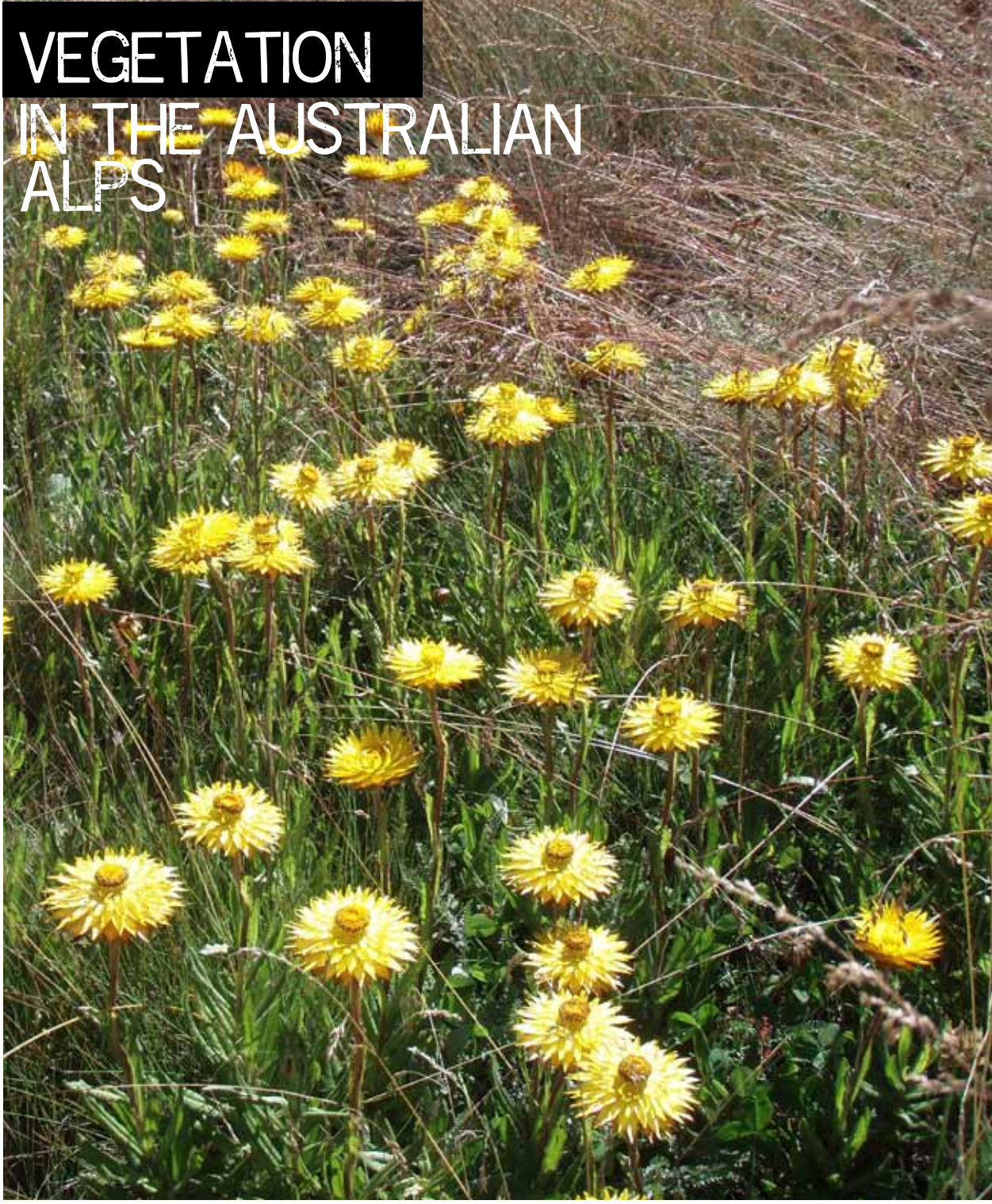
VEGETATION IN THE AUSTRALIAN ALPS



text: Rod Mason
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Plants provide Aboriginal people with food, fibre, medicine, shelter and tools. Most plants have a song, story, dance and ceremony associated with it. Each plant also has a group of people who have a responsibility to care for and control the use of that plant and the animals linked to it. Only women use some plants while others are associated with men.

Plants are used in a similar, if not the same way, wherever they grow across Australia. For example, eucalypts provide weapons and utensils, shelter, firewood, charcoal for art and sap for medicine and tanning skins.

Plants that grow at high altitudes are only accessible during summer and this is why there were large gatherings of Aboriginal people in the mountains during the warmer months. The Australian Alps provided a plentiful supply of seeds, berries, nectar and roots to eat and a supply of medicines that were not available at lower altitudes. The bark of some shrubs were used to make string nets to catch Bogong Moths and plants also provided shelter and food for a variety of animals that were also useful to Aboriginal people.

The life cycle of some plants indicate the availability of food resources elsewhere and sometimes dictated the movement of people. For example, the end of the flowering season of one species may indicate that it was time for one group of people to leave an area and another to arrive or a certain species of wattle flowering indicates fish are plentiful somewhere else.

VEGETATION

DIVERSITY AND ABUNDANCE IN A HARSH ENVIRONMENT

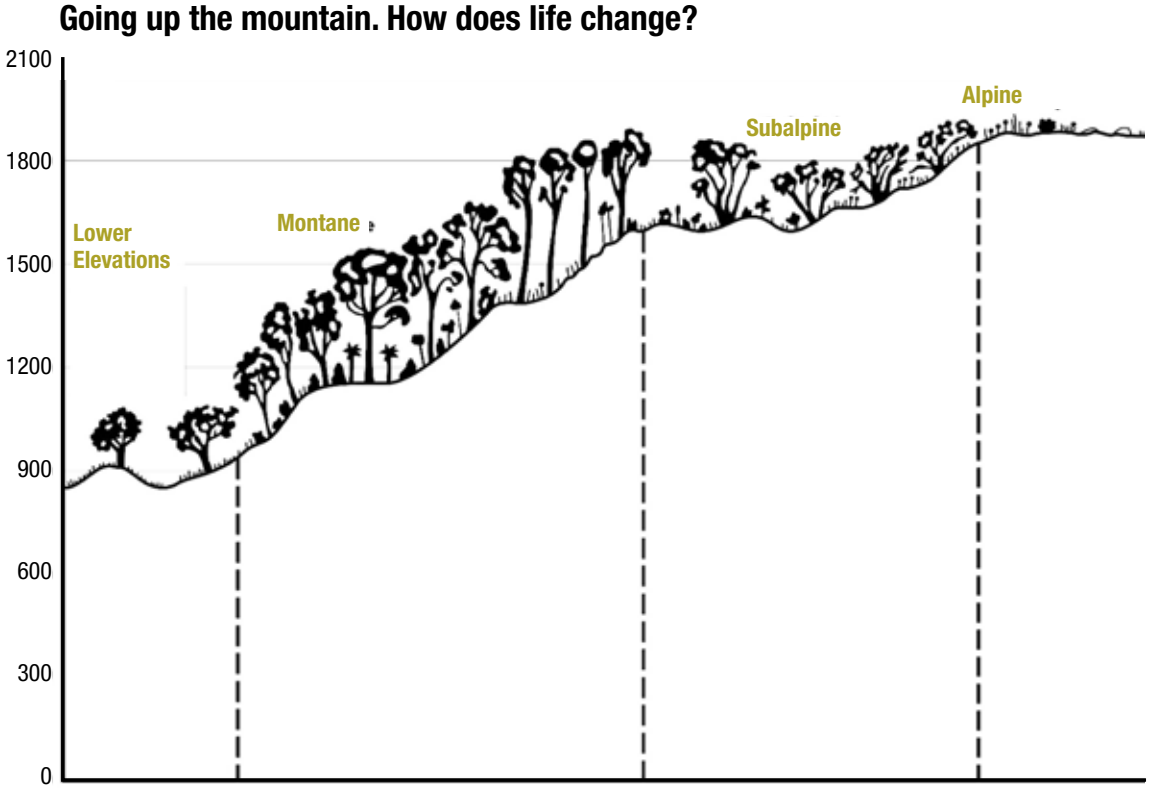
Summer visitors to the Australian Alps are often greeted by mass displays of yellow Billy Buttons, pink Trigger Plants, white Snow and Silver Daisies and many other species of flowering herbs and shrubs. Species from across nearly all Australian plant families grow here either in the eucalypt forests of the montane slopes, or the open woodlands and herb-fields of the alpine and subalpine plateaus. Although most of the plants of the Alps are recognisably similar to those growing in other areas of Australia, the species that grow here have evolved special characteristics in response to this harsh environment.

Cold weather, high precipitation, persistent snow, frost, strong winds, steep slopes and big variations in temperatures - these factors restrict growth and present other challenges to the plants which grow in the Australian Alps. Alpine plants are by necessity adapted to grow in these extreme conditions.

ALTITUDINAL ZONES

The Australian Alps (and mountain areas throughout the world) are characterised by a sequence of vegetation communities with distinct altitudinal zones. Travelling up the mountains, you can readily observe the zones and the different vegetation communities within them. They are characterised by changes in height and species of the dominant eucalypts, the growth forms of certain plants and the density and type of understorey. These changes are linked to changing climatic factors and soil characteristics. Zones can also be recognised by the different colours of the canopy at each level from foothills to high peaks.

There are four distinct zones as you travel up the mountain; lower slopes or tableland, montane, subalpine and alpine. The most obvious change is the transition at the tree line or upper altitude where trees grow. Above the tree line is the true alpine zone where there are no trees and vegetation is primarily of dwarfed shrubs and ground-hugging herbs.



Altitudinal zones.

Lower elevations: include some tableland plains and lower slopes of mountains. A Tableland is a plateau that is less elevated than in the alpine and subalpine zones. Tablelands are extensive in NSW. In Victoria the landforms found at this elevation are foothills. In the ACT, the lower slopes include areas of grassy woodlands and open woodlands found above the level of cold air drainage in valley floors. On the lower slopes or tableland areas of the Alps there are grassy woodlands and dry open forests. Lower growing trees are well spaced and allow a lot of sunlight on to the forest floor. The soils are shallow and hard setting and merge into clay with depth. The open understorey consists of grasses and small shrubs.

Montane zone: As you move up to the montane slopes where precipitation is higher, the forest generally becomes taller, wetter, darker and more dense and it is these montane forests which form the most extensive zone in the Australian Alps. The dominant trees, a mixture of eucalypts, are taller and grow closer together. The understorey is made up of ferns and small trees. High rates of organic breakdown, characteristic of wet forests, result in deep soils.

At the highest elevation of the montane slopes, just below the subalpine zone, there is a band of tall open forest dominated by Alpine Ash (also known as Woollybutt because of its butt of rough, fibrous bark). This narrow band of forest has high precipitation levels with temperatures that allow rapid rates of organic breakdown and vigorous plant growth. Consequently there is a lot of organic matter that can be quickly turned into soil. The soils are deep with plenty of water available to plants and the trees are able to grow tall - the Alpine Ash are the tallest eucalypts in the Australian Alps. The understorey of this forest, however, is much sparser than that of the tall open forests at the lower altitudes, with only a few small trees, shrubs and herbs forming a groundcover.

Subalpine zone: Above about 1500 metres there is an abrupt change from tall forests to a low-growing subalpine woodland dominated by Snow Gums. The plants growing here have to endure low temperatures all year round, and much of the precipitation is in the form of snow and ice. The trees are stunted and often twisted away from prevailing winds. The understorey of this zone is either low-growing shrubs or grasses and herbs.

In the alpine zone above the tree line, it is always treeless but cold air drainage also produces treeless communities in valleys below the tree line. On clear, still nights cold air drains into basin-like valleys, creating alpine conditions at lower elevations. Snow Gums grow on the rims of such valleys and on the knolls above them, thus inverting the treeline. These treeless valleys are called frost hollows and are a major feature of the subalpine zone.

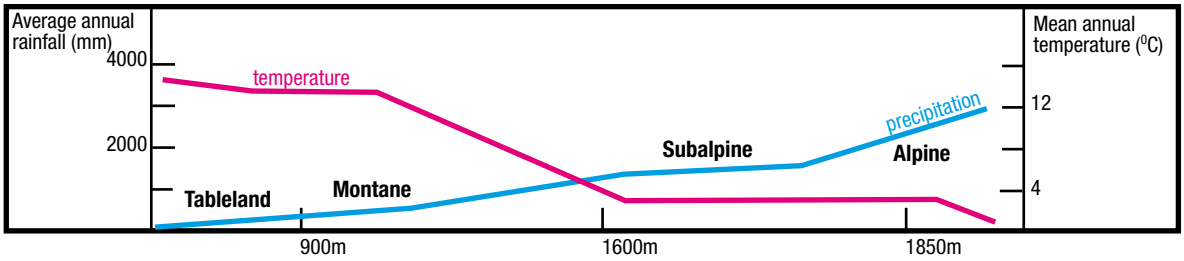
Alpine zone: The most abrupt change in the landscape is seen above the tree line. The alpine zone, subject to the coldest temperatures and the most persistent snow, is too cold for trees. The tree line generally coincides with the mean mid-summer temperature of about 10°C. At this level, where snow cover remains for four months of the year, the leaves of most plants are blocked from direct sunlight and thus unable to photosynthesise all year round. This restricts the development of large root systems, trunks and branches - all features of a tree. The altitude of the tree line depends on latitude and local climatic factors.

In the absence of trees, the alpine zone is a mosaic of heathland, grassland, herbfield and bogs, interspersed by bare protruding rock and rock pavements. The vegetation reflects drainage patterns of water and cold air as well as variations in the soils, topography and degree of exposure. The plants here are mostly ground-hugging and reach no more than a metre in height. Soils are shallow and vary enormously. There are stony soils on peaks and ridges, loamy soils on gentle slopes and peats in the low-lying bogs.

VEGETATION

On the exposed rocky ridges and scree slopes, soils are sparse, shallow and well-drained. Here vegetation communities tend to be scattered shrubby heathland and ground-hugging feldmark or snowpatch communities. The most extensive communities of the alpine zone are tall alpine herbfields and tussock grasslands that grow on sheltered, gentle slopes and hilltops where soils are moderately deep and well-drained. At the bottom of the basin-like valleys, and on poorly drained slopes where soils are deep and waterlogged and decay of organic material is incomplete, Sphagnum bogs and wet heathlands are found.

Comparison of temperature and precipitation



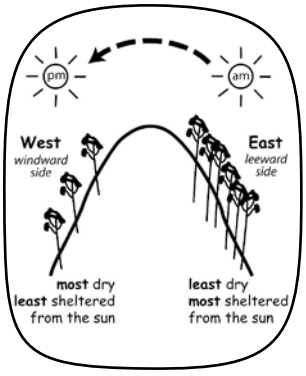
VEGETATION COMMUNITIES OF THE AUSTRALIAN ALPS

Vegetation communities reflect localised differences in climate, landform and aspect. Communities are described by the most common life form of the plants in that community; either trees (woody, one main stem, tall), shrubs (woody, multiple stems, short) or herbs (non-woody, small and short-lived). The structure of the various vegetation communities is generally the same throughout the Australian Alps, but the key species in each community differ slightly from Victoria to New South Wales and the ACT. Also, there are no true feldmark communities in Victoria or the ACT and, the alpine herbfields are much less extensive. Instead, heath communities are prominent in the Victorian high country. Short alpine herb-fields are found on the exposed ridgetops and late lying snowpatches that would generally support feldmark communities in New South Wales.

Variation within the zones

Variations in vegetation communities within altitudinal zones are associated with variations in topography, soils and aspect. The topography of the Alps varies enormously, from sheer escarpments and deep gorges to rolling hilltops and shallow basins. The relief of differing land forms contributes to the development of a range of soils that vary in depth, structure and content, all of which are important factors in determining vegetation communities. In the alpine zone, for instance, shallow soils found on rocky, exposed ridges and scree slopes support shrubby heathland. The soils of the gentle slopes and rounded hilltops are deeper and loamy and carry alpine herbfields and tussock grasslands. Bog plant communities are found on peats developed in the bottoms of basin-like valleys.

Aspect and vegetation



Aspect is a major factor governing vegetation communities. For example, forests of the steep montane slopes vary from wet tall forests on the south- east slopes to dry tall forests on the north-west slopes. Conditions are always drier on the north-western slopes. The sun rises in the east, shining on the eastern slopes in the early part of the day when temperatures are low and there is still ample moisture around from the night before.

Temperatures remain moderate and the vegetation stays moist. As the sun moves into the western sky, the temperatures for the day reach their maximum, the hot sun streams down directly on the western slopes, and any excess moisture is quickly evaporated. At the top of the mountains in the alpine zone, the drier, north-west aspect is generally also exposed to prevailing winds, often carrying snow and ice. Here you find the hardiest species best adapted to exposure. On the leeward side (sheltered from prevailing winds and the hottest sun), species tend to be taller and less hardy.

At the highest elevations, snow is blown off the exposed aspect on to the leeward side (usually the south-east facing slope) where it accumulates in deep drifts. These drifts, known as snow patches, are sheltered from the hottest sun and remain almost all year round, melting only at the height of the alpine summer. The short alpine herbfield or snowpatch community generally grows below snow patches where the environment is much colder than elsewhere. Some plants of snowpatch communities, such as the Marsh Marigold, grow and even flower beneath the melting snow.

Woodland: These occur in the river valleys and foothills or tableland in and around the Australian Alps. Woodland is an open community of shorter trees (10 – 30m), with a generally grassy understorey. Key species are Mountain Swamp Gum (*Eucalyptus camphora*) (Vic) or Yellow Box (*Eucalyptus melliodora*) (NSW, ACT) and River Red Gum (*Eucalyptus camaldulensis*).

Open forests (Dry Sclerophyll): Open Forests occur on the drier north and west-facing steep montane slopes and gentler lowland hills. They are characterised by fire resistant eucalypts, woody shrubs and grasses that tolerate drier conditions. Key species are Red Stringybark (*Eucalytptus macrorhyncha*), Broad-leaved Peppermint (*Eucalyptus dives*) (Vic) and White Gum (*Eucalyptus rossii*).

Tall open forests (Wet Sclerophyll): Tall open forests occur on the extensive, moist south and east-facing slopes of the steep montane zone on deep, well-structured soils built up from aeons of deposition from above and litter induced by high precipitation and moderate temperatures. The environment is moist and the understorey generally lush and thick and characterised by ferns and other moisture-loving plants. The plants of this zone are usually fire sensitive. Key species are Narrow-leaved Peppermint (*Eucalyptus radiata*) (Vic), Candlebark (*Eucalyptus rubida*) (Vic), Brown Barrel (*Eucalyptus fastigata*) and Mountain Gum (*Eucalyptus dalrympleana* (NSW, ACT) and Manna Gum (*Eucalyptus viminalis*).

Alpine Ash forest (AKA Wet Scherophyl forest): Alpine Ash Forest, dominated by Alpine Ash (*Eucalyptus delegatensis*) and Mountain Gum (*Eucalyptus dalrympleana*), occurs in the moist, upper levels of the montane zone. This forest is characterised by tall, straight trees and a fairly open understorey of grasses, herbs and some shrubs. Soils built up from higher level deposition and litter build-up induced by high precipitation and moderate temperatures creates a fertile environment. Alpine Ash exhibits seed dormancy which, in contrast to other montane species, enables it to tolerate the colder temperatures of higher elevations. However Alpine Ash is very fire sensitive, so regeneration is reliant on the seed bank in mature trees.

Subalpine woodland: occurs on the more sheltered areas of the undulating plateaus of the subalpine zone. It is dominated by Snow Gum (*Eucalyptus pauciflora*), the only species of tree able to grow at this altitude, the understorey is typically a grassland or herbfield community. At the highest and coldest elevations, Snow Gums grow in shrub or mallee form (stunted with many stems). They are not found in rocky, stony or waterlogged areas.

Alpine shrubby heathland: is found in the less sheltered areas of the subalpine zone and in the alpine zone on the shallow, stony, well-drained soils of stony slopes and on rocky ridges. Dominated by shrubs, the community is sparsely populated by woody heaths interspersed with herbs and tussock grasses. The key species are Yellow Kunzea (*Kunzea ericifolia*), Alpine Grevillea (*Grevillea australis*), Leafy Bossiaea (*Bossiaea foliosa*) (Vic), Common Oxylobium (*Oxylobium ellipticum*) (NSW) and Mountain Plum Pine (*Podocarpus lawrencei*).

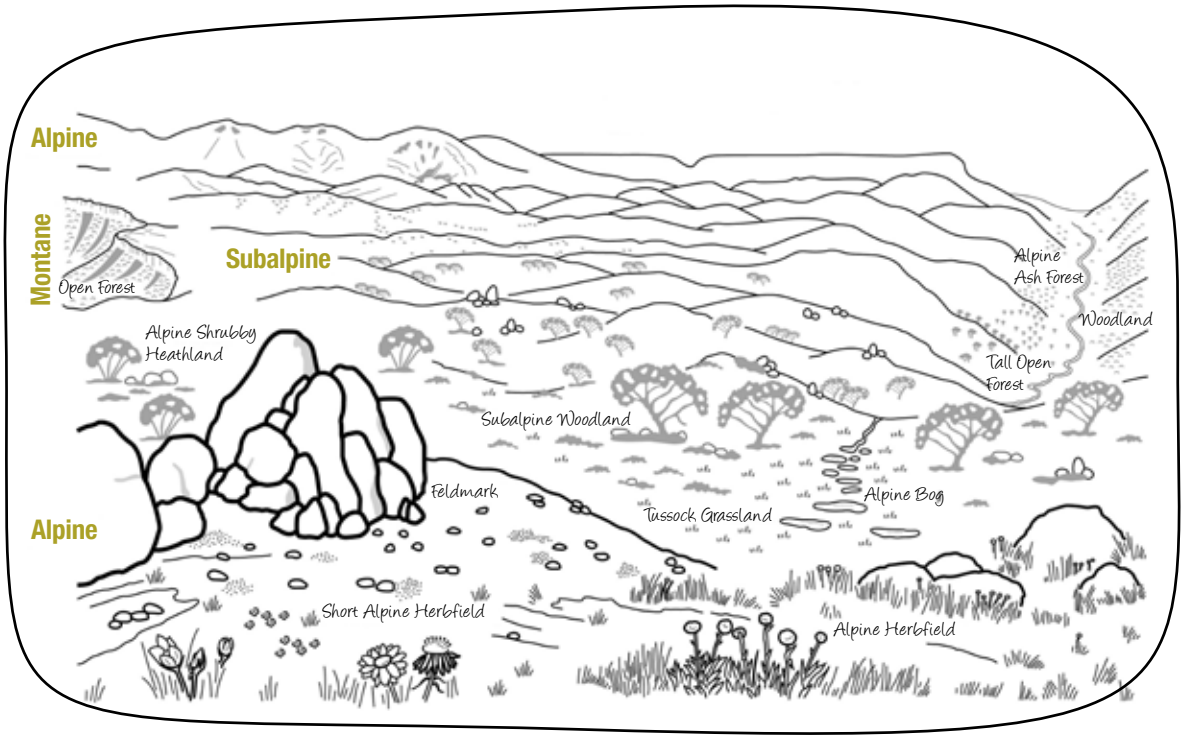
Tussock grassland: Tussock Grassland occurs on the less well-drained areas of the sub-alpine zone and is often associated with cold air drainage basins below the tree line The community is characterised by separate grass tussocks, the tops of which form a closed canopy of interlacing leaves. Shade-tolerant herbs may occupy the spaces between the tussocks. The key species are Prickly Snow Grass (*Poa costiniana*) and Mountain Gentian (*Gentianella diemensis*).

Tall Alpine herbfield: occurs on well-drained slopes and rolling hilltops of the subalpine and alpine zones in relatively sheltered sites without exposure to strong winds and waterlogged or stony soils. The community is characterised by tussock grasses and small herbs growing together to form a continuous cover. The key species are Snow Daisies (*Celmisia* spp), Snow Grasses (*Poa* spp.) and Billy Buttons (*Craspedia* spp.).

Alpine bog: these bogs occur in the subalpine and alpine zones on permanently wet sites and is dominated by hummock forming Sphagnum Moss (*Sphagnum cristatum*) growing with sedges, rushes and wetland heaths. Bogs are generally spring-fed seepages on hillsides and edges of valleys. In still wetter parts - such as valley floors - Sphagnum disappears and the sedges form a fen. Other key species are Pineapple Grass (*Astelia alpina*) (Vic) and Swamp Heath (*Epacris paludosa*).

Short alpine herbfield: is found in the alpine and subalpine zones, specifically below long lasting snow patches. Here the environment is colder and thus the growing season shorter and soils frequently wetter than in Alpine Herbfields. The key species are Alpine Marsh Marigold (*Caltha introloba*), Alpine Wallaby Grass (*Danthonia nudiflora*) (Vic), Alpine Plantain (*Plantago* sp.), Alpine Trachymene (*Trachymene humilis*) (Vic) and White Purslane (*Neopaxia australasica*) (NSW).

Feldmark: Feldmark communities only occur in the alpine zone of NSW on exposed ridges at the highest elevations where they are exposed to high winds, coldest temperatures and severe frosts. They are characterised by an open community of sparsely growing, dwarf plants dominated by cushion-forming or prostrate species only a few inches high with bare earth and rock in between. The key species are Rock Heath (*Epacris petrophila*), Chionohebe (*Chionohebe densifolia*), Spreading Coprosma (*Coprosma pumila*) and Hard Cushion Plant (*Colobanthus pulvinifica*).



Vegetation communities of the Australian Alps.

VEGETATION

ADAPTATIONS OF ALPINE PLANTS

The combination of geographical isolation and adaptation to extreme conditions has led to the evolution of a considerable number of plant species that do not occur anywhere else. These are known as endemic plants. Ten percent of the plants in the Australian Alps are endemic, a much higher percentage than in most other areas.

Plants of the alpine and subalpine zones have developed a number of behavioural and physical adaptations in response to the characteristically low temperatures, extreme summer temperature fluctuations, high levels of precipitation (winter snow and summer rain), frequent frosts and strong winds of these high elevations. These adaptations are repeated in high mountains throughout the world. Although the climate of the Australian Alps is comparatively mild, our alpine plants display most of these universal characteristics.

CHALLENGE	ADAPTATION
extremely short growing season following a long cold and snowy winter-spring period	**rapid growth period** Most species are dormant in winter, then grow rapidly, flower and set seed ,during the short, warm (or summer) season of 4-5 months from November to April. Some species such as the Marsh Marigold (Caltha introloba) flower whilst still under the snow. **seed dormancy and stratification** The seeds of many alpine plants remain dormant over the winter period and will not germinate until subjected to stratification, a 6-8 week moist period at low temperatures, which breaks the dormancy. Species that require stratification include the Mountain Banksia (Banksia canei) and the Snow Gum (Eucalyptus pauciflora). Overwintering beneath the snow provides a natural stratification treatment and the seeds are ready to germinate quickly at the onset of spring. This mechanism protects them against germination late into the growing season, just before snow comes. **vegetative growth** Some plants such as eucalypts and some wattles regrow vegetatively from stock root or send out runners that shoot up.
strong winds	**growth form and size** Rosette plants, tussock grasses and dwarf shrubs are common plant types in the alpine zone. Small size and a ground-hugging habit are essential for most alpine plants to avoid the strongest winds and take advantage of the warmer conditions close to the soil. Other plants such as tussock grasses grow with their stems clumped together. This provides protection from winds and frost.
snow and ice	**flexible stems** Taller shrubs have flexible stems so that they bend rather than break under the weight of snow. Snow Gum branches are not so flexible, and many are pruned each year during heavy snow falls. The leaves of the tussock grass, both living and dead, provide protection against low temperatures and needle ice for new growth at the tussock base.
shorter daily photosynthetic periods	**Optimum photosynthesis and respiration at lower temperatures** Optimum photosynthesis rates of alpine plants happen at lower temperatures period than for plants in non-alpine zones. Even so, only a limited amount of energy can be harnessed because of the shorter daily photosynthetic periods and shorter annual growth periods. This results in less growth over long periods of time. Hence dwarf alpine shrubs such as the Mountain Plum Pine (Podocarpus lawrencei) may be much older than they appear.
needle ice will lift and break root of poorly anchored young plants	**Early development of root systems in seedlings** A well developed root system is essential for contending with needle-ice heave. Most of the early growth of alpine plants is below the soil surface.
water locked up in snow and ice is unavailable to plants	**Drought tolerance and cold hardiness** The leaves of alpine and desert plants have similar adaptations to help reduce moisture loss through the leaf surface. Leaves are often small and thick and leathery, or folded, or rolled. Hairs on leaf surfaces help reduce moisture loss by restricting air circulation across the surface, which reduces evaporation.

VEGETATION

UNIQUE PLANTS

The uniqueness of the alpine and subalpine vegetation of the Australian Alps has been acknowledged nationally and internationally. Kosciuszko National Park and its plant communities have been recognised by the United Nations Educational Scientific and Cultural Organisation (UNESCO) as a World Biosphere Reserve. This is one of only 300 Biosphere Reserves listed world wide.

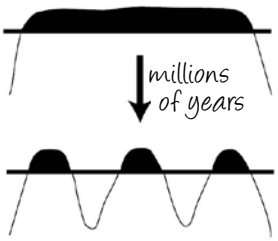
Anemone Buttercup, a threatened species.

Much of the area encompassing the Australian Alps has been protected in national parks and other conservation areas. Despite this, there are many threatening processes, both natural and those imposed by human interaction, that are having an increasing negative impact on the vegetation.

There are a number of native plants that currently have the status of threatened species. These include the Anemone Buttercup, Bogong Daisy-bush and the Silky Daisy Bush. The presence of introduced plants and animals, development for skiing and other recreational activities, tourism, grazing, forestry and fires have all had, or are having, significant impacts on the vegetation of the Australian Alps.

ALPINE ISLANDS

Millions of years ago the alpine and subalpine mountain peaks and ridges were once higher and more continuous, connected by large alpine or subalpine tracts. Over a long period of time, rivers have worn deep valleys, forming extensive areas of montane slopes.



This dissection has separated alpine areas and climatic changes such as global warming since the last ice age have caused them to recede. Alpine and subalpine zones, particularly in Victoria where the degree of dissection is greater, have become small islands isolated from each other by distance, different climatic conditions and different vegetation communities. These small pockets are even more vulnerable to human interaction because each is limited in area and adapted to particular climatic conditions. In addition, plant growth can be slow because of the short growing season and so recovery after damage may take longer than for plants growing in more favourable climates.

PLANTS AND FIRE

Fires have been a natural part of the landscape in south-eastern Australia for thousands of years, although always less frequent and of lower intensity in the alpine environment. Many plants in the Australian Alps have evolved to live with fire and some plants have developed special adaptations in response to fire. The effect of one fire is not as environmentally significant as the frequency, timing and intensity of fires over many years. This is called the fire regime and plants in Australia have adapted to particular fire regimes in different ecological zones and regions.

The alpine vegetation communities have adapted to a regime of infrequent and low intensity fires. Most plant species survive bushfires by using one or both of two basic mechanisms – one involving resprouting of damaged plants, the other a range of responses which result in new plants being established from seed. Fires of the right intensity and timing can trigger a successful survival response. However, harmful effects can follow fires that occur at the wrong time and fires that recur at the wrong frequency. The way in which some plants respond to fire is not always a specific fire adaptation. It may be a general response to stress and could be triggered by drought, frost, disease or browsing.

VEGETATION

Burnt Snow Gums.

Eucalypts have a number of specific adaptations that enable them to survive and recover well from fires. A lignotuber is a bulbous mass that forms on the seedling below the surface of the soil. Most eucalypts develop lignotubers to varying degrees of size and strength. As the seedling lignotuber increases in size there is a proliferation of dormant bud strands within the woody mass. The storage tissues also contain nutrient and starch reserves. It is these reserves and the dormant buds which enable eucalypts to re-sprout following damage by grazing, fire, logging or some other agent of destruction.

Eucalypts also have the ability to produce epicormic shoots. A small shaft of tissue with bud producing properties, called an epicormic bud strand, grows radially outwards from the old leaf axil at a rate which corresponds to the diameter growth of the mother stem. These bud strands are capable of producing leafy shoots but are normally held back by growth substances produced in the leaves and shoots above them. Should these leaves and shoots be lost through insect attack or fire, this restraint is removed, and shoots may develop.

Some vegetation communities need fire to preserve their biodiversity. For example, Alpine Ash forests may only exist because periodic, intense fires create the conditions needed to re-establish them every one or two centuries. More frequent fire is needed to preserve diversity in heathlands or grasslands. Other communities, such as rainforests, might only persist if kept free of fire.

Many alpine and subalpine ecosystems can recover fairly readily from fire. However, wetlands can be very slow to recover particularly if the peat below the Sphagnum Moss gets burnt because of the changes in the hydrography of the community. Water, which was once held in the bogs, is no longer available, changing the character of the environment completely.

Alpine Ash regeneration.

VEGETATION

PLANTS THAT DON'T BELONG

A weed can be an introduced or a native plant, one that has invaded an ecosystem where it doesn't belong and where is has a negative impact. In the Alps most weeds are introduced plants that are there due to disturbance from past land uses.

Some weeds were introduced on purpose while others have arrived by accident. In the 1800s, European explorers and settlers planted crops such as blackberries as a food supply for people. There were also acclimatisation societies whose main aim was to make the new country feel and look more like England where the first European settlers originated. Ornamental trees and shrubs were planted in early gardens in towns in the Alps. Foreign grasses were planted for horses, sheep and cattle. Some introduced plants were used to stabilise road batters or revegetate disturbed areas.

Weeds generally begin their invasion in areas of bare ground where native plants have been removed or have died for some reason. Many weeds appear to have links with roads and ski resort development. Some common weeds in the Alps include Radiata Pine, Black Willow, English Broom, Yarrow, Clover, St. John's Wort, Twiggy Mullein, Dandelion, Sorrel, Scotch Thistle, Lupin and Himalayan Honeysuckle.

St John's Wort in flower.

It's likely that the weed, Orange Hawkweed has been in the Alps for some decades but only recently has it begun to spread and therefore been noticed by park managers. In other countries such as New Zealand, Hawkweed is a menace in alpine areas due to it being highly invasive. Park managers are investing significant resources on either eradicating this weed or containing it as much as possible. Once weed and pest animals have become fully established in a National Park, it is virtually impossible to eradicate them.

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VEGETATION

GLOSSARY

Alpine zone: the elevation above the tree line with mean midsummer temperatures below 10°C and very high precipitation. Alpine zone landforms include rolling summits, exposed ridgelines and rocky outcrops. Vegetation includes herbfields, grasslands, bogs and fens.

Growth forms: the great variety of plant form is related to the different ways in which they grow. The German botanist, Raunkiaer developed one way of looking at plant form according to where they grow and how they survive through the winter. Other ways of describing plants are based on how much they branch, the direction in which branches grow and how far they grow. Trees will often change their branching pattern as they grow.

Montane: high slopes where the mean midwinter temperature is above 0°C and there is very high precipitation. Here snow falls but does not persist. Landforms include steep slopes dissected by deep gullies, escarpments, deep gorges and waterfalls. Vegetation includes tall, wet, open forests, dry, open forests and rainforests.

Precipitation: when cloud particles become too heavy to remain suspended in the air, they fall to the earth as precipitation. Precipitation occurs in a variety of forms including hail, rain, freezing rain, sleet or snow.

Subalpine: the zone immediately below the tree line with a mean midsummer temperature above 10°C, very high precipitation and snow persisting for one month or more. Landforms include undulated plateaus, shallow basins and rolling hills. Vegetation includes subalpine woodlands, mostly scattered Snow Gum with herbfield, grassland or heathland understorey.

Tableland: foothills and low plateaus which are warmer, with lower rainfall and generally no precipitation in the form of snow. The vegetation comprises woodlands, shorter trees with heathy shrubs or grassland understorey.

Treeline: the area where trees do not grow due to temperatures that are too cold and persistent snow.

Understorey: the plants which grow beneath the canopy of taller tree. The understorey can include grasses, herbs and shrubs and sometimes vines, ferns, mosses, lichens and fungi.
Vegetation communities: plants that form part of an ecosystem.

PLANTS AND ANIMAL SPECIES

Alpine Ash, *Eucalyptus delegatensis*
Anenome Buttercup, *Ranunculus anemoneus*
Billy Button, *Craspedia sp*
Black Willow, *Salix nigra*
Bogong Daisy-bush, *Olearia frostii*
Dandelion, *Taraxacum officinale*
English Broom, *Cytisus scoparius*
Himalayan Honeysuckle, *Leycesteria formosa*
Lupin, *Lupinus angustifolius*
Marsh Marigold, *Caltha intoloba*
Mountain Plum Pine, *Podocarpus lawrencei*
Orange Hawkweed, *Hieracium aurantiacum*
Radiata Pine, *Pinus radiata*
Scotch Thistle, *Onopordum acanthium*
Silky Daisy Bush, *Olearia erubescens*
Silver Daisy, *Celmisia asteliifolia*
Snow Daisy, *Brachycome nivalis*
Snow Gum, *Eucalyptus pauciflora*
Sorrel, *Acetosella vulgaris*
St John's Wort, *Hypericum perforatum*
Trigger Plant, *Stylidium graminifolium*
Twiggy Mullein, *Verbascum virgatum*
White clover, *Trifolium repens*
Yarrow, *Achillea millefolium*

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