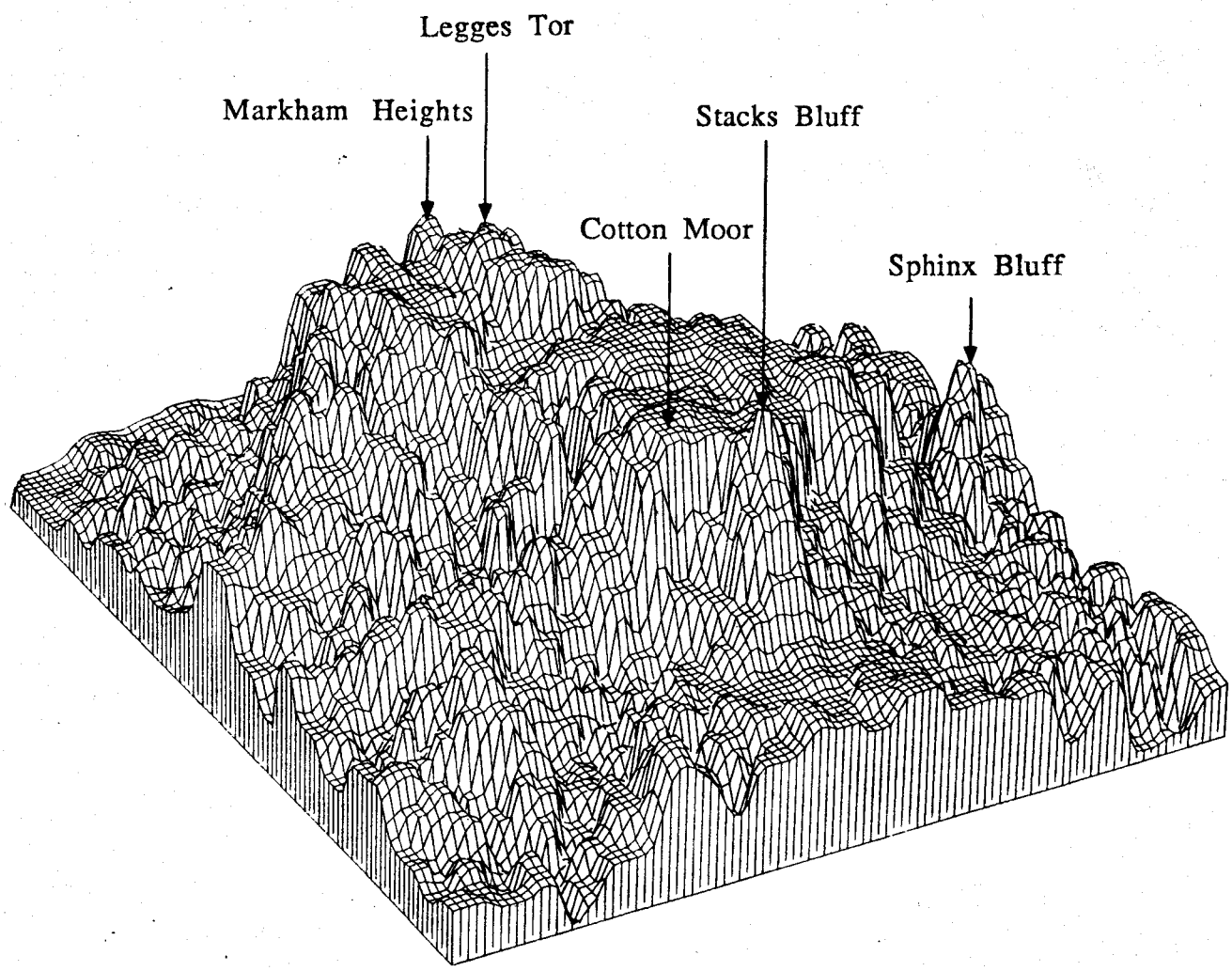
# PLANT COMMUNITIES OF THE BEN LOMOND PLATEAU

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Cover : Three dimensional plot of the Ben Lomond Plateau from the southwest. Note the lower Southern plateau surface (RHS) and the higher altitude Northern plateau surface (Left Background). (Plot provided by the Department of Parks,Wildlife and Heritage).

# CONTENTS

# ACKNOWLEDGEMENTS

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The report was printed by the Department of Parks, Wildlife and Heritage.

PHOTO 1:

General view to the southeast of the subdued topography of the lower Ben Lomond plateau surface from Piesse Vale. Bare boulderfields in the Rodway Valley can be seen in the central left of the photo with rocky outcrops visible in the background. The plateau terrain lacks the deep "U-shaped" valleys, prominent cols, hanging valleys and moraines typical of more severely glaciated areas in Tasmania such as Mt. Field.

# FOREWORD

The Queen Victoria Museum and Art Gallery and the Plomley Foundation are glad to be able to present-

**Plant communities of the Ben Lomond Plateau,**

By John B. Davies and Margaret J. Davies.

This is the first of what is hoped will be an authoritative series of publications on topics of public interest, to be issued in a new series-

**Occasional Papers of the Queen Victoria Museum and Art Gallery.**

The interest of the Plomley Foundation is at present concerned with ecological research in Tasmania, with a bias towards studies relating to the northern parts of the State. In this regard it is appropriate to present the present study of plant communities of the Ben Lomond Plateau by two experienced botanists.

The Foundation is now giving special attention to ecological research, and hopes to fund a number of such projects over the years. There is a paticular need in Tasmania to undertake ecological studies carried out by fully qualified persons.

Rhonda Hamilton
Acting Director
Queen Victoria Museum

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Honorary Research Associate
Queen Victoria Museum

# 1. BACKGROUND

## OBJECTIVES OF THE STUDY

The authors received a brief from the Queen Victoria Museum and Art Gallery and the Plomley Foundation to conduct a botanical survey of the Ben Lomond Plateau. The Survey was to list the plant communities and vascular species and indicate the conservation significance of the area.

The major objectives of the study were:-

(1) **To document the flora.**

(2) **To describe and map the plant communities.**

(3) **To identify and describe the major patterns of variation in the vegetation.**

## LOCATION AND TOPOGRAPHY

Ben Lomond is situated in north-eastern Tasmania, at latitude 41° 32'S, longitude 147° 39'E, 50 kilometres south-east of Launceston. It forms the southern boundary of the north eastern massif, which is bounded to the north-west by Mt. Arthur and by Mt. Victoria in the north -east.

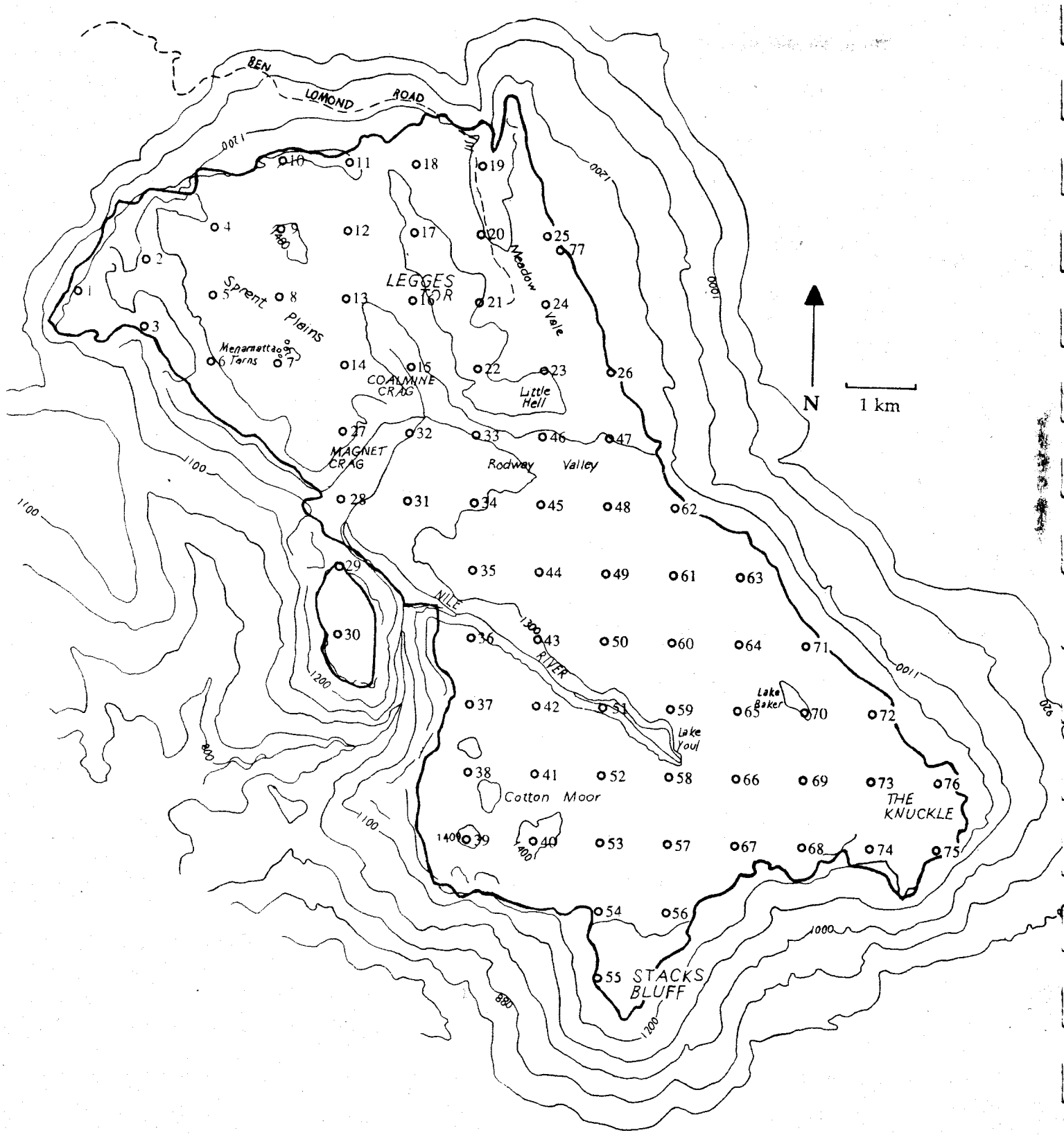
The plateau is a roughly rectangular area of approximately 6500 hectares, ranging in altitude from 1200m to over 1500m. The northern half of the plateau maintains an altitude of 1400m, while the southern half ranges between 1300m and 1400m alt. Legges Tor at the northern end of the plateau is the second highest point in the State at 1572m. Stacks Bluff at 1527m is the highest point at the southern end. Rodway Valley dissects the plateau and descends to an altitude of 1240m. (See Map 1)

Lake Youl is the largest lake on the plateau, and is drained by the Nile River which flows in a southerly direction from the plateau through Speke Gorge.

The eastern side of the plateau is slightly elevated resulting in a predominantly westerly to north-westerly drainage pattern.

MAP 1

The Ben Lomond Plateau study area
showing locations and numbers of plot sites



## GEOLOGY AND GEOMORPHOLOGY

Broadly speaking, the mountains of Tasmania are of two types (Davies 1965). In the centre, east and south-east, they tend to be plateau-like in character, whereas in the west, they tend to be ridge-like. This difference is caused by the underlying rocks - folded pre-Carboniferous rocks in the west, and post-Carboniferous more or less horizontal sediments, intruded by granite and dolerite in the east.

The basement rocks of the northeastern massif are slates, siltstones, greywackes and quartzite of the Mathinna Beds (Fish & Yaxley 1966). These were folded intensely during the Devonian Period, and subsequently intruded by granite. Peneplanation followed and later Permian and Triassic rocks were deposited. These were intruded by dolerite during the Jurassic period with sills up to 300m thick. The igneous rocks conform to and mimic the sedimentary structure, and while maintaining a generally horizontal structure, these rocks were extensively faulted and uplifted (Caine 1983). The resulting mountains have the tabular form of the Fault-Structure Province, and are the sources of the North and South Esk Rivers, and the Forester, Pipers and Ringarooma Rivers.

Geologically the Ben Lomond Plateau is predominantly dolerite. The only exception is a highly localised area of exposure of the Parmeener Super-Group (Forsyth et al 1974) in the creek bed of Rafferty Creek under Coalmine Crag. This exposure consists of the sedimentary rocks, sandstone, siltstone and mudstone, with a narrow coal sequence. This was once worked commercially (Plomley 1989).

Immediately upslope of this exposure on the lower slopes of Coalmine Crag, hornfels occurs mixed with dolerite, but the actual zone of contact metamorphism is not exposed. An aboriginal quarry was discovered in this region during field work for the present study. Scattered occurrences of hornfels are also found associated with 'sorted polygons' in the upper catchment of Storys Creek.

In the highlands of Tasmania there is ample evidence of glacial and periglacial activity during the Pleistocene epoch (Fish & Yaxley 1966), when approximately one fifth of the area of the State was covered with ice. A small ice-cap existed on Ben Lomond, which was the only plateau in the north east to be glaciated. The effects of these glaciers accounts for much of the contrast between the alpine scenery of Ben Lomond and that of the other mountains in the north-east. There are large areas of exposed bedrock with little detrital cover, which have no equivalents on the other mountains (Caine 1983).

The glacial history of the area is however largely unknown as few features identifiable as glacial forms exist. The main evidence of glacial action are the erosional features, such as smooth bedrock surfaces on the plateau, and a small number of moraines at lower elevations.

During later Pleistocene times, almost all of the plateau surface was covered by glacier ice in the form of two separate ice-caps. One existed on the plateau north of the Rodway Valley and the other on the southern plateau.

Caine (1983) differentiated two episodes of glacial activity, plateau and cirque glaciation, which seem to be well separated in time. The dating of the two glacial phases is uncertain, although the deposits and forms from the two phases are quite clear.

Relict periglacial depositional features are also found on the Ben Lomond Plateau. The most notable are the blockfields. Those found on Mt. Barrow and Ben Lomond are the most extensive allochthonous blockfields in the world and they are found on the floors of most of the valleys of the plateau. Approximately 26% of the Ben Lomond plateau area is covered by such blockfields. (Caine 1983). The largest area of bare blockfield in the study area is found in the Rodway Valley between the northern and southern plateau.

Within the Rodway Valley, there are more than 50ha of unvegetated blockfields, with a further 40ha elsewhere on the northern plateau. The southern plateau has almost as much bare blockfield, but there are few extensive contiguous areas. Vegetated blockfields are found around the bare areas and on the valley floors.

Evidence that a periglacial climate still exists on the Ben Lomond Plateau is the presence of "sorted polygons". This small scale patterned ground is found only on very small but widely dispersed parts of the mountain plateau and is formed by frost action in dolerite debris. (See Community 18)

SOILS

The soils in the study area vary markedly in response to topography, drainage and geology. A large proportion of the study area is devoid of soils and characterised by dolerite rock exposure and boulderfields. Organic soils (peats) develop in areas subject to waterlogging on valley bottoms and drainage lines associated with bogs, tarns and aquatic plant communities. These peats vary from shallow (<10cm) to deep (>60cm), and are usually black to dark brown and often consist of a fibrous surface layer over a muck peat. The deep peats are most extensively developed on the western side of Rodway Valley near Rafferty Creek and Talus Creek, where numerous tarns occur. These organic soils typically support areas of Astelia alpina, Sphagnum moss and epacridaceous shrubland and heath, dominated by Richea gunnii, Richea scoparia and Richea acerosa.

Mineral soils are also found, particulary in the better drained sites. Shallow uniform textured clay loams, and loams derived from dolerite are commonly found on well drained flats and slopes. These soils are typically yellow-brown to yellow-red in colour and less than 30cm deep.

Smooth exposures of dolerite bedrock devoid of soils, are widespread on both the northern and southern parts of the plateau, particularly on crests. Deep (i.e. >50cm) uniform and gradational textured soils derived from dolerite are also found but these tend to be restricted to well drained lower slopes and flats. These soils are also typically yellow-brown to yellow-red in colour. In some circumstances these mineral soils contain a shallow organic surface horizon.

Shallow (<50cm) and deep (>50cm) uniform textured sands derived from dolerite are restricted to the south-eastern corner of Lake Youl associated with beach and dune deposits. These soils are either devoid of vegetation or support a grassy shrubland and have a high erosion hazard. Deep uniform textured sands and sandy loams derived from sandstone, are restricted to a highly localised area on Rafferty Creek associated with the only known exposure of Triassic sedimentary rock (Upper Parmeener Super-Group) on the plateau. These soils are almost devoid of vegetation and are highly erodable.

Nicolls & Dimmock (1971) refer to highland soils on dolerite as alpine humus soils with small areas of moor peats.

All of the soils are acidic and moderately to strongly leached. Chemical analyses of alpine soils from Ben Lomond have been conducted by Noble (1981). Pinkard (1980) described the Ben Lomond dolerite soils on the plateau as stony brown gradational soils with an average depth of 20cm.

## CLIMATE

### GENERAL

Tasmania has a temperate latitude maritime climate, with the prevailing weather dominated by a westerly airstream (the 'Roaring Forties') and a sub-tropical high pressure system.

In summer the belt of high pressure strengthens and is centred around 40° S. This weather pattern brings mild to warm conditions especially to the north-eastern part of the State. (Faulkner 1986).

The high pressure system weakens and moves northwards during the winter months, allowing a more frequent penetration of temperate depressions and polar maritime air. This brings cooler, more moist conditions to the State.

There are no permanent weather stations located on the Ben Lomond plateau, the nearest comprehensive station being located at Mt. Barrow .

The present climate of Ben Lomond is a maritime periglacial one in which freeze-thaw cycles and high soil and atmospheric humidities are common. Freezing does not penetrate far into the soil (Caine 1983).

### RAINFALL

Rainfall is primarily frontal or orographic, and is heaviest during the winter months. The north eastern massif forces the westerly air stream up to over 1400m from the Midlands Valley and Tamar Basin. The winter rainfall is mainly a result of a series of cold fronts constantly sweeping across the State but occasionally depressions in Bass Strait produce heavy rainfall on Ben Lomond. This weather pattern produces heavy rains and snow in the north-east accompanied by strong easterly winds (Faulkner 1986).

As mentioned before, the only long term record of climatic conditions above the treeline is that from Mt. Barrow at an altitude of 1320m. These records show the expected winter maximum for rainfall, with a high probability of snowfall in all months of the year ( Caine 1983).

Noble (1981), recorded summer rainfall for three years at several stations on the north face of Ben Lomond. Using a regression analysis, he arrived at a rainfall of 1277 mm for 1260m altitude. However, the actual plateau is up to 200m higher than this, and it is probable that an increase in rainfall would therefore be experienced at this higher altitude.

## TEMPERATURE

Again, there are few records of temperature on Ben Lomond, but they have been made intermittently during winter at 1555 m elevation near Giblin Peak (Caine 1983). These have shown temperatures consistently 2° C lower than those for equivalent periods at Mt Barrow. The coldest temperatures, and the greatest number of days per month of frost, coincide with the heaviest precipitation in July and August.

Extrapolations from stations at low elevations suggest a January average temperature of about 10° C. Minimum temperatures below - 6° C are uncommon based on records on Ben Lomond from 1981 to 1985 (Faulkner 1986). In July 1981, a minimum of -18° C has been casually recorded at the Ben Lomond ski village.

## SNOW COVER

All areas in Tasmania experience snowfall from time to time. Snowfall is common in winter above 800m, but of the north-eastern mountains, only Ben Lomond has a regularly sustained seasonal snow cover. This is thought to be due to the high number of heavy frost days at Ben Lomond.

North-easterly winds bring the heaviest early season snowfalls whilst the westerlies dominate the snowfall pattern as the season progresses (Faulkner 1986).

## DISTURBANCE

### GENERAL

The most conspicuous disturbance to the vegetation has resulted from road construction and development associated with the ski village at the northern end, and recent fires on the southern plateau.

### DEVELOPMENT

Disturbance related to development is mainly restricted to the alpine village area, the main access road, and ski tow areas. Caine (1983) found active erosion only evident where disturbance of vegetation by fire or construction had occurred.

### TRAMPLING

Problems from trampling are evident on tracks mainly on the northern end of the plateau. Areas of poor drainage where Astelia alpina and cushion plants occur are commonly affected.

### SLOPE-GROOMING

Slope-grooming has been undertaken on the ski-runs, in an attempt to extend the duration of snow-cover, and eliminate obstacles to down-hill skiers. The removal of boulders, and "clear felling" of shrubs, has promoted soil loss and land degradation. Attempts to stabilise the area using exotic grasses and straw mulch have introduced a number of exotic weeds such as the thistle, Cirsium vulgare , sheep sorrel, Rumex acetosella, the flatweed, Hypochoeris radicata, and ragwort, Senecio jacobaea.

### FIRE

The Ben Lomond alpine flora has probably been subjected to drought and fire over a long period of time. Most fires are caused by man, with lightning playing only a small part, as such storms are invariably accompanied by heavy rain (Jackson & Bowman 1982). However, there may be areas associated with poor drainage, blockfields, or topographic protection which have been free of fire for long periods of time.

The Tasmanian aboriginals regularly set fire to the vegetation as part of their hunting and land management (Jones 1969), and historical records document aboriginal burning at high altitudes in Tasmania (Plomley 1966).

Recent research indicates that the Ben Lomond Plateau formed part of the territory of the PLANG.UM.MAIR.REEN.NER Band who occupiedthe Fingal Valley and would have come to the plateau only in the warm weather; and that other bands were no more than visitors there. (Plomley, pers. com.) No aboriginal quarry sites were previously known to exist on the plateau (Lourandos 1968), but during this survey a quarry site was discovered below Coalmine Crag.

The change from an aboriginal to a European burning regime took place during the first 30 years of the 1800's, and is thought to have resulted in a decrease in frequency of burning (Noble 1981).

Numerous areas where fires had occurred were observed by Noble (1981) particularly on the southern end of the plateau. Similar observations were made during this study (see vegetation map in Appendix 6). Some of the more recent burns appeared to be spot fires, and probably occurred 20-30 years ago. Noble (1981) suggested there have been fewer recent fires at high altitudes compared with the number occuring during the Aboriginal burning regime.

It appears the high northern part of the plateau has a lower fire frequency, possibly due to the protection from fire afforded by large block-fields on the slopes below and a higher rainfall.

## PREVIOUS VEGETATION STUDIES

As part of a State-wide documentation of plant communities in reserves, Jackson (1974) listed the plant communities occuring in the Ben Lomond National Park, based on community structure and floristics of the dominant stratum.

The most detailed botanical study conducted in the park to date was that of Noble (1981) who investigated altitudinal gradient in relation to species richness.

As part of a State-wide classification of alpine, treeless high altitude vegetation, Kirkpatrick (1982,1983) used floristic data from 430 sites including 14 from Ben Lomond.

Kirkpatrick et al (1985) investigated the State-wide floristic variation in bolster heaths, including those at Ben Lomond, although the study ignored the rare Chionohebe ciliolata rock cushion community.

Ben Lomond floristic data was also included in a Statewide grassy vegetation survey conducted by Kirkpatrick & Duncan (1987) which described 15 communities and listed one as present in the Ben Lomond National Park.

No botanical survey of the whole plateau surface had been conducted before the present study.

# 2. VEGETATION OF THE BEN LOMOND PLATEAU

SUMMARY

SPECIES

A total of 169 plant species was recorded on the Ben Lomond Plateau, representing 37 dicotyledons, 7 monocotyledons, 1 gymnosperm and 6 fern and fern ally families. A species list is provided in Appendix 3.

The five most common families (Asteraceae, Poaceae, Epacridaceae, Cyperaceae and Proteaceae) account for about half the total species recorded, with most families only represented by one or two species. A number of introduced plants have become naturalised on the plateau as a result of the use of introduced grasses, clovers and straw in efforts by the skiers and Department of Lands, Parks and Wildlife to stabilise soil and revegetate areas affected by slope - grooming in the Ski Village area. It is likely the number of introduced plant species will increase as a result of these practices.

The most common species recorded on the plateau were the herbs Poa gunnii and Gentianella diemensis, which occurred in 79% and 75% of the sampling sites respectively. Of the shrubs, Richea scoparia was the most frequent (in 71% of sites), followed by Orites acicularis and Pentachondra pumila (both in 70% of sites), Baeckea gunniana (69%) and Epacris serpyllifolia (68%). A list of the species present in the communities identified, and showing the cover class for each species at each site, is presented in Appendix 4.

One species, the rock cushion plant Chionohebe ciliolata is of particular note. In Tasmania, this species is known only from a small localised area within the Ben Lomond National Park, near Stonjeks Lookout. It is also found on the south island of New Zealand, although future taxonomic work may identify the Tasmanian species as a new Tasmanian endemic. If this were the case, the species would suddenly gain the status of being rare and endangered, thus requiring even greater care with management and protection.

Two other species of interest collected during the survey are an as yet undescribed Carex species, and a Colobanthus species which has affinities with the New Zealand species Colobanthus strictus but which may be a new species. The flowering specimen was collected from the edge of Rafferty Creek and the seed has been propagated by Dr Tony Orchard (Tasmanian Herbarium).

Taxonomic difficulties were encountered with the Oreomyrrhis species O.ciliata and O.sessiliflora. Two forms of Leptospermum rupestre were found, the normal green form, and a grey form, the latter possibly resulting from hybridisation with Leptospermum lanigerum which grows at lower altitudes around the plateau.

## PLANT COMMUNITIES

Twenty two plant communities were identified and described, consisting of 15 major and 7 minor communities. The minor communities generally did not cover an area large enough to sample but were obviously distinct from the surrounding major communities. A list of the communities with their distribution and habitat, appears in Appendix 2.

The communities can be divided into two main groups - aquatic and terrestrial (see diagram 1). The aquatic communities can be further classified according to whether the bodies of water are permanent or temporary.

The terrestrial communities can be separated into those which are predominantly vegetated or those with a very low cover and a high percentage of bare rock exposed. The predominantly vegetated communities can be further divided according to drainage (poor, intermediate or well-drained).

The major factor influencing the distribution of the plant communities appears to be drainage, with altitude the second most important factor. The shrubland communities range from poorly drained to well-drained sites, with the difference between them being the dominant shrub species, (Richea gunnii in poorly drained areas and Leptospermum rupestre in well-drained areas.)

## CONSERVATION STATUS

One of the long-term objectives in conservation is to preserve the greatest diversity of ecosystems, a wide range of plant and animal species, and a wide variety of heterogeneous habitats in which evolution can proceed far into the future.

Duncan and Brown (1985) found that alpine communities had the most satisfactory conservation status of the vegetation types in Tasmania. However, alpine grasslands have historically been utilised for grazing which has resulted in the introduction of weed species, and the degradation of their conservation value.

All except four of the communities described are considered adequately reserved in State Reserves elsewhere in Tasmania.
The four of note are:-

| | |
|---|---|
| Community 22 | (Chionohebe ciliolata Rock Cushion) |
| Community 18 | (Montia australasica Open Stony Herbfield) |
| Community 13 | (Poa costiniana - Poa gunnii Alpine Grassland) |
| Community 2 | (Richea scoparia - Poa costiniana Grassy shrubland) |

The reservation status of these and the other communities of the Ben Lomond Plateau are discussed in the next section.

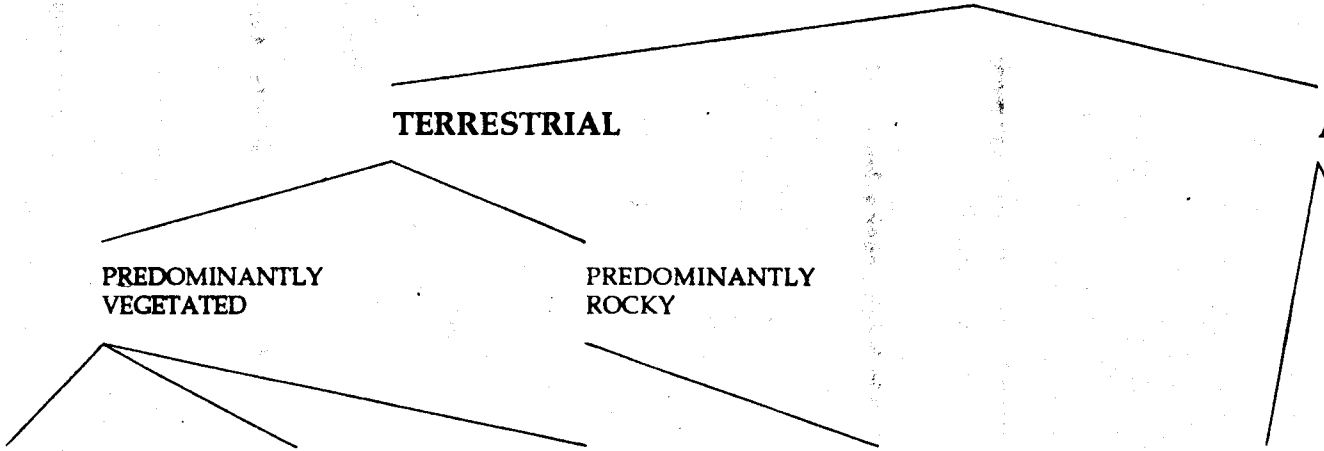
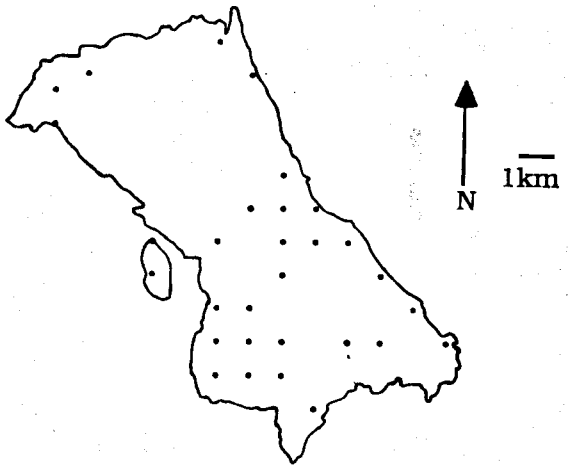



Diagram 1 Key to the 22 Plant Communities described for the Ben Lomond Plateau.

## DESCRIPTIONS OF THE PLANT COMMUNITIES AND RESERVATION STATUS

# COMMUNITY 1

Richea scoparia - Empodisma minus - Poa gunnii
Grassy Shrubland (See photo 2.)




This community is the most widespread community on the plateau, and was recorded at 39% of the sample sites. It typifies the vegetation of intermediate to poorly drained sites, at altitudes between 1230m - 1475m.

The structural form is usually shrubland less than 1 m in height, over a dense herbaceous ground cover dominated by Empodisma minus and Poa gunnii.

The community usually develops on moors and flat valley floors, and is widespread on the southern part of the plateau, particularly on Cotton Moor. It is also found at altitudes below 1475m on the north-western corner of the plateau, and at Meadow Vale.

The constant dominants are the shrubs Richea scoparia and Baeckea gunniana, neither of which is faithful to this community. Other constant species include the erect shrubs Orites acicularis, O. revoluta and Epacris serpyllifolia, and prostrate shrubs Pentachondra pumila and Cyathodes dealbata. These prostrate species tend to be associated with surface rock exposures.

Constant components of the herbaceous ground cover include the grasses Poa gunnii and Danthonia pauciflora, the herbs Senecio pectinatus var. pectinatus, Empodisma minus, Euphrasia collina, Gentianella diemensis, and the sedges Oreobolus distichus and Carpha alpina. In localised damp sites Astelia alpina is present with dense swathes of Empodisma minus.

In the better drained sites associated with outcrops of bedrock and shallow soils Astelia alpina is absent whilst Agrostis parviflora and Ewartia catipes grow in rock crevices.

Prostrate Epilobium species and lichens develop on flat rock exposures subject to periodic pooling and droughting.

This community is closely related to Community 4 (Richea scoparia-Empodisma minus - Abrotanella forsteroides Cushion Shrubland) which contains a constant cushion plant (bolster heath) component and tends to develop in the poorer drained areas.

Localised areas of Community 16, (Myriophyllum pedunculatum Aquatic Herbfield) are also found in poorer drained areas within the community where ephemeral pools occur. Community 1 merges into Community 2 (Richea scoparia - Poa costiniana Grassy Shrubland) at higher altitudes (>1440m) on the northern plateau.

Reservation Status

Community 1 is represented in other State Reserves and National Parks, including Cradle Mt - Lake St Clair, Walls of Jerusalem and Mt Field.

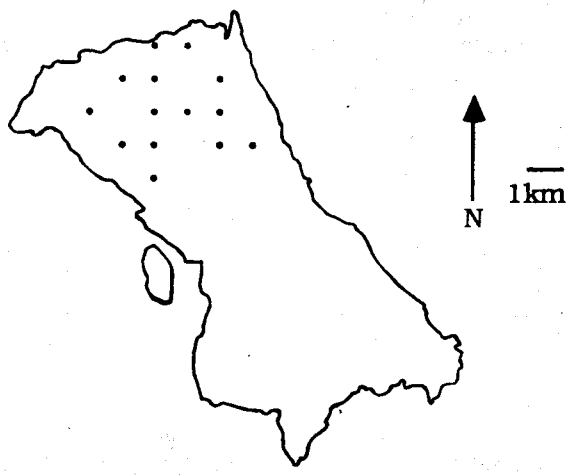
Photo 2: COMMUNITY 1. Richea scoparia - Empodisma minus - Poa gunnii Grassy Shubland.

Shrubland dominated by Richea scoparia and Baeckea gunniana, with a herbaceous ground cover of Empodisma minus, Poa gunnii, Carpha alpina and Astelia alpina.

This is the most widespread community on the Ben Lomond Plateau. (View looking south towards Stacks Bluff).

# COMMUNITY 2

Richea scoparia - Poa costiniana
Grassy Shrubland.




This community is widespread in the high northern region of the plateau at altitudes greater than 1440m. It occupies approximately 18% of the study area and is common in intermediate or well drained sites on Legges Tor, Little Hell, Coalmine Crag and Magnet Crag.

The constant dominant species include Orites acicularis, Bellendena montana, Richea scoparia, Coprosma nitida and Baeckea gunniana. This erect shrub stratum is less that 1m in height.

The constant components of the grassy ground cover include the grasses Poa costiniana, Poa gunnii and Danthonia pauciflora, the herbs Empodisma minus, Senecio pectinatus var. pectinatus, Gentianella diemensis, Euphrasia collina, and the prostrate shrubs Pentachondra pumila and Cyathodes dealbata.

The community is similar to Community 1 (Richea scoparia - Empodisma minus - Poa gunnii Grassy Shubland) which occurs at lower altitudes, and contains Orites revoluta as a constant dominant. Poa gunni is a constant dominant in both communities, but Poa costiniana is generally restricted to the higher altitude community.

Reservation Status

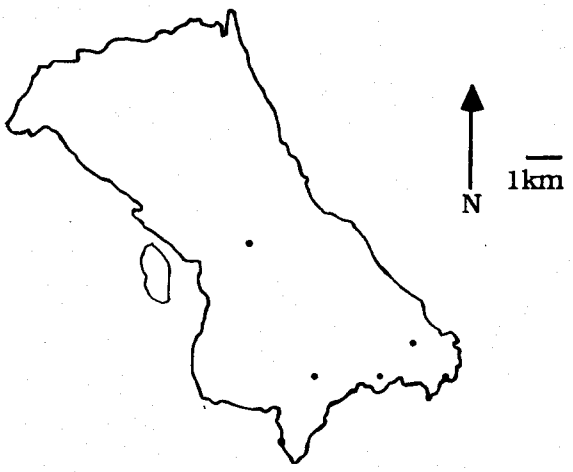
This community is probably present at high altitudes on the Central Plateau and may also occur in the Cradle Mt-Lake St Clair National Park.

The conservation status of grassy communities is generally considered poor, as many are threatened with the elimination of native species through pasture improvement and stock grazing, and the invasion of exotic weed species.

Such exotics are rare or absent in the more remote ecosystems such as Ben Lomond, thus making this a very important area from a conservation point of view.

# COMMUNITY 3

Leptospermum rupestre
Dry Rock Heath




This community was found in approximately 8% of sites and ranged in altitude from 1310m to 1470m. It is typically found on extremely well-drained shallow soils on the exposed north facing slopes on the southern end of the plateau. It is common on Storys Bluff, The Knuckle, as well as on the warmer north to north-east facing slopes in the Nile River Valley. It reaches its highest altitude on Stacks Bluff.

The structural form of the community varies from open shrubland less than 1 metre in height, to closed heath.

The constant dominants are the erect shrubs Leptospermum rupestre, Richea sprengelioides, Orites revoluta and Epacris serpyllifolia, whilst Orites acicularis and Bellendena montana are also found.

Constant components of the open rocky ground cover are the grass Poa gunnii, and the prostrate shrubs Pentachondra pumila, Monotoca empetrifolia, and Exocarpos humifusus. These species are associated with rock exposure which acts as a heat bank and provides protection from extreme cold.

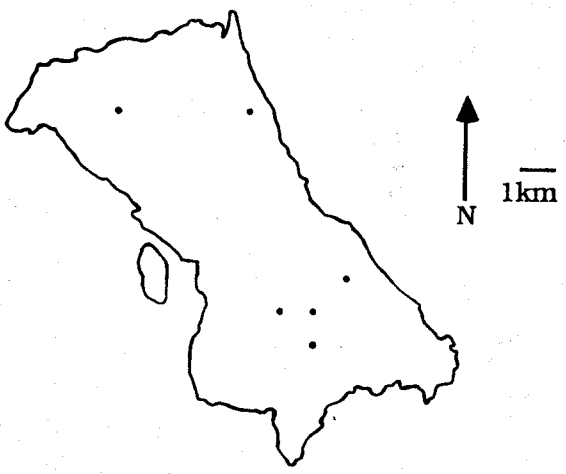
This community is closely related to Community 9 (Eucalyptus archeri - Orites revoluta Dry Scrub) which occurs in similar extremely well-drained sites with favourable warm aspects at lower altitudes.

Reservation Status

It is probable that this community is well represented in other National Parks and State Reserves, including Mt Field, Cradle Mt - Lake St Clair, Hartz Mt, Mt Barrow and Walls of Jerusalem.

# COMMUNITY 4

Richea scoparia - Empodisma minus - Abrotanella forsteroides
Cushion Shrubland.




Community 4 was sampled in approximately 8% of the study area within an altitudinal range of 1300m to 1440m. It is typical of poorly drained or waterlogged sites on valley flats and moors. It was sampled on the southern plateau around Lake Youl and on Twelvetrees Moor, in Meadow Vale on the northern plateau and on Sprent Plains in the northwest.

The structure of the community consists of shrubs less than 1m in height, with a dense ground cover less than 0.1m in height. The constant dominants include the shrub, Richea scoparia,the cushion forming shrub, Abrotanella forsteroides, and the herbs Empodisma minus and Poa gunnii.

Other constant species include Gentianella diemensis, Carpha alpina, Astelia alpina, Oreobolus distichus and the cushion forming herb Pterygopappus lawrencii. The grass Danthonia pauciflora often colonises the cushions.

Localised areas of Communities 16 (Myriophyllum pedunculatum Aquatic Herbfield), 17 (Carex gaudichaudiana Fen), 19 (Restio australis Cord-Rushland) and 20 (Gleichenia alpina Fernland) occur within this community.

## Reservation Status

This community is well-reserved on a State-wide basis, and is present in the Cradle Mt - Lake St Clair, Mt Field, South West, Walls of Jerusalem, and Franklin-Lower Gordon Wild Rivers National Parks. The community was observed up to an altitude of 1520m on Legges Tor, which suggests it may reach its highest altitude in this State in the Ben Lomond Park.

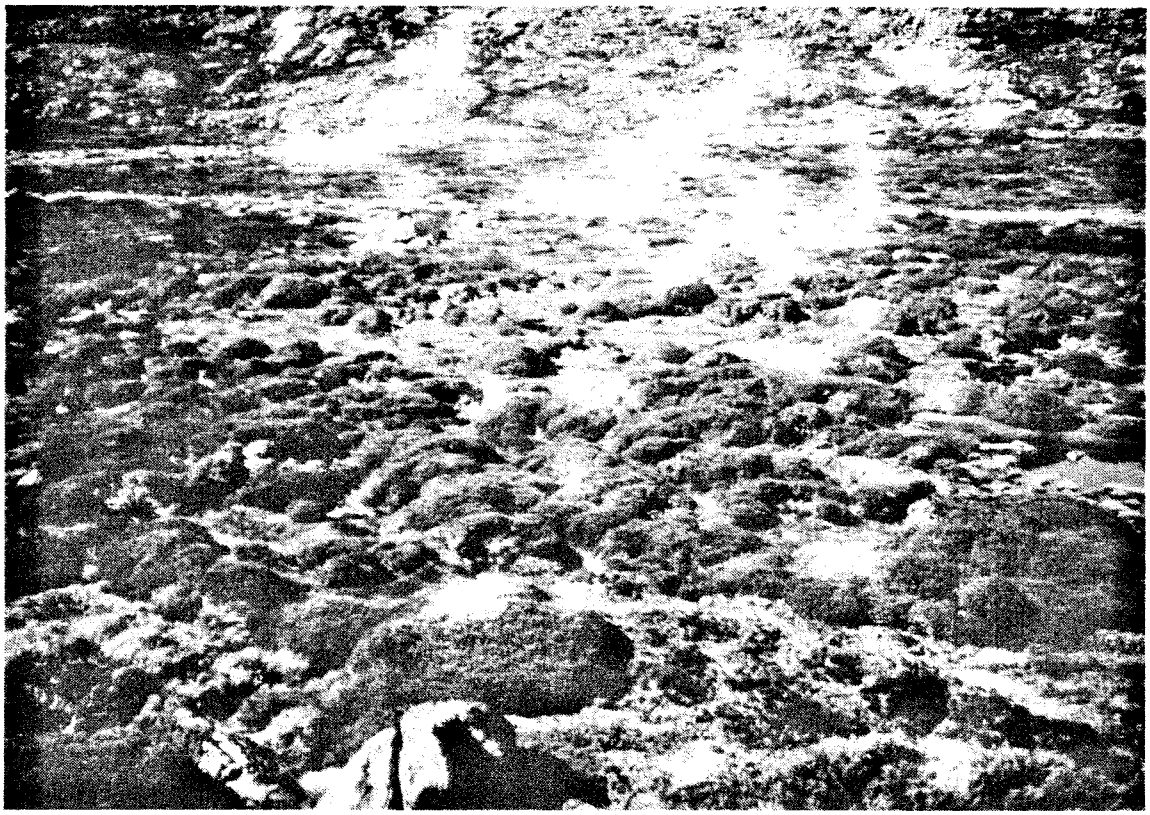


Photo 3 : COMMUNITY 4 , Richea scoparia - Empodisma minus - Abrotanella forsteroides Cushion Shrubland.

General view of community, showing poorly drained valley flat dominated by Richea scoparia, with Astelia alpina and Empodisma minus. A small pond with Abrotanella forsteroides can be seen on the right of the photo.

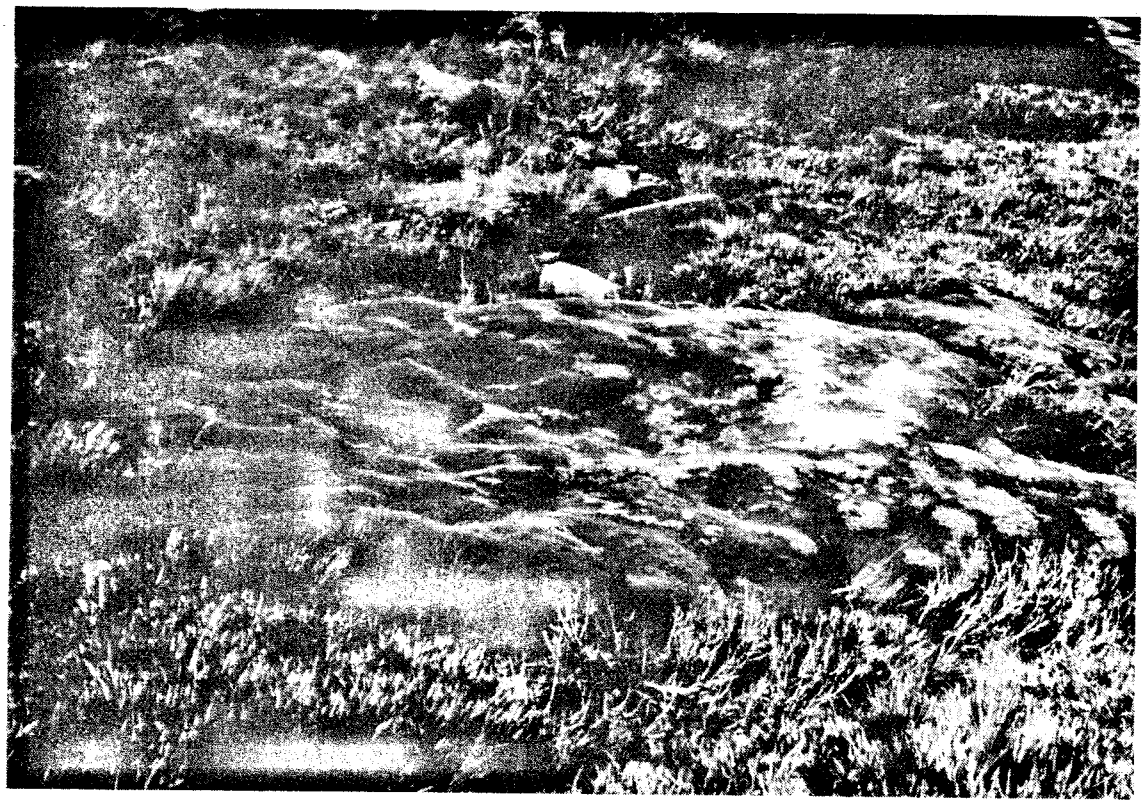
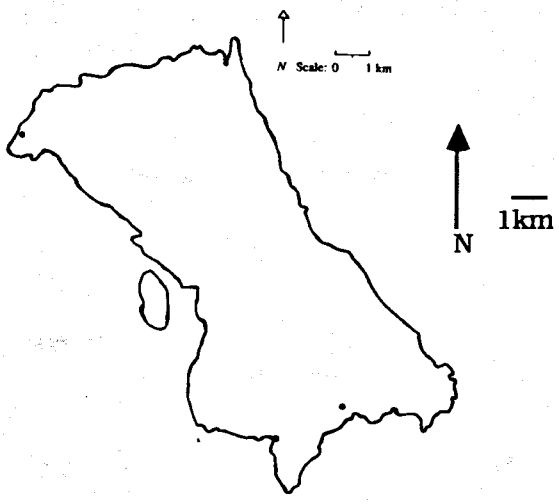


Photo 4 : COMMUNITY 4 : Richea scoparia - Empodisma minus - Abrotanella forsteroides Cushion Shrubland.

Dense ground cover typical of this community, showing cushion-forming habit of Abrotanella forsteroides and Pterygopappus lawrencii, surrounded by Astelia alpina, Empodisma minus, Carpha alpina and Poa gunnii.

# COMMUNITY 5

Orites revoluta - Poa gunnii
Grassy Shrubland




Community 5 was found in approximately 4% of the study area within a range of altitudes from 1250m in the far north-west of the plateau, to 1374m on the southern plateau.

The community is typically low in stature (less than 0.3m), with a very low shrub cover and a dense grassy ground cover. The presence of dead branches at sites 54 and 67 indicate these areas had been burnt recently probably within the last 30 years.

No evidence of fire was noted at site 1 and the shrub layer was tall. However this site appeared very drought-prone being north facing, and the vegetation had strong affinities with the burnt areas. It also had a taller shrub layer.

Poa gunnii and Pentachondra pumila are constant dominants, with the shrubs Orites revoluta, Richea acerosa and Westringia rubiaefolia also present. Other species present include Epacris serpyllifolia, Orites acicularis, Richea sprengelioides, and Leptospermum rupestre. Small amounts of Baeckea gunniana were found regenerating at site 54.

The herbaceous ground cover includes the constant dominants mentioned above as well as the grass Danthonia pauciflora, Grevillea australis, Monotoca empetrifolia and Exocarpos humifusus.

The community has strong affinities with the drought and fire-adapted community 3. (Leptospermum rupestre Dry Rock Heath).

Reservation Status

This community is considered well conserved in the State, and it is probable that it is found in the Cradle Mt - Lake St Clair, Hartz Mt, Mt Field, Southwest, Walls of Jerusalem and Franklin-Lower Gordon Wild Rivers National Parks, and the Mt Barrow State Reserve.

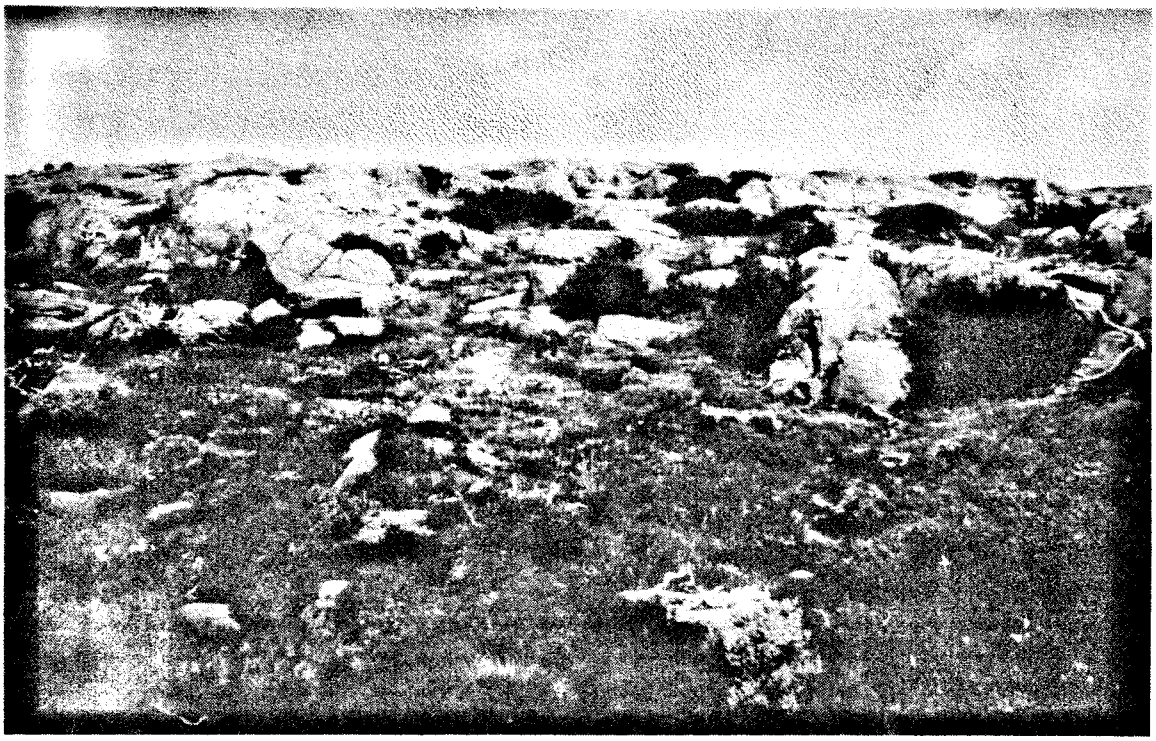
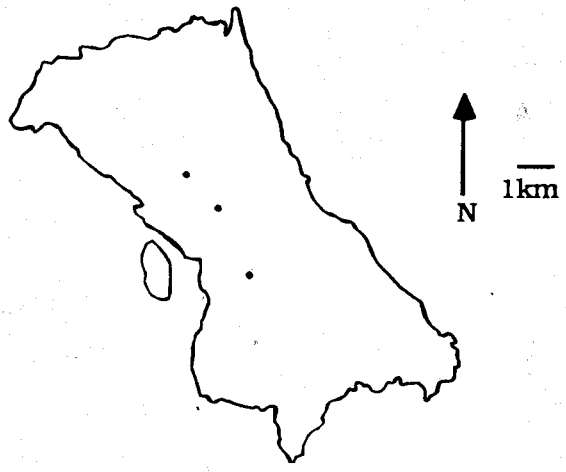


Photo 5: COMMUNITY 5: Orites revoluta -Poa gunnii Grassy Shrubland.

The low shrub cover of Orites revoluta can be seen. The community has recently been burnt.

# COMMUNITY 6

Richea acerosa - Poa gunnii
Grassy Shrubland




This community occurs in intermediate to well-drained sites, particularly on gentle north-facing slopes.

It ranges in altitude from 1265m to 1295m and was recorded in the Rodway Valley and in the Nile River Valley. It is probably also present in the north-west of the plateau at lower altitudes on dry aspects.

The constant dominants are the erect shrub Richea acerosa and the prostrate shrub Grevillea australis. Other constant species include the erect shrubs Westringia rubiaefolia, Baeckea gunniana, Orites revoluta, O. acicularis, Epacris serpyllifolia, Epacris gunnii and Richea scoparia, and the prostrate shrub Pentachondra pumila.

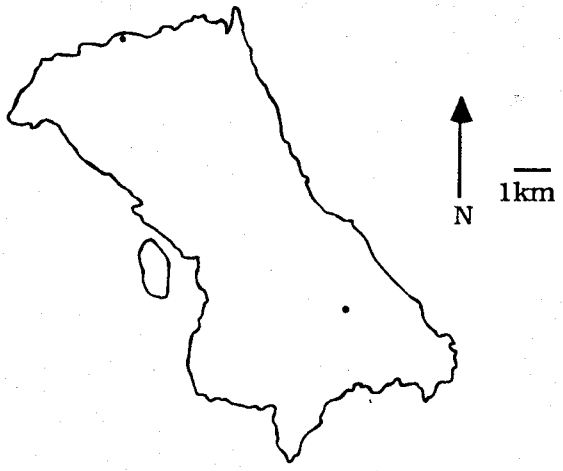
Constant components of the ground cover are the graminoids Empodisma minus and Poa gunnii, and the herbs Gentianella diemensis and Senecio pectinatus. Restio australis is found in the more poorly drained areas of the community.

Reservation Status

It is probable that this community also occurs in the Cradle Mt - Lake St Clair, Mt Field, Walls of Jerusalem, and Franklin - Lower Gordon Wild Rivers National Parks, and the Mt Barrow State Reserve.

# COMMUNITY 7

Ewartia catipes - Gentianella diemensis
Skeletal Rock Herbfield.




This community typifies the vegetation on sheets of glaciated dolerite pavement bedrock and on rocky outcrops. It was recorded in approximately 3% of the the sample sites, and was sampled near Old Bills Monument on the northern plateau, and on the rock crests between Lake Youl and Lake Baker. It is also known to occur in the north-western part of the plateau, and around Legges Tor. The altitude ranged from 1375m to 1420m.

Structurally the community is an open herbfield less than 0.1m in height, and is characterised by an extremely low cover (less than 5%). Most of the community consists of bare rock and lichens. Shrubs are typically absent from the community and the species present are restricted to skeletal soils within the small cracks associated with the cooling joints in the dolerite. (See photo 6). The community therefore occupies the most drought-prone and shallow-soiled habitat exploited by higher plants on the plateau.

No species is dominant but scattered occurences of the herbs Ewartia catipes, Oreomyrrhis sp., Luzula sp. and Gentianella diemensis and the grasses Agrostis parviflora and Deyeuxia monticola are found. At altitudes over 1400m Poa costiniana also occurs, while Poa gunnii is found throughout the community's altitudinal range. Other species occasionally present include Danthonia diemenica, Plantago tasmanica, Senecio pectinatus var. pectinatus and Montia australasica.

Community 7 is closely related to Community 22 (Chionohebe ciliolata Rock cushion) found on Stonjeks Lookout.

Reservation Status

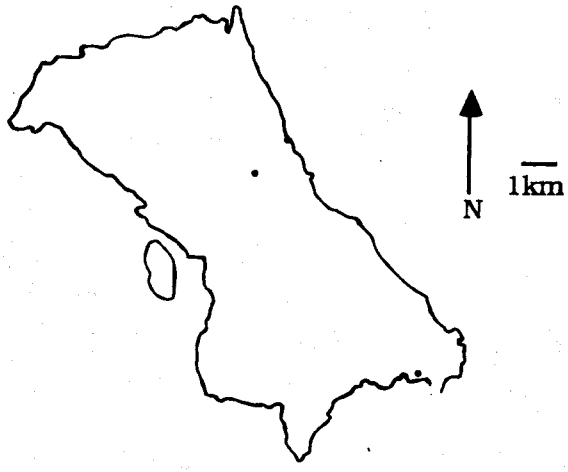
It is probable that this community is also present on rocky outcrops in the Cradle Mt - Lake St Clair, Walls of Jerusalem and Franklin - Lower Gordon Wild Rivers National Parks, and the Mt Barrow State Reserve

Photo 6 : Community 7: Ewartia catipes - Gentianella diemensis Skeletal Rock Herbfield, northwest of Sprent Plains.

Columnar jointing in sheets of glaciated dolerite pavement bedrock can be seen. Species are restricted to skeletal soils within these joints.

# COMMUNITY 8

Lichen Community




Community 8 is characterised by extensive areas of boulderfield, and the absence of higher plant species. Approximately 4% of the area surveyed is occupied by this community, which was sampled at the southern end of Hamilton Crags, on Giblin Fells, and below The Knuckle. More extensive areas of scree occur elsewhere on the plateau, especially in Rodway Valley. (see photo 7)

Soils are absent on the boulderfields, which are extremely well drained and drought prone.

The community is dominated by lichens.

Reservation Status

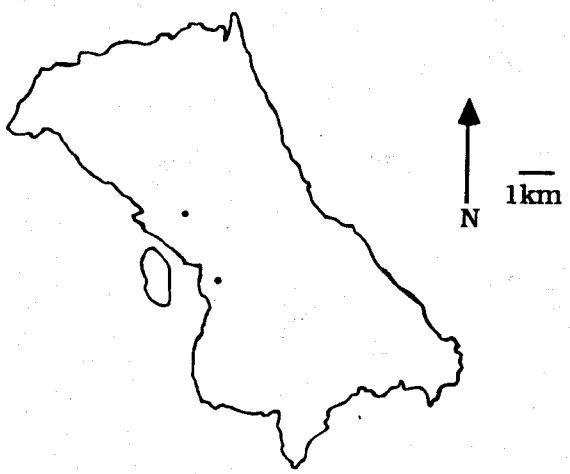
Rock scree communities are widespread on dolerite mountains in Tasmania. They occur in the Mt Barrow State Reserve, and the Walls of Jerusalem, Franklin-Lower Gordon Wild Rivers, Cradle Mt - Lake St Clair, Hartz Mt and Mt Field National Parks.

Photo 7: COMMUNITY 8: Lichen Community

Lichen covered boulders characteristic of this community in the Rodway Valley.

# COMMUNITY 9

Eucalyptus archeri - Orites revoluta
Dry Scrub




This community was recorded at altitudes between 1260m and 1350m on well drained, north-facing slopes on the western ends of the Nile River and Rodway Valleys. The dry warm aspect would make these sites particularly prone to fire and drought.

The structural form of Community 9 varies from scrub to low woodland with the height of the small tree stratum varying from 2.5m to 10m (see photo 8). The dense understorey of low shrubs is typically less than 1.5 in height.

The constant dominant of the tree stratum is Eucalyptus archeri, while Orites revoluta dominates the understorey. Other shrubs present include Westringia rubiaefolia, Coprosma nitida and Cyathodes parvifolia. Leptospermum rupestre is locally abundant in the Nile River Valley site. Other understorey species include Oxylobium ellipticum, Richea sprengelioides and Hakea lissosperma. The herbs Senecio gunnii, Stylidium graminifolium, Lycopodium fastigiatum, Geranium potentilloides and the grass Deyeuxia monticola are found in the stony ground cover.

The community may be regarded as the low altitude equivalent of Community 3 (Leptospermum rupestre Dry Rock Heath).

Reservation Status

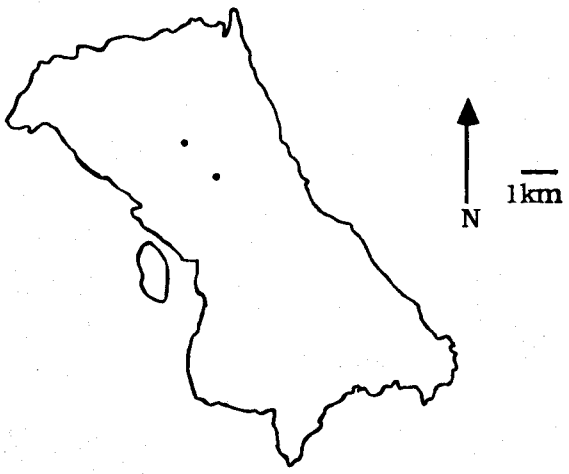
This community has its stronghold in the Ben Lomond National Park, where it forms the tree-line. It is also found in the Mt Barrow State Reserve.

Photo 8 : COMMUNITY 9 : Eucalyptus archeri - Orites revoluta Dry Scrub.

Shrubby understorey of Orites revoluta, and Leptospermum rupestre, with a small tree stratum of Eucalyptus archeri, typical of this community.

# COMMUNITY 10

Richea gunnii - Richea scoparia
Bog Heath




This community is highly localised on the plateau. It is mainly restricted to poor drainage flats on the central parts of the plateau, associated with the valley flats of Talus Creek and Rafferty Creek. It develops between an altitude of 1295m to 1370m, on sites where deep peat soils (greater that 0.5m) are present.

The tallest stratum consists of dense shrubs about 1 m high, co-dominated by Richea scoparia, Richea gunnii and Olearia obcordata; Epacris serpyllifolia, Orites revoluta, Baeckea gunniana and Richea acerosa are also present. Stringy tangles of creeping rope-rush Empodisma minus are found throughout the shrubs.

The herbaceous ground cover includes Astelia alpina and Lycopodium fastigiatum with Sphagnum cristatum, Gleichenia alpina, Poa gunnii, and Carex sp. occasionally present.

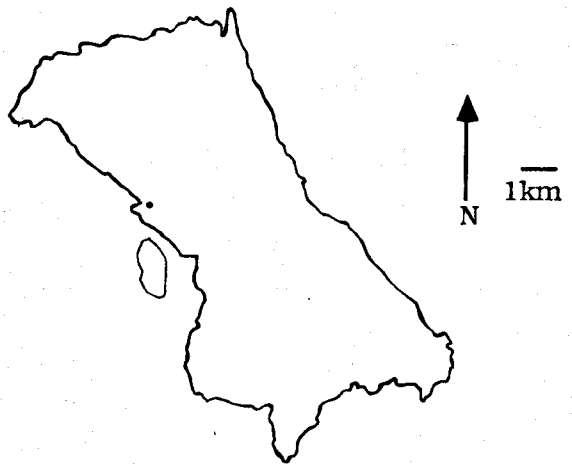
The community occupies some of the most poorly drained non-aquatic sites on the plateau.

Reservation Status

This community is highly localised at Ben Lomond, but is also found in a number of other reserves including the Cradle Mt - Lake St Clair, Mt. Field, Walls of Jerusalem and Franklin - Lower Gordon Wild Rivers National Parks.

# COMMUNITY 11

Richea gunnii - Baeckea gunniana
Grassy Shrubland




This community was recorded in poorly drained moorland at the western end of Rodway Valley. At an altitude of 1215m, it was the lowest site in the present study.

Richea gunnii and Baeckea gunniana dominate the low shrub stratum (less that 1 m in height), with Westringia rubiaefolia, Restio australis and Orites revoluta also present. The dense herbaceous ground cover is dominated by Empodisma minus, Carpha alpina, Poa gunnii and Lycopodium fastigiatum, with Astelia alpina, Gentianella diemenica and Pultenaea subumbellata also present. The bolster plants (cushion plants), Abrotanella forsteroides and Pterygopappus lawrencii are also found in the vicinity.

Community 11 is closely related to Community 4 (Richea scoparia Empodisma minus - Abrotanella forsteroides Cushion Shrubland) which does not contain Richea gunnii or Pultenaea subumbellata, and is found at higher altitudes.

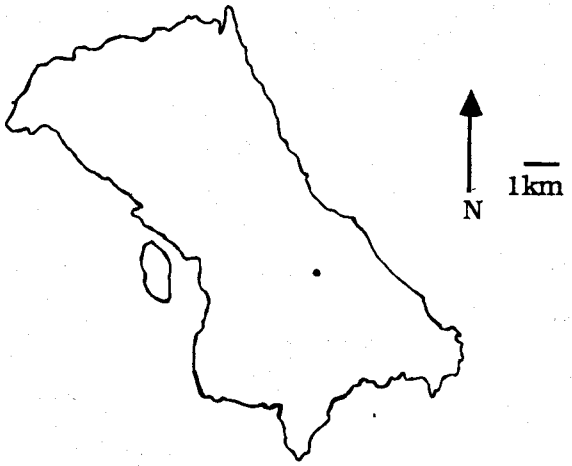
Small areas of communities 16 (Myriophyllum pedunculatum Aquatic Herbfield) and 21 (Isolepis crassiuscula Aquatic Herbfield) occur within Community 11.

Reservation Status

It is probable that this community is also present in the Cradle Mt. - Lake St Clair, Mt Field and Walls of Jerusalem National Parks.

# COMMUNITY 12

Carpha alpina - Deschampsia caespitosa
Fen




This herbaceous community is highly localised on the plateau, and was sampled at one site on the rise east of Long Valley. It is restricted to poorly drained flat stony sites, with occasional pools, and is associated with cold air drainage depressions.

The community is open, and is dominated by Carpha alpina, with Drosera arcturi, Ourisia integrifolia and Myriophyllum pedunculatum. Where pools occur, the aquatic herbs Deschampsia caespitosa and Isolepis crassiuscula are found.

Reservation Status

It is probable that this community also occurs in the Cradle Mt - Lake St Clair National Park.

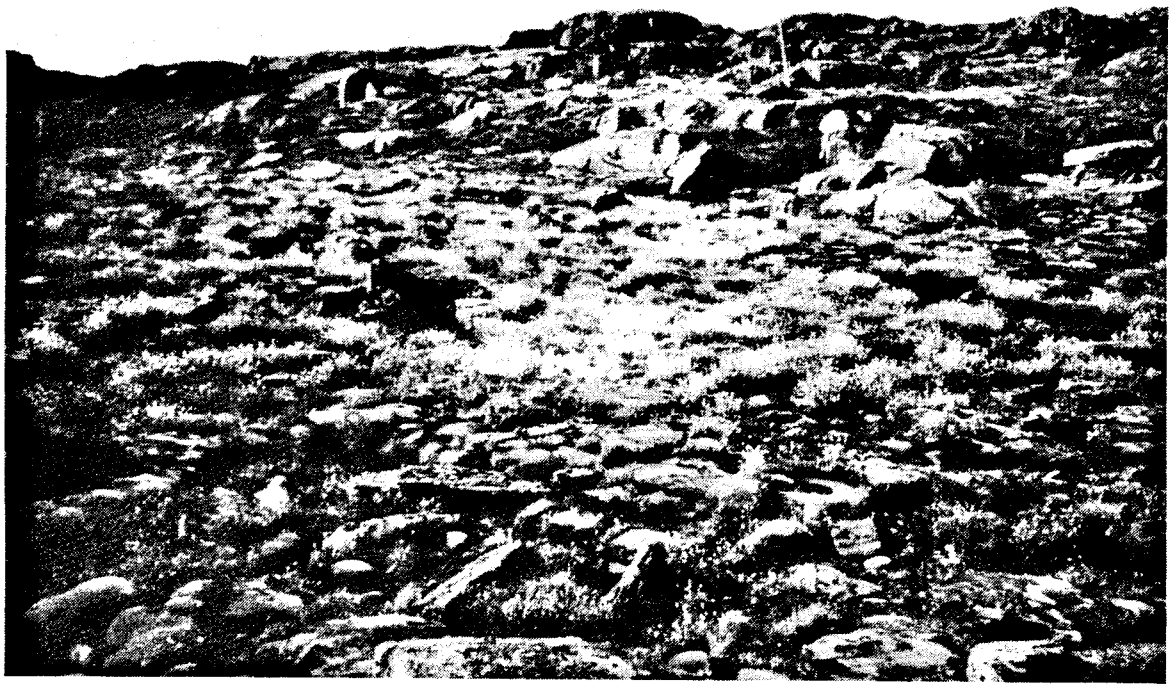
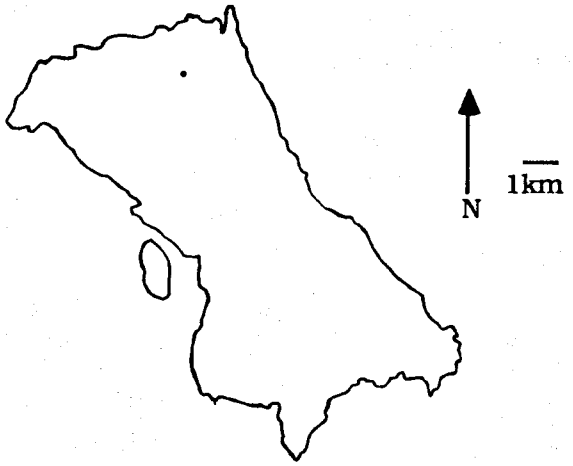


Photo 9 : COMMUNITY 12: Carpha alpina - Deschampsia caespitosa Fen.

This open, stony community dominated by Carpha alpina, develops in poorly drained frost hollows. The aquatic grass, Deschampsia caespitosa, is found where shallow pools occur.

# COMMUNITY 13

Poa costiniana - Poa gunnii
Alpine Grassland




This community is found in the high altitude northern parts of the plateau, at sites typically with an intermediate drainage. It was sampled on the extremely stony Plains of Heaven, and is also present on Sprent Plains near Menamatta Tarns.

It is typically low, (less that 0.1 m in height), and dominated by the grasses Poa gunnii and Poa costiniana. Poa costiniana is found in the higher altitude sites, over about 1450m, whereas Poa gunnii extends throughout the community's range. Other grasses present include Danthonia pauciflora, Danthonia nivicola, Hierochloe fraseri, and Agrostis parviflora. Other species present include Ewartia catipes, Gentianella diemensis, Oreobolus distichus, Lycopodium fastigiatum, Euphrasia collina, Oreomyrrhis sp., Lagenifera stipitata and Senecio pectinatus var. pectinatus. The prostrate shrubs Pentachondra pumila, Coprosma pumila, Cyathodes dealbata and Drapetes tasmanica are also present.

Reservation Status

It is probable that this community occurs in the Cradle Mt - Lake St Clair National Park and on the Central Plateau.

The State-wide conservation status of grasslands is considered poor. Grassy communities on private and Crown land are all threatened with the elimination of native species through pasture improvement and stock grazing. The invasion of exotic weed species is also associated with stock grazing. (Kirkpatrick and Duncan 1987).

Such exotics are rare or absent in the more remote grassy eco-systems such as Ben Lomond, thus making this an important area from a grassland conservation perspective.

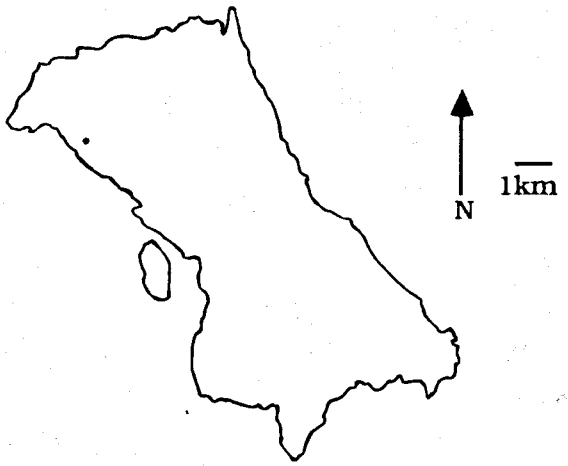
Photo 10 : COMMUNITY 13: Poa costiniana - Poa gunnii Alpine Grassland.

High altitude form of community dominated by Poa costiniana. (Plains of Heaven 1505m A.S.L.).

Photo 11 : COMMUNITY 13: Lower altitude form of community 13 dominated by Poa gunnii (Menamatta Tarns, 1450m A.S.L.)

# COMMUNITY 14

Richea sprengelioides - Richea scoparia
Scree Shrubland




**This community is typical of the vegetation found on well drained skeletal soils developed on screes and boulderfields.**

It varies from closed to open heath depending on rock exposure, and tends to be weakly dominated by a range of shrubs including Richea sprengelioides, Richea scoparia, Orites revoluta and Orites acicularis. Baeckea gunniana and Bellendena montana are also present.

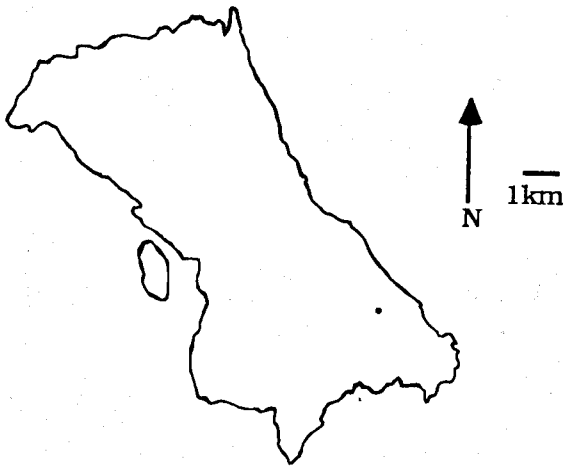
The clubmoss, Lycopodium fastigiatum, often occurs in the sheltered rock crevices.

Reservation Status

This community is well conserved on a State-wide basis, and probably is also present in the Cradle Mt - Lake St Clair, Hartz Mt, Mt. Field, Southwest and Walls of Jerusalem National Parks, and in the Mt Barrow State Reserve.

# COMMUNITY 15

Isoetes gunnii
Aquatic Herbfield




This community develops in permanent water-bodies such as lakes and the larger tarns. It was recorded on the southern plateau in Lake Baker at an altitude of 1345 m. It also occurs in Lake Youl.

The only species present is the quillwort, Isoetes gunnii, which grows on the bottom of lakes.

Reservation Status

This community is well reserved on a State-wide basis, and is probably found in the Cradle Mt - Lake St Clair, Mt Field, Hartz Mt and Southwest National Parks.

# COMMUNITY 16

Myriophyllum pedunculatum
Aquatic Herbfield.

This community develops in bodies of water such as small ponds and tarns particularly those which are subject to periodic drying. It is found throughout the plateau, particularly on the valley bottoms associated with Community 4 (Richea scoparia - Empodisma minus - Abrotanella forsteroides Cushion Shrubland). It is common in the vicinity of Menamatta Tarns.

The community is dominated by dense, stringy, bright green mats of the herb Myriophyllum pedunculatum. During summer, when the tarns dry out completely, this looks superficially like a "lawn". Carex gaudichaudiana is occasionally present (see photo 12).

Reservation Status

This community is widespread in the State, and occurs in at least the Mt. Field and Cradle Mt - Lake St Clair National Parks.

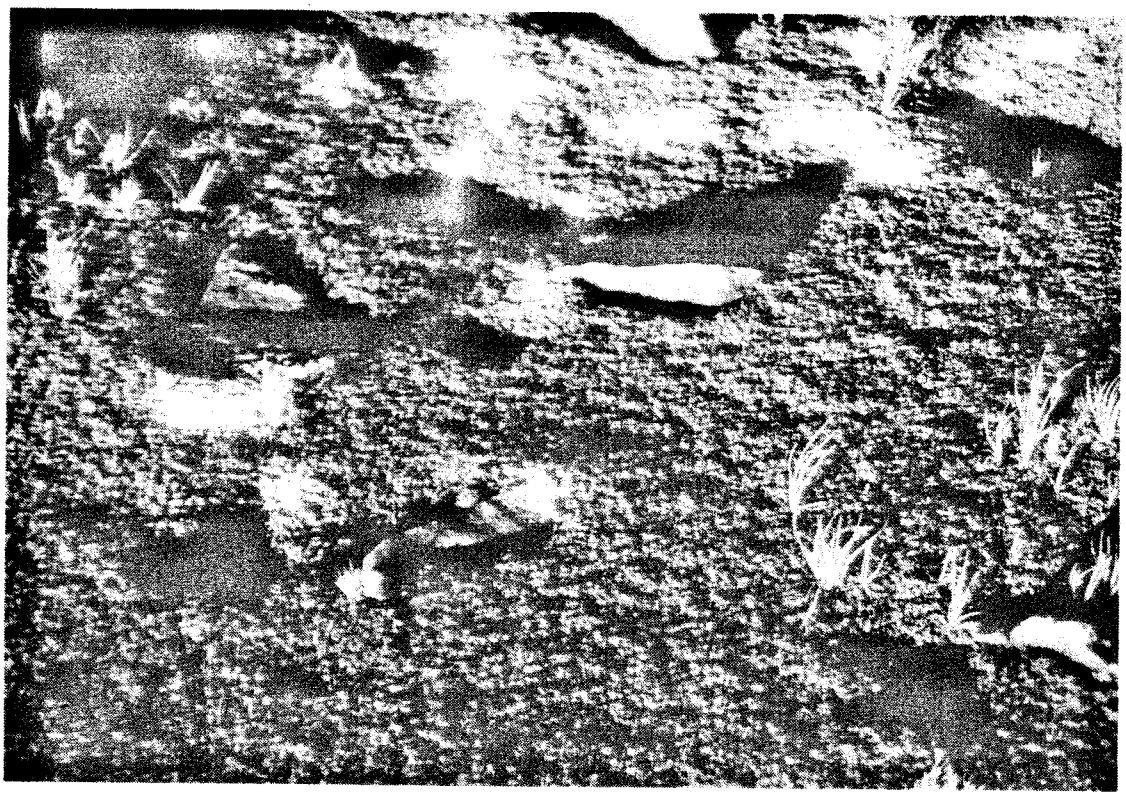


Photo 12 : COMMUNITY 16: Myriophyllum pedunculatum Aquatic Herbfield.

Note the lawn -like appearance of Myriophyllum pedunculatum typical of this community. The taller Carex gaudichaudiana can be seen also.

## COMMUNITY 17

Carex gaudichaudiana
Fen

This community is localised but widespread and was found in shallow stony pools throughout the plateau.

The sedge Carex gaudichaudiana dominates this community. It is similar to Communities 16 (Myriophyllum pedunculatum Aquatic Herbfield) and 21 (Isolepis crassiuscula Aquatic Herbfield).

Reservation Status

This community occurs in a number of other parks, including the Mt Field and Cradle Mt - Lake St Clair National Parks.

## COMMUNITY 18

Montia australasica
Stony Herbfield

This community is found where sorting of dolerite gravels and small stones occurs to form "sorted polygons". This small-scale patterned ground is a result of freeze/thaw cycles associated with the present day periglacial conditions occurring on the Ben Lomond plateau.

The sites contain a dark brown clay loam soil, covered by gravels and small stones. The community is found locally throughout the plateau in flattish areas associated with cold air drainage such as on Stacks Bluff, Cotton Moor and near the Alpine Village.

The sites are often sparsely colonised (cover less than 1%), exclusively by the creeping biennial herb Montia australasica.

This community is closely related to Community 7 ( Ewartia catipes - Gentianella diemensis Skeletal Rock Herbfield) which develops on sheets of glacial dolerite pavement bedrock rather than in stony gravel deposits.

Reservation Status

Ben Lomond may be this community's stronghold area in the State. Similar localised areas of "sorted polygons" may be present in the Cradle Mt Lake -St Clair National Park, but not to the same extent.

Photo 13 : COMMUNITY 18: Montia australasica Stony Herbfield.
"Sorted polygons" typical of this community can be seen. The extremely low plant cover is also evident.

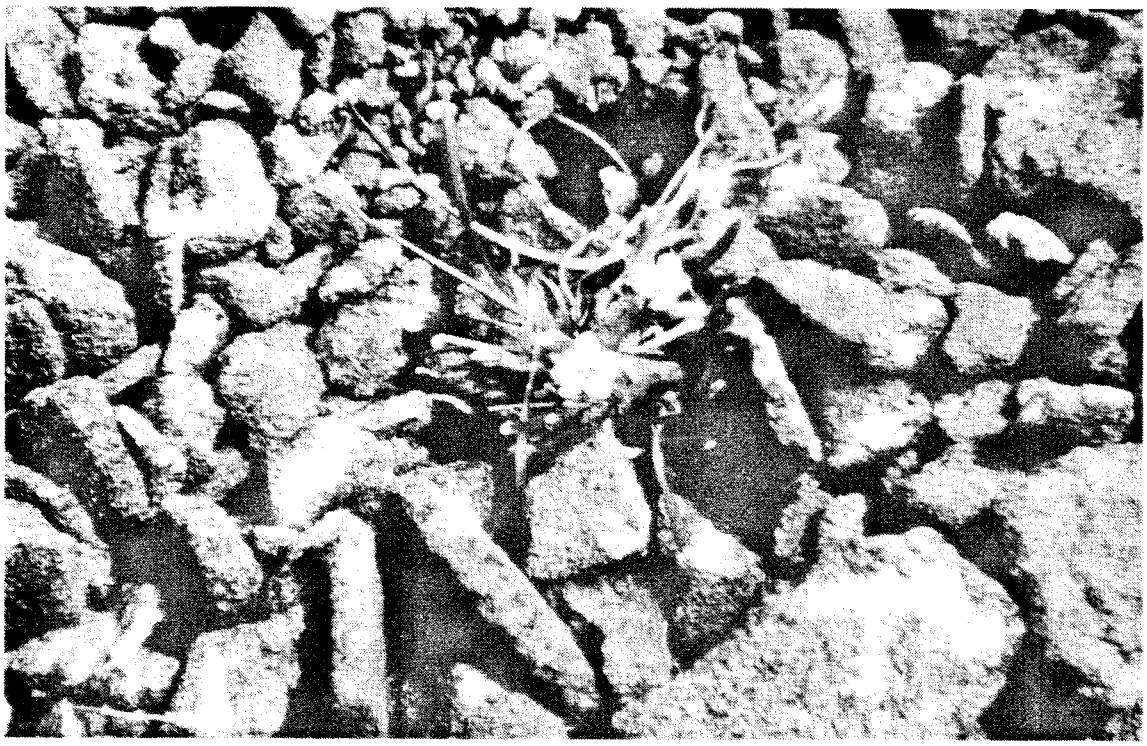


Photo 14: COMMUNITY 18: Montia australasica Stony Herbfield. Montia australasica in flower.

# COMMUNITY 19

Restio australis
Cord-Rushland

This community is found in localised areas of poor drainage, and tends to occur on gentle north-facing lower slopes where frosts and snow are less severe. It is found on the floor of the Nile River Valley, and seems to occur mainly on the southern plateau where the lowest altitude areas of the plateau occur.

The dominant species is Restio australis, with Empodisma minus and clumps of Astelia alpina also present.

Reservation Status

This community is well represented in other reserves in the State, including the Mt Field, Hartz Mt, and Cradle Mt-Lake St Clair National Parks.

Photo 15 : COMMUNITY 19: Restio australis Cord - Rushland.

This highly localised community occurs on gentle, north-facing lower slopes such as in the Nile River Valley.

# COMMUNITY 20

Gleichenia alpina
Fernland

Community 20 is highly localised and found mainly on the southern plateau on warmer north-facing lower slopes where frosts and snow are not as severe. It occurs on poorly drained areas of valley floors, such as the Nile River Valley.

The dominant species is the mat-forming fern, Gleichenia alpina. Other species present are Astelia alpina, Empodisma minus, Poa gunnii and the occasional shrub of Orites acicularis, Orites revoluta, Richea gunnii and Epacris serpyllifolia.

## Reservation Status

This community is well represented in other reserves in the State, including the Mt Field, and Cradle Mt-Lake St Clair National Parks.

# COMMUNITY 21

Isolepis crassiuscula
Aquatic Herbfield

This community is found in small ponds and tarns which are not subject to drying out to the same extent as those in Community 16 (Myriophyllum pedunculatum Aquatic Herbfield).

The aquatic sedge, Isolepis crassiuscula occurs under the above conditions in localised throughout the plateau in the valley flats.

Reservation Status

This community is also reserved in at least the Mt. Field and Cradle Mt - Lake St Clair National Parks.

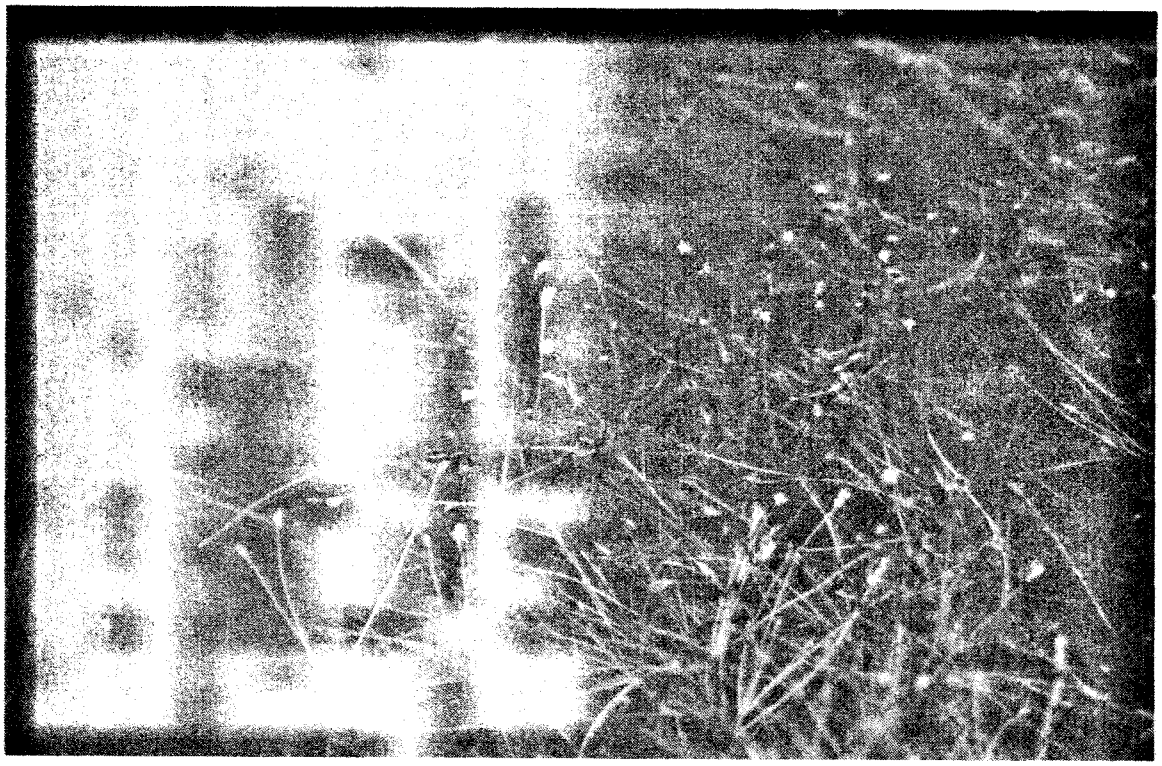
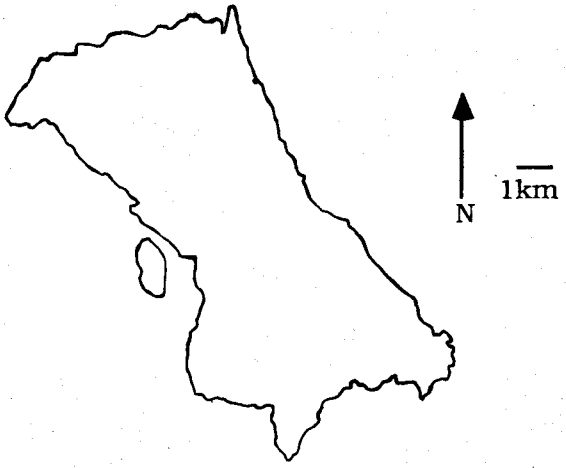


Photo 16: COMMUNITY 21: Isolepis crassiuscula Aquatic Herbfield.

This community is found in the more permanent water bodies, and is dominated by the sedge Isolepis crassiuscula.

# COMMUNITY 22

Chionohebe ciliolata
Rock Cushion




This community is found at high altitude (1520m) on an extremely well-drained rocky site on Stonjeks Lookout, at Hamilton Crags.

It contains the rare cushion-forming herb, Chionohebe ciliolata, which is presently known in Tasmania only from this very restricted locality. The community occurs on west facing stony slopes, where skeletal soils develop, or in rock crevices and between boulders where no obvious soil exists. The compact cushions range in size from 10-40 cm in diameter with some cushions showing signs of die-back.

Other herbs present with a very low cover, include Gentianella diemensis, Poa costiniana, Deyeuxia monticola, Ewartia catipes and Oreomyrrhis sp.

Chionohebe ciliolata also grows in subalpine fellfield and bare rocky places on the west coast of New Zealand's south island (Allan 1982).

Reservation Status

This community is not known from any other locality in the State.

If further taxonomic work identifies the Tasmanian species as distinct from the New Zealand Chionohebe, it will be a rare and endangered plant species. Careful planning and management of this area of the Park is therefore essential.

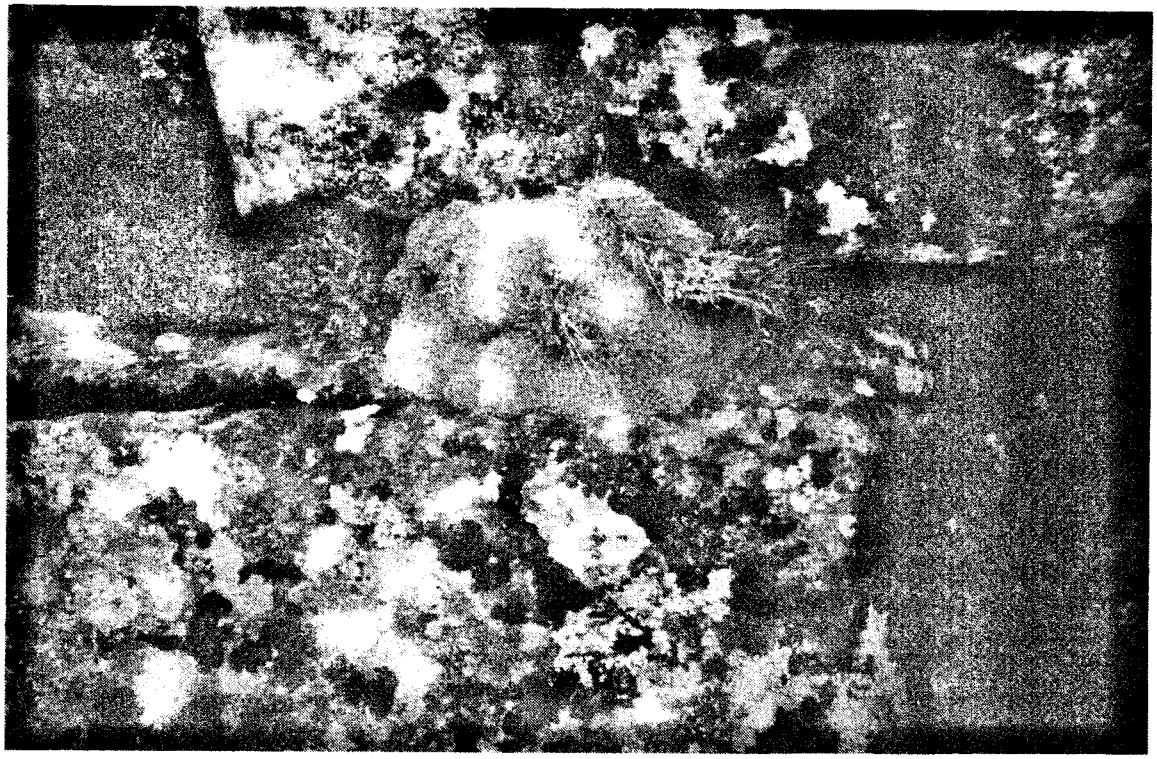


Photo 17 : COMMUNITY 22 Chionohebe ciliolata Rock Cushion

Cushion of Chionohebe between rocks on Stonjeks Lookout. This species occupies the best drained sites colonised by cushion forming species in Tasmania.

# 3. BRIEF COMPARISON OF THE ALPINE VEGETATION OF THE BEN LOMOND PLATEAU AND MT. FIELD

## INTRODUCTION

Mt Field National Park is located 75 km north-west of Hobart. Geologically it is similar to Ben Lomond, being mainly dolerite, and the area was also glaciated during the Pleistocene Epoch. Glacial erosion features such as cirques, U-shaped valleys, truncated spurs and hanging valleys give the Park its present rugged landscape. In contrast there are very few glacial erosion features at Ben Lomond, the major ones being glaciated pavements. Periglacial blockstreams are present in both National Parks, but are much more extensive at Ben Lomond.

## VEGETATION

The area of alpine vegetation is much greater and less dissected at Ben Lomond than Mt Field, and has a greater grassy element. Shrublands are generally more widespread at Ben Lomond, with only localised areas of closed heath. This more open structure of the communities has enabled the grassy element to develop.

With the absence of Eucalyptus coccifera at Ben Lomond (except for eight individuals planted near the Foresters Lodge in the Ski Village) the only eucalypt on the plateau is E. archeri, which forms the tree-line at approximately 1250m.

Many of the woody shrubs are common to both areas. Richea scoparia is more common at Ben Lomond, as is Orites acicularis, while Orites revoluta is more common at Mt Field. The species Westringia rubiaefolia and Helichrysum backhousii var. kingii are not present at Mt Field, while H. backhousii var. backhousii is absent from Ben Lomond. The deciduous beech Nothofagus gunnii, is present at Mt Field, but was not recorded at Ben Lomond. At higher altitudes, on rocky sites at Mt Field, Archeria serpyllifolia is common, but this species is absent from Ben Lomond. Also more common on rock sites at Mt Field is the conifer Podocarpus lawrencii. At Ben Lomond, this species is very restricted on boulderfields.

The absence of the endemic conifers from the Ben Lomond Plateau is a major difference from Mt Field. The species Microstrobos niphophilus, Diselma archeri and Microcachrys tetragona are all common at Mt Field. Pencil Pine (Athrotaxis cupressoides) and King Billy Pine, (A. selaginoides) are absent from Ben Lomond, but are all found at Mt Field.

The bolster cushion communities with Abrotanella forsteroides and Pterygopappus lawrencii found on Ben Lomond are similar to those occuring on the eastern moors of Mt Field, but they differ in not containing the endemic herb Plantago gunnii which colonises the cushions at Mt Field. The community also has a greater altitudinal range at Ben Lomond, possibly due to the lack of competition from the high altitude cushion species, Phyllachne colensoi, Dracophyllum minimum and Donatia novae-zelandiae, all of which are found at Mt Field.

Another difference between the Ben Lomond and Mt. Field alpine vegetation is the absence of extensive grasslands at Mt Field. The grass Poa costiniana is common at Ben Lomond but absent from Mt Field, possibly due to the higher altitude and drier environment at Ben Lomond.

Other species present at Ben Lomond, but not recorded at Mt Field include Phebalium montanum, Cryptandra alpina, Hymenanthera dentata, Ewartia catipes and the rock cushion Chionohebe ciliolata.

The differences in vegetation at Ben Lomond and Mt Field may be due to climatic, topographical or geographical differences. Ben Lomond has a lower rainfall than Mt Field, and is probably subject to more severe frosts, the Ben Lomond Plateau rises to an altitude over 1500m whereas Mt Field West is just over 1400m. In addition, the Plateau is geographically isolated, and many species common on the western and central mountains of Tasmania have not invaded the mountains of the northeast.

# 4. IMPLICATIONS OF INTRODUCED EUCALYPTUS COCCIFERA SEEDLINGS AT SKI VILLAGE

Eight individual plants of E. coccifera growing near Foresters Lodge are thought to have been planted about 20 years ago. The trees are thriving at an altitude of 1445m, well above the current Eucalyptus archeri tree-line (approx. 1200m). Eucalyptus coccifera normally forms the tree-line on dolerite mountains in Tasmania except in the north-east. The fact that these trees have been successfully established on Ben Lomond, suggests that the absence of the species is not due to lack of suitable habitat, but is due to historical and present barriers to the migration of E. coccifera from the west and south-east.

Where E. coccifera and E. archeri are found together such as on the Western Tiers E. coccifera extends to much higher altitudes than E. archeri. The success of E.coccifera at this site suggests that the current tree-line on Ben Lomond is at a much lower altitude than would have been the case if E. coccifera had successfully invaded the north-eastern mountains. (B. Potts pers. comm.)

Photo 18 : One of eight introduced Eucalyptus coccifera trees near Foresters Lodge. The success of these trees at 1445m suggests the tree-line at Ben Lomond could be higher than the present day tree-line, if this species had successfully invaded the north-eastern mountains.

# 5. EVIDENCE OF DISTURBANCE CAUSED BY LIGHTNING STRIKE

Whilst conducting field work for this project near Old Bills Monument on the northwest corner of the plateau, a highly localised but conspicuous area of soil and vegetation disturbance was found, thought to have resulted from a lightning strike.

The disturbance was 75m north of Old Bills Monument, and consisted of a shallow discontinuous trench about 30cm wide and between 15 -35cm deep gouged into the ground. There were two small spots and one continuous trench 5m long, with a 90° bend half way along it. No signs of burning were evident but numerous roots exposed in the trench had been severed. Shrubs up to 1 m high and 70cm across had been uprooted and thrown up to 2m and soil and rocks scattered over the surrounding vegetation. One large rock had been thrown on to an Orites acicularis bush. (see Photo 20).

Such lightning strikes may possibly affect micro-drainage patterns, as the trench was filled with water and a new drainage pattern created.

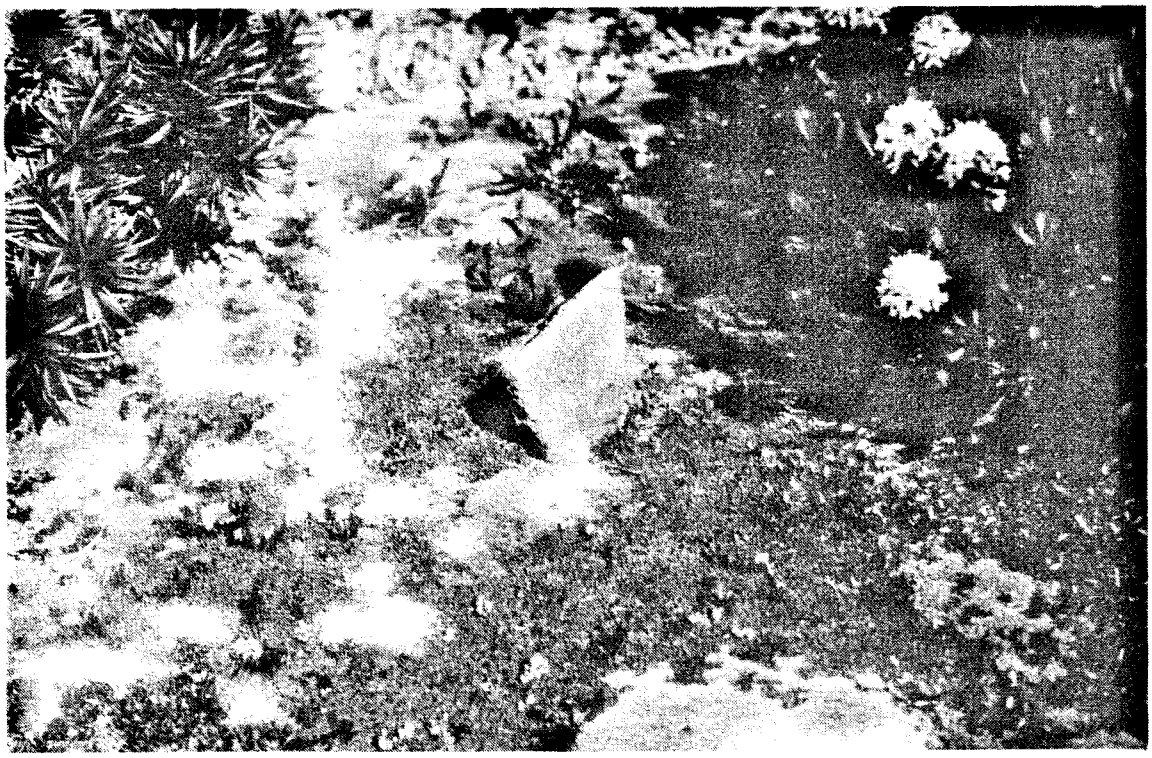


Photo 19: Angular dolerite fragment imbedded in a cushion of Abrotanella forsteroides and Pterygopappus lawrencii resulting from a lightning strike near Old Bills Monument.

Photo 20: Large rock thrown onto a bush of Orites acicularis by a lightning strike near Old Bills Monument.

# APPENDIX 1

## SURVEY METHOD AND ANALYSIS OF DATA

### SAMPLING AND DESCRIPTION

The quantitative sampling of the highland vegetation of the Ben Lomond Plateau, was limited to the region shown in Map 1 and covered an area of approximately 6500 ha.

The study area is bounded by a conspicuous steep escarpment on the eastern and southern sides. The boundary on the western and northern sides followed the edge of the plateau surface except where the Nile River and Rafferty Creek drain the plateau. An arbitrary plateau boundary determined from aerial photographs was used in this area, as well as in the northwestern corner of the plateau near Stein Crags. An isolated unnamed high level area to the west of the main plateau was included in the survey area.

The altitude of the study area ranges from approximately 1200m in the lower reaches of Rafferty Creek, to 1572m on Legges Tor.

The topography includes wide expanses of gently undulating stony plateau, with localised areas of stony slopes, cliffs and shallow valleys.

Most of the area is above the eucalypt tree-line(1200m), but localised areas of Eucalyptus archeri woodland and scrub are present on the western edges of the study area, where the plateau escarpment is not distinct as at Rafferty Creek and Talus Creek.

The objective in sampling the plateau vegetation was to obtain quantitative data representative of the full range of floristic and structural composition of the vegetation. A randomly sited systematic design was employed using sites located at 1000m intervals along traverse lines forming a 1 km grid system within the study area (see Map 1). A total distance of 73km of strip-line was surveyed. The sites were marked on aerial photographs, and their location identified in the field by using a 100m tape and compass bearings from major topographic features.

The sampling unit adopted was a 20 m diameter circular area. A day pack was placed at the centre of the sample area and the 10 m radius paced out. An exception to this sampling method was Site 70, in Lake Baker, where the aquatic vegetation was interpreted from that visible from the edge of the lake. Attempts were made to ensure the sampling area did not cross any apparent or topographic discontinuities and that the vegetation within the area was homogeneous. The structure of the vegetation was described following Specht (1970).

All vascular plant species within the plot were recorded with relevant structural information (height, cover) using "TASFORHAB" (Peters 1984). Species which could not be identified at the time of sampling were collected for later identification using the herbarium collection of the Queen Victoria Museum and Art Gallery, and the Tasmanian Herbarium.

In addition to the vegetation data, notes were made on relevant site characteristics including drainage, soil type, soil depth, topographic position and proportion of site covered by boulders or bedrock. The altitude for each site was determined from 1:25,000 topographic maps, as was the grid reference.

### NOMENCLATURE

Taxonomic nomenclature follows Buchanan et al (1989). The only exception was Colobanthus affin. strictus which follows Allan (1982). The authorities for the nomenclature of all species encountered during sampling of the vegetation are given in Appendix 3. Voucher specimens collected during the project have generally been deposited in the Herbarium of the Queen Victoria Museum and Art Gallery in Launceston.

## DATA ANALYSIS

The data were initially coded for entry on to the vegetation data base "TASFORHAB" (Peters 1984) with the co-operation of the Department of Lands Parks & Wildlife. However, it was soon realised that data analysis would not be completed in the limited time available. The data was therefore re-coded and entered by the authors on to "ECOPAK" (Ecological Data Base Package) at the University of Tasmania for analysis.

The data were initially ordinated using "DCA" (Detrended Correspondence Analysis) (Hill & Gauch 1980) and classified using the polythetic divisive computer program "TWINSPAN" (Hill 1979). The initial TWINSPAN groups were then studied in detail. Some groups were readily identifiable and consistent with field observations. Others were anything but clear and were re-sorted so that the final groups were consistent with field observations and not purely numerically generated. This resulted in the description of 15 major plant communities. "Constant dominants" were considered to be species with a frequency of occurrence of at least 80%.

Another 6 minor communities were described from field notes of communities recognised in the field but not recorded in the grid sampling scheme. One community, (community 22) "Chionohebe ciliolata Rock Cushion, was described from site 77 which was the only non-grid sampling site. This was chosen because it included this rare and highly localised community.

## VEGETATION MAPPING

A vegetation map (Appendix 6) was constructed from interpretation of colour aerial photos (1981 Wesley Vale 1:20,000) using a mirror stereoscope. Fourteen initial mapping units were identified, as well as one community "Chionohebe Rock Cushion" (Community 22) which was mapped from field observations. These boundaries were digitised on the "Biogeographical Information System" (Department of Lands Parks and Wildlife), and the areas grouped into the final mapping units.

The initial mapping unit "active streambank erosion", was amalgamated and mapped with "grassy alpine shrubland", and the unit "grassy Orites revoluta dry shrubland", was combined with "Orites revoluta dry heath/shrubland". The "grassy alpine shrubland" was divided into high or low altitude forms, thus resulting in fourteen final mapping units.

The low altitude grassy alpine shrubland includes communities 1, 6, 10, 11 and 12. The rest of the final mapping units correspond to the individual major communities as shown on the map, except for "recently burnt (since 1960)", and "grassy shrubland on recent sand deposits". The recently burnt areas were similar to Community 5, while the grassy shrubland on sand deposits was included in Community 1, but mapped separately for its geomorphological interest.

## APPENDIX 2

## SUMMARY OF PLANT COMMUNITIES AND THEIR DISTRIBUTION AND HABITAT

Notes:
(1) Distribution on the Ben Lomond Plateau predominantly northern (N), southern (S), eastern (E) or western(W).
(2) Community occurs largely on poorly - drained (Pd) or well-drained (Wd) sites.
(3) "MC" indicates a minor community not sampled by the grid system, but described from field notes
(4) This site was located outside the grid sampling system. (See Map 1)

| Comm. No. | Community Name | Site Number | Geographic Distribution (Note 1) | | | | Drainage Status (Note 2) | |
|---|---|---|---|---|---|---|---|---|
| | | | N | S | E | W | Pd | Wd |
| 1 | Richea scoparia - Empodisma minus - Poa gunnii Grassy Shrubland | 2, 3, 4, 19, 25, 29, 30, 35, 37, 38, 39, 40, 41, 42, 45, 47, 48, 49, 50, 52, 53, 56, 61, 62, 63, 66, 69, 71, 72, 76, | x | x | x | x | x | x |
| 2 | Richea scoparia - Poa costiniana Grassy Shrubland | 5, 7, 9, 11, 12, 13, 14, 16, 18, 20, 21, 22, 23, 27 | x | | x | x | | x |
| 3 | Leptospermum rupestre Dry Rock Heath | 44, 55, 57, 68, 73, 75 | | x | x | x | | x |
| 4 | Richea scoparia - Empodisma minus - Abrotanella forster oides Cushion Shrubland | 8, 24, 51, 58, 59, 64 | x | x | x | x | x | |
| 5 | Orites revoluta - Poa gunnii Grassy Shrubland | 1, 54, 67 | x | x | x | x | | x |
| 6 | Richea acerosa - Poa gunnii Grassy Shrubland | 32, 34 43, | x | x | x | x | | x |
| 7 | Ewartia catipes - Gentianella diemensis Skeletal Rock Herbfield | 10, 65 | x | x | x | x | | x |
| 8 | Rock Scree | 26, 46, 74 | x | x | x | x | | x |

| Comm. No. | Community Name | Site Number | Geographic Distribution (Note 1) | | | | Drainage Status (Note 2) | |
|---|---|---|---|---|---|---|---|---|
| | | | N | S | E | W | Pd | Wd |
| 9 | Eucalyptus archeri - Orites revoluta Dry Scrub | 31, 36 | | x | x | x | | x |
| 10 | Richea gunnii - Richea scoparia Bog Heath | 15, 33 | | | | x | | x |
| 11 | Richea gunnii - Baeckea gunniana Grassy Schrubland | 28 | | x | x | x | x | |
| 12 | Carpha alpina - Deschampsia caespitosa Fen | 60 | x | x | x | x | x | |
| 13 | Poa costiniana - Poa gunnii Alpine Grassland | 17 | x | | x | x | x | x |
| 14 | Richea sprengelioides - Richea soocoparia Scree Shrubland | 6 | x | x | x | x | | x |
| 15 | Isoetes gunnii Aquatic Herbfield | 70 | | x | x | | | x |
| 16 | Myriophyllum pedunculatum Aquatic Herbfield | MC ( Note 3) | x | x | x | x | x | |
| 17 | Carex gaudichaudiana Fen | MC | x | x | x | x | x | |
| 18 | Montia australasica Stony Herbfield | MC | x | x | x | x | | x |
| 19 | Restio australis Cord-Rush Land | MC | | x | x | x | x | |
| 20 | Gleichenia alpina Fernland | MC | x | | x | x | x | |
| 21 | Isolepis crassiuscula Aquatic Herbfield | MC | x | x | x | x | x | |
| 22 | Chionohebe ciliolata Rock Cushion | 77 (Note 4) | x | | x | | x | |

## APPENDIX 3

### VASCULAR PLANTS OF THE BEN LOMOND PLATEAU
### LIST OF SPECIES

(e) = endemic (i) = introduced

### DICOTYLEDONS

APIACEAE (UMBELLIFERAE)
- Hydrocotyle sibthorpioides Lamk.
- Oreomyrrhis ciliata Hook.f.
- (e) Oreomyrrhis sessiliflora Hook.f.

ASTERACEAE (COMPOSITAE)
- (e) Abrotanella forsteroides (Hook.f.) Benth.
- (e) Brachyscome spathulata Gaud. ssp. glabra (DC.) Stace
- Brachyscome tenuiscapa Hook.f.
- Celmisia asteliifolia Hook.f.
- Cotula filicula (Hook.f.) Benth.
- Craspedia alpina Backh. ex Hook.f.
- Erigeron pappocromus Labill.
- (e) Ewartia catipes (DC.) P. Beauv.
- (e) Ewartia planchonii (Hook.f.) P. Beauv
- Gnaphalium argentifolium Wakef.
- Gnaphalium traversii Hook.f.
- (e) Helichrysum backhousii (Hook.f.) F.Muell. ex Benth. var. kingii W.M. Curtis
- (e) Helichrysum hookeri (Sonder) Druce
- Helichrysum scorpioides Labill.
- (i) Hypochoeris radicata L.
- Lagenifera stipitata (Labill.) Druce
- Leptorhynchos squamatus (Labill.) Less.
- Microseris lanceolata (Walp.) Schultz-Bip.
- Olearia algida Wakef.
- (e) Olearia ledifolia (DC.) Benth.
- (e) Olearia obcordata (Hook.f.) Benth.
- Olearia phlogopappa (Labill.) DC.
- (e) Olearia tasmanica (Hook.f.) W.M. Curtis
- (e) Pterygopappus lawrencii Hook.f.
- Senecio gunnii (Hook.f.) Belcher
- (i) Senecio jacobaea L.
- Senecio lautus Forst.f. ex Willd.
- Senecio pectinatus DC. var. pectinatus

BRASSICACEAE (CRUCIFERAE)
- Cardamine gunnii Hewson

CAMPANULACEAE
- (e) Wahlenbergia saxicola A.DC.

CARYOPHYLLACEAE
- Colobanthus affin. strictus Hook.f. Cheesem.
- Scleranthus biflorus (Forst. & Forst.f.) Hook.f.

CLUSIACEAE (GUTTIFERAE)
- Hypericum japonicum Thunb.

DROSERACEAE
- Drosera arcturi Hook.

## APPENDIX 3

EPACRIDACEAE
(e) Cyathodes dealbata R.Br.
(e) Cyathodes parvifolia R.Br.
(e) Cyathodes straminea R.Br.
(e) Epacris gunnii Hook.f.
Epacris serpyllifolia R.Br.
Lissanthe montana R.Br.
(e) Monotoca empetrifolia R.Br.
Pentachondra pumila (Forst. & Forst.f.) R.Br.
(e) Richea acerosa (Lindley) F. Muell.
(e) Richea gunnii Hook.f.
(e) Richea scoparia Hook.f.
(e) Richea sprengelioides (R.Br.) F.Muell.
Sprengelia incarnata Smith
var. montana R.Br.
(e) Trochocarpa thymifolia (R.Br.) Sprengel

ERICACEAE
Gaultheria depressa Hook.f.
(e) Pernettya tasmanica Hook.f.

EUPHORBIACEAE
Poranthera microphylla Brongn

FABACEAE (LEGUMINOSAE)
Oxylobium ellipticum (Labill.) R.Br
Pultenaea juniperina Labill.
Pultenaea subumbellata Hook.
(i) Trifolium sp.

GENTIANACEAE
Gentianella diemensis (Griseb.) J.H. Willis

GERANIACEAE
Geranium potentilloides L'Herit. ex DC.
Pelargonium australe Willd.

GOODENIACEAE
Scaevola hookeri (Vriese) F.Muell. ex Hook.f.
Velleia montana Hook.f.

HALORAGACEAE
Gonocarpus montanus (Hook.f.) Orch.
Gonocarpus serpyllifolius Hook.f.
Myriophyllum pedunculatum, Hook.f.
var. pedunculatum

LAMIACEAE (LABIATAE)
(e) Westringia rubiaefolia R.Br.

LOGANIACEAE
Mitrasacme serpyllifolia R.Br.

MYRTACEAE
Baeckea gunniana Schauer
Eucalyptus archeri Maiden & Blakely
(e) Eucalyptus coccifera Hook.f. (Introduced to Ski Village - see section 4)
Leptospermum lanigerum (Aiton) Smith
(e) Leptospermum rupestre Hook.f.

## APPENDIX 3

ONAGRACEAE
- Epilobium curtisiae Raven
- (e) Epilobium fugitivum Raven & Englehorn
- Epilobium sarmentaceum Hausskn.
- Epilobium tasmanicum Hausskn.
- Epilobium willisii Raven & Engelhorn

PITTOSPORACEAE
- Billardiera longiflora Labill
- Pittosporum bicolor Hook.

PLANTAGINACEAE
- Plantago daltonii Decne.
- (e) Plantago paradoxa Hook.f.
- Plantago tasmanica Hook.f.

POLYGONACEAE
- (i) Rumex acetosella L.

PORTULACACEAE
- Montia australasica (Hook.f.) Pax & Hoffm.

PROTEACEAE
- (e) Bellendena montana R.Br.
- Grevillea australis R.Br.
- Hakea lissosperma R.Br.
- (e) Orites acicularis R. Br.
- (e) Orites revoluta R. Br.
- (e) Persoonia gunnii Hook.f.

RANUNCULACEAE
- Ranunculus gunnianus Hook.
- (e) Ranunculus nanus Hook.
- (e) Ranunculus triplodontus Melville

RHAMNACEAE
- (e) Cryptandra alpina Hook.f.

ROSACEAE
- (e) Acaena montana Hook.f.
- Acaena novae-zelandiae Kirk
- Rubus gunnianus Hook.

RUBIACEAE
- Asperula gunnii. Hook.f.
- Coprosma pumila Hook.f.
- Coprosma nitida Hook.f.
- Galium australe DC.
- Galium ciliare Hook.f.

RUTACEAE
- Boronia citriodora Gunn ex Hook.f.
- (e) Phebalium montanum Hook.

SANTALACEAE
- (e) Exocarpos humifusus R.Br.

## APPENDIX 3

SCROPHULARIACEAE
- Chionohebe ciliolata (Hook.f.) B.Briggs & Ehrend.
- (e) Euphrasia collina R. Br.
  ssp. diemenica (Sprengel) W.R. Barker
- Gratiola nana Benth.
- (e) Ourisia integrifolia R. Br.
- Veronica calycina R.Br.

STACKHOUSIACEAE
- Stackhousia monogyna Labill.

STYLIDIACEAE
- Stylidium graminifolium Swartz

THYMELAEACEAE
- (e) Drapetes tasmanicus Hook.f.
- (e) Pimelea sericea R.Br.

TREMANDRACEAE
- (e) Tetratheca procumbens Gunn ex Hook.f.

VIOLACEAE
- Hymenanthera dentata R.Br. ex DC.
- Viola betonicifolia Smith
- Viola hederacea Labill.

WINTERACEAE
- Tasmannia lanceolata (Poiret) A.C. Smith

## APPENDIX 3

### MONOCOTYLEDONS

CENTROLEPIDACEAE

(e) Centrolepis muscoides (Hook.f.) Hieron.

CYPERACEAE

Carex archeri Boott
Carex breviculmis R.Br.
Carex gaudichaudiana Kunth
Carex sp. aff. diandra Shrank
Carpha alpina R.Br.
Isolepis crassiuscula Hook.f.
Isolepis subtilissima Boeck.
Oreobolus distichus F.Muell.
Oreobolus pumilio R.Br.
Schoenus calyptratus Kuk.
Uncinia compacta R.Br.
Uncinia nervosa Boott

JUNCACEAE

Juncus sandwithii Lourteig
Luzula acutifolia Nordensk.
Luzula australasica Steudel

LILIACEAE

Astelia alpina R.Br.

ORCHIDACEAE

Caladenia lyallii Hook.f.
Prasophyllum alpinum R.Br.
Prasophyllum suttonii R. Rogers & B. Rees

POACEAE (GRAMINEAE)

Agrostis parviflora R.Br.
Agrostis venusta Trin.
(i) Anthoxanthum odoratum L.
Danthonia diemenica Morris (in Press)
Danthonia nivicola Vick.
Danthonia nudiflora P. Morris
Danthonia pauciflora R.Br.
Deschampsia caespitosa (L.) P. Beauv.
Deyeuxia carinata Vick.
Deyeuxia monticola (Roemer & Schultes) Vick.
Hierochloe fraseri Hook.f. ex Rodway
Hierochloe redolens (Vahl) Roemer & Schultes
Poa costiniana Vick.
Poa fawcettiae Vick.
(e) Poa gunnii Vick.
Poa hiemata Vick.
Poa labillardieri Steudel
Trisetum spicatum (L.) Richter

RESTIONACEAE

Empodisma minus (Hook.f.) L. Johnson & Cutler
Restio australis R. Br.

### GYMNOSPERMS

PODOCARPACEAE

Podocarpus lawrencei Hook.f.

## APPENDIX 3

### PTERIDOPHYTES

ASPIDIACEAE
Polystichum proliferum (R.Br.) C. Presl

BLECHNACEAE
Blechnum penna-marina (Poir.) Kuhn

GLEICHENIACEAE
Gleichenia alpina R. Br.

HYMENOPHYLLACEAE
Hymenophyllum peltatum (Poir.) Desv.

ISOETACEAE
(e) Isoetes gunnii A. Braun

LYCOPODIACEAE
Lycopodium australianum Herter
Lycopodium fastigiatum R.Br.
Lycopodium scariosum Forst.f.

## Erratum: Appendix 4

Sites 1 - 77

Delete next line, headed (L - R) 1 0 1 10 etc.

Explanation: Each site is represented by one vertical column. The communities contain various numbers of sites. (See Appendix 2 ), e.g. community 1 is represented by columns 1-30 inclusive, community 2 by columns 31-44, and so on, but ommitting Communities 16-21 inclusive which were described from field notes.

## APPENDIX 4

## TABLE OF SPECIES BY SITE AND COVER DENSITY.

### EXPLANATION

1, up to 0.1%; 2, 0.1 - 1%; 3, 1 - 10%; 4, 10 - 30%; 5, 30 - 70%; 6, 70 - 100%.

| GENUS | SPECIES | % OF SITES | SITES 1 - 77 |
|---|---|---|---|
| | | | \| 0 \| 10 \| 20 \| 30 \| 40 \| 50 \| 60 \| 70 |
| Poa | gunnii | 79 | 4-341-133333331133343444343411-133413 3-131333311-11313443434345-3111-----1-3-3--- |
| Gentianella | diemensis | 75 | 1-2-111111111111111111111111111111--111-11111111131----11113111-11111111------11-1--1 |
| Richea | scoparia | 73 | 4-343113431333444314431333434143333 4-333333343313---13-1313---441--------44---3-- |
| Pentachondra | pumila | 71 | 4-3-111113333331111111343313111--33--31111111333341 1-11----433313-----11---13--- |
| Orites | acicularis | 70 | 4-3-141133411111-1113114-3414343413331313311333311 1-11---11--1411--------4-1-3-- |
| Baeckea | gunniana | 69 | 4534343434333 4-43133443 34-4315--33331333 3-1333-1-1-----1-1--41-----4-14 31-1-- |
| Epacris | serpyllifolia | 68 | ---1343331 13--34134314-1334343 1-3-3-1311--31331113-1-341-33111-------111-1----- |
| Empodisma | minus | 66 | -434313--33331333331311134-1--1-331-331333 3-3----1-33553 4-13-31-----1-4431---- |
| Orites | revoluta | 64 | -3111131111311111114-41131341 43---4-1--------333333------431414-----43111 1-3-- |
| Bellendena | montana | 57 | 4111-131-3--11-11-1111131--1-333131111 31-13113111 1-------31-4-------1-----1-- |
| Senecio | pectinatus | 57 | --1----113111111-1111311111-11-1311--1-111111-1----13-111-31-11-1---------1--- |
| Lycopodium | fastigiaum | 56 | ---1111--111111-1-1---11--1111---1-111-1111-1-1-1--1--1-3111-1-----11113-11-- |
| Carpha | alpina | 53 | ----1131-1111111131131-1-11111-1--3---113111-3------151114--1-1----------331--- |
| Euphrasia | spp. | 51 | --211----1--11-11-1111111-1111-111--1111111111------111--1--111--------1---1--- |
| Coprosma | nitida | 47 | -3----1111-11-1--1-1-1-11-11-13113111-13113-11----------1---11----31-----1--- |
| Oreobolus | distichus | 47 | --1-133111111111-1111311-1-------1--11111-1--1------11-111--1-1----------1-1--- |
| Danthonia | pauciflora | 45 | -------1-1111111111-1-15-111-1-13---13111311 3-------11--11--1-----------23--- |
| Astelia | alpina | 42 | 31--11---1311-1-1-11-131-----1--11--11313---1-------111--1--1-----------411---- |
| Richea | sprengelioides | 42 | --33---331-134-11-4-4-33-3--411-----1-------113333 1-------3-4-4-1----3-----3-- |
| Cyathodes | dealbata | 38 | --3-1---133111--1111113111--1--31--11---311-------31-------------------3--- |
| Coprosma | pumila | 35 | -------1111111-----1--11---1-------1-111111-1-------1-1-11-11-11----------1--- |
| Lissanthe | montana | 30 | --31----11--31----1-1-13----1-13-3-11--111-----1--------3----1-----3--------- |
| Celmisia | longifolia | 26 | ---11-----11---1-11----11-1-------111--11---1----1------31----------1---- |
| Leptospermum | rupestre | 26 | 1--1-4343----3------1--1--1--1-----------33433 3-------3--1-------5-------- |
| Richea | acerosa | 25 | -----1--------4--1---1-1--1--------3----------1334311145-------11------- |
| Poa | costiniana | 22 | ----1----------------------------1331111131 34-31----------------1----------3--1 |
| Epilobium | spp. | 21 | 1-1------1--1-1------1---1-1--1-1--1-------1---------111--1---------- |
| Grevillia | australis | 21 | -----11-------3--1---1----1-----------------3-313----11--31-33---------- |
| Westringia | rubiafolia | 21 | 4----1--------4-----------------------1331------331-41-----31-11----- |
| Oreomyrrhis | ciliata & sessiliflora | 18 | ----------1----1----1--------1---11-1-1---------1-1-----11----------1--1 |
| Ewartia | catipes | 17 | --------3---1------1----1-1-------1---------11---1----------11----------3--1 |
| Monotoca | empetrifolia | 16 | -----1-1----------1-1---------133131------13---------- |
| Oreobolus | pumilio | 16 | -1---11--------1-1--------1--1---------1-1----------1----------11---- |
| Craspedia | alpina | 16 | 11-------11------1-1-11----------1----------11---1---------- |
| Exoparpos | humifusus | 14 | ----------1---------11-----1--------111131------3---------- |
| Lagenophora | stipitata | 14 | ----1-----1------1-1---1----------1--11----------1----------1-----1--- |
| Abrotanella | forsteroides | 13 | ----------3----------1---1---------4313333----------1----- |
| Deyeuxia | monticola | 13 | ----------1----------1--11-------13---11----1---------1 |
| Dathonia | diemenica | 13 | ---1---1----1----1----1----------1----------1-------1---11------1------- |

| GENUS | SPECIES | % OF SITES | SITES 1 - 77 |
|---|---|---|---|
| Helichrysum | backhousii var kingii | 13 | |
| Acaena | novae-zelandiae | 12 | |
| Olearia | ledifolia | 12 | |
| Pterygopappus | lawrencii | 12 | |
| Uncinia | compacta | 10 | |
| Acaena | montana | 9.1 | |
| Brachycome | spp. | 9.1 | |
| Carex | gaudichaudiana | 9.1 | |
| Epacris | gunnii | 9.1 | |
| Olearia | obcordata | 9.1 | |
| Gnaphalium | traversii | 9.1 | |
| Plantago | tasmanaica | 7.8 | |
| Senecio | gunnii | 7.8 | |
| Drapetes | tasmanica | 7.8 | |
| Agrostis | parviflora | 7.8 | |
| Geranium | potentilloides | 6.5 | |
| Richea | gunnii | 6.5 | |
| Lichens | | 6.5 | |
| Tasmannia | lanceolata | 5.2 | |
| Hierochloe | fraseri | 5.2 | |
| Luzula | spp. | 5.2 | |
| Myriophyllum | pedunculatum | 5.2 | |
| Ourisia | integrifolia | 5.2 | |
| Schoenus | calyptratus | 5.2 | |
| Stylidium | graminifolium | 5.2 | |
| Deyeuxia | carinata | 5.2 | |
| Drosera | arcturi | 3.9 | |
| Hierochloe | redolens | 3.9 | |
| Olearia | algida | 3.9 | |
| Phebalium | montanum | 3.9 | |
| Plantago | daltonii | 3.9 | |
| Pultenaea | subumbellata | 3.9 | |
| Restio | australis | 3.9 | |
| Velleia | montana | 3.9 | |
| Cotula | filicula | 3.9 | |
| Blechnum | penna-marina | 2.6 | |
| Cyathodes | parvifolia | 2.6 | |
| Cryptandra | alpina | 2.6 | |
| Deschampsia | caespitosa | 2.6 | |
| Galium | australe | 2.6 | |
| Montia | australasica | 2.6 | |
| Pimelea | sericea | 2.6 | |
| Viola | hederacea | 2.6 | |
| Pultenaeea | juniperina | 2.6 | |
| Danthonia | nivicola | 2.6 | |
| Agrostis | aemula | 2.6 | |
| Pelagonium | australe | 2.6 | |

| GENUS | SPECIES | % OF SITES | SITES 1 - 77 |
|---|---|---|---|
| | | | 0 10 20 30 40 50 60 70 |
| Iselepis | crassiuscula | 2.6 | 1 |
| Eucalyptus | archeri | 2.6 | 1 |
| Galium | ciliare | 2.6 | 4 4 |
| Agrostis | spp. | 1.3 | 1 1 |
| Cardamine | gunnii | 1.3 | 1 |
| Gleichenia | alpina | 1.3 | 1 |
| Helichrysum | scorpioides | 1.3 | 4 |
| Olearia | phlogopappa | 1.3 | 1 |
| Oreomyrrhis | sessiliflora | 1.3 | 1 |
| Oxylobium | ellipticum | 1.3 | 1 |
| Scleranthus | biflorus | 1.3 | 3 |
| Senecio | leptcarpus | 1.3 | 1 |
| Sprengelia | incarnata | 1.3 | 1 |
| Trisetum | Spicatum | 1.3 | 1 |
| Trochocarpa | thymifolia | 1.3 | 1 |
| Viola | betonicifolia | 1.3 | 1 |
| Wahlenbergia | saxicola | 1.3 | 1 1 |
| Sphagnum | cristatum | 1.3 | 4 |
| Hakea | lissosperma | 1.3 | 1 |
| Poa | hiemata | 1.3 | 1 |
| Prasophyllum | alpinum | 1.3 | 1 |
| Cotula | alpina | 1.3 | 1 |
| Epilobium | curtisiae | 1.3 | 1 |
| Epilobium | sarmentaceum | 1.3 | 1 |
| Ranunculus | gunnianus | 1.3 | 1 |
| Luzula | acutifolia | 1.3 | 1 1 |
| Poa | labillardieri | 1.3 | 1 |
| Carex | sp. | 1.3 | 1 |
| Ranunculus | nanus | 1.3 | 1 |
| Mitrasacme | serpyllifolia | 1.3 | 1 |
| Isoetes | gunnii | 1.3 | 3 |
| Chionohebe | ciliolata | 1.3 | 1 |

## APPENDIX 5

### LIST OF SITES, GRID REFERENCES AND ALTITUDES

Note: The grid references are given in accordance with the Australian Grid Reference System.

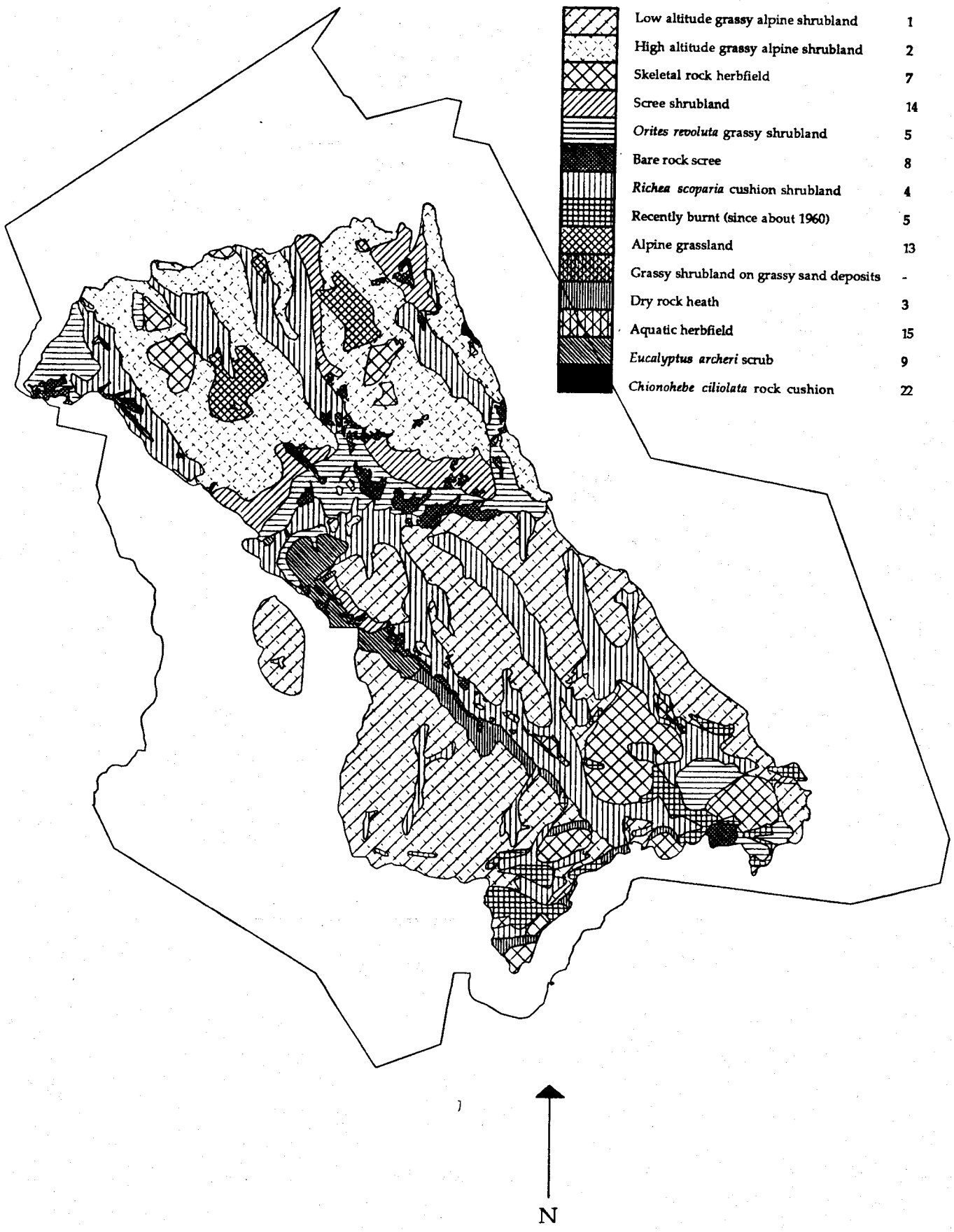
| SITE NO. | EASTING | NORTHING | ELEVATION |
|---|---|---|---|
| 1 | 54900. | 40150. | 1250. |
| 2 | 55000. | 40200. | 1310. |
| 3 | 55000. | 40100. | 1230. |
| 4 | 55100. | 40250. | 1440. |
| 5 | 55100. | 40150. | 1450. |
| 6 | 55100. | 40050. | 1330. |
| 7 | 55200. | 40050. | 1440. |
| 8 | 55200. | 40150. | 1440. |
| 9 | 55200. | 40250. | 1475. |
| 10 | 55200. | 40350. | 1480. |
| 11 | 55300. | 40350. | 1420. |
| 12 | 55300. | 40250. | 1440. |
| 13 | 55300. | 40150. | 1450. |
| 14 | 55300. | 40050. | 1440. |
| 15 | 55400. | 40050. | 1370. |
| 16 | 55400. | 40150. | 1460. |
| 17 | 55400. | 40250. | 1505. |
| 18 | 55400. | 40350. | 1490. |
| 19 | 55500. | 40350. | 1380. |
| 20 | 55500. | 40250. | 1440. |
| 21 | 55500. | 40150. | 1510. |
| 22 | 55500. | 40050. | 1510. |
| 23 | 55600. | 40050. | 1520. |
| 24 | 55600 | 40150. | 1435. |
| 25 | 55600. | 40250. | 1475. |
| 26 | 55700. | 40050. | 1450. |
| 27 | 55300.. | 39950. | 1440. |
| 28 | 55300. | 39850. | 1215. |
| 29 | 55300. | 39750. | 1310. |
| 30 | 55300. | 39650. | 1340. |
| 31 | 55400. | 39850. | 1260. |
| 32 | 55400. | 39950. | 1265. |
| 33 | 55500. | 39950. | 1295. |
| 34 | 55500. | 39850. | 1290. |
| 35 | 55500. | 39750. | 1350. |
| 36 | 55500. | 39650. | 1350. |
| 37 | 55500. | 39550. | 1395. |
| 38 | 55500. | 39450. | 1395. |
| 39 | 55500. | 39350. | 1405. |
| 40 | 55600. | 39350. | 1405. |
| 41 | 55600. | 39450. | 1394. |
| 42 | 55600. | 39550. | 1380. |
| 43 | 55600. | 39650. | 1295. |
| 44 | 55600. | 39750. | 1350. |
| 45 | 55600. | 39850. | 1328. |
| 46 | 55600. | 39950. | 1355. |
| 47 | 55700. | 39950. | 1390. |
| 48 | 55700. | 39850. | 1370. |
| 49 | 55700. | 39750. | 1342. |
| 50 | 55700. | 39650. | 1345. |
| 51 | 55700. | 39550. | 1300. |
| 52 | 55700. | 39450. | 1390. |
| 53 | 55700. | 39350. | 1368. |

APPENDIX 5 (CONT)

| SITE NO. | EASTING | NORTHING | ELEVATION |
|---|---|---|---|
| 54 | 55700. | 39250. | 1374. |
| 55 | 55700. | 39150. | 1470. |
| 56 | 55800. | 39250. | 1310. |
| 57 | 55800. | 39350. | 1350. |
| 58 | 55800. | 39450. | 1305. |
| 59 | 55800. | 39550. | 1305. |
| 60 | 55800. | 39650. | 1345. |
| 61 | 55800. | 39750. | 1390. |
| 62 | 55800. | 39850. | 1365. |
| 63 | 55900. | 39750. | 1405. |
| 64 | 55900. | 39650. | 1345. |
| 65 | 55900. | 39550. | 1375. |
| 66 | 55900. | 39450. | 1375. |
| 67 | 55900. | 39350. | 1312. |
| 68 | 56000. | 39350. | 1310. |
| 69 | 56000. | 39450. | 1340. |
| 70 | 56000. | 39550. | 1345. |
| 71 | 56000. | 39650. | 1370. |
| 72 | 56100. | 39550. | 1355. |
| 73 | 56100. | 39450. | 1365. |
| 74 | 56100. | 39350. | 1280. |
| 75 | 56200 | 39350. | 1330. |
| 76 | 56200. | 39450. | 1315. |
| 77 | 55620. | 40230. | 1520. |

# APPENDIX 6

## VEGETATION MAP OF THE BEN LOMOND PLATEAU



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