

The vegetation and substrate classes

Lowland forest

Lowland forest covers more than half of the park (> 16 765 ha). There are nine main forest types: rimu-rata/kamahi, rimu-rata/mahoe, kahikatea-rimu/kamahi, rata-kamahi, kamahi-toro, rata, kamahi, tawa, and kohekohe (see Fig. 4).

Rimu-rata/kamahi forest

The most extensive type is rimu-rata/kamahi forest (Appendix 1c) which forms a belt up to 4 km wide encircling most of the lower slopes of Mt Taranaki and Pouakai. Scattered tall rimu (taller than 25 m) and associated epiphytic rata (Plate 2) are emergent above a canopy layer dominated by kamahi (Plate 6). Other species represented are mahoe (*Melicytus ramiflorus* subsp. *ramiflorus*) (Plate 2) and hinau (*Elaeocarpus dentatus*), while miro (*Prumnopitys ferruginea*) is common in the upper portion of the belt. Tawa (*Beilschmiedia tawa*), the tree characteristic of inland Taranaki forests at comparable altitudes, is barely represented; the recent volcanic activity, higher rainfall, and associated leaching of soil nutrients favours kamahi instead. Beneath the canopy is an understorey of many small trees such as mahoe, kamahi, and toro (*Myrsine salicina*), tree ferns (*Cyathea smithii* and *Dicksonia squarrosa*), and shrubs, especially large-leaved coprosmas (*Coprosma grandifolia* and *C. lucida*) (Plate 3). The common ground cover plants are bush rice grass, various hook-seeded sedges, crown fern (*Blechnum discolor*) (Plate 3), hen and chicken fern, and a filmy fern, *Hymenophyllum demissum*. Seedlings and saplings of mahoe, miro, and kamahi are locally abundant. The liane, supplejack, occurs throughout the lower half of this type and the taller trees support numerous clumps of the perching lilies, *Collospermum microspERMUM* and *Astelia solandri*.

A showy-flowered shrub, kohurangi, which the early explorers noted growing abundantly on the ground and as an epiphyte, is now almost exclusively found growing high above the ground with the perching lilies. This is one of many changes in forest composition and dynamics caused by goat browsing (see Browsing mammals). Although goat numbers are relatively low at present it is unlikely that these forests will ever again match the luxuriance described by the early explorers and settlers.

Natural successional changes are also evident; for example, there is a noticeable lack of rimu and rata regeneration, a feature reported in some other New Zealand lowland forests. In the Stratford and North Egmont quarters many of the standing rimu and rata are moribund, and huge logs lie on the forest floor, most being almost completely covered by large, perching, multi-stemmed

Plate 1 Lowland forest (semi-coastal forest)

1 *Knightia excelsa*. (Rewarewa)

- a twigs with adult leaves and flower buds × 0.3.
- b empty pods with persistent styles × 0.5.
- c bud and fully opened flower × 0.5.
- d empty pod × 1.5.

2 *Laurelia novae-zelandiae*. (Pukatea)

- a single hairy fruitlet × 0.8.
- b false fruit with hairy fruitlets × 0.8.
- c leafy twig × 0.6.
- d male flower × 5.5.
- e female flower × 5.5.
- f stamen × 12.0.

3 *Dysoxylum spectabile*. (Kohekohe)

- a compound leaf × 0.4.
- b flower × 2.0.
- c part of flowering raceme × 0.8.
- d fruiting stem × 0.4.



kamahi. Many of the few rimu saplings and poles found in this forest have also established epiphytically on logs and tree trunks but, unlike those of kamahi, most will eventually fall off their host and perish. In marked contrast to the current lack of replacement of rimu and rata in these forests is the sustained regeneration of mahoe, miro, and kamahi.

A logged variant of this type covers much of the lower north-western slopes of the Pouakai Range and is also represented in most forest remnants on private land adjoining the park boundary. In places where forest was clearfelled, near the lower reaches of Plymouth Track, dense thickets of kamahi have established. Elsewhere, only selected large trees of rimu, miro, and rata were removed from the forest, and the composition closely resembles that of the unmodified rimu/rata-kamahi type.

Rimu-rata/mahoe forest

In the Dawson Falls quarter of the park the lowland forest is a rimu-rata/mahoe type (Appendix 1d), although in some parts rata is barely represented and only rimu is emergent above a layer of mahoe and tree ferns. Druce (1964) originally drew attention to the different composition of the forest here and suggested that it resulted from partial destruction of the original forest by the Burrell eruption and increased soil fertility following the "topdressing" of ash. As shown on the vegetation map (Fig. 4), the extent of this type, to a large degree, mirrors the cover depths of the Burrell lapilli as mapped by Druce (1966) and Neall (1980). Mahoe, 6 m or more tall, dominates the canopy and associates include putaputaweta (*Carpodetus serratus*), kaikomako (*Pennantia corymbosa*), broadleaf, pigeonwood (Plate 3), mountain horopito (Plate 8), and tree ferns, particularly soft tree fern (*Cyathea smithii*). The most common understorey plants are *Coprosma tenuifolia*, *C. grandifolia*, pate, and hangehange (*Geniostoma rupestre* var. [*G. ligustrifolium*]). The important ground cover plants are the same as in the rimu-rata/kamahi type but the most common seedlings are kaikomako, miro, mountain horopito, and broadleaf.

Plate 2 Lowland forest

1 *Meliccytus ramiflorus* subsp. *ramiflorus*.

(Mahoe)

- a leafy twig with male flowers $\times 0.6$.
- b part of twig with fruits $\times 0.8$.
- c top and side view of male flower $\times 8.0$.
- d top and side view of female flower $\times 8.0$.
- e fruit whole and cut to show seeds and their points of attachment $\times 3.0$.

2 *Metrosideros robusta*.

(Rata)

- a top and side view (cut to show ovary) of flower $\times 1.5$.
- b leafy twig $\times 0.8$.
- c part of twig with leaves and dehiscing fruit $\times 0.6$.
- d dehiscing fruit $\times 5.0$.

3 *Dacrydium cupressinum*. (Rimu)

- a twig of juvenile scale leaves $\times 0.6$.
- b twig bearing seed with poorly developed aril $\times 3.0$.
- c twig of adult scale leaves $\times 0.6$.
- d juvenile and adult scale leaves $\times 3.0$.

Kahikatea-rimu/kamahi forest

Perhaps the most distinctive lower altitude forest type represented in the park is kahikatea-rimu/kamahi (Appendix 1e), occurring on the gently sloping, poorly drained land south-west of the Norfolk Road end. Tall kahikatea (*Dacrycarpus dacrydioides*) (Plate 4) and rimu (higher than 25 m) grow in dense stands here. Understorey trees include pokaka (*Elaeocarpus hookerianus*), kamahi and, near the park boundary, a large amount of waiwaka or swamp maire (*Syzygium maire*). Waiwaka (Plate 4) occurs as scattered individuals elsewhere in the lower altitude forest on Mt Taranaki but never as a major forest component. Like rata, it is a member of the myrtle family, but the showy stamens which form the bulk of the flower are white rather than crimson. The most obvious adaptation which enables waiwaka to tolerate poor drainage is its "breathing roots" (pneumatophores) which project above the water table.

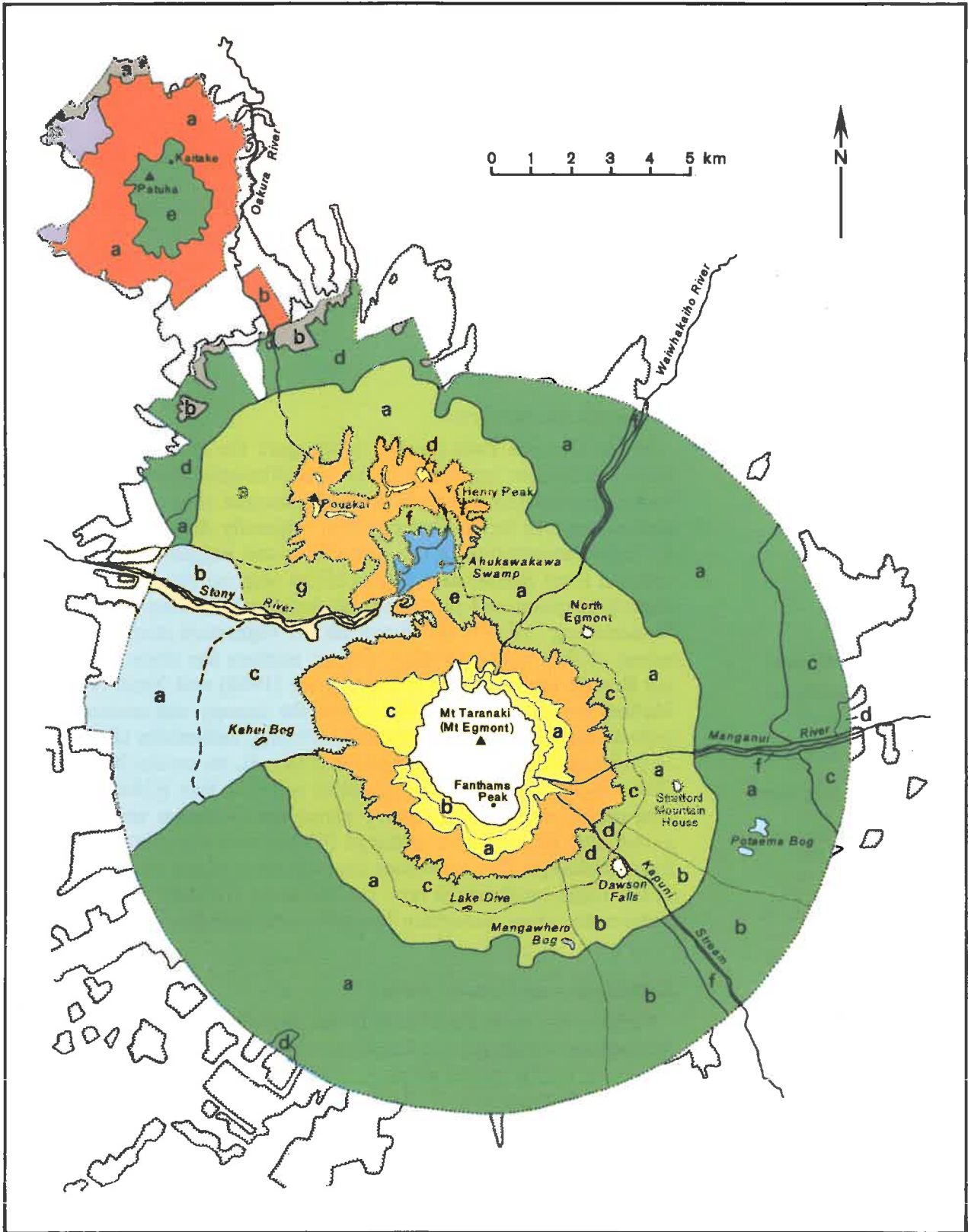
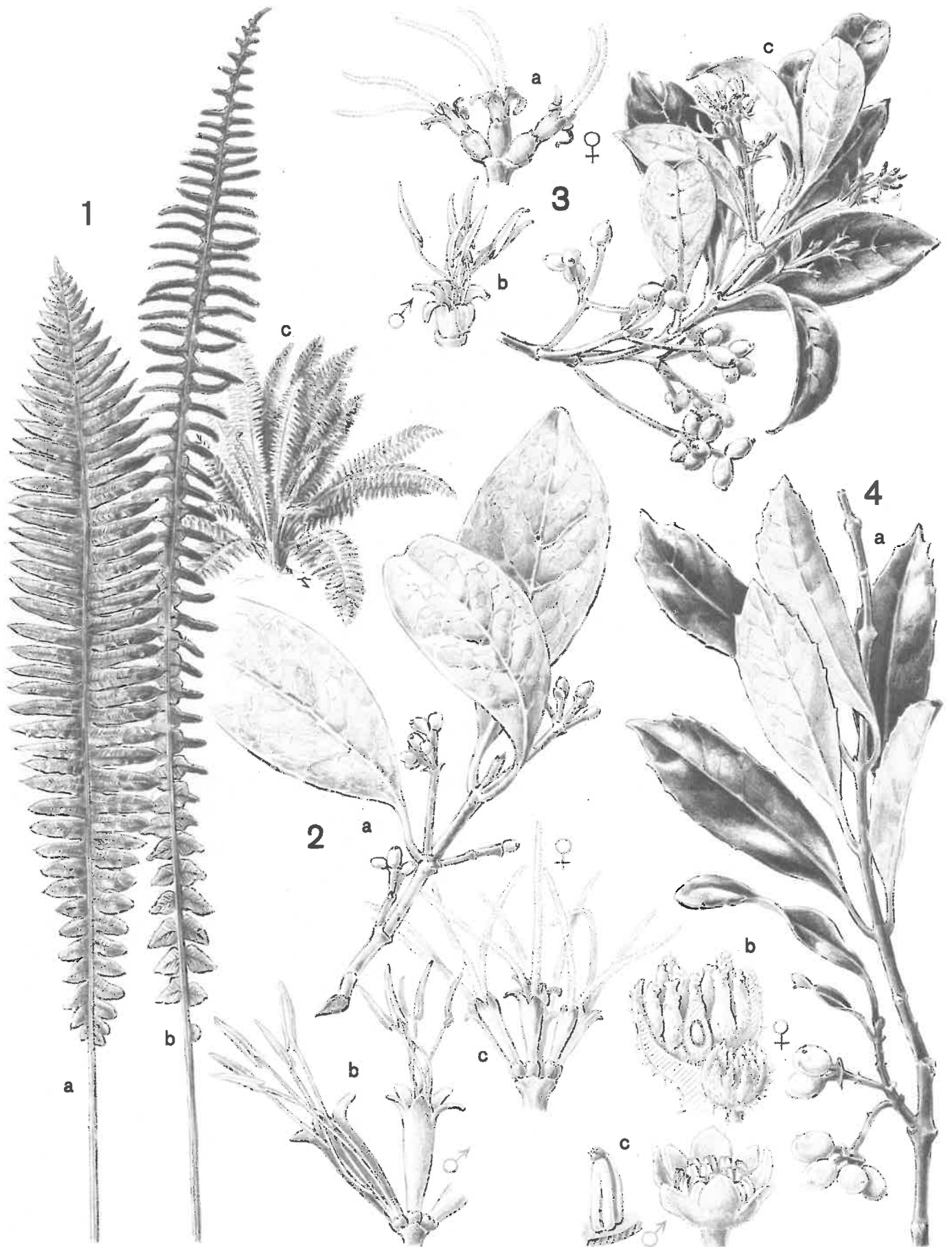


Figure 4: Vegetation and substrate class map of Egmont National Park.

Figure 4: Legend

a	rimu-rata/kamahi forest
b	rimu-rata/mahoe forest
c	kahikatea-rimu/kamahi forest
d	logged forest, kamahi predominant, tawa seldom present
e	kamahi forest (miro, hinau, toro common, and mountain totara present)
f	kamahi forest (occasional terrestrial rata present)
a	tawa forest (rewarewa, pukatea, hinau common; occasional rimu and kamahi)
b	logged forest, kamahi predominant, some tawa, trend to a
	kohekohe forest (rewarewa, tawa, pukatea common)
a	scrub and tree fernland trend to
b	scrub and tree fernland trend to d
a	kamahi-mountain totara forest (incl. "goblin forest")
b	kamahi-mountain totara forest with kanuka (incl. "goblin forest")
c	mountain totara-kaikawaka/broadleaved shrubs forest (kamahi seldom present)
d	mountain totara/broadleaved shrubs forest (kaikawaka and kamahi seldom present)
e	kaikawaka-mountain totara/kamahi forest
f	kaikawaka/kamahi forest+kaikawaka/leatherwood scrub
g	kamahi forest+leatherwood scrub
a	rata-kamahi forest
b	rata forest
c	kamahi-toro forest (including toro and kanuka forest)
	Stony River (kanuka forest, scrub and shrubland, herbfield, and river bed)
	leatherwood scrub and shrubland
a	red-tussockland
b	herbfield
c	moss-herbfield and mossfield (with red tussock and shrub rings)
d	red-tussockland and tussock-herbfield
	gravelfield, stonefield, boulderfield, rockland, ice and snowfield
	lowland mire
	montane mire
†	exotic plantation



Two divaricating shrub species, rohutu (*Neomyrtus pedunculata*) and *Pseudopanax anomalus*, are common in this type (Plate 4). A large tufted lily, *Astelia fragrans*, dominates the ground cover and many of the species found in the lowland mires (see Mire vegetation) are also present; for example, *Gahnia xanthocarpa* and *Astelia grandis*. Large clumps of the perching lily *Collospermum microspermum* adorn the upper branches of the kahikatea and rimu, and the small strap-leaved fern *Grammitis pseudociliata* grows on the lower trunks of some of the kahikatea. This forest type occurs elsewhere in patches too small to map, for example, around Potaema Bog.

Rata-kamahi forest

On the western side of Mt Taranaki, between the Okahu Stream and Stony River, the forest is a rata-kamahi type (Appendix 1f). As Druce (1964) has described, it developed on debris flow fans (Maero debris flows) formed after the Newall eruption. This young forest is dominated by small-diameter kamahi, and rata which established terrestrially rather than epiphytically. There is evidence throughout of the massive destruction associated with debris flows and flood waves which swept down from the upper slopes. For example, at the end of Puniho Road, the kamahi trees have rather spectacular growth forms because many individuals that were flattened by flood waves sprouted numerous new leaders along the length of their prostrate trunks. Much debris was later washed away leaving these horizontal trunks perched above the present ground level. Terrestrial rata-kamahi forest also lines the banks of the Stony River, just outside the park boundary, in Blue Rata Scenic Reserve. Blue rata, the local name given to terrestrial rata, refers to the colour of the wood. According to Maxwell (1947) this forest formerly covered "many scores of acres" and was milled for use as telephone poles, the clean-trunked, small-crowned trees being noted for their straight-grained durable wood. A full botanical description of Blue Rata Scenic Reserve is given in Clarkson and Boase (1982).

The forest lining the flood margins of the other large rivers of the park such as the Manganui, Kapuni, and Waiwhakaiho is similar except that terrestrial rata is only occasionally found amongst the overwhelmingly dominant kamahi.

Kamahi-toro forest (including toro forest and kanuka forest)

Above 500 m altitude, kamahi and rata decline in abundance and toro becomes more common, sometimes forming thickets of small-diameter trees (less than 20 cm d.b.h.) with little or no understorey (Appendix 1i). Where there are understorey and shrub layers, mountain horopito is dominant and tangles of bush lawyer (*Rubus cissoides*) fill many of the canopy gaps. Kanuka (*Kunzea ericoides* var. *ericoides*) is also well represented in many places on these upper slopes, especially on fans formed from rock debris and on sites affected by the most recent debris flows. On the flatter parts of the Maero debris flows where drainage is poor, are pockets of manuka scrub and other mire vegetation (see Mire vegetation).

Plate 3 Lowland forest

1 *Blechnum discolor*.

(Crown fern)

a sterile frond $\times 0.4$.

b fertile frond $\times 0.4$.

c habit of plant $\times 0.1$.

2 *Coprosma grandifolia*.

a twig with leaves and fruit $\times 0.6$.

b male flowers; also cut to show attachment of filaments $\times 8.0$.

c female flowers $\times 8.0$.

3 *Coprosma lucida*.

a female flowers $\times 8.0$.

b male flower $\times 8.0$.

c twig with leaves, female flowers, and developing fruits $\times 0.6$.

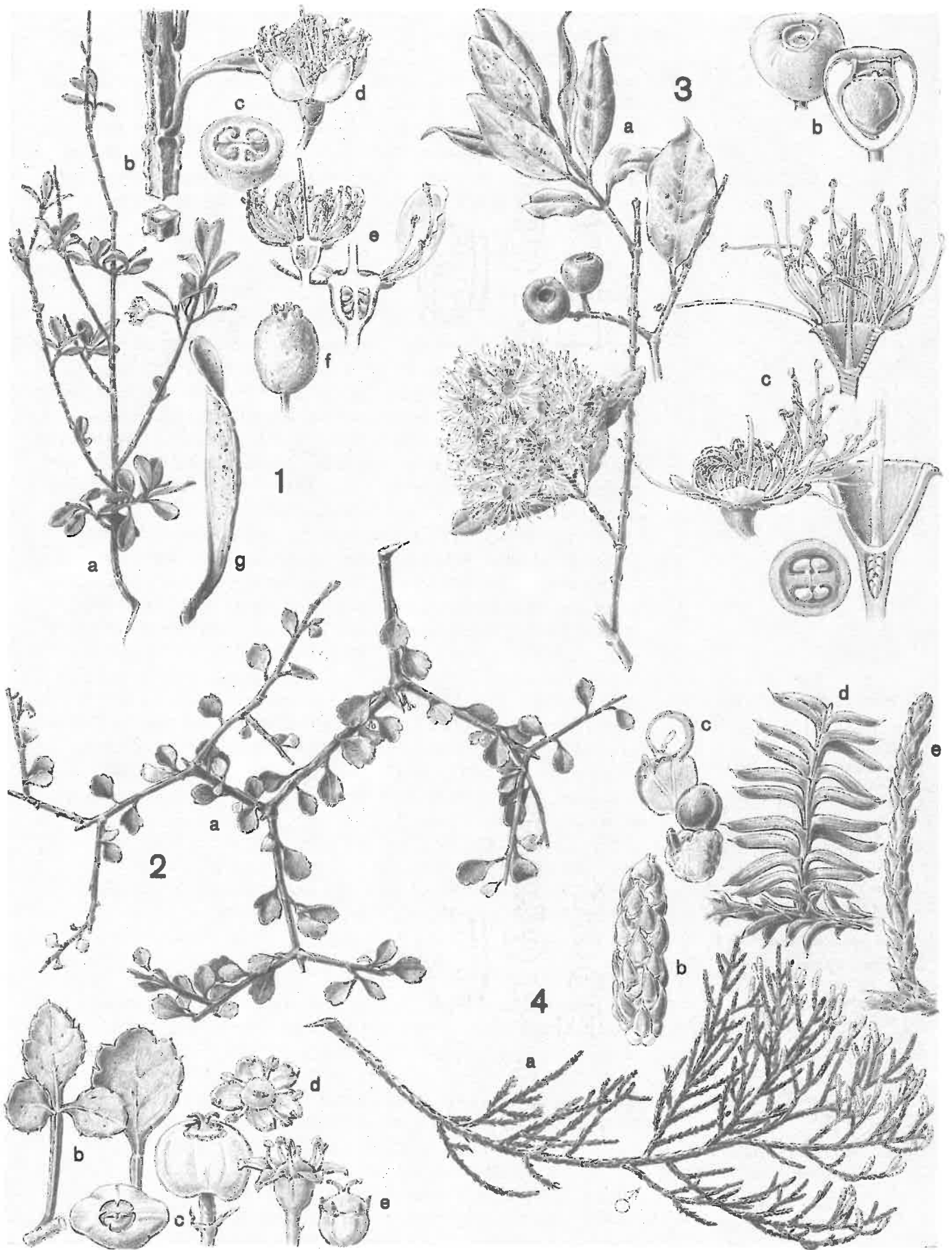
4 *Hedycarya arborea*.

(Pigeonwood)

a twig with leaves and fruit $\times 0.6$.

b female flower; also pistil cut to show single ovule $\times 3.0$.

c male flower $\times 3.0$; also single stamen on disc $\times 6.0$.



Rata forest

On the steep lower south-west slopes of the Pouakai Range is an area almost completely dominated by huge rata (Appendix 1g). This forest developed following fires started by the Newall eruption, the rata becoming established on the burnt logs and bare ground. Kamahi and toro are the other major components of this type.

Kamahi forest

All the forest types on the Kaitake Range are significantly different from the lower altitude forests of Mt Taranaki and Pouakai. They have been described in detail by Clarkson (1985). Kamahi forest (approximately 480 ha) covers nearly all the peaks and steep upper slopes of the Kaitake Range (Appendix 1h). The lower limit of the type averages 450 m but is lower on the wetter, steeper, landward slopes than on the gentler coastal slopes. Below this is tawa forest. The change in dominance from tawa to kamahi is caused by many factors correlated with increasing altitude, including the higher rainfall, increased humidity and cloudiness, and shallower, more leached soils. It is most marked where there is a sudden steepening of slope as occurs near ridge crests. The kamahi are sometimes little more than 7 m high, multi-leadered and wind-shorn. Soft tree fern, pigeonwood, toro, and hinau are all common canopy associates and there are also scattered emergent miro. In the understorey, the most frequent components are soft tree fern and lowland horopito (*Pseudowintera axillaris*). Several species found in this forest are unknown elsewhere in the park including a small-leaved coprosma relished by goats, which has oblong crimson drupes, *Coprosma colensoi*, and an epiphytic fern with rhizomes densely clad in shaggy brown scales, *Phymatosorus novae-zelandiae*. The dominant ground cover species are bush rice grass, hook-seeded sedges, and the fern *Blechnum fluviatile*. Filmy ferns (*Hymenophyllum sanguinolentum* and *H. multifidum*), kidney fern (*Cardiomanes reniforme*) (Plate 9), hanging spleenwort (*Asplenium flaccidum* subsp. *flaccidum*) (Plate 9), and perching lilies (*Collospermum microspermum* and *Astelia solandri*) are common epiphytes. Some of the features of this forest are reminiscent of the upper altitude kamahi ("goblin") forest of Mt Taranaki and Pouakai, e.g., the abundance of filmy ferns and the presence of mountain totara and broadleaf. This type, however, is best considered as a stepland variant of the Mt Taranaki and Pouakai rimu-rata/kamahi type, as lowland species such as rewarewa and pigeonwood are well represented.

Tawa forest

The bulk of the Kaitake forest (> 1600 ha) is a type dominated by tawa (Appendix 1b). On well-drained slopes, tawa up to 20 m high contributes most to canopy cover, the remainder usually consisting of rewarewa and hinau, although in the gullies pukatea is prominent and on the ridge tops there is a substantial amount of kamahi. Major subcanopy species are pigeonwood, tawa, pukatea, mahoe, and silver fern (*Cyathea dealbata*), with wheki (*Dicksonia squarrosa*), pigeonwood, and silver fern dominant in the shrub layer. The gully bottoms are choked with tangles of kiekie

Plate 4 Lowland forest (swamp forest)

1 *Neomyrtus pedunculata*. (Rohutu)

- a twig showing leaves and a flower $\times 0.8$.
- b stem showing quadrangular shape and ribs $\times 3.0$.
- c fruit cut across to show seeds $\times 3.0$.
- d side view of flower $\times 3.0$.
- e flower cut to show ovary $\times 3.0$.
- f berry $\times 3.0$.
- g leaf $\times 5.0$.

2 *Pseudopanax anomalus*.

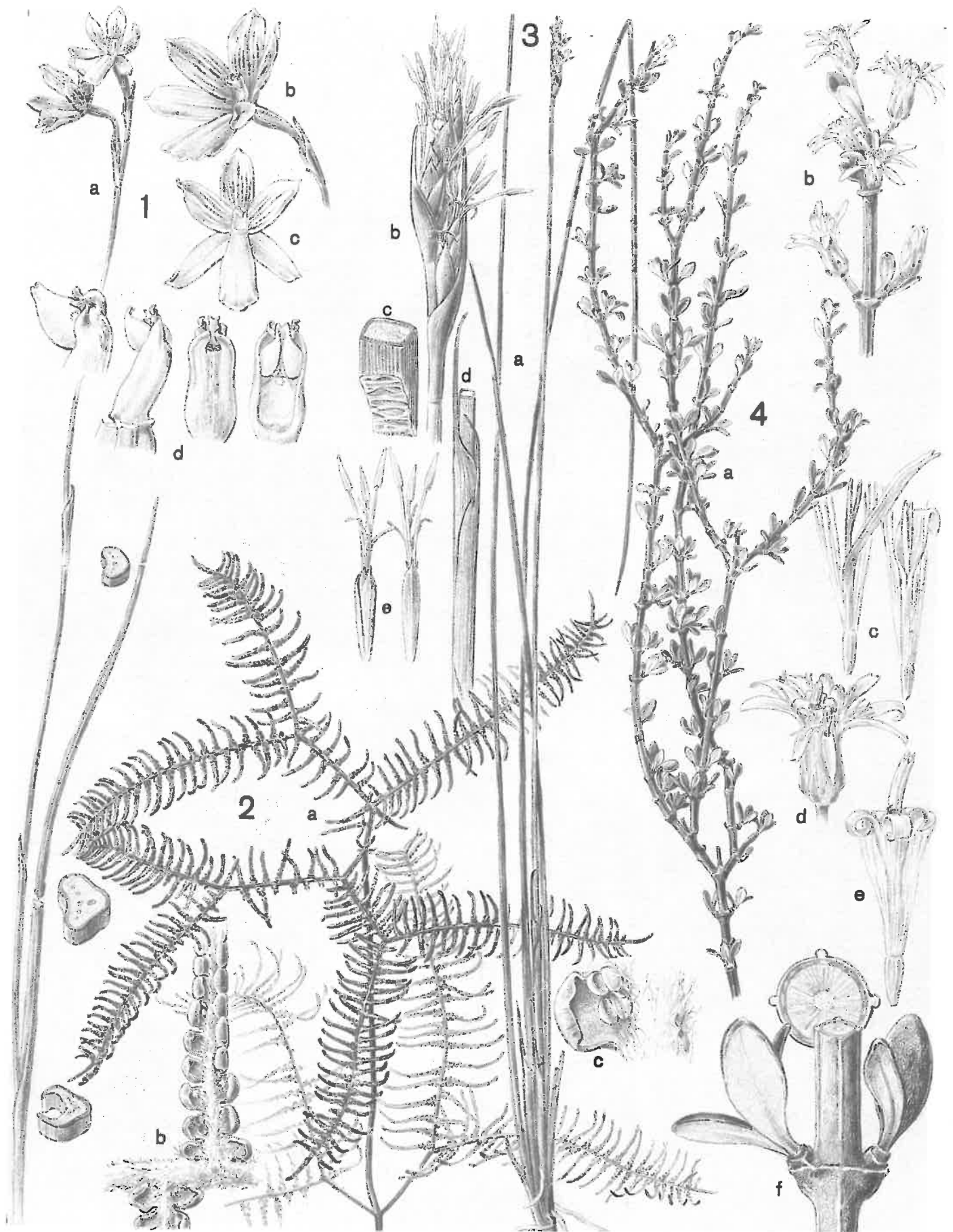
- a leafy twig showing divaricating habit $\times 0.8$.
- b compound and simple leaves $\times 3.0$.
- c top and side view of fruit $\times 3.0$.
- d top and side view of male flower $\times 3.0$.
- e side view of female flower $\times 3.0$.

3 *Syzygium maire*.

- (Waiwaka)
- a twigs showing leaves, flowers and berries $\times 0.8$.
- b berry; also cut to show seed $\times 1.5$.
- c flower; also cut to show ovary and ovules $\times 1.5$.

4 *Dacrycarpus dacrydioides*.

- (Kahikatea)
- a twig with scale leaves and pollen cones $\times 0.8$.
- b pollen cone $\times 6.5$.
- c ripe seed on aril; also cut to show embryo and micropyle $\times 1.5$.
- d juvenile scale leaves $\times 4.0$.
- e adult scale leaves $\times 4.0$.



(*Freycinetia baueriana* subsp. *banksii*) and supplejack. Common epiphytes include fragrant fern (*Phymatosorus scandens*), a large perching lily, kahakaha (*Collospermum hastatum*), and a small-leaved climbing rata, *Metrosideros perforata*. Crown fern and bush rice grass are the most common ground cover plants. A logged variant of this type, in which kamahi is more prominent than tawa, covers much of the land surrounding the small volcanic dome Pukeiti. That part within the Pukeiti Private Scenic Reserve has been mapped and described in Clarkson and Boase (1982).

Kohekohe forest

Two patches of semi-coastal forest (approximately 160 ha) on the lower coast-facing slopes of the Kaitake Range are characterised by the prominence of kohekohe, pukatea, rewarewa (Plate 1) and the palm, nikau (*Rhopalostylis sapida*), together with small amounts of karaka, titoki, and puriri (*Vitex lucens*). Tawa becomes a common component above 250 m. This type is very different from all others in the park, not only because of the presence of warmth-loving species but also because kamahi is very rare (Appendix 1a). The common understorey plants are silver fern, pigeonwood, and kawakawa (*Macropiper excelsum* var. *excelsum*). Supplejack and kiekie tangles are especially common in the gullies and the main ground cover plants are hook-seeded sedges and bush rice grass. The glossy-leaved puka (*Griselinia lucida*) and kahakaha are the most prominent epiphytes. A plant found in this type and unknown elsewhere in the park is the delicate star lily, *Arthropodium candidum*.

Plate 5 Lowland mire

- 1 *Thelymitra venosa*.
a leaf and flowering stem × 0.8; note cross-sections of leaf × 4.0.
b flower × 1.5.
c front view of flower × 1.5.
d side and front views of column × 4.0.
- 2 *Gleichenia dicarpa*.
(Tangle fern)
a frond × 0.4.
b underside of pinnules with sporangia in pairs × 4.0.
c pinna with empty sporangia × 12.0.
- 3 *Lepidosperma australe*.
(Four-square sedge)
a whole flowering plant × 0.4.
b spike-like flower head with subtending bract × 3.0.
c culm cut to show quadrangular shape and spongy mesophyll × 5.0.
d part of culm showing leaves × 3.0.
e flowers × 5.0
- 4 *Olearia virgata* var. *virgata*.
a leafy twig × 0.8.
b part of twig with several capitula × 1.5.
c ray florets × 3.0.
d capitulum × 3.0.
e disc floret × 3.0.
f stem node showing leaf attachment; note cross-section to show stem ribs × 0.4.

Lowland tree fernland and scrub, induced grassland, and cliff vegetation

The lower north-western slopes of the Kaitake Range, formerly known as the Patuha Open Lands (see Human activity in the park), are covered with pure stands of the mamaku tree fern (*Cyathea medullaris*) and broadleaved scrub (mostly less than 6 m) interspersed with patches of gorse. At an early stage of succession (c. 1965), gorse was dominant throughout, but has rapidly been overtaken by the developing forest. Common canopy components of the scrub are mahoe, pigeonwood, hangehange, rewarewa, and the introduced brush wattle (*Albizzia lophantha*). Also present is the frost-tender, small tree whau (*Entelea arborescens*), which is unknown elsewhere in the park. The likely future dominants, kohekohe, tawa, and pukatea, all occur in the undergrowth.

On the higher peaks and cliffs of the range, the kamahi forest cover is broken by small pockets of induced grassland and cliff vegetation. The grassland has developed since clearance of forest in European times, for tracks, trigs, and other reasons, and has been maintained and extended by goat browsing, particularly at Patuha Pa and Goat Rock. Common species are the grasses sweet vernal (*Anthoxanthum odoratum*), bush rice grass, and *Rytidosperma gracile*, and the composite herbs *Gnaphalium gymnocephalum* and *Lagenifera pumila*. The steep cliff sides, which never supported forest, are characteristically dominated by mountain flax; common



associates include kiokio (*Blechnum* sp. [*B. capense* agg., common sp. with reduced lower pinnae]), *Sticherus cunninghamii*, *Lycopodium scariosum*, and *Coprosma robusta*. On some of the rocky outcrops the usually epiphytic orchids *Dendrobium cunninghamii*, *Earina mucronata*, *E. autumnalis*, and *Bulbophyllum pygmaeum* are a feature. The presence of mountain flax here is an enigma as the species is absent from seemingly suitable sites elsewhere in the park and indeed from the whole of the Egmont ringplain. Mountain flax was cultivated by the Maori (Kirk 1870), so it is possible that it was planted at the pa sites on the peaks of the range and later became naturalised (see Human activity in the park).

Near the lower reaches of Plymouth Track old logging roads and disturbed forest margins support manuka scrub (see logged rimu-rata/kamaha forest p. 27). A little to the west, a different scrub type dominated by narrow-leaved mahoe (*Melicytus lanceolatus*), *Coprosma robusta*, and *Hebe* "egmontiana" [*H. stricta* var. *egmontiana*] has developed where pines (mainly *Pinus radiata*), originally established to control gorse and blackberry, have been felled.

Exotic plantations

Less than 30 ha of exotic plantations now remain on the Kaitake Range (see Human activity in the park). The largest are at Lucys Gully and are mainly of coast redwood (*Sequoia sempervirens*), macrocarpa (*Cupressus macrocarpa*), and *Eucalyptus* spp. Other exotic trees present include maritime pine (*Pinus pinaster*) and Douglas fir (*Pseudotsuga menziesii*). Some of the more open-canopied plantations have a dense understorey and ground cover of native plants, including hangehange, mahoe, kawakawa, and kohekohe. Localised populations of native terrestrial orchids e.g., *Corybas trilobus*, *C. rivularis*, *C. cheesemanii*, *Chiloglottis cornuta*, and *Gastrodia sesamoides*, occur in places where the shrub layer is sparse and a thick leaf litter covers the ground. Terrestrial orchids are known to be associated with mycorrhizal fungi which assist in the uptake of nutrients; such fungi are common in this litter type. Thus, paradoxically, two of the indigenous orchid species known from the exotic plantations, *Corybas cheesemanii* and *Gastrodia sesamoides*, have to date not been found in indigenous vegetation in the park.

There are other smaller plantations of macrocarpa and *Eucalyptus* spp. at the Wairau Road end.

Montane forest

Montane forest occurs between approximately 760 m and 1100 m on Mt Taranaki and Pouakai and covers nearly one third of the park area (11 165 ha). Seven types have been delineated on the map (Fig. 4) but six are of minor extent compared to the main type, kamahi-mountain totara forest. A more detailed survey would probably allow the definition of further types on the upper slopes of Pouakai.

Plate 6 Lowland and montane forest

1 *Weinmannia racemosa* var. *racemosa*.

(Kamaha)

a twig from low altitude understorey with trifoliolate leaves × 0.6.

b twig from low altitude canopy showing unifoliolate leaves and capsules × 0.6.

c twig arising from epicormic bud × 0.8.

d juvenile trifoliolate leaves × 0.8.

e stem node and stipules × 4.0.

f young capsules × 5.5.

g twig from high altitude canopy ("goblin forest") with unifoliolate leaves × 0.6.

