

## **Crown Pastoral Land Tenure Review**

**Lease name : MT ARROWSMITH**

**Lease number : PC 009**

## **Conservation Resources Report**

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

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

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

**August**

**06**

## **Conservation resources of Mt Arrowsmith Pastoral Lease, Canterbury**

*Department of Conservation, Canterbury Conservancy, Pastoral Lease tenure review report to Knight Frank Limited*

July 3, 1997

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### **PART 1 - INTRODUCTION**

#### **1.1 Mt Arrowsmith**

Mt. Arrowsmith pastoral lease covers 8,160 hectares of land between Lake Heron, the South Branch of the Ashburton River, the Cameron River valley and the Wildman Brothers Range in mid Canterbury. The homestead is on an area of freehold at the south-west corner of Lake Heron, 38 km from the nearest town, Mt. Somers.

Land adjoining to the north is Upper Lake Heron pastoral lease, to the east is Clent Hills, to the south is Hakatere pastoral lease, to the north-west and west is unoccupied Crown Land, formerly part of Hakatere and Mt Arrowsmith pastoral leases, and to the south-east is Barossa freehold. Lake Heron, with a 20.12 m marginal strip (previously Section 58 strip) forms part of the eastern boundary of Mt. Arrowsmith Station. In the north-west corner, a 38 ha section of the Cameron fan wetland has been surrendered from Upper Lake Heron Station and is to be gazetted Wildlife Management Reserve.

The Lake itself and a 40.23 m strip surrounding it is Wildlife Refuge subject to the Wildlife Act 1953. The lake bed is a Nature Reserve under the Reserves Act 1977. The Cameron River and Lake Heron are part of the Rakaia River Water Conservation Order which protects the lake and associated waters in their natural state.

The property lies across two ecological districts - the Arrowsmith and Hakatere Districts, within the Heron Ecological Region. Both districts have been surveyed as part of the Protected Natural Area Programme in 1984/1985. Four whole or part Recommended Areas for Protection (RAPs) have been identified on Mt Arrowsmith: Hakatere 2 - Lake Stream/Cameron Fan/Lake Heron; Arrowsmith 6 - Upper Harding Stream; Arrowsmith 7 - Cameron River; and the very northern corner of Hakatere 10 - Ashburton Fans.

Other properties in the vicinity undergoing tenure review, are Double Hill on the opposite side of Lake Heron Basin and Barossa to the south-east.

## PART 2 - CONSERVATION RESOURCE DESCRIPTION

### 2.1 Landscape

#### 2.1.1 Context

Mt. Arrowsmith pastoral lease comprises the lower end of the Wild Mans Brother Range, one of the lateral ranges stemming south-east from the Arrowsmith Range, and a portion of the western Heron Basin floor. It is bounded by the Cameron and South Branch Ashburton river valleys and Lake Heron.

The property is part of two wider landscapes - the "Heron Basin" landscape and a "range and valley landscape" between the Heron Basin and the Arrowsmith Range. Very little of these landscapes are currently protected. A large tract of Conservation land and retired pastoral lease extends from the Arrowsmith Range to the Main Divide and includes some of the range and valley landscape (retired Hakatere pastoral lease northwest of Boundary Creek, and Wild Mans Hill, previously on Mt Arrowsmith pastoral lease).

The Heron Basin is especially notable for its unusually well-preserved and extensive assemblage of glacial landforms, and for its lakes and wetlands which provide nationally important habitat for birdlife, particularly Lake Heron and Lake Stream wetland which are probably the most important habitat areas of their type in the South Island High Country.

The Heron basin has been identified as a regionally outstanding natural landscape in the only comprehensive landscape study of the Canterbury region (the Canterbury Regional Landscape Study, BMP and LA 1993). The Basin is different from other high country intermontane areas with its relative lack of development, one of the main factors contributing to the high natural values of its lakes and wetlands.

Mt Arrowsmith pastoral lease is an important part of the Heron Basin landscape and makes a significant contribution to its outstanding status, forming almost half of the western enclosing wall and including most of the moraine area on the west side of the Basin floor. The southern half of the Cameron Fan, one of the two large alluvial fans in the Basin and major contributor to Lake Heron, and most of its large marginal wetland, are within the lease.

The range and valley landscape to the west of the Basin has been identified as regionally significant in the BMP and LA 1993 study. The Ashburton valley is the longest and largest of the three distinctly different valleys in this area, and the Cameron is the second longest. The open braided Ashburton riverbed downstream of Mt Arrowsmith has high natural habitat values, and the Cameron valley is a major part of the catchment of Lake Heron and Lake Stream wetland. A large portion of the flat ancient-moraine veneered range summits in this area occur on Mt Arrowsmith pastoral lease including the Harding plateau, and the altitudinal sequence of glacial deposits from the floor of the Heron Basin to range summit, which is the most complete and extensive in the Basin.

## 2.1.2 Landscape Description

The landscape of Mt. Arrowsmith Pastoral Lease can be described in terms of three broad landscape character types - the Heron Basin, the Ashburton and the Cameron Valleys.

### 2.1.2.1 Heron Basin Landscape

The Heron Basin landscape type can be further broken down into six distinct landscape units.

#### 1. *Wild Mans Brother Range Summit*

This landscape unit includes the upper slopes and summit of the Wild Mans Brother Range, from 1100 to 1600m, which forms the enclosing skyline for the west side of the central Heron Basin. The unit comprises four broad east- west trending ridges separated by wide valleys and head basins, coalescing in a broad, rolling, glacially smoothed plateau. Vegetation is dominated by snow tussock with areas of cushion bog in wet depressions at the head of side streams. On windswept summits tussock is replaced by scree plants, stunted tussock and prostrate woody plants and herbs. A bulldozed 4 W.D. track in Big Gully is the only obvious human modification.

#### 2. *Harding Plateau*

This is a large 9 km sq. elevated, glacially smoothed and moraine veneered plateau at the southeast end of the Wild Mans Brother Range. Harding Stream dissects the upper plateau separating it from adjacent Harding Hill. The snow and red tussock cover provides a sense of scale and spaciousness. Sphagnum bogs and other wetland vegetation exist in the numerous wet depressions. There are no visible modifications.

#### 3. *Harding Hill*

This is a prominent discrete skyline hill, known locally as the Ribbonwood block, with a distinctive symmetrical convex form, about 3.5km long and ranging in height from about 800m to 1225m. There are numerous screes and steep coalescing fans on the hill sides with associated thickets and strips of matagouri/*Coprosma* shrubland with occasional clusters of mountain ribbonwood. A 300-700m wide strip of undulating low altitude morainic country exists between the hill and the eastern boundary fence. Snow tussock is the dominant vegetation throughout this area although short tussock and hieracium are intermixed on the lower slopes. A bulldozed track is the only obvious visible modification.

#### 4. *Moraine Sidewalls and Basin Floor*

The lower slopes of the Wild Mans Brother Range and the western basin floor comprises an assemblage of lateral and ablation moraine landforms continuous from

and distinctive due to their scale and degree of continuity, their clarity, and the strongly horizontal north-south trending pattern of the multiple moraine ridges. The lower gentler slopes include 4 tarns and small wetlands in numerous depressions. Snow and short tussock is the predominant surface cover over much of the slopes. Matagouri is common on the lower country, much of which has been developed or improved in large paddocks for more intensive grazing.

#### 5. Lower Ashburton Valley

This is the lower true left of the Ashburton River valley downstream of the confluence with Boundary Creek, where it runs in a southeast direction for about 5km. The side slopes ranging in height from about 800m to 1200m asl are steep and well dissected, forming a sequence of ridges and valleys with narrow elevated ridges on the lower slopes. The slopes have a moderately dense cover of predominantly snow tussock with short tussock and hieracium at lower altitude. Dense thickets of matagouri/*Coprosma*/ribbonwood shrubland are common particularly around relict scree. The Ashburton River, forming the property boundary, flows through an impressive gorge, at the upper end of this unit, down through a deep rock channel and into the upper end of the open riverbed system where floodplain development begins. A bulldozed track is the only obvious modification through this area.

#### 6. Cameron Fan

The part of this classic alluvial fan on Mt. Arrowsmith consists of a dry alluvial floodplain with a distinctive uniform grey moss and sparse grassland cover, and a broad tussock wetland margin. The Hakatere-Heron road paralleled by a power line bisects the Mt. Arrowsmith part of the fan. To the west of the road, the fan is little altered apart from a gravel pit near the boundary road gate. On the lake side of the road, about half the dry fan area has been developed into large paddocks with coniferous shelter belts and a drain extends into the wetland almost to the lake edge in one place. A few willows are dotted around the lake shore and are more numerous around the mouth of Triangle Stream.

#### 2.1.2.2 Ashburton Valley

Ten kilometres of the Mt Arrowsmith boundary follows the braided gravel bed of the upper Ashburton River valley. The retired high altitude country of Hakatere forms the entire true right of the valley, and a retired piece of Mt Arrowsmith (Wild Mans Hill) and conservation land comprise the upper true left, extending back to the Main Divide.

The valley floor consists of a three tiered outwash plain and river floodplain with fescue, snow tussock and *Racomitrium* moss. Two features of this area are a large 1.5 km clear stream along the terrace-slope interface which forms a distinctive bridal veil type waterfall, and a rock-cut gorge at the lower end of the valley.

The steep side slopes of the lower valley have a moderately dense snow tussock cover and large scree slides with associated perimeter matagouri shrubland. Higher

up the valley the less steep and lower side slopes include small steep sided ridges and valleys, small basins and low angled old fan surfaces. Two plateaux and a narrow ridge form the summit. Uniform snow tussock covers the slopes, and there is extensive scree on the western aspects.

Two 4 WD tracks, the northwest boundary fence and a musterers' hut are the only obvious human modifications but they are insignificant in the context of the whole upper Ashburton valley which has a highly natural character and highly unified appearance.

### **2.1.2.3 Cameron Valley**

The lower 6.5 km of the true right side of the Cameron Valley is within the Mt. Arrowsmith pastoral lease. The side slopes are very steep, glacially smoothed planar slopes dissected by several small deep, steep sided gullies running down to the valley floor. Two of the larger gullies have steep alluvial fans at their lower end. Large areas of rock outcrop form very steep rugged slope crests in places.

Tussock grassland is the predominant surface cover with snow tussock on the higher slopes and short tussock and exotic species on the lower slopes. *Matagouri/Coprosma* shrubland with occasional ribbonwood is extensive along the valley floor, lower slopes and gullies, and particularly on the slopes upstream of, and including, Big Gully.

### **2.1.3 Visual Values**

Mt Arrowsmith pastoral lease is not visible from any major roads but is visible from the Heron Basin, a popular recreation area.

Mt Arrowsmith pastoral lease is visible from the Ashburton Gorge road north of Blowing Point Bridge; from the Hakatere-Heron road along virtually its whole 25km length; especially between Maori Lakes and Lake Heron where it totally dominates the view west; and from the shoreline of Lake Heron and the lake itself. Virtually all the eastern side of the Wild Mans Brother Range and about half of the lower morainic country on Mt Arrowsmith, as well as the Cameron fan and lake shore are clearly visible from these public viewpoints. The Cameron valley is also visible by trampers and climbers en route to the Arrowsmith Range.

There are certain parts of the property however that are important to views within the Heron Basin that are considered to be particularly significant in terms of the public experience of the outstanding natural landscape of the Basin:

- The southeast end of the Wild Mans Brother Range in particular Harding Hill and Harding Plateau overtopped by the distant permanently snowy peaks of the Arrowsmith Range are the sole subject of the very first vista of the Heron Basin gained just north of Blowing Point bridge on the Ashburton Gorge road. This vista is identified as an important view in the Ashburton Lakes Landscape

Assessment by Boffa Miskell 1994. It is responsible for the very first impressions of the Basin.

- This vista expands into a wider view of the southwest end of the Basin from Hakatere Station, with the distinctive glaciated forms of Mt Guy, Dogs Hill and Harding Hill forming most of the skyline at around 7-10km distant, with more of the Arrowsmith Range visible over their summits.
- Harding Hill increasingly dominates the view to the west from the Hakatere-Heron road heading towards Lake Heron, due to its prominent, discrete and distinctive convex skyline form. The dense dark grey shrubland on its eastern slopes is also notably visible.
- Harding Hill and also the eastern slopes of the Wild Mans Brother Range to the north of the Hill form the backdrop to views west across Maori Lakes. The general panoramic view west and north across Maori Lakes is unique within the Basin (there are no other views across a smaller lake and wetland from the road) and is considered to be one of the more impressive panoramas of the Basin.
- Impressive views across Lake Heron to the eastern side of the Basin and to Mt Sugarloaf, an isolated "sugarloaf" peak, exist from the road north of the Arrowsmith homestead and the western shoreline of the Lake, the only shore-line area accessible to the general public from the road and a popular picnicking and fishing spot. Willows along the lake margin prevent views across the lake close to the homestead.
- A view up the Cameron valley to the Arrowsmith Range, over the northeast shoulder of the Wild Mans Brother Range, also exists from the western shoreline.

These views were also identified as significant in the 1994 Boffa Miskell study.

- The Cameron Fan and its large marginal wetland are experienced at close range as the road passes immediately adjacent to the wetland and through the middle of the Fan.
- The fan and wetland also provide the unobstructed foreground to impressive views across the Basin to Mt Sugarloaf, the distinctive pyramidal peaks of the Palmer Range on the northeast side of the Basin, Ragged Range to the north across the Rakaia River, and up the Cameron valley to the Arrowsmith range

## 2.2 Landforms and Geology

Basement rocks on Mt. Arrowsmith are sandstone and argillite of the Torlesse Group, of Triassic (early Mesozoic) age. The Lake Heron Basin is a down-faulted valley trending north-south, filled with Quaternary deposits. The dominant cover beds in the Basin and on the range and valley block, are derived from glacial activity in the last half million years, which are unusually well preserved. The oldest glacial sediments

on the high plateaux of the mountain block are relatively thick layers of glacial till, deposited during the third last (Waimaunga) glaciation, 300,000 - 250,000 years ago and the second last (Waimea) glaciation 190,000 - 130,000 years ago. Some of these moraines remain near Mt Pyramid - these are among the only well-defined moraines known at such high altitude in Canterbury. Periglacial landforms, including cryoplanated surfaces, solifluction lobes and benches, and boulder screes on unglaciated steep slopes have been affected by freeze thaw processes during the last glaciation.

An early advance of the Otiran glaciation formed prominent terminal and lateral moraines at 1000m near Clent Hills and 1400m near Big Gully, and a later advance left a terminal moraine loop around the south end of Lake Heron. The melting of the glaciers deposited the extensive hummocky ablation moraine, with tarns and wetlands on the west side of Lake Heron. The South Ashburton Gorge was probably cut down to its present depth at this time. A series of old lake beaches, up to 712 m altitude, are still evident at the foot of the moraine downland. These were formed when Lake Stream was dammed by a glacier from 12 000 years ago.

At the end of the glaciation, thick colluvium accumulated on slopes, alluvial deposition began in the region and a layer of loess was deposited on the slopes and moraines, forming the basis of the fine material of the present soils. A well defined fault trace trending north-south between Harding Hill and the road, crosses the early and mid-Otiran moraines. The Cameron fan was formed in the late post glacial period, and at times flowed into Lake Heron. Among the youngest deposits in the area are gravels of the present river floodplains, recent mobile screes and organic deposits in wetlands.

A fossil locality in the South Ashburton valley, 2.5 km south of Alex Hut (to the west of Pyramid) contains wood dated at about 7 000 years ago.

Drainage of the property goes in two different directions - Lake Heron and the Cameron River drain north to the Rakaia and the South Ashburton drains south to the sea through the foothills south of Mt Somers. Major sources of inflows into Lake Heron come through Mt Arrowsmith Station - Dunbar, Triangle and Olliver Streams, and some is released gradually from the Cameron fan wetland.

### **2.3 Climate**

Rainfall ranges from approximately 800mm at the homestead to approx. 1400mm at the summit of the Wild Man Range. Rainfall is predominantly from the south-west although some north-west rain is experienced on the Wild Man Range. Snow can lie above the 1000m contour for up to four months during the winter with heavy falls occurring as low as the homestead and on the Cameron Fan.

During late spring and early summer the station is subject to dry northwest winds. Summers are subject to temperature fluctuations. Moderate/high temperatures are experienced during the day with low temperatures and occasional frosts at night.

## 2.4 Vegetation

Mt. Arrowsmith demonstrates a typical vegetation altitudinal sequence, from improved pastures in the basin floor, to short tussockland with adventive species in the valleys and lower slopes, to the predominant tall tussockland on higher altitude slopes. There are associated wetland communities in depressions and around lake, streams and tarns, scrub in rocky or steep areas and vegetation typical of scree and riverbeds.

### *Shrublands*

Shrublands are localised and limited on Mt. Arrowsmith. The most extensive scrub patches are on the Cameron Valley floor and side-slopes, where matagouri (*Discaria toumatou*) is predominant and mingimingi (*Coprosma propinqua*) is common. Tutu (*Coriaria sarmentosa*) forms large patches and mountain ribbonwood (*Hoheria lyallii*) occurs in some places. The largest area of mountain ribbonwood in the Cameron Valley is in Big Gully and the adjacent side slopes. The scrub here is diverse, with matagouri dominant and includes kowhai (*Sophora microphylla*), kanuka (*Kunzea ericoides*), manuka (*Leptospermum scoparium*) and weeping mapou (*Myrsine divaricata*) which are scarce in the Heron basin.

Low scrub (matagouri and porcupine scrub (*Hymenanthera alpina*)) occurs at the north-west corner of the Cameron Fan dryland. Scrub with *Carmichaelia robusta*, *Coprosma intertexta* (an uncommon plant), mingimingi, matagouri, *Olearia virgata*, *Clematis marata*, *Muehlenbeckia australis*, *M. complexa*, lawyer (*Rubus squarrosus*) also lines the section on Dunbar Stream which flows along the south-west side of the Cameron fan, against the steep bank of glacial deposits on that side.

The scrub communities on the Ribbonwood block (Harding Hill slopes), especially those along the margins of the block scree are in excellent condition. Matagouri and mingimingi dominate, corokia (*Corokia cotoneaster*) is prominent in some high level scrub patches, shrub daisy (*Olearia virgata*) is abundant in one damp area and mountain ribbonwood occurs on block scree. Other species present, which are rare on Mt. Arrowsmith include *Coprosma intertexta*, *C. ciliata* and *Hebe cf. glaucophylla*.

The most extensive area of tall shrub with mountain ribbonwood on Mt Arrowsmith is on the steep south facing slopes of the upper South Ashburton River Gorge and in the lower Harding Stream. The cover is relatively dense and diverse with matagouri, mingimingi, mountain wineberry (*Aristotelia fruticosa*), tauhinu (*Cassinia vauvilliersii*), *Hebe* sp.cf. *traversii*, shrub daisy, occasional kanuka, mountain flax (*Phormium cookianum*) and lawyer.

From about 1200 - 1300 m small areas of shrubland occur in the Upper Olliver and Triangle Streams with turpentine scrub (*Dracophyllum uniflorum*), *Coprosma ciliata*, mingimingi, *Hebe* spp., mountain wineberry porcupine scrub and mountain flax.

### Wetlands

Impeded drainage on ancient moraines, lake margins and shallow basins has created various wetland communities, including sedge marsh, red tussocklands and a mosaic of cushionbogs.

- Nearly 5km of the Lake Heron shoreline on Mt. Arrowsmith comprises sedge marsh, between 500 and 1000m in width. It is part of Hakatere RAP 2 and is often referred to as the Cameron fan wetland. The predominant cover consists of sedge tussock (*Schoenus pauciflorus*) with red tussock (1m or more high) and *Carex diandra*. The rich flora includes a large *Craspedia* sp., *Luzula picta* var. *limosa*, *Nertera balfouriana*, mud pondweed (*Potamogeton suboblongus*), and the moss, *Climacium dendroides*. *Triglochin striatum*, rarely seen in inland freshwater wetlands, was collected there in the 1970s, as was a small *Dracophyllum*, probably *D. prostratum*. An area of large *Carex secta* occurs at the south-west end. Sedge tussock and red tussock dominates the western side of the marsh and towards its middle and *Carex diandra* near the lake. Small patches of cushion-dominated vegetation with comb sedge, *Pernettya nana*, spoon leaved sundew (*Drosera arcturi*) and mountain bladderwort occur in places.

The common occurrence of mounds of sphagnum moss (*Sphagnum cristatum*) suggests that with appropriate protection the mounds may increase and the marsh may naturally evolve into a raised bog. Introduced species are present but of low importance. Cattle pugging and bare mud patches are common along the lake shore.

- In the headwater catchment of Harding Stream ancient moraines on a large gently sloping plateau-like surface have created areas of impeded drainage, resulting in an extensive wetland between raised drier bouldery areas. Most of the vegetation is red tussock (*Chionochloa rubra*), in places 120cm or more high. Interspersed with it are small elongate areas of cushion bog (*Oreobolus pectinatus* dominant). The drier moraine ridgelets have a snow tussock cover (*Chionochloa rigida*, *C. macra*) with many species of herb and dwarf shrub and a few larger shrubs (*Dracophyllum uniflorum* mainly).

To the north, the red tussock wetland grades into red tussock on dry ground, and then to areas of pure snow tussock. Hybrids of red tussock with one or both of the snow tussocks are also present. Uphill from the wetland and also on the steep slopes beneath it, snow tussock and herbs dominate.

The wetter parts of the red tussock-dominated areas have a varied flora. Patches of *Sphagnum cristatum* with *Carpha alpina* occur in some very wet areas. Hardly any introduced plants occur anywhere in the wetland. The cushion bog areas generally have a richer flora than those where red tussock dominates. Small pools occur on many of them and there are also mounds formed by *Sphagnum*, red tussock and other species.

The vegetation of drier land is in good condition. Signs of sheep and hare grazing are present, but their impact is minimal, especially in the wetland

- In the upper catchment of Olliver Stream is a section of plateau, sloping downwards from point 1670m to a shallow basin where the stream rises (between 1600-1500m). The stream then descends more steeply into a deeply incised valley.

The whole upper catchment of Olliver Stream has vegetation in excellent condition. Of particular significance is the assemblage of plants in a series of cushion bogs, forming a mosaic with snow tussock vegetation (*Chionochloa macra* mainly, with some *C. rigida* at lower levels).

The dominant plants in the cushion bogs are *Oreobolus pectinatus* and *Abrotanella caespitosa*, (also present in the Harding Stream plateau bogs). However, several other species are present which are entirely absent from the Harding Stream bogs. They are: *Centrolepis pallida*, *Dracophyllum prostratum*, *Euphrasia dyeri*, *Kelleria laxa* and *Rostkovia magellanica*. *Rostkovia* is of very considerable biogeographic interest. It is scarce on the New Zealand mainland, being known only from bogs in Fiordland, Western Otago, and one other site in Canterbury, (Lagoon Saddle), between the Waimakariri and Rakaia catchments. It is commoner on Stewart Island and the Auckland and Campbell Islands and otherwise is found on Tristan da Cunha South Georgia, Falkland Islands and Patagonia. In Canterbury it is not only a very rare plant, but is at its northernmost location in the world. The *Centrolepis* and *Euphrasia* are otherwise known in Canterbury only from the top of Mt Somers (Brian Molloy, personal communication). The *Dracophyllum prostratum* occurs there and in the Two Thumb Range. All are more common in Otago - Southland - Fiordland. Here, on Mount Arrowsmith, the *Dracophyllum* reaches its northernmost limit. The presence of *Centrolepis*, *Euphrasia* and *Kelleria* is a link between their southern populations and others in north-west Nelson.

Other plants worthy of note in the bogs and associated flushed areas, where small springs emerge are: *Caltha obtusa*, *Celmisia haastii*, *Forstera tenella*, *Juncus novae-zelandiae*, *Dolichoglottis scorzonerooides*, *Oreomyrrhis* sp. (a very small, possibly undescribed species), and the moss *Climacium dendroides*.

The bogs appear mainly to have shallow peat over gleyed loessic soil, but in one place at least 1m of peat was present. A system of shallow pools is present in the bogs. Only two other Canterbury bog areas are known to have such elaborate pools, one at Lagoon Saddle and another in the Andrews River, Arthur's Pass National Park.

- Two tarns, probably kettleholes, occur in the moraines near Dunbars Stream. The northern tarn is deep and permanent; the southern tarn is shallow and dries out, by evaporation in summer. The flora in and about each tarn is different. The shallower one has a varied and distinctive flora, dominated by native species, including some confined to tarn and lake shores (*Crassula sinclairii*, *Hypsela rivalis*, *Parahebe canescens*, *Pratia perpusilla*). The northern tarn has less diversity and is dominated by rushes and sedges.

*Short Tussocklands*

Short tussockland is the predominant vegetation of the lower moraine sidewalls, basin floor and the lower altitude side-slopes of the Ashburton and Cameron valleys. Communities grade into tall tussockland above and improved pasture below. Fescue tussock (*Festuca novae zelandiae*) dominates with extensive areas of cotton daisy (*Celmisia spectabilis* var. *magnifica*) and a considerable component of adventive species (such as sweet vernal (*Anthoxanthum odoratum*), browntop (*Agrostis capillaris*), and mouse-ear hawkweed (*Hieracium pilosella*)).

On the Cameron Fan, predominantly on the west side of the road, the substrate is well-drained and gravelly, with only a shallow soil. The area is cold in winter and wind exposed, and in summer is hot and drought prone, resulting in a distinctive plant cover. Fescue tussock is stunted and very scattered, while *Hieracium pilosella*, though present is never abundant. The hardy woolly moss (*Racomitrium lanuginosum*) is the main plant cover, otherwise the low cover consists of small native and introduced grasses, dwarf shrubs and forbs. Plants of interest include *Carmichaelia corrugata*, *Colobanthus buchanani*, *Carex decurtata*, *Gentiana serotina*, *Hebe pimeleoides*, *Leptinella serrulata*, *Raoulia parkii*, *R.* sp. "black" (an undescribed species known from only a few locations, all in Canterbury) and *Stackhousia minima*. The species assemblage is distinctive and characteristic of this kind of "dryland" habitat.

*Tall Tussocklands*

- Tall tussockland is the dominant vegetation community on the higher country of Mt. Arrowsmith. *Chionochloa macra* dominates above about 1350 m, and *C. rigida* below. Between 1300 and 1400m there is often a mix of the two species. Along with *C. macra* at high altitudes there is commonly cotton daisy, *Raoulia subsericea*, *Celmisia viscosa*, *C. lyalli*, *Pentachondra pumila* and fescue tussock.

The best areas of alpine grassland vegetation are around point 1670m and in the head of Olliver Stream down to about 1150m altitude. Apart from the dense snow tussock many other alpine species are present, varying depending on aspect, slope and drainage. Of particular note are *Acaena saccaticupula*, dwarf spaniard (*Aciphylla montana*), giant spaniard (*A. scott-thompsonii*), *Astelia petriei*, *Celmisia viscosa*, *Coprosma ciliata*, *Geum leiospermum*, creeping mapou (*Myrsine nummularia*), *Lobelia linnaeoides*, *Plantago novae-zelandiae*, *Pimelea pseudo-lyalli*, *Poa kirkii*, mountain shield fern (*Polystichum cystostegia*), and *Pratia macrodon*. Few adventive species are present and they are never abundant in the upper valleys.

Around 2.5 km north-west of Mt Pyramid is a plateau area, forming a saddle between the Cameron and Ashburton valleys and known in this report as Ranoch Muir. On its surface, among scattered small *Chionochloa macra* plants, is a short turfy vegetation containing *Celmisia sessiliflora*, comb sedge (*Oreobolus pectinatus*), *Phyllachne colensoi* and many other small, mat-forming plants.

- *Chionochloa rigida* dominates the grassland vegetation below about 1350 m and is in particularly good condition on the higher slopes and ridges in the upper part of the Cameron Valley and south branch Ashburton River. Cotton daisy is common on the valley floor and higher slopes - with other dominant species being scattered fescue tussock, blue tussock, *Dracophyllum uniflorum*, *Leucopogon fraseri*, *L. colensoi* and *Raoulia subsericea*. Below 1100m in the Ashburton and particularly on the lateral moraines in the Heron basin there is also scattered matagouri, often abundant sweet vernal and *Hieracium pilosella*.
- Red tussock (*Chionochloa rubra*) is most common in the wetlands of Mt Arrowsmith, particularly on the shores of Lake Heron and on the Harding Stream plateau. These areas and the vegetation have been described under the wetlands section of the report. In the upper Harding Stream the red tussock wetland grades into red tussock on dry ground. This is the most extensive area of dry red tussock in the ecological district, and is part of Arrowsmith RAP 6. *Chionochloa rigida*, *Gaultheria depressa*, cotton daisy, bidibid (*Acaena caesiglauca*), *Anisotome aromatica*, fescue and blue tussocks are most commonly associated with the red tussock in these drier areas. *Chionochloa rigida* increasingly dominates as the ground gets drier, along with fescue tussock and cotton daisy.

#### "Alpine tops"

Amongst the areas of dense grassland described above, on the high plateau above 1500m that stretches from Mt Pyramid south are large, bare, wind eroded areas. These have a scattering of cushion plants, the most common of which are *Luzula pumila*, *Phyllachne colensoi*, *Dracophyllum pronum*, *Anisotome flexuosa*, *Celmisia angustifolia* and *Lycopodium fastigiatum*. Of particular interest in these areas is the occurrence of plants of *Lobelia linnaeroides*, *Raoulia hectori* and *R. petriensis* all of which reach their northern-most limit at this site and *R. petriensis* is rare in Canterbury. Other interesting plants along this plateau are the lichens *Alectoria nigricans* and *Centraria islandica* and the plants, *Haastia sinclairii*, *Leptinella pectinata*, *Lignocarpa carnosula*, *Myosotis elderi*, *Poa lindsayi*, *Koeleria* sp, *Raoulia hookeri* var. *apice-nigra*, *Ranunculus crithmifoliosus*.

## 2.5 Fauna

A brief faunal survey was carried out for tenure review, and birds were also recorded during the vegetation field work. Lake Heron is also regularly surveyed and has a history of up-dated records.

### 2.5.1 Birds

A very high diversity of bird species use Lake Heron and the extensive wetland margin on the north-west side of the lake. A total of 54 birds have been recorded using the lake and of these 38 bird species use the adjacent wetlands for feeding, breeding, moulting and loafing including Southern Crested grebe, waterfowl, rails and herons.

Lake Heron is rated as an *outstanding* wildlife habitat of national importance. It is regarded as the most important lake in the upper Ashburton catchment in terms of species diversity and abundance and is regarded as one of the largest and most valuable wildlife habitats of its type in Canterbury. Factors contributing to the importance of the lake system are the large size of the habitat, the diversity of the habitats (lake and wetland) and the presence of the largest breeding population of Southern Crested grebes in New Zealand. Lake Heron is also a nationally important breeding site for New Zealand scaup. Blue ducks have been recorded on the lake and the secretive marsh crake and Australasian bittern on the lake edge wetlands.

The braided river portion of the Cameron Fan supports a variety of bird species including wrybill (threatened), banded dotterel and the endemic black-fronted tern.

Protection of the wetland and the water quality of the lake are therefore paramount to maintaining habitat and feeding grounds for this wildlife.

Other birds on Mt Arrowsmith include New Zealand falcon (a threatened species), Australian harrier hawk and the New Zealand pipit which occur in the open tussock grasslands.

### 2.5.2 Lizards

Lizard species recorded in many areas on Mt. Arrowsmith include the common skink (*Leiopisma sp*) and the common gecko (*Hoplodactylus sp*). Other species which could be present include the endangered scree skink (*Leiopisma otagense*) form "waimatense", the spotted skink (*Leiopisma lineoocellatum*) and the jewelled gecko (*Heteropholis gemmeus*).

### 2.5.2 Invertebrates

Alpine weta (*Hemideina maori*) is common on scree, boulder-fields and beneath stones in the tussock grasslands. The scree weta (*Deinacrida connectens*) is also likely to be present on scree.

The alpine grasshoppers *Sigaus auatralis*, *S. villosus*, *Paprides nitidus* and *Brachaspis nivalis* occur in the tussock grasslands of the district. One noteworthy invertebrate which is common in the wetlands is the large native dragonfly (*Uropetala carovei*).

### 2.5.4 Freshwater fish

In Boundary Stream which flows into the South Branch Ashburton River immediately west of Mt Arrowsmith Station, the freshwater data base records long-finned eel, alpine galaxias, common river galaxias, koaro, upland bully, salmon, brown and rainbow trout. This gives a general indication of species that might occur in the streams of Mt Arrowsmith.

Cameron Stream, Dunbar Stream and Ollivers Stream were electro-fished on 22 January 1996. Brown trout were present in all these streams and rainbows were also observed in Ollivers Stream, where trout were abundant. Native species recorded included alpine galaxias, common river galaxias and upland bully. Common bully were also present in Dunbar and Ollivers Streams. Water quality was high with a mayfly and caddis dominated invertebrate fauna. The snail, *Potamopyrgus*, was present in the slower flowing reaches of these streams.

The general impression gained of the area was that brown trout were ubiquitous throughout the system with competitive interactions and predation possibly accounting for the limited diversity of native fish.

A small wetland area adjacent to the road about 500 metres east of the campground supported an abundant invertebrate fauna, including backswimmers (*Notonectids*), waterboatman (*Corixids*), damselflies and the snail, *Potamopyrgus*. The aquatic plants *Potamogeton* and *Myriophyllum* were abundant. Upland bully were present in large numbers together with common river galaxias (*Galaxias vulgaris*).

## 2.6 Historic Values

No records of Maori occupation are known for Mt Arrowsmith although foraging parties almost certainly visited Lake Heron and the headwaters of the Ashburton River for freshwater mussels, eels and birds and probably stayed in a seasonal camp near Maori Lakes (on an adjacent property).

European settlement began with stocking with sheep and cattle in 1857 and 1858. No detail is known of the early settlement except what is recorded for Upper Lake Heron, Mt. Arrowsmith (earlier known as Lower Lake Heron) and Clent Hills by Acland (1975). A homestead built around 1860 forms part of the present shearers' quarters on the Mt Arrowsmith homestead block. It has been extensively modified, probably at the end of the last century, and consequently has lost some of its historical significance.

Mt Arrowsmith has been continuously stocked since the mid 19th century. Until the mid 1980s sheep grazed the upper Ashburton and Cameron Valleys and the mountain ridge between them as far west as the glaciers in the valley heads. Charred wood indicates extensive burning of the grasslands and scrub during the first 100 years of European settlement.

Since then the upper-most valleys and mountains, including Wildmans Hill, have been destocked. Through most of the last 140 years cattle were grazed mainly in Lake Heron Basin. Recently they have been grazing above Boundary Stream in the South Ashburton Valley - on both sides of the river. The adjoining south side of the Upper South Ashburton Valley has been retired from Hakatere and should be destocked.

## 2.7 Public Recreation

### 2.7.1 Physical characteristics

Mt Arrowsmith pastoral lease is a backcountry environment in a natural setting. Walking tracks are very limited. There are 4 w.d. tracks in the South Ashburton River, and from Lake Heron to the upper South Ashburton River via a route at the head of Big Gully and near the Pyramid. Otherwise access is by route finding in the riverbed or in the open on relatively easy going tussock country.

### 2.7.2 Public access

The Hakatere-Heron road provides legal access to the property. According to cadastral maps however, the legal road beyond the piece of freehold land around the homestead, to Upper Lake Heron station does not follow the formed road for the whole distance. Permission is required to use the farm tracks which give access to the South Ashburton River and the Wildman Brothers Range between the Ashburton and Cameron rivers. Marginal strips for the Cameron, Ashburton and Lake Heron are registered on the title, but have not been surveyed. There is no legal practical access to the upper Cameron River. Most people currently drive to the locked gate at the upper edge of the Cameron fan and walk along the south bank of the Cameron River - on Mt Arrowsmith Station.

### 2.7.3 Activities

Existing recreational use centres around Lake Heron and the Cameron River. Lake Heron is commonly used for fishing. Its reserve status prohibits shooting, and boating is restricted to craft propelled only by paddles or oars. The quiet and the presence of a rich bird life particularly the scarce species such as crested grebe, grey teal, marsh crake, bittern and abundance of scaup and coot, make this a good bird-watching site.

A small camping ground is present on leasehold land beside the mouth of Harding ? Stream, at the south-west corner of the lake. This is particularly popular in summer. Occasional off-road vehicle travellers pass through the area.

The high peaks of the Arrowsmith Range, in the heads of Ashburton and Cameron Valleys are popular for climbing, ski-touring and heli-skiing. Some tramping parties also use the upper valleys. Access is normally by the Cameron Valley. The upper South Ashburton Valley is also accessible from the Cameron Valley via the "Rannoch Muir Saddle", or one of several saddles further west along the Wildman's Brother Range. The Canterbury Mountaineering Club hut at the head of the Cameron valley is used by an average of 200 people a year.

Over much of the central part of the property there is little demand, as far as is known, for public access, although the gorged section of the Ashburton Valley has some spectacular scenery and would be suitable for a walking access. Mountain biking is also a potential use of the area. The hill block might be suitable for horse-trekking.

## PART 3 - CONSULTATION AND DISTRICT PLANS

### 3.1 NGO Consultation

A meeting was held on 24 September 1997 with representatives from Canterbury Botanical Society, Four Wheel Drive Club, Trout Unlimited, North Canterbury and Aoraki Conservation Boards, Canterbury Botanical Society, Forest and Bird, FMC, Agenda 21, and the Epicentre to discuss the tenure review on Mt Arrowsmith amongst other properties.

Colin Burrows outlined the botanical values and some areas of geomorphic interest. Ken Sibly (4 W D club) talked about access along the unformed legal road in the South Branch Ashburton and Martin Lukes (Agenda 21) the recreational interest of the property, particularly the Cameron Valley and the need for a designated carpark for 20-30 cars at the mouth of the valley. There was also discussion of the damage cattle were doing in the gravel riverbed and the regenerating matagouri shrublands.

David Hodder from the Deerstalkers Association was not able to attend the meeting but sent a fax outlining the hunter interest. There is no hunting left on the property but it was important to maintain access up the Ashburton River for hunters, anglers, trampers and climbers. It was also important to maintain access to part of the Lake Heron shoreline and protection of the trout spawning grounds.

### 3.2 District Plans

Mt Arrowsmith lies within the Ashburton District. Their proposed District Plan was notified in March 1995. Under this Plan Mt Arrowsmith is zoned Rural C (High Country).

The plan identifies four areas on Mt. Arrowsmith that are of significant conservation value, based on the four RAPs mentioned previously. The eastern side of the property, basically east of the moraine side walls, is an area of landscape importance (part of the plan's outstanding landscape component Area 4, the Lake Heron Basin).

For areas of landscape importance, areas of significant conservation value, riparian<sup>1</sup> and alpine environments (areas above 1000m) the District Plan has a number of rules:

- No earthworks to exceed 20 metres<sup>3</sup> in volume and/or 50 metres<sup>2</sup> in area in any one hectare in any continuous period of five years, or to be located on slopes greater than 20 degrees.
- No clearance of indigenous vegetation in the Rural C zone to exceed 100m<sup>2</sup> in area in any one hectare in any continuous period of five years, except for amenity plantings.

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<sup>1</sup> any land within the bed of any lake, river or stream; within any naturally-occurring wetland; and/or within 100m of any lake, or 20m of any river or stream

- No exotic tree planting, except amenity tree plantings (and in the case of riparian management areas - no exotic tree planting intended for commercial purposes)
- No buildings to be erected.

For general landscape values, except for what is provided in the rules above, all building and tree planting (other than of amenity trees), and earthworks (other than the repair and maintenance of operational tracks in Rural C and located on slopes with an angle of greater than 20°), shall be Controlled Activities in respect of siting, design and methods of construction.

For general natural conservation values except as provided for in the rules above, no clearance of indigenous vegetation other than matagouri, which has an average maximum height of the canopy of greater than three metres, shall exceed 1000 m<sup>2</sup> in any area in any continuous period of five years.