mountain five-finger, and haumakaroa, especially at higher altitude. However, kaikawaka is absent from the recent debris fans on the north-west slopes of Mt Taranaki and montane forest is only barely represented, the upper forest limit being considerably depressed as a result of destruction by recent debris flows.

On Pouakai the pattern is very different, as most of the forests have not been affected by such recent extensive disturbances. Both kamahi and kaikawaka reach higher altitudes than on Mt Taranaki. Kamahi–mountain totara forest gives way almost imperceptibly to leatherwood scrub with kaikawaka occurring in both types. Exceptions to this general pattern are some of the forests at the southern end of the range.

Kaikawaka/kamahi forest + kaikawaka/leatherwood scrub

On the slopes and ridges above the northern margin of Ahukawakawa Swamp is a mosaic of kaikawaka/kamahi forest and kaikawaka/leatherwood scrub, the former mainly on relatively sheltered easterly aspects and the latter exposed to the prevailing westerly winds.

Kamahi forest + leatherwood scrub

The very steep slopes above the northern upper reaches of the Stony River support a mosaic of kamahi forest and leatherwood scrub. This area was blasted by the *c.* 1500–1550 A.D. eruptions and is fully exposed to the westerly winds which are channelled between Pouakai and Mt Taranaki.

Plate 9 Montane forest

1 *Hymenophyllum rarum.* (Filmy fern)
a habit of plant ×0.8.
b indusium containing sporangia ×12.0.
c indusium cut to show sporangia and method of attachment to receptacle ×10.0.
d single frond ×1.5.

2 *Cardiomanes reniforme.* (Kidney fern)
a rhizome with a young frond and two fertile fronds ×0.6.
b indusium cut to show receptacle and sporangia ×8.0.
c sori on frond margin ×8.0.

3 *Hymenophyllum pulcherrimum.* (Filmy fern)
a fertile frond ×0.6.
b part of fertile frond ×5.0.
c top view of indusium with sporangia ×10.0.
d side view of indusium with sporangia ×10.0.

4 *Asplenium flaccidum* subsp. *flaccidum.* (Hanging spleenwort)
a single fertile frond ×0.6.
b part of fertile frond showing sori ×1.5.

Mire vegetation

Although little more than 300 ha (less than 1% of the park area) supports mire vegetation, this class is remarkable for its floristic richness and the diversity it adds to the park landscape. The Ahukawakawa Swamp alone has nearly 260 different species of higher plants (Druce 1976b) and several of these are unknown elsewhere in the park. The most accessible mires are Ahukawakawa Swamp (situated close to the Round The Mountain Track), "Potaema Bog" (near Pembroke Road), and the lakelet, Lake Dive (on the Lake Dive Track). There are, however, many other mires, all small and difficult to reach, but of great botanical interest. These include "Norfolk Road Bog", "Mangawhero Bog", "York Road Bog", "Denbeigh Road Bog", and an extensive network of bogs to the west of Kahui Hut. Altogether there is a range of mires from fertile swamps to infertile acid bogs.

Lowland mires

Potaema Bog at 670 m a.s.l. is the largest of the lowland mires and has the greatest variety of vegetation (Appendix 2). The surrounding forest is mostly rimu–rata/kamahi but a narrow belt in which kahikatea is prominent occurs close to the bog margin. Also present in this belt are some rata of terrestrial origin, mountain totara, pokaka, and a few kaikawaka. Towards the forest margin, kamahi becomes shorter and more shrubby, and a robust lily, *Astelia grandis*, and a large tussocky sedge with harsh cutting


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leaves, *Gahnia xanthocarpa*, become understorey dominants. Common shrubs are rohutu and mingimingi (*Leucopogon fasciculatus*). At the edge of the mire, kamahi gives way to manuka and lancewood (*Pseudopanax crassifolius*) which overtop a dense frontage of *Gahnia xanthocarpa*. Beyond this, in the mire proper, is a sparse cover of manuka overtopping scattered flax (*Phormium tenax*), *Astelia grandis*, and a mixture of rushes and sedges. The most common of these are four-square sedge (*Lepidosperma australe*) (Plate 5), *Baumea rubiginosa*, and the adventive jointed rush (*Juncus articulatus*). During summer, a blue-flowered orchid, *Thelymitra venosa* (Plate 5), can be found growing amongst the sedges. Another plant flowering here at this time is the insect-catching sundew, *Drosera binata*, which, like the *Thelymitra*, dies back in winter. A few sites near the centre of the bog have sphagnum and tangle fern (*Gleichenia dicarpa*) (Plate 5), species more characteristic of infertile acid mires.

Norfolk Road Bog (548 m a.s.l.) is very similar in composition to Potaema Bog, but flax is rare, there is more tangle fern and, in the shrub belt, a twiggy coprosma, *Coprosma tenuicaulis*, is very prominent.

York Road Bog (548 m a.s.l.) is better drained than both the Potaema and Norfolk Road bogs, with manuka forming a more or less continuous canopy over the understorey dominant *Gahnia xanthocarpa*.

Denbeigh Road Bog (570 m a.s.l.), has a substantial water flow making it more fertile than the other mires, and it is dominated by flax, *Gahnia xanthocarpa* (taller than 2.5 m), and *Astelia grandis*. The most common woody plant here is the shrub daisy, *Olearia virgata* var. *virgata* (Plate 5), which has four-angled stems and small tomentum-backed leaves.

A network of small mires has developed in the many shallow depressions on the surface of the Maero debris flows of western Mt Taranaki. The largest of them. "Kahui Bog", is 2.5 km west of Kahui Hut. Nearly all of the mires are composed of scattered manuka overtopping beds of the bluish-green rush-like sedge, *Baumea rubiginosa*. Another species of *Baumea* with much finer culms, *B. tenax*, is common on the mire margins and in the lower altitude mires it is joined by the fern *Blechnum minus*. The tall (up to 100 cm) green-flowered orchid *Prasophyllum patens* has been found in some of these mires.

Montane mires

Ahukawakawa Swamp is tucked between Mt Taranaki and Pouakai at 920 m a.s.l. Most of the vegetation features of this mire complex have been mapped and described by Margaret Bayfield (Waters 1982). Her map is reproduced on p. 46 (Fig. 5) and data from typical plots are given in Appendix 4.

The scrub and shrubland on the southern margins, particularly on the Maero debris flows, is dominated by inaka (*Dracophyllum longifolium* var. [*D. filifolium*]) (Plate 12) but many other shrubs are common, especially *Coprosma* sp. (t) of Eagle (1982), *Hebe odora* (Plate 13), mountain tauhinu (*Cassinia vauvilliersii*) (Plate 13) and leatherwood (Plate 12). There are many more shrub species on the northern swamp margins, where inaka is often only a minor

Plate 10 Montane mire

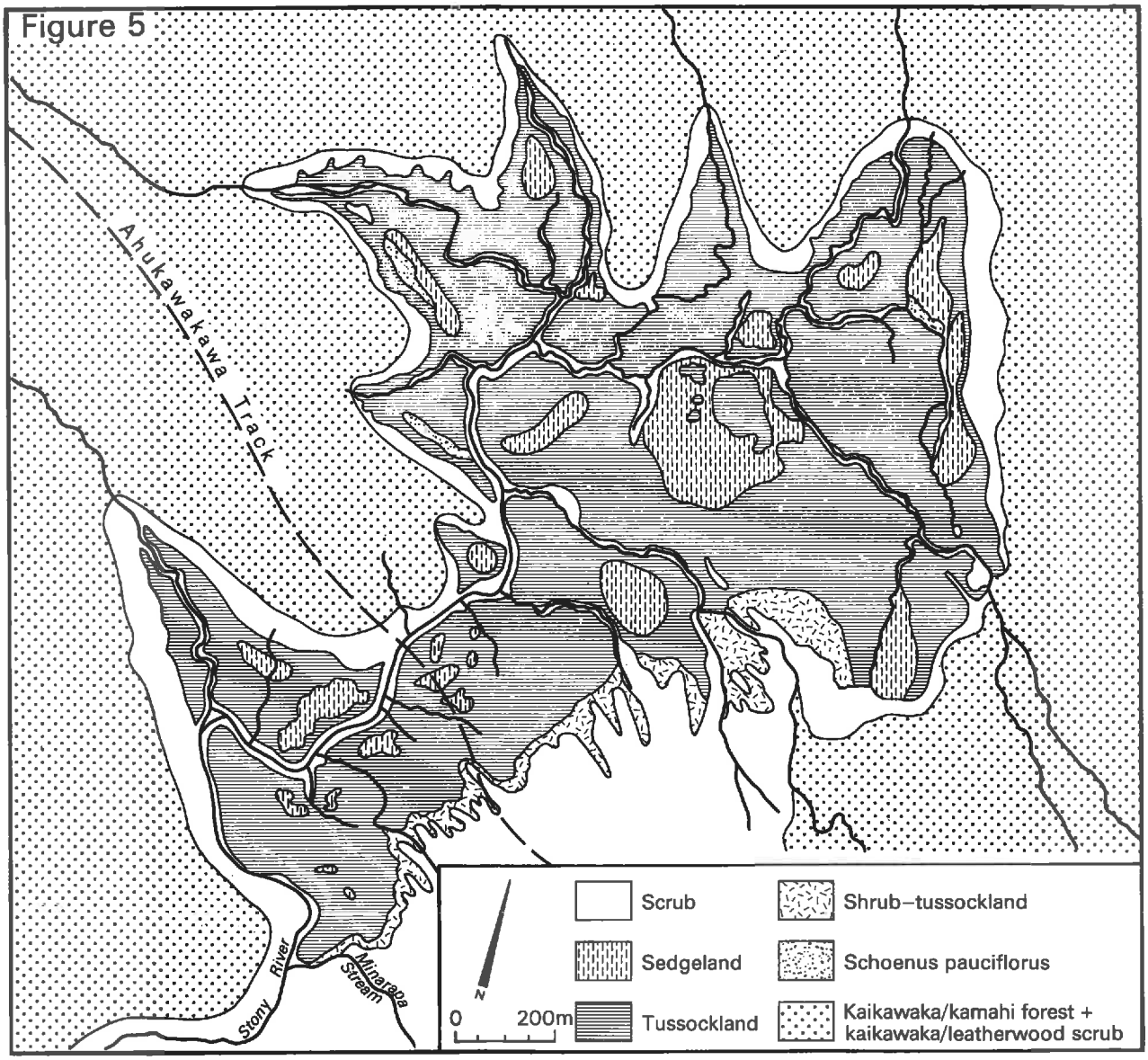
1 *Bulbinella hookeri*.
a flowering stem ×0.6.
b leaves ×0.6.
c stem cut to show attachment of young capsule ×1.5.
d young capsule cut across ×2.5.
e vertical section of young capsule ×2.5.
f top view of flower ×2.5.
g side view of flower ×2.5.

2 *Carex coriacea*.
a leaves, culm and spikes on filiform peduncles ×0.6.
b spike ×2.5.
c utricle cut to show nut ×5.0.
d utricle ×5.0.

3 *Oreobolus pectinatus*. (Comb sedge)
a single leafy fan ×1.5.
b cushion habit cut to show three leafy fans ×0.8.

4 *Schizaea* sp. cf. *fistulosa* and *australis*.
a habit of plant ×0.8.
b young stipe ("crosier") ×4.0.
c lamina enclosing sporangia ×4.0.
d lamina cut to show sporangia ×8.0.

5 *Melicytus* sp. (a)
a branch showing divaricating habit ×0.6.
b adult leaves and method of attachment ×3.0.
c fruit ×3.0.
d twig with fruits ×2.0.
e juvenile leaf ×8.0.
f seedling showing cotyledonary leaves and juvenile leaf form ×4.0.



Broad vegetation pattern of Ahukawakawa Swamp (from Waters 1982).

component. *Hebe* spp. are particularly well represented (Plate 18), with *Hebe* "egmontiana", *H. macrocarpa* var. [*H. corriganii*], *H. venustula*, and *H. odora* all common, together with a bewildering series of hybrids. *Coprosma* sp. (p) of Eagle (1982) is also common and can be distinguished from its close relative, *Coprosma* sp. (t) by its more tightly divaricate habit and the presence of crimson rather than white drupes. Two other divaricating shrubs which are prominent, especially on a terrace site where the Stony River turns westward before plunging over Bells Falls, are a shrub daisy, *Olearia capillaris*, and an unusual relative of mahoe, *Melicytus* sp. (a). This species of *Melicytus*, first recognised by A. P. Druce, is known from the Ahukawakawa Swamp margins and the Pouakai Range scrub and shrubland, but nowhere else in New Zealand. Adult and juvenile foliage (Plate 10) are markedly different and, unlike those of its dioecious close relatives, each flower has both male and female parts. This plant is a favoured food of the hares which inhabit this part of the park in destructively high numbers.

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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