Toitu te whenua
Land Information
New Zealand

Crown Pastoral Land
Tenure Review

Lease name :
CURRAGHMORE & STREAMLANDS
Lease number : PT 005 / PT 098

Conservation Resources Report

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

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

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

May 08

STREAMLANDS

and

CURRAGHMORE

PASTORAL LEASES

CONSERVATION RESOURCES REPORT

DEPARTMENT OF CONSERVATION

JULY 2007

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PART 1 INTRODUCTION

The 5990 ha Curraghmore Pastoral Lease and the 5840 ha Streamlands Pastoral Lease are located on the southwest flank of the Grampian Mountains and the lower ridges in the northern part of the Stony River catchment at the eastern side of the Mackenzie Basin in South Canterbury. The property covers moderately-steep mountainous country on the flank of the Grampian Mountains and gentler lower-altitude ridges and valleys to the southwest. The property ranges in altitude from 500 m at its western boundary near Haldon Road to 1921 m at Black Rocks on the Grampian Mountains. The northwest part of the property is drained by un-named tributaries of Grays River. All other parts of the property are drained by the Stony River, including its tributaries Moffat Stream and Balloon Stream. Grays River flows into the Tekapo River. Stony River flows into Lake Benmore. Both rivers are within the Waitaki River catchment.

Nearly all parts of Curraghmore and Streamlands pastoral leases lie in the Grampians Ecological District (ED). A small low-altitude part of the property along Haldon Road lies in the Pukaki ED. A small area at the eastern edge of the property lies in the Kirkliston ED. Grampians and Pukaki ecological districts are within the Mackenzie Ecological Region (McEwen, 1987), which was surveyed in the early 1980s as part of the Protected Natural Areas Programme. Three areas on eastern parts of the property, on the Grampian Mountains (Grampians ED), were recommended for protection by that survey (Espie *et al.*, 1984). A larger area encompassing the original areas has since been recommended for protection (Lee, 1996).

The property adjoins The Grampians Pastoral Lease to the north and east, Kirkliston Pastoral Lease to the southeast, Stony Creek Pastoral Lease to the southwest and freehold land on Grays Hill and Haldon stations to the west. Access to the property is from State Highway 8 near Burke Pass via Haldon Road. A number of unformed legal roads exist to and through parts of the property.

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

- High Country Tenure Review Programme Landscape Assessment, Curraghmore/Streamlands, Blakely Wallace Associates, November 2006, 14p + photos + maps.
- Curraghmore-Streamlands Vegetation Report, Mark Davis, February 2007, 36p including photos + maps.
- Assessment of the Bird and Lizard Values of Curraghmore and Streamlands Pastoral Leases, Marieke Lettink, January 2007, 16p including photos + maps.
- Streamlands and Curraghmore pastoral leases, A Report on the Aquatic Fauna Surveys, Scott Bowie, February 2007, 10p + photos + maps.
- Curraghmore and Streamlands Pastoral Leases Tenure Review, Assessment of Invertebrate Values and Recommendations for their Protection, Rowan Emberson and Pauline Syrett, December 2006, 19p + photos + maps.

Topographical map to be inserted

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

2.1 LANDSCAPE

2.1.1 Landscape Context

Curraghmore and Streamlands pastoral leases are located on the eastern side of the Mackenzie Basin approximately 35 kilometres south of Tekapo on Haldon Road. The two properties adjoin one another and form part of the west and south flanks of the Grampian Mountains. The Grampian Mountains in turn are part of the eastern enclosing ranges of the Mackenzie Basin, including the Rollesby, Dalgety and Kirkliston ranges and the Grampian Mountains.

The Mackenzie Basin forms an extensive intermontane basin bounded by high glaciated mountains to the north and west. The Grampian Mountains and adjoining ranges are dissected block mountains that form the southeast margin of the Mackenzie Basin. Deposits of loess and alluvium overlie moraine and outwash gravels on the basin floor. Wide open spaces, high enclosing ranges, and a semi-arid climate and landscape define the overall character of the Mackenzie Basin.

The property rises from the valley floor along Haldon Road and includes the low hills in the Stony River tributary catchments of Moffat and Balloon streams and the steep western and southern flanks of the Grampian Mountains.

2.1.2 Landscape Description

For the purposes of this landscape assessment Curraghmore and Streamlands pastoral leases are divided into five landscape units, reflecting areas of similar landscape character (refer to the Landscape Values map). For each landscape unit, landscape character is evaluated using the following criteria:

- Intactness: the condition of the natural vegetation, patterns and processes and the degree of modification present.
- Legibility: expressiveness: how obviously the landscape demonstrates its formative processes.
- Aesthetic Factors: e.g. distinctiveness and coherence. Distinctiveness is the quality that makes a particular landscape visually striking; this frequently occurs when contrasting natural elements combine to form a distinctive and memorable visual pattern. Coherence is based on characteristics including intactness, unity, continuity, and compatibility (intrusions, alterations, disruptions tend to detract from coherence).
- Historic Factors: historically valued attributes in the context of a high country landscape.
- Visibility: the visibility of the landscape from public vantage points.
- Significance: the local, regional or national significance of the characteristics and features, or combination of characteristics and features, within each unit.
- Vulnerability: a measure of the susceptibility of the landscape unit to landscape degradation.

Landscape Unit 1, Curraghmore Front Faces

This unit includes a narrow band of flats and northwest-facing slopes east of Haldon Road. The flats (and the adjoining freehold land) are cultivated and fenced into paddocks. At the time of the inspection (end of September) the flats and toe slopes were green, in stark contrast to the dry brown slopes of the remainder of the front faces. The faces consist of a dissected ridge and gully landform that descends to the west and southwest. A prominent spur rises from behind the Curraghmore Station buildings to intersect with the main ridge west of Moffat Stream. An access track traverses the main ridge. The largest gullies are located on the boundary with Grampians Pastoral Lease (east of the main access track) and there is another deep gully immediately adjacent to the main ridge above Moffat Stream. This latter gully extends south and then swings around to the west behind the Streamlands homestead and buildings.

The front faces are fairly uniform in appearance. They are highly modified and consist of rocky terrain with very bare denuded faces. Sweet brier is conspicuous on lower slopes with sparse short tussock, porcupine shrub and patchy matagouri on dry sunny faces. Grey (matagouri-*Coprosma*) shrubland is also associated with waterways. Dark faces have pasture grasses, some tussock and fewer rocky areas than the sunny faces. Bare ground, hawkweed and other weeds such as horehound are prevalent on lower and mid slopes. Rock outcrops and stock camps are other features. Some wilding conifers occur on south-facing slopes. Electricity pylons and lines are located on the northwest corner of the property. An airstrip and shed are located on lower slopes north of the Streamlands homestead.

Above approximately 1100 m short tussock and tall tussock become reasonably continuous though within a thick mat of hawkweed. Tussock is present in the upper catchment adjacent to The Grampians Pastoral Lease and in the head of the catchment that extends down to the Streamlands homestead. Tussock cover varies between sunny and dark faces.

Visual and Scenic Values

This unit has no distinctive or special characteristics below 1100m. It merges as part of the lower and mid slopes of the Grampian Mountains and as such is part of the range backdrop to the eastern side of the Mackenzie Basin. The snow-tussock zone (above 1100 m) is reasonably intact and visually contiguous with the upper Grampian Mountains.

Evaluation Summary

Criteria	Value	Comment
Intactness	Low	Highly modified up to 1100 m; snow-tussock above 1100 m.
Legibility	Medium	Landform processes are legible but not highly so compared with the upper slopes and summit of the Grampian Mountains.
Aesthetic Factors	Low	Not distinctive or memorable.
Historic Factors	Low	
Visibility	Medium	Visible from a reasonably wide area.
Significance	Low	
Vulnerability	Low	Already modified but vulnerable to landscape change through forestry and further wilding conifer spread.

This unit is typical of lower north and northwest slopes of the Grampians Mountains and adjacent ranges. It is significant as part of the backdrop to the Mackenzie Basin. Areas above approximately 1100 m with relatively intact tussock form a reasonably coherent landscape. Below this elevation, the area contains no distinguishing features and is typical of lower slopes in this part of the Basin.

Landscape Unit 2, Curraghmore Back Tributaries

This unit includes the upper parts of Moffat Stream and Balloon Stream and their tributaries. Both stream valleys are long, narrow, dissected and contiguous with the steep faces and summit ridge area of the Grampian Mountains. The summit ridge and upper basins are in the alpine zone, rising to 1921 m at Black Rocks on the boundary with The Grampians Pastoral Lease. The main features are the distinctive Black Rocks, the extensive rocky volcanic-like screes and rockland, and the mosaic of sparse alpine vegetation. The screes and rock outcrops are visible over a wide area. Black Rocks is a local landmark.

The upper slopes of the Grampian Mountains (below Black Rocks) are steep and dissected with rugged gullies, prominent rocky outcrops and tussock-covered slopes. Grey, black and reddish screes are especially prominent nearer the ridge. The upper tributaries have a moderate to very high level of naturalness. The lower slopes and especially sunny faces are more modified and hawkweed is a significant feature. Some tussock regeneration is occurring.

Upper Moffat Stream flows within an entrenched narrow gorge. Exposed rocky ribs and screes with grey shrubland contrast with tussock-covered slopes on the valley sides towards the head of the valley. Tussock here is reasonably continuous but thin on the valley floor and lower slopes. Further downstream, tussock is replaced by exotic species and grey shrubland. A steep narrow gorge with rock bluffs and associated shrubland is a feature midway along the stream within Curraghmore Pastoral Lease. South-facing slopes have denser tussock cover.

Balloon Stream and tributaries exhibit similar patterns to Moffat Stream with a reasonably high degree of naturalness above approximately 1100 m. Tussock cover is more fragmented below 1100 m, especially on dry sunny faces. Grey shrubland is a significant feature, mainly associated with lower gullies, stream edges, rocky bluffs and the valley floor. Scattered wilding conifers occur mainly on south faces of the upper tributaries. Overall this area forms a reasonably coherent landscape with natural patterns and processes intact.

Visual and Scenic Values

Visual values are high throughout this unit. The steep rugged mountain faces and dissected tributaries are visually impressive, distinctive and have a high degree of naturalness. The upper slopes and basins on and below the ridge have high visual and scenic values. The impressive summit and basin landforms associated with lichen-covered black rocks, fellfield, rockland, large scree-covered slopes and diverse alpine plant communities are distinctive and impressive. Below the upper basins the tussockland, herbfield and shrubland communities on the steep rugged faces are also very impressive features.

The views from this part of the property are spectacular, especially west to the Benmore Range and across the broad sweep of the Mackenzie Basin to the glaciated mountains beyond.

Evaluation Summary

Criteria	Value	Comment
Intactness	High	Natural processes and patterns intact.
Legibility	High	Very expressive of formative processes.
Aesthetic Factors	High	Visually impressive montane landforms and associated plant communities.
Historic Factors	Low	Associated with pastoral history and folklore.
Visibility	Medium to High	Visible from over a wide area within the Mackenzie Basin including Haldon Road.
Significance	Medium	A regionally significant landscape. The west face of the Grampians Mountains is a distinctive landscape feature in

		this part of the Mackenzie Basin. It contains the local landmark "Black Rocks".
Vulnerability	High	Vulnerable to landscape and ecological degradation.

The upper basins, slopes, and stream tributaries that form part of the western face of the Grampian Mountains within this unit are important and contain significant inherent landscape values.

Landscape Unit 3, Streamlands Front Faces and Low Hills

This unit is contiguous with Landscape Unit 1 (Curraghmore front faces) and similar in aspect and character. It has been retained as a separate unit for descriptive purposes. The unit includes the front faces to the south-east of the Streamlands station buildings, an area of low hills north of Stony River and the slopes up to approximately 1100 m on the main ridge above Moffat Stream.

The front faces appear as northwest-facing hill country with a series of smooth flattened spurs and shallow dissected gullies. Immediately to the south of this landform is a steep gully, which drains southwest to Stony River (west of the main ridge above Moffat Stream). All parts of this unit are highly modified. Little indigenous cover remains apart from scattered shrubland and very scattered tussock. During the inspection (early spring), green grass extended midway up the slope.

The low hills are gently rolling and dissected and have been converted into pasture. Indigenous plant cover is mostly confined to gullies, watercourses and damp areas and includes patchy shrubland and modified wetlands on the valley floor. Small alluvial flats and low terraces occur adjacent to Haldon Road and Stony River.

Visual and Scenic Values

The Streamlands front faces and low hills are fairly typical of the hill country landscape in this part of the Mackenzie Basin. They are part of the wider landscape of and backdrop to the Mackenzie Basin but are not distinctive or memorable. The front faces are visible from Haldon Road and the low hills are visible from Haldon Road and Stony River Road. Stony River Road is a public road, which provides access to an attractive, memorable and remote backcountry landscape. It also has an historical association with the early pastoral runs in this area.

Evaluation Summary

Criteria	Value	Comment
Intactness	Low	Indigenous vegetation patterns have largely disappeared.
Legibility	Medium	Low vegetation cover reveals underlying landform patterns.
Aesthetic Factors	Low	Not distinctive or memorable.
Historic Factors	Low	Associated with early pastoralism.
Visibility	Medium	Visible at close range from Haldon and Stony River roads.
Significance	Low	
Vulnerability	Low	Already modified. Vulnerable to wilding tree spread and large scale forestry.

This unit is highly modified and contains no distinguishing features. There are no significant inherent landscape values.

Landscape Unit 4, Streamlands Back Tributaries

This unit comprises the lower reaches of Moffat and Balloon streams between Curraghmore and Stony Creek pastoral leases. This section of Moffat Stream (below 1100 m) has no large tributaries, whereas this section of Balloon Stream (below 1500 m) has several large tributaries.

Southeast-facing slopes above Moffat Stream are relatively gentle; northwest-facing slopes have extensive rock outcrops and an arid appearance. Vegetation is reasonably modified. Patterns include extensive shrublands associated with watercourses and rocky areas. Most of this part of the Moffat Stream catchment appears to have been over-sown and top-dressed. The ridge between Moffat and Balloon streams is dry and barren with extensive hawkweed and depleted short tussock.

The main Balloon Stream valley is narrow with rocky gorges especially in the streams mid sections. Vegetation is fairly modified below 1100 m especially on sunny faces. Above this snow-tussock is variable: continuous in some areas but noticeably depleted on dry sunny faces. Shrublands are present on lower slopes and valley floors. A stone musterer's hut is a significant historic structure beside Balloon Stream midway up the valley and is an important part of the cultural history of the area.

Below the stone hut, Balloon Stream is more open with a wider alluvial valley floor. The valley sides alternate between prominent rocky outcrops and ribs, and smooth grassy slopes. Shrubland associated with a talus slope is a feature on the northern side of the lower valley. Shrubland and tussock cover is generally depleted, although shrubland remains a significant feature on lower slopes and the valley floor and stills makes a significant contribution to the landscape character.

Visual and Scenic Values

The backcountry tributaries on Streamlands Pastoral Lease are not visually distinctive or highly memorable but do have considerable visual and scenic values as a scenic backcountry landscape. They form part of the montane landscape of the western side of the Grampian Mountains. The stream tributaries are an impressive landform feature. Vegetation patterns are modified and degraded in parts but the area remains a significant and coherent high country landscape.

Evaluation Summary

Criteria	Value	Comment
Intactness	Medium	Variable: intact above 1100 m; fragmented on lower sunny slopes and valley floors.
Legibility	High	Formative processes highly legible.
Aesthetic Factors	Medium	Visually coherent overall but degraded areas and some farm tracks detract.
Historic Factors	Medium	Associated with the back country and pastoral history of the area. Contains an historic stone musterer's hut.
Visibility	Low	
Significance	Medium	Part of the western slopes of the Grampian Mountains.
Vulnerability	Medium	Upper parts vulnerable to further modification.

Balloon Stream and its tributaries within Streamlands Pastoral Lease contain significant inherent landscape values. This area is contiguous with upper slopes within Landscape Unit 2 (Curraghmore back tributaries) and contains steep rugged slopes, extensive rock outcrops, bluffs and tussockland and shrubland communities.

Landscape Unit 5, Upper Stony River

This relatively small unit includes the south-facing slopes of the Grampian Mountains at the juncture of the Kirkliston Range. The unit faces south to the Hakataramea Valley and The Hunters Hills rather than to the Mackenzie Basin. It includes a large steep valley and side tributaries between 700 m and 1600 m in the headwaters of Stony River. The unit includes steep upper slopes and gentler toe slopes, fans and alluvial surfaces near the property boundary on the valley floor.

The higher slopes have a high degree of naturalness with scree, snow-tussock and other plant communities largely intact. Turpentine shrubland is prominent and forms dark brown patches within scree and tussockland. Below this upper zone, hawkweed is present but snow-tussock is more or less continuous to the valley floor. In landscape terms the whole of the unit is reasonably intact and coherent despite a degree of modification.

Visual and Scenic Values
This unit retains the appearance of a natural landscape. The slopes and vegetation patterns form a coherent landscape which is part of the Grampian Mountains and is a backdrop to the upper Hakataramea Valley. Apart from some modification of the vegetation and farm tracks there is no other sign of human induced change.

Evaluation Summary

Criteria	Value	Comment
Intactness	Medium	High on upper slopes; some impacts from pastoral use at lower altitudes.
Legibility	High	Formative processes highly legible.
Aesthetic Factors	Medium	Visually coherent. Minor disruption by access tracks and vegetation modification.
Historic Factors	Low	
Visibility	Low	Not highly visible.
Significance	Medium	
Vulnerability	Medium	Vulnerable to farm development that would further fragment vegetation patterns and natural character.

This unit forms a significant natural landscape. The varied landform types and relatively natural vegetation patterns from the Stony River headwaters to the ridge form an important part of the southern Grampian Mountains landscape.

Significance of Landscape Values

Higher-altitude slopes, ridges and valleys above approximately 1100 m on the western and southern flanks of the Grampian Mountains have significant inherent landscape values. The basins, ridges and steep upper slopes of the Grampian Mountains form intact landforms and support indigenous plant communities (rockland, scree, tussockland and herbfield) with high naturalness values. These higher-altitude parts of the property form a significant part of the mountain backdrop to the Mackenzie Basin. This area is one of the best remaining representative examples of a pre-human landscape.

The mid-sections of Moffat and Balloon streams, and the south-facing slopes in the upper Stony River catchment, also have significant inherent landscape values. The coherent landforms, absence of landform modification and the relatively natural indigenous plant communities (tussockland, shrubland and rockland) are representative of the pre-human landscape.

Insert Landscape map here

2.2 GEOLOGY, LANDFORMS AND SOILS

2.2.1 Geology

The basement rocks of the Grampian Mountains and Stony River area are Rakaia terrane rocks comprising schistose to non-schistose quartzofeldspathic sandstone (greywacke) and mudstone (argillite) of Triassic age (Forsyth, 2001). Minor areas of conglomerate and volcanic rock are present in the Rakaia terrane, though no substantial exposures were observed on the property. Rocky slopes and outcrops are frequently sculptured and smoothed by wind. Hill slopes are mostly mantled with deposits of loess (wind-deposited sediments). The valley floors along Haldon Road and Stony River are overlain with till and outwash gravel of the Tekapo and Mt John glacial formations (Gair, 1967). Recent alluvial deposits are present along lower-altitude streams. No significant faults are identified on the property.

2.2.2 Landforms

Curraghmore Pastoral Lease is dominated by the moderately-steep slopes of the Grampian Mountains. Streamlands Pastoral Lease covers gentler lower-altitude ridges and valleys on the lower southwest slopes of the range, in the Stony River catchment. The higher steeper mountain slopes are dissected by small valleys and studded with rock outcrops and bluffs. The summit of the Grampian Mountains lies between 1500 and 1900 m and is broad with extensive areas of exposed rock, boulderfield and stonefield influenced in places by earlier periglacial conditions. The main mid-altitude valleys (Moffat Stream and Balloon Stream) trend northeast-southwest, are relatively narrow and only moderately dissected. Lower slopes, in the western and southern parts of the property along Haldon Road and Stony River, are even-contoured and smoothed by a mantle of loess. The Grampian Mountains forms part of the eastern boundary of the Mackenzie Basin and is transitional in character between the mountain ranges of Canterbury and Otago.

2.2.3 Soils

Higher altitude parts of the property on the Grampian Mountains have Kaikoura steepland soils along the range summits and Omarama steepland soils on the upper southwest slopes. Mid-altitude slopes mostly have Tengawai hill soils and Dalgety shallow soils. The main outwash deposits have Acheron gravelly-sandy loams. Recent alluvium along rivers and streams has Tasman sandy loams.

Significance of Geology, Landforms and Soils

The Grampian Mountains form part of the eastern boundary of the Mackenzie Basin, separating the lower mountain ranges of coastal South Canterbury from the intermontane Mackenzie Basin. The dominance of the mountain ranges, the extensive moderately-dissected country on the lower southwest slopes, the presence of periglacial landforms on the range summit and wind-sculptured rock outcrops on montane slopes are notable features on the property. The mountain ranges are transitional in character between the mountain ranges of Canterbury and Otago. There are no geopreservation sites listed for the property.

2.3 CLIMATE

Curraghmore and Streamlands pastoral leases have a semi-arid mountain climate with cold winters and very warm dry summers. Predominant winds are from the northwest, with occasional gales. Snow can affect all parts of the property and lie at higher altitudes for several weeks in winter.

Average annual precipitation is between 600 and 800 mm (Tomlinson, 1976). The climate of the area is strongly influenced by the sheltering effects of the Southern Alps, resulting in drier conditions than occur in most of New Zealand's other mountain environments.

2.4 LAND ENVIRONMENTS OF NEW ZEALAND (LENZ)

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

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

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

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

Small areas of lower-altitude country on Curraghmore and Streamlands pastoral leases are classified as "much reduced" (acutely- or chronically-threatened) or "at risk" land environments. Two of these land environments have less than 1% of their total areas legally protected, and none have more than 4% protected. All remaining mid- and low-altitude parts of the property are classified as "at risk" or "critically under-protected" land environments, with less than 10% of their total areas legally protected. Higher-altitude parts of the property on the Grampian Mountains have no threat category.

Significance of Land Environments

On Curraghmore and Streamlands pastoral leases, small areas on the western property boundary along the Haldon Road are "acutely threatened". Gentle low-altitude areas at the southwest corner of the property near lower Stony River are "chronically threatened". Minor areas on lower slopes are

"at risk" and all other lower slopes (below approximately 1100 m) are "critically under-protected". Higher-altitude parts of the property on the Grampian Mountains have no threat category.

Insert LENZ Map here

2.5 VEGETATION

2.5.1 Ecological Context

Most parts of Curraghmore and Streamlands pastoral leases are in Grampians Ecological District (ED), with several small low altitude fans to the northwest in the Pukaki ED. Both districts are in Mackenzie Ecological Region. A small area at the eastern edge of the property lies in the Kirkliston ED which is in the Waitaki Ecological Region. Part of Recommended Area for Protection (RAP) Grampians 6 extends around Black Rocks on the Grampian Mountains, and represents alpine fellfield (Espie *et al*., 1984). The summit area includes the only known occurrence of *Celmisia ramulosa* in the Grampians ED and abundant *Aciphylla dobsonii* which is rare in the ED. RAP Grampians 7 is located in the headwaters of Stony River at the north end of the Kirkliston Range and represents the transition from snow-tussock to alpine fellfield. RAP Grampians 8 is located nearby, representing alpine fescue tussock and narrow-leaved snow-tussock. Lee (1996) observed that the RAPs were too small and did not fully represent the range of altitudes and aspects on the Grampian Mountains. Lee noted the significance of the periglacial geomorphology, dryland vegetation and wetland (flush) vegetation, and recommended protection of one larger area to improve representation of these features and the plant communities generally.

The vegetation pattern on the property is typical of that on the Grampian Mountains and Kirkliston Range. On these mountain ranges rockland communities are present on exposed alpine summits and ridges, and a cap of slim snow-tussock occurs at high altitude, especially on shady aspects. Narrow-leaved snow-tussock is common at mid-to upper-altitudes and short tussock at mid-to lower-altitudes, though both communities are depleted and are often sparse. Exotic herbfield and grassland is extensive at low altitude and extends to mid altitude on the northwest side of the property. Grey (matagouri-*Coprosma*) shrublands are associated with lower valleys, alluvial fans and terraces on the southeast side of the property; they are more restricted on the northwest side, where sweet brier is more noticeable. Wetlands are largely restricted to alpine and subalpine seepages, and modified sedgelands on valley floors and fans.

McGlone (2001) suggests that the pre-human vegetation of the intermontane basins of Central Otago and South Canterbury was mixed grassland and shrubland, dominated by non-*Chionochloa* grasses and small-leaved shrubs. Low scrub-forest was present on lower slopes with species such as mountain totara, mountain toatoa, bog pine, kowhai, *Coprosma*, *Myrsine* and *Dracophyllum* shrubs. Upslope, the scrub-forest gave way to snow totara and turpentine shrublands, with patches of narrow-leaved snow-tussock on rocky habitats. The alpine slopes and tops were dominated by slim snow-tussocklands. Prostrate kowhai, *Coprosma* and other small-leaved shrubs are present on the property and represent elements of the original woody vegetation.

2.5.2 Vegetation and Flora

Upper and mid slopes are dominated by tall tussockland, while rockland communities are associated with tors, bluffs, talus and screes. The tall tussockland gives way to modified short tussock grassland and exotic herbfield on mid to lower slopes, fans and terraces. Rockland communities are less common on lower slopes, except in valley gorges where rock outcrops are extensive. Grey shrubland is usually prominent on toe-slopes and in lower to mid gullies around rock outcrops and talus patches. Prostrate kowhai is common on sunny lower slopes at the northwest end of the property. Wetlands are largely restricted to small valley floor sedgelands and seepages in some mid to upper valleys. The vegetation is described more fully below for the four distinct parts of the property, (see Botanical Values map). Naturalness is rated using low, medium, and high.

Western Curraghmore Catchments

This area covers the hills at the northwest end of the property, including all the valleys on Curraghmore Pastoral Lease west of upper Moffat Stream. Fans are dominated by exotic grassland. Some areas adjacent to Haldon Road have been cultivated. Sunny hill slopes are dominated by exotic herbfield, sweet brier and shrubland containing prostrate kowhai. Shady slopes are grassier, while short tussock occurs on shady and sunny slopes. Shrubland is largely restricted to the valley floors and lower slopes. Snow-tussockland occurs in the upper southern valley of this area.

The fans adjacent to Haldon Road have a land environment (LENZ) threat category of acutely threatened, and all were visited. They mostly comprise cropping paddocks, direct-drilled paddocks and pine plantations. The threatened land environment on the west side of Haldon Road north of the Streamlands homestead is dominated by exotic grasses and clovers with a few scattered fescue-tussock, matagouri and pukio around a pond. Less modified fans are dominated by exotic grasses and herbs such as *Poa annua*, Kentucky bluegrass, mouse-ear hawkweed, haresfoot trefoil, white clover, suckling clover, *Myosotis discolor*, storksbill, *Veronica arvensis*, bromes, yarrow, Chewing's fescue and browntop. Patches of indigenous vegetation occur but its overall cover is always very low. A scattered population of *Carex muelleri* (threat status: sparse) is present along a fence on the west side of Haldon Road near the Curraghmore homestead. A holding paddock near a woolshed (just south of Curraghmore homestead) contains a few patches of *Leptinella serrulata* (gradual decline), wire moss, other mosses, *Carex breviculmis*, *Rytidosperma pumilum*?, and lichens. Upper fans support more indigenous plants, though they are strongly dominated by exotic grasses, herbs and sweet brier. Indigenous plants include scattered fescue tussock, matagouri, porcupine shrub, *Olearia odorata*, *Carmichaelia petriei*, native broom, *Carmichaelia vexillata* (serious decline) and *Acaena buchananii* (gradual decline). Low rock outcrops support *Geranium sessiliflorum*, *Raoulia parkii*, scabweed and scrub pohuehue. Gullies contain a patchy shrubland of matagouri, porcupine shrub, mingimingi, scrub pohuehue and sparse *Olearia odorata*. A 40-50 m patch of shrubland up to 3 m tall occurs near the southwest boundary of Curraghmore Pastoral Lease. Significant inherent values are present, but they are generally not part of functional indigenous ecosystems.

Most sunny slopes above Haldon Road support prostrate kowhai shrublands, particularly where low shattered bedrock is present. Bare ground and rock comprise a cover of 20-35% in these communities. The largest prostrate kowhai are up to 2.5 m high, but many plants are heavily browsed and few seedlings are present. Associated shrubs include porcupine shrub, mingimingi, native broom, scrub pohuehue, sweet brier, *Carmichaelia petriei* and occasional *Olearia odorata*. Indigenous shrub cover varies from 5-30%, while sweet brier is up to 20% at the north end, decreasing towards the south. The ground surface is dominated by exotics such as mouse-ear hawkweed (10-40%), *Veronica arvensis*, *Poa annua*, Kentucky bluegrass, bromes, haresfoot trefoil, sweet vernal, viper's bugloss, storksbill, woolly mullein, moth mullein, sheep's sorrel, *Aphanes arvensis*, Deptford pink and *Myosotis discolor*. Indigenous species include *Chondropsis semiviridis*, mosses, blue tussock, fescue tussock, silver tussock, scabweed, *Raoulia parkii*, *Poa maniototo*, orchids, *Geranium sessiliflorum*, blue wheatgrass and *Crassula sieberiana. Convolvulus verecundus* (sparse) and *Acaena buchananii* occur locally, with threatened *Leptinella serrulata (gradual decline)* and *Carex albula* (range restricted) rarely present. Rock fern is present on rubbly ground and one moribund *Olearia fimbriata* (serious decline) is present on these slopes. Shady aspects are grassier with abundant Chewing's fescue, mouse-ear hawkweed, scattered fescue tussock, mosses, *Raoulia subsericea*, *Coprosma petriei*, red woodrush, browntop, patotara, *Celmisia gracilenta*, *Carex breviculmis*, native violet, *Ranunculus multiscapus*, sweet vernal, sparse sweet brier and *Olearia odorata*. Gully shrublands are dominated by *Olearia odorata* and matagouri with mingimingi, sweet brier, porcupine shrub and occasionally tauhinu. Silver tussock and ribbons of pukio occur in some gullies. Naturalness is medium in the shrublands, but low-medium or less in other communities. Significant inherent values are present here. Sweet brier is the main woody weed on these slopes. Two large contorta pine trees are present with many saplings and seedlings around them. Broom is present at one location and an area of sprayed gorse is also present.

The critically threatened spring annual *Ceratocephala pungens* (nationally critical) is present at two localities. The northern location is within a prostrate kowhai community, while the southern location is on a fan above the deer paddocks near the airstrip. The sparse northern population is associated with depleted vegetation dominated by mosses, *Veronica arvensis*, viper's bugloss, *Aphanes arvensis*, *Chondropsis semiviridis*, Kentucky bluegrass, storksbill and woolly mullein. The southern population of around 100 plants occurs among similar vegetation with the addition of mouse-ear hawkweed and *Myosotis discolor*. Bare ground (around 30%), rabbit droppings and sheep dung are characteristic of both sites. These sites are very significant. During the main vegetation survey, many other suitable habitats were seen in this vicinity.

The vegetation of the northeast catchment in this area is depleted. It is dominated by mouse-ear hawkweed (around 40% cover). Other prominent species include fescue tussock, silver tussock, suckling clover, sweet vernal, browntop, sheep's sorrel, scabweed, blue tussock, patotara, Kentucky bluegrass and *Rytidosperma pumilum*. *Carex muelleri* is widespread on the western ridge top, and *Acaena buchananii* and threatened *Aciphylla subflabellata* (sparse) are also present in this catchment. Naturalness is low, and bare ground and rock sometimes comprise more than 50% of total cover. Narrow-leaved snow-tussock is restricted to a shady slope in the upper valley. Shrubland is confined to riparian margins and a few seepages, and supports *Olearia odorata*, matagouri, mingimingi, mountain wineberry, lawyer, *Parsonsia capsularis*, *Clematis marata* and native broom. Threatened *Coprosma intertexta* (sparse) occurs in the shrublands with broom, some of which has been sprayed. Prostrate kowhai occurs on rocky ridges in the lower valley.

The southern valley has narrow-leaved snow-tussock in its upper and middle reaches. Summit ridges support depleted slim snow-tussock and narrow-leaved snow-tussock, with common mouse-ear hawkweed, common *Carex muelleri* and localised *Acaena buchananii*. On upper west-facing slopes narrow-leaved snow-tussock has a cover of around 20%, while other species include mouse-ear hawkweed, *Lagenifera* sp., golden speargrass, red woodrush, *Epilobium glabellum*, fescue tussock, blue tussock, catsear and *Cardamine* aff. *bilobata* (data deficient). Talus patches and seepages occur in the upper valley and Maori onion is common on the valley floor. Talus patches near the stream support *Olearia odorata*, *Coprosma cheesemanii*, mingimingi, scrub pohuehue, porcupine shrub, *Blechnum penna-marina* and matagouri. On shady aspects, slim snow-tussock is present but narrow-leaved snow-tussock is dominant. Lower down the valley, snow-tussock persists on shady slopes but is replaced by fescue tussock on sunny aspects. A patchy grey shrubland extends from the valley floor to the ridge top on a north-facing slope. Significant inherent values are present in this valley.

Grampian Mountains and Kirkliston Range

This area covers the west-and south-facing catchments of the Grampian Mountains and Kirkliston Range. It supports extensive rockland communities on outcrops, talus and scree. Tall tussockland covers most remaining surfaces, slim snow-tussock being restricted to higher-altitude slopes while narrow-leaved snow-tussock is widespread. Shrublands include prostrate *Dracophyllum* on exposed upper ridges and tops, turpentine shrubland on mid shady slopes, and grey shrubland on valley floors and rocky slopes. Wetlands occur on valley floors and in upper basins where seepages are locally prominent.

Diverse cushion and mat communities derived from slim snow-tussockland occur on exposed mountain tops. They are dominated by lichens, *Phyllachne colensoi*, blue tussock, *Raoulia hectorii*, *Kelleria dieffenbachii*, *Dracophyllum muscoides* and slim snow-tussock. Other species include *Raoulia grandiflora, Luzula pumila, L. banksiana* var. *rhadina*?, *Leptinella pectinata* ssp. *villosus, Rytidosperma pumilum*, vegetable sheep, *Colobanthus acicularis*, *C. buchananii*, *C. strictus*, threatened *Aciphylla montana* var. *gracilis* (range restricted), *Carmichaelia monroi, Dracophyllum pronum, Ranunculus enysii, Celmisia sessiliflora, C. angustifolia, C. laricifolia, C. gracilenta, Anisotome imbricata, Stellaria gracilenta, Brachyglottis bellidioides*, red woodrush and *Chionohebe pulvinaris.* Mouse-ear hawkweed, king devil and sheep's sorrel are uncommon except near vehicle tracks. Minor development of solifluction lobes (gradual movement of wet soil down slope) occurs

on gentle west-facing slopes. Lower exposed ridges on the Kirkliston Range support mixed slim snow-tussock and narrow-leaved snow-tussock and similar cushion or mat species. *Carex muelleri* is abundant and *Carmichaelia vexillata* (serious decline) is present. One plant of *Myosotis pygmaea* var. *glauca* (nationally endangered) was seen. Overall naturalness is medium/high or high in these communities and significant inherent values are present.

Slim snow-tussockland occurs on shady slopes down to about 1260 m. Tussock cover varies from 20 to 50%. Other prominent species are blue tussock, fescue tussock, lichens, mosses, *Raoulia grandiflora* and mouse-ear hawkweed. Additional species include golden speargrass, *Aciphylla montana* var *gracilis*, wire moss, mountain clubmoss, *Rytidosperma pumilum*, *Ranunculus gracilipes*, *Lobelia linnaeoides*, *Stellaria gracilenta*, *Blechnum penna-marina*, red woodrush, *Celmisia angustifolia*, snowberry, everlasting daisy, *Epilobium glabellum*, *Brachyscome sinclairii* and hybrid narrow-leaved snow-tussock. Where there are few exotic plants and limited grazing impacts by sheep, wallabies and hares, naturalness is medium/high. Accessible sites close to tracks and spurs are more modified, with more hawkweed, sheep's sorrel and browsed tussocks. In these situations naturalness is medium. With decreasing altitude, narrow-leaved snow-tussock usually replaces slim snow-tussock on shady slopes below 1350 m. Snow-tussock cover varies from 30 to 50%. Other prominent plants are fescue tussock, blue tussock, bog rush, golden speargrass, *Celmisia angustifolia* and mouse-ear hawkweed. Additional species include *Raoulia subsericea*, *Pimelea oreophila*, mosses, turpentine shrub, *Carex breviculmis*, *Brachyscome radicata*, *Ranunculus gracilipes*, *R. multiscapus*, *Anisotome aromatica*, *A. flexuosa*, sweet vernal, native violet, snowberry, red woodrush, false speargrass, *Celmisia gracilenta*, *Rytidosperma pumilum*, *Carex muelleri*, sheep's sorrel, king devil and dandelion. Naturalness is medium to medium/high. In the southern corner of this area, the snow-tussock extends onto fans, with red tussock occurring on the valley floor. Significant inherent values are associated with all these communities.

On sunny gravelly slopes the snow-tussock cover is sparser and golden speargrass, fescue tussock and blue tussock are prominent. The range of species is similar to those mentioned previously but with additional species such as blue wheatgrass, *Scleranthus uniflorus*, scabweed, catsear, *Coprosma petriei*, *Epilobium glabellum*, *Euchiton luteo-album*, *Acaena caesiiglauca*, *Geranium sessiliflorum* and creeping pohuehue. Naturalness is medium. The threatened *Ischnocarpus novae-zelandiae* (gradual decline) is present at one location in the Moffat Stream headwaters. In the lower western part of the larger area, snow-tussock cover is reduced to 15 to 25%. Exotic plants are more prominent, especially mouse-ear hawkweed and sometimes king devil. Species diversity is less and naturalness is low/medium or medium.

Lower slopes are characterised by fescue tussock, with a cover of up to 20% on shady slopes and less than 10% on sunny slopes. Other prominent species are mouse-ear hawkweed, blue tussock, patotara, sheep's sorrel, sweet vernal, king devil and browntop. Additional species include *Poa lindsayi*, *Geranium sessiliflorum*, *Pimelea oreophila*, *Carex breviculmis*, *Oxalis exilis*, *Dichondra repens* agg., *Raoulia parkii*, *R. subsericea*, blue wheatgrass, red woodrush, *Scleranthus uniflorus*, the threatened *Carmichaelia vexillata* (serious decline), *C. monroi*, *Celmisia gracilenta*, viper's bugloss and *Acaena caesiiglauca*. Naturalness is low/medium or medium. Fescue tussock also occurs on lower ridges with exotic herbs and grasses, *Carex muelleri* (sparse) and patches of *Acaena buchananii* (gradual decline). *Leptinella serrulata* was found on an upper ridge between Moffat and Ballon valleys. Significant inherent values are restricted to threatened plants.

Rock outcrops are common on upper slopes and support plants such as lichens, blue tussock, *Colobanthus acicularis*, *Koeleria cheesemanii*, *Hebe cheesemanii*, *H. pinguifolia*, edelweiss, bristle tussock, mosses, *Cardamine* aff. *Bilobata* (data deficient), *Blechnum penna-marina*, mouse-ear hawkweed, *Pimelea oreophila*, everlasting daisy, *Helichrysum intermedium*, *Coprosma* aff. *pseudocuneata*, *C. cheesemanii*, threatened coral broom (gradual decline), *Leptinella pectinata* and *Cystopteris tasmanica*. Naturalness is high. At mid altitudes, rock outcrops support plants such as mingimingi, golden speargrass, matagouri, *Olearia odorata*, *Asplenium hookerianum*, *Pellaea calidirupium*, necklace fern, blue tussock, bristle tussock, *Craspedia lanata* and *Hebe buchananii*.

Mid altitude talus patches are covered with lichens and woolly moss, while other plants include scrub pohuehue, blue tussock, *Coprosma cheesemanii*, *Olearia odorata*, porcupine shrub, *Brachyglottis cassinioides*, golden speargrass, giant speargrass, fescue tussock, snow-tussock, prickly shield fern and *Blechnum penna-marina*. Naturalness in these habitats is medium/high or high. The gorge and bluffs of the upper Stony River catchment at the south end of the area support giant speargrass, *Olearia odorata*, *O. bullata*, mingimingi, matagouri, *Coprosma intertexta*, *C.* aff. *pseudocuneata, C. cheesemanii, C. dumosa*, broad-leaved snow tussock, *Carmichaelia vexillata*, coral broom, *Brachyscome longiscapa*, native broom and porcupine shrub. Significant inherent values are associated with all these habitats.

Small screes extend though the tall tussocklands, especially on sunny aspects. They support low numbers of plants such as *Ranunculus haastii, R. crithmifolius, Epilobium porphyrium, Leptinella atrata, Schizeilema hydrocotyloides* and sheep's sorrel. *Ranunculus crithmifolius* also occurs in small erosion slumps, sometimes with the tiny grass *Agrostis muscosa*. *Celmisia ramulosa* (uncommon in the ED) was seen on talus in the headwaters of Balloon Stream. Naturalness in these habitats is medium/high or high. Significant inherent values are present.

Extensive shrublands occur in the middle reaches of Balloon Stream. On rocky northwest slopes they contain sparse prostrate kowhai, mingimingi, matagouri, *Coprosma virescens*, porcupine shrub, coral broom and *Olearia odorata* to two metres tall. White fuzzweed (*Vittadinia australis agg*.) which is classified data deficient was found on a sunny rock ridge in the mid Balloon valley. *Einadia allanii* was also found in a similar location. In the gorge and tributary gullies the shrublands are up to three metres high and contain mingimingi, matagouri, *Olearia odorata*, mountain wineberry, *Carmichaelia petriei*, native broom, golden speargrass, giant speargrass, bracken, *Hebe subalpina, H. rakaiensis*, scrub pohuehue, lawyer, native jasmine, *Helichrysum intermedium* on bluffs and narrow-leaved snow-tussock. The naturalness of these shrublands is medium/high or high. One exotic broom bush is present in the southern-most tributary to the east. Some shrublands contain low numbers of sweet brier. The Moffat Stream shrublands are concentrated on the eastern side, extending up tributaries, concave slopes, bluffs and around talus. They contain mingimingi, matagouri, *Olearia odorata*, porcupine shrub, mountain wineberry, scrub pohuehue, lawyer and *Clematis marata*. An upper tributary on the east just above the Streamlands Pastoral Lease boundary supports a similar shrubland containing *Coprosma intertexta* and has high naturalness values. All these shrublands have significant inherent values.

Shrublands of *Brachyglottis cassinioides* and turpentine shrub occur in mid to upper eastern headwater tributaries of Moffat Stream on rocky slopes and talus in narrow-leaved snow-tussockland. The community is dominated by these shrubs and narrow-leaved snow-tussock, with common fescue tussock, blue tussock, *Blechnum penna-marina* and mouse-ear hawkweed. Other species include snowberry, *Anisotome aromatica*, *Carex breviculmis*, red woodrush, mosses, *Coprosma cheesemanii*, *Ourisia caespitosa* and king devil. Naturalness is medium/high, despite wallaby and hare browsing. *Dracophyllum pronum* shrubland is widespread on upper shady slopes while turpentine shrubland often occurs on mid to lower shady slopes, and around rock outcrops. These communities are dominated by snow-tussock, with turpentine shrubs having less than 25% cover. Other plants include snowberry, *Gaultheria crassa*, false speargrass, mouse-ear hawkweed, *Pimelea oreophila*, blue tussock, golden speargrass, *Raoulia subsericea*, red woodrush, sheep's sorrel, *Dracophyllum pronum*, king devil, *Celmisia angustifolia*, lichens, mountain club moss and wire moss. Naturalness is medium/high, and significant inherent values are present.

Upper valley seepages contain *Psychrophila novae-zelandiae*, mosses, liverworts, bog rush, *Euchiton mackayi*, *Ourisia caespitosa*, dandelion, threatened *Ranunculus maculatus* (sparse), *R. gracilipes, Colobanthus apetalus*, blue tussock, *Juncus novae-zelandiae, Anisotome aromatica* and *Epilobium komarovianum*. There are few weeds and naturalness is medium/high to high. The largest seepages occur in the southeast headwater basin of Balloon Stream. A small number of valley floor flushes occur in the upper western Moffat Stream catchment. They are dominated by mosses and bog rush; additional species are liverworts, *Geranium microphyllum* (data deficient), *Ranunculus*

maculatus, native violet, *Anisotome aromatica*, *Hydrocotyle tripartita*, *H. novae-zeelandiae*, white clover, fescue tussock, purging flax and mouse-ear hawkweed. Naturalness is medium/high. Sphagnum moss occurs in a small streamside seepage at the entrance to the upper Stony River tributary. Other seepages of bog rush, rautahi and Maori onion occur downstream along Stony River among snow-tussock, patches of fescue tussock and silver tussock. Significant inherent values are associated with all these wetlands.

Stream margins in general support plants such as bog rush, mosses, *Geranium microphyllum, Carex petriei, Psychrophila novae-zelandiae, Ranunculus maculatus*, everlasting daisy, *Acaena inermis, A. saccaticupula, Epilobium komarovianum, Hydrocotyle novae-zeelandiae, Stellaria gracilenta, Oreomyrrhis ramosa*, Maori onion, giant speargrass, golden speargrass, purging flax, silver tussock, snow-tussock and fescue tussock. Plants on stony terraces include silver tussock, *Epilobium melanocaulon*, everlasting daisy, *Acaena inermis, Blechnum penna-marina*, white clover, *Geranium sessiliflorum* and browntop.

Lower Moffat and Balloon Stream Valleys

This area covers Moffat and Balloon valleys primarily below the Curraghmore/Streamlands pastoral lease boundary. It does not include the tributaries of Balloon Stream which have been covered in the Grampian Mountains and Kirkliston Range section. These lower valleys are characterised by depleted vegetation dominated by exotic grasses and herbs. The main floodplains retain good-stature matagouri shrubland and small areas of sedgeland, while grey shrubland occurs in side valleys, around talus and rock outcrops. Dry rock outcrops provide habitat for a distinctive fern flora. An alluvial terrace at the entrance to Balloon valley supports remnant short tussock grassland.

North and western slopes are characterised by much bare ground and mouse-ear hawkweed with a cover up to 40%. Other species include scabweed, *Scleranthus uniflorus*, blue tussock, viper's bugloss, creeping pohuehue, storksbill, *Geranium sessiliflorum*, woolly mullein, haresfoot trefoil, Kentucky blue grass, king devil, *Coprosma petriei*, sheep's sorrel, *Poa lindsayi*, porcupine shrub, harebell, *Pimelea pulvinaris* and sparse fescue tussock. Naturalness is low. On southern and eastern slopes the vegetation is dominated by mouse-ear hawkweed, browntop, sweet vernal and sometimes sheep's sorrel. Fescue tussock has a cover of 5 to 10% with blue tussock up to 5%. Some slopes appear to have been over-sown and top-dressed, and naturalness is low/medium. Gently-sloping tops are dominated by mouse-ear hawkweed Other species include *Poa annua*, *Veronica arvensis*, *Myosotis discolor*, haresfoot trefoil, sheep's sorrel, blue tussock, *Poa maniototo*, fescue tussock and soft brome. Occasional mingimingi, matagouri and *Olearia odorata* are present and naturalness is low. With increasing altitude, fescue tussock becomes prominent by about 1000 m.

Depleted short tussock grassland occurs on a stony alluvial terrace at the entrance to Balloon Stream valley. It is dominated by mouse-ear hawkweed and Chewing's fescue, with prominent blue tussock, *Poa maniototo*, sheep's sorrel, mosses, *Poa annua* and *Chondropsis semiviridis*. Additional plants include *Poa lindsayi*, creeping pohuehue, fescue tussock, scabweed, *Raoulia parkii*, blue wheatgrass, *Convolvulus verecundus, Carmichaelia vexillata*, matagouri, exotic grasses and herbs and a few broom plants. A wetland thread at the eastern end is nourished by a seepage from the terrace riser above. Overall naturalness is low/medium to medium, and significant inherent values are present.

Open shrubland occurs in gullies and on rocky lower slopes. It is comprised of *Olearia odorata*, matagouri, mingimingi, porcupine shrub, scrub pohuehue, *Carmichaelia petriei* and *Clematis marata*. Occasional *Coprosma intertexta* (sparse) occurs in some gullies. Some sunny slopes in lower Moffat valley support *Coprosma virescens*, mountain wineberry, native jasmine and occasional prostrate kowhai. Nearby rock outcrops are occupied by prostrate kowhai, mingimingi, *Olearia odorata*, porcupine shrub, scrub pohuehue and coral broom. Other species include *Coprosma petriei, Carex breviculmis*, mouse-ear hawkweed, sheep's sorrel, blue tussock, blue wheatgrass, woolly mullein, *Brachyglottis haastii*, scabweed, tall oat grass, *Senecio quadridentatus, Stellaria gracilenta, Thelymitra longifolia, Scleranthus uniflorus, Dichondra brevifolia, Luzula*

banksiana var. *rhadina*, *Crassula sieberiana*, threatened *Anogramma leptophylla* (gradual decline), *Pleurosorus rutifolius* (sparse), *Pellaea calidirupium, Cheilanthes sieberi* and necklace fern. The rock outcrop communities are of medium/high naturalness and significant inherent values are present.

Patchy shrublands up to 2.5 m tall occur on the main floodplains. They contain matagouri, *Olearia odorata*, mingimingi, lawyer, scrub pohuehue, and less commonly porcupine shrub, native broom, *Carmichaelia petriei*, mountain wineberry and *Clematis marata*. The ground surface is dominated by exotic herbs and grasses, and naturalness is low/medium. In lower Balloon valley denser shrublands containing gooseberry occupy talus on shady slopes above the floodplain, while Russell lupin, uncommon broom and poplar are present on the floodplain. Gooseberry also occurs in shrublands in lower Moffat valley.

Stony low terraces in the middle reaches of Balloon Valley are moderately weedy and support species such as *Epilobium melanocaulon*, fescue tussock, *Acaena inermis*, matagouri, silver tussock, *Carex kaloides*, rautahi, matagouri, mouse-ear hawkweed, white clover, viper's bugloss and exotic grasses. Low numbers of several willow species are present, and naturalness is low/medium to medium.

Small pukio wetlands occur on the floodplains of Moffat and Balloon streams. Exotic grasses are widespread in these wetlands. Other species are white clover, *Carex kaloides*, *C. buchananii*, rautahi, soft rush, silver tussock, Maori onion and bog rush. Naturalness is low/medium. A small wetland thread on a terrace at the entrance to Balloon valley is dominated by pukio. Other species present are *Carex virgata*, *C. kaloides*, *C. diandra*, *C. buchananii*, rautahi, Maori onion, *Ranunculus amphitrichus*, *R. acris*, exotic grasses, soft rush, white clover, yarrow and Californian thistle. Naturalness is low/medium to medium, reflecting the abundance of exotics and cattle trampling. A similar wetland borders the terrace and Stony River Road, though it is wetter. It is dominated by rautahi, *Ranunculus acris* and exotic grasses, with some pukio. Additional species include *Carex gaudichaudiana*, *Eleocharis acuta*, *Montia fontana*, *Azolla filiculoides*, Russell lupin, crack willow, broom, *Ranunculus repens* and monkey musk. Naturalness is low/medium to medium. Significant inherent values are associated with these wetlands, despite their modified condition.

Western Streamlands Catchments

This area covers the hills at the south west end of the property including the valleys on Streamlands pastoral lease west of lower Moffat Stream. Gentle hill slopes and fans in this area are characterised by exotic herbfield and grassland, which contain remnant but degraded indigenous communities. They include patches of grey shrubland on sunny slopes, valley floor matagouri shrubland and small sedge wetlands.

Acutely threatened land environments (LENZ) in this area are mostly low altitude alluvial fans and terraces and all were visited. The northern-most LENZ is dominated by exotic grasses and herbs and has been over-sown and top-dressed, though occasional matagouri remains. A hay paddock and a sprayed paddock occur alongside Haldon Road, also with occasional matagouri and scattered fescue tussock. Sparsely scattered silver tussock and matagouri occur in a paddock adjacent to the homestead. This paddock also supports a ribbon of pukio associated with a spring. The wetland is dominated by exotic grasses and clovers. Other species are *Carex diandra*, soft rush, curled dock and silver tussock. A nearby duck pond has a margin of pukio, with moderately dense rautahi extending into the adjacent paddock.

South of the Streamlands homestead a threatened land environment supports farm buildings, tree plantings and grassland dominated by haresfoot trefoil, Kentucky bluegrass, *Poa annua*, yarrow, ryegrass, white clover, suckling clover and cocksfoot. There are also occasional porcupine shrub, native broom, matagouri (up to 20 plants, the tallest are approximately three metres) and fescue tussock. Immediately south of a small block of Grays Hill freehold, a creek channel and adjacent fan

comprise another threatened land environment. The vegetation is dominated by exotic grasses and herbs, except for a few fescue tussocks and patches of tall matagouri 1.5 to 2.5 m tall. Gooseberry and one *Aciphylla subflabellata* (sparse) are present. Mature willows occupy the dry creek bed. The remaining two threatened land environments are dominated by exotic grasses and herbs. The first also supports scattered fescue tussock, blue tussock, occasional native broom, porcupine shrub and scrub pohuehue on exposed knolls, and a small patch of *Acaena buchananii*. (gradual decline). The southern-most one occurs on a small fan at the junction of two streams and supports sparse fescue tussock (< 1%). Significant inherent values are associated with some of these threatened land environments, but they are not part of functional indigenous ecosystems.

The vegetation on the gently rolling fans and hills south of Stony River Road is depleted. Among shattered low bedrock, prominent plants are mouse-ear hawkweed, lichens, Kentucky bluegrass, *Veronica arvensis*, *Veronica verna*, *Stellaria gracilenta*, *Raoulia parkii*, scabweed, blue tussock, patotara, *Convolvulus verecundus*, haresfoot trefoil, sheep's sorrel, creeping pohuehue and woolly mullein. Adjacent fans are dominated by similar exotic species with the addition of *Myosotis discolor*, yarrow, dandelion, Californian thistle, viper's bugloss, browntop and curled dock. Patches of silver tussock and fescue tussock also occur, with the occasional patch of *Acaena buchananii.* (gradual decline). One plant of the threatened orchid *Hymenochilus tanypodus* (sparse) was seen here. Sweet brier is sparsely scattered across these surfaces, with more on rubbly hill slopes nearby. The meandering depressions would formerly have supported seepages, as indicated by the presence of *Carex kaloides* and *Carex buchananii*. Northwest of the road the vegetation is similar, but on moist slopes Chewing's fescue, white clover and suckling clover are dominant, with scattered vigorous fescue tussock. Browntop and cocksfoot are locally abundant in some areas. Dry ridges and knolls have similar weedy communities to the dry areas above, but with the addition of downy brome and *Poa maniototo*. The naturalness of all these communities is low.

Gentle west-facing lower slopes are characterised by depleted exotic herbfield and grassland. Rolling lower ridgetops are dominated by *Veronica arvensis*, mouse-ear hawkweed, and exotic grasses, with *Poa maniototo*, blue tussock, suckling clover, haresfoot trefoil and *Poa annua*. Sunny slopes have up to 30% bare soil with scattered rocks and are dominated by mouse-ear hawkweed. Additional species include *Chondropsis semiviridis*, scattered fescue tussock, blue tussock, scabweed, *Raoulia parkii*, harebell, *Geranium sessiliflorum,* blue wheatgrass, *Erophila verna*, *Veronica arvensis*, *Myosotis discolor*, sheep's sorrel, *Poa annua*, Kentucky bluegrass, browntop, sweet vernal and patotara. Naturalness is low. A few rocky slopes support heavily browsed prostrate kowhai among hawkweed-dominated vegetation, with browsed porcupine shrub, *Olearia odorata* and matagouri. Shady slopes support exotic grasslands dominated by browntop, sweet vernal and mouse-ear hawkweed, with scattered shrubs. Fescue tussock cover is around 5%, and other species include mosses, golden speargrass, *Olearia odorata*, matagouri, mingimingi, blue tussock, sheep's sorrel, mouse-ear chickweed, white clover, *Pimelea oreophila* and patotara. Naturalness is low to low/medium.

The vegetation on higher and steeper northwest-facing slopes above the main un-named stream is depleted. It is dominated by mouse-ear hawkweed and haresfoot trefoil. Other species include *Poa maniototo*, sheep's sorrel, scabweed, *Acaena buchananii*, *Raoulia parkii*, browntop, *Chondropsis semiviridis*, fescue tussock, blue tussock, patotara and *Carmichaelia petriei*. Naturalness is low. Rocky spurs support sparse shrubland, with prostrate kowhai occurring on one southern spur. Other species include matagouri, porcupine shrub, mingimingi, scrub pohuehue, coral broom (gradual decline) and a grove of *Coprosma virescens*. Dryland herbs, grasses and ferns occur on the spur, including *Convolvulus verecundus* and rock fern. Naturalness is medium. Another patch of *Coprosma virescens* was seen further northeast on talus with bracken, matagouri, mingimingi and scrub pohuehue; the shrubland extends into an adjacent gully with *Olearia odorata*. Significant inherent values are associated with the southern shrubland.

Patchy shrublands up to 2.5 m tall occur in the main stream valley floor and on adjacent shady slopes. They contain matagouri, *Olearia odorata*, mingimingi and native broom, the ground surface

being dominated by exotic grasses. Naturalness is low/medium. The best shrubland occurs around a blocky talus on a shady slope above the stream. It is dominated by mingimingi and matagouri, with porcupine shrub, *Olearia odorata*, scrub pohuehue, lawyer and native jasmine, occasional native broom and golden speargrass. Lichens and mosses are abundant on rocks, with blue tussock, fescue tussock and exotic grasses. Naturalness is medium/high. Significant inherent values are present along the whole valley floor.

Wetlands are restricted to parts of the main valley floor, and are dominated by pukio, exotic grasses and white clover. Other species include *Carex kaloides*, *C. buchananii*, rautahi, *Ranunculus repens*, curled dock, *Rumex obtusifolius*, silver tussock, Maori onion, *Eleocharis acuta*, soft rush and *Potentilla anserinoides*. Naturalness is low/medium and significant inherent values are present.

Notable Flora

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

Table 1 Notable plant species, Curraghmore and Streamlands pastoral leases.

Plant species	Threat status	Distribution on property
Acaena buchananii	Gradual decline	Scattered across property, mostly at low to mid-altitude.
Aciphylla montana var. *gracilis*	Range restricted	Irregularly scattered across the Grampian Mountains.
Aciphylla subflabellata	Sparse	Northern-most catchment next to The Grampians Pastoral Lease; fan in western streamlands.
Anogramma leptophylla	Gradual decline	Bluffs above lower Moffat Stream.
Cardamine aff. *bilobata*	Data deficient	Rock outcrops in upper valley of Grampian Mountains.
Carex albula	Range restricted	North end of lower altitude western slopes above Haldon Road.
Carex muelleri	Sparse	Widespread and often abundant across property, especially the Grampian Mountains.
Carmichaelia crassicaule (coral broom)	Gradual decline	Scattered across property, mostly on rubbly sunny slopes, rock outcrops and in stream gorges.
Carmichaelia vexillata	Serious decline	Scattered across property, mostly on sunny slopes, rock outcrops, ridges, terraces and fans.
Celmisia ramulosa	Uncommon in ED	Headwaters of Balloon Stream on talus.
Ceratocephala pungens	Nationally critical	Lower altitude western slopes and fans above Haldon Road.
Convolvulus verecundus	Sparse	Mostly lower-altitude sites on slopes above Haldon Road and adjacent to lower Stony River.
Coprosma intertexta	Sparse	Upper Stony River catchment; stream gully in northern-most catchment next to The Grampians Pastoral Lease; two tributaries in lower and mid Moffat valley.
Einadia allanii	Uncommon in eastern Canterbury	Sunny rocky ridge, mid Balloon valley; sunny slope of tributary in lower Moffat valley.
Geranium microphyllum	Data deficient	Wetlands, streamsides and tall tussockland on the Grampian Mountains.
Hymenochilus tanypodus	Sparse	Fan west of Stony River Road.
Ischnocarpus novae-zelandiae	Gradual decline	Moffat Stream headwaters.

Leptinella serrulata	Gradual decline	Holding paddock near Curraghmore homestead; north end of lower western slopes above Haldon Road; upper ridge between Moffat and Balloon valleys.
Myosotis pygmaea var. *glauca*	Nationally endangered	Side spur off Kirkliston Range summit.
Olearia fimbriata	Serious decline	Stream gully on lower altitude western slopes above Haldon Road.
Pleurosorus rutifolius	Sparse	Bluffs above lower Moffat Stream.
Ranunculus maculatus	Sparse	Seepages in Upper Western Moffat Stream catchment.
Sophora prostrata (prostrate kowhai)	Regionally uncommon original shrub	Lower sunny spurs and slopes on western side of property; smaller populations in similar habitat in lower and mid Moffat and Balloon valleys.
Sphagnum cristatum (sphagnum moss)	Uncommon in eastern Canterbury	Seepage at valley entrance to headwaters of Stony River.
Vittadinia australis agg. (white fuzzweed)	Data deficient	Sunny rocky ridge in mid Balloon valley.

Significance of Vegetation and Flora

The western Curraghmore catchments support significant prostrate kowhai shrublands on sunny slopes, which are representative of original woody communities. The upper southern catchment on the western faces of Curraghmore pastoral lease contains the only substantial tall tussocklands in this area, and they are in reasonable condition. Threatened plants found in the area include *Ceratocephala pungens, Carmichaelia vexillata, Olearia fimbriata, Acaena buchananii, Leptinella serrulata, Aciphylla subflabellata, Carex muelleri, Convolvulus verecundus, Coprosma intertexta* and *Carex albula*. Acutely threatened land environments are highly modified, but some on toe slopes and fans support indigenous communities typical of lower slopes.

The Grampian Mountains and Kirkliston Range are significant as they support the greatest diversity of communities on the property, which are generally in good to very good condition. Original rockland communities occur on rock outcrops, screes and talus. Exposed summit ridges support diverse cushion and mat communities, partly induced from slim snow-tussocklands. Slim snow-tussocklands represent an original community type and are restricted to higher slopes and ridges. Narrow-leaved snow-tussockland is very extensive, though many are induced by burning. Shrublands representative of original woody communities include *Dracophyllum* shrublands on shady slopes (sometimes with *Brachyglottis cassinioides*) and small-leaved shrublands in lower catchments, where rock outcrops and gorges are prominent. Wetlands are largely restricted to upper basin seepages. Threatened plants found in this area include *Myosotis pygmaea* var. *glauca, Carmichaelia vexillata, Acaena buchananii,* coral broom, *Ischnocarpus novae-zelandiae, Leptinella serrulata, Carex muelleri, Coprosma intertexta, Ranunculus maculates, Aciphylla montana* var. *gracilis, Geranium microphyllum, Vittadinia australis agg and Cardamine* aff. *bilobata. Celmisia ramulosa* (uncommon in the E D) is also present. *Einadia allanii* and *Sphagnum cristatum* were seen and are uncommon in eastern Canterbury.

In lower Moffat and Balloon valleys, rock outcrops and bluffs on sunny slopes support a significant dryland fern flora and associated grey shrublands containing prostrate kowhai. Both are representative of original communities. The valley floors contain elements of original shrublands and wetlands. A river terrace at the entrance to Balloon Stream valley supports the best low altitude short tussock grassland seen on this landform on the property. Threatened plants in this area include *Carmichaelia vexillata, Anogramma leptophylla,* coral broom, *Convolvulus verecundus, Coprosma intertexta* and *Pleurosorus rutifolius. Einadia allanii* (uncommon in eastern Canterbury) is also present.

Significant values in the western Streamlands catchments are associated with the major eastern stream valley, but they are limited in extent. They include patchy valley-floor shrublands, shrubland containing prostrate kowhai on sunny rocky slopes and another around talus on a shady slope. The valley floor also supports remnant wetlands. Acutely threatened land environments are highly modified but some contain tiny wetlands and patches of tall matagouri. Threatened plants found in the area include *Acaena buchananii,* coral broom, *Aciphylla subflabellata*, *Convolvulus verecundus* and *Hymenochilus tanypodus.*

Insert botanical map here

2.5.3 Problem Plants

The main problem plant on the property is sweet brier. It is widespread in the western Curraghmore catchments, with its density decreasing to the southwest in the western Streamlands catchments. It is sparse in the lower Balloon and Moffat valleys. In all these localities it is prominent on degraded sunny slopes and rock outcrops, and is scattered through valley floor and gully shrublands. It is unlikely to become a problem over other parts of the property, though it could spread further in valuable prostrate kowhai habitat. Small infestations of broom are present at lower altitudes and pose a considerable threat.

Crack willow is common on the floodplain of lower Balloon Stream. A few small crack willow plants and one other willow species are present above the gorge. Small willow trees are present in the river terrace wetland at the entrance to Balloon valley. Occasional willow trees are present along streams in western parts of the property. A few poplars occur in lower Balloon Stream, and Russell lupin is common on the lower floodplain, extending onto the terrace to the north. Several male fern were seen in the middle to upper reaches of Balloon Stream above the gorge.

A few wilding conifers are present on the ridge between Moffat and Balloon streams near the boundary between Curraghmore and Streamlands, and in the northeast headwaters of Stony River. There is a threat of wilding pine spread from adjacent properties to the north and the south.

2.6 FAUNA

2.6.1 Bats

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

2.6.2 Birds and Lizards

There is virtually no forest present in the Grampians and Pukaki EDs and none recorded on Curraghmore and Streamlands pastoral leases (McEwen, 1987). The bird fauna is therefore characterized by species of open habitats. Australasian harrier, grey warbler, New Zealand pipit, paradise shelduck, silvereye and southern black-backed gull are widespread in the area, and were recorded nearby on The Grampians Pastoral Lease (Sedgeley, 2006). Threatened bird species recorded on that property were banded dotterel (threat status: gradual decline), black shag (sparse) and New Zealand falcon (gradual decline).

The Department of Conservation's Herpetofauna Database contains just one lizard record from the property: a common skink or McCann's skink found near Moffat Stream. Threatened lizard species recorded in the vicinity of the property include jewelled gecko (gradual decline), long-toed skink (sparse), scree skink (gradual decline) and spotted skink (gradual decline). The nearest known localities for these species are Hakataramea Pass (jewelled gecko), Tekapo River (long-toed skink), Edwards Stream near Lake Tekapo (scree skink) and the upper Tekapo River (spotted skink). Spotted skink has also been recorded on Simons Pass Pastoral Lease (N. Head, Department of Conservation, *pers. comm.*). The more common lizard species, common skink, McCann's skink and Southern Alps gecko, are widespread and abundant in the Mackenzie Ecological Region, and have been recorded from The Grampians Pastoral Lease (Sedgeley, 2006).

Bird and lizard species observed on Curraghmore and Streamlands pastoral leases are described for five geographic areas of the property.

Western Curraghmore Catchments

This area extends east of Haldon Road to the northwest ridge of the upper Moffat Stream catchment. These catchments include low-to mid-altitude slopes supporting depleted natural vegetation. Scattered rock outcrops and limited areas of indigenous shrubland are also present. Sweet brier is common on some slopes.

Indigenous birds recorded from this area were Australasian harrier, paradise shelduck, spur-winged plover, South Island pied oystercatcher and southern black-backed gull. Naturalised birds observed were blackbird, chaffinch, dunnock, goldfinch, greenfinch, house sparrow, Australian magpie, skylark, starling, song thrush, redpoll and yellowhammer.

Lizard species found in this area were common skink (two sightings), McCann's skink (five sightings), Southern Alps gecko (31 sightings) and one sighting of an unidentified skink (either McCann's skink or common skink).

Western Streamlands Catchments

This area contains low- to mid-altitude slopes and catchments on the northwest part of Streamlands Pastoral Lease. It adjoins the lower Moffat Stream catchment on its southeast boundary and the western catchments of Curraghmore Pastoral Lease to the northeast. This area is dominated by depleted natural vegetation with limited areas of indigenous shrubland. Small rock outcrops and rocky areas are scattered throughout.

Indigenous bird species recorded from this area were Australasian harrier, banded dotterel (one sighting) (gradual decline), paradise shelduck, southern black-backed gull, spur-winged plover, welcome swallow and white-faced heron. Naturalised bird species observed were chaffinch, goldfinch, greenfinch, Australian magpie, skylark, starling and yellowhammer.

Lizard species found in this area were common skink (two sightings), McCann's skink (two sightings) and Southern Alps gecko (eight sightings).

Moffat Stream Catchment

This area comprises the entire catchment of Moffat Stream excluding a small part of the northern-most sub-catchment. Vegetation ranges from depleted natural vegetation at low altitudes to relatively intact snow-tussockland in the upper catchment. Indigenous shrubland dominated by *Olearia odorata*, matagouri and mingimingi flank parts of Moffat Stream and some of its tributaries. High altitude habitats include numerous rock outcrops, talus and fellfield.

Indigenous birds recorded from this area were Australasian harrier, black shag (one sighting) (sparse), grey warbler, New Zealand falcon (three sightings) (gradual decline), New Zealand pipit, southern black-backed gull and white-faced heron. Naturalised birds observed were Californian quail, chaffinch, chukor, redpoll, skylark, song thrush and yellowhammer.

Lizard species found in this area were common skink (nine sightings), McCann's skink (21 sightings), Southern Alps gecko (27 sightings), spotted skink (one sighting) (gradual decline) and one sighting of an unidentified skink (either common skink or McCann's skink).

Balloon Stream Catchment

This area comprises the entire catchment of Balloon Stream excluding its southern-most sub-catchment. Vegetation ranges from depleted natural vegetation at lower altitudes to relatively intact snow-tussockland in the upper catchment. Extensive areas of indigenous shrubland, dominated by *Olearia odorata*, matagouri and mingimingi, flank Balloon Stream and its tributaries above Balloon Stream Hut. High altitude habitats include numerous screes, rock tors (including Black Rocks) and fellfield.

Indigenous bird species recorded from this area were Australasian harrier, black shag (gradual decline), grey warbler, New Zealand falcon (two sightings) (gradual decline), New Zealand pipit, paradise shelduck, silvereye and southern black-backed gull. Black shags were sighted at three locations and at a breeding colony at the confluence of Balloon Stream and one of its larger tributary streams. The black shag colony consisted of at least 10 adults and six intact nests, one of which contained three juveniles and one of which contained two chicks. Naturalised bird species recorded were blackbird, Californian quail, chaffinch, dunnock, goldfinch, song thrush, redpoll, Australian magpie, skylark and yellowhammer.

Lizard species found in this catchment were common skink (six sightings), McCann's skink (62 sightings), scree skink (one sighting) (gradual decline) and Southern Alps gecko (46 sightings).

Stony River Catchment

This area comprises the eastern-most catchment of Streamlands Pastoral Lease, which is defined by the northwest slopes of the Kirkliston Mountains and the upper Stony River catchment. This catchment has extensive snow-tussockland and some red tussockland. High altitude habitats include rock outcrops, numerous screes and fellfield. The lower altitude section of Stony River contains numerous rock outcrops and indigenous shrubland dominated by matagouri, small-leaved *Coprosma* species and *Olearia odorata*.

Indigenous bird species recorded from this area were Australasian harrier and New Zealand pipit. Naturalised species recorded were redpoll, skylark, song thrush and yellowhammer.

Lizard species found in this catchment were McCann's skink (11 sightings) and Southern Alps gecko (nine sightings).

Bird Species Recorded

Twenty-seven bird species were recorded on Curraghmore and Streamlands pastoral leases during this inspection: 13 indigenous species (Table 2) and 14 naturalised species.

Table 2 Indigenous bird species recorded from Curraghmore and Streamlands pastoral leases, November/December 2006.

Bird species	Threat status	Distribution on property
Australasian harrier	Not threatened	Throughout.
banded dotterel	Gradual decline	Western Streamlands catchments.
black shag	Sparse	Moffat and Balloon stream catchments.
grey warbler	Not threatened	Indigenous shrubland throughout.
New Zealand falcon (eastern)	Gradual decline	Moffat and Balloon stream catchments.
New Zealand pipit	Not threatened	Throughout at higher altitudes.
paradise shelduck	Not threatened	Lower-altitude pastures and water bodies; western catchments; Balloon Stream.
silvereye	Not threatened	Indigenous shrubland throughout.
southern black-backed gull	Not threatened	Throughout.
South Island pied oystercatcher	Not threatened	Near Haldon Road.
spur-winged plover	Not threatened	Western catchments.
welcome swallow	Not threatened	Western Streamlands catchments.
white-faced heron	Not threatened	Western catchments; lower Moffat Stream.

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

Lizard species recorded

Two hundred and forty-five lizards were recorded from 123 different locations on the property, comprising five species: 18 common skinks, 102 McCann's skinks, 121 Southern Alps geckos, one scree skink, one spotted skink and two unidentified lizards (common skink or McCann's skink).

Table 3 Lizard species recorded from Curraghmore and Streamlands pastoral leases, November/December 2006.

Lizard species	Threat status	Distribution on property
common skink	Not threatened	At a range of altitudes and habitats throughout.
McCann's skink	Not threatened	At a range of altitudes and habitats throughout.
scree skink	Gradual decline	Upper Balloon Stream catchment.
Southern Alps gecko	Not threatened	At a range of altitudes and habitats throughout.
spotted skink	Gradual decline	Upper Moffat Stream catchment.

Significance of the Bird and Lizard Fauna

Curraghmore and Streamlands pastoral leases provide feeding and breeding habitats for four chronically threatened species: banded dotterel, New Zealand falcon, scree skink and spotted skink (all gradual decline) and one at risk species: black shag (sparse). A black shag breeding colony, (containing six nests and at least 10 adults, three juveniles and two chicks at the time of survey) is present in the Balloon Stream catchment. The property also provides extensive feeding and breeding habitats for five non-threatened indigenous species: grey warbler, silvereye, common skink, McCann's skink and Southern Alps gecko.

Insert bird and lizard map here

2.6.3 Freshwater Fauna (fish and invertebrates)

The northwest part of Curraghmore Pastoral Lease is drained by un-named tributaries of Grays River. Eastern parts of Curraghmore Pastoral Lease and all parts of Streamlands Pastoral Lease are drained by Stony River, including its tributaries Moffat Stream and Balloon Stream. Grays River flows into the Tekapo River. Stony River flows into Lake Benmore. Both rivers are within the Waitaki River catchment. Most of the Waitaki River is recognised as a 'Type II' in the Waters of National Importance (WONI) documentation (Chadderton *et al* 2004), and this includes all waterways on these pastoral leases. Recognition in WONI implies that the waterway contains special features of national significance; but only sections of 'Type II' catchments are of national importance. This significance is because it is in the top ten sites by Natural Heritage Value score in its biogeographical unit; and also for its threatened bird, plant and fish communities.

One of the distinguishing features of the Waitaki Catchment is the presence of hydroelectric dams. This has two major effects on fish communities. The first is that fish communities upstream from the dams are generally composed of only non-diadromous species (those species without a marine phase in their lifecycle), although some exceptions do occur (e.g. longfin eel may still be present and common bully and koaro have become non-diadromous substituting lakes for the sea). The second effect is that fish communities are separated into discrete populations preventing re-colonization of previously dewatered streams.

The New Zealand Freshwater Fish Database (NZFFD) has 1074 records from the Waitaki River catchment (at 4th of December 2006). No species are recorded from the property. Species recorded from Grays River and Stony River near the property are longfin eel, Canterbury galaxias, upland bully, common bully, rainbow trout and brown trout. Longfin eel is considered threatened (gradual decline) by Hitchmough *et.al.* (2007).

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

Western Catchments

This area incorporates the western parts of the property adjacent to Haldon Road. Water bodies in this area are permanent and ephemeral streams, and wetlands in the lower parts of some stream gullies. The wetlands appear to be "palustrine-ephemeral" (Johnson and Gerbeaux, 2004) (i.e. not directly associated with lakes or rivers). Some have been enlarged by excavation. The ephemeral nature of many stream channels means they support vegetation similar to that on adjoining slopes: pasture, hawkweed, scattered sweet brier and matagouri shrubland. Willows, pines and monkey musk are present along some streams. Pukio is present in some wetlands. Stock and wild animal access appears unrestricted. Vehicle tracks cross some streams by culvert or ford.

The stream flow varies in width from dry (at the time of survey) to one and a half metres. The wetlands and associated farm ponds are up to 20 m wide. Stream depths range from 100 to 400 mm, with pools up to one metre deep. Ephemeral stream substrates are predominantly soil or silt; larger stream substrates also have boulders and cobbles.

Five sites were electro-fished and one site hand-netted in this area. Canterbury galaxias were found at one site near the Streamlands homestead. No species were recorded at the other five sites. Additional species from near this area recorded in the NZFFD are longfin eel, Canterbury galaxias, common bully, upland bully and brown trout.

Macro-invertebrates observed in this area were: *Olinga feredayi*, *Pycnocentria* sp., *Pycnocentrodes aeris*, *Hydropsychidae* sp., *Hydrobiosis* sp. dobsonfly (*Archichauliodes diversus*), two-winged fly (*Austrosimulium* sp.), water boatman (*Sigara* sp.), back swimmer (*Anisops* sp.), damselflies

(*Anisoptera* spp.), dragonflies (*Zygoptera* spp.), snail (*Potamopyrgus* sp.), flatworm (*Cura* sp.) and worm (*Oligochaete* sp.).

Moffat Stream Catchment

This area incorporates the entire watershed of Moffat Stream within the property. The main water bodies in this area are Moffat Stream, its many small ephemeral and permanent tributaries, and occasional wetlands on the terraces in the lower valley. The upper reaches of the streams flow through tussockland and shrubland; the middle reaches flow through tussockland, grassland and shrubland; and the lower reaches flow through grassland (pasture) and riparian shrubland. Monkey musk is present along most permanent stream channels. Ephemeral stream beds support grassland and shrubland. Pukio is commonly present in the small wetlands. Stock and wild animal access appears unrestricted. Vehicle tracks cross many of the stream channels.

Moffat Stream is about three metres wide in its middle reaches and approximately two and a half metres wide in its lower reaches. Most tributary streams were dry at the time of survey, but appear to sometimes be up to three metres in width. The largest wetlands are 30 metres long and 20 metres wide. Moffat Stream is approximately 100 mm deep in its upper reaches and 200 mm deep in its lower reaches, with pools over 600 mm deep in places. The tributary streams vary between 100 and 300 mm in depth. All ephemeral streams appear to be no more than 100 mm deep during rain events. The wetlands have subsurface water with only occasional pools of open water, no more than 150 mm deep. The permanent stream substrates are predominantly bedrock, boulders and cobbles; substrates of ephemeral streams, seepages and wetlands are generally silty.

Eight sites were electro-fished in this area. Brown trout were found at five sites, Canterbury galaxias at four sites (mostly in the upper reaches), upland bully at four sites (in the lower reaches), and alpine galaxias at one site on the property boundary in the upper reaches. No records of other species are listed for this area in the NZFFD.

Macro-invertebrates observed in this area were: mayflies (*Coloburiscus humeralis*, *Deleatidium lillii*-group, *Deleatidium myzobranchia*-group, *Nesameletus* sp. and *Oniscigaster* sp.), stoneflies (*Stenoperla prasina* and *Zelandobius* sp.), caddisflies (*Helicopsyche* sp., *Beraeoptera roria*, *Olinga feredayi*, *Pycnocentria* sp., *Pycnocentrodes aeris*, *Hydropsychidae* sp., *Aoteapsyche* sp. and *Hydrobiosis* sp.), dobsonfly (*Archichauliodes diversus*), two-winged fly (*Austrosimulium* spp.), flatworm (*Cura* sp.) and worm (*Oligochaete* sp.).

Balloon Stream Catchment

This area incorporates all parts of the watershed of Balloon Stream on the property. Water bodies in this area are Balloon Stream and its permanent and ephemeral tributaries. Streams flow through vegetation similar to that described for the Moffat Stream catchment, but with more turpentine shrubland in the upper reaches and Russell lupin, willow, poplar and broom in the lower reaches. Monkey musk is present in parts of this stream catchment. Stock and wild animal access appears unrestricted. Vehicle tracks cross many of the stream channels, particularly in the lower sections.

Balloon Stream is approximately two and a half metres wide near the main fork in its headwaters and over seven metres wide at the property boundary in its lower reaches. Tributary streams are less than one metre wide. Balloon Stream ranges in depth from 200 mm in its upper reaches to 400 mm in its lower reaches, with pools of over one and a half metres in places. The tributary streams vary between 100 and 200 mm in depth. The ephemeral streams appear to be no deeper than 100 mm during rain events. The substrates of permanent streams are boulders and cobbles, with some bedrock in places. Ephemeral streams have silty substrates.

Four sites were electro-fished and one site hand-netted in this area. Canterbury galaxias were found at four sites, upland bully at three sites and brown trout at three sites. One site in the upper reaches had no fish present. No records of other species are listed for this area in the NZFFD.

Macro-invertebrates observed in this area were mayflies (*Coloburiscus humeralis, Deleatidium lillii*-group, *Deleatidium myzobranchia*-group and *Nesameletus* sp.), stoneflies (*Megaleptoperla grandis* and *Stenoperla prasina*), caddisflies (*Helicopsyche* sp., *Olinga feredayi*, *Pycnocentria* sp., *Pycnocentrodes aeris*, *Hydropsychidae* sp., *Aoteapsyche* sp. and *Hydrobiosis* sp.), dobsonfly (*Archichauliodes diversus*), two-winged fly (*Austrosimulium* sp.), flatworm (*Cura* sp.), leech (*Hirudinea* sp.) and worm (*Oligochaete* sp.).

Stony River Catchment

This area incorporates the northern headwaters of Stony River on the eastern part of Streamlands Pastoral Lease. Water bodies in this area are permanent headwater streams. These streams flow through tussockland and shrubland. Monkey musk is present along some stream channels. Stock and wild animal access appears unrestricted. Vehicle tracks cross some of the stream channels. The streams vary in size, from a half to two metres in width, and from 100 to 300 mm in depth. Stream substrates are mainly boulders and cobbles, with some areas of silt also present.

Three sites were electro-fished in this area. Canterbury galaxias were found at the two upper sites and brown trout at the lower site. An additional species, (Upland bully), from the same catchment is recorded in the NZFFD.

Macro-invertebrates observed in this area were mayflies (*Coloburiscus humeralis, Deleatidium lillii*-group, *Deleatidium myzobranchia*-group and *Nesameletus* sp.), stonefly (*Stenoperla prasina*), caddisflies (*Helicopsyche* sp., *Pycnocentria* sp., and *Aoteapsyche* sp.), dobsonfly (*Archichauliodes diversus*), flatworm (*Cura* sp.) and worm (*Oligochaete* sp.).

Species Recorded

Four fish species were recorded during this survey of Curraghmore and Streamlands pastoral leases.

Table 4 Fish species recorded from Curraghmore and Streamlands pastoral leases, November-December 2006.

Fish Species	Threat Status	Known Distribution on Property
alpine galaxias	Not threatened	Only in upper Moffat Stream.
brown trout	Introduced	In many permanent streams.
Canterbury galaxias	Not threatened	Many permanent streams (mostly in upper reaches).
upland bully	Not threatened	Many permanent streams (mostly in lower reaches).

Significance of the Freshwater Fauna

No threatened fish species were recorded in freshwater habitats on the property, though these habitats are in relatively good condition, especially in their upper reaches. One area of freshwater habitat in upper Moffat Stream is significant for species diversity (three native fish species). Most of the Waitaki River including all catchments on the property is listed as a 'Type II' Waters of National Importance (Chadderton *et al.*, 2004), indicating that the water bodies contain special features of national significance.

Insert Fresh water fauna values map in here

2.6.4 Terrestrial Invertebrates

Curraghmore and Streamlands pastoral leases adjoin The Grampians Pastoral Lease, which was surveyed in 2006. Five sites sampled during The Grampians survey are near the property boundary, and three were assessed as having significant inherent invertebrate values (Emberson and Syrett, 2006). Notable species collected at these sites include the threatened ground beetle *Holcaspis abdita* (threat status: nationally critical), the grasshopper *Brachaspis* 'Hunter Hills' (range restricted) and the large flightless weevil *Inophloeus* c.f. *sulcifer*, which is vulnerable to mammalian predation. A new species of the well known and well-collected genus, *Holcaspis*, was found on The Grampians Pastoral Lease at the crest of the ridge to the north of Moffatt Stream.

Invertebrates of Curraghmore and Streamlands pastoral leases are described below for the four distinct parts of the property.

Western Catchments

This area consists of gently to moderately sloping surfaces rising to a northeast-southwest trending ridge. It is dissected by minor streams. The vegetation is heavily modified, especially on the lower slopes, but remnants of shrubby vegetation remain in the stream gullies. The northern part of the area has extensive stands of sweet brier. The main invertebrate values in the area centre on habitat of the small grasshopper, *Sigaus* c.f. *minutus* 'blue', in the southwest corner of the property. Populations of *Sigaus* c.f. *minutus* 'blue' were observed in several localities. They occurred between 590 and 940 m on thin, stony soils with sparse, low vegetation.

An area of shrubby vegetation below a rocky outcrop in a tributary of Stony River was identified as retaining a diverse and representative beetle fauna, including five species of host-specific weevils belonging to the genera *Peristoreus* and *Praolepra* on *Coprosma* spp., *Olearia odorata*, porcupine shrub and *Carmichaelia petriei*. Smith's dragonfly and Chilton's giant dragonfly were seen flying by the stream here. Red damselfly and blue damselfly were seen by a small stock dam. The darkling beetle, *Artystona lata*, (range restricted) was found at two sites within the area and the localised ground beetle, *Holcaspis bessatica*, and darking beetle, *Mimopeus impressifrons*, were collected from this area. At the northern end of the western catchments kowhai moth and kowhai seed moth were found on prostrate kowhai.

Moffat Stream Catchment

The long narrow valley of Moffat Stream stretches from Stony River Road to the crest of the Grampian Mountains. The upper parts of the valley retain a cover of tussockland with remnant shrublands. In the lower parts of the valley the western slopes have been extensively over-sown and top-dressed, whilst the eastern slopes retain more native vegetation, but in a degraded state. There are a number of remnant stands of shrubby vegetation here.

The significant inherent invertebrate values of this catchment are associated mainly with the remnant shrublands throughout the valley, which retain a diverse and representative beetle fauna including a borer beetle, a chequered beetle, a native ladybird, six species of weevils, longhorn beetles, leaf beetles, marsh beetles, dermestids, a flower beetle, a fungus weevil, a manuka beetle, a cadelle beetle and a rough mould beetle. The fungus weevil, *Cerius otagensis*, beaten from *Carmichaelia petriei*, was previously known from only four female specimens collected at two sites in Central Otago, 90 km and 140 km to the southwest. This species seems to be associated with *Carmichaelia* and is flightless, so it is vulnerable to extinction through fragmentation of its habitat.

The ground beetle, *Holcaspis bidentella*, (nationally critical) was collected from two sites in the valley bottom of Moffat Stream, and from the ridge crests on either side of Moffat Stream. At higher altitudes the darkling beetle, *Artystona lata*, (range restricted) was found under rocks and Chilton's

giant dragonfly was seen sunning itself on scree. The darking beetle, *Mimopeus impressifrons*, was also collected from this area.

Balloon Stream Catchment

This area includes the lower northern side of Balloon Stream and, in its upper reaches, the whole catchment up to the ridge separating it from the Stony River catchment, and to the crest of the Grampian Mountains at 1921 m. The area retains large areas of invertebrate habitat in relatively natural condition. The habitats are diverse, including stony river flats at the mouth of the valley, a river terrace riser, extensive shrubland on the valley sides and gully bottoms, tussockland, rocky tors, cushionfield and rockland.

Significant inherent invertebrate values are associated with a suite of high altitude insect species collected from the top and western slopes of the Grampian Mountains. The grasshopper, *Brachaspis* 'Hunter Hills', (range restricted), the large flightless weevil *Inophloeus* c.f. *sulcifer*, a moss beetle and mountain stone weta were found here. The speargrass weevil, *Lyperobius barbarae*, appeared to be associated with *Aciphylla dobsonii* in rockland and an undescribed, alpine migadopine ground beetle was collected from the distinctive rockland habitat.

The darkling beetle, *Artystona lata*, (range restricted) was found in lower Balloon Stream. The localised ground beetle, *Holcaspis bessatica*, and the darking beetle, *Mimopeus impressifrons*, were collected from several sites in this area. A diverse and representative fauna of beetle species, including a leaping beetle, was collected from a shrubland at 720 m altitude in Balloon Stream. The boulder copper butterfly, southern blue butterfly and tussock butterfly were all observed in the lower parts of this area. Dobsonfly larvae were present under rocks beside Balloon Stream, and Chilton's giant dragonfly was seen at higher altitudes.

Stony River Catchment

This small area comprising the headwaters of Stony River is bounded to the northwest by a ridge separating it from Balloon Stream, and to the east by the crest of the Kirkliston Range. It includes areas of tussockland on outwash fans and steep valley sides and turpentine shrubland up to 1630 m. Golden speargrass is prominent along the ridge tops.

The significant invertebrate values are mostly at higher altitudes and include several species of ground beetles and two large weevil species. The ground beetle, *Holcaspis bidentella*, (nationally critical) was collected from the upper slopes. The speargrass weevil, *Lyperobius carinatus* (sparse) was collected from golden speargrass, and the grasshopper, *Brachaspis* 'Hunter Hills' (range restricted) was also found on the ridge tops. In addition, the localised ground beetle, *Holcaspis bessatica*, and the large, flightless weevil, *Inophloeus* c.f. *sulcifer*, were collected from the ridge crest.

An undescribed species of the largely forest-dwelling ground beetle genus *Cerabilia* was collected from three sites in the area. The mountain stone weta was found at two sites. A diverse and representative beetle fauna was collected from the shrubby vegetation in a gully above Stony River, including specialist, host-specific weevil species from *Carmichaelia petriei* and *Olearia odorata*.

Species Recorded

During this survey, 129 species of insects were collected or observed from 68 sites on the property. All but seven were identified at least to tribe, and most to genus or species. There were 103 beetle (Coleoptera) species from 24 families. Nine of the beetle species are naturalised. Eleven notable species were recorded: one is a nationally critical species, one is in gradual decline, two are range restricted, one is sparse, one is a flightless species previously known from only four specimens, one

is an undescribed species of a largely forest-inhabiting genus, one is a localised species from well-known genera, one is an un-described species from an un-described alpine genus, and two are large, flightless weevils vulnerable to mammalian predation.

Table 5 Notable invertebrate species recorded from Curraghmore and Streamlands pastoral leases, November/December 2006.

Species	Significance	Distribution on Property
Artystona lata	Range Restricted*.	Scattered over the lease.
Brachaspis 'Hunter Hills'	Range Restricted*.	Grampian Mountains above 1400m.
Cerabilia n. sp.	Un-described species of a largely forest-inhabiting genus.	Stony River headwaters
Cerius otagensis	Flightless, known from only four specimens, all female, Central Otago only (Holloway, 1982).	Moffat Stream.
Holcaspis bessatica	Localised species from a well-known genus, Mackenzie Basin only.	Western catchments, Balloon Stream catchment.
Holcaspis bidentella	Nationally Critical*.	Moffat Stream and Stony River catchments.
Inophloeus c.f. *sulcifer*	Large, flightless weevil vulnerable to mammalian predation.	Headwaters of Balloon Stream
Lyperobius barbarae	Limited distribution, vulnerable to mammalian predation.	Grampian Mountains.
Lyperobius carinatus	Large, flightless weevil vulnerable to mammalian predation, Sparse*.	Grampian Mountains.
Mimopeus impressifrons	Localised species, Mackenzie Basin and Central Otago only.	Scattered over lease below 1200 m.
Sigaus minutus 'blue'	Reproducing populations of a species in gradual decline*.	Front faces and valleys on Streamlands.

*Threat status from Hitchmough *et.al*. (2007)

Significance of the Invertebrate Fauna

Five threatened invertebrate species were recorded on the property: *Holcaspis bidentella* (nationally critical), *Sigaus minutus* 'blue' (gradual decline), *Artystona lata* (range restricted), *Brachaspis* 'Hunter Hills' (range restricted) and *Lyperobius carinatus* (sparse). Six other notable species were recorded. Invertebrate values are widespread over the property and two distinct areas with significant inherent values have been identified. The first, located in the southwest corner of the property, contains significant areas of habitat for the small grasshopper *Sigaus* c.f. *minutus* 'blue' as well as an excellent stand of shrubby vegetation providing habitat for a diverse range of insect species. The other area includes the higher altitude parts of the Moffat Stream, Balloon Stream and Stony River catchments. This area includes significant shrublands, which support a diverse insect fauna including at least one very rare species and some outstanding high altitude insect habitat.

Insert invertebrate map here

2.6.5 Problem Animals

Wallabies and their droppings were frequently encountered on the property, particularly in the upper Moffat and Balloon stream catchments. Fallow deer and chamois were observed near the ridge between Moffat and Balloon streams. Hares and rabbits were common throughout the property, particular at lower altitudes. Possum scats were found in rocky areas and shrublands throughout the property.

Collectively, these introduced herbivores browse native vegetation, exacerbating damage caused by sheep and cattle. Hares and rabbits also have a role in supporting predator populations because they are primary prey for some introduced predators such as feral cats and ferrets (Norbury *et al*., 1998). Feral cats, hedgehogs, mustelids (ferrets, stoats and weasels) and rodents were not encountered during this survey but at least some of these species are almost certainly present. These predators include native birds and lizards in their diets and pose a significant threat to invertebrates, especially the larger, flightless species.

2.7 HISTORIC

2.7.1 European Heritage Values

Curraghmore and Streamlands pastoral leases were created from the split of Grampian Hills in 1911. The homestead run (Run 296) of Grampian Hills (now known as The Grampians) was first leased for grazing by John Hall (later Sir John Hall and Prime Minister of New Zealand) in 1859. In 1860 the run was transferred to John Tucker Ford, who already leased a large area on the Kirkliston Range, bringing the area of the combined property to 36,000 hectares. The property transferred in 1866 to Dr Fisher. Substantial areas on the Kirkliston Range were subdivided from the property and large blocks of arable land adjacent to Grays Hills Station were freeholded. Dr Fisher sold the property to John Sutton in 1882, who sold it shortly after to Ernest Chapman, G.G. Russell and J.M. Ritchie. Chapman transferred his share to his partners in 1888 and the property was then sold to William Grant in 1892. Grant sold the property to John McArthur in 1908. The property was split up in 1911, forming Curraghmore and Streamlands and leaving the Grampians homestead run with 6475 hectares (Pinney, 1971).

An historic single-room stone hut is present beside Balloon Stream on Streamlands Pastoral Lease. The hut is constructed from large stones with clay packed into the gaps. It has a stone chimney, which is partly collapsed. The corrugated iron roof, half of which is missing, is weighted down by rocks hanging from wire. The floor area of the hut is approximately 4 m by 3.5 m. It is recorded as an historic site (# 69) on the Department of Conservation's historic database. The date of construction is not recorded. A more recent weatherboard-clad hut is present nearby and has no historical significance. The other huts on the property (Moffat Stream and the blown down hut close to the Grampian Mountains main ridge) have no historical significance.

The historic rabbit fence (built in the 1890s), which extended from the Waitaki Valley to Lake Pukaki, traverses the south western end of the property adjacent to Stony River Road. This remains an integral part of fencing on the property. The original fence was approximately 42 miles long with materials for it valued at 3,600 pounds and purchased in 1888. Men and huts were located every ten miles along the fence for maintenance purposes.

An archaeological site (site number I 39/1, Grays Hills (2)) is present south west of the Stony River Road close to the Streamlands/Stony Creek Pastoral Lease boundary. The site type is a quarry and is described as "The site is marked by quantities of large white flakes of arthoquartzite (sic) on the surface. Odd scattered flakes also occur elsewhere on the hillside". The actual source stone is not apparent.

Significance of Historic Resources

Three significant historic features are present on the property. The old stone hut beside Balloon Stream on Streamlands Pastoral Lease, the rabbit fence that is adjacent to the Stony River Road and the archaeological site. The fence is significant as it provides impressive historical testimony to the magnitude of the rabbit problem and the government's active financial involvement in the problem.

2.8 PUBLIC RECREATION

2.8.1 Physical Characteristics

The Grampian Mountains are part of the eastern enclosing ranges of the Mackenzie Basin. Curraghmore and Streamlands pastoral leases form part of the western and southern flanks of the Grampian Mountains, and include the backcountry catchments of Moffat and Balloon streams.

These streams originate from the southwest flanks of the Grampian Mountains. The eastern part of Streamlands Pastoral Lease includes part of the steep south faces of the Grampian Mountains which face towards the upper Hakataramea Valley. The property can be divided into five recreation units.

Curraghmore Front Faces

This unit covers the narrow band of flats and northwest-facing slopes east of Haldon Road. The front faces are fairly uniform in appearance consisting of rocky terrain with bare faces, grading at higher altitudes to tussockland. The farm track south of the Curraghmore homestead, that traverses through this unit, is a key access way. It provides relatively easy access to the northwest Grampian Mountains and the headwaters of Moffat Stream. The setting for this unit is predominantly cultural due to the farming influence and the presence of buildings and electricity pylons and lines.

Curraghmore Back Tributaries

This unit includes the upper parts of Moffat and Balloon streams and their tributaries, and the upper southwest slopes of the Grampian Mountains. Both valleys are long and narrow with dissected gullies and are contiguous with the steep faces and summit ridge of the Grampian Mountains. The summit and upper slopes of the Grampian Mountains provide a spectacular and highly-natural setting for recreation, apart from a bulldozed track along the range summit. Rockland, herbfield, tussockland and shrubland communities are relatively intact, and grade down-slope to more modified tussockland and shrubland communities. Shrubland is a significant feature in the lower valleys, especially along stream edges, in rocky gorges and on rocky slopes. Farm tracks are present on the range crest and the main ridges. A farm hut (good condition) is situated by the yards in Moffat Stream. Another hut (now blown down) is situated below the Grampian Mountains main range crest south of Black Rocks. The setting for this unit is highly natural, except for the presence of vehicle tracks.

Streamlands Front Faces and Low Hills

This unit covers the front faces to the east and southeast of the Streamlands station buildings and up to the main ridge above Moffat Stream. This entire unit has been modified and has little indigenous cover remaining apart from scattered shrubland and very scattered remnant tussock. Farm tracks are present throughout the unit. Stony River Road and a power line bisect the southwest corner of the unit. Stony River Road is a key access way to the upper valley. The setting for this unit is predominantly cultural due to the influence of farming and the presence of roads and power lines.

Streamlands Back Tributaries

This unit comprises the lower parts of Moffat and Balloon valleys. The area is dry and barren in character, with depleted tussockland, scattered patches of shrubland, occasional rocky slopes and, at lower altitudes, over-sown and top-dressed grassland and depleted grassland dominated by mouse-ear hawkweed. The middle reaches of Balloon Stream provide a more natural setting for recreation, with rocky gorges, and more extensive shrubland and tussockland. Sited together are a farm hut (good condition) and historic stone hut (described in the historic values section) on a river terrace before Balloon Stream starts to enter a gorge. The historic stone hut and black shag breeding colony are interesting features. Farm tracks up the main valleys provide relatively easy access. The setting for this unit is predominantly cultural due to the influence of farming; however the middle reaches of Balloon Stream and its tributaries have vegetation and landscapes that are more natural. The stone hut and shag colony are features within the valley that provide opportunities for visitor appreciation.

Upper Stony River

This unit covers the south-facing slopes of the Grampian Mountains at the juncture of the Kirkliston Mountains. It includes a large steep valley, mountain slopes, fans and alluvial surfaces in the upper reaches of Stony River. Indigenous vegetation is less modified, with snow tussockland, shrubland and scree. Farm tracks traverse the valley floor and main ridge. The setting for this unit is relatively natural.

2.8.2 Legal Access

Roads

Haldon Road is a formed legal road that abuts the western property boundary in several locations. Stony River Road is a formed gravel road that bisects the southwest corner of the property and provides access to Moffat and Balloon streams. Stony River Road follows the legal road in parts. Three unformed legal roads are present: two of these are in the southwest corner of the property, and the third traverses the length of Moffat valley. Generally these unformed legal roads do not follow any formed roads or tracks.

Adjoining Public Conservation Land

There is no public conservation land adjacent to the two properties.

Marginal Strips

No marginal strips appear to be present along streams within the property boundary of Curraghmore Pastoral Lease (Run 72). Streamlands Pastoral Lease (Run 72B) is subject to section 24(9) Conservation Act 1987 (marginal strips). No evidence has been found to establish that the widths and extents of streams within Streamlands Pastoral Lease have been determined.

2.8.3 Activities

There are no current recreation permits issued for either Curraghmore or Streamlands pastoral leases. Known recreational activities include four-wheel-driving, hunting, fishing and tramping. Higher-altitude parts of the property provide good opportunities for tramping, walking, hunting, mountain biking, nature study, scenery appreciation and, in winter months, may provide opportunities for ski touring. Lower-altitude parts of the property provide good opportunities for horse-riding, mountain-biking, four-wheel-driving, fishing, picnicking, nature study and historic resource appreciation.

The Balloon Stream huts (farm and historic) provide a node for overnight accommodation and have strategic recreation value.

Significance of Recreation

Significant features of Curraghmore and Streamlands pastoral leases are the highly natural and spectacular recreation setting on the crest and upper slopes of the Grampian Mountains, the opportunities to provide access along existing vehicle tracks to that high-altitude area, and the historic stone hut and the shag colony in the middle reaches of Balloon Stream.

The vehicle track south of the Curraghmore homestead provides access to the northwest end of the Grampian Mountains and the headwaters of Moffat Stream. The vehicle tracks up Balloon valley and the Moffat valley provide good access to the central and southwest section of the Grampian Mountains. The significance of this access is that it allows multiple entry and exit points within the

larger Grampian Mountains area. The Balloon Stream huts are strategic for overnight accommodation.

PART 3 OTHER RELEVANT MATTERS AND PLANS

3.1 CONSULTATION

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

- PNAP surveys recommended two areas for protection on the property: Black Rocks alpine herbfields (noted as one of the best in the area) and the south Grampians herbfields.
- Rock outcrops and small streams on the property look very interesting on the map.
- Protection of water quality on the property is important. Streams in the area are stable; they are vegetated to the edges and flow most of the time.
- The Mackenzie landscape report notes the landscape as outstanding.
- In the 1950's there was very little vegetation on the property; the front country is not very good.
- There are significant infestations of *Hieracium* (hawkweed) on the property.
- Environment Canterbury has a legal interest in both leases, with a current rabbit and land management agreement which places restrictions on use of the degraded areas and is monitored every two years. (20 yrs from 1990: expires 2010).
- The ecological sustainability of farming the area needs to be addressed; very little should go to freehold land as it is not ecologically sustainable; careful evaluation of the semi-arid hill country is necessary.
- Recreational access along the track along the range top (from Hakataramea Pass) needs to continue to be available; access along the top needs to be continuous through all the leases.
- The potential for long mountain-biking traverses across adjoining leases, incorporating tracks and links in the area, should be considered; there are good farm tracks for mountain bike use across the properties.
- Tramping is regularly done up Moffat Stream with an overnight stay in Stony Hut.
- An historic quarry is recorded in the area.
- The front ridgeline would make a good boundary between freehold and public conservation land.
- Proposed boundaries need to be contiguous with those proposed for The Grampians Pastoral Lease; links across several properties need to be looked at to consider the context of protection in the area.
- The southeast side of all the adjoining leases could be taken to form one large continuous Conservation Area.
- Tenure review of Kirkliston Pastoral Lease is producing a bad outcome for conservation. This property must be looked at carefully so as not to produce the same results.

3.2 DISTRICT PLANS

The northwest parts of Curraghmore and Streamlands pastoral leases lie within the Rural Zone of the Mackenzie District. One Site of Natural Significance is present on the property boundary:

- 47a Grampians: on the crest of the Grampian Mountains northeast of Black Rocks (part Grampians RAP 6).

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

The southeast parts of Curraghmore and Streamlands pastoral leases lie within the Rural Zone of the Waimate District. Three Sites of Natural Significance are present on the property:

- 1A: on the crest of the Grampian Mountains northeast of Black Rocks (part Grampians RAP 6).
- 1B: on the southern end of the Grampian Mountains (Grampians RAP 7).
- 1C: on the southern end of the Grampian Mountains (Grampians RAP 8).

The Waimate District Plan contains a number of rules that restrict or control activities in the Rural Zone, covering activities such as the clearance of indigenous vegetation, tree planting and set-backs from waterways.

3.3 CONSERVATION MANAGEMENT STRATEGIES

Curraghmore and Streamlands pastoral leases lie within the Waitaki Place Unit of the Canterbury Conservancy. Relevant priority objectives for this unit listed in the CMS (Department of Conservation, 2000) are:

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

3.4 NEW ZEALAND BIODIVERSITY STRATEGY

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

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

PART 4 ATTACHMENTS

4.1 ADDITIONAL INFORMATION

4.1.1 Scientific Names of Species

Plant Species referred to in text

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

Common name	Scientific name
alpine fescue tussock	*Festuca matthewsii*
blue tussock	*Poa colensoi*
bog pine	*Halocarpus bidwillii*
bog rush	*Schoenus pauciflorus*
bracken	*Pteridium esculentum*
bristle tussock	*Rytidosperma setifolium*
broad-leaved snow-tussock	*Chionochloa flavescens*
bromes*	*Bromus* spp.
broom*	*Cytisus scoparius*
browntop*	*Agrostis capillaris*
Californian thistle*	*Cirsium arvense*
catsear*	*Hypochoeris radicata*
Chewings fescue*	*Festuca rubra*
clover*	*Trifolium* sp.
cocksfoot*	*Dactylis glomerata*
contorta pine*	*Pinus contorta*
coral broom	*Carmichaelia crassicaule*
crack willow*	*Salix fragilis*
creeping pohuehue	*Muehlenbeckia axillaris*
dandelion*	*Taraxacum officinale*
Deptford pink*	*Dianthus armeria*
downy brome*	*Bromus tectorum*
edelweiss	*Leucogenes grandiceps*
elderberry*	*Sambucus nigra*
everlasting daisy	*Helichrysum bellidioides*
false speargrass	*Celmisia lyallii*
fescue tussock	*Festuca novae-zelandiae*
foxglove*	*Digitalis purpurea*
giant speargrass/taramea	*Aciphylla scott-thomsonii*
golden speargrass/taramea	*Aciphylla aurea*
gooseberry*	*Ribes uva-crispa*
gorse*	*Ulex europaeus*
grey willow*	*Salix cinerea*

haresfoot trefoil* ..... *Trifolium arvense*
hawkweed*..... *Hieracium* sp.
horehound*..... *Marrubium vulgare*
Kentucky bluegrass* ..... *Poa pratensis*
king devil*..... *Hieracium praealtum*
kowhai ..... *Sophora microphylla*
lawyer..... *Rubus schmidelioides*
male fern*..... *Dryopteris filix-mas*
Maori onion..... *Bulbinella angustifolia*
matagouri..... *Discaria toumatou*
mingimingi ..... *Coprosma propinqua*
monkey musk* ..... *Mimulus guttatus*
moth mullein* ..... *Verbascum virgatum*
mountain clubmoss..... *Lycopodium fastigiatum*
mountain oat grass..... *Deyeuxia avenoides*
mountain toatoa ..... *Phyllocladus alpinus*
mountain totara..... *Podocarpus hallii*
mountain tree fern ..... *Cyathea colensoi*
mountain wineberry..... *Aristotelia fruticosa*
mouse-ear hawkweed* ..... *Hieracium pilosella*
narrow-leaved snow-tussock ..... *Chionochloa rigida*
native broom..... *Carmichaelia australis*
native jasmine..... *Parsonsia* sp.
native violet..... *Viola cunninghamii*
necklace fern ..... *Asplenium flabellifolium*
patotara..... *Leucopogon fraseri*
poplar*..... *Populus* sp.
porcupine shrub ..... *Melicytus alpinus*
prickly shield fern..... *Polystichum vestitum*
prostrate kowhai ..... *Sophora prostrata*
pukio..... *Carex secta*
purging flax* ..... *Linum catharticum*
rautahi..... *Carex coriacea*
red tussock..... *Chionochloa rubra*
red woodrush..... *Luzula rufa*
rock fern ..... *Cheilanthes humilis*
Russell lupin*..... *Lupinus polyphyllus*
ryegrass* ..... *Lolium perenne*
scabweed ..... *Raoulia australis*
scrub pohuehue..... *Muehlenbeckia complexa*
sheep's sorrel*..... *Rumex acetosella*
silver tussock/wi..... *Poa cita*
slim snow-tussock ..... *Chionochloa macra*
snowberry..... *Gaultheria depressa*
snow totara ..... *Podocarpus nivalis*
snow tussock ..... *Chionochloa* sp.
soft brome*..... *Bromus hordeaceus*
soft rush*..... *Juncus effusus*
sphagnum moss ..... *Sphagnum cristatum*
storksbill*..... *Erodium cicutarium*
suckling clover* ..... *Trifolium dubium*
sweet brier* ..... *Rosa rubiginosa*
sweet vernal*..... *Anthoxanthum odoratum*
tall oat grass*..... *Arrhenatherum elatius*
tauhinu..... *Ozothamnus leptophyllus*

turpentine shrub ..... *Dracophyllum uniflorum*
vegetable sheep ..... *Raoulia eximia*
viper's bugloss* ..... *Echium vulgare*
white clover* ..... *Trifolium repens*
white fuzzweed ..... *Vittadinia australis*
willow* ..... *Salix* sp.
wire moss ..... *Polytrichum juniperinum*
woolly mullein* ..... *Verbascum thapsus*
yarrow* ..... *Achillea millefolium*

Animal Species referred to in text

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

Common name	Scientific name
alpine galaxias	*Galaxias paucispondylus*
Australasian harrier/kahu	*Circus approximans*
Australian magpie*	*Gymnorhina tibicen*
banded dotterel	*Charadrius bicinctus bicinctus*
bat	*see* South Island long-tailed bat
Bennett's wallaby*	*Macropus rufogriseus rufogriseus*
blackbird*	*Turdus merula*
black shag/koau	*Phalacrocorax carbo novaehollandiae*
blue damselfly	*Austrolestes colensonis*
boulder copper butterfly	*Lycaena boldenarum*
brown hare*	*Lepus europaeus occidentalis*
brown trout*	*Salmo trutta*
brushtail possum*	*Trichosurus vulpecula*
California quail*	*Callipepla californica brunnescens*
Canterbury galaxias	*Galaxias vulgaris*
chaffinch*	*Fringilla coelebs*
Chilton's giant dragonfly	*Uropetala chiltoni*
chukor*	*Alectoris chukar*
common bully	*Gobiomorphus cotidianus*
common skink	*Oligosoma nigriplantare polychroma*
dunnock*	*Prunella modularis*
European hedgehog*	*Erinaceus europaeus occidentalis*
European rabbit*	*Oryctolagus cuniculus cuniculus*
fallow deer*	*Dama dama dama*
feral cat* (house cat)	*Felis catus*
ferret*	*Mustela furo*
goldfinch*	*Carduelis carduelis*
greenfinch*	*Carduelis chloris*
grey warbler/rironiro	*Gerygone igata*
hare*	*see* brown hare
hedgehog*	*see* European hedgehog
house sparrow*	*Passer domesticus*
jewelled gecko	*Naultinus gemmeus*

koaro ..... *Galaxias brevipinnis*
kowhai moth ..... *Uresiphita polygonalis maorialis*
kowhai seed moth ..... *Stathmopoda aposema*
longfin eel/tuna ..... *Anguilla dieffenbachii*
long-toed skink ..... *Oligosoma longipes*
McCann's skink ..... *Oligosoma maccanni*
mountain stone weta ..... *Hemideina maori*
New Zealand falcon/karearea ..... *Falco novaeseelandiae*
New Zealand pipit/pihoihoi ..... *Anthus novaeseelandiae novaeseelandiae*
paradise shelduck/putakitaki ..... *Tadorna variegata*
possum* ..... *see* brushtail possum
rabbit* ..... *see* European rabbit
rainbow trout* ..... *Oncorhynchus mykiss*
red damselfly/kihitara ..... *Xanthocnemis zealandica*
redpoll* ..... *Carduelis flammea*
scree skink ..... *Oligosoma waimatense*
short-tailed bat ..... *Mystacina tuberculata*
silvereye ..... *Zosterops lateralis lateralis*
skylark* ..... *Alauda arvensis*
Smith's dragonfly ..... *Procordulia smithii*
song thrush* ..... *Turdus philomelos*
Southern Alps gecko ..... *Hoplodactylus* aff. *maculatus* "Southern Alps"
southern black-backed gull/karoro ..... *Larus dominicanus dominicanus*
southern blue butterfly ..... *Zizina labradus oxleyi*
South Island long-tailed bat ..... *Chalinolobus tuberculatus*
South Island pied oystercatcher ..... *Haematopus ostralegus finschi*
spotted skink ..... *Oligosoma lineoocellatum*
spur-winged plover ..... *Vanellus miles novaehollandiae*
starling* ..... *Sturnus vulgaris*
stoat* ..... *Mustela erminea*
tussock butterfly ..... *Argyrophenga* sp.
upland bully ..... *Gobiomorphus breviceps*
wallaby* ..... *see* Bennett's wallaby
weasel* ..... *Mustela nivalis vulgaris*
welcome swallow ..... *Hirundo tahitica neoxena*
white-faced heron ..... *Ardea novaehollandiae novaehollandiae*
yellowhammer* ..... *Emberiza cintrenella*

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