

It becomes increasingly divaricating in response to browsing, eventually forming a complex lattice-work of rigid stems with spiny tips, which to some extent protect the new leaves from further damage.

In the mire proper, the most common plant is the large grass, red tussock (Plate 13), which is typical of medium fertility mires. Several sedges are also common, especially *Carex coriacea* (Plate 10), which is summer green and has a graceful drooping seedhead, and the smaller star sedge (*Carex echinata*), on which the mature seed head clusters have a star-shaped arrangement. A tufted lily, *Bulbinella hookeri* (Plate 10) which, if unbrowsed by hares, produces masses of golden flowers during early summer, is also common. The ground layer plants here include mosses, especially *Dicranoloma robustum*, and many different small herbs and grasses, some of which are also common components of the alpine herbfields of Mt Taranaki. Towards the mire centre shrubs are common only on the better drained sites such as stream banks or mounds; those scattered in the mire proper are much dwarfed. Within the red tussock-dominated vegetation there are small patches of several other distinctive vegetation types. Sedgeland dominated by the reddish-stemmed *Schoenus pauciflorus* occurs in flushes, and cushion bog dominated by comb sedge (*Oreobolus pectinatus*) (Plate 10) and sphagnum occurs on the most poorly drained and acidic sites. A rather unobtrusive plant, and one of the several species confined to this part of the park, is a miniature fern belonging to the genus *Schizaea* (*S.* sp. cf. *fistulosa* and *australis*) (Plate 10). Several sites on top of the Pouakai Range also support cushion bog vegetation but with a much greater element of alpine herbfield species, and a creeping bog daisy, *Celmisia* "setacea", not found elsewhere in the park. The lakelets at the eastern end of the Ahukawakawa Swamp are fringed with flax, and a pond weed, *Potamogeton suboblongus*, and a milfoil, *Myriophyllum pedunculatum* subsp. *novae-zelandiae*, grow partially submerged in the water.

Flax also fringes the northern shore of Lake Dive, a lakelet on the south-west slope of Mt Taranaki at 804 m a.s.l. The 'trunked' sedge, *Carex secta* var. *secta*, is prominent as well. Many are host to small creeping herbs, including everlasting daisy, lantern berry (*Luzuriaga parviflora*), and *Gonocarpus aggregatus*.

The Mangawhero Bog (730 m a.s.l.), less than 3 km south-east of Lake Dive, is quite fertile because of the flush conditions associated with the springs there. It is dominated by *Carex secta* var. *secta* and flax overtopped by scattered manuka. A wetland willowherb, *Epilobium chionanthum*, is common.

Subalpine scrub and shrubland

Scrub and shrubland vegetation covers most of the upper Pouakai Range and forms a belt 800 m to 1 km wide around Mt Taranaki between 1100 m and 1400 m a.s.l. Scrub and shrubland is also found associated with the park mires (see Mire vegetation).

Most widespread is the type (Appendix 5a) dominated by the shrub daisy, leatherwood (*Brachyglottis rotundifolia* var.), which



forms a tight-knit canopy usually no more than 2.5 m high. Its rigid multi-stemmed, often semi-prostrate stems make traverse almost impossible. On the axial ranges of the North Island the subalpine scrub zone is usually dominated by another shrub daisy, *Olearia colensoi*, also known as leatherwood. Comparison of the North Island distribution of the two leatherwoods shows that *Olearia colensoi* avoids recent volcanic soils whereas *Brachyglottis rotundifolia* var. flourishes on them.

Leatherwood has thick leathery leaves covered beneath with whitish tomentum (Plate 12). Wardle (1965) has suggested that New Zealand plants of mostly wet, cloudy subalpine climates possess these features in order to make effective use of short spells of fine weather and to withstand infrequent but intense periods of drought. Leatherwood flowers (Plate 12) lack ray florets and the bracts, which remain long after the "parachuted" seed has been dispersed by the wind, are known as "wood flowers" (Plate 12).

The most common canopy associates of leatherwood are mountain five-finger, haumakaroa, inaka, *Hebe* "egmontiana" and two small-leaved coprosmas, *Coprosma pseudocuneata* (Plate 12) and *C. sp. (t)*. Inaka, a member of the *Epacris* family, has needle-like leaves (Plate 12) and is a leading dominant in a type (Appendix 5b) common on sites which are slightly less well drained or have been disturbed by slipping or debris flows. On these disturbed sites, inaka shrubland is usually a forerunner to leatherwood scrub.

Scattered emergent wind-shorn kaikawaka occur in places in the lower parts of the scrub and shrubland belt, especially on the Pouakai Range. Mountain totara and broadleaf are also present but have growth forms markedly different from their forest counterparts. The mountain totara are stunted, windshorn, and shrub-like whereas the broadleaf have compact, domed crowns and are mostly of terrestrial rather than epiphytic origin. Litter covers most of the ground, but a tufted lily *Astelia* sp. [unnamed; aff. *A. nervosa*] is usually present. Fewer vascular epiphytes are present here than in the montane forest, but the filmy ferns, *Hymenophyllum multifidum* and *H. armstrongii*, and the small strap-leaved ferns, *Grammitis magellanica* subsp. *nothofagei* and *G. billardierei*, are quite common. Bush lawyer is the only liane.

With increasing altitude, the shrubs become shorter and more compact. Leatherwood loses its overwhelming dominance and mountain tauhinu (Plate 13), *Hebe odora* (Plate 13), *Myrsine divaricata*, and inaka become more prominent. Where the shrub cover has been broken by rock falls or landslides, pockets of low-growing plants, more typical of the tussockland and herbfield, occur.

Although the Pouakai Range and Mt Taranaki scrub and shrublands have many features in common, there are some significant differences in composition. Several plants found on the Pouakai Range are absent from or present only in very low numbers on Mt Taranaki and vice-versa. These differences reflect and highlight the relatively recent history of disturbance on Mt Taranaki, especially on the north-western slopes. For example, a mountain tutu, *Coriaria pteridoides*, well known as an early coloniser of disturbed sites, is common on Mt Taranaki but scarce on the Pouakai Range. Species found on the Pouakai Range but

Plate 11 Subalpine scrub

1 *Libocedrus bidwillii*. (Kaikawaka)

- a branch showing foliage and female cones $\times 0.6$.
- b female cone $\times 2.5$.
- c adult foliage enlarged $\times 2.5$.

2 *Pseudopanax colensoi* s.s.

- (Mountain five-finger)
- a branch showing foliage and compound umbels of flower buds $\times 0.6$.
- b side view of male flower $\times 4.0$.
- c side view of female flower $\times 4.0$.

3 *Pseudopanax simplex* (incl. *P. simplex* var. *sinclairii*).

- (Haumakaroa)
- a branch showing foliage and compound umbels of ripe fruit $\times 0.6$.
- b base of petioles showing attachment to stem $\times 3.0$.
- c compound leaf and petiole $\times 1.3$.
- d side and top view of fruit $\times 4.0$.
- e simple leaf $\times 0.8$.



not on Mt Taranaki include the prostrate tree fern *Cyathea colensoi*, and two shrubs, *Hebe venustula* (Plate 18) and *Coprosma* sp. (p).

Shrubland gives way to shrub-tussockland and ultimately to tussockland with increasing altitude or poor drainage. At first, a few spindly plants of red tussock project through the shrub-dominated canopy but gradually or abruptly, depending on the steepness of slope, red tussock assumes dominance (Appendix 5d).

Subalpine and alpine tussockland

Tussockland (Appendix 6) occurs as a narrow c. 500 m-wide belt between 1400 m and 1600 m a.s.l. on Mt Taranaki. It also covers the high peaks and poorly drained tops of the Pouakai Range and is predominant in the Ahukawakawa Swamp (see Mire vegetation).

In the common type, red tussock (Plate 13), between 75 cm and 120 cm tall, dominates the canopy, and silver tussock is an important associate. Mt Taranaki is the only area above tree-line in the North Island where silver tussock is so important (Druce 1961). At the lower limits of the belt and where drainage is not too poor, shrubs are scattered amongst the tussock. The most common is *Hebe odora* (Plate 13) followed by mountain tauhinu (Plate 13), inaka, leatherwood, and the much smaller semi-prostrate shrub *Coprosma depressa*. Where conditions are most favourable for the tussocks they are crowded together and little space remains for smaller plants. But at the upper levels of the belt or on poorly drained sites, the tussocks are more widely spaced, and there is a well-developed herb layer. This type of vegetation is named tussock-herbfield (Appendix 7c).

The most spectacular flowering plants in the park, a golden-flowered buttercup, *Ranunculus nivicola* and the large-leaved ourisia (*Ourisia macrophylla* subsp. *macrophylla*), are common in the tussockland. *Ranunculus nivicola* (Plate 14) flowers between November and February and, as its specific name suggests, it also grows in the often snow-covered upper herbfield zone. The large-leaved ourisia (Plate 14), which flowers over a similar period, has long flower stalks (up to 40 cm) with many whorls of white flowers. As the lower-most whorls of flowers die back, those on the whorls above open, giving a flowering display lasting many weeks. Although most prominent in the tussockland, the large-leaved ourisia also clothes many of the stream banks in the goblin forest and occurs well up into the herbfield zone.

A green-hooded orchid, *Pterostylis banksii* var. *patens*, distinguished from other species of the genus found in the park by its strongly reflexed lateral sepals, is occasionally found at the lower limits of subalpine tussockland (Plate 14). Like all its close relatives, it has a labellum (Plate 14) which is sensitive to insect visitors, suddenly flicking them upwards and into the bottom of the flower. If an insect is trapped it has only one possible route to follow to get out. In doing so it deposits and receives pollen thus ensuring cross-fertilisation of the flower.

The poorly drained tussockland of the Pouakai tops (Appendix 6a) is floristically quite different from the type already outlined.

Plate 12 Subalpine scrub and shrubland

1 *Brachyglottis rotundifolia* var. [*Senecio elaeagnifolius*].

(Leatherwood)

a branch habit, leaves, and old flower stalk × 0.6.

b remnant bracts "wood flowers" from previous flower season × 4.0.

2 *Coprosma pseudocuneata*.

a branch × 0.6.

b apical shoot showing leaf arrangement × 2.5.

3 *Dracophyllum longifolium* var. [*D. fillifolium*].

(Inaka)

a branch × 0.6.

b old capsule in calyx × 12.0.

c needle-leaf × 4.0.

