged thistle*	<i>Carduus tenuiflorus</i>
woolly mullein*	<i>Verbascum thapsus</i>

4.1.2 References Cited

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4.2 ILLUSTRATIVE MAPS

- 4.2.1 Topo/Cadastral Map
- 4.2.2 Landscape Unit Map –see page 5
- 4.2.3 Values Map