

Crown Pastoral Land Tenure Review

Lease name : CASTLE DENT

Lease number : PO 196

Conservation Resources Report - Part 1

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.

August 05

**DOC CONSERVATION RESOURCES REPORT
ON TENURE REVIEW OF CASTLE DENT
PASTORAL LEASE (P 196) UNDER PART 2 OF
THE PASTORAL LAND ACT 1998**

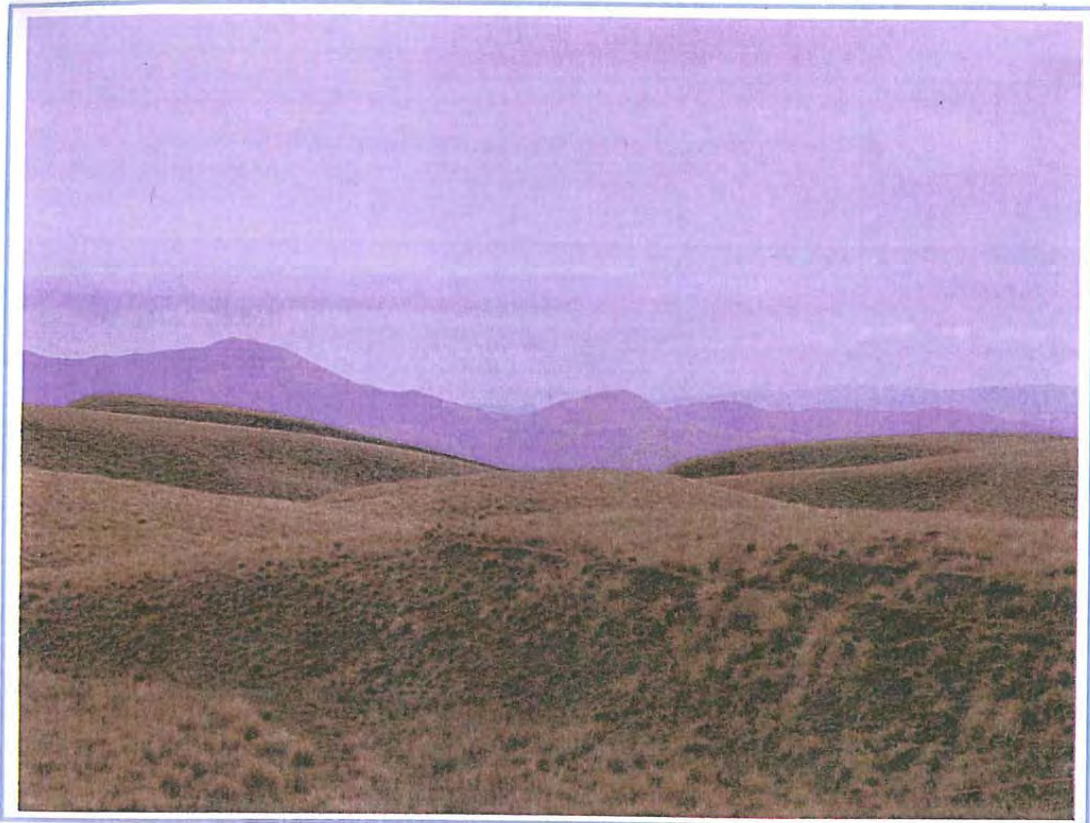


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1998**

PART 1

INTRODUCTION

1.1 Background

The lessee of the Castle Dent Pastoral Lease (the lease) has applied to the Commissioner of Crown Lands for a review of the property's pastoral lease tenure.

Castle Dent Pastoral Lease is leased by Castle Dent Limited. The 4172 ha property comprises of two blocks separated by approximately 3 km by land of different tenure; the Home Block (1550 ha) and the less intensively farmed Run Block (2622 ha). The Home Block covers an elevation range from 125m asl. To 500m asl., with a significant area below 300m asl. The Run Block lies over an elevation range of 480m asl. – 972m asl. And much is over 750m asl. The homestead is located approximately 6 km from Lawrence, on the southern boundary of the Home Block.

1.2 Ecological Setting

The lease is within Otago's eastern uplands and straddles two ecological districts, both of which are in the Lawrence Ecological Region. The Run Block lies on the south western boundary of the Waipori Ecological District (ED), the Home Block lies on the northern boundary of the Lawrence ED.

The Waipori ED is approximately 192,000 ha and includes the peaty uplands of Lammerlaw and Lammermoor Ranges and the surrounding hill country and Lake Mahinerangi. It was surveyed as part of the Protected Natural Areas Programme (PNAP) in the summers of 1990/91 and 1991/92 (Carter, 1994). An area partially within the lease was identified as a Recommended Area for Protection (RAP). This area, RAP 3: Lammerlaw Tops is 3700 ha of predominantly narrow-leaved snow tussock (*Chionochloa rigida*) and associated inter-tussock communities. The relevant extract from the Waipori PNA survey is attached as Appendix 1.

The 927 ha of RAP 3: Lammerlaw Tops within the lease was surrendered from the lease in 1995 and has since been administered by the Department of Conservation (DOC). It now forms part of the Te Papanui Conservation Park, a 20,882 ha area administered by DOC pursuant to section 19 of the Conservation Act 1987.

The Lawrence ED covers approximately 97,500 ha and forms catchments for the Clutha, Tuapeka and Waitahuna Rivers. It is predominantly developed, low, rolling, dissected hill country and has not been surveyed under the PNA programme. Remaining indigenous vegetation is mainly fire induced tussockland, scattered areas of scrub and small forest remnants. Semi-intensive sheep and cattle farming occur in the lower parts of the district, while exotic forest plantations occupy much of hilly country throughout the ED.

There are marginal strips along the Tuapeka River, and a section of Bowlers Creek, which form the eastern and southern boundaries of the Home Block respectively (refer Map 4.2.1). The western boundary of the Home Block adjoins two areas of scenic reserve, administered by DOC pursuant to section 19 of the Reserves Act 1977 and referred to in the Otago Conservation Management Strategy (Otago CMS) as “G44 153- Bowlers Creek Scenic Reserve”. Within the Home Block there is also a small area of Crown land allocated to DOC pursuant to section 62 of the Conservation Act 1987, identified in the Otago CMS as “G44 137- Castle Dent”.

There is a marginal strip along the Beaumont River (which forms the western boundary of the Run Block). The block’s entire northern and eastern boundaries adjoin the Te Papanui Conservation Park. The southern boundary partially adjoins an area of land administered by DOC pursuant to section 62 of the Conservation Act 1987, referred to in the Otago CMS as “H44 015- Glendhu Tussock Reserve”.

The tenure review inspection of the lease was conducted by a multi-disciplinary team of 7 people from the 3-5 December 2002.

PART 2

INHERENT VALUES: DESCRIPTION OF CONSERVATION RESOURCES AND ASSESSMENT OF SIGNIFICANCE

2.1 Landscape

Methodology:

Four landscape units (LU’s) have been identified on the lease (refer Map 4.2.2) with boundaries being defined principally by changes in aspect and land cover. These are:

1. Top of the Run Block (LU1)
2. Bottom of the Run Block (LU 2)
3. Beaumont River Faces (LU 3)
4. The Home Block (LU 4)

Each landscape unit is defined, and a description of landscape character in terms of landform, land cover and land use is given. An assessment of landscape values is made using the following criteria.

- Naturalness –the level of naturalness of vegetation, and extent of human intervention.
- Legibility –the clarity of formative processes and how striking these physical processes are.
- Aesthetic values – these include the concepts of memorability and naturalness. Aesthetic factors which can make a particular landscape vivid include simplicity in landform, muted colours and fine textured ground cover.

A description of visual values is given and an assessment of each landscape unit's vulnerability to change is made.

2.1.1 (LU 1)- Top of the Run Block

Description:

This unit encompasses the top portion of the expansive plateau rise which extends out from the southern end of the Lammerlaw Range. These rangelands abut the Lammermoors and combine to form a distinctive high altitude tableland typified by smoothly curved topography and an intricate drainage pattern known as dendritic, that resembles the branch pattern of a tree.

The unit is bounded in the north and east by the Te Papanui Conservation Park, while its western limit is the Beaumont River. The southern boundary is less definitive but generally follows a change in the drainage pattern that occurs close to spot height 778m.asl. Above this spot height the watercourses tend to be more superimposed over the ground and follow an intricate tracery.

The landform is unvarying and is characterised by wide crested ridgelines that tend to have a steeper eastern face that tilts by the way of a back slope towards the west. The plateau rise gradually falls towards the south, with the overall altitudinal range being just over 200m.

Similar to the landform, the vegetative cover is relatively homogenous with narrow-leaved snow tussock being the dominant species, while the inter-tussock mix comprises of prostrate snowberry and a mixture of native herbs. Finger bogs are the common origin of the numerous watercourses. Weed species are notably absent.

Landscape Values:

The outstanding natural landscape values of this landscape unit are attributable to the simplicity of the tall grasslands being overlaid on a subdued even landform. In aesthetic terms, the unit conveys a strong sense of coherence due to the fine texture and near monochromatic tonal range of the tall grasslands. Furthermore, this unit forms an integral component of a more expansive tall grassland landscape that extends over the whole of the Lammerlaws, with the distinctive features of these grasslands being their naturalness, intactness and boundless qualities. The whole unit makes an important contribution to a quintessential Otago high country landscape.

Visual Values:

The visual value is moderate owing to the subdued nature of the topography and lack of grade.

Potential Vulnerability to Change:

The landscape unit's natural characteristics are highly sensitive to change, with the major threats being:

- Decline in the stature and density of the snow tussock through concentrated grazing and burning.
- Further subdivision fencing, which would lead to artificial fragmentation of the existing even snow tussock cover.
- Uncontrolled Off Road Vehicle's (ORVs), especially through the fragile bogs and on visible faces.
- Wind distributed wilding pines.
- Afforestation.
- Dispersal of further gorse by stock.
- Further earth disturbances, which might allow opportunist species such as hawkweed too establish.
- Unsympathetic siting, colour and finishes to "built" elements.

2.1.2 (LU 2) Bottom of the Run Block

Description:

This unit forms the lower portion of the plateau rise that extends out from the southern end of the Lammerlaws. The unit's northern boundary follows an approximate line across from spot height 778m.asl. Te Papanui Conservation Park defines the eastern boundary while the western limit follows the unmetalled public track that leads to the southern end of the Lammerlaws. The south eastern corner adjoins the Glendhu Tussock Reserve.

The subtle differences in the topography compared with LU1 include both the deeper indentations of the complex gully system and the crests of the ridgelines having a more convex trait. Occasionally the side slopes of these rounded landforms are etched by depressions containing localized finger bogs. The drainage pattern is less intricate than in the upper portion of the plateau rise with the larger watercourses linking up to form one of the main tributaries of the Waipori River. The gradient over this unit is shallow, descending approximately 150m between the high and low points. upper high point and where the property bounds the conservation land in the south.

Compared with LU 1, the vegetation on LU 2 is more influenced by aspect and pastoral management, with the sward of narrow-leaved snow tussock being less dense and lower in stature and the inter-tussock composition containing a greater content of introduced grasses, which are most evident on stock campsites and along the unmetalled track margins. There is a short row of pine trees surrounding the stockyards, however, this land unit is "clean" of wind-distributed wilding pines.

Numerous water races sidle around the side slopes. These were constructed to collect water for use in the historic Waipori diggings.

Landscape Values:

The natural landscape values are high and are complementary both in landform and land cover to LU 1. Although the tall grasslands have been slightly modified, by farming the unit still retains an overall appearance of being intact. A distinctive

feature is the unvarying qualities of the tall grasslands which collectively with tussock grasslands of similar condition on the adjoining properties, create an unending tract of tall grasslands. The modifications associated with the farming operation are localized and are fully anticipated within this pastoral context.

Visual Values:

The visual value is relatively lower than LU1 owing to the harsh line where the tall grasslands change into the improved pasture west of the unmetalled track. This results in visitors viewing “across” the tussock grasslands rather than “through” them.

Potential Vulnerability to Change:

This unit is highly sensitive to change, with threats including:

- Further subdivision fencing, which would lead to artificial fragmentation of the existing even snow tussock cover.
- Uncontrolled ORV's, especially through the fragile bogs and visible faces.
- Wind distributed wilding pines.
- Afforestation.
- Dispersal of further gorse by stock.
- Further earth disturbances, which would allow opportunist species such as hawkweed to establish.
- Unsympathetic siting, colour and finishes to “built” elements.

2.1.3 (LU 3) Beaumont River Faces

Description:

This unit incorporates the rounded crest of the ridge that forms the watershed between the Beaumont and Waipori Rivers and the relatively steep-sided slopes overlooking the Beaumont River. The unit's northern boundary follows the access track to the remains of several derelict huts while the Beaumont River forms the western boundary. The southern portion of the unit is a block of hill country that falls moderately towards the west. The side slopes are regularly dissected by narrow gullies that tend to steepen before reaching the Beaumont River.

The Beaumont River winds around a series of interlocking steep spurs, with a section of the river being contained within rocky walls for approximately 2 km. This gorge is characterised by a sequence of plunge pools and reaches of white water. Many of the side streams flowing into the Beaumont River have been captured by a substantial water race that redirects the water towards the Waipori River.

Vegetation is strongly dictated by aspect and farm management. The rounded crest of the ridgeline has been extensively converted into pasture, and snow tussock growth being checked by periodic burning. This tract of improved pasture follows a wide strip of land between the water race and the unmetalled track in the east. The

numerous bogs and wet flushes have been affected by periodic burning and stock trampling.

Below the watercourse the mid slopes are clad in modified tall tussock, while the lower slopes are covered in a mosaic of tall tussock and mixed shrublands. The shrublands within the enclosed gorge are relatively intact as they have been sheltered from burning. Species within these shrublands include *Coprosma* spps, kanuka, manuka, mountain flax, toetoe, and the occasional broadleaf.

The native vegetation communities in the unit's southern portion are fragmented. The sunny slopes have been converted into pasture, while the darker slopes contain only remnants of manuka that appear to be burnt on a regular basis.

Landscape Values:

The gorge section of the Beaumont River has moderately-high landscape values, attributable to the wild and scenic qualities associated with reaches of white water tumbling over and around large rocks. In aesthetic terms, the enclosed gorge is a vivid feature as it contrasts markedly with the uniformity and openness of the tall grasslands.

Visual Values:

The visual values are moderate due both to part of it being enclosed within a river gorge and the lack of visual accessibility from any public vantage points.

Potential Vulnerability to Change:

This unit is moderately sensitive to change, with threats including:

- Depletion and decline of native shrublands.
- Decline in ecological health of tall grasslands.
- Dispersal of further gorse by stock.
- Wind distribution of wilding pines.
- An increase in water abstraction affecting the visual quality of the gorge.

2.1.4 (LU 4) Home Block

Description:

The Home Block has been assessed as one landscape unit owing to the repetitive nature of the landform, dominated by a complexity of ridgelines separated by irregular-shaped gullies. Rounded crests typify the ridgelines with the ridges gradually descending in altitude towards the southern end of the hill block. This unit contains more exposed rock outcrops than the units within the Home Block.

The irregular-shaped gullies penetrate into the main ridgeline that separates Bowlers Creek from the Young Valley Creek and the Tuapeka River. There are a number of smaller tributaries feeding into the main watercourses that wind around the small side

spurs jutting out from the slopes. The side slopes of the gullies are lightly undulating, with the gradient increasing markedly along the lower side slopes where there is the occasional rapid drop off to the valley floor. The topography of the Young Valley is different to the surrounding broken hill country as the valley has a wide concave cross section.

The composition of the vegetation can be divided into two separate categories. Firstly there is the developed pasture that is well maintained by regular aerial oversowing and top dressing (AOS&TD). Secondly there is native shrublands dominated by kanuka/manuka.

The composition of the kanuka/manuka shrublands depends on aspect and disturbance history. On sites protected from previous fires, the kanuka/manuka shrublands are relatively diverse with a strong representation of other native woody species including widely distributed cabbage trees, *Pittosporum* spp, marbleleaf, *Coprosma* spp, broadleaf and red matipo. Within the centre of the more-established shrubland communities occasional pockets of silver beech occur, whilst around the fringes of the older shrublands occasional single or small groves of southern kowhai are present.

In areas of rapidly regenerating kanuka/manuka the native flora is less diverse with large patches of bracken fern being a common ground cover. Within such areas the vegetative cover is going through a dynamic phase and opportunist weed species such as Himalayan honeysuckle, elderberry and gorse are common. Wilding pines are also wide spread through the kanuka/manuka shrublands and some of these are at a cone-bearing stage.

The hill country has been subdivided into several large grazing blocks that are accessed by the relatively well-maintained Young and Medwin Roads which approximate the main ridge line.

Landscape Values:

Parts of this unit convey significant landscape values that are attributable to:

- The irregular pattern of the kanuka/manuka shrublands contrasting with the open pasture.
- The coarse texture of the kanuka/manuka shrublands that vary from the fine texture of the surrounding pasture.
- The repetitive nature of the kanuka/manuka shrublands, which help to generate a sense of local identity.
- The striking contrast in colour between the olive/grey of the kanuka/manuka shrublands and the light green of the surrounding pasture.

In total these qualities create a rural landscape that has distinctive “parkland” characteristics primarily owing to the edge of the shrublands being well defined by cultivated farmland. From a natural landscape perspective many of the larger intact shrublands form an altitudinal gradient that extends from close to the crest of the main ridgeline down to the valley floors.

Visual Values:

The visual resource value of the kanuka shrublands can only be appreciated from localized viewing points owing to the deep folds in the topography. A series of small remnants are visually accessible for a stretch of approximately 1km along State Highway 8. However, due to the fragmented nature of these shrublands their visual/scenic value is limited.

Potential Vulnerability to Change:

The potential changes to the inherent landscape characteristics of this unit are:

- Increased edge effect by creating more convoluted margins in the shrublands.
- Further encroachment into the shrublands' margins by weed species such as gorse and Himalayan honeysuckle.
- Further fragmentation of the existing intact shrublands.
- Further spread of wilding pines.
- Introduction of large-scale plantation forestry which would have an adverse effect on the existing parkland-like qualities.

2.1.5 Significance of the Landscape

Much of the pastoral lease has moderate to high landscape values. These values are:

- Significant areas of snow tussockland in the Run Block
- The ability to amalgamate these areas into the Te Papanui Conservation Park, thereby preserving the tall grasslands' special intrinsic values of having both indefinable boundaries and a sense of remoteness.
- The wild and scenic qualities of the Beaumont River gorge.
- Significant areas of regenerating silver beech and kanuka/manuka forest and shrublands in the Home Block.

2.2 Landforms, Geology and Soils

a) Landforms and Geology

The Run Block lies on a broad, rolling spur of gentle relief projecting from the Lammerlaw Range. The range and spur are part of the Otago peneplain, a late Cretaceous to early Cenozoic erosion surface blanketed with up to 5 m depth of loess deposited during the Quaternary, smoothing the older landscape (Bishop and Turnbull, 1996). The surface is dissected by the heads of small streams, with the effect being exaggerated by the instability of the loess soils on steeper slopes. Rock outcrops are rare on the spur while small bare rock bluffs occur on the sides of the deeper gullies.

A branch of the northern spur continues through the Home Block and is presumed also to be part of the Otago peneplain, but here it is confined between the deeply

incised Tuapeka River and Bowlers Creek catchments. This spur is more heavily dissected by large gullies that fall steeply to these base levels.

The geology underlying the lease is Haast Schist of the Caples Group (Caples Terrane), which increases in metamorphic grade from south to north (Marshall, 1918; Bishop and Turnbull, 1996). Much of the Home Block lies on sandstone/mudstone semi-schist, grading to schist at its northern end (Haast Schist grades IIB and IIIA). The Run Block lies on quartzofeldspathic schist grading from IIIA in the south to IIB in the northeastern third of the block with some greywacke conglomerate, breccia and gold bearing schist (Bishop and Turnbull, 1996).

The major structural features in the vicinity of the lease is the the Tuapeka fault zone, which lies just east of the Home Block and an anticline fold that runs the length of the Lammerlaw Range, to the north of the Run Block.

b) Soils

The parent material of loess and schist colluvium form predominantly loess and loam soils, the thickness of which is largely slope-dependent, hence there is a marked variation of soil depth. The difference in rainfall between the Run and Home blocks has a marked effect on the soils, as in lower rainfall areas there are predominantly pale-coloured moderately leached compact subsoils, with poor winter drainage on easier slopes, while in the higher rainfall areas soils are strongly leached, with more friable, better drained subsoils, being upland podzolised yellow-brown earths and podzols (Maungataui Lammerlaw).

The majority of the Run Block is within Gopreservation site no. 356 Lammerlaws/Lammermoors, which is characterised by rolling hillslopes and steep gullies. This site contains large areas of soils under unmodified vegetation and that have formed under sequences of climate and vegetation. These soils have been characterised in detail (Arand *et al*, 1991. See Appendix 2 and Map 4.2.3).

2.2.3 Significance of Landforms, Geology and Soils

The soils in the Run Block have been recognised by Arand *et al* (1991) as being nationally important. The factors that contribute to the soils significance are:

- Large areas of soils under unmodified vegetation.
- Soils under sequences of climate and vegetation.
- Soils have been characterised in detail.

2.3 Climate

The southern boundary of the Home Block and the northern boundary of the Run Block receive on average approximately 600mm p.a. and 1000mm p.a. of rainfall respectively.

Within the Run Block there is a summer maximum of rainfall and lesser peak in winter. Snow can fall in any month and is the main form of precipitation during

winter. Due to the rolling terrain and exposure from all directions, the area is windy, with the mean wind speed being 20km/hr. Fog and cloud is common between 600 m asl. and 800 m asl.

The Home Block has a cool, moist climate with average rainfall at the homestead being between 600-800mm p.a. Summer droughts are uncommon and snow may lie for a few weeks during winter at higher altitudes.

2.4 Vegetation

The following four land units are identified for the purpose of describing the vegetation.

- Run Block- Waipori River Catchment
- Run Block- Beaumont River Catchment
- Northern Home Block
- Southern Home Block

The extent of each unit is described on map 4.2.3 and the list of vascular plants recorded during the survey is attached as Appendix 2.

2.4.1 Run Block- Waipori River Catchment

Narrow-leaved snow tussock (*Chionochloa rigida*) is the dominant species of the remarkably uniform grassland that covers most of this unit. Snow tussock cover varies from 20-50% on sunny faces at low elevation to nearly 100% at high elevation. Intertussock vegetation is mainly the exotic grasses sweet vernal (*Anthoxanthus odoratum*) and browntop (*Agrostis capillaris*), but catsear (*Hypochaeris radicata*) is prominent throughout, along with a suite of small native species that include patotara (*Leucopogon fraseri*), *Pernettya macrostigma*, *Raoulia subsericea*, *Kelleria dieffenbachii*, *Lycopodium fastigiatum*, and, mainly at low elevation, golden Spaniard.

Manuka (*Leptospermum scoparium*) predominates in the lowest elevation gullies of this land unit, becoming increasingly sparse and smaller-statured with elevation to its limit at about 800m asl. in tussock grassland. Inaka (*Dracophyllum longifolium*) and *Hebe odora* are conspicuous components of shrubland with manuka at higher elevations. Scattered stands of silver beech (*Nothofagus menziesii*) also occur on the banks of the Waipori River.

Most headwaters support small bogs with variable species composition including *Sphagnum* mosses, *Dracophyllum prostratum*, turpentine shrub (*D. uniflorum*), sundew (*Drosera arcturi*), rautahi, and occasional shrubs of bog pine (*Halocarpus bidwillii*). Snow tussock and most of the small herbaceous and sub-shrub species of the surrounding tussock grassland also occur, at least at the fringes, in bogs. Small tarns are present in several of these wetlands.

2.4.2 Run Block- Beaumont River Catchment

The face between the axial road and the Beaumont River, north of the huts centred on grid reference G44 496904, is dominated at higher altitudes by snow tussock and at lower altitudes by shrubland.

Within the tussocklands, tussock density is variable but of tall stature. Intertussock vegetation is similar in composition and abundance to that in the adjacent land unit. Bogs are less abundant as the catchments are of a steeper profile than the adjacent unit. The bogs species composition is also similar to that in the adjacent land unit.

The shrubland in the Beaumont River catchment (centred on grid reference G44 493890) is characterised by manuka, some kanuka (*Kunzea ericoides*) up to 500m asl., *Olearia bullata*, tauhinu (*Ozothamnus leptophyllus*), inaka, *Coprosma rugosa*, *C. rigida*, native broom (*Carmichaelia petriei*), mountain flax (*Phormium cookianum*), bracken, and prickly shield fern (*Polystichum vestitum*). Manuka grades into the tussock grasslands, becoming increasingly sparse and smaller-statured with elevation to its limit at about 800 m asl.

Between the main axial track and the large water race in the western part of the upper block, snow tussock grassland with scattered manuka has been burnt and grazed to the extent that tussocks are sparse and very small and the vegetation is dominated by exotic pasture species. Nevertheless, this area has potential to recover in the absence of fire and grazing.

The area at the south-western end of this land unit contains predominantly introduced pasture species, burnt and cleared shrubland and scattered small stands of kanuka and manuka.

2.4.3 Northern Home Block

This unit is the portion of the Home Block north of two un-named streams centred on grid references G44 4877775 and 480776 respectively.

Stands of silver beech are located in tributary gullies and the steep-sided main courses of Youngs Valley, the Tuapeka River, and Bowlers Creek. The silver beech trees, up to 20m tall and 0.5m diameter at breast height, form a canopy over a sparse understorey that includes broadleaved small trees such as lancewood (*Pseudopanax crassifolius*), broadleaf (*Griselinia littoralis*) and marble leaf (*Carpodetus serratus*). *Coprosma* species, *Fuchsia colensoi*, and a few other shrub species are also present as a sparse shrub layer. Ground cover is mostly beech litter, with scattered ferns including *Blechnum montanum*, *B. fluviatile*, and prickly shield fern.

Surrounding the beech stands and extending up most steep gully sides and faces are stands of kanuka up to 15 m tall, with usually less manuka, forming a more or less continuous canopy. Broadleaf, marble leaf, kowhai (*Sophora microphylla*) and cabbage tree (*Cordyline australis*) are occasionally conspicuous, especially at lower elevations. A Halls totara (*Podocarpus hallii*) was recorded on a face centred on grid reference G44 49478, above the Tuapeka River.

There is usually little or no understorey, except for *Coprosma* species where broadleaved trees dominate the canopy in gully bottoms. Ground vegetation comprises mainly sparse pasture species, bracken (*Pteridium esculentum*), and prickly shield fern. Kanuka is more or less absent above about 500 m asl. and narrow-leaved snow tussock is present as relict plants in pasture surrounding areas of kanuka/manuka shrubland.

An extensive wetland area occupies much of the wide floor of Youngs Valley. Rautahi (*Carex coriacea*) covers seepage areas, whereas soft rush (*Juncus effusus*) and less *J. distegus* form clumps on drier ground, usually in association with silver tussock (*Poa cita*), some hard tussock (*Festuca novae-zelandiae*), lotus (*Lotus pedunculatus*) and common pasture species. Sweet grass (*Glyceria* sp.) is abundant at streamsides.

2.4.4 Southern Home Block

This unit has been extensively developed and the exotic dominated pasture regularly ASTOD. Indigenous character is therefore restricted to bracken fern and kanuka/manuka dominated shrub in the gully heads and faces above the Tuapeka River between spot heights 363 m asl. and 287 m asl. The kanuka/manuka shrublands on the shady steeper sections of these faces are relatively intact and regenerating strongly. The species composition of these areas is similar to other kanuka/manuka stands on the Home Block, with cabbage trees being more prevalent.

2.4.5 Problem Plants

Run Block

Problem plants are remarkably rare. Three *Hieracium* species (*H. pilosella*, *H. praealtum*, *H. lepidulum*) occur only as scattered plants at the lowest elevations, where they pose little threat to natural values in the dense tussock-dominated grassland. At low elevations there are scattered patches of gorse (*Ulex europeaeus*), especially along the sides of the Beaumont and Waipori Rivers, and a few scattered wilding conifers. Both gorse and wilding conifers pose a considerable threat to the natural values of tussock grassland. Spanish heath (*Erica lusitanica*) was not recorded but is present nearby and should be prevented from establishing in the tussock grasslands, where it would be a significant threat to natural values.

Home Block

Gorse is frequent along the margins of shrubland and forest, while broom (*Cytisus scoparius*) is less prevalent. Himalayan honeysuckle (*Leycesteria formosa*) is aggressively invading low vegetation of bracken and prickly shield fern. None of these species is considered a significant threat to natural values of shrubland and forest within this block. Spanish heath was also recorded amongst sparse shrubland on the Home Block's westernmost spur. It is likely to spread along tracks and forest edges, but will probably be overtopped and displaced as the native vegetation becomes denser and taller.

Conifers are widespread through the kanuka/manuka shrublands with some of the pines being at cone-bearing stage. Ongoing removal and monitoring of pines will be required, given the ongoing invasion of wildings from the exotic timber plantations on both the eastern and western boundaries.

2.4.6 Significance of Vegetation

The ecological values on the lease are outlined in Map 4.2.3. The significance of the four major plant communities and associated vegetation sequences are described below.

Forest and shrubland

Forest, in particular silver beech, covered most of the Lammerlaw Ecological Region (ER) below treeline before the arrival of Polynesian people some 750 years ago. Evidence for the area's former forest is found as soil charcoal, surface features such as forest dimples, subfossil logs of Hall's totara and the relict stands of forest.

The majority of this vegetation has been removed from the Lawrence ER, and its re-establishment is prevented through the ongoing destruction of successional shrublands. The shrubland and forest that remain on the lease therefore have very high ecological significance as being amongst the few surviving examples of the pre-Polynesian and pre-European woody vegetation of the ER.

Tussock grassland

The Run Block tussock grassland is similar to that of the adjacent Te Papanui Conservation Park, and typical of tussock grassland that covered the upper elevations of the Lammerlaw ER before the arrival of European settlers. Most tussock grassland at these elevations on the Otago plateau has been converted to farmland or exotic forest plantation, and that which remains here represents one of very few extensive montane tussock grassland landscapes surviving in Otago. Tussock grassland on the lease is a conspicuous component of this landscape, not least because it fills a prominent gap in the grassland protected in the adjacent Conservation Park, and is in very good condition. It is of considerable ecological significance.

Wetland

The Youngs Valley wetland is significant due to its size (approximately 10 ha), its linkages to shrubland and forest ecosystems and the scarcity of remaining low elevation wetlands in the Lawrence ED. It has high potential for restoration

Bogs

The upland bogs on the Run Block are typical of others elsewhere in the Waipori ED as described by Carter (1993) and Otago Regional Council (1998). These have excellent water holding potential and contribute to the steady stream flow of the associated catchments. Some also are refugia for bog pine, a species much reduced in the Waipori ED.

Sequences

Three sequences are significant, the first being the riparian vegetation along Bowlers Creek, the second being similar riparian vegetation along the Tuapeka River, the third being shrublands in both the Beaumont and Waipori Rivers into the adjoining tussock grasslands.

The Bowlers Creek sequence spans 150 m. to 400 m asl. at the northern boundary of the lease, where it abuts an existing scenic reserve, thereby giving a rise to a potential overall sequence from 150 m to 600 m. This sequence forms a wildlife corridor and protects the top 6km of the 10km Bowlers Creek catchment.

The Tuapeka River sequence also spans 150 m asl. to 400 m asl. and complements areas of similar vegetation on the Tuapeka's eastern bank. Under the current land tenure these are protected by the Forest Accord, thereby forming a wild life corridor and protecting a portion of the Tuapeka River catchment.

The third sequence comprises of regenerating forest and shrublands which grade into tussock grasslands and associated high elevation vegetation of the summit of the Lammerlaw Range. This sequence allows for the altitudinal migration of both flora and fauna.

Threatened or significant species

Olearia bullata and *Thelymitra formosa* are listed as "sparse" by Hitchmough (2002).

2.5 Fauna

2.5.1 Invertebrate Fauna

Weather during the survey was generally fine and mild with cool evenings but increasing cloud and some thunderstorms occurred in the north on the final day. Invertebrates were mostly collected by hand. In addition, night time ultraviolet light – wet traps were placed for one evening at a site on the upper Waipori Rivers, at the south eastern edge of the northern block (H44 522867). Appendix 4 contains a species list of the invertebrates collected on the lease.

Run Block fauna

Of the invertebrates recorded, a significant proportion of the moths, a few of the butterflies and three species of grasshopper are associated with tall tussock grassland. A good mixture of speargrass and herbs, with shrub species on steeper ground and in gullies, enrich the grassland faunal habitats. This shows in the presence of species such as the widespread speargrass moth *Graphania nullifera*, and the *Hebe* feeding torticid *Harmologa pontifical* which is rarely found in Otago. In additions, four moth species associated with rock talus, and/or exposed rock bluffs were noted. These included the geometrid *Helastia plumbea*, a feeder on mosses on the rock faces, which is uncommonly found this far east. Many of these insects are representative of lower South Island grassland/shrubland that retains good natural character. The diversity

associated with this block is attested to by the presence of local and uncommon species such as the geometrids *Graphania sequens*, *Graphania* n.sp.cf. *insignis* (an eastern Otago endemic) and the crambid *Scoparia trapezophora*. Two moth species have type localities associated with the block: *Aletia sollemnis* (Meyrick 1914) (type locality upper Waipori River; a local but sometimes common species, also found during this survey) and *Orocrambus geminus* (Patrick 1991) (type locality Lammermoor Range, associated with snowgrass, not found during this survey).

Characteristic of extensive wet flush areas along streams and in the heads of gullies are moths *Orocrambus aethonellus* and *Eudonia octophora*. The cranefly *zealandotipula novarae* (seasonally very abundant), giant darning needle dragonfly *Uropetala chiltoni* and stonefly *Zealandobius kuscheli* (endemic to east Otago schist terrain) are also indicative of the natural character of flush habitats. Suggesting the complexity of wetlands, with some areas of increased fertility or surface water flooding, are noctuid moths *Graphania fenwicki* (larvae on herbs in damp grassland; endemic to East Otago) and *Tmetolophota arotis* (larvae feed on toetoe). The occurrence of *G. fenwicki* is of some interest in that Patrick *et al.* (1993) found it only of Maungatua on the eastern edge of Waipori ED during their invertebrate survey of this ED. They considered it to be a species of “extreme south east of the South Island”.

On the north-western edge of the block a riparian zone between the Beaumont River and the power company water race holds a mosaic of the habitats mentioned previously and also protects instream values.

Home Block fauna

Shrubland and forest vegetation signal the potential for invertebrate diversity and the significant inherent value of these ecosystems. Invertebrate habitat diversity includes deep and often rocky gorges with silver beech forest refugia and a diversity of herbs and shrubs. Also lianes, such as *Muehlenbeckia australis*, which is rich in insect herbivores including the Copper butterfly (*Antipodalycaena* n.sp.). The large stands of tall kanuka and small groups of kowhai, both with seasonally abundant flower resources, also contribute to the diversity of the invertebrate habitat. Beech forest fragments retain many typical and viable invertebrate associations for the region, indicated in part by the presence of large mygalomorph spiders. The viability of these fragments is particularly significant for the Lawrence ED where beech ecosystems have almost disappeared.

South of the Young Valley/Tuapeka River confluence lie some east to south-facing scrub-covered slopes below spot heights 363 m asl. and 348 m asl. Mainly kanuka at the top, these faces appeared to have more diverse vegetation towards the valley floors but they were not investigated in any details. They also had more prominent rock outcrops than was noted elsewhere on the lease, with some talus accumulation. These rocky habitats can have considerable importance as invertebrate habitat, but there was insufficient time to investigate them.

There are significant riparian and floodway communities where shrubs shelter stream insects, bind soils, and also provide stream shade and coarse organic material. In this sense the shrublands are buffering stream ecosystems that are otherwise exposed to sedimentation (pulsed from forestry blocks and including much particulate matter

from intense pastoral land use). Up to 5 kilometres of riparian vegetation along Bowlers Creek and a similar length along Tuapeka River at low altitude (120-370 m asl.) provide, for the Lawrence ED, significant faunal habitat. The presence of seepage zones and small water courses within these riparian zones add further diversity. These riparian zones also provide corridors linking with similar habitat which has riparian setbacks in both the neighbouring conservation land and the Glendhu Forest.

The extensive wetland in Youngs Valley is a modified ecosystem. Widely represented insects (such as a red coat damsel *Xanthicnemis zealandicus* and the stonefly *zelandobius uniramous*) are present. Botanical diversity at this site is limited, which in turn limits the diversity of plant-associated insects, but there is considerable restoration potential.

2.5.1.1 Significance of the Invertebrate Fauna

Patrick *et al.* (1993) indicate that the upper Waipori in the region of the Run Block is a significant area for conservation of a very complex upland invertebrate fauna including many significant regionally-endemic elements. This diversity continues into the Run Block as borne out by the results of this survey.

Rare and local species found include the noctuid moths *Graphania sequens*, *G fenwicki* and *Graphania* n.sp., cf. *insignis* and the crambid beetle *Scoparia trapezophora*. Other notable records are the geometrid *Helastia plumbea*, considered to be uncommon in the east, and the tortricid *Harmologa pontifical* which is known from few Otago localities. Overall the Run Block insect assemblage indicates an invertebrate fauna of high diversity from bog, grassland, shrubland and rockfaces in near natural condition. There is a strong southern New Zealand element in the fauna.

Although the values of the Home Block are more dispersed, the low altitude (130-370 m asl.) wooded communities associated with gullies and extensive riparian zones of Bowlers Creek and Tuapeka River are significant for the Lawrence ED, as within the ED ecosystems such as the beech forest fragments are scarce and few are protected. These remain viable for invertebrates and have strong regenerative potential if de-stocked, woody weeds controlled and given room for expansion. Retention of linkages with riparian corridors and other remnants would also improve conservation values.

The combination of the Home Block's faunal habitats, which includes tall shrubland, beech forest fragments, lianes, gorges, some rock bluffs and talus slopes is significant as it is representative of the Lawrence ED.

2.5.2 Herpetofauna

“Site locations of rare and endangered herpetofauna are recorded in the original report. Herpetofauna of this nature is at risk of illegal activities including damage and removal through unlawful interference and disturbance. Accordingly, information regarding the locations of any such herpetofauna has been deleted from this version of the report. The Department of Conservation has put in place mechanisms to ensure that such information can be released for genuine scientific and research purposes. Please contact the Department of Conservation directly to determine whether the information can be released.”

Habitats surveyed (all during the day) were tussock grasslands, rock outcrops, stream/gorge shrublands, beech remnants and manuka shrublands.

In a rock crevice one gecko dropping was found. Another solitary dropping, which was more consistent with those of skinks, was found on a stone near the edge of the rock outcrop. The gecko dropping was in size with those of *Hoplodactylus* sp. “Central Otago” (Hitchmough, unpub.), which has been recorded nearby at Beaumont and is widespread and common in the Clutha Valley.

Skinks, probably *Oligosoma maccanni*, were observed on a rock face adjacent to Bowlers Creek. Except for these locations no other evidence of lizards was found on the property.

It is possible, however, that the jewelled gecko (*Naultinus gemmeus*) has survived in forest remnants. This species is notoriously difficult to detect in inland Otago and the failure to find this species at Castle Dent cannot be taken as evidence for its absence.

2.5.2.1 Significance of Herpetofauna

The presence of lizard droppings and the sighting of skinks confirm that lizards are present at a couple of places on the lease. However, the lease contains no known significant herpetofauna values.

2.5.3 Avifauna

Table 1 lists bird species seen or heard on the lease. A possible additional species is brown creeper (*Mohua novaeseelandiae*), two of which were tentatively identified through binoculars in kanuka forest.

Table 1: Bird species recorded on the lease. Exotic species are denoted by an asterisk.

Species	Common name	Habitat
<i>Acanthisitta chloris</i>	Rifleman	Forest, shrubland
<i>Alauda arvensis</i> *	Skylark	Pasture, tussock grassland
<i>Anthornis melanura</i>	Bellbird	Forest, shrubland
<i>Anthus novaeseelandiae</i>	Pipit	Pasture, tussock grassland

<i>Carduelis flammea</i> *	Redpoll	Forest, shrubland, pasture
<i>Circus approximans</i>	Australasian harrier	Pasture, tussock grassland
<i>Emberiza citrinella</i> *	Yellowhammer	Forest, shrubland, pasture
<i>Fringilla coelebs</i> *	Chaffinch	Forest, shrubland, pasture
<i>Gerygone igata</i>	Grey warbler	Forest, shrubland
<i>Gymnorhina tibicen</i> *	Australian magpie	Pasture, tussock grassland
<i>Haematopus ostralegus</i>	Pied oystercatcher	Pasture, tussock grassland
<i>Sturnus vulgaris</i> *	Starling	Forest, shrubland, pasture
<i>Tadorna variegata</i>	Paradise shelduck	Pasture, tussock grassland
<i>Turdus merula</i> *	Blackbird	Forest, shrubland, pasture
<i>Vanellus miles</i>	Spur-winged plover	Pasture, tussock grassland

2.5.3.1 Significance of Avifauna

The most significant record is Rifleman, as the lease is at the edge of its distributional limit. (Bull *et al*, 1985). Rifleman were seen in beech/kanuka forest near Bowlers Creek.

2.5.4 Aquatic Fauna

There are no freshwater fish records for the lease registered on the National Institute of Water and Atmospheric Research Freshwater Fish Database. However, DOC has conducted previous surveys in adjacent areas outside the lease boundary, where dusky galaxiid (*Galaxias pullus*) and brown trout were recorded.

During the inspection, 11 sites were fished within the lease boundaries (refer to Appendix 5 for their location). Streams within the lease flow into the Clutha and the Waipori catchments.

Waipori Catchment

The lower Waipori sites contained brown trout, the upper sites contained only dusky galaxiid. Trout access to the upper sites must be somehow being prevented as dusky galaxiids have never been recorded co-existing with brown trout.

The main stem of the Waipori River contained low numbers of aquatic invertebrates, possible due to the lack of spaces in the substrate. However the species present suggests excellent water quality. The riparian margins were in the main in good condition with tussock dominating, which provide both excellent bank stability and fish cover.

Clutha Catchment

The power company water race, Beaumont River and Bowlers Creek were surveyed.

The water race is an open trench-like channel with no in-stream or bank cover, therefore providing little fish habitat. Koura and one small trout were found.

The Beaumont River was surveyed above the power company weir intake. The week prior to the inspection a flash flood turned over the stream bed and caused bank erosion. Both events had an adverse effect on the fish survey. One brown trout was observed while invertebrate numbers were very low with only one stonefly being

recorded. The stream bed was of bedrock/cobble/ coarse gravel. There was a lot of exposed bedrock but this could have been due to the recent flood.

Bowlers Creek

A site at the middle of the Home Block was surveyed. This site is lined by silver beech which totally enclosed the creek, creating an excellent riparian margin. Brown trout were recorded in low numbers. Water quality appeared to be high with unidentified species of stoneflies being present.

2.5.4.1 Significance of Aquatic Fauna

Dusky galaxias are ranked as a species in gradual decline (Hitchmough, 2002). It is confined to eastern Otago, primarily in Waipori River, from just below Mahinerangi Dam and upstream to upper headwaters; in upper tributaries of Tuapeka and Waitahuna Rivers and one tributary of the Taieri River. Distributional surveys are incomplete, but at present there are only twenty known populations. Eight of these populations are in the Waipori and Tuapeka catchment, in areas within first rotation forestry plantations. The impacts of logging on these populations is unknown, but are not expected to be beneficial. The largest populations exist in the upper Waipori River and a series of Waipori tributaries draining the Lammerlaw Ranges. As the presence or absence of Dusky galaxiids does seem to be controlled by the presence of competing brown trout, brook char (*Salvelinus fontinalis*) and koaro (*Galaxias brevipinnis*) the population on the lease is significant.

2.5.6 Problem Animals

Pig rooting was evident in scattered locations across much of the property, but damage to native vegetation is insignificant. Hares and rabbits are present, and fallow deer frequent the forest and shrubland. At the time of the survey, 1080 poison had been laid for possums, and little fresh possum sign was evident. Animal pests are having little effect on the native vegetation, suggesting that their numbers are low. Feral cats, ferrets, stoats, hedgehogs, and rats are likely to be present throughout the lease, and undoubtedly reduce populations of native birds, reptiles, and invertebrates. The boundary between the Run Block and the property immediately to the west, Beaumont Station, is not stock proof. Cattle from Beaumont Station frequent the Run Block, and have been found in the Glendhu Tussock Reserve.

2.6 Historic

2.6.1 Maori Cultural Values

There are no known Maori sites recorded on the lease.

2.6.2 Heritage Values

There are no known heritage sites recorded on the lease.

2.7 Public Recreation

2.7.1 Physical Characteristics

In 1992 DOC compiled a Recreation Opportunity Spectrum (ROS) for the entire Otago Conservancy whereby all areas regardless of land tenure, were classified and mapped according to setting, activity and recreational experience characteristics.

The top third of the Run Block is zoned 'Winter Backcountry Walk In', which is characterised by "a feeling of relative remoteness from populated areas". The highly natural setting is a valued part of the experience and may be associated with motivations of "escape from town", education, exercise, and/or a sense of being close to nature. Such walk-in areas are described as being "although relatively close to visitor facility developments, access to these areas is only possible on foot and is often associated with tramping tracks or routes".

The middle third of the Run Block is zoned 'Backcountry 4WD In' which is characterised by "a feeling of relative remoteness from populated areas". The highly natural setting is a valued part of the experience and may be associated with motivations of "escape from town", education and nature appreciation. Four wheel drive vehicles are desirable to give access to high country tussock grasslands and block mountains and more rugged remote areas such as the Lammerlaws and Lammermoors to the north.

The remainder of the pastoral lease is zoned "rura"1. This recreational opportunity is characterised by a feeling of being away from urban areas, but in a strongly human-modified setting. Focus of activity in this class is likely to be on companionship with family and friends and relaxation. Common recreation activities would be driving for pleasure, horse riding, walking and picnicking. Duration of trips is usually less than a day.

In 1988, Federated Mountain Clubs compiled an outdoor recreation plan for Central Otago's block mountains (Mason, 1988). The eastern Lammerlaws are noted as offering a natural experience in summer and a remote experience in the winter, as the area holds particular attractions for recreational naturalists and for those wishing to disappear from the sights and sounds of civilisation.

2.7.2 Legal Access

a) Roads

Gardiners Track (a rough formed track) provides 4WD access to and through the Run Block and coincides in parts with the legal road. Gardiners Track branches off Munro Road near Gabriels Gully, winds through the Glendhu Forest and traverse the length of the Run Block.

Two other legal roads bifurcate off Gardiners track, the first providing solely legal along the Run Blocks south eastern boundary to the Waipori River, the second

approximates a farm track and provides access to Beaumont River. It is unclear who (if anyone) maintains Gardiners Track and Medwins/Youngs Roads.

Medwin and Youngs Roads, in combination, provide legal and practical 4WD access along the north to south running ridge that bisects the Home Block. Legal roads bifurcate off this road providing legal access to the upper and lower reaches of Bowlers Creek, the upper reaches of the Tuapeka River and the ridge centred on grid reference G44 491786.

There is a section of formed track between Youngs Road and the entrance to the Home Block from SH 8 that is not on legal road.

b) Marginal Strips

Marginal strips are present along the Tuapeka River, the Beaumont River and the lower section of Bowlers Creek.

2.7.3 Activities

Gardiners Track provides public access to Te Papanui Conservation Park's southern boundary, and in combination with Medwins and Youngs Road, offers opportunities for scenic driving, four-wheel driving, mountain biking and horse riding. Other recreational activities include day walks, and foot access for tramping and cross-country skiing on the Lammerlaws and Lammermoors. With the lessees permission deer hunting takes place in Bowlers Creek, while pig hunting is possible over much of the property.

A relatively well maintained 4-6 berth musterers hut is located beside the Run Block stockyards. With the permission of the lessee, the public use this hut occasionally.

PART 3

OTHER RELEVANT MATTERS & PLANS

3.1 Consultation

The lease was discussed in Alexandra at an NGO early warning meeting held on September 21st 2002 and at a DOC report-back meeting May 22nd 2003. The following points were made by NGOs at the early warning meeting.

- The part of the Run Block above 700-800 m asl. is largely unmodified and subject to significant inherent values should become conservation land. Access along Gardiners Track from the east gives access to Te Papanui Conservation Park and tenure review should ensure that this access is maintained. Any tenure review outcomes from the Run Block could be incorporated onto the Te Papanui Conservation Park (Federated Mountain Club (FMC)).
- Tenure review provides an opportunity to secure practical public access along the true left bank of Bowlers Creek (via a benched track) to the silver beech

reserve upstream. Currently legal access is along the true right bank. This reserve is presently under-utilised and provides a currently unavailable roadside recreational opportunity between Milton and Roxburgh. The Run Block, due to its aspect, has a reduced snow line and therefore offers good untapped opportunities for cross-country skiing (Public Access New Zealand (PANZ)).

NGOs made the following comments at the 22nd May 2003 early warning meeting.

- The significant access route up the true left bank of Bowlers Creek should be secured by this review and appropriate carparking, signage and route marking provided. The tenure review should also result in full protection of the areas of significant vegetation in Bowlers Creek (PANZ).
- Freeholding of the extensively modified area in the Run Block immediately to the west of the vehicle track would risk comprising the landscape values of the surrounding area, if this area was inappropriately developed (Forest and Bird).
- The legal road that branches off Youngs Road, zig zagging down a ridge to Bowlers Creek through spot height 253m may have been surveyed and could provide suitable public access. Given its location, access via this route may be attractive to future freehold owners (PANZ).
- The lease contains pigs and some fallow deer. Access along the true left bank of Bowlers Creek would provide better access than the currently legal access along the opposite bank (New Zealand Deerstalkers Association).
- The restoration to full Crown ownership of the Run Block tussock grasslands would maintain continuity with tussock grasslands on Beaumont Station (Prof. Alan Mark).

FMC have also produced a report outlining the significant recreation, conservation and landscape values on the property. A full copy of this report is attached as Appendix 6. The key recommendations are as follow.

1. In the Run Block all the land in the northern and eastern portions should be protected by their return to full Crown ownership and control, under management of DOC. The formed road through the centre of the Run Block should be included within the protected portion to provide for continued public access. The hut beside the yards (within the area to be returned to full Crown ownership and control) should be retained for public use and enjoyment.
2. The areas of kanuka forest and beech remnants on steep faces above Bowlers Creek should be returned to full Crown ownership and control and managed as conservation land.
3. The areas of kanuka forest and beech remnants on steep faces above the Tuapeka River should be returned to full Crown ownership and control and managed as conservation land, as well as one large face of kanuka and beech forest on a gully leading to the Tuapeka River.

4. It may be appropriate to protect additional, smaller kanuka/beech remnants by the use of protective covenants.
5. In the Run Block, public access along the water race above the Beaumont River should be provided for.
6. Where the formed road differs in alignment from the legal road, it should be ensured that the formed road has legal status as a public road.
7. Marginal strips must be laid off along any parts of Bowlers Creek and both the Beaumont and Tuapeka rivers that fall inside freehold land.

FMC also noted the presence of the greenhood orchid, *Pterostylis foliate*, in one area of kanuka shrubland. St George (1999), after unsuccessfully examining sites where this orchid has been recorded historically noted that no records of *Pterostylis foliate* have been made south of the Kakanui Ecological District in the last 30 years. The Castle Dent population may therefore represent the current southern limit of this taxon.

3.2 Regional Policy Statements & Plans

The section of the Home Block east of Young Road is subject to the Otago Regional Plan: Water Rule which requires resource consent for suction dredge mining.

3.3 District Plan

The property is located within the Rural Resource Area of Clutha District Plan. In general, the operative Clutha District Plan does not act as a trigger for the protection of tussock grasslands and smaller wetlands and forest areas. The plan requires resource consent for clearance of areas 5 ha or more of indigenous forest vegetation or 2ha or more of wetlands, and development within 10 m of any watercourse. In addition, ground exceeding 30° slope that has been made bare by removal of vegetation must be revegetated.

The portion of the Home Block east of Young Road is in the Tuapeka West Water Supply Catchment. Resource consent is required for soil disturbance activities (including removal of vegetation, and the planting and harvesting of trees for commercial purposes) within 20m of any water body and for any activity that has a significant adverse effect on any wetland.

There are no Potentially Outstanding Landscapes, Outstanding Natural Features, registered archaeological sites, significant wetlands, or areas of significant habitat of indigenous fauna as set out in the tables of the plan. Protection is limited to the controls set out above.

3.4 Conservation Management Strategy & Plans

The Otago Conservancy has prepared a Conservation Management Strategy (CMS) which was approved by the New Zealand Conservation Authority in August 1998.

The CMS identifies 41 special places of conservation interest in Otago Conservancy. Castle Dent lies partly within the Lammermoor-Upper Taieri Special Place.

The CMS objectives for the Lammermoor-Upper Taieri Special Place relevant to Castle Dent is:

“To protect the high conservation, landscape, hydrological and historic values of the uplands while allowing and providing for appropriate recreational use”

The key implementation methods relevant to Castle Dent are:

- a) Endeavour to negotiate with landowners through a variety of mechanisms including pastoral lease tenure review to provide protection for important landscape, nature conservation, recreational and water supply areas;
- b) Develop and promote a “Te Papanui Conservation Park” concept for the tussock grasslands and associated wetlands to be administered by the department on the range crests, as a predominantly remote experience area with little recreational development;
- c) Removal of wild animals and pest plants as appropriate;
- d) Improve recreational facilities and access points;
- e) The use of ORVs on land administered by the department will be confined to firm, formed vehicle tracks selected in accordance with the criteria in Section 28.3.13;
- f) Carry out an investigation of public access needs and make recommendations for a rationalisation of marginal strips and roads.

Priorities for the Lammermoor- Upper Taieri special place are:

Protection, negotiation and advocacy in relation to the range crest tussock grasslands and scroll plain wetland will be priorities in this special place.

3.5 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 which is a blueprint for managing the country’s diversity of species and habits and sets a number of goals to achieve this aim. Of particular relevance to tenure review, is Goal Three, the aim of which is to:

- 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 ecosystems 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.

The strategy outlines action plans to achieve this goal covering terrestrial and freshwater habitat and ecosystem protection, sympathetic management, pest management, terrestrial and freshwater habitat restoration, threatened terrestrial and freshwater species management.

PART 4: MAPS ETC.

4.1 Additional information

4.1.1 References

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4.1.2 Appendices

Appendix 1: Description of RAP 3: Lammerlaw Tops. From Carter, J. 1994. Waipori Ecological District: Survey Report for the Protected Natural Areas Programme. Department of Conservation, Wellington. June 1994.

Appendix 2: Geopreservation sites No. 356: Lammerlaws and Lammermoors- Excerpt from Arand, J.; Basher, L.; McIntosh, P.; Heads, M. 1991. Inventory of New Zealand Soil Sites of International, National and Regional Importance. Part 1- South Island and Southern Offshore Islands (1st Edition). New Zealand Society of Soil Science Occasional Publication 1.

Appendix 3: Vascular Plant Species List for Castle Dent Pastoral Lease.

Appendix 4: Invertebrate Species List for Castle Dent Pastoral Lease.

Appendix 5: Site details for Aquatic Fauna Survey.

Appendix 6: Federated Mountain Club Survey Report

4.2 ILLUSTRATIVE MAPS

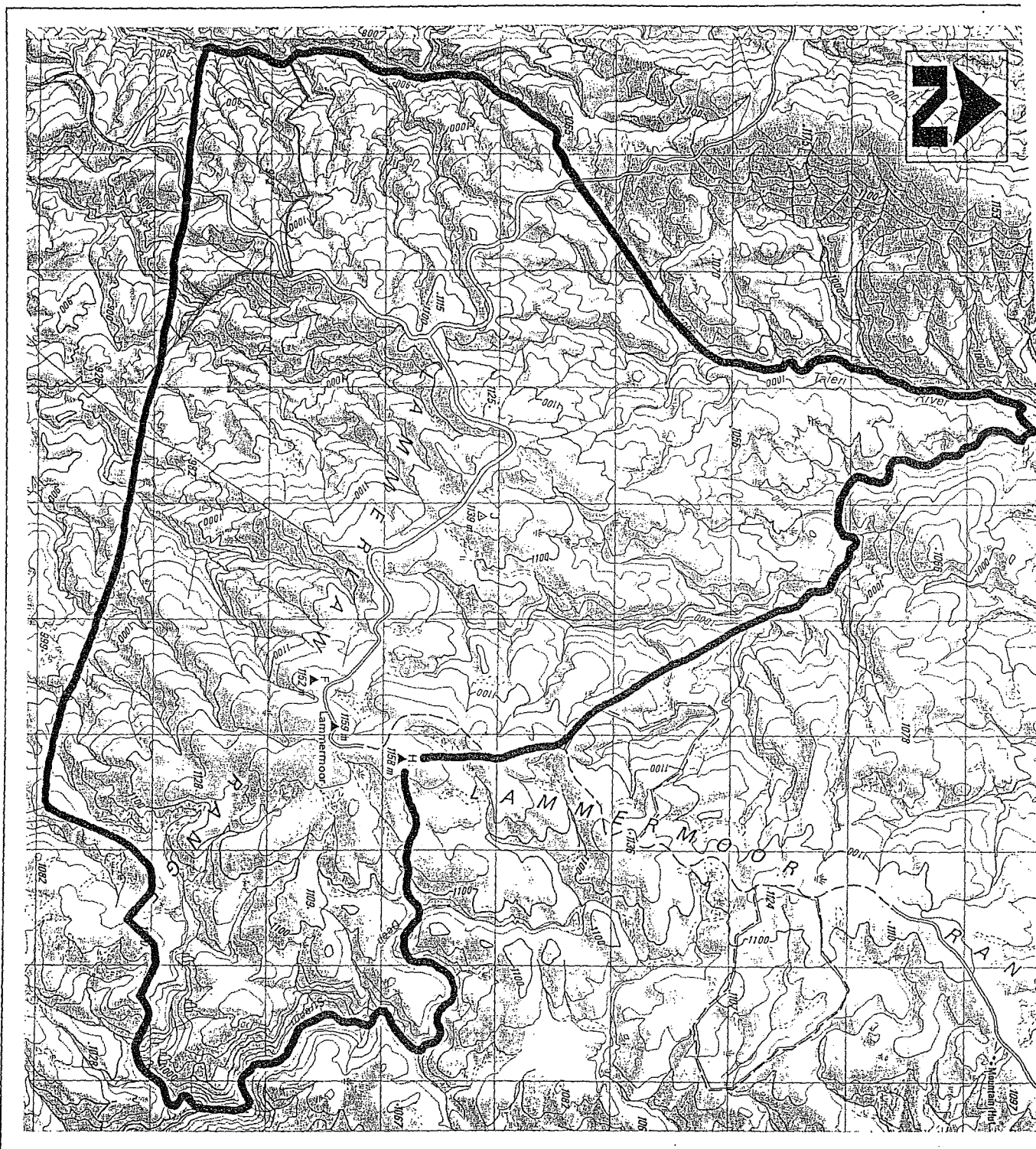
4.2.1: Topo/Cadastral

4.2.2: Values- Landscape units and Landscape values

4.2.3: Values- Ecological/Recreational

4.2 Photographs

Appendix 1: Description of RAP 3: Lammerlaw Tops. From Carter, J. 1994. Waipori Ecological District: Survey Report for the Protected Natural Areas Programme. Department of Conservation, Wellington. June 1994.



GRID REFERENCE CENTRE *H44/540 950*

AREA · 3700 ha

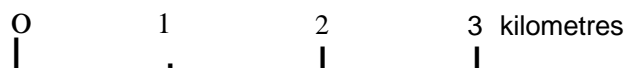
ALTITUDE RANGE · 900 - 1159 metres

TENURE · Pastoral Lease

SAMPLE SITES · 18.6-18.1,19.1-19.12,20.1-20.5,21.1-21.6

AERIAL PHOTOS SN 8286 / J3 / J5113

Map Licence No 1991/42



SECTION FIVE : AREAS RECOMMENDED FOR PROTECTION

5.3 RAP 3: LAMMERLAW TOPS.

Landsystem: Upland plateau

TWINSpan group, Ecological Units, (Plots)

- 6 *Chionochloa rigida* and *Halocarpus bidwillii* shrub and grassland on side slope, (20.5,21.4,18.9)
- 8 *Chionochloa rigida* and *Celmisia semi-cordata* tussockland. (18.10)
- 9 *Chionochloa rigida* and *Celmisia prorepens* tussockland. (19.12)
- 10 *Chionochloa rigidatussockland* on sideslopes. (21.2,18.6,21.6,20.3,19.3,19.4,19.6,19.9)
- 11 *Halocarpus bidwillii* and *Chionochloa rigida* on *Sphagnum cristatum* wetlands (3.8, 18.8)
- 12 *Halocarpus bidwillii* and lichen wetlands. (21.3a, 20.4, 21.3b)
- 13 *Keferlia paludosa*, *Gefmisia glandulosa* *Sphagnum cristatum* wetlands. (19.5, 19.2, 19.8, 19.11)
- 14 Lichen and moss cushion wetlands, (18,7,20.2,21.5,19.10)
- 15 Snowbank vegetation. (19,1, 19,7, 20.1,21.1)

Location and Landform

This RAP covers an area from around the Lammermoor Top along the dividing ridge of the Lammerlaw Range and the slopes down both the south and north sides of the Range. This area has a central position to the major drainage systems of the District. There is a continuously repeated pattern of finely divided asymmetrical valleys rising to broad, planar or rolling tops (Fig. 5.3).

The eastern boundary of this RAP is shared with the Deep Stream Scenic Reserve. The streams at this end drain into Deep Stream and rock formations are exposed along the stream courses. The Lammermoor Top has three domed, almost equal high points, with a radial drainage system

The northern slopes drain the head of the Taieri River. These streams begin from nivation hollows at the head of all the slopes. The streams flow locally over ramp-like or chute waterfalls created by the schist bed-rock sloping the same direction as the stream flow. At the higher elevation the shallow slope angle contributes to poor drainage and the development of a system of sphagnum wetlands with stepped pools. Lower down the streams have a steeper gradient and the wetland areas occupy stream side, lower sideslope locations or places of irregular drainage. The steep sides of all the valleys are in the lee of the prevailing south west weather. The main ridge lines of the area converge to form a wedge shape,

The southern slopes of the Lammerlaw Range follow a similar pattern to the north side, except that the stepped pool, wetland system and snowbanks are restricted to the highest elevations. The asymmetrical landform patterns are very pronounced here with small patches of erosional activity evident in some places. Most of the streams on the southern side of the Range drain towards the Waipori River and Lake Mahinerangi, except the south-west corner which drains via the Beaumont River into the Clutha. A few very long and roughly parallel ridge lines divide the streams and link the skyline ridge with the lower slopes,

Vegetation

The vegetation covered nine of the 15 TWINSpan classification plant groups (Fig. 2.2). The high-altitude tussockland is the most extensive type of vegetation group of this RAP. The next

that represent this vegetation TWINSpan Group 10 occur close together on the DCCA ordination at the high altitude end of the grassland range (Fig. 4.7). A large number of native inter-tussock species are in this group. The whipcord hebes, *H. propinqua* and *H. poppefwellii* occur in this group, together with some snowbank species such as *Caltha obtusa*, *Astefia linearis* and *Gingdia baxterii*.

Two other grassland types were distinguished by the TWINSpan classification in Groups 8 and 9. One of these groups is a *C. rigida* and *Pernettya macrostigma* combination and the other had a very dense canopy of *Chionochloa rigida* and a more typical inter-tussock species composition without the snowbank species.

There were *Juncus effusus* and *Carex coriacea* and other lowland wetland and introduced species in the ecological units of TWINSpan Group 6. This type of vegetation was widespread on the south side of the Lammerlaw Range and occurred in the hollows on poorly drained slopes. This ecological unit graded into more open and better drained areas with inter-tussock species such as *Cefmisia semicordata*. The overall character of this group may have been modified by fire in the past.

The sample (21.4) with *Phyllocladus alpinus* is at the edge of this group and had little in common with the other samples. The lower tier species may be the link between these seemingly different types of vegetation. The DCCA ordination confirms the great diversity of these ecological unit samples by their wide scatter (Fig. 4.6).

The other main components of the RAP were the wetland communities in Groups 11, 12, 13 and 14. Group 11 had the bog pine, lichen and *Sphagnum* associations. *Hafocarpus bidwillii* is also in Group 12. The sedge *Carex gaudichaudiana*, *Gentiana amabilis* and *Orosera arcturi* were major components of Group 13. In the low-growing cushion bogs of TWINSpan Group 14 *Oonatia novae-zealandiae* and *Oreobolus pectinatus* were very common. This last group is often associated with the short first-order streams at the catchments heads.

At the head of the Taieri River some species of interest include *Mitrasacme novae-zealandiae*, *liparophylum gunnii* and *Actinotus novae-zealandiae*.

Discussion

The Lammerlaw Tops cover the headwaters of the important catchments of the Waipori Ecological District. The Taieri River is one of eastern Otago's most important rivers and water quality is a major issue for many downstream uses. The tannin-rich brown waters are referred to on the label of '45 South' whiskey.

This area is one of the two largest blocks recommended for protection. It has some of the best *Chionochloa rigida* tussockland of the District and Region. The wetlands have very good examples of finger bog wetlands and stepped pools. A significant proportion of the snowbank vegetation and landforms to be recommended for protection are within this RAP. The snowbanks have a very diverse and probably unmodified range of herbfield plant species.

These wetlands and blue tussock-herbfields are also very important sites for native insects. Two new species of caddisfly, several undescribed stoneflies and a new moth in the genus *Gymnobathra* were first found here. Snowbanks are rich in diurnal beetles and moths, while the highest points have some moth species such as *Scoparia sideraspis*, which are not recorded elsewhere in the ecological District or even on the Rock and Pillar Range (Patrick et al. 1993).

SECTION FIVE: AREAS RECOMMENDED FOR PROTECTION

There are very few fences in the area; they usually follow property boundaries. There is one track along the axis of the Range and down the southern slopes. Three trig marks mark the Lammermoor Top. The area is comprised of a continuous and unbroken landscape of tussockland on asymmetrical rolling mountain slopes and tops.

Summary : RAP 3 - Lammerlaw Tops

Representativeness :

Large areas of tussockland; finger bogs, bog pools and snowbanks.

Diversity and pattern :

Subtle change from wetland to grassland to snowbank.

Rarity and special feature :

Excellent landscape qualities of texture and shape. *Mitrasacme novae-zealandiae*, *Actinotus novae-zealandiae* and *Liparophyllum gunnii* were found in this area.

Naturalness :

Unmodified vegetation on natural landforms with few interruptions.

Long-term viability :

High with present management and low fire frequency.

Size and shape :

One of the largest RAP's in the District.

Buffering and surrounding landscape :

Vegetation to the north west, north and at lower altitude was more depleted. Buffered by distance or isolation from modified environments.

Appendix 2: Geopreservation sites No. 356: Lammerlaws and Lammermoors-
Excerpt from Arand, J.; Basher, L.; McIntosh, P.; Heads, M. 1991. Inventory of New
Zealand Soil Sites of International, National and Regional Importance. Part 1- South
Island and Southern Offshore Islands (1st Edition). New Zealand Society of Soil
Science Occasional Publication 1.

H44 550805

AREA(ha): 220 ALTITUDE(m): 480-676 RAINFALL(mm): 1300

TOPOGRAPHY: rolling to steep colluvial mountain slopes and tops PARENT MATERIAL: schist colluvium overlain by loess (especially on lower parts of north facing slopes) VEGETATION: snow tussock/introduced grassland; red tussock/rush-sedge grassland

SOILS: upland yellow-brown earths (Mahinerangi Waipori Nardoo Lammerlaw), organic soils (Bungtown), gley soils (pioneer)

IMPORTANCE: 1 SIGNIFICANCE: (i) excellent altitudinal range of soils.(ii) internationally known scientific study site (especially for hydrological studies). Has great potential for pedological studies of the long-term effects of converting tussock grassland to exotic forest

VULNERABILITY: 1 MODIFICATIONS/THREATS: some introduced grasses; very little grazing by sheep

TENURE: Crown land OWNER/MANAGER: Timberlands

CONTACT PERSON: Rick Jackson DATE OF INFORMATION: May 1991

REFERENCES: Hewitt (1982) Bonell et al. (1990) Pearce et al. (1984) O'Loughlin et al. (1984)

(356) Lammerlaws and Lammermoors

REGIONAL/CITY COUNCIL(S): Otago ECOLOGICAL DISTRICTS(S): 68-02 Waipori

LOCALITY and GRID REFERENCE: extends from Lammermoor Range to Lammerlaw Range and Lake Onslow Region H43 535075

AREA(ha): 700 ALTITUDE(m): 650-1000 RAINFALL(mm): 600-1100

TOPOGRAPHY: rolling hillslopes with deep gullies (dissected peneplain) PARENT MATERIAL: loess and schist colluvium

SOILS: upland podzolised yellow-brown earths and podzols (Maungatua Lammerlaw), upland yellow-brown earths (Teviot)

IMPORTANCE: 2 SIGNIFICANCE: (i) large area of soils under unmodified vegetation.(ii) soils under sequences of climate and vegetation.(iii) soils have been characterised in detail.

VULNERABILITY: 1 MODIFICATIONS/THREATS: grazed by sheep and cattle; 4WD roads; trailbike damage of wetlands

TENURE: pastoral lease OWNER/MANAGER: Rocklands Station, Beaumont Station, Castle Dent Station and Halwyn Station

CONTACT PERSON: Peter McIntosh DATE OF INFORMATION: August 1991

REFERENCES: McIntosh and Backholm (1981) McIntosh et al. (1983)

(357) Whisky Gully Scenic Reserve

REGIONAL/CITY COUNCIL(S): Otago ECOLOGICAL DISTRICTS(S): 68-03 Tapanui

LOCALITY and GRID REFERENCE: 5 km SE of Tapanui G45231660

AREA(ha): 100 ALTITUDE(m): 300-700 RAINFALL(mm): 800

TOPOGRAPHY: steep colluvial mountainslopes PARENT MATERIAL: schist colluvium VEGETATION: beech forest; broadleaved-podocarp/snow tussock forest; introduced grassland

SOILS: lowland yellow-brown earths (Tuapeka), upland yellow-brown earths (Waikaia), upland podzolised yellow-brown earths and podzols (Maungatua), organic soils (Kaherekoau), recent soils (Mataura)

IMPORTANCE: 3 SIGNIFICANCE: (i) contains a moderate range of soils, including some under beech forest (which was formerly more extensive).

VULNERABILITY: 3

TENURE: scenic reserve OWNER/MANAGER: Department of Conservation

CONTACT PERSON: Peter McIntosh DATE OF INFORMATION: April 1990

NOTES: Called "Tapanui Domain" in Allen (1978)

REFERENCES: New Zealand Soil Bureau (1968) Allen (1978)

(358) Goodwood Scenic Reserve

REGIONAL/CITY COUNCIL(S): Otago ECOLOGICAL DISTRICTS(S): 69-01 Waikouaiti

LOCALITY and GRID REFERENCE: 6 km SE of Palmerston J43347182

AREA(ha): 19 ALTITUDE(m): 30-70 RAINFALL(mm): 500

TOPOGRAPHY: rolling colluvial hills PARENT MATERIAL: schist loess over sandy limestone and sandstone VEGETATION: podocarp-broadleaved/snow tussock forest; broadleaved forest; broadleaved-podocarp forest

SOILS: yellow-grey - yellow-brown earth intergrades (Warepa Karitane)

IMPORTANCE: 3 SIGNIFICANCE: (i) one of the only protected remnants of coastal podocarp/broadleaved forest in Otago.

VULNERABILITY: 3

TENURE: scenic reserve OWNER/MANAGER: Department of Conservation

Appendix 3: Vascular Plant Species List for Castle Dent Pastoral Lease.

Exotic species are denoted with an asterisk.

Species	Common name	Plant type
<i>Acaena novae-zelandiae</i>	Bidibidi	Dicot herb
<i>Acianthus</i> sp.	Orchid	Monocot herb
<i>Aciphylla aurea</i>	Golden Spaniard	Dicot herb
<i>Agrostis capillaris</i> *	Browntop	Grass
<i>Anaphalioides bellidioides</i>		Dicot herb
<i>Anthoxanthum odoratum</i> *	Sweet vernal	Grass
<i>Aporostylis bifolia</i>	Orchid	Monocot herb
<i>Astelia nervosa</i>		Tussock herb
<i>Blechnum fluviatile</i>		Fern
<i>Blechnum montanum</i>	Mountain kiokio	Fern
<i>Blechnum novae-zelandiae</i>	Kiokio	Fern
<i>Blechnum penna-marina</i>		Fern
<i>Bulbinella angustifolia</i>	Maori onion	Monocot herb
<i>Caladenia lyallii</i>	Orchid	Monocot herb
<i>Cardamine debilis</i>	Bitter cress	Dicot herb
<i>Carex coriacea</i>	Rautahi	Sedge
<i>Carex dissita</i>		Sedge
<i>Carmichaelia petriei</i>	Native broom	Shrub
<i>Carpodetus serratus</i>	Marble leaf	Tree
<i>Celmisia gracilentia</i>		Dicot herb
<i>Celmisia prorepens</i>		Dicot herb
<i>Celmisia semicordata</i>		Dicot herb
<i>Cerastium fontanum</i> *	Mouse-eared chickweed	Dicot herb
<i>Chionochloa rigida</i>	Narrow-leaved snow tussock	Grass
<i>Cirsium arvense</i> *	Californian thistle	Dicot herb
<i>Cirsium vulgare</i> *	Scotch thistle	Dicot herb
<i>Coprosma cheesemaniae</i>		Shrub
<i>Coprosma ciliata</i>		Shrub
<i>Coprosma colensoi</i>		Shrub
<i>Coprosma foetidissima</i>		Shrub
<i>Coprosma parviflora</i> var. <i>dumosa</i>		Shrub
<i>Coprosma propinqua</i>	Mikimiki	Shrub
<i>Coprosma rhamnoides</i>		Shrub
<i>Coprosma rigida</i>		Shrub
<i>Coprosma rugosa</i>		Shrub
<i>Cordyline australis</i>	Cabbage tree	Tree
<i>Coriaria sarmentosa</i>	Tutu	Shrub
<i>Corokia cotoneaster</i>	Korokio	Shrub
<i>Cortaderia richardii</i>	Toetoe	Tussock grass
<i>Cyathea smithii</i>	Soft tree fern	Fern
<i>Cyathodes empetrifolia</i>		Subshrub

<i>Cytisus scoparius</i> *	Broom	Shrub
<i>Dactylis glomerata</i> *	Cocksfoot	Grass
<i>Digitalis purpurea</i> *	Foxglove	Dicot herb
<i>Discaria toumatou</i>	Matagouri	Shrub
<i>Dracophyllum longifolium</i>	Inaka	Shrub
<i>Dracophyllum prostratum</i>		Shrub
<i>Dracophyllum uniflorum</i>	Turpentine shrub	Shrub
<i>Drosera arcturi</i>	Sundew	Dicot herb
<i>Epilobium brunnescens</i>		Dicot herb
<i>Epilobium ciliatum</i> *	Willow herb	Dicot herb
<i>Erica lusitanica</i> *	Spanish heath	Shrub
<i>Festuca novae-zelandiae</i>	Hard tussock	Grass
<i>Fuchsia colensoi</i>	Fuchsia	Shrub
<i>Fuchsia excorticata</i>	Tree fuchsia	Tree
<i>Galium aparine</i> *	Cleavers	Dicot herb
<i>Gaultheria antipoda</i>	Fool's beech	Shrub
<i>Gaultheria crassa</i>		Shrub
<i>Gaultheria depressa</i>		Shrub
<i>Gentiana</i> sp.	Gentian	Dicot herb
<i>Geranium microphyllum</i>		Dicot herb
<i>Glyceria fluitans</i> *	Sweet grass	Grass
<i>Grammitis billarieri</i>		Fern
<i>Griselinia littoralis</i>	Broadleaf	Tree
<i>Gunnera monoica</i>		Dicot herb
<i>Halocarpus bidwillii</i>	Bog pine	Shrub
<i>Hebe odora</i>		Shrub
<i>Hebe salicifolia</i>	Koromiko	Shrub
<i>Helichrysum filicaule</i>		Dicot herb
<i>Herpolirion novae-zelandiae</i>	Grass lily	Monocot herb
<i>Hieracium lepidulum</i> *	Tussock hawkweed	Dicot herb
<i>Hieracium pilosella</i> *	Mouse-eared hawkweed	Dicot herb
<i>Hieracium praealtum</i> *	King devil	Dicot herb
<i>Histiopteris incisa</i>	Water fern	Fern
<i>Holcus lanatus</i> *	Yorkshire fog	Grass
<i>Hydrocotyle moschata</i>		Dicot herb
<i>Hydrocotyle novae-zelandiae</i> var. <i>montana</i>		Dicot herb
<i>Hypochoeris radicata</i> *	Catsear	Dicot herb
<i>Hypolepis millefolium</i>		Fern
<i>Juncus articulatus</i> *	Jointed rush	Rush
<i>Juncus distegus</i>		Rush
<i>Juncus effusus</i> *	Soft rush	Rush
<i>Juncus gregiflorus</i>		Rush
<i>Kelleria dieffenbachii</i>		Dicot herb
<i>Kunzea ericoides</i>	Kanuka	Tree
<i>Lagenifera strangulata</i>		Dicot herb
<i>Leptospermum scoparium</i>	Manuka	Shrub
<i>Leucopogon fraseri</i>	Patotara	Shrub

<i>Leycesteria formosa</i> *	Himalayan honeysuckle	Shrub
<i>Luzula leptophylla</i>		Rush
<i>Lycopodium australianum</i>		Fern
<i>Lycopodium fastigiatum</i>		Fern
<i>Lycopodium volubile</i>		Fern
<i>Melicytus alpinus</i>	Porcupine shrub	Shrub
<i>Mimulus guttatus</i> *	Monkey musk	Dicot herb
<i>Mimulus moschatus</i> *	Musk	Dicot herb
<i>Muehlenbeckia australis</i>		Vine
<i>Muehlenbeckia complexa</i>	Pohuehue	Vine
<i>Mycelis muralis</i> *	Wall lettuce	Dicot herb
<i>Myosotis laxa</i> subsp. <i>caespitosa</i> *	Water forget-me-not	Dicot herb
<i>Nothofagus menziesii</i>	Silver Beech	Tree
<i>Olearia arborescens</i>		Shrub
<i>Olearia bullata</i>		Shrub
<i>Ozothamnus leptophyllus</i>	Tauhinu	Shrub
<i>Pernettya macrostigma</i>		Subshrub
<i>Phormium cookianum</i>	Mountain flax	Tussock herb
<i>Pittosporum tenuifolium</i>	Kohuhu	Tree
<i>Poa cita</i>	Silver tussock	Grass
<i>Poa colensoi</i>	Blue tussock	Grass
<i>Podocarpus hallii</i>	Hall's totara	Tree
<i>Polystichum vestitum</i>	Prickly shield fern	Fern
<i>Prunella vulgaris</i> *	Self heal	Dicot herb
<i>Pseudopanax crassifolius</i>	Lancewood	Tree
<i>Pseudowintera colorata</i>	Peppertree	Shrub
<i>Pteridium esculentum</i>	Bracken	Fern
<i>Pterostylis graminea</i>	Greenhood orchid	Monocot herb
<i>Ranunculus glabrifolius</i>		Dicot herb
<i>Ranunculus reflexus</i>		Dicot herb
<i>Ranunculus repens</i> *	Creeping buttercup	Dicot herb
<i>Raoulia subsericea</i>		Dicot herb
<i>Rubus cissoides</i>	Lawyer	Vine
<i>Rubus schmidelioides</i>	Lawyer	Vine
<i>Rumex acetosella</i> *	Sheep's sorrel	Dicot herb
<i>Sambucus nigra</i> *	Elder	Shrub
<i>Sclerathus uniflorus</i>		Dicot herb
<i>Senecio minimus</i>	Fireweed	Dicot herb
<i>Sophora microphylla</i>	Kowhai	Tree
<i>Stellaria parviflora</i> *	Chickweed	Dicot herb
<i>Taraxacum officinale</i> *	Dandelion	Dicot herb
<i>Thelymitra formosa</i>	Sun orchid	Monocot herb
<i>Trifolium repens</i> *	White clover	Dicot herb
<i>Ulex europaeus</i> *	Gorse	Shrub
<i>Viola cunninghamii</i>		Dicot herb
<i>Wahlenbergia albomarginata</i>	Harebell	Dicot herb

Appendix 4: Invertebrate Species List for Castle Dent Pastoral Lease.

A large range of invertebrates was seen during the survey, not all of which were collected. These included a wide variety of spiders, including orbweb species in both blocks and large mygalomorphs (funnelwebs, etc.) in forest remnants in the southern block. A large number of caddis was collected, especially in the UV traps, but identifications are not yet available.

Species which have been identified or which were identified in the field without capture are listed below:

Odonata	(dragonflies, damselflies)		
		common	
Coenagrionidae	<i>Xanthocnemis zealandica</i>	redcoat damselfly mountain	no specimens captured, identity assumed; widespread species
Petaluridae	<i>Uropetala chiltoni</i>	giant dragonfly	observed along water race, north block; widespread species
Corduliidae	<i>Procordulia</i> sp.		observed in southern block by T.J.; both species are widespread
Dermaptera	(earwigs)		
	<i>Parisolabis tapanuiensis</i>	native earwig	local species; good new record
Plecoptera	(stoneflies)		
Antarctoperlinae	<i>Zelandobius kuscheli Zelandobius uniramous</i>		local species; low alpine shrubland/small streams, esp. characteristic of Lammermoor Range lowland to low alpine grassland streams; common in Otago

	(grasshoppers, crickets, etc.)		
Orthoptera			
Acrididae	<i>Sigaus campestris</i> <i>Paprides dugdali</i> <i>Sigaus australis</i>	grasshopper	southern montane/alpine species; common in good grasslands southern/eastern species; common in good grasslands common and widespread in good quality grassland; montane -alpine
Coleoptera	(beetles)		
Scarabaeidae	<i>Pyronota festiva</i>	manuka beetle	widespread and common in grasslands
Carabidae	<i>Oregus aerus</i> <i>Bembidium</i> species	carabid carabid	common and widespread in low alpine Otago diurnal carabid, small and active; widespread species
Tenebrionidae	<i>Mimopeus opaculus</i> <i>Philoneis</i> species	darkling beetle	larvae eats dead wood, common and widespread in Otago larvae eats dead wood, common and widespread in Otago larvae eats dead wood of shrubs, common and widespread in Otago
Cerambycidae	<i>Navomorpha sulcatum</i> <i>Ochosternus</i>	longhorn	
Elateridae	<i>zealandicus</i>	click beetle	widespread
Mecoptera	(scorpionflies)		
	<i>Nannochorista philpotti</i>	NZ scorpionfly	NZs only species; local in slow streams; good find
Diptera	(true flies; two-winged flies)		
Tipulidae	<i>Gynoplistia</i> n. sp.		flightless crane fly; larvae probably associated with wet silts

	<i>Leptotarsus</i> (<i>Macromastix</i>) cf. <i>fucatus</i> <i>Limonia</i> (<i>Dicranomyia</i>) sp.		widespread through South Island beech forests, but may be a species complex
	<i>Zelandotipula novarae</i>		common genus common, widespread; larvae associated with wet seepages
Bibionidae	<i>Dilophus nigrostigma</i>		common, widespread; numerous throughout district at time of survey spider parasites; probably widespread; two specimens caught, escaped
Acroceridae	<i>Oncodes</i> sp.	bladderflies	
	<i>Melangyna</i> <i>novaezealandiae</i>	hoverfly	common native species, widespread
Lepidoptera	(moths, butterflies)		
Noctuidae	<i>Aletia sollennis</i>		type locality Waipori; grassland species; local, occ. common; good find
	<i>Graphania nullifera</i>	speargrass moth	widespread on speargrass common and widespread, lowland to montane, larvae on herbs/ shrubs
	<i>Graphania ustistriga</i>		uncommon & local noctuid, good find indicates good habitat
	<i>Graphania sequens</i>		common montane grassland noctuid
	<i>Graphania disjungens</i>		local and uncommon species, larvae on herbs in damp grassland; eastern Otago endemic; excellent find
	<i>Graphania fenwicki</i>		common early emerging grassland noctuid
	<i>Graphania paracausta</i>		
	<i>Graphania</i> n.sp. cf <i>insignis</i>		local, eastern Otago endemic species; good find

	<i>Graphania mutans</i>		extremely common and widespread, herb-feeding noctuid
		alpine	widespread on Chionochloa in alpine/montane areas with
	<i>Ichneutica ceraunias</i>	cutworm	good habitat
	<i>Ichneutica notata</i>		local alpine grassland species; good find
	<i>Rhapsa scotoscialis</i>		common & widespread species, larvae on litter
	<i>Tmetolophota arotis</i>		common cutworm on Cortaderia etc.
Geometridae	<i>Austrocidaria cedrinodes</i>		Coprosma feeding species, common and widespread, low alpine
			widespread but local to shrubland; larvae on
	<i>Epiphryne charidema</i>		Dracophyllum
	<i>Helastia alba</i>		widespread, but local, forest/ shrubland edge
	<i>Helastia corcularia</i>		widespread and common; larvae on mosses on rock
	<i>Helastia plumbea</i>		good find, uncommon in east, rocky areas
			larvae on Polystichum; widespread forest/ grassland
	<i>Ischalis fortunata</i>	fern moth	species
	<i>Paranotoreas brephosata</i>	orange underwing	diurnal species of grasslands; larvae on Epilobium; widespread
			southern species, diurnal, grasslands; larvae on flowers; very good find
	<i>Pasiphila</i> n.sp.		herb feeding, widespread but local
	<i>Xanthorhoe occulta</i>		rare; shrublands - larvae on Hebe, few Otago localities; excellent find
Tortricidae	<i>Harmologa pontifica</i>		
	<i>Orocrambus aethonellus</i>	grassmoth	common species of wet grasslands
Crambidae	<i>Eudonia philerga</i>		larvae on mosses on rock; widespread species
	<i>Eudonia octophora</i>		wetland areas; common & widespread species
	<i>Eudonia torodes</i>		widespread but local in grassland/ rocky areas; good find
	<i>Scoparia rotuella</i>		widespread in montane grassland; larvae on Epilobium

	<i>Scoparia trapezophora</i>		local species of low alpine grasslands - good find
	<i>Argyrophenga</i>	tussock	widespread species; many present, identified on site; not
Nymphalidae	<i>antipodum</i>	ringlet	collected.
		common	larvae on <i>Muehlenbeckia complexa</i> ; widespread but more
Lycaenidae	un-named butterfly	copper grp	research required
	<i>Zizina oxleyi</i>	southern blue	common and widespread in grasslands; larvae on clovers
Hepialidae	<i>Wiseana mimica</i>	porina moth	early species in south in montane zone; common locally
Glyphipterigidae	<i>Glyphipterix barbata</i>		<i>Chionochloa</i> borer; common in snowgrass areas
Pterophoridae	<i>Platyptilia replotalis</i>	plume moth	widespread and common; larvae on <i>Plantago</i> flowers
Depressariidae	<i>Eutorna caryochroa</i>		host unknown; good find; local species of grasslands

Appendix 5: Site details for Aquatic Fauna Survey.

Location	G.P.S Reading	Species Recorded
Waipori river	2250542 / 5487057	Brown trout
Trib of Waipori river	2250430/ 5487029	No fish
Waipori River	2250720 / 5490637	Dusky galaxiid
Waipori River	2250721 / 5490647	Dusky galaxiid
Pond	2251974/ 5491261	No fish
Beaumont River	2249975 / 5491928	Brown trout
Waipori River	2249970/5492178	Dusky galaxiid
Waipori Trib	2250391/5491052	No fish
Trustpower water race	2249300/5487054	Brown trout
Trib of Tuapeka	2249256/5487024	No fish
Bowlers Creek	2247088/5479878	Brown trout

Appendix 6: Federated Mountain Club Survey Report

Castle Dent Pastoral Lease

Field survey and assessment of significant recreational,
conservation and landscape values

Report prepared by Dr. Kelvin Lloyd



**Federated Mountain Clubs of
New Zealand-(Inc.)**



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Scope of Survey and Information Sources

A field survey was undertaken to identify significant recreation and conservation values on Castle Dent Pastoral Lease. This report describes the results of the survey and makes recommendations as to how significant inherent values might be protected through the tenure review process under the Crown Pastoral Land Act 1998.

Dr. Kelvin Lloyd is currently employed as a plant ecologist by Landcare Research in Dunedin. He has considerable experience of outdoor recreation in Otago and a thorough knowledge of its botany. A two-day field inspection of the property was undertaken in December 2003, with the property being traversed on foot. This report also draws on information provided in the Otago Conservation Management Strategy.

Description of Property

Castle Dent Pastoral Lease is located near Lawrence, with access from State Highway 8. The property lies within the Waipoli Ecological District.

Castle Dent Pastoral Lease

The property comprises two separate blocks that differ considerably in their characteristics. The lower block lies between 100-500 m altitude and is centred on a ridge that rises to the north between Bowlers Creek and the Tuapeka River. Exotic pasture covers spurs and ridges and the lower faces of this block, while stands of kanuka occupy many of the gullies that cut into the main ridge from either side. Several of these kanuka stands contain remnants of mature beech forest (Fig. 1). The upper block is separated by a distance of 4 km from the lower block, and lies between the Beaumont and Waipori Rivers, rising from 500 m to 1000 m elevation at its highest point (Fig. 2), below the crest of the Lammerlaw Range (This upper property boundary is relatively new, following acquisition of the high altitude tussock grassland portion of the property by the Department of Conservation, which now manages it as conservation land). The upper

block is also centred on a ridge with gullies on either side, but the landscape is much more dissected than the lower block. The dominant vegetation cover is tussock grassland, which forms dense stands across two thirds of the block, but has been considerably modified by fire and grazing in the south-western corner.

The recently established douglas fir plantations of Halwyn Forest occupy the gap between the two blocks of Castle Dent. Established exotic plantation forests dominate areas below 650 m altitude to the east of the property, although a finger of tussock grassland and exotic forest on the ridge between the Tuapeka and Waipori Rivers is managed as conservation land (Glendhu Forest). A large area of tussock grassland abutting the eastern side of the upper block, incorporating parts of the Waipori River and Deep Creek, was recently purchased from Halwyn Station and is now managed as conservation land. New exotic forest plantations have been established in many areas to the west, although the remnant beech forests of Bowlers Creek Scenic Reserve (Fig. 3) serve as a small buffer at lower elevations on this side. The lower block of Castle Dent Pastoral Lease can currently be seen as an island of farmland, with pockets of native forest, embedded in a sea of exotic plantation forestry. Gorse and broom are problem weeds in areas of steeper country at lower altitudes on either side of the property, except where there is a cover of sCIUb or forest.

Access

The property is easily accessible from State Highway 8 some 7 km west of the township of Lawrence. A formed public road suitable for 4WD vehicles is centred on the main ridge system and runs from SH 8 to the top of the property. Access is also possible along Gardiners Track, a public road that runs through the Glendhu conservation land mentioned in the previous paragraph, meeting the southern boundary of the upper block of Castle Dent Pastoral Lease.

Recreational Values

The recent (March 2003) creation of the Te Papanui Conservation Park, which encompasses tussock grasslands centred on the Lammermoor and Lammerlaw Ranges, is likely to stimulate recreational interest in the area in and around Castle Dent Pastoral Lease.

Currently, most recreation on the property appears to centre on the upper block, which has a greater sense of remoteness than the lower block and is dominated by native vegetation. A small comfortable 2-bunk hut with a fireplace and water supply shows evidence of regular visitation by people from the local area. The area does not appear to be accessed by those walking in on foot, due to the relatively long distance (10 km and uphill) from S.H. 8. Recreation includes 4WD, horseback and mountain biking trips that traverse the public road through the property. The opportunity for pig and deer hunting in the gullies on either side is also valued. Use of the property for back country skiing appears under-utilised, but this area could provide a site for it that is very accessible from Dunedin. Recreational attractions include the scenic landscape of extensive tussock grassland at the top of the property, and beyond it to the north. Tributaries of the Waipori River form small gorges (Fig 4) and the dissected tussock grassland landscape on the eastern side of the block (Fig.) is particularly scenic and peaceful. Apart from in the southeast, most of the tussock grassland is free from sparniard (*Aciphylla*) species, allowing pleasant

walking among the tussocks. The upper gorge of the Waipori River is a dramatic natural feature on the eastern boundary (Fig. 5). Half way up the block, an historic water race traverses from the Beaumont River to tributaries of the Waipori River (Fig. 6). This water race is currently being upgraded with the intention of providing extra water to the Waipori River for use in generating electricity from Lake Mahinerangi. A formed track beside this race on the western side, in conjunction with a 4WD track leading down to the intake structure, could provide an interesting round trip to the Beaumont River for mountain bikers. Two derelict huts are present on the Beaumont River faces. From the top of the property there are panoramic views from Kaka Point on the Otago coast to the Blue Mountains, Whitecomb Range, Garvie Mountains and Old Man Range.

The lower block appears to be used only for access, or for hunting at the permission of the lessee. Bowlers Creek Scenic Reserve, which borders the western side of the lower block, does not appear to attract much usage (with the exception of hunting) as it is not visible from S.H. 8, contains no tracks and access is not indicated. There would be considerable potential to increase recreational use in this area, which is not currently perceived as a recreational destination by those living outside the local area. Track development could provide an accessible day walk among the natural forest, shrubland, rock outcrop and river communities within the Bowlers Creek gorge. The Tuapeka River could be added to such a trip by following legal roads that cross the main ridge of the lower block (see Map 2).

Conservation Values

Lower block

The conservation values of the lower block of Castle Dent lie in the remnants of beech forest and extensive kanuka shrublands that occupy the gulleys dissecting the block, and occur on the steep faces of the Tuapeka River and Bowlers Creek. The larger stands of kanuka tend to retain remnants of mature beech forest within their core areas. In some areas, small shrubby wetlands are present in shallow gullies within the kanuka stands.

Many of the kanuka stands allow entry of stock and the diversity of native species tends to be low at the shrubland margins, with a sparse ground cover of herbs, shrubs and ferns. Much bare ground is present. However this changes with increasing distance into the kanuka forest, as use by stock declines. Broadleaved forest species start to be seen (mainly as seedlings) and a greater range and cover of native herb, sedge, fern and shrub species. Of particular note are the presence of the unusual cut-leaved parsley fern (*Botrychium biforme*) and a diverse range of ground orchids in the genera *Corybas* and *Pterostylis*. These understory species are typical of relatively dry, fertile lowland forests in the coastal Otago area. In damp forest gulleys, the presence of palatable tree saplings of broadleaf and three finger, as well as hen and chicken fern, testify that stock seldom penetrate this far.

A significant record from one area of kanuka shrubland was the greenhood orchid, *Pterostylis foliata*. While not appearing on the most recent rare and threatened plant lists, Moore & Edgar (1976) described the South Island distribution of this species as "Records few". More recently, *P. foliata* was described as "rare in most regions" by St George (1999), who cited early (1890s)

collections from several sites in coastal and inland Otago. At none of these could he find specimens more recently. The nearest of these sites to Castle Dent Pastoral Lease are Milburn and Tuapeka Mouth. No records south of the Kakanui Ecological Region appear to have been made of this species in the last 30 years, thus the Castle Dent population may represent the current southern limit of this taxon.

- In core areas of the larger kanuka stands, mature remnants of silver beech signify the original dominant vegetation cover of these low altitude sites, and are little different in structure to larger areas of beech forest in the region, such as in the nearby Bowlers Creek Scenic Reserve and at the Blue Mountains. It seems very likely that silver beech forest would eventually return to dominance over what is presently kanuka shrubland, given freedom from fire, logging and grazing by stock.

The areas of native shrubland and forest that remain on the lower block of Castle Dent Pastoral Lease are important remnants of an ecosystem that has largely been eradicated from lowland Otago. The remnants of beech forest, while small, have potential for increase in size, and together with those present in Bowlers Creek Scenic Reserve, could provide one of the most accessible sites in which to experience a beech forest ecosystem in eastern Otago.

Upper block

Dense narrow-leaved snow tussock grassland covers northern and eastern areas of the upper block. The grassland in the higher parts of this area has a taller stature, which along with the presence of occasional shrubs of bog pine, appears to reflect a lower frequency of fire. Small fens and bogs are common in shallow gullies, where sedges, sundews and small native buttercups are present. *Celmisia semicordata*, the largest alpine daisy, is common in the upper part of the block, but absent at lower elevations. Here the tussock grassland is shorter in stature, but still very dense. Species from several orchid genera (*Aporostylis*, *Pterostylis*, *Thelymitra*, *Caladenia* and *Microtis*) were commonly seen, and spectacular patches of the sky lily (*Herpolirion novae-zelandiae*) were also observed. The eastern boundary of the upper block roughly follows the upper Waipori River. The lower part of the Waipori River within this boundary forms a gorge in which many rock outcrops are present, along with regenerating shrublands (dominated by manuka) and several small remnants of beech forest (Figs 5 & 7). These areas add greatly to the habitat diversity of the upper block. Smaller gorges also create a variety of habitats along the western tributaries of the Waipori River that lie within the property (Fig. 4), and are probably important for native lizards. Streams appear pristine and would provide good habitats for native fish such as galaxiids.

In the southwest corner of the upper block and on faces of the Beaumont River below the derelict huts (grid reference G44: 896904) recent burning and grazing has caused considerable modification to the tussock grassland. Tussock cover is sparse, patchy and low in stature, and many tussocks are dead, with exotic pasture grasses dominating. In general, the Beaumont River side of the block has suffered more modification than the Waipori River side.

Wildlife

The following native bird species were observed during the field inspection.

Upper block: chaffinch, bellbird, blackbird, falcon, grey warbler, harrier, magpie, paradise duck, redpoll, skylark, starling and yellowhammer.

Lower block: bellbird, blackbird, black backed gull, chaffinch, grey warbler, magpie, oystercatcher, redpoll, rifleman, spur winged plover, thrush, yellowhammer.

Weeds

The upper parts of the upper block are remarkably weed-free. Small areas of mouse-ear hawkweed (*Hieracium pilosella*) are occasionally present at lower altitudes on sunny faces, but of greater concern is the frequent presence of tussock hawkweed (*H. lepidulum*) in southeastern areas of the block. Occasional trees of *Pinus contorta* are also present in this area, and should be controlled. The exotic daisy, cats ear (*Hypochaeris radicata*) was common in the tussock grassland, but is of little ecological significance. Gorse is a serious problem on land adjacent to the western boundary of the block, on the western side of the Beaumont River, but has largely been prevented from invading onto the property (Fig. 8). One outlying gorse plant was observed on a fenceline at grid reference H44: 521 928 and the same fence has broken wires at grid reference H44: 525 922.

Landscape Values

The upper block has considerable landscape value as an area of extensive tussock grassland on the slopes of the Lammerlaw Range. The lack of trees and buildings in this area contributes greatly to its visual appeal. The dissected topography of sinuous spurs and incised gorges provides a rich texture to this landscape, which is highlighted in partly cloudy conditions.

The landscape appeal of the lower block lies in its freedom from monocultural plantation forestry, and in the mosaic of pasture spurs and kanukalbeech-forested gullies.

Crown Pastoral Land Act 1998 (CPLA)

Part 2, Section 24 of the CPLA describes the process for tenure review of pastoral leases and has the objects of:

- (a) To:
 - (i) Promote the management of reviewable land in a way that is ecologically sustainable;
 - (ii) Subject to subparagraph (i), enable reviewable land capable of economic use to be freed from the management constraints (direct and indirect) resulting from its tenure under the reviewable instrument; and
- (b) To enable the protection of significant inherent values of reviewable land: -
 - (i) By the creation of protective mechanisms; or (preferably)
 - (ii) By the restoration of land to **full** Crown ownership and control; and

- (c) Subject to paragraphs (a) and (b), to make easier-
- (i) The securing of public access to and enjoyment of reviewable land; and
 - (ii) The freehold disposal of reviewable land.

The following sections of this report are guided by these CPLA objectives in making recommendations for areas to be protected under the tenure review process.

Recommendations

Areas to be protected

Castle Dent Pastoral Lease is a significant property due to the inclusion of both high altitude tussock grasslands and lowland areas where remnants of native forest are present. Many significant inherent recreation, conservation and landscape values are present. The best method of protecting the significant inherent values of this land will be restoration to full Crown ownership and control under Section 24(b)(ii) of the CPLA.

In the upper block, the bulk of the land with significant inherent values should be protected by returning to full Crown ownership and control, under management of the Department of Conservation, all the land in the northern and eastern portions of this area (Map 1). This would extend the link between the existing Olendhu conservation land, and the Te Papanui Conservation Park, which provides a fully protected altitudinal sequence of natural vegetation from 600 m elevation to >1100 m on the Lammerlaw Range. In addition, the headwater catchments of the Waipori River would become entirely protected, given that those on the eastern side are already managed for conservation. The formed road running through the centre of the block should be included within the protected portion to provide for continued public access. Retention of the hut at grid reference 044: 499 865 within the area to be returned to full Crown ownership and control would continue to allow for public use of this facility, and enjoyment of the area.

Most of the remaining land on the southwestern side of the upper block has been heavily modified for pastoral use and freehold disposal of this land would be consistent with the objectives in Section 24 (a)(ii) and (c)(ii) of the CPLA.

Finding a clear-cut boundary between land with significant inherent values and land with economic use is more difficult in the lower block due to the pattern of kanuka/beech forest in the gullies and pasture on the intervening spurs. Protection of the forest remnants must incorporate exclusion of stock: protected areas will need to be securely fenced. The areas of kanuka forest on steep faces above Bowlers Creek should be returned to full Crown ownership and control and managed as conservation land, as should the majority of the forested gulleys on the Bowlers Creek side. All of these areas have significant inherent value as sites for fertile lowland indigenous forest, which is rare in the region. These could be added to the existing Bowlers Creek Scenic Reserve. Likewise, kanuka stands on the steep faces above the Tuapeka River should also be returned to full Crown ownership and control, as well as one large face of kanuka and beech forest on a gully leading to the Tuapeka River. These areas have limitations for pastoral use, and the latter would likely undergo conversion to exotic plantation forest if not

subject to a protective mechanism. It may be appropriate to protect an additional, smaller remnant of kanuka/beech forest by use of a protective covenant under Section 24(b)(i) of the CPLA. Such a covenant should provide for fencing to exclude stock, and should prohibit fire, and planting of exotic trees. The indicative boundaries for these areas as indicated on Map 2 would protect all the kanuka stands which contain remnants of beech forest, allowing eventual succession to beech forest throughout these stands. In some cases, areas of pasture will need to be included within the proposed conservation land to allow for practical fencelines. These can be expected to quickly return to kanuka forest cover, given the vigour that this species shows elsewhere on the property. Some areas of less-diverse kanuka forest are present on the remaining land, which is generally suitable for pastoral farming and could be freeholded. Existing fences can be used to define boundaries in many cases.

Access

Access is largely provided for by existing public roads. Formed roads provide direct public access through the centre of both blocks. The lower block also has unformed legal roads which give access to Bowlers Creek and the Tuapeka River. These should be retained, as they provide potential for recreational access, and would allow a round trip between these two rivers. In the upper block, public access along the water race on the Beaumont River side of the block should be provided for. Additionally, where the formed road differs in alignment from the legal road, it should be ensured that the formed road has legal status as a public road. Marginal strips must be laid off along any parts of Bowlers Creek, the Beaumont River and the Tuapeka River that fall inside freeholded land. The location of the property on State Highway 8, just over an hour's drive from Dunedin, would justify the provision of recreational facilities to allow a day walk incorporating Bowlers Creek and the Tuapeka River.

Conclusions

Castle Dent Pastoral Lease is a very accessible property that contains a roughly equal balance of areas of significant inherent value, and areas that could freeholded for economic use. Carrying out the recommendations of this report would enable protection of significant recreation, conservation and landscape values present, and eventually could allow for a new public walking opportunity from State Highway 8.

References

- Moore, L.B. and Edgar, E. (1976). *Flora of New Zealand. Volume II. Indigenous Tracheophyta, Monocotyledones except Gramineae.* Government Printer, Wellington.
- St George, I. (1999). *Nature guide to New Zealand native orchids.* Random House New Zealand, Auckland.

Acknowledgements

Ray Macdonald, the lessee, granted access to the property to enable the survey, and was very helpful in providing transport to the top of the property.



Figure 1: Dissected hill country on the lower block of Castle Dent Pastoral Lease, with developed pasture on spurs and stands of kanuka and beech in gullies. The photograph looks across the boundary of the lower block to where the land on the adjacent title is being prepared for exotic forestry.



Figure 2: Looking across tussock grassland vegetation in the highest part of the upper block toward the Blue Mountains.



Figure 3: Looking across kanuka stands in the lower block of Castle Dent Pastoral Lease to the silver beech forests of Bowlers Creek Scenic Reserve.



Figure 4: A small gorge in a tributary of the Waipori River, within the extensive tussock grassland ecosystem that dominates the dissected topography of the upper block of Castle Dent Pastoral Lease.



Figure 5: The upper Waipori Gorge forms a dramatic feature on the eastern boundary of the upper block. Shrublands occur on the faces of the gorge and several small stands of silver beech are present.



Figure 6: Water race to the Beaumont River. The track beside the race provides good access to the Beaumont River, which could be used for mountain biking.



Figure 7: Beech forest remnant and shrublands in the upper Waipori Gorge.



Figure 8: Dense stands of gorse across the western boundary of the upper block, on the western side of the Beaumont River.