Toitu te whenua
Land Information
New Zealand

Crown Pastoral Land Tenure Review

Lease name : Muzzle

Lease number : Pm 005

Conservation Resources Report

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

They are released under the Official information Act 1982.

Copied November 2003

Department of Conservation
Te Papa Atawhai

PAS 401

5 August 1999.

Simon Bamford
Property Consultant
PO Box 794
BLENHEIM

Dear Simon

MUZZLE STATION TENURE REVIEW - REVISED CONSERVATION RESOURCE REPORT RECOMMENDATIONS.

Please find attached the revised Conservation Department recommendations for the Muzzle Station. These recommendations replace the earlier recommendations made under the 1948 Land act process. These revised recommendations are made in accordance with the Departments standard procedures and reflect the department's view as per the 1998 CPLA.

At this point full documentation for the easements is not available, but is being actioned. These will be finalised as soon as the consultation phase is under way.

The revised recommendations are in accordance with 3.2 of your approved project plan. Once the consultation phase is under way the marginal strip and consent process will be initiated.

The Department has made tenure review a priority and we are anxious that we can make some progress over the next few months. Please note that in some instances the Department's recommendations may have changed as the objectives and definitions are now different under the CPLA. This point should be clearly made to the lessee's.

At this point the department does not have any status information and therefore these recommendations may change if new information comes to hand. It should also be noted that the Department has indicated that it would like to include the Clarence Reserve Crown Land in with this review. We have asked the Commissioner of Crown Lands for direction on this issue. The Nelson/Marlborough Conservancy is now of the opinion that it would like to acquire the Crown Land area and will be formally notifying the CCL.
Please if you have any concerns please feel free to contact me.

Yours faithfully

Mike Clare
Manager High Country Tenure Review
For CONSERVATOR

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MUZZLE
PART 4 (FOR OFFICIAL USE ONLY)
RECOMMENDATIONS AND JUSTIFICATION

4.1 Recommendations

4.1.1 That the proposals described below be submitted to the CCL's Agent, during the consultation process on the preliminary proposal for this tenure review, as representing the views developed under delegated authority from the Director-General of Conservation.
[Note that additional proposals, developed after the initial report is written, may also be put forward at the consultation stage.]

4.1.1 Note that statutory consents will be required before the CCL can include (in the preliminary proposal for this tenure review) the designations set out in paragraphs: 4.2.5.1,4.2.6.1, and 4.2.7.1 below.

4.1.2 Note that any disposition of the land by the Crown will be subject to the relevant provisions of Part IV A Conservation Act.

4.2 Proposals and Justification

4.2.1 Land to be Restored to or Retained in Full Crown Ownership and Control

4.2.1.1 *Name:* Inland Kaikoura Range
Existing status: Pastoral lease.
Authority: s.35 (2)(a) (i) CPLA
Proposal: That an area of approximately 12,000 hectares be designated as a Conservation area to be managed by the Department of Conservation.
Description: This large area includes the summits, ridges, slopes and stream headwaters of the Inland Kaikoura Range above 900 metres. The lower boundary follows the change of slope along the main Clarence fault. The northern boundary borders Bluff Station and includes the lower true left bank of Darts Stream to the Clarence River. At the southern end the proposed boundary includes the Spray catchment, Red Hill and the true right branch of Ortley Stream to the Clarence River. In many places the boundary follows existing fences or natural boundaries.
Justification: The land is characterised by areas that have the following significant inherent values:
1) The Muzzle Station alone is part of the special natural quality and integrity of a High Country landscape. The following values contribute to this:

- A spectacular high country landscape, relatively free of modification
- Impressive wide vista and spectacular views.
- Scale, and diversity of landforms
- Clarence valley Limestone fault and associated landscapes.
- Dramatic peaks and catchments of the Inland Kaikoura's Range.
- Contrasting gorges and braided Clarence River.

- Over whelming sense of remoteness.

2) The majority of this area meets PNAP criteria for protection of priority natural areas (RAPs) These values are:

- Twelve RAPs were identified during the ecological survey of the property, ten of these occur within this greater area.
- Most extensive area of intact plant communities on the property, including alpine, rockland, scree, tall tussock grassland, shrubland and forest communities.
- Darts Stream shrublands of kanuka/manuka are the most extensive on the property and abuts a similar area on Conservation land.
- Extensive mountain and Halls totora on open slopes and terraces
- Ravine Stream catchment contains the densest and largest *aclphylla glaucescens*/silver tussock community on the property.
- Catchments contain areas of beech forest that is actively regenerating.
- Dead Horse Gully wetland is the only significant wetland on the property and one of the few in the Ecological District.
- Slopes of the Inland Kaikoura's have a range of broad-leaved-snow tussock grassland.
- Stream communities have a diverse range of shrublands.
- Cow Stream limestone outcrop has a range of limestone plants.
- Carters Knob is the most representative area of broad-leaved snow tussock on the property
- Gridiron volcanics next to the Clarence River host a variety of shrubland species.
- Raoulia Flat in the Clarence River bed is typical of plant communities that would have been widespread in the past.
- Dry land shrublands in the Spray represent a low altitude community on bare ground.
- Forest and shrubland habitats contain a number of native birds
- Extensive unmodified riverbed is habitat for a number of river birds.

3) The property is host to a variety of endemic plants/communities that are uncommon. The key ones are:

- Extensive scree plants growing along the main range, cover a broad altitude range and support a number of nationally rare or threatened species.
- Large number of Marlborough endemics, representing significant biodiversity and endemism.
- There are a number of plants only found in this locality.
- Diverse range of plants only found on the Limestone and sandstone outcrops.
- Centre of distribution for many of Marlborough's plant species and communities.
- Nationally important centre for diversity of lizards and giant wetas.

4) The ten areas will when combined contribute significantly to the natural functioning and ecological integrity of the Inland Kaikoura's. As:

- All the areas are linked and no area is a stand-alone concept. This fulfils ideal reserve design criteria.

- The size of the area will ensure that the key representative ecosystems are well buffered.

5) The Clarence valley and the Muzzle have a number of special geo-physical features. These are:

- Area of fastest rate of uplift in New Zealand.
- Dramatic uplift has created dramatic erosion characterised by extensive screes.
- Graphic faulting landforms
- Wide range of landforms, providing an important scientific and educational resource
- Complex array of rock types that are well exposed in several locations.
- Important location for early-Cretaceous angiosperm fossils.

6) The Muzzle forms part of the wider historic and cultural complexes and landscapes of the high Country. These are:

- Old cob buildings and dry stone walls representing early pastoral activity.
- The Clarence valley features in the early Marlborough literature, and is one of the few areas surviving today in NZ where it is possible to understand the isolation and remoteness of the early high country farms.

7) The Muzzle is a setting of high natural value for outdoor recreational opportunities as it:

- Provides alternative access on to the Inland Kaikoura Range as well as Mt Tapuae-o-Uenuku for tramping and climbing.
- Important remote area experience
- Is a significant part of the Nelson/Marlborough recreation asset
- Provides a broad spectrum of recreational activities.

Management and boundary issues: Active management of this large remote area will be difficult, however the issues will be primarily centred on weed and pests control. At the lower altitudes briar and small patches of broom are the dominant weeds. Control of the latter will require vigilance especially around the river bed areas. Goats are scattered through out and will require a continuation of existing control methods in order to protect the Marlborough endemics. Pigs are largely confined to the lower areas and recreational shooting should with the landowners concurrence take care of them. Part of the proposed Conservation land will be unfenced and while this is considered undesirable, fencing is a very expensive option. It is considered desirable that all sheep are kept behind fences and that a cattle only regime be allowed in areas where there are no fences. And accept that there may be some stock trespass up the slope into the public Conservation land.

The recreational component will largely be one of semi wilderness/remote experience for the higher lands. Shooting permits and access permission will be the main issue. The Clarence River will continue to be the main focus for recreation from rafters and canoeists this will require some management.

4.2.1.2 *Name:* Bluff Hill
Existing status: Pastoral lease
Authority: s.35 (2)(a) (i) CPLA
Proposal: That an area of approximately 400 hectares be designated as a Conservation Area to be managed by the Department of Conservation.
Description: Bluff Hill is a prominent limestone outcrop next to the Clarence River. Bluff Stream dissects Bluff Hill and has formed impressive limestone bluffs.
Justification: The land is characterised by areas that have the following significant inherent values:

1) Bluff Hill contributes to the special natural quality and integrity of the Clarence valley landscape. The special values associated with this area are:

- Impressive limestone bluffs and gorges.
- Setting within the overall Clarence valley

2) Area meets the PNAP criteria for protection as a priority area. These values are:

- Area represented the other two RAPs identified on the property
- Diverse specialised flora growing on limestone
- Dense native Marlborough broom
- Manuka shrubland and scattered Halls totora
- Mixture of broad-leaved snow tussock and silver tussock

3) The special plant communities growing on the limestone host a number of Marlborough endemics that are specialised and uncommon in the Region.
4) While Bluff Hill is isolated from the larger area proposed for protection, it does contribute and represent a special limestone feature of the Clarence valley.
5) Bluff Hill is an impressive geo-physical feature. The limestone fault and associated hills dominate the valley. Bluff Hill is part of this system

Management and boundary issues: It is not anticipated that this area will be fenced as the majority of the values are confined to the steep bluffs and out of reach of grazing domestic stock. Feral goats are present in the area and some level of control is required. It is proposed that the public access easement will link through this area and some track formation will be required.

4.2.2 Land to be Restored to or Retained in Crown Control

Not Applicable

4.2.3 Existing Reserve

Not Applicable

4.2.4 Existing Conservation Area

Not Applicable

4.2.5 Land Being Disposed of Subject to a Protective Mechanism

4.2.5.1 *Name:* Muzzle public access easement.
Existing status: Pastoral lease
Authority: s.40 (1) (c) CPLA
Proposal: That an area of 20 hectares (20kms x10m) be designated as land that may be disposed of subject to the creation of an easement for the purpose of providing public access.
Description: This public access easement will start from Smokers Hole (just down stream from Goose Flat hut), follow the 4WD track to Bluff Hill and then across the front face above the Clarence to join up with the 4WD track again near the area known as the "*the Rapu.*" From here the farm track is followed to the northern boundary at Darts Stream. This proposed easement would also head northwest from Smokers Hole to the Bluff River.
Justification: This proposed access easement will provide as of right all year round public access for walkers, horses and non-motorised bikes. This access will provide legal, practical access through the Muzzle as well as providing linkages to the higher altitude lands, via the numerous streams and rivers.
Linkages will also be possible with the adjoining Clarence Reserve and in the longer term may be possible via Bluff Station to the North.
Management and Boundary issues: The route outlined above will ensure that the public is kept away from the homestead complex and main farming areas. The easement is primarily along the Clarence River and should not impinge on farming operations. The route will require marking and appropriate signage. River users will primarily be utilising the river margins, but do camp or utilise the Muzzle huts occasionally. Some discussion will be required to discuss managing this user group. Access from Clarence reserve is very river dependent and may not be possible for long periods of the year. The remoteness of the area does require groups to be independent and self-reliant.
Type of protective mechanism: An easement under s.7 (2) Conservation Act for public access.
Attachment: Terms and conditions

4.2.6 Other qualified designations

4.2.6.1 *Name:* Muzzle management access easement.
Existing status: Pastoral lease
Authority: s.36 (3)(b) CPLA
Proposal: That the designation of land under s.35 (3) CPLA, for disposal be subject to the creation of an easement to provide the Department of Conservation with access for management purposes.
Description: This management access easement will start from the Spray Stream below Tyler Point, follow the 4WD track past the homestead to the northern boundary at Darts Stream.
Justification: This route is over the existing farm track and will allow the Department of Conservation to have occasional vehicle access to the

proposed Conservation areas in order to facilitate proper management of the area.
Management and boundary issues: It is not anticipated that management access will be required often and therefore track maintenance should not be an issue. Prior access permission will be sought, but it is not anticipated that it will be unreasonably withheld.
Type of Qualification: Easement in favour of the adjacent land.
Attachment: Terms and conditions

4.2.7 Exemption or variation of a marginal strip width

4.2.7.1 *Name:* Bluff Stream
Existing status: Pastoral lease
Description: A variation to increase the width of the marginal strips on the true right and left bank of Bluff Stream is sought from the proposed Conservation area of Bluff Hill through to the greater Conservation Area. This increase in width is to protect the shrublands along the stream margin and the actual width will be determined during the consultation phase.
Justification: There are a number of significant inherent values associated with this increase in width. They are:

- Protection of the riparian shrublands that are very diverse and have a number of special features.
- Protection of these shrublands will provide natural ecological linkages from the lower altitude lands to the higher region, allowing seasonal fauna movement
- Ensure that there are good access corridors that are practical

Management and Boundary issues: The existing status quo management is envisaged, with the main management concern being burning, spraying and earth disturbance. If these latter points are managed carefully, no particular management requirements are envisaged.

4.2.8 Other matters

4.2.8.1 NGO Consultation. The above proposals should largely fulfil the NGOs aspirations for the Muzzle. Protections of key sites are advocated, along with good, as of right access. However there will be strong concerns expressed about the lessee being offered freehold title over his farmland. The NGOs have advocated a special lease and covenants over the balance of the property that was not identified as proposed Conservation area. Unfortunately earlier discussions and inspections were clearly advocating some form of Crown control i.e. Special lease. While this was discussed with the lessee, in general terms, it is apparent that without the detail no general agreement was likely. A reassessment of the Conservation resource under the CPLA clearly indicates that the land being identified for disposal, as freehold does not have significant inherent values that indicate that there should be some form of Crown control. The objectives of the CPLA are being met and also consideration is being made of the requirements for a clean split and those covenants should be used sparingly.

4.2.8.2 Clarence Reserve Crown Land. The Muzzle review has been linked to the adjacent Clarence Reserve Crown land area for some time. The Muzzle

lessee has indicated an interest in acquiring part or all of this Crown land. So that he can obtain a balance of country for his farming operation if the review of the Muzzle proceeds. The CR also provides access to the Muzzle from the inland Kaikoura Road. Securing this access is vital for the secure future of the Muzzle. Earlier the Crown Land area was proposed as a *"Special Lease"* and the passage of the CPLA allowed the area to be considered for disposal. However there is considerable Conservation interest in this area and some rationalisation is considered desirable. Direction is required as to whether this Crown Land area is included as part of the Muzzle review or as separate review under Part 3 of the CPLA.

PART 5

ATTACHMENTS

5.1. Additional Information

(i) Terms and conditions of qualified designations
(ii) Terms and conditions of protective mechanisms

5.2. Illustrative Maps

5.2.1 Topo/Cadastral

5.2.2 Values

5.2.3 Boundaries

NELSON/MARLBOROUGH CONSERVANCY
Internal Report No.16

Conservation Values of Muzzle Station Southern Marlborough (including recommendations for protection)

by

Mike Harding

Department of Conservation
Private Bag 5
Nelson
New Zealand

December 1994

CONTENTS

Bibliographic reference:

HARDING, M. 1994: A survey of Conservation Values of Muzzle Station Southern Marlborough (including recommendations for protection) Internal Report No 16, Nelson. 41 pp.

1.0 INTRODUCTION

This report describes the conservation values of Muzzle Station in Marlborough and makes recommendations for the protection of those values by setting aside reserves and introducing lease conditions. The assessment of these values is based on available literature and on a field inspection of the property by Department of Conservation (DoC) botanist, Shannel Courtney, Federated Mountain Clubs representative, Andy Dennis, and consultant, Mike Harding, over nine days in October/November 1994.

The purpose of this report is to identify the Department of Conservation's interest in the property for nature conservation, recreation, and historic resource protection. It has been prepared in response to a request for tenure review from the lessee of Muzzle Station. It forms the Department's part of the joint Landcorp/DoC submission to the Commissioner of Crown Lands, and is just one stage in a process of consultation and negotiation which may result in tenure change on the property.

The first part of this report describes the natural values of the property, including its geology and soils, flora and fauna, landscape, recreation, and historic values. The second part of the report proposes formal protection for the most significant of these values by the establishment of twelve protected areas and through conditions on the grazing lease. Freeholding is not recommended, as the parts of the property suitable for freehold ownership are small and isolated. The recommendations in this report are based on readily-available information. It is likely that other significant values will be identified in the future. The Department of Conservation reserves the right to alter these recommendations in light of such information, and to negotiate further protection for features on the property.

The Muzzle Run covers almost 17,000 hectares on the Inland Kaikoura Range, north of the mid-Clarence River, in inland Marlborough. The property is leased by Colin and Tina Nimmo and is presently stocked with approximately 3000 merinos, 500 cattle, and numerous horses (Colin and Tina Nimmo, per.comm.). The property also supports 400 beehives, producing honey from 'blue borage' (vipers bugloss). The lease is a standard pastoral lease under the Land Act 1948.

2.0 CONSERVATION VALUES

2.1 GEOLOGY AND LANDFORMS

Muzzle Station covers an area with an interesting and complex geology. These geological features have been recently mapped and described by Reay (1993). Basement rocks of the Inland Kaikoura Range are comprised of highly folded and contorted greywackes and argillites formed from sediments deposited in the New Zealand Geosyncline during the Jurassic Period. Collectively known as the Torlesse Group, this series includes concretions, rare conglomerate and limestone bands, and igneous dykes and extrusives (DSIR 1962). These rocks are well exposed along the main alpine ridge and upper flanks of the Inland Kaikoura Range. Mid Cretaceous igneous rocks outcrop on the major summits of the range (Reay 1993).

At the base of the steep south-eastern flank of the range, in the Clarence valley and coinciding with the Clarence Fault, is a younger sequence of conglomerate, siltstone, sandstone and limestone which was deposited during the early Tertiary. This series outcrops as a series of prominent ridges and scarps from the Chalk Range in the north to Bluff River in the south. Outlying remnants of this formation outcrop at Bluff Hill (with mudstone and volcanics) and across the Clarence River, at Limestone Hill and Warder, on Clarence Reserve. On Muzzle Station the Bluff, Muzzle, Ravine, and Dart Streams have cut down through these deposits to form narrow and spectacular gorges and ravines.

Between these sediments and the Clarence River, a series of graded siltstones and sandstones of intermediate age (Cretaceous) occur. This formation outcrops as low rounded hills forming the lower altitude parts of the property. Adjacent to the river, particularly between Red Hill Stream and Bluff River and south of Ravine Stream, are prominent terraces of outwash gravels, deposited during the most recent (Pleistocene) glaciations. These terraces support the areas of developed pasture in the vicinity of the Muzzle Homestead and Ravine Hut.

Fossils are rare in the Torlesse (basement) rocks, but present in the younger sediments. Daniel (1989) reports a diverse fossil megaflora from coal-bearing deposits in lower Red Hill Stream and from other deposits at several locations on the south side of the Clarence River, on Clarence Reserve. Daniel describes 34 new leaf form species from these deposits and believes that this early Cretaceous angiosperm flora assemblage is unique in the Southern Hemisphere.

The existing landforms of the area are a result of continued uplift and erosion, particularly block-faulting during the Tertiary and more recent transcurrent faulting. The Clarence River continues downcutting adjacent to the line of the major Clarence Fault, and nearly all the tributary streams have been clearly displaced sideways where they cross the fault line. The over-steep flanks of the Inland Kaikoura Range, the weak rock structure, and the relatively brief annual snow cover result in high rates of natural erosion from the upper slopes and the wide unstable beds of the major streams.

Topographically, the property can be divided into two main landsystems, separated by the Clarence Fault. The first lies north of the fault and comprises the steep south-eastern flank

of the Inland Kaikoura Range. It is dominated by the high summit ridge of the range, at over 2200 metres, the upper catchments of the major streams and their broken dividing ridges, and the broad front faces of the range between 900 and 1500 metres. The second landsystem lies south of the Clarence Fault and comprises the rolling hill country between the fault and the Clarence River. It includes the limestone ridges and bluffs, the lower catchments of the major streams, and the terraces and flats of the Clarence River.

The Clarence Fault is a spectacular landscape feature. It separates distinct geological and topographical features, is clearly visible throughout the area, and provides excellent examples of surface fault features such as exposed scarps and rifts, displaced streams, and disjoint landforms. Sulphur springs or seepages are present where stream gorges cross the fault line. One such feature - an exposed 'high angle reverse fault plane' - on a high terrace in Dart Stream, is listed as a Geopreservation Site (Stirling 1988).

The limestone ridges, bluffs, and gorges, especially Bluff Hill, 'St Pauls' ridge, Bluff Stream gorge and Ravine Stream gorge, are also distinctive and spectacular landscape features. These outcrops dominate the lower altitude parts of the property and the gorges provide impressive examples of sedimentary deposition and downcutting, particularly the 'brick-work' displayed in the Bluff, Muzzle, and Ravine Stream gorges. Contacts between the different sedimentary layers, and associated volcanics, are exposed on Bluff Hill and on a prominent bluffs south of Muzzle Stream at The Rapu. Volcanic dykes and sills exposed on the ridge north of lower Bluff Stream are listed as a Geopreservation Site representing the best exposure of Grasseed Volcanics (Weaver et al, 1990).

Another interesting landform is a low terrace isolated between an old channel and the present channel of the Clarence River between Bluff and Muzzle Streams. Known locally as 'The Rapu', it is an excellent example of a mesa and a stranded river meander. A further notable landscape feature is the Carriage Drive between Roaring Meg and Gentle Annie Streams. This gently sloping and broad ridge is a high level remnant of an alluvial fan and is listed as a Geopreservation Site (Kenny and Hayward 1993).

2.2 SOILS

Alpine areas on the property are dominated by weathered rock ridges and bluffs, shattered rock pavements on gentler summit ridges, extensive rock scree slopes, and deep gravel deposits in stream beds. The scree slopes are especially spectacular in the north of the property, on the slopes of Mt Alarm and Mt Tapuae-O-Uenuku, where they extend from above 2300 m (in the scenic reserve) to below 1200 m in the Muzzle and Dart Valleys. Incipient soils derived from rock fragments and loess are a minor component in the alpine zone.

The front faces of the range, between 900 and 1500 m support steepland yellow-brown earths (Gibbs 1980) interspersed with cones of rock scree. These Class VIIIe soils are prone to severe sheet, gully, and debris-avalanche erosion, often resulting in the development of extensive screes. A survey in 1942 showed that 75% of the 1.6 million hectares of Kaikoura steepland soils had lost more than half their topsoil (Gibbs 1980). These faces presently support depleted tussock grassland and are grazed seasonally by sheep.

The lower altitude country, between the Clarence Fault and the Clarence River, supports yellow-grey earths grading to brown-grey earths on semi-arid sites (Gibbs 1980). These ...s experience moisture deficits for about 3 months of the year (up to six months for brown-grey earths) and are prone to moderate sheet, soil slip, and wind erosion. There are also small areas of clayey soils derived from limestone and basic rocks. Fertility varies depending upon parent rock and moisture deficiency is the main limitation for plant growth. These soils support the more productive pastures of the property and therefore make up the most important grazing land.

Recent terraces and floodplains are composed of gravelly alluvium with little soil development, the best examples being the stable flood channels of the Clarence River.

2.3 VEGETATION AND FLORA

Vegetation History:

The existing vegetation patterns in the mid Clarence valley have been strongly influenced by fire. Investigations of forest and shrublands on the Seaward Kaikoura Range have revealed abundant charcoal deposits in the soil (Wardle 1971) and examination of buried soils throughout the South Island indicate that fire was an occasional natural phenomenon (Molloy 1977). Widespread burning occurred about 6000 years ago and again about 2500 years ago (ibid) and became more frequent in the Clarence Valley following Polynesian settlement about 1000 years ago (Wardle 1971). The lack of stumps or wood suggest that forest has been absent from large parts of the valley for a long time and Williams (1989) believes that the extent of forest on the Inland Kaikoura Range has changed very little since the 1850s. It is likely that the montane parts of the property were originally a covered with mosaic of forest, shrubland and tussock, and that some low altitude species such as matai (Prumnopitys taxifolia) and totara (Podocarpus totara) were present.

Early European observations of the vegetation in the Clarence Valley describe open country. Shortly after pastoral activity began, the Ottley Fells run (Now Bluff and Muzzle Runs) was described in 1869 by J.C.Chaytor as "a splendid bit of country, quite open and up the knees in grass" (Sherrard 1966). In 1899 the "native blue-grass [presumably *Agropyron scabrum* (Williams 1989)], once the chief pasture plant in the Clarence Valley, had almost disappeared" (Sherrard 1966). Repeated burning occurred during the early years of pastoralism, reducing the remaining forests and shrublands to isolated remnants in upper stream catchments and sheltered gorges, and further depleting the native grasslands.

Present day vegetation patterns comprise intact scattered alpine plant communities, subalpine shrublands, totara and beech forest remnants and mixed hardwood forest/shrublands in upper catchments, modified broad-leaved tussock grasslands and open screes on upper montane slopes, montane shrublands in lower altitude valleys and gorges, scattered totara, kanuka and herbaceous calcicoles on limestone bluffs and scarps, induced short tussock grasslands with introduced pasture plants on low altitude hill country, cultivated pasture on some river terraces, and rockland plant communities throughout on steep slopes and gorge sides.

Alpine vegetation:

The alpine zone is dominated by open rock and scree, with vegetation present as scattered plant communities typical of the inland Marlborough mountain ranges. A wide range of herbs and grasses are present, notably many species of the daisy family (*Raoulia, Helichysum*, and *Haastia*) including the spectacular 'vegetable sheep', *Haastia pulvinaris* and *Raoulia eximia*. Snow cover prevented an investigation of the high alpine flora, though Williams (1989) records sparse and scattered plant communities and notes the influence of widespread rock wasting on the stability of the alpine zone.

Mixed tussock-herbfield is present at stable low alpine sites, and dominant species are mid-ribbed snow tussock (*Chionochloa pallens*), *Celmisia spectabilis, Aciphylla aurea, Aciphylla monroi, Ranunculus insignis, Muehlenbeckia axillaris, Wahlenbergia albomarginata, Leucopogon suaveolens, Leucopogon fraseri, Gaultheria novae zealandiae, Gaultheria crassa, Poa colensoi, Hebe carnosula, Hebe atropurpurea*, and *Hebe lycopodioides*. This grades into the shrubland community described below.

Sub-alpine shrublands:

Subalpine shrublands are present at forest margins in the tributary streams, on open bluffs and ridges, and adjacent to Hall's totara (*Podocarpus hallii*) forest remnants on open faces. In the valleys they are dominated by *Brachyglottis monroi, Dracophyllum uniflorum*, snow totara (*Podocarpus nivalis*), celery pine (*Phyllocladus alpinus*), mountain tauhinu (*Cassinia vauvilliersii*), mountain wineberry (*Aristotelia fruticosa*), *Olearia cymbifolia*, and porcupine shrub (*Melicytus alpinus*). Occasionally present are: *Myrsine nummularia, Hebe decumbens, Gaultheria crassa*, midribbed snow tussock, *Aciphylla glaucescens, Traversia baccharoides*, flax (*Phormium cookianum*), and prickly shield *fern (Polystichum vestitum*). In the Muzzle Stream catchment these shrublands grade into a low mountain ribbonwood (*Hoheria lyallii*) - Hall's totara forest, and then into mountain beech forest. On open faces adjoining Hall's totara forest the shrublands are dominated *by Brachyglottis monroi, Dracophyllum longifolium*, snow totara and *P.nivalis X P.hallii* hybrids, with occasional mountain ribbonwood. On exposed ridges the shrublands are less dense and dominated by stunted *Brachyglottis monroi*, mountain tauhinu and snow totara.

Forests:

Mountain beech forest (*Nothofagus solandri* var *cliffortioides*) is present in the upper Muzzle Stream catchment at altitudes between 600m and 1350m, as small pockets in the head of Ravine Stream, frequently on steep slopes surrounded by rock and talus, and in one small patch in Dart Stream. Hall's totara forest is mostly present in small patches in the headwaters of the major streams, including Muzzle Stream, and in isolated pockets in lower gorges and on limestone bluffs. There has been insufficient time for beech to recolonise its pre-burning habitat and continued disturbance has limited the extent to which totara has regenerated. Both forest types are successfully re-establishing over areas where there has been no recent burning, with extensive Hall's totara regeneration in Bluff, Ravine, and Dart Streams. Mixed hardwood forests cover quite extensive areas on the steep slopes in the upper stream catchments and lower gorges.

The mountain beech forest frequently has a scattered understorey of putaputaweta (Carpodetus serratus), broadleaf (Griselinia littoralis), Hall's totara, lancewood (Pseudopanax crassifolius), three finger (Pseudopanax colensoi), and Coprosma linariifolia. Occasionally present in the typically sparse understorey are bush lawyer (Rubus cissoides), Helichysum lanceolatum (ex H.aggregatum), Hebe venustula, Hebe traversii, Olearia cymbifolia, corokia (Corokia cotoneaster), and Brachyglottis monroi.

In the upper stream catchments and on montane slopes Hall's totara is present in dense stands with occasional broadleaf, celery pine, Coprosma linariifolia, mountain ribbonwood, and weeping mapou (Myrsine divaricata). Many Hall's totara stands are bordered by healthy regeneration into shrublands or grasslands, often with scattered matagouri (Discaria toumatou), and tauhinu. Hall's totara on limestone bluffs and gorges is generally scattered and frequently associated with large kohuhu (Pittosporum tenuifolium), akiraho (Olearia paniculata), and patches of kanuka (Kunzea ericoides) or manuka (Leptospermum scoparium).

The mixed hardwood forests are diverse communities dominated by akiraho, broadleaf, lancewood, kohuhu, Coprosma linariifolia, and putaputaweta. Other species present are Olearia odorata, mountain ribbonwood, kowhai (Sophora microphylla), weeping mapou, Helichrysum lanceolatum, and occasionally fierce lancewood (Psuedopanax ferox), Pseudopanax 'ternatus', Pseudopanax arboreus, and Ewartia sinclairii.

Montane Shrublands:

Shrublands are common on lower slopes and on valley sides. The most common native shrublands are those dominated by matagouri and Coprosma propinqua with a diverse range of other species including: the introduced sweet brier (Rosa rubiginosa), Olearia odorata, native broom (Carmichaelia ovata), tauhinu (Cassinia fulvida), corokia, mountain wineberry, Brachyglottis monroi, Hebe rakaiensis, tutu (Coriaria sarmentosa), and occasionally kohuhu, toe toe (Cortaderia richardii) and cabbage tree (Cordyline australis). Several scrambling or climbing plants are common in these thick and tangled shrublands, including Parsonsia capsularis, leafless clematis (Clematis afoliata), Muehlenbeckia complexa, bush lawyer (Rubus schmidelioides), and leafless lawyer (Rubus squarrosus). At lower altitudes, particularly in the south of the property, sweet brier tends to dominate, except on south-facing slopes, where the native component is higher.

Manuka, and occasionally kanuka, is present in small patches on relatively undisturbed dry sites in the main stream valleys. Other species present in these shrublands are: corokia, mingimingi (Cyathodes juniperina), Clematis forsteri, Viola filicaulis, Laganifera pumila, Laganifera strangulata, Craspedia elongata, Acaena anserinifolia, and the orchid Chiloglottis cornuta. In the north of the property, particularly in the lower Dart Stream catchment, kanuka shrublands are common. There are also localised areas of kanuka on steeper limestone slopes and bluffs, often in association with Hall's totara. In riverbeds, and on drier montane sites, a shrubland of Brachyglottis monroi and tauhinu dominates. Other species present in these shrublands are Olearia cymbifolia, Olearia coriacea, Aciphylla glaucescens, akiraho, and matagouri.

Tussocklands

Native tussock grasslands are only present as scattered and depleted remnants, except for areas of mid-ribbed snow tussock in the alpine zone and areas of broad-leaved snow tussock (Chionochloa flavescens) on the lower flanks of the range, between about 900 m and 1200 m, and often adjacent to scree slopes. Associated with broad-leaved snow tussock is fescue tussock (Festuca novae zelandiae), Rytidosperma setifolium, Acaena caesiiglauca, Aciphylla aurea, Aciphylla glaucescens, Ranunculus insignis, and a range of other herbs. This snow tussock grassland frequently merges, at lower altitudes, with silver tussock (Poa cita) grassland and scattered shrubs, particularly mountain tauhinu, Olearia cymbifolia, and matagouri. Scattered silver tussock is relatively common on more fertile sites, particularly on limestone ridges. A shrub/tussockland of matagouri, fescue tussock, and Agropyron scabrum was formerly present on the valley floors (Williams 1989).

Rockland and Scree:

There are extensive areas of exposed rock and scree throughout the property, particularly on steep valley sides and gorges, and at higher altitudes on ridges and faces. The rocklands have a sparse but diverse community of specialised dry-climate plants including: Brachyglottis monroi, the coral daisies (Helichrysum coralloides, H.intermedium, H.parviflorum), the sun hebes (Heliohebe hulkeana, H.acuta, H.pentasepala, H.raoulii), Hebe rupicola, Hebe traversii, Hebe rakaiensis, native daphnes (Pimelia traversii, P.sericeo-villosa, P.aridula), Marlborough rock daisy (Pachystegia insignis), mat daisies (Raoulia australis, R.apice-nigra, R.hookeri), prostrate broom (Sophora prostrata), porcupine shrub (Melycitus alpinus), Melycytis 'Marlborough', speargrasses (Aciphylla aurea, A.glaucescens, A. monroi), Celmisia gracilenta, Leptinella pyrethrifolia, Myosotis australis, Colobanthus acicularis, Vittadinia australis, tutu (Coriaria kingiana), mountain flax, Poa colensoi, and Poa buchananii. Of more limited distribution are: Exocarpus bidwillii (Muzzle Stream), Muehlenbeckia ephedroides, and pink broom (Notospartium carmichaeliae) in the Muzzle, Ravine and Dart Streams. The introduced vipers bugloss (Echium vulgare) and woolly mullein (Verbascum thapsus) are common at lower altitudes.

Many of the specialised scree plants are present on the open scree slopes including: Epilobium pycnostachyum, Epilobium forbsii, penwiper (Notothlaspi rosulatum), Hebe epacridea, Myosotis traversii, Leptinella dendyi, Poa buchananii, Oxalis exilis, Stellaria roughii, Lobelia roughii, Wahlenbergia cartilagenea, Convolvulus fracto-saxosa, and Acaena glabra (Williams 1989). It is possible that the rare Raoulia cinerea may also be present.

Riverbeds:

Recent alluvial deposits, particularly on the wide gravel beds of the main streams support a sparse plant community with Helichrysum depressum, silver tussock (Poa cita), Epilobium melanocaulon, Epilobium microphyllum, mat daisies (Raoulia australis, R. tenuicaulis, R apice-nigra, and Raoulia species 'M'), Muehlenbeckia axillaris, Parahebe decora, tutu (Coriaria kingiana), and the introduced vipers bugloss and woolly mullein. On stable sites matagouri, tauhinu, Olearia odorata, and manuka have become established.

An interesting riverbed plant community is present on fine gravels and sand on old flood channels of the Clarence River. It is dominated by bare ground and Raoulia australis mats, with Epilobium rostratum, Epilobium microphyllum, Colobanthus brevisepalus, Poa maniototo, Poa lindsayi and small matagouri seedlings. The community is surprisingly free of introduced plants, with only scattered vipers bugloss and woolly mullein present.

Limestone vegetation:

A distinct plant community is present on exposed limestone soils and talus, especially on steep bluffs and scarps. Hall's totara and akiraho are present in small patches or as individual trees, often associated with kanuka. Small trees and shrubs include: pink broom, native daphnes (Pimelea pseudo-lyallii and P.oreophila), Brachyglottis monroi, and occasional kohuhu. Plants endemic to limestone include: Aciphylla aurea (limestone form), Carmichaelia astonii, Gentiana astonii, Schizeilema roughii (limestone form), Poa acicularifolia, Galium perpusillum, and Senecio glaucophyllus. Other species present include: Plantago spathulata, Craspedia elongata, Brachycome sinclairii, Marlborough rock daisy, Heliohebe hulkeana, Aciphylla glaucescens, Ranunculus insignis, Anisotome filifolia, Vittadinia australis, and silver tussock.

Wetlands and flushes:

Permanent wetlands or seepages are rare on the property and mostly modified by grazing pressure. Small seepages occur on stable riverbeds but are too limited to support any diversity of flora. Wetland areas in the alpine zone were not investigated. Only one wetland of any significance was located; along a fault-depression in the upper reaches of Dead Horse Gully Stream. It extends over about 2 or 3 hectares, but is substantially modified over most of this area. Dominant plants include: Carex secta, toetoe (Cortaderia richardii), Leptinella dioica, Juncus breviflorus, Eleocarpus acuta, Epilobium minutiflorum, Epilobium ciliatum, Viola cunninghamii, Hydrocotyle microphylla, Ranunculus flabellifolius, Montia fontana, Plantago raoulii, and native dock (Rumex flexuosus).

Significant weeds:

Brier is the most widespread of the introduced weeds on the property. It is particularly common at the southern end of the property where it forms dense shrublands. Hawthorn is also present but is largely confined to the area between Bluff River and Red Hill Stream, especially near the homestead. In the same area there are minor infestations of introduced broom. Willow has been planted throughout the property, but is nowhere a major problem except adjacent to the main Clarence River. Vipers bugloss, woolly mullein, and a wide range of other introduced herbs and grasses are present throughout the lower altitude parts of the property. At least four species of Hieracium are present (H. pilosella, H. praealtum, H. lepidulum, and another unidentified species).

Flora:

Williams (1989) recorded over 450 species of native vascular plants and 125 introduced species from the Inland Kaikoura Range, most of which are present on the property. Many of these species are characteristic of the dry greywacke mountains and of lower altitude

limestone habitats. Several of these species are Marlborough endemics, including: Hebe rupicola, Olearia coriacea, pink broom, and Pachystegia insignis.

2.4 FAUNA

The field investigation of the property was concentrated on plant communities. No comprehensive bird or lizard surveys were undertaken, but all species encountered were observed and noted.

Common bird species present in beech or Hall's totara forest were bellbird, rifleman, grey warbler, chaffinch. Shrublands and low forest have a more diverse bird fauna including blackbird, California quail, grey warbler, goldfinch, and chaffinch. Other species present were bellbird, silvereye, greenfinch, yellowhammer, rifleman, hedgesparrow, redpoll, starling, songthrush, and chukor. In adjacent open country skylark, harrier, and paradise shelduck were common.

Manuka and kanuka shrublands supported a greater range of native birds, particularly the extensive kanuka shrublands in the north of the property around Dart Stream. Birds observed in this habitat were bellbird, rifleman, grey warbler, robin, brown creeper, tomtit, chaffinch, and greenfinch.

The open gravel bed of the Clarence River, and to a lesser extent the major sidestreams, supports a large number of birds including black-backed gull, banded dotterel, black-fronted tern, South Island pied oystercatcher, black shag, paradise shelduck, Canada goose, pipit, welcome swallow, and spur-winged plover. Shining cuckoo were also heard at the Muzzle homestead.

Native falcon were observed above river gorges in the lower altitude parts of the Inland Kaikoura Range at three locations (Spray Stream, Bluff River, and Dart Stream). Kea were not observed but station records indicate that they were once common in the area. They are present in the Seaward Kaikoura Range and in the lower Clarence Valley, and I have observed kea in the upper Hodder Valley, in the Inland Kaikoura Range, in December 1990. Other species recorded from the area during the Ornithological Society survey between 1969 and 1979, were native pigeon, tui, and fantail from the mid Clarence Valley and kea from the nothern side of the Inland Kaikoura Range (Bull et al, 1985).

Only the common skink (Leiolopisma nigriplantare maccanni) was observed on the property, though the spotted skink (Leiolopisma lineoocellatum) was observed north of the property in Limburn Stream and both the scree skink (Leiolopisma waimatense) and the common gecko (Hoplodactylus maculatus) have been recorded from the area (Pickard and Towns 1988). The rare black-eyed gecko (Hoplodactylus kahutarae) was recently found in the Hodder Catchment and may be present elsewhere in the Inland Kaikoura Range, as the area is largely unsurveyed (Brian Paton, pers comm.). Other unnamed lizard species have been recorded from the wider area, making the herpetofauna one of the most diverse in the country (Courtney 1992).

Insect populations were not surveyed, but several interesting native species have been recorded from the area, including the giant scree weta (Deinacrida connectens) (Meads

1990) and the bluff weta (Deinacrida sp.) (Brian Paton, pers.comm.). The Kaikoura weta (D.parva) has been recorded from the Seaward Kaikoura Range (Gibbs 1994). Alpine grasshoppers Brachaspis nivalis, and Paprides nitidus have also been recorded from the Inland Kaikoura Range (Bigelow 1967).

Introduced goats were observed throughout the property, especially adjacent to the stream gorges and on steep limestone bluffs. Pig sign was encountered in shrubland on most parts of the property and chamois were observed in the upper reaches of Muzzle Stream. Deer sign was also observed in Muzzle Stream adjacent to The Tongue. Rabbits were widespread and relatively common in places. Possum sign was widespread but not abundant, and a single mouse was observed on steep slopes above Spray Stream. Cat and hare sign was also observed, and ferrets are common (Tina Nimmo, pers.comm.)

2.5 LANDSCAPE

Muzzle Station is dominated by the high summits and broad slopes of the Inland Kaikoura Range, the hogback limestone ridges, and the wide and sinuous course of the Clarence River. It is an impressive landscape with wide vistas and spectacular views. The peaks of the Inland and Seaward Kaikoura Ranges are the highest peaks in the South Island outside the main Southern Alps. They dominate the valley and provide a sense of remoteness which, when combined with the very limited signs of human settlement, give the mid-Clarence Valley the characteristics of a wilderness area.

The weak and faulted rock of the Inland Kaikoura Range, combined with the relatively brief period of winter snow cover, provide spectacular rates of natural erosion, with many shattered rock bluffs and large screes. Streams drop steeply and carry large debris loads creating wide unstable stream beds and active riverbed aggradation. The Clarence Fault, and the block-faulted landforms associated with it, provide excellent examples of faulting and uplift. Continued erosion by the Clarence River and its tributary streams have formed impressive erosion features including the stranded terrace (or mesa) at The Rapu, large river meanders and terraces, and the narrow ravines with their limestone 'brickwork'.

Significant features of the present landscape are its scale, diversity of landform, and lack of woody vegetation. The pre-human landscape is likely to have had more extensive forest or shrubland cover, no farm tracking, and no isolated patches of green pasture or introduced trees. Because of its scale, these human influences have a relatively minor impact. However, it is important that any further landscape modification is controlled, particularly tree planting, cultivation, farm tracking, and the location of new buildings.

2.6 HISTORY

Little is documented of the pre-European association with the mid-Clarence Valley. In a recent publication dedicated by the Waitaha people, the journey of the Waka Arai Te Uru from Tahunanui (Nelson) to Te Pari Nui a Whitianga (the White Bluffs in Cloudy Bay) is described. The people paddled into the waters of the Wairau River Lagoon and built a village they called Te Waikawa o Omaka. They were guided on this journey by a large peak that reflected the sun's rays and which they later called Te Tapuwae o Uenuku - 'the stepping place of the Rainbow God' (Ngatapuwae Trust 1994). Later, pounamu was brought to Te Waikawa o Omaka from the south via trails in the Waihopai or Awatere

Valleys (ibid). Both the Awatere and the Clarence (Waiau-toa) Rivers are described as subsidiary pounamu trails by Brailsford (1984) and old Maori ovens have been recorded near the Muzzle Homestead (Sherrard 1966).

The first expression of interest in the mid-Clarence Valley by Europeans was when George Williams of Nelson applied for a pastoral run for the northern side of the valley from the Gloster to the Dee (Sherrard 1966). The application was approved in 1857 and the run, named Ottley Fells, comprised a strip of low altitude country almost 50 kilometres long and 5 kilometres wide along the north bank of the Clarence River. It was leased by George Williams and his brothers, Henry and Frederick, from 1858 to 1866. The lease was then held by the New Zealand Trust and Loan Company for 6 years and, in 1869, the Chaytor bothers of Coverham grazed cattle on the run. Cattle were successfully driven by Chaytor (after two failed attempts) to the gold workings at Hokitika, along a route past Lake McRae, Hanmer, Lake Sumner, and Harper Pass (ibid).

The lease of Ottley Fells transferred to G. Bennett and John Symons in 1871. Symons bought Bennett's share and then in 1873 bought Kekerengu Station (about 11000 acres of freehold and 11000 acres of leasehold land). Soon after he leased Coverham (3100 acres of freehold and 20,000 acres of leasehold land) eventually buying it and adding it to the Kekerengu Run. During the period that Symon owned the enlarged Kekerengu Run, the existing stone fences at the Bluff Homestead (now old Muzzle Homestead) were built, and black poplars and willows planted, by Matthew Beattie, the manager of the Ottley Fells part of the property (ibid).

In 1899 the Kekerengu property was purchased by Mrs D. Rutherford and her son Edmund for almost £40,000, except for the Elliot Block, between the Spray and Gloster Streams, which transferred to Molesworth. During the 1880s and 1890s the mid-Clarence Valley suffered from increasing numbers of rabbits and scab disease threatened the sheep. A Crown Lands Commission report in 1906 stated that the Bluff Homestead was uninhabited and that, apart from around the homestead, tussock was the only grass "and even that in many places had been ruthlessly burnt out and bare earth only meets the eye. Indiscriminate firing for years had devastated the country and what fire left the rabbits had finished off" (quoted in: Sherrard 1966). Herb Melville, who was a musterer on Clarence Reserve, describes the country in 1919: "The Reserve country from just below Quail Flat was a seething mass of rabbits. The Bluff country abandoned for three years to the rabbit was indescribable; even the matagouri trees were barked right up to the top prickle" (quoted in: McCaskill 1969).

Rutherford sold Kekerengu in 1911 and then land exchanges resulted in the Crown resuming ownership of 52,000 acres between Branch Stream and Spray Stream, subsequently called Bluff Run. It was leased sporadically until 1920 when the lease was purchased by a partnership of W.S. Bennett, A.J. Murray and P.J. Halligan. Mr Bennett took up residence at the Bluff Homestead and Mrs Bennett recorded the following about the property: "Rabbits had reduced it to a state it would be very hard to describe. Grass there was none. Even the tussock had been killed out and all the tussock that was left was on the steep faces on the range country. All that was left was matagouri bushes and even they had been stripped of their bark right out to the end of the highest branches. Nothing remained of the pack track to Kekerengu. All had been washed away once the tussock had gone; manuka had grown over the track in the lower country" (quoted in: Sherrard 1966).

The partnership began the arduous task of restoring pasture cover, packing in grass seed, controlling rabbits, and erecting fences. The Bennetts sowed 8000 acres of pasture, by hand, between 1921 and 1930. It was so successful that the Department of Agriculture consulted Mr Bennett before using a 'modified Bennett mixture' in Government attempts to rehabilitate Molesworth Station in 1938 (McCaskill 1969). Murray bought Halligan's share in the property in 1924, and Bennett sold his share to J.A. Chaffey in 1945, beginning a partnership between Murray and Chaffey that lasted till 1980 when the lease for the Muzzle part of the property was bought by the present owners, Colin and Tina Nimmo (Brooks 1989).

Historic values:

The old Muzzle Homestead was occupied up until 1990 when a new homestead was built nearby. The old homestead, built in the early 1860s, is in remarkably good condition and relatively unmodified. The old snowgrass-thatched roof has been replaced by corrugated iron (since at least 1906) and the interior lined. The old grape vine still trails along under the roof eves and the cob baker's oven still remains at the rear of the building. The cob stables are also in good condition, though all these buildings will need continued maintenance to protect their historic features. These buildings were probably constructed at the same time, and by the same builders, as the Quail Flat cookhouse, which is listed as a Geopreservation Site (Black et al, 1991).

2.7 RECREATION AND ACCESS

The most significant public use of the Muzzle Station is by hunters and rafters. Most hunters enter the property by vehicle along the 80 kilometre access road from Kekerengu, as access has not been readily available through the Clarence Reserve property and the Clarence River is frequently difficult to cross. A four-wheel-drive vehicle is needed to negotiate the portion of the road between Dart Stream and the homestead. Hunting requires consent from the Nimmos and hunters usually stay at the old homestead or at the station hut at Ravine Stream. The main game animals sought are pigs, goats, rabbits, and California quail.

The Clarence River has become a popular river to raft or kayak. Most people enter the river at the Acheron confluence on Molesworth Station and leave the river at the State Highway 1 road bridge near the river mouth. Rafters typically spend four or five days on the river. Popular overnight stops are near the Muzzle Homestead, at Goose Flat (on Clarence Reserve), Ravine Hut, and at the Dart River. Rafters are not required to, and generally do not, seek consent from the Nimmos, but occasionally call on them for assistance. It is likely that the trip down the Clarence River will increase in popularity, though Colin Nimmo believes that rafting has not increased in recent years.

The isolation of Muzzle Station means that the area is little used by trampers. Mt Tapuae-O-Uenuku is a popular destination for trampers and climbers, but almost all access is via the Hodder Valley. Very few parties (maybe two or three a year) traverse the Muzzle property as part of longer trips through central Marlborough. The property is occasionally traversed by horse riders.

Muzzle Station has many characteristics of remote backcountry or wilderness. It is extensive and has very few facilities. There is only one main vehicle track, and several farm tracks, traversing the property. The area offers great potential for walking, mountain-biking and horse riding, though these are not major uses at present. The easiest access is by raft or kayak, or by four-wheel-drive vehicle, though farm roads soon become impassable after rain. The property has some spectacular high country scenery and is of particular interest to amateur botanists, geologists or geographers. Difficult access and lack of publicity have limited public use of the area.

2.8 SUMMARY OF SIGNIFICANT VALUES

Muzzle Station lies completely within the Tapuae-O-Uenuku Ecological District, which encompasses the central part of the Inland Kaikoura Range. Mt Tapuae-O-Uenuku Scenic Reserve, centred on the high peaks of the Inland Kaikoura Range and lying almost entirely above 2000 metres, is the only protected area within the ecological district. The remnant indigenous plant and animal communities on Muzzle Station represent the full altitudinal range of communities of the ecological district. The lower altitude communities currently have no formal protection. The significant natural features of the property are summarised below.

Geology and Landform:

- an area of the fastest rates of uplift (mountain-building) in the country;
- the only part of the country where such dramatic uplift occurs in an area of relatively low precipitation and brief snow cover, resulting in high rates of natural erosion;
- the most extensive screes in the country, over the widest range of altitude (from 1000m to almost 2500m);
- an area of active fault movement, providing graphic examples of faulted landforms;
- a wide range of landform features, providing an important scientific and educational resource for the understanding and interpretation of earth processes and of the geological history of New Zealand;
- a complex array of rock types which are well exposed at several locations;
- an important location for early-Cretaceous angiosperm fossils;
- a spectacular high country landscape, relatively free of human structures, roads and exotic trees;
- wide areas of drought and erosion-prone soils which have suffered from previous degradation.

Flora:

- centre of distribution for many eastern Marlborough plants, including scree plants, rockland plants, and limestone plants;
- nationally-important centre of biodiversity and endemism;
- widespread Hall's totara forest remnants and significant isolated beech forest remnants;
- diverse shrublands and mixed hardwood forests, supporting good bird populations and providing opportunities for forest regeneration;
- significant areas of tall-tussock grassland, now rare in inland Marlborough;
- excellent examples of limestone gorge, bluff and talus plant communities;
- extensive scree flora over a wide altitude range.

Fauna:

- a nationally-important centre of diversity for lizards and giant weta;
- contains habitat likely to support populations of rare lizards and insects, particularly the black-eyed gecko and the bluff weta;
- healthy populations of the vulnerable NZ falcon;
- important shrubland habitats for native birds, including robin and brown creeper;
- extensive unmodified riverbed habitat for black-fronted tern, banded dotterel, and other water birds.

Recreation:

- an important remote-experience area with great potential for backcountry tramping, walking, nature study, hunting, horse riding, mountain biking, rafting and kayaking;
- a significant part of the range of recreation resources available in the Nelson-Marlborough region.

Historic:

- old cob buildings representative of early pastoral activity in Marlborough;
- the property is an important and salutary example of the effects of induced land degradation and then the benefits of subsequent restoration.

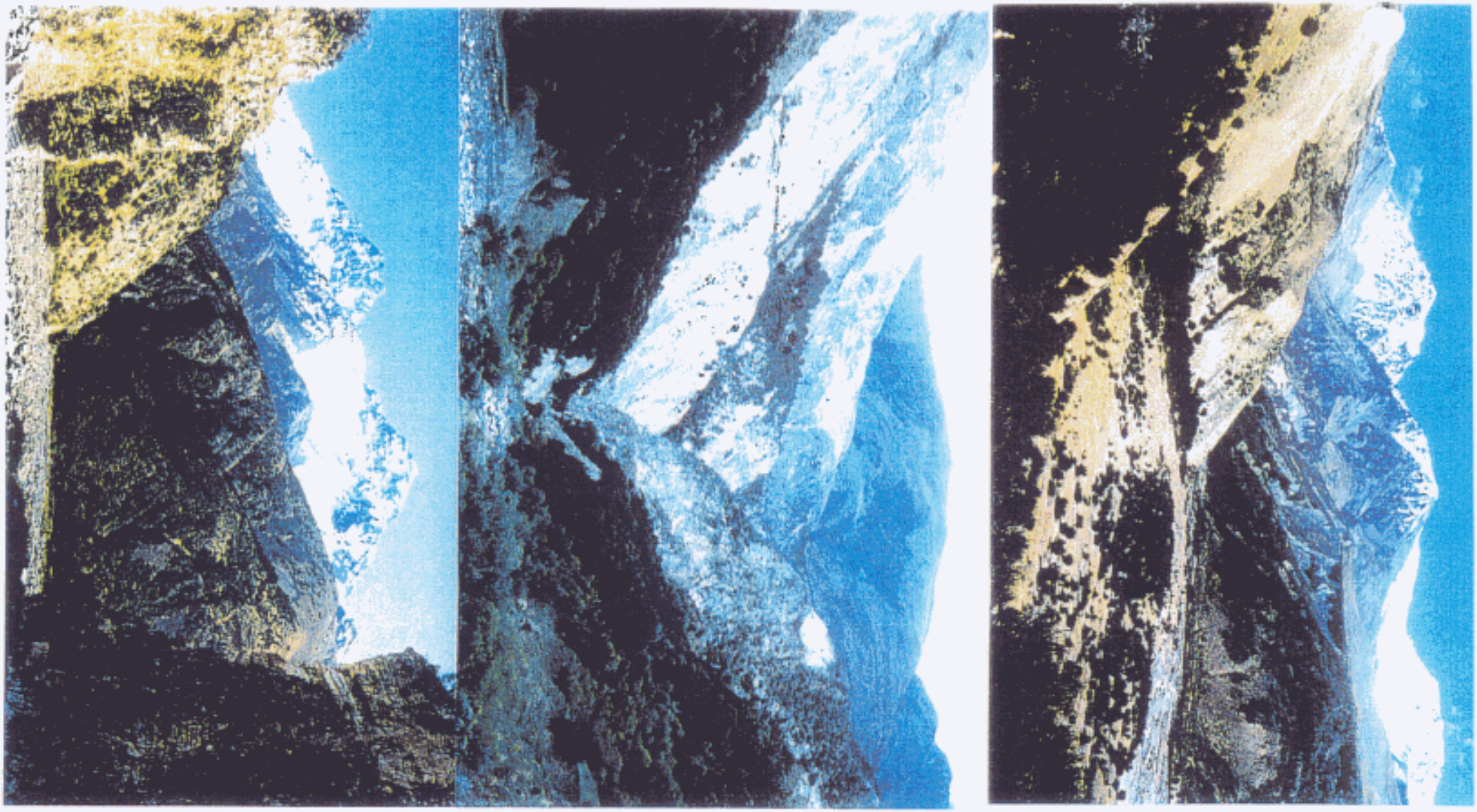
4. ACKNOWLEDGEMENTS

The preparation of this report would not have been possible without the assistance of Shannel Courtney and Kevin O'Conner of DOC, and Andy Dennis of FMC. Shannel provided essential information on botanical values and important critical comments on an earlier draft of the report. Kevin O'Connor and Andy Dennis also provided valuable comments on the contents and recommendations of the draft report. The field inspection was made particularly successful by the friendly hospitality of Colin and Tina Nimmo, and the enjoyable company of Shannel and Andy during field investigations. Steve Bagley provided useful comments on the historic resources of the area, and Miles Reay of the Institute of Geological and Nuclear Sciences kindly provided a copy of the new geological map of the mid-Clarence Valley.

1. Lower Dart Stream with thick kanuka shrublands in the foreground and mixed shrubland in the middle-distance. RAP 2 covers the shrubland communities on the right side (true-left) of the stream, and to the right of the photo. RAP 3 covers the steeper eroding gorge in the middle distance. The snowy peak on the left is point 2578, just south of Mt. Alarm (RAP 1).

2. The impassable limestone gorge of Ravine Stream with the slopes of the upper catchment beyond (all within RAP 4). Manuka and mixed shrubland cover the lower slopes of the gorge (foreground) and limestone plant communities, including endemic southern Marlborough plants, and scattered mountain totara, are present on the steeper limestone talus slopes.

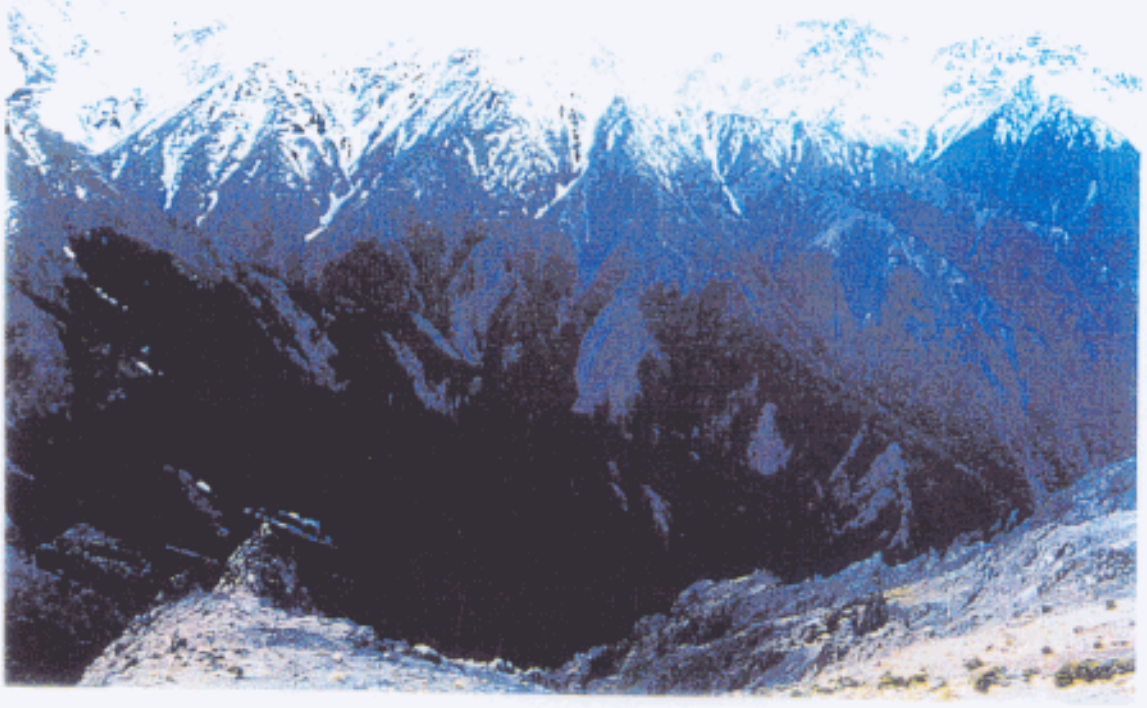
3. The limestone gorge in the north branch of Muzzle Stream with the front peaks of the Mt. Alarm massif in the distance. The limestone 'brickwork' is characteristic of the steep-sided limestone gorges, and supports diverse rockbluff communities including sun hebes, Marlborough rock daisy, and pink broom. The photo is taken from the lower boundary of RAP 1 in the Muzzle Stream catchment.



4. South branch of Muzzle Stream, containing the most extensive areas of mountain beech on the property. The steep dissected mountain country is typical of the higher slopes of the Inland Kaikoura Range, and is included in RAP 1.

5. The Rapu (RAP 6), showing the bed of the cut-off meander in the foreground, the stranded mesa on the right, and the exposed contact between the Gridiron Volcanics and Bluff Sandstone on the bluff on the left. The protruding rusty concretions can be seen on the wind-sculptured slopes of the mesa, and the mixed shrublands are obvious on the lower slopes of the bluff.

6. Bluff Hill (RAP 7) viewed from above Smokers Hole. The meandering course of the Clarence River occupies the centre of the photograph, and the northern, snow-covered, end of the Seaward Kaikoura Range is visible in the distance. Isolated patches of mountain totara and manuka are visible to the left, just below the summit of Bluff Hill. The open limestone faces and talus slopes are clearly visible, though the main shrubland communities are on the obscured (northern) side of Bluff Hill.



7. Remnant mountain totara stand in the head of Dead Horse Gully, within RAP 5. This is a typical mountain totara remnant, surrounded by bare slopes and bluffs, and accompanied by healthy totara regeneration (on the slopes to the right). Dense Aciphylla glaucescens is present in the gully on the left.

8. Mixed hardwood shrublands on the northern side of Bluff River. This plant community is typically present on the steep valley sides where the major streams exit from their dissected upper catchments. Mountain totara regeneration is present on the distant slopes, in front of the bluffs, and a tussock grassland community covers the gentler subalpine slopes on the left. The snow-covered peak is Constitution Hill (1947m). All the area visible in the photograph is within RAP 1.

(DIS.MAS:0485.KOC)

9. Bluff Stream (foreground) with exposed Amuri Limestone and associated sediments on the adjoining bluff. Mt. Alarm is the obvious peak in the distance, with the Muzzle Stream catchment in the middle distance. The front faces of the Inland Kaikoura Range, which support broad-leaved snow tussock grassland and screes, dominate the left of the scene.

10. The confined limestone gorge in the southern tributary of Bluff Stream. The inclined layers of limestone are typical features of the gorges, providing abundant cracks for the establishment of dry rockland and limestone plants.

11. Broad-leaved snow tussock grasslands on the front faces of the Inland Kaikoura Range at about 1100m between Spray Stream and Red Hill Stream (RAP 9). The tussock grassland is interspersed by areas of active scree. More stable slopes in the background support a mixed tussock-shrubland grading into denser shrublands on less-disturbed sites.

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