

THE ALPINE VEGETATION OF VICTORIA, EXCLUDING THE BOGONG HIGH PLAINS REGION

by

N. G. WALSH, R. H. BARLEY AND P. K. GULLAN*

ABSTRACT

Walsh, N.G., Barley, R.H. & Gullan, P.K. The alpine vegetation of Victoria, excluding the Bogong High Plains region. *Muelleria* 6(4):265-292(1986).—All alpine and subalpine areas of naturally treeless vegetation in Victoria, with the exception of the Bogong High Plains, were surveyed during the summer months between November 1980 and February 1982. Floristic information from 498 quadrats was analysed via a computer-based, numerical sorting and classification procedure to determine the major floristic vegetation types of the area. These were then arranged hierarchically into 10 floristic *communities*, each of which contained one or more distinct floristic *sub-communities*. Each of the 29 sub-communities is described and its distribution given in this paper.

Heathlands were the commonest structural category (almost two-thirds of all quadrats sampled) but these occupied a wide range of environments from deep, water-retentive bogs to dry, exposed, rocky outcrops. Grasslands occupied most of the remaining sites.

INTRODUCTION

This paper presents the results of a systematic botanical survey of alpine vegetation in Victoria, with the exception of the Bogong High Plains region (which was the subject of a similar study by McDougall (1982)). The results of the survey have been interpreted to identify the major vegetation types and to indicate their broad-scale distribution within the study area.

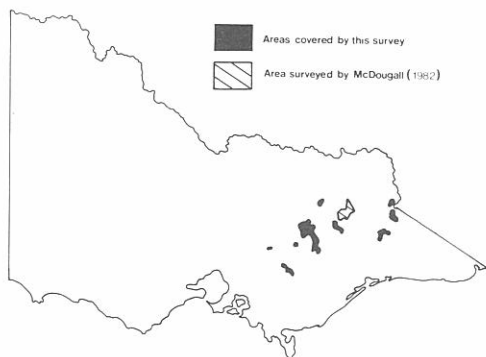


Fig. 1 Distribution of alpine or subalpine treeless areas in Victoria.

THE STUDY AREA

The study area is defined as all treeless alpine and subalpine country within the Victorian alps, excluding the Bogong High Plains (Fig. 1). The major mountain systems include, from west to east, Lake Mountain, the Baw Baw Plateau, Mts Skene and Bulier, the Bluff, Mts Howitt and Cobbler, the Snowy Range, Mts Wellington and Buffalo, the Dargo High Plains, the Nunniong Plateau, the Cobberas and Davies Plain (Fig. 2). Approximately 70 km² of naturally treeless, alpine or subalpine vegetation, i.e. approximately one third of the total area covered by this kind of vegetation in Victoria, occurs fragmentedly within the study area. Most of the remainder of this type of vegetation is distributed almost continuously across the Bogong High Plains.

* National Herbarium of Victoria, Birdwood Avenue, South Yarra, Victoria, Australia 3141.

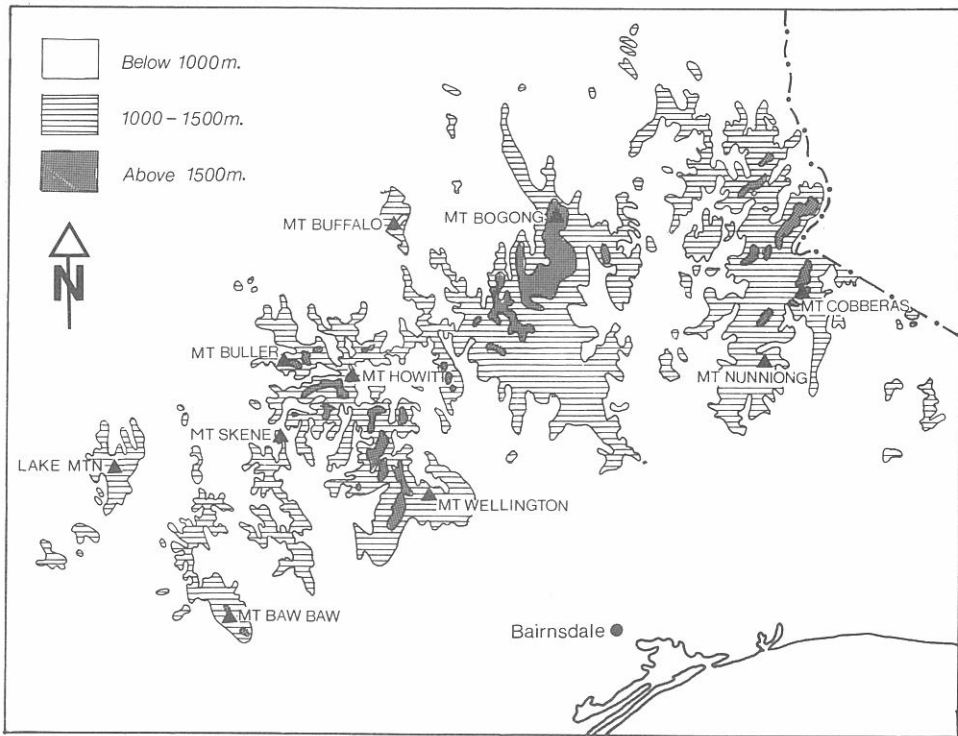


Fig. 2. Major mountain ranges above 1000 m in the study area.

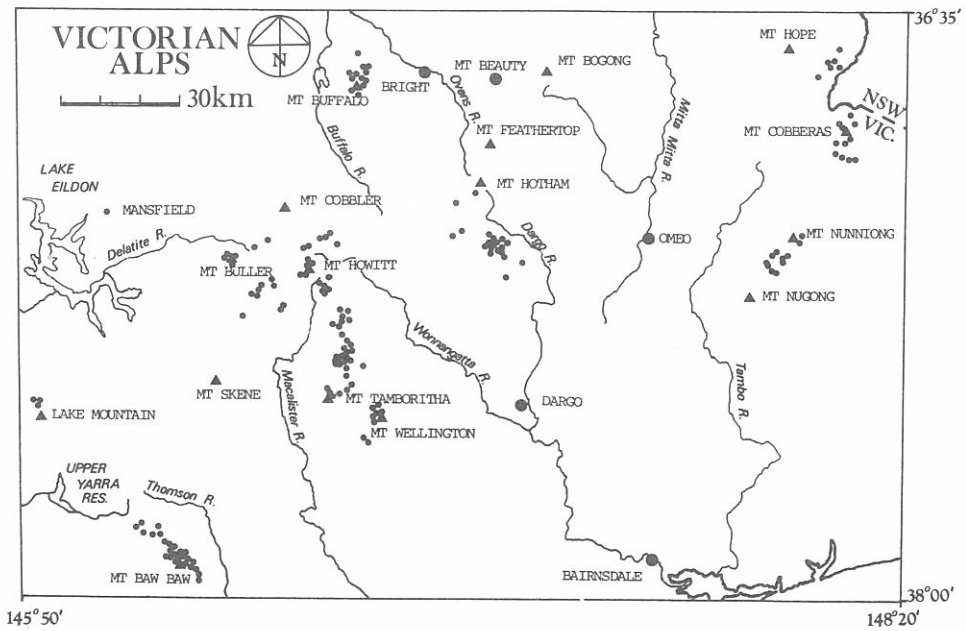


Fig. 3. Distribution of the 498 sample sites in the study area.

THE SURVEY

Method

DATA COLLECTION

In each square kilometre of treeless vegetation at least three quadrats, each 4 x 5 m, were chosen to represent different vegetation types. Sampling intensity was increased in areas of apparent high diversity to ensure that all vegetation types were represented. A total of 498 sites were sampled (Fig. 3), an average of about 7 sites to each square kilometre. This high sampling intensity reflects the high degree of local variation of the vegetation and fragmented dispersal of (often small) areas of treeless vegetation in the study area. Each site was sampled in a uniform stand of vegetation. In very restricted occurrences of a vegetation type, quadrats may have been smaller than 4 x 5 m.

Every vascular plant species within a quadrat was identified and assigned a cover/abundance value (Gullan 1978) corresponding to a visual estimate of its performance in that quadrat. Dominant cryptogams (mosses and lichens) were similarly treated. Height and extent of cover of shrub and ground layers at each site were noted, as were slope, aspect, altitude and percentage cover of cattle faeces and exposed rock or earth.

PLANT IDENTIFICATION

All plants which could not be identified in the field were collected, labelled and taken to the National Herbarium of Victoria (MEL) for closer examination and comparison with the Herbarium's reference collection. This procedure allowed for the identification to species level of all but a few plants collected. Where suitable material was available, specimens of particularly difficult groups were submitted to recognised experts for identification. Nomenclature follows that of Forbes *et al.* (1984).

Availability of only sterile material for the following species reduced their determination to generic level:

Agrostis hiemalis, *A. parviflora*, *A. venusta*—recorded as *Agrostis* sp.

Chiloglottis cornuta, *C. gunnii*—recorded as *Chiloglottis* sp.

Danthonia eriantha, *D. setacea*—recorded as *Danthonia* sp.

Deyeuxia carinata, *D. crassiusculus*—recorded as *Deyeuxia* sp.

Isolepis aucklandicus, *I. montivagus*—recorded as *Isolepis* sp.

No attempt was made to discern between the four alpine species of *Sphagnum* (*S. australe*, *S. cristatum*, *S. falcatum*, *S. subsecundum*) and these have all been recorded as *Sphagnum* spp.. Costin *et al.* (1979) segregated alpine or subalpine forms of *Erigeron pappochroma* into three distinguishable taxa, A, B and C, and this arrangement has been adopted in the present study. *Craspedia glauca* is treated by the same authors as including six taxa, A-F. Five forms of this plant were recorded in the present study and listed as *Craspedia* C-G. These do not necessarily correspond to like-named taxa of Costin *et al.*, but C and D are in both cases similar, if not synonymous.

DATA STORAGE AND ANALYSIS

Information from each quadrat site (floristics, locality, altitude and sampling date) was stored on magnetic disc. Analyses utilized a computer-based, numerical classification procedure followed by a hand-sorting procedure, as outlined in Gullan (1978). The result of the analyses is a set of two-way tables, which present all of the data in a sorted form. However, because many species occur in relatively few of the quadrats and add little to the overall vegetation description, the two-way tables presented in this report do not contain all the species recorded in each quadrat. For a full explanation of the tables see Gullan *et al.* (1981).

Generally a trend of increasing wetness of the vegetation from left to right (quadrats) and top to bottom (species) is depicted in the tables.

Terminology

The several terms given below have precise definitions in the context of this work (following Gullan *et al.* 1981). Other terms (such as alliance, formation, association) commonly used in vegetation description have been variously misapplied and are not universally understood. Their use has been avoided in this paper.

SUB-COMMUNITY

A sub-community is a group of quadrats which have a similar floristic composition. This term is synonymous with the "nodum" of Poore (1955) and is the basic unit of vegetation used in this study.

COMMUNITY

A community is a collection of sub-communities (or sometimes a single sub-community) which have floristic and environmental affinities. The community may represent either a floristic continuum along which arbitrary divisions have been made to form sub-communities, or a collection of sub-communities which are considered to be different temporal phases of the same vegetation type, or a single vegetation type having undergone different disturbance regimes (e.g. fire, grazing, clearing).

CHARACTER SPECIES

A character species is one which occurs frequently and consistently in the quadrats of a sub-community. The resolution of character species is based upon a formula which sets the lower limit for species occurrence in quadrats of a sub-community at 35%-55%, the exact value depending on the number of quadrats representing that sub-community (see Gullan *et al.* 1981).

COMMUNITY NAMES

These are descriptive names applied to the communities and utilize common rather than scientific terminology in an attempt to convey an impression of the structure and environment of the community. These names do not follow set rules such as those outlined by Specht (1970) or Braun-Blanquet (1928) because they are not intended to form the basis for a formal nomenclature.

Limitations and Qualifications

FLORISTICS

Although all quadrats were sampled during summer, the main growing season for most alpine plants, certain seasonally-apparent species (particularly orchids) and ephemerals may have been unrecorded because they were absent or insufficiently represented at the time of sampling.

DISTRIBUTION OF SUB-COMMUNITIES

The distribution maps provided with the sub-community descriptions show sites where a sub-community has been positively recorded. They are intended only to show sub-community distribution in a broad sense within the study area and cannot be interpreted as maps indicating the entire ranges of the sub-communities.

WEEDS

Information on alien species (mean % occurrence, mean % cover) has been provided for each sub-community in order to give some indication of weed invasion into native plant communities. Certain areas, such as roadsides and muster yards, contain a very much higher weed composition than indicated for any sub-community but were generally not sampled in this study. For this and other reasons the weed information provided does not indicate the abundance or distribution of weeds within the entire study area.

RESULTS

The results of the survey and its analyses are presented in three ways in order to provide easy access to any piece of information relevant to the aims of this paper.

Two-way Tables

The two-way tables (Tables 1-3) provide a succinct description of the floristic composition of the vegetation and are the most important source of information about floristic variation within and between different kinds of vegetation. They contain almost all of the raw data. All character species of the sub-communities are listed and only those species which occur in fewer than about 5% of the quadrats are absent.

Community Descriptions

Ten communities have been described for the study area. It is possible that a greater number of communities would have existed at the time of European settlement and certain that, of those communities described, at least some have undergone modification as a result of land management practices.

A brief description of each of the communities is given below.

ALP COMMUNITY 1: *Podocarpus* Heathland (1 sub-community; 11 sites. Alt. 1400-1740 m, av. 1606 m).

A floristically and ecologically well-defined closed-heathland forming thickets on rocky, usually igneous substrates occupying exposed ledges or steep gullies at high altitudes. Although widespread throughout the study area (with the exception of the Baw Baw and Nunniong Plateaux), individual stands of this community are confined to small and often isolated sites, usually covering 100 m² or less. Species composition is particularly constant, with a low floristic diversity and invariable dominance of the coniferous shrub *Podocarpus lawrencei*.

ALP COMMUNITY 2: Low Alpine Shrubland (2 sub-communities; 12 sites. Alt. 1460-1760 m, av. 1617 m).

A low-shrubland of medium to steeply graded slopes, comprising several species which are commonly associated with Snow Gum Woodlands at lower altitudes. Soils are typically shallow with igneous or sedimentary outcrops common. Herbaceous species are not common and grasses usually dominate the fairly sparse ground layer.

ALP COMMUNITY 3: Sparse, Rocky Alpine Heathland (4 sub-communities; 31 sites. Alt. 1400-1805 m, av. 1580 m).

A diverse community occupying rocky sites varying from exposed crags and summits to small, gentle rises within relatively flat snowplains. The constituent sub-communities are variously dominated by any of a number of low, spreading shrubs (e.g. *Phebalium squamulosum*, *Oxylobium alpestre*, *Grevillea australis*, or *Hovea longifolia*). The ground layer is usually sparse with a variety of herbs and grasses, various combinations of which represent local variants of the community.

ALP COMMUNITY 4: *Kunzea ericifolia* Heathland (3 sub-communities; 20 sites. Alt. 1380-1740 m, av. 1541 m).

The dominance of the procumbent, layering shrub *Kunzea ericifolia* makes this an easily recognizable community with local variants occurring on most ranges, with the exceptions of the eastern and western extremities of the study area. The community is invariably associated with shallow soils overlaying an extensive rocky substrate. Floristic richness is generally low, a trait common to vegetation dominated by a single species.

ALP COMMUNITY 5: Baw Baw Alpine Heathland (2 sub-communities; 18 sites. Alt. 1320-1535 m, av. 1410 m).

This community is restricted to the Baw Baw plateau where it usually occupies dry to damp sites of northerly aspect. Shrub cover is frequently dense, up to 1.5 m tall, dominated by *Helichrysum secundiflorum*, *Olearia phlogopappa*, *O. algida* and a low, dense, highland form of *Pultenaea muelleri*. The ground layer incorporates a wide variety of herbs. This community merges to Snow Gum Woodland at lower altitudes where many of the same species are common components of the shrub stratum.

ALP COMMUNITY 6: Alpine Heathland (4 sub-communities; 123 sites. Alt. 1160-1760 m, av. 1507 m).

This is the most abundant and widespread alpine community, occupying a wide variety of habitats throughout the study area. It is characterised by a low, discontinuous shrub cover of *Hovea longifolia* (and occasionally *Grevillea australis*) and a dense tussock-grass cover of *Poa fawcettiae* (or *P. phillipsiana* in basaltic areas). Other graminoid or herbaceous species are locally common and indicative of various edaphic or climatic conditions, but a number of small herbs are ubiquitous (e.g. *Microseris scapigera*, *Asperula gunni*, *Carex breviculmis*, *Leptorhynchos squamatus* and the introduced *Rumex acetosella*).

ALP COMMUNITY 7: Alpine Grassland (3 sub-communities; 64 sites. Alt. 1200-1680 m, av. 1481 m).

This community is closely allied, floristically and geographically, to community 6. It may be distinguished by a higher cover of grasses or the branching rope-rush *Empodisma minus* and a corresponding paucity of shrub species. The community frequently forms extensive, unbroken tracts on flat snow-plains. Soils are typically deep and water-retentive but are seldom waterlogged. This community contains representatives of the weediest vegetation encountered in the study area and includes the most heavily grazed areas sampled.

ALP COMMUNITY 8: Baw Baw Damp Alpine Heath (1 sub-community; 8 sites. Alt. 1305-1480 m, av. 1379 m).

This community occupies a position transitional between sodden, Wet Alpine Heathland (community 9) and Baw Baw Dry Alpine Heathland (community 5) on the Baw Baw Plateau. Soils are deep, damp and peaty. Granite boulders are common. The vegetation includes a fairly even mixture of shrub species (*Grevillea australis*, *Asterolasia trymalioides*, *Epacris petrophila*, *Orites lancifolia*, *Helichrysum hookeri*) and rarely exceeds a height of one metre. Although geographically and ecologically a transitional vegetation type, the above shrub species and several herbs are more abundant than in either of the adjacent communities.

ALP COMMUNITY 9: Wet Alpine Heathland (6 sub-communities; 112 sites. Alt. 980-1760 m, av. 1450m).

A low, open- to closed-heathland scattered throughout the study area on wetter sites. This community includes alpine bog vegetation dominated by *Sphagnum* spp., i.e. mosses with a high water-retentive capacity. These mosses contribute to an environment which is, in Australia, confined almost entirely to the alps and subalps. Vegetation which is not dominated by *Sphagnum* spp. usually supports a higher diversity and abundance of shrubs and has *Empodisma minus* as the main ground cover. This is the commonest wetland species throughout the study area but, on the Bogong High Plains, it is apparently confined to waterlogged depressions (McDougall, 1982). The epacrids *Richea continentis* and *Epacris paludosa* are ubiquitous in sites supporting community 9.

ALP COMMUNITY 10: Damp Alpine Heathland (3 sub-communities; 49 sites. Alt. 1120-1740 m, av. 1404 m).

This community is invariably associated with sphagnum

bogs, broad drainage platforms and deep, humus-rich soils at stream margins. It occurs on the Snowy Range, Dargo High Plains and mountains to the far east of the study area. Shrub cover is generally sparse whereas the ground layer is usually dense and varied, consisting mainly of low, matting herbs. *Sphagnum* clumps are occasional but rarely continuous (cf. community 9). Both the *Sphagnum* and the tender herb layer are commonly dissected by cattle or brumbies which are prevalent in some areas. A relatively high proportion of weeds (averaging 8% of species total) is consistent with utilisation of these areas for grazing.

Sub-community Summary Sheets

The following three sets of information have been amalgamated to produce a summary sheet for each of the 29 sub-communities. These constitute the primary means of describing vegetation in this paper.

SUB-COMMUNITY DISTRIBUTION MAPS: The distribution of each sub-community throughout the study area is shown by means of a schematic map on which is marked the locations of all of its constituent quadrat sites.

CHARACTER SPECIES TABLES: These tables summarise information from the two-way tables and present it in a different format. The tables contain the character species of each sub-community listed in order of their frequency of occurrence, and the frequency (% FREQ) and mean cover/abundance (C/A) of each species. Species are arranged to show their relative importance within an individual sub-community, in contrast to the two-way tables in which they are arranged to demonstrate the inter-relationships between sub-communities.

SUB-COMMUNITY DESCRIPTIONS AND ANNOTATIONS: A simple description has been prepared for each sub-community which includes briefly summarised information on its distribution, environment, altitude, aspect, incline, structure, floristic richness and weed composition.

ACKNOWLEDGEMENTS

The authors wish to express their gratitude to the following people and organisations who assisted in various aspects of this work—to Peter Durkin, Stephen Forbes, Knud Hansen, Sally Lloyd, Charles Meredith, John Renowden, Harm van Rees, Ron Walsh and Jan White for assistance with fieldwork and processing of raw data; to the (then) Forests Commission of Victoria for provision of accommodation during several stages of the fieldwork; to various officers of the National Parks Service for helpful advice and transport when working within Mt Baw Baw and Mt Buffalo National Parks; to Bob Chinnock (AD), Elizabeth Edgar (CHR), Max Gray (CANB), Tony Orchard (HO), Joy Thompson (NSW) and Karen Wilson (NSW) for identification or confirmation of specimens unable to be matched at the National Herbarium of Victoria (MEL).

REFERENCES

- Braun-Blanquet, J. (1928). 'Pflanzensoziologie' (Springer: Berlin).
 Carr, S.G.M. & Turner, J.S. (1959) The ecology of the Bogong High Plains, 1 & 2. *Aust. J. Bot.* 7: 12-63.
 Costin, A.B., Gray, M., Totterdell, C.J. & Wimbush, D.J (1979). 'Kosciusko Alpine Flora.' (CSIRO/ Collins: Sydney).
 Forbes, S.J., Gullan, P.K. Kilgour, R.A. & Powell, M.A. (1984). 'A Census of the Vascular Plants of Victoria.' (National Herbarium of Victoria: Melbourne).
 Forbes, S.J., Walsh, N.G. & Gullan, P.K. (1982). Vegetation of East Gippsland. *Muelleria* 5: 53-113.
 Gullan, P.K. (1978). Vegetation of the Royal Botanical Gardens Annexe at Cranbourne, Victoria. *Proc. Roy. Soc. Vict.* 90: 225-240.

- Gullan, P.K. & Norris, K.C. (1981). An investigation of environmentally significant features (botanical and zoological) of Mt Hotham, Victoria. *Ministry for Conservation, Victoria. Environmental Studies Series* No. 315.
- Gullan, P.K., Walsh, N.G. & Forbes, S.J. (1981). Vegetation of the Gippsland Lakes catchment. *Muelleria* 4: 333-383.
- McDougall, K. (1982). The alpine vegetation of the Bogong High Plains. *Soil Conservation Authority, Victoria. Environmental Studies Publication* No. 357.
- Poore, M.E.D. (1955). The use of phytosociological methods in ecological investigations. Practical issues involved in an attempt to apply the Braun-Blanquet system. *J. Ecol.* 43: 245-269.
- Specht, R.L. (1970). Vegetation. *In* Leeper, G.W. (ed.), 'The Australian Environment.' (Dominion Press: North Blackburn, Victoria). pp. 44-67.

Manuscript received 19 June 1985.

LOW ALPINE SHRUBLAND : SUB-COMMUNITY ALP 2.2

CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A
<i>Carex breviculmis</i>	83	1	<i>Prostanthera cuneata</i>	67	2	<i>Poa fawcettiae</i>	67	1
<i>Oxylobium alpestre</i>	67	2	<i>Gonocarpus montanus</i>	67	+			

NO. OF SITES: 6 STRUCTURE: Low shrubland

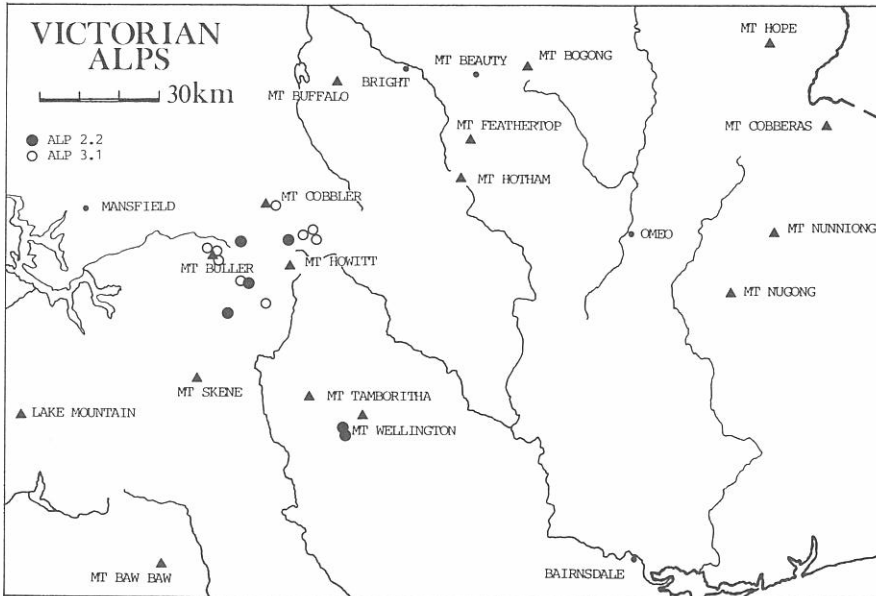
DISTRIBUTION: The Bluff, Mt. McDonald, The Viking, The Razor, Mt. Speculation and Mt. Stirling.

ENVIRONMENT: Shallow, rocky soil of exposed ridges and slopes, usually of southern aspect and moderate slope.

ALTITUDE: Mean = 1595m, Highest = 1720m, Lowest = 1530m

MEAN FLORISTIC RICHNESS: 15 species per site MEAN WEED COMPOSITION: 1% of species, 1% of cover

NOTES: A shrubland sub-community containing two variations. The first, dominated by *Prostanthera cuneata*, *Oxylobium alpestre* and *Pimelea axiflora*, occurs in damper or more sheltered sites than those of the second variant, dominated by *Acacia alpina*, *Grevillea australis*, *Baeckea ramosissima* and *Phebalium squamulosum*. This sub-community is not common in the Study Area, and more closely resembles the understorey of Snow Gum Woodlands (Gullan et al. 1981 Forbes et al. 1982). Most of these sites are close to woodland, and the lack of tree species may be attributed to the effects of cold-air drainage, unstable rocky substrates, or other local factors.



SPARSE ROCKY ALPINE HEATHLAND : SUB-COMMUNITY ALP 3.1

CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A
<i>Poa fawcettiae</i>	100	2	<i>Hypochoeris radicata</i>	62	1	<i>Danthonia alpicola</i>	54	+
<i>Helipterum albicans</i>	77	1	<i>Luzula novae-cambriae</i>	62	1	<i>Oxylobium alpestre</i>	54	1
<i>Bulbine bulbosa</i>	69	1	<i>Carex breviculmis</i>	62	1			
<i>Microseris scapigera</i>	62	1	<i>Stellaria pungens</i>	62	1			

NO. OF SITES: 13 STRUCTURE: Low open-heathland

DISTRIBUTION: Rocky peaks of the Howqua, Jamieson, Delatite and Macalister River catchments.

ENVIRONMENT: Rocky gullies, shale and scree slopes, and on isolated rock outcrops.

ALTITUDE: Mean = 1571m, Highest = 1805m, Lowest = 1400m

MEAN FLORISTIC RICHNESS: 17 species per site MEAN WEED COMPOSITION: 6% of species, 6% of cover

NOTES: This sparse, ledge-herbfield vegetation is structurally distinct from any other in the Study Area. It bears floristic affinities nearest to the dry shrubland of community 2, but the several shrub species characteristic of that community are lacking, whilst several specialist crag and ledge species occur commonly in ALP 3.1, (e.g. *Luzula novae-cambriae*, *Helipterum albicans*, *Bulbine bulbosa* and *Danthonia alpicola*).

SPARSE ROCKY ALPINE HEATHLAND : SUB-COMMUNITY ALP 3.2

CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A
<i>Carex breviculmis</i>	100	1	<i>Helipterum albicans</i>	80	1	<i>Brachycome rigidula</i>	60	1
<i>Grevillea australis</i>	100	1	* <i>Hypochoeris radicata</i>	80	+	<i>Leptorhynchus squamatus</i>	60	1
<i>Poa hothamensis</i>	100	1	<i>Leucopogon suaveolens</i>	80	1	<i>Microseris scapigera</i>	60	1
<i>Celmisia asteliifolia</i>	80	1	<i>Luzula novae-cambriae</i>	80	1	<i>Oxylobium alpestre</i>	60	1
<i>Stellaria pungens</i>	80	1	<i>Aciphylla glacialis</i>	60	+	<i>Scleranthus biflorus</i>	60	+
<i>Crassula sieberiana</i>	80	1	<i>Asperula gunnii</i>	60	1	<i>Trisetum spicatum</i>	60	1

NO. OF SITES: 5 STRUCTURE: Low open-heathland

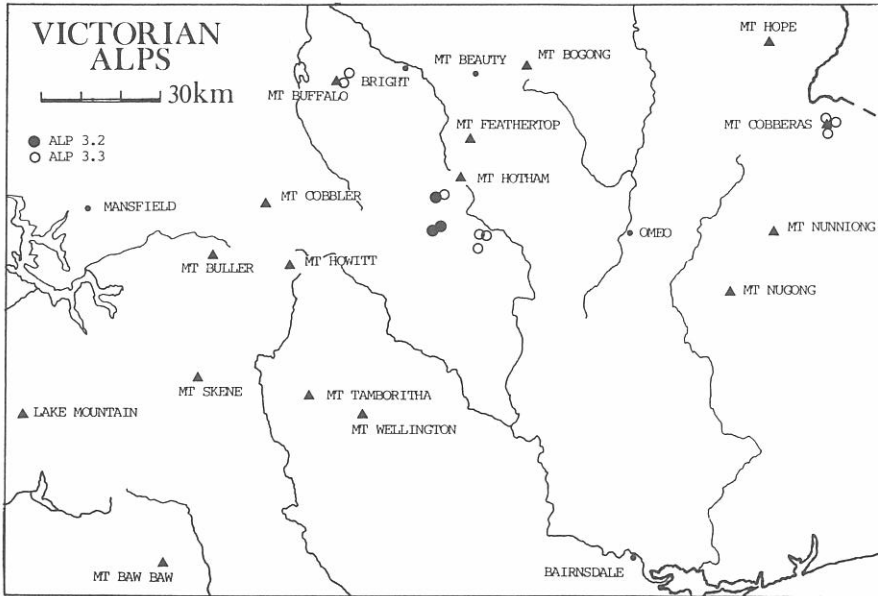
DISTRIBUTION: Restricted to the vicinity of The Twins and Mt. Blue Rag.

ENVIRONMENT: Shaley, often steep slopes with very little soil development.

ALTITUDE: Mean = 1628m, Highest = 1680m, Lowest = 1580m

MEAN FLORISTIC RICHNESS: 22 species per site MEAN WEED COMPOSITION: 4% of species, 3% of cover

NOTES: Many of the character species of ALP 3.2 are lithophilic herbs (e.g. *Brachycome rigidula*, *Crassula sieberiana*, *Helipterum albicans* and *Luzula novae-cambriae*) which occur predominantly on shale or in rock crevices. Shrubs such as *Grevillea australis* and *Leucopogon suaveolens* are occasional on intervening ledges along with *Poa hothamensis* (Ledge Grass), a species which is uncommon in alpine grassland or wet shrubland.



SPARSE ROCKY ALPINE HEATHLAND : SUB-COMMUNITY ALP 3.3

CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A
<i>Carex breviculmis</i>	89	1	<i>Bossiaea foliosa</i>	67	1	<i>Stellaria pungens</i>	56	1
* <i>Hypochoeris radicata</i>	67	1	* <i>Cerastium glomeratum</i>	56	+	<i>Poa phillipsiana</i>	56	1
* <i>Rumex acetosella</i> sp. agg.	67	1	<i>Grevillea australis</i>	56	2			

NO. OF SITES: 9 STRUCTURE: Low open-heathland

DISTRIBUTION: Occasional on the Dargo High Plains, Mt. Buffalo and The Cobberas.

ENVIRONMENT: Well-drained sites; dry or rocky slopes or granitic peaks.

ALTITUDE: Mean = 1594m, Highest = 1800m, Lowest = 1450m

MEAN FLORISTIC RICHNESS: 20 species per site MEAN WEED COMPOSITION: 2% of species, 1% of cover

NOTES: ALP 3.3 is represented by sites sharing shrubland or herbland species, but the histories of some of these sites indicate that they may have supported different vegetation types in the recent past. Some sites are presently being grazed, or are being maintained as ski slopes. The areas in these situations have a high incidence of introduced species (e.g. *Rumex acetosella*, *Hypochoeris radicata*, *Trifolium repens* and *Cerastium glomeratum*), and several resilient native species. Natural open-shrubland occurs on the rocky summits and slopes of The Cobberas where other low shrubs *Phebalium phyllicifolium* and *Bossiaea foliosa* occur. Sub-community ALP 3.3 is therefore floristically cohesive, but not necessarily representative of a particular environment.

SPARSE ROCKY ALPINE HEATHLAND : SUB-COMMUNITY ALP 3.4

CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A
<i>Lomandra micrantha</i>	100	1	* <i>Hypochoeris radicata</i>	75	1	<i>Grevillea australis</i>	75	2
<i>Microseris scapigera</i>	100	1	<i>Poa hienata</i>	75	2	<i>Hovea longifolia</i>	75	1
<i>Oreomyrrhis eriopoda</i>	100	1	<i>Carex breviculmis</i>	75	1	<i>Pratia pedunculata</i>	75	+
* <i>Rumex acetosella</i> sp. agg.	100	+	* <i>Chrysanthemum leucanthemum</i>	75	1	<i>Poa fawcettiae</i>	75	1
<i>Stellaria purgens</i>	100	+	<i>Cotula filicula</i>	75	+			

NO. OF SITES: 4 STRUCTURE: Low open-heathland

DISTRIBUTION: Restricted to the summit of Mt. Skene.

ENVIRONMENT: Exposed slopes of gentle gradient. Soils are quite deep and water-retentive, and overlay sedimentary bedrock.

ALTITUDE: Mean = 1545m, Highest = 1560m, Lowest = 1520m

MEAN FLORISTIC RICHNESS: 18 species per site MEAN WEED COMPOSITION: 13% of species, 10% of cover

NOTES: *Lomandra micrantha* var *sororia* is confined to this sub-community on Mt. Skene and only a few isolated peaks in eastern Victoria, including areas of the Snowy Range and Mt. Wellington. The treeless areas of vegetation on Mt. Skene consist of narrow clearings within the Snow Gum Woodland and are probably the result of wind exposure rather than a response to true alpine conditions on the peak.



Kunzea ericifolia HEATHLAND : SUB-COMMUNITY ALP 4.1

CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A
<i>Kunzea ericifolia</i>	100	3	<i>Micranthemum hexandrum</i>	80	1	<i>Brachycome spathulata</i>	80	+
<i>Carex breviculmis</i>	100	1	<i>Hovea longifolia</i>	80	1			
<i>Stipa nivicola</i>	100	1	<i>Poa phillipsiana</i>	80	1			

NO. OF SITES: 5 STRUCTURE: Low closed-heathland

DISTRIBUTION: Frequent within treeless areas of the Buffalo Plateau.

ENVIRONMENT: Granitic rises within the depressions of the plateau. Soils are very shallow and coarse. Large granite tors are common nearby.

ALTITUDE: Mean = 1420m, Highest = 1560m, Lowest = 1380m

MEAN FLORISTIC RICHNESS: 15 species per site MEAN WEED COMPOSITION: 2% of species, 1% of cover

NOTES: This *Kunzea ericifolia* dominated low-heathland is structurally and floristically similar to Unit 4 of McDougall (1982) and sub-communities ALP 4.2 and ALP 4.3 but differs in the presence of *Micranthemum hexandrum*, *Aciphylla simplicifolia* and *Poa phillipsiana* as character species. These species are uncommon elsewhere within the Study Area, but occur occasionally in rocky situations. Their frequency on the Buffalo Plateau is indicative of the extent and uniformity of this granite massif.

BAW BAW DRY ALPINE SHRUBLAND : SUB-COMMUNITY ALP 5.1

CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A
<i>Carex breviculmis</i>	92	1	<i>Viola hederacea</i>	77	1	<i>Poa hienata</i>	62	1
<i>Hydrocotyle algida</i>	92	1	<i>Celmisia asteliifolia</i>	77	1	* <i>Cerastium fontanum</i>	54	+
* <i>Hypochoeris radicata</i>	92	1	<i>Gonocarpus montanus</i>	62	+	<i>Helichrysum secundiflorum</i>	54	1
<i>Oreomyrrhis eriopoda</i>	85	1	<i>Olearia phlogopappa</i>	62	1	<i>Olearia algida</i>	54	1
<i>Stylidium graminifolium</i>	85	1	<i>Asperula gunnii</i>	62	+	<i>Orites lancifolia</i>	54	1
<i>Pultenaea muelleri</i>	77	2	<i>Luzula modesta</i>	62	1	* <i>Rumex acetosella</i> sp. agg.	54	+
<i>Senecio gunnii</i>	77	+	<i>Lycopodium fastigiatum</i>	62	1			

NO. OF SITES: 13

STRUCTURE: Low shrubland

DISTRIBUTION: Common throughout the more northerly peaks of the Baw Baw Plateau (from Mt. Whitelaw to Mt. Erica).

ENVIRONMENT: Dry granitic slopes of northerly aspect, associated with the highest peaks.

ALTITUDE: Mean = 1400m, Highest = 1535m, Lowest = 1320m

MEAN FLORISTIC RICHNESS: 22 species per site

MEAN WEED COMPOSITION: 12% of species, 10% of cover

NOTES: A structurally uniform shrubland made up of low, dense thickets of *Pultenaea muelleri* interspersed with the taller shrubs *Olearia phlogopappa*, *Helichrysum secundiflorum* or *Orites lancifolia*. Other shrubs are rare and the ground layer, although floristically diverse, is generally sparse. The same species occur with in Snow Gum woodland at lower altitudes or in more sheltered sites.



BAW BAW DRY ALPINE SHRUBLAND : SUB-COMMUNITY ALP 5.2

CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A
<i>Asperula gunnii</i>	100	1	<i>Prasophyllum</i> spp.	100	+	<i>Pultenaea muelleri</i>	80	1
<i>Carex breviculmis</i>	100	1	* <i>Rumex acetosella</i> sp. agg.	80	+	<i>Stylidium graminifolium</i>	80	+
<i>Celmisia asteliifolia</i>	100	1	* <i>Cerastium fontanum</i>	80	+	<i>Asterolasia trymalioides</i>	60	+
<i>Danthonia nudiflora</i>	100	2	<i>Luzula modesta</i>	80	1	<i>Craspedia</i> sp. 'D'	60	+
* <i>Hypochoeris radicata</i>	100	1	<i>Scaevola hookeri</i>	80	1	<i>Helichrysum hookeri</i>	60	+
<i>Olearia algida</i>	100	+	<i>Senecio gunnii</i>	80	+	* <i>Leptorhynchus squanatus</i>	60	+
<i>Oreomyrrhis eriopoda</i>	100	+	<i>Gonocarpus montanus</i>	80	+	<i>Prostanthera cuneata</i>	60	1
<i>Pimelea alpina</i>	100	+	<i>Hydrocotyle algida</i>	80	+	<i>Scleranthus biflorus</i>	60	+
<i>Poa hienata</i>	100	1	<i>Plantago alpestris</i>	80	1	<i>Trochocarpa clarkei</i>	60	1
<i>Viola hederacea</i>	100	+	<i>Podolepis robusta</i>	80	1			

NO. OF SITES: 5

STRUCTURE: Low shrubland

DISTRIBUTION: Common throughout the more northerly mountains of the Baw Baw Plateau (from Mt. Whitelaw to Mt. Erica).

ENVIRONMENT: Saddles and flatter areas on northerly faces of the plateau. Surrounding areas usually contain large granite tors.

ALTITUDE: Mean = 1436m, Highest = 1490m, Lowest = 1340m

MEAN FLORISTIC RICHNESS: 30 species per site

MEAN WEED COMPOSITION: 9% of species, 8% of cover

NOTES: This sub-community is characterized by a lack of shrubs, which accounts for the diverse continuous ground layer. Granite outcrops are frequent, and it is on the lee side of these that the only shrubs of the sub-community occur.

ALPINE HEATHLAND : SUB-COMMUNITY ALP 6.1

CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A
<i>Poa fawcettiae</i>	88	2	<i>Stellaria pungens</i>	72	1	* <i>Rumex acetosella</i> sp. agg.	59	+
<i>Microseris scapigera</i>	88	1	<i>Hovea longifolia</i>	69	2	<i>Asperula gunnii</i>	59	1
<i>Carex breviculmis</i>	88	1	<i>Leucopogon suaveolens</i>	63	1			

NO. OF SITES: 32 STRUCTURE: Low open-heathland

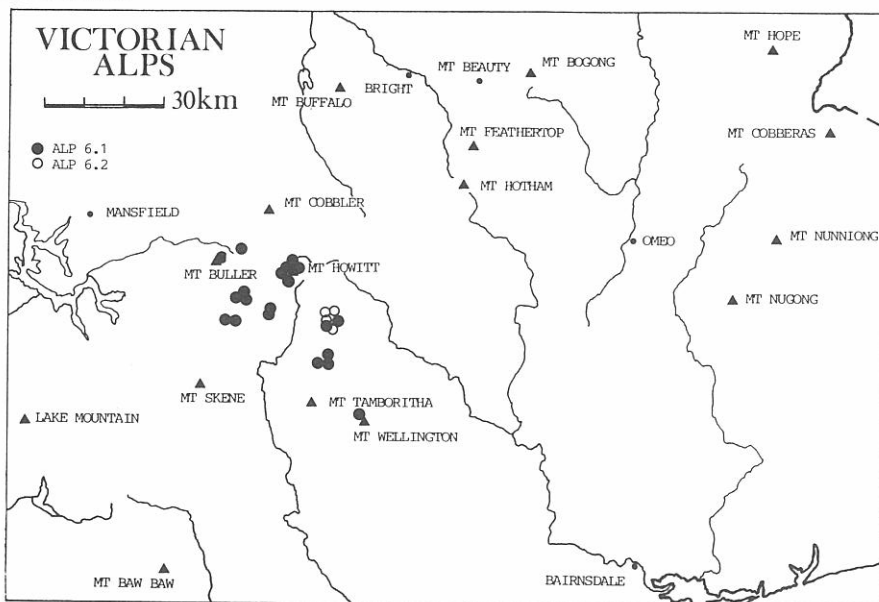
DISTRIBUTION: Common on ridges and slopes of The Viking and in the region of Mt. Speculation, Mt. Howitt and The Bluff.

ENVIRONMENT: Usually areas of sedimentary boulders or shale, or sedimentary substrate with shallow soil.

ALTITUDE: Mean = 1620m, Highest = 1740m, Lowest = 1400m

MEAN FLORISTIC RICHNESS: 22 species per site MEAN WEED COMPOSITION: 6% of species, 4% of cover

NOTES: Sub-community ALP 6.1 shares many species with the previously described ledge-herbfield community (ALP 3.1). Reduced exposure and gentler inclines permit the development of richer soils. This enables the establishment of a less patchy vegetation, comprising a perennial shrub layer with *Hovea longifolia*, *Leucopogon suaveolens* and occasionally *Grevillea australis*, and perennial herbs *Celmisia astellifolia*, *Styliidium graminifolium* and *Coodenia hederacea*.



ALPINE HEATHLAND : SUB-COMMUNITY ALP 6.2

CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A
<i>Hakea microcarpa</i>	100	1	<i>Podolepis jaceoides</i>	86	1	<i>Baeckea ramosissima</i>	71	1
<i>Hovea longifolia</i>	100	1	<i>Viola betonicifolia</i>	86	+	<i>Styliidium graminifolium</i>	71	1
<i>Leptorhynchus squamatus</i>	100	1	<i>Poa fawcettiae</i>	86	2	<i>Ajuga australis</i>	71	+
<i>Carex breviculmis</i>	100	1	<i>Asperula gunnii</i>	86	+	<i>Leucopogon suaveolens</i>	71	1
<i>Microseris scapigera</i>	100	1	<i>Bossiaea foliosa</i>	86	1	<i>Lomandra micrantha</i>	71	1
* <i>Hypochoeris radicata</i>	86	1	<i>Trisetum spicatum</i>	86	+	<i>Ranunculus graniticola</i>	71	1
<i>Leucopogon stuartii</i>	86	1	<i>Erigeron</i> sp. 'C'	86	1			

NO. OF SITES: 7 STRUCTURE: Open-heath

DISTRIBUTION: Sampled only in the Bryce Plain region of the Study Area.

ENVIRONMENT: Flat or gently sloping raised sites adjacent to creeks or drainage lines. Soils are shallow, derived from basalt.

ALTITUDE: Mean = 1440m, Highest = 1490m, Lowest = 1390m

MEAN FLORISTIC RICHNESS: 33 species per site MEAN WEED COMPOSITION: 8% of species, 6% of cover

NOTES: The occurrence of a shallow soil layer over a largely impervious basalt substrate promotes a curious combination of wet and dry shrubland species in this sub-community. Deep-rooting shrubs such as *Epacris microphylla* and *Hakea microphylla* are more common in subalpine wetlands, but in this sub-community occur with species more typical of dry sites (e.g. *Leucopogon stuartii* and *Baeckea ramosissima*).

ALPINE HEATHLAND : SUB-COMMUNITY ALP 6.3

CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A
Carex breviculmis	95	1	Microseris scapigera	69	+	Craspedia sp. 'E'	48	1
Poa fawcettiae	88	2	Leucopogon suaveolens	64	1	Celmisia asteliifolia	45	+
Asperula gunnii	86	1	Viola betonicifolia	64	+	Grevillea australis	45	1
Hovea longifolia	86	1	*Rumex acetosella sp. agg.	60	1	Poa costiniana	43	2
Ranunculus graniticola	86	1	Oreomyrrhis eriopoda	55	+	Stipa nivicola	40	1
Leptorhynchos squamatus	79	1	Pimelea alpina	50	1			
Scleranthus biflorus	74	+	Trisetum spicatum	48	+			

NO. OF SITES: 42 STRUCTURE: Open-heath to grassland

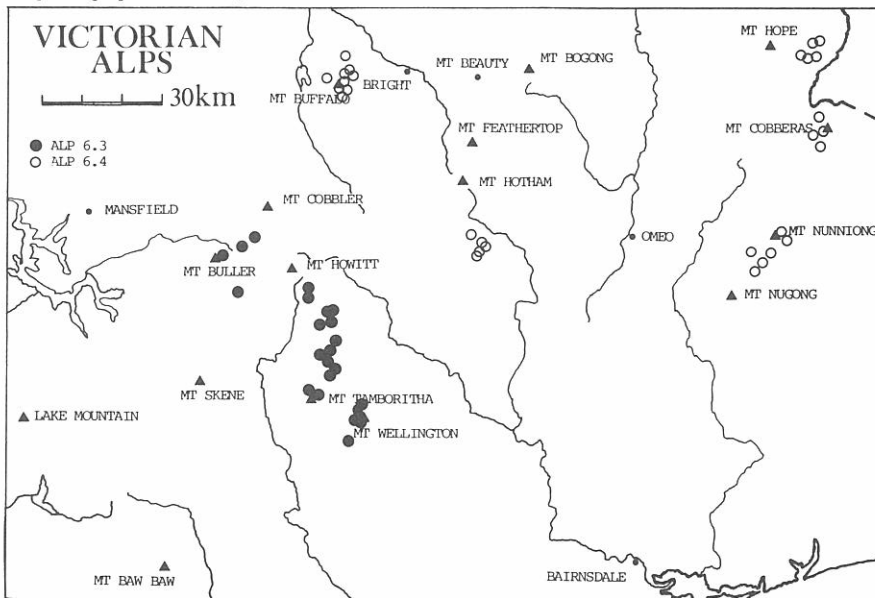
DISTRIBUTION: Common on alpine and subalpine plains of the Snowy Range area.

ENVIRONMENT: Raised areas of plains, usually with poor drainage, but not permanently wet.

ALTITUDE: Mean = 1490m, Highest = 1680m, Lowest = 1220m

MEAN FLORISTIC RICHNESS: 27 species per site MEAN WEED COMPOSITION: 8% of species, 6% of cover

NOTES: This is one of the most common types of vegetation in the Snowy Range area. It is floristically similar to sub-community ALP 6.1, but is found at lower altitudes and in wetter soils. Several wetland species occur in ALP 6.3, including the grass *Poa costiniana* which also grows amongst the sphagnum bogs, and is part of the preferred diet of cattle on the high plains (H. Van Rees pers. comm.). Introduced species *Rumex acetosella* and *Hypochoeris radicata* are common and indicate considerable disturbance, while the presence of the weeds *Cerastium glomeratum* and *Trifolium repens* may indicate increased nutrient supply. These species are often found growing directly on drying cattle faeces.



ALPINE HEATHLAND : SUB-COMMUNITY ALP 6.4

CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A
Carex breviculmis	95	1	Hovea longifolia	64	1	Brachycome spathulata	48	1
Leptorhynchos squamatus	81	1	Poa phillipsiana	64	2	Oreomyrrhis eriopoda	48	+
Scleranthus biflorus	76	1	Ranunculus graniticola	57	1	Microseris scapigera	45	1
Danthonia pilosa	74	1	*Rumex acetosella sp. agg.	55	+	Asperula gunnii	45	1
Craspedia sp. 'E'	64	1	Ajuga australis	50	+	Luzula modesta	43	+

NO. OF SITES: 42 STRUCTURE: Open-heath to grassland

DISTRIBUTION: Widespread in the Eastern Highlands, where recorded from Mt. Buffalo, Dargo High Plains, Nunniong Plateau, The Cobberas, Cowombat Flat and Davies Plain.

ENVIRONMENT: Dry, shallow soils, developed over igneous or sedimentary substrate with occasional outcrops.

ALTITUDE: Mean = 1450m, Highest = 1760m, Lowest = 1160m

MEAN FLORISTIC RICHNESS: 22 species per site MEAN WEED COMPOSITION: 6% of species, 4% of cover

NOTES: A common vegetation with many variants. On Mt. Buffalo it occurs near the rim of depressions or basins and frequently includes the uncommon grass *Stipa nivicola*. At lower sites it merges into a damp grassland dominated by *Poa fawcettiae*. On the Dargo Plains ALP 6.4 is often dominated by extensive tracts of *Poa phillipsiana* and *P. costiniana* or *P. fawcettiae*. These areas have long been subject to spring or autumn burning to promote summer fodder, a practice which has led to depletion of the shrub element in this vegetation. A similar situation exists on the western snowplains of the Nunniong Plateau but eastern plains of the plateau are apparently not burnt and the bush pea *Pultenaea fasciculata* is common. A higher proportion of non-graminoid herbs is usually supported on higher altitude plains of the Davies Plain and Mt. Cobberas regions than other areas where this sub-community occurs.

ALPINE GRASSLAND : SUB-COMMUNITY ALP 7.1

CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A
Ranunculus graniticola	89	1	Empodisma minus	64	2	Scleranthus biflorus	54	+
Carex breviculmis	86	1	Carex gaudichaudiana	64	1	Celmisia asteliifolia	50	1
Asperula gunnii	86	1	Leptorhynchus squamatus	61	1	Craspedia sp. 'F'	50	+
Viola betonicifolia	75	+	Microseris scapigera	61	1	Hovea longifolia	50	1
Poa fawcettiae	71	2	Poa costiniana	57	2	*Trifolium repens	46	1
Cotula alpina	71	1	Luzula modesta	54	1			
Brachycome decipiens	71	1	*Rumex acetosella sp. agg.	54	+			

NO. OF SITES: 28

STRUCTURE: Grassland to open-heath

DISTRIBUTION: The plains of the Snowy Range, Mt. Howitt areas.

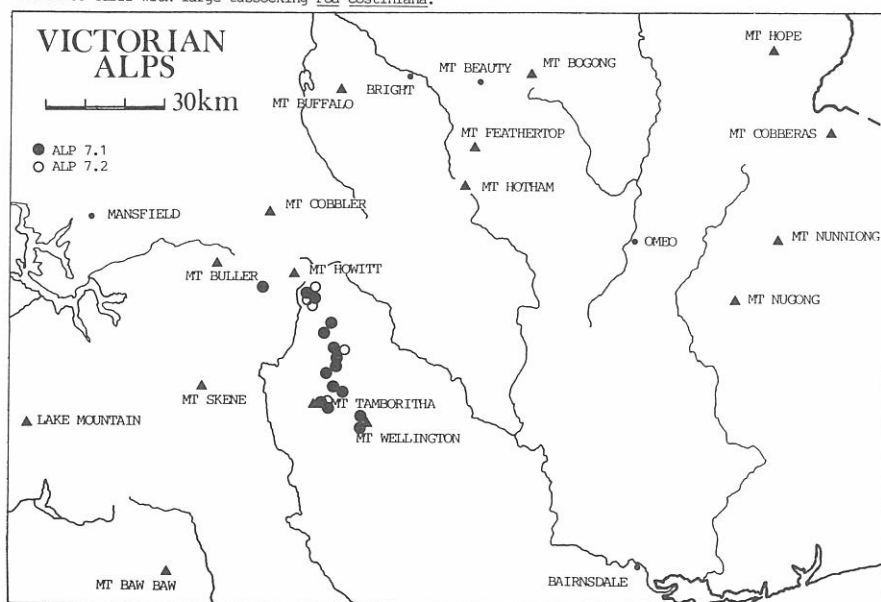
ENVIRONMENT: Level, low-lying areas of subalpine plains

ALTITUDE: Mean = 1500m, Highest = 1680m, Lowest = 1260m

MEAN FLORISTIC RICHNESS: 32 species per site

MEAN WEED COMPOSITION: 7% of species, 6% of cover

NOTES: Spatially and ecologically this vegetation links the shrublands of community ALP 6 with the sedge/land/wet heathland of community ALP 9. A decreased incidence of *Hovea longifolia*, *Leucopogon suaveolens* and other shrubs characteristic of the drier vegetation, and the occurrence of the heath *Epacris breviflora* and the woody everlasting *Helichrysum hookeri* demonstrate the increased wetness of this sub-community. The soils are deep and peaty, the water retentive properties permitting *Carex gaudichaudiana* and *Empodisma minus* (a species commonest in the true wetlands), to form dense turfs with large tussocking *Poa costiniana*.



ALPINE GRASSLAND : SUB-COMMUNITY ALP 7.2

CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A
Carex gaudichaudiana	100	1	Ranunculus gunnianus	86	1	Empodisma minus	71	2
Gonocarpus micranthus	100	+	Viola betonicifolia	86	1	Carex breviculmis	71	1
Asperula gunnii	86	1	Hypericum japonicum	86	1	Celmisia asteliifolia	71	+
Brachycome decipiens	86	1	Poa hiemata	86	1	Scleranthus biflorus	71	1
Cotula alpina	86	1	Agrostis hiemalis	71	+			
Ranunculus graniticola	86	1	Ajuga australis	71	1			

NO. OF SITES: 8

STRUCTURE: Grassland

DISTRIBUTION: Howitt Plain and near airstrip on Snowy Range.

ENVIRONMENT: Damp, low-lying areas in open grassland situations.

ALTITUDE: Mean = 1595m, Highest = 1630m, Lowest = 1580m

MEAN FLORISTIC RICHNESS: 29 species per site

MEAN WEED COMPOSITION: 4% of species, 3% of cover

NOTES: This is a minor variant of sub-community ALP 7.1, slightly wetter and with a further reduction in *Hovea longifolia*, *Leucopogon suaveolens* and *Grevillea australis* shrub cover. The majority of sites containing this sub-community are on Howitt Plain. This fenced area has in the past been intensively grazed and occasionally burnt. The present tussock-grassland structure of this plain reflects such a history, and parallels the present situation over much of the Bogong High Plains (Carr and Turner 1959).

ALPINE GRASSLAND : SUB-COMMUNITY ALP 7.3

CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A
* <i>Trifolium repens</i>	97	1	* <i>Cerastium glomeratum</i>	66	+	<i>Brachycome scapigera</i>	55	1
<i>Poa hienata</i>	93	2	<i>Hypericum japonicum</i>	62	1	<i>Carex breviculmis</i>	55	1
<i>Epilobium hillardianum</i>	76	+	<i>Luzula modesta</i>	59	1	<i>Oreomyrrhis eriopoda</i>	52	+
* <i>Rumex acetosella</i> sp. agg.	69	1	<i>Dichondra repens</i>	55	1	* <i>Taraxacum officinale</i> spp.agg.	48	1

NO. OF SITES: 28

STRUCTURE: Grassland/sedgeland

DISTRIBUTION: Common in the Dargo High Plains region with isolated occurrences in the far east Nunniong-Cobberas area.

ENVIRONMENT: Dry basalt or granite-derived soils on flat or gently sloping ground. Rock outcrops usually not present.

ALTITUDE: Mean = 1450m, Highest = 1620m, Lowest = 1200m

MEAN FLORISTIC RICHNESS: 28 species per site

MEAN WEED COMPOSITION: 17% of species, 17% of cover

NOTES: One of the weediest and most species-poor sub-communities in the Study Area. The Dargo High Plains are heavily stocked and extensively grazed by cattle from early summer to late spring. Freehold land on the plains encompasses a large proportion of their treeless areas and pasture improvement has been carried out here by seasonal burning or spreading of fertilizer and sowing of European grasses such as *Phleum pratense*. Despite this disturbance, several rare or endemic alpine herbs persist, though they are infrequently encountered in this sub-community (e.g. *Epilobium curtisiae*, *E. willisii*, *Wahlenbergia densiflora*, *Brachycome tenuiflora*, *Oreomyrrhis argentea* and *Carex paupera*, a sedge recorded twice in Victoria). The sites supporting this sub-community to the east of the Dargo High Plains are restricted to igneous outcrops, and have also been grazed for many years.



BAW BAW DAMP ALPINE HEATHLAND : SUB-COMMUNITY ALP 8.1

CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A
<i>Asperula gunnii</i>	100	1	<i>Poa hienata</i>	100	1	<i>Celmisia asteliifolia</i>	75	1
<i>Asterolasia trymalioides</i>	100	1	<i>Pimelea alpina</i>	88	1	<i>Orites lancifolia</i>	63	1
<i>Empodisma minus</i>	100	1	<i>Podolepis robusta</i>	88	1	<i>Olearia algida</i>	63	1
<i>Epacris petrophila</i>	100	1	<i>Craspedia</i> sp. 'D'	88	1	<i>Helichrysum hookeri</i>	63	2
<i>Grevillea australis</i>	100	1	<i>Carex breviculmis</i>	75	1	<i>Pratia pedunculata</i>	63	+

NO. OF SITES: 8

STRUCTURE: Open-heath

DISTRIBUTION: Headwaters of the East and West Tanjil Rivers, Mustering Flat and St. Gwinnear Flat, on the Baw Baw Plateau.

ENVIRONMENT: Edges of broad depressions and open gully heads where soils are generally sodden and deep. Frequently associated with raised areas within bogs or Wet Alpine Heath vegetation.

ALTITUDE: Mean = 1380m, Highest = 1480m, Lowest = 1305m

MEAN FLORISTIC RICHNESS: 23 species per site

MEAN WEED COMPOSITION: 0% of species, 0% of cover

NOTES: This heathland generally forms a band between the Dry Alpine Shrubland (ALP 5.1) and various Wet Alpine Heath sub-communities. Consequently most of the species are indicative of one of these sub-communities, but a few, such as *Asterolasia trymalioides* and *Pratia pedunculata* (an uncommon alpine herb) appear to be more or less restricted to this transitional zone.

WET ALPINE HEATHLAND : SUB-COMMUNITY ALP 9.1

CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A
<i>Astelia alpina</i>	100	1	<i>Asperula gunnii</i>	82	+	<i>Euphrasia gibbsiae</i>	64	1
<i>Celmisia asteliifolia</i>	100	+	<i>Epacris paludosa</i>	82	1	<i>Senecio pectinatus</i>	64	+
<i>Olearia algida</i>	100	1	<i>Herpolirion novaezelandiae</i>	82	+	<i>Baeckea gunniana</i>	64	1
<i>Richea continentis</i>	100	2	<i>Oreobolus distichus</i>	82	1	<i>Gonocarpus micranthus</i>	55	+
<i>Poa hienata</i>	91	1	<i>Epacris petrophila</i>	73	1	<i>Nertera depressa</i>	55	1
<i>Gentianella diemensis</i>	91	1	<i>Plantago alpestris</i>	73	1	<i>Schoenus calypttratus</i>	55	+
<i>Pimelea alpina</i>	91	1	<i>Empodisma minus</i>	73	3			
<i>Craspedia</i> sp. 'd'	82	1	<i>Lycopodium fastigiatum</i>	73	+			

NO. OF SITES: 12

STRUCTURE: Open-heath to herbfield

DISTRIBUTION: Scattered over the entire Baw Baw Plateau.

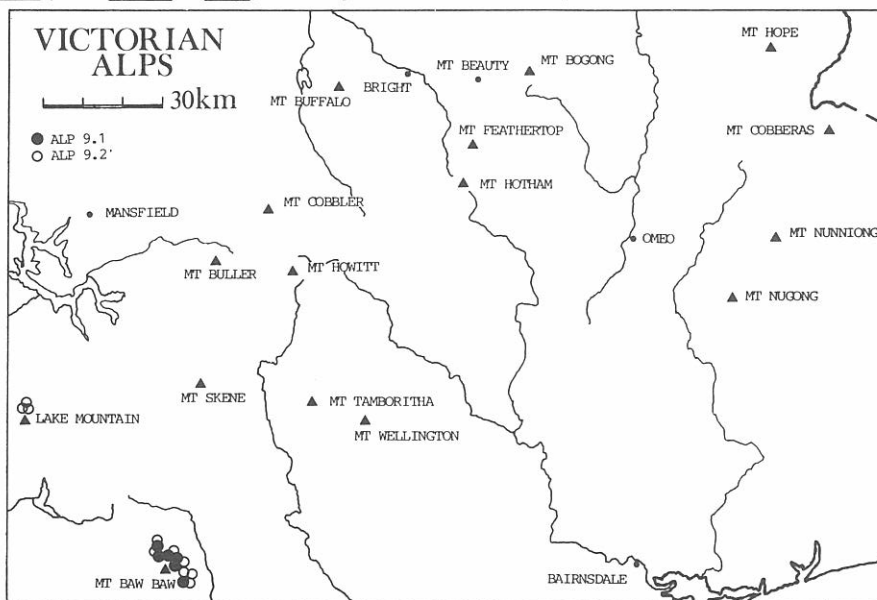
ENVIRONMENT: Depressions where the rocky substrate is exposed or thinly overlain by peat. Shallow, gravel-based pools are often nearby.

ALTITUDE: Mean = 1440m, Highest = 1500m, Lowest = 1340m

MEAN FLORISTIC RICHNESS: 27 species per site

MEAN WEED COMPOSITION: 0% of species, 0% of cover

NOTES: This sub-community is characterized by a dense turf of *Empodisma minus* and *Poa hienata*, with epacrids *Richea continentis* and *Epacris paludosa* forming a medium-dense shrub layer. It is typical of the heads of watercourses and margins of deeper and more water-retentive sphagnum bogs. The otherwise rare clubmosses, *Lycopodium scarosum* and *Huperzia selago*, are frequent in this sub-community.



WET ALPINE HEATHLAND : SUB-COMMUNITY ALP 9.2

CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A
<i>Astelia alpina</i>	100	1	<i>Thelymitra venosa</i>	70	+	<i>Nertera depressa</i>	52	+
<i>Empodisma minus</i>	100	2	<i>Baeckea gunniana</i>	70	1	<i>Craspedia</i> sp. 'd'	52	+
<i>Epacris paludosa</i>	96	1	<i>Carpha nivicola</i>	59	1	<i>Euphrasia gibbsiae</i>	48	+
<i>Gentianella diemensis</i>	89	1	<i>Sphagnum</i> spp.	59	2	<i>Poa costiniana</i>	48	1
<i>Olearia algida</i>	89	+	<i>Callistemon sieberi</i>	59	1			
<i>Richea continentis</i>	81	1	<i>Asperula gunnii</i>	59	+			

NO. OF SITES: 27

STRUCTURE: Low heathland/mossland

DISTRIBUTION: Widespread on Baw Baw Plateau and at Echo Flat near Lake Mountain.

ENVIRONMENT: Perpetually wet areas with a deep, peaty substrate.

ALTITUDE: Mean = 1400m, Highest = 1485m, Lowest = 1270m

MEAN FLORISTIC RICHNESS: 21 species per site

MEAN WEED COMPOSITION: 0% of species, 0% of cover

NOTES: This is the most frequent treeless vegetation on the Baw Baw Plateau. Wet Alpine Heath or sphagnum bogs occupy a greater proportion of the plateau than of any other Victorian alpine area. Deep, spongy hummocks of water-retentive *Sphagnum* spp. and *Empodisma minus* provide a substrate for the shrubs of this sub-community which is usually moist all year round. Summer-flowering herbs, shrubs and annuals (particularly *Thelymitra venosa* and *Gentianella diemensis*) make this one of the showiest of the alpine sub-communities of the Central Highlands.

WET ALPINE HEATHLAND : SUB-COMMUNITY ALP 9.3

CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A
Richea continentis	92	1	Carex appressa	77	1	Isolepis aucklandica	54	+
Sphagnum spp.	92	2	Olearia aligda	69	+	Celmisia asteliifolia	54	1
Epacris paludosa	92	2	Hydrocotyle algida	69	1	Nertera depressa	54	1
Blechnum penna-marina	77	+	Thelymitra venosa	62	+			
Astelia alpina	77	1	Epilobium gunniamum	62	1			

NO. OF SITES: 13

STRUCTURE: Low heathland/mossland

DISTRIBUTION: Scattered over the Baw Baw Plateau, and occasional at Echo Flat near Lake Mountain.

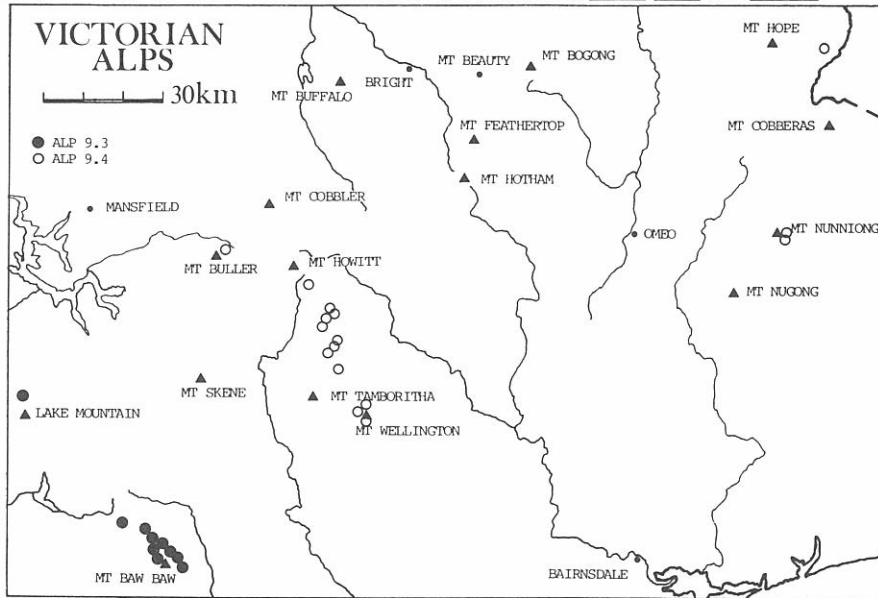
ENVIRONMENT: Restricted to the vicinity of permanent water, either on the verge of steeply-banked creeks, near springs on hillsides or by pools in snow-plain depressions. Substrate is sodden peat, with little inorganic matter.

ALTITUDE: Mean = 1375m, Highest = 1570m, Lowest = 980m

MEAN FLORISTIC RICHNESS: 24 species per site

MEAN WEED COMPOSITION: 0% of species, 0% of cover

NOTES: ALP 9.3 is a wetter variant of ALP 9.2. The most significant difference between the two is the virtual absence of *Empodisma minus* (a dominant species in ALP 9.2) and a reduced abundance of the shrub *Baeckea gunniana* in ALP 9.3. The latter species is replaced by the small shrub *Baeckea utilis* var. *latifolia*.



WET ALPINE HEATHLAND : SUB-COMMUNITY ALP 9.4

CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A
<i>Empodisma minus</i>	100	2	<i>Richea continentis</i>	85	2	<i>Poa costiniana</i>	55	1
<i>Sphagnum</i> spp.	95	3	<i>Asperula gunnii</i>	70	1	<i>Ranunculus pimpinellifolius</i>	50	1
<i>Baeckea gunniana</i>	90	1	<i>Carex gaudichaudiana</i>	65	1	<i>Luzula modesta</i>	50	+
<i>Epacris paludosa</i>	90	1	<i>Epacris breviflora</i>	59	1			

NO. OF SITES: 20

STRUCTURE: Low heathland/mossland

DISTRIBUTION: Mt. Buller, the plains of the Snowy Range area, and three isolated sites in the Digger's Holes and Davies Plain areas.

ENVIRONMENT: Permanently wet drainage lines and valley floors, usually of low to moderate incline.

ALTITUDE: Mean = 1520m, Highest = 1760m, Lowest = 1400m

MEAN FLORISTIC RICHNESS: 24 species per site

MEAN WEED COMPOSITION: 2% of species, 1% of cover

NOTES: This is the true sphagnum bog vegetation common through the alps and subalps of Victoria. A dense cushion is formed by the moss, interspersed with epacrids *Richea continentis* and *Epacris paludosa* and the rope-rush *Empodisma minus*. The water-retentive qualities of these moss-beds are believed to effect the catchments and reservoirs draining the high areas. Observations indicate that cattle graze in the bogs only towards the end of summer as surrounding fodder dries off (H. Van Rees pers. comm.). During this period, degradation of the bog occurs through trampling and faecal coverage.

WET ALPINE HEATHLAND : SUB-COMMUNITY ALP 9.5

CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A
<i>Empodisma minus</i>	90	2	<i>Carex gaudichaudiana</i>	67	1	<i>Gonocarpus micranthus</i>	60	+
<i>Baeckea gunniana</i>	83	1	<i>Pultanea tenella</i>	67	1	<i>Sphagnum</i> spp.	60	3
<i>Poa fauconetiae</i>	71	1	<i>Gentianella diemensis</i>	63	1	<i>Carex blakei</i>	50	1
<i>Asperula conferta</i>	77	1	<i>Poa costiniana</i>	63	1	<i>Erigeron</i> sp. 'A'	47	1
<i>Richea confertis</i>	70	1	<i>Epacris paludosa</i>	63	1			

NO. OF SITES: 29

STRUCTURE: Low heathland/mossland

DISTRIBUTION: Frequent on the Buffalo Plateau, with a few isolated occurrences near Mt. Nunniong and the high areas of Davies Plain.

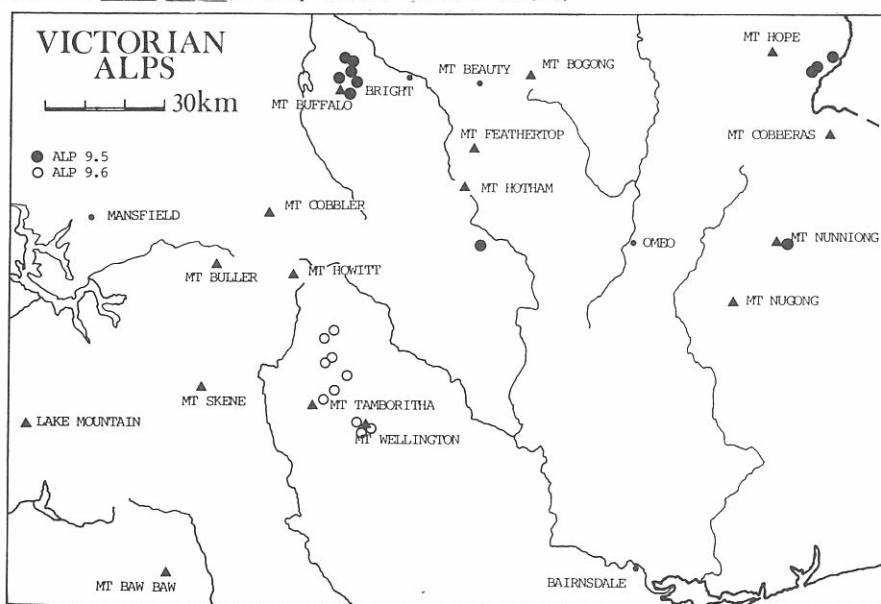
ENVIRONMENT: Broad valley floors and basins, heads of springs and gently sloping seepage lines. Soils are mainly granitic (Mt. Buffalo and Mt. Nunniong) or rhyolitic (Davies Plain).

ALTITUDE: Mean = 1460m, Highest = 1720m, Lowest = 1310m

MEAN FLORISTIC RICHNESS: 20 species per site

MEAN WEED COMPOSITION: 1% of species, 0% of cover

NOTES: See also description for sub-community ALP 9.2 and ALP 9.4, and 8A (McDougall 1982). The sphagnum bogs on Mt. Buffalo have floristic affinities with those of the Baw Baw Plateau. Several restricted species are common to both mountains (e.g. *Nertera depressa*, *Carex blakei* and *Coprosma moorei*) and other species, which are usually common in alpine bogs, are absent (e.g. *Restio australis*). Sphagnum bogs on Targo and Davies Plains support a variant which includes *Epacris coriacea*, a newly recorded species for Victoria.



WET ALPINE HEATHLAND : SUB-COMMUNITY ALP 9.6

CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A
<i>Callistemon sieberi</i>	100	2	<i>Celmisia asteliifolia</i>	80	+	<i>Asperula gunnii</i>	70	1
<i>Empodisma minus</i>	90	2	<i>Epacris breviflora</i>	80	2	<i>Gonocarpus micranthus</i>	60	+
<i>Baeckea gunniana</i>	80	2	<i>Poa clivicola</i>	80	1	<i>Oreobolus distichus</i>	60	1

NO. OF SITES: 10

STRUCTURE: Closed-heath

DISTRIBUTION: Mt. Wellington and Snowy Range areas.

ENVIRONMENT: Permanently wet drainage lines of moderate slope, often with pools of water.

ALTITUDE: Mean = 1500m, Highest = 1700m, Lowest = 1280m

MEAN FLORISTIC RICHNESS: 23 species per site

MEAN WEED COMPOSITION: 2% of species, 1% of cover

NOTES: This wet heathland sub-community invariably occurs in close proximity to the subalpine woodlands. It frequently forms pockets along seepage lines and springs within the woodland, or fringing sphagnum mossbeds. When the fringe completely surrounds the bogs, it forms a very effective buffer and disturbance is minimized. Unlike the water-retentive mossbeds this vegetation is more often associated with moving water, and therefore generally occurs on sloping sites.

DAMP ALPINE HEATHLAND : SUB-COMMUNITY ALP 10.1

CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A
<i>Carex gaudichaudiana</i>	100	1	<i>Hydrocotyle algida</i>	86	1	<i>Restio australis</i>	57	1
<i>Gonocarpus micranthus</i>	93	1	<i>Hypericum japonicum</i>	86	1	<i>Callistemon sieberi</i>	57	1
<i>Ranunculus pimpinellifolius</i>	93	1	<i>Luzula modesta</i>	86	1	<i>Scleranthus biflorus</i>	57	+
<i>Oreomyrhis ciliata</i>	93	1	<i>Poa costiniana</i>	79	1	<i>Acæna anserinifolia</i>	57	+
<i>Bæckea gunniana</i>	86	1	<i>Epacris breviflora</i>	71	1	<i>Brachycome nivalis</i>	57	1
<i>Empodisma minus</i>	86	1	<i>Juncus falcatus</i>	71	1	<i>Diuris pedunculata</i>	57	+
<i>Epilobium gunnianum</i>	86	+	<i>Grevillea australis</i>	71	+	<i>Epilobium billardieranum</i>	57	+
<i>Asperula gunnii</i>	86	1	<i>*Trifolium repens</i>	71	+	<i>*Rumex acetosella</i> sp. agg.	57	+
<i>Cotula alpina</i>	86	1	<i>Poa hienata</i>	71	1			

NO. OF SITES: 14 STRUCTURE: Heathland/herbfield

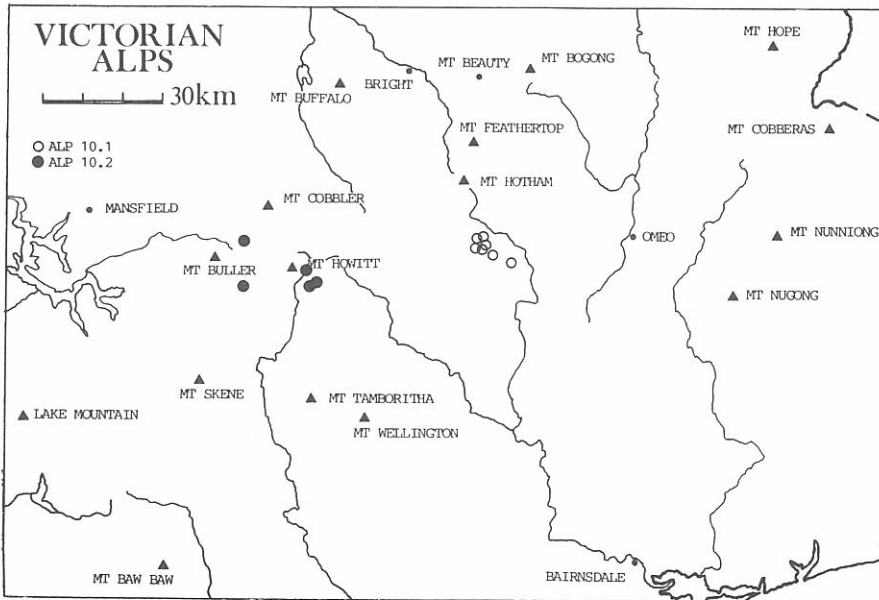
DISTRIBUTION: High spurs of eastern aspect in the Dargo High Plains area.

ENVIRONMENT: Depressions within grassland, fringes of streams or sphagnum bogs. Sites are seldom inundated with water, and the deep, basaltic soils are firm and dark.

ALTITUDE: Mean = 1520m, Highest = 1590m, Lowest = 1310m

MEAN FLORISTIC RICHNESS: 38 species per site MEAN WEED COMPOSITION: 8% of species, 6% of cover

NOTES: This vegetation is intermediate between the grassland-herbfield communities of community ALP 6, and the Wet Heathlands of community ALP 9. *Sphagnum* spp. is present in some sites, but rarely forms a continuous layer as it does in community ALP 9. This non-continuity appears to be the result of incursions by cattle grazing or *Poa costiniana* and other moist herbage, which create muddy channels in the substrate. These channels act as drains for surface water, thereby dissecting and slowly drying the surrounding vegetation. In slightly less sodder areas several herbaceous species form a dense, low turf which although cropped short by cattle is resilient to trampling. These species include *Juncus falcatus*, *Hypericum japonicum*, *Oreomyrhis ciliata*, *Gonocarpus micranthus* and *Ranunculus pimpinellifolius*.



DAMP ALPINE HEATHLAND : SUB-COMMUNITY ALP 10.2

CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A
<i>Bæckea gunniana</i>	100	1	<i>Oreobolus distichus</i>	100	1	<i>Carex appressa</i>	80	1
<i>Brachycome scapigera</i>	100	1	<i>*Cerastium fontanum</i>	100	1	<i>Carex jackiana</i>	80	1
<i>Cotula alpina</i>	100	1	<i>*Trifolium repens</i>	100	1	<i>*Taraxacum officinale</i> spp.agg.	80	+
<i>Epilobium gunnianum</i>	100	1	<i>Caltha introloba</i>	80	1	<i>Veronica serpyllifolia</i>	80	1
<i>Gonocarpus micranthus</i>	100	1	<i>Carex gaudichaudiana</i>	80	1	<i>Luzula modesta</i>	80	+
<i>Hypericum japonicum</i>	100	1	<i>Grevillea australis</i>	80	1	<i>Plantago euryphylla</i>	80	1
<i>Oreomyrhis ciliata</i>	100	1	<i>Ranunculus graniticola</i>	80	+	<i>Poa costiniana</i>	80	1

NO. OF SITES: 5 STRUCTURE: Low heathland/herbfield

DISTRIBUTION: Howitt Plain, The Bluff and Mt. Stirling.

ENVIRONMENT: Snow-melt zones and bog-margins in cold air drainage pockets.

ALTITUDE: Mean = 1640m, Highest = 1740m, Lowest = 1560m

MEAN FLORISTIC RICHNESS: 41 species per site MEAN WEED COMPOSITION: 11% of species, 10% of cover

NOTES: This is floristically the richest vegetation in the Study Area, and also the weediest. Like lowland riparian vegetation, this rivulet sub-community supports species of the drier surrounding vegetation as well as those characteristic of wetlands, due to the narrow transition zone created by the stream bank. It also has a flora peculiar to itself, and by virtue of the unstable state of the soil caused by rapid runoff throughout much of the year, provides a disturbed substrate for weed species to invade.

DAMP ALPINE HEATHLAND : SUB-COMMUNITY ALP 10.3

CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A
<i>Empodisma minus</i>	87	2	<i>Luzula modesta</i>	65	1	<i>Deyeuxia crassiuscula</i>	47	1
<i>Restio australis</i>	87	1	<i>Stylidium graminifolium</i>	62	1	<i>Hakea microcarpa</i>	47	1
<i>Asperula gunnii</i>	81	1	<i>Epacris breviflora</i>	62	1	<i>Ranunculus collinus</i>	47	1
<i>Epacris microphylla</i>	71	1	<i>Cotula alpina</i>	59	1	<i>Ranunculus pimpinellifolius</i>	47	1
<i>Gonocarpus micranthus</i>	71	1	<i>Hydrocotyle algida</i>	56	1	<i>Carex gaudichaudiana</i>	44	1
<i>Poa costiniana</i>	71	1	<i>Schoenus apogon</i>	53	1	<i>*Trifolium repens</i>	44	1
<i>Hypericum japonicum</i>	68	1	<i>Oreomyrrhis ciliata</i>	53	1	<i>Wahlenbergia ceracea</i>	44	1
<i>Festuca hookeriana</i>	65	1	<i>Hypoxis hygrometrica</i>	47	1			
<i>Velleia montana</i>	65	1	<i>Brachycome scapigera</i>	47	1			

NO. OF SITES: 30

STRUCTURE: Heathland

DISTRIBUTION: Highlands in the far east, from Mt. Nugong north to Davies Plain.

ENVIRONMENT: Broad, shallow drainage lines and seepage platforms on hillsides. Soils are basaltic (on Nunniong Plateau) and rhyolitic (on the Cobberas-Davies Plain ridge).

ALTITUDE: Mean = 1320m, Highest = 1680m, Lowest = 1120m

MEAN FLORISTIC RICHNESS: 34 species per site

MEAN WEED COMPOSITION: 4% of species, 3% of cover

NOTES: A local variant of alpine heathland or damp grassland characterized by a dense, turf-like ground layer, including *Festuca hookeriana*, (an uncommon alpine grass), *Empodisma minus*, *Poa costiniana* and several uncommon herbs (e.g. *Arthropodium minus*, *Epilobium curtisiae*, *Euphrasia caudata* and a short, fine-leaved form of *Stylidium graminifolium*). Two rare alpine grasses are also found in this sub-community (*Deyeuxia parviseta* and an undescribed species with affinities for *Deyeuxia microseta*). At the time of sampling most of these sites were regenerating from autumn burning, a common practice in Victorian high country to encourage summer fodder growth for cattle. The paucity of woody species and prevalence of grasses and annual herbs may be attributable to a long history of natural and deliberately-lit fires.

