Introduction

The dormant volcano Mt Taranaki (Mt Egmont) stands on the western coast of North Island in splendid isolation from the central volcanoes Tongariro, Ruapehu, and Ngauruhoe. Revered by Maori and European alike, it, more than any other feature, gives the people of the Taranaki province their sense of identity. Since 1881, thanks to the foresight of some early settlers, the "area comprised within a circle formed with a radius of six miles (9.6 km) around the summit of Mt Egmont containing 72 382 acres (29 292 ha)" has been protected, first as a "forest reserve" and later (1900) as a national park. Other land, notably 2400 ha of the Kaitake Range, was added to the original reserve so that the total area of Egmont National Park is now just over 33 500 ha (Fig. 1— in back pocket).

The vegetation mantling the mountains of the park is the main subject of this account. Introductory sections contain brief descriptions of the physical environment and the effects of introduced browsing mammals and human activities. The main previous contributions to the botanical knowledge of the park are then summarised. An outline of the vegetation pattern and substrate classes follows. These are then described in detail, with photographic illustration of most of them. Features of the flora are discussed and the final section attempts to place the park in a regional context and gives some suggestions for future management.

All the localities described in the text are shown on Fig. 1. General information on tracks, climbing routes, accommodation and other facilities is given on the back of this map. More detailed information can be found in the park handbook (Tullett 1980).

Since more than 650 vascular plant taxa occur in the park, only a selection from each vegetation or substrate class is described, mainly plants that are common or abundant but also some of the less common or special ones. Some 65 taxa are illustrated in 18 plates (Plate 1–18). The reader should be able to identify many of the plants encountered in the field by referring to these illustrations and to the appendices which give the composition of typical plots from each vegetation or substrate class. The plates and appendices are presented in an altitudinal sequence, from low to high, and the relevant plate or appendix number is given where species or vegetation types are described in the text. A large proportion of the remaining taxa is illustrated elsewhere; for the vascular plants, Wilson (1982), Mark and Adams (1978), and Salmon (1985) are useful guides. For non-vascular plants, readers may begin with Allison and Child (1971), Martin and Child (1972), and Allison and Child (1975).

Only where a plant has an accepted common name is this used. When a common name is used for the first time the scientific name is given in brackets. A glossary of common and scientific names is provided (p. 85). As many of the currently accepted scientific names have come into use only recently a glossary with current and previous scientific names is also provided (p. 87). A glossary of technical terms, mainly botanical and geological, used but not specifically explained in the text, begins on page 88.

The present account is largely derived from a reconnaissance vegetation survey of the park which formed the major part of a 1981 University of Waikato D. Phil. thesis entitled "Vegetation Studies in the Taranaki Land District". A concise description of the park (Clarkson 1980) and a more detailed account of the Kaitake Range (Clarkson 1985) also resulted from the survey.

Wind-shaped kaikawaka at tree-line (1100 m), North Egmont.
M.R. Boase.

Geology, landforms, and volcanic history

(from Grant-Taylor 1964; Druce 1964, 1966; Neall 1974, 1976, 1979, 1980, 1982).

The sequence of linear (NNW to SSE) volcanic activity known as the Taranaki Volcanic Succession began at Paritutu and the Sugar Loaf Islands near New Plymouth 1.75 million years ago, and was followed by the genesis of Kaitake, Pouakai, and Mt Taranaki, 575 000, 250 000, and 70 000 years ago respectively. Thus the park contains three, progressively younger, major volcanic landforms, each having been exposed for decreasing time intervals to erosion.

Mt Taranaki is a substantially intact andesite volcano reaching 2518 m a.s.l. It has the typical graceful, steep, concave slopes of a layered volcano (strato-volcano), features much exaggerated in the paintings of some early artists such as Charles Heaphy. A relatively small-diameter peak (volcanic pile) of andesite lava and interbedded tephra is surrounded by an extensive apron of volcanic conglomerate, breccia, and tephra deposits. Termed the ringplain, this apron extends from Cape Egmont in the west to Stratford in the east.

Several phases of upper cone building have occurred but most of the present structure is of Aranuian age (less than 12 000 years B.P.) and is made up of lavas derived from the summit crater and the parasitic cone of Fanthams Peak. Where lava extrusion occurred in confined circumstances or on very low gradients, especially in the summit crater and at auxiliary vents on the margins of the volcanic pile, the lava quickly cooled to form volcanic domes. The present summit of Mt Taranaki is part of a volcanic dome within the main crater (tholoid), which was emplaced during the latest volcanic activity. The crater rim to the west has now collapsed. Lava domes that cooled over source vents but outside the main crater (cumulodomes) include The Dome (*Te Umu Taomanawa*), Skinner Hill, and Beehives. On the basis of their tephra cover beds, these are thought to have been emplaced between 7000 and 3000 years ago. A combination of the obstruction caused by Beehives and the later debris flow deposition around it altered the drainage pattern to form the lakelet Lake Dive.

The oldest lava flows are preserved in places in the west but to the north and east many of these older lavas have been removed by erosion, resulting in remnant outliers of picturesque form such as Humphries Castle, Lion Rock, and Warwick Castle (*Tahuna A Tutawa*). The later history of the cone has been dominated by collapse to the north, east, and south, which has resulted in breaches subsequently filled by younger lava extrusives. Thus the youngest lava flows now occupy steep-sided gullies, for example, in Minarapa Stream, bordered by older lava-capped ridges.

Tephra eruptions have accompanied most of the major construction events of the Mt Taranaki cone. In general, they comprised widespread, shortlived, airfall pumiceous lapilli eruptives which alternated with profuse, smaller airfall ash eruptives. The recent tephra eruptions substantially determined the present vegetation pattern in various parts of the park.

Between 1500 and 1550 A.D. four small hot incandescent gas-charged avalanches (nuées ardentes) of sand, gravel and stones, the Newall and Waiweranui eruptions, descended the Stony River catchment on the north-western slopes, reducing much of the native forest to carbonised logs. Fires started by these eruptions swept 3 km northwards across the western slopes of the Pouakai Range. Even more recently, around 1655 A.D., the Burrell eruptions deposited pumice gravel over a large area on the ESE side, andesite gravel on the WNW side, and ash over all the upper slopes of Mt Taranaki. The most recent outbreak, the Tahurangi eruption of 1755 A.D., was very small and deposited 5 to 12 cm of ash on the upper slopes of the mountain.

The eruption of lava flows and tephra deposits has, however, been more than balanced by collapses from a continuing unstable cone, resulting in mud flows (lahars), debris flows, and floods which constructed the ringplain. The most recent large scale lahar, the Opua Formation, occurred about 7000 years ago and was derived from the large "amphitheatre" which now exists between Bobs Ridge and Fanthams Peak. This lahar flowed to the coast, destroying everything in its path and set in place the highly distinctive mounds or conical hills of the landscape inland from Opunake. Most of the surfaces below the lava cone within the park have been formed by dry or water-based volcanic debris flows. Three formations, in order of decreasing age, are recognised: Kahui Debris Flows, Ngatoro Formation, and Maero Debris Flows. These deposits are multiple, thin (< 3 m) and seldom extend more than 15 km from source, the bulk occurring around the northern fringe of the cone. Prior to 3500 years ago, debris flows blocked the drainage between Mt Taranaki and the Pouakai Range, leading to the formation of the Ahukawakawa Swamp and forcing Stony River (*Hangatahua*) to become entrenched in lava of The Dome to form Bells Falls (*Te Rere A Tahurangi*). The paths of some of the more recent debris flows are marked by a tongue of shrubby vegetation extending from the subalpine scrub zone down through the montane forest zone to the swamp margin on the slopes north of Holly Hut. At least 14 Maero Debris Flows have originated from the upper cone over the last 500 years accumulating as fan-shaped deposits below 1200 m or being channelled along river courses, scouring them out at high altitude, and forming aggradational terraces at low altitude. Most represent collapses of the western crater rim. To the north and north-west of the summit the tree line has been depressed 300 m below its present level elsewhere on the mountain by Maero flows which are derived from between Big Pyramid and Puniho Hill. The most recent major debris flow occurred about 100 years ago and flattened native forest from Pyramid Stream to the park boundary.

In marked contrast to debris flow deposition is the accumulation of alluvium, most extensively along the Stony and Waiwhakaiho catchments. Named the Hangatahua gravels by Neall (1979), these flood deposits are of post-Newall eruption age and are preserved above existing flood plains. They form distinctive surfaces marked by dry river channels and numerous scattered large (> 2 m) boulders which are particularly distinctive in the Okato region inland from Opunake.

Superimposed on the cone and the ringplain is an almost perfect pattern of radial drainage. More than fifty streams and rivers originate on the slopes of Mt Taranaki and emerge at the park boundary to continue their flow across the ringplain (see Fig. 1). The major ones are the Waiwhakaiho, Stony, Manganui, and Kapuni. Waterfalls and cascades are a common feature of the steep upper reaches of most watercourses. The most spectacular, Bells Falls, Dawson Falls (*Te Rere A Noke*), Brames Falls, and Curtis Falls, are the result of watercourses crossing the terminii of erosion-resistant old lava flows. Many rivers are deeply entrenched in their middle reaches with vertical cliffs up to 100 m in places. They are less entrenched in their lower reaches but at the park boundary still have banks up to 15 m high.

Springs occur in many places on the mountain as the interbedded layers of tephra and other more resistant material such as lava encourages lateral water movement. The headwaters of some of the larger streams and rivers such as the Manganui are fed by large springs which gush directly from the foot of lava-capped ridges. Bubbling Springs at Dawson Falls are probably the most accessible. Although most of the mountain springs are clear water springs, some, most notably those in the headwaters of Kokowai (ochre) and Mangawhero (red stream) streams, carry high concentrations of iron and manganese oxides. On a gently sloping shelf perched above the Mangawhero Stream, subterranean springs flow to the surface and have deposited a thick crust of kokowai. The mire so formed is informally referred to as "Mangawhero Bog". The other small mires of the lowland zone appear to have developed after tephra deposits dammed streams in areas of gentle relief, although springs may also have contributed to the formation of the "Denbeigh Road Bog". In the largest of these mires, Potaema, the basal sediments have been dated at 3180 ± 100 years B.P. (M.S. McGlone pers. comm.).

Kaitake is estimated to have once been as large as Mt Taranaki but the original massive volcano has been reduced by erosion to a circular area of radiating ridges which rise to a central point, Patuha, only 684 m a.s.l. Other high points on the ridges are Kaitake (650 m), Pioke (650 m), "Kirihau" (610 m) and Te Iringa (610 m). Kaitake andesite is confined to ridge crests and stream exposures, the most prominent exposures being at Goat Rock and Patuha Pa. Few portions of the Kaitake ringplain are now evident on the landscape because they were mostly buried by lahars from Pouakai. The most prominent remnants occur as high planar interfluves to the east of Inglewood and Eltham. The drainage pattern on Kaitake remains radial, but beyond the remnants of the cone region, streams and rivers (Timaru Stream and Oakura River) flow around the margins of the structure due to the effect of the younger Pouakai ringplain surfaces dipping north-westward and surrounding the range.

Pouakai is less dissected than Kaitake and retains many of the smooth lower and middle slopes characteristic of an andesite volcano. Parts of the Pouakai ringplain are still preserved between Inglewood and Okato and along the eastern boundary of the Egmont ringplain, due principally to topographic obstructions protecting the older ringplain from younger devastating Egmont lahars. Pouakai is also estimated to have been almost as high as present day Mt Taranaki. Remnant lava flows appear to radiate from a central point in the vicinity of the peak Tatangi (1337 m), and the other high peaks, Pouakai (1377 m), Hump (1295 m), Maude Peak (1221 m), and Henry Peak (1222 m), probably represent the last out-pouring of lava from this centre. Between these peaks is an extensive area of diverse terrain which results from erosion of the interior of the volcano and is breached to the north by the Kiri Stream. The drainage pattern on Pouakai is also radial but, because of its greater age, is more integrated than on Mt Taranaki with streams and rivers having more tributaries.

Tree-line view from the Translator Road, North Egmont.
M.R. Boase.

Soils

(from New Zealand Soil Bureau 1968; Tonkin 1970; Aitken *et al.* 1978; and Palmer *et al.* 1981).

Three main soil groups are represented in the park: yellow-brown loams, recent soils, and lithosols. Yellow-brown loams, derived from thick volcanic ash, are semi-mature, moderately to strongly acidic, and moderately to strongly leached. They occur over most of the Pouakai and Kaitake Ranges and on some parts of Mt Taranaki. Recent soils are derived from the recent andesitic sands and gravels of debris flows (Maero series) and the youngest volcanic ash overlying older ash (Burrell and Tahurangi series). They are strongly leached but relatively unweathered mineral soils. Intergrades between recent soils and yellow-brown loams, and composite recent soils over yellow-brown loams also occur. Intergrades, composite recent soils, and recent soils together cover nearly all of Mt Taranaki below 1000 m. Above this altitude lithosols are virtually ubiquitous. They are generally very weakly developed soils because strong erosion is continually removing the finer material or burying it under fresh additions of coarse rock. There are some minor areas of organic soils composed of peat and interbedded volcanic ash. These are the Ahukawakawa Swamp, several small mires at lower altitudes, and some flat ground on the top of Pouakai Range.

Relatively even-aged stands of kaikawaka which have colonised old slip faces on the Razorback, North Egmont.
M.R. Boase.

Climate

(from New Zealand Meteorological Service 1973; Coulter 1976; and Thompson 1981).

The park climate ranges from warm and almost frost-free on the lower coastal aspects of the Kaitake Range to alpine on the summit of Mt Taranaki, with its perpetual ice and snow field.

Rainfall is directly related to the orographic effect of the mountains, particularly Mt Taranaki, on the moisture-laden prevailing winds blowing from the Tasman Sea. Mean annual rainfall is about 1500 mm near the North Taranaki coast, and 1100 mm to 1300 mm near the South Taranaki coast, increasing more or less constantly with altitude to about 6500 mm at 1000 m and probably about 8000 mm at 2000 m, with rather more rain on the northern and western slopes of Mt Taranaki than elsewhere. Some of the extreme values recorded on the mountain are notable: for example, 1574 mm of rain fell in the single month of July in 1974, one of the highest monthly totals ever recorded in New Zealand, and during a 48 hour period in February 1971, 795 mm of rain fell.

Annual average temperature declines from about 13 °C at New Plymouth to 9 °C at Stratford Mountain House (846 m) to about −1 °C at the summit of Mt Taranaki. As well as the general decline in temperature with increasing elevation, the diurnal temperature range becomes much greater. For example, summer temperatures on the scoria slopes of Mt Taranaki at 2000 m a.s.l. may exceed 25 °C during the day then rapidly drop below freezing point after sunset. The average number of annual ground frosts is 6.9 at New Plymouth and 95.6 at the Stratford Mountain House; the average numbers of days with snow are 0.1 and 14.0, respectively.

Relative humidity and the incidence of cloud cover, fog, and mist increase with elevation above sea level. Average relative humidity at 9.00 a.m. in New Plymouth is 78% whereas at Stratford Mountain House it is 87%. The sky over Mt Taranaki is often clear in the morning but cloudy in the afternoon, with the summit covered in a white cloud cap (*potaema*). Fog is reported on an average of 49 days per year at Stratford Mountain House.

Wind also increases with altitude, the average wind speed at New Plymouth being 16 km per hour while an estimate for the summit of Mt Taranaki is 40 km per hour. The mountain topography causes much distortion to the overall wind flow patterns, so that at New Plymouth westerly winds from the coast are frequent, whereas at Stratford northerlies and southerlies are more common. Wind speed is increased by channelling between the northern slopes of Mt Taranaki and the southern slopes of Pouakai. Strong winds sometimes carry salt-spray from the coastline into the park.

Browsing mammals

Before the arrival of Europeans the native vegetation of the park, although having to cope with natural biological pressures such as defoliation by insects and fungal attack and the eating of foliage by native birds, was spared damage by browsing mammals. But with the introduction of cattle, sheep, goats, pigs, deer, hares, rabbits, and possums, the ecological scene was drastically changed. The history of the introduction and spread of browsing mammals in the park is outlined in Atkinson (1964), Mawhinney (1976), New Zealand Forest Service (1975), and Russell (1981).

Goat numbers were greatest during the 1960s and damage was so severe that many "dead areas" developed on sites at lower altitude in the scrub and shrubland belt. The shrub cover was completely removed over areas as great as 5 ha, being superseded by graze-tolerant low-growing grasses, sedges, and herbs. As well as this more spectacular type of damage, in many places major changes in structure and composition of vegetation occurred as a result of browsing. The New Zealand Forest Service (1975) reported that in the lower altitude forests the main species depleted were *Coprosma* spp., pate (*Schefflera digitata*), karapapa (*Alseuosmia macrophylla*), kotukutuku (*Fuchsia excorticata*), five-finger (*Pseudopanax arboreus* var. *arboreus*), tarata (*Pittosporum eugenioides*), and hen and chicken fern (*Asplenium bulbiferum* s.s.). Along stream banks and on river terraces in particular, the diverse ground cover vegetation was replaced by swards of unpalatable bush rice grass (*Ehrharta diplax* subsp. *diplax*) and hook-seeded sedges (*Uncinia* spp.). In the upper altitude forest, the damage was not as great but species such as broadleaf (*Griselinia littoralis*), kotukutuku, and *Pseudopanax* spp. were depleted and mountain horopito (*Pseudowintera colorata*) became even more dominant than before. Significant reductions in goat numbers in recent years, resulting mainly from the efforts of New Zealand Forest Service hunters, have led to a dramatic recovery of vegetation in many places on the mountain. However, trouble spots remain. Goats congregate in favoured places, so even though only minor browse damage can be seen over wide areas of forest nowadays, there are still places with severe damage. The induced grasslands on some of the Kaitake Range peaks, for example, are prevented from reverting to kamahi forest by the small, but persistent, herds of goats which camp there.

Possums damage plants by defoliation, bark scratching, and bark biting. The New Zealand Forest Service (1975) reported that, in the lower altitude forest on Mt Taranaki, highly palatable species such as kohurangi (*Brachyglottis* sp. [*Senecio kirkii* s.s.]) and karapapa had been depleted. Locally heavy defoliation of kamahi (*Weinmannia racemosa* var. *racemosa*) and other species had occurred, especially where *Pseudopanax* spp., kotukutuku, and wineberry (*Aristotelia serrata*) were abundant and provided balance and variety of food. Kamahi defoliation was greatest in the Kaitake Range forest where the species is relatively uncommon and other broadleaved trees, such as kohekohe (*Dysoxylum spectabile*) and titoki (*Alectryon excelsus* var. *excelsus*), also suffered severely. Emergent rata (*Metrosideros robusta*) were killed as a result of possum browsing, although as both Druce (1964) and Pracy (1965) noted, widespread dying of rata occurred on Mt Taranaki long before the first reports of serious possum damage. Possum numbers reached a peak between 1948 and 1951 with a decline after that date (Russell 1981), but the most recent survey (Russell *loc. cit.*) suggested that possum numbers were still very high. Pellet densities recorded were 200–300 percent greater than those found in similar surveys in the Kaimai and Kaimanawa Ranges. Possum numbers were greatest in the rimu–rata/kamahi forest of the eastern slopes of Mt Taranaki, with scattered but often severe defoliation of kamahi evident.

Cattle trespass has been a problem since the park's inception. In the early 1900s, it was deliberate farming practice to turn animals into the park when feed was short during winter. The humorous stories of the "Me and Gus" series (Anthony 1938) set in the Midhirst district include one entitled "Winter Feeding the Herd". This vividly describes the problems of relocating cattle after they had been illegally set loose in the park. This practice has ended now and, with the park almost completely fenced, cattle damage occurs only infrequently.

Sheep have also strayed into the park in the past but as it is bordered by few sheep farms their impact has been minor.

Hares are common in the tussocklands of the park where they cause considerable damage. They feed on the tiller bases of silver tussock (*Poa* sp. [*P. laevis* auct. N.Z.]) and red tussock (*Chionochloa rubra*) causing some of them to die back. The fleshy, large herbs *Ranunculus nivicola* and *Ourisia macrophylla* subsp. *macrophylla* are particularly sought after, whereas others, such as everlasting daisy (*Helichrysum* "alpinum"), are not often selected, and in any case apparently recover more readily from browse damage. Thus, in heavily damaged tussockland on Carrington Ridge, everlasting daisy was found to have become more prominent as silver tussock and the large fleshy herbs declined in abundance. Perhaps the most noticeable change initiated by hares, however, is the decline of the lily *Bulbinella hookeri* in the Ahukawakawa Swamp. To date, there have been no deliberate attempts to reduce hare numbers in the park.

Rabbits are only a minor problem as they live mainly along roadsides, on river flats, and at the park margins, preferring introduced grasses to native plants.

Although deer were liberated in the park in the past and again quite recently (illegally), they have never become established.

Browsing mammals have now been a major factor in shaping the structure and composition of the vegetation for more than 70 years. Not only are these changes unacceptable in terms of the aims of a national park but they have increased the already high rate of natural erosion. This has been a result of either removal of vegetation cover or retardation of vegetation recovery after natural events such as flooding or slipping.

Human activity in the Park

The land we now know as Egmont National Park was used by the Maori long before the European settlement of Taranaki. Evidence of this is still apparent on the landscape. In fact, the discovery of a Maori earth oven (*umu*) beneath the upper layers of volcanic ash on Mt Taranaki was one of the clues which led scientists to realise that eruptions had occurred there in comparatively recent times. The Maoris were attracted to the mountain by the resources it offered, including birds as food, and kokowai pigments. Rawson (1980, 1981) has documented the evidence of former extensive Maori occupation of the park: food pits, tracks and sites of former cultivation, villages, and fortifications (*pa*).

The vegetation of several areas in the park still reflects the effects of Maori activity, and nowhere more so than parts of the Kaitake Range where early successional forest covers former occupied sites. The presence at one place of isolated large karaka (*Corynocarpus laevigatus*) trees and no juveniles suggests that, as verified elsewhere in New Zealand, trees were deliberately introduced by the Maori as a food source. As well, the anomalous distribution pattern of mountain flax (*Phormium cookianum* subsp. *hookeri*), found only on rocky outcrops of the Kaitake Range, may result from naturalisation there after having been cultivated at some range-top occupation sites.

Initial European exploration of the park was via the Pouakai Range, approximately along the line of the present day Mangorei Track. James Henry, an early guide on the Pouakai route, was one of many local people who collected plants and seeds for export. In 1868 he cleared small patches of native vegetation on the Pouakai Range to establish Scottish heather (*Calluna vulgaris*) and "blue currant" (?*Vaccinnium* sp.), but they did not persist. As early as 1872 the Provincial Government voted one hundred pounds ($200) for a bridle track (Mangorei Track) over the ranges, which was cut in 1873. Log bridges built to cross the small streams around "The Extinguisher" were built of kaikawaka (*Libocedrus bidwillii*) felled from the surrounding forest. The local effect on the vegetation of the fuel-gathering activities of the early parties of travellers must have been considerable, especially when large groups camped in the forest for several days at a time. To this day, shrub-dominated vegetation at sites such as Graylings Clearing, along the otherwise forest-lined lower Mangorei Track, is evidence of the damage caused by early visitors.

The establishment of the "Old House" (North Egmont) in 1892, Dawson Falls Hostel in 1896, and Stratford Mountain House in 1907, together with associated roading and subsequent building enlargements, all led to changes in the nearby vegetation. In the early years, mountain totara (*Podocarpus cunninghamii*) was used for everything from firewood to fence battens and building materials. The rough pasture and manuka (*Leptospermum scoparium*) scrub immediately below Konini (Dawson Falls) marks the site of a former grazing paddock for horses and milking cows.

The Kaitake Range was also the focus of much activity in the early days of European settlement. The Boars Head Mine was the scene of several abortive gold mining ventures, the first in 1870 when a specimen crusher operated there. Logging and forest clearance occurred prior to 1926 in the area formerly known as the Patuha Open Lands. Much of this area was later planted in pines (mainly *Pinus radiata*) to control an infestation of blackberry (*Rubus fruticosus* agg.) and gorse (*Ulex europaeus*). From 1952 to 1971, most of these trees were felled, allowing reversion to native forest to begin (see Lowland tree fernland and scrub....). However, exotic plantations still remain at Lucys Gully and at the end of Wairau Road (see Exotic plantations).

A metal crushing plant operated at the end of York Road at various times between 1908 and 1940. Rock was transported by rail from a quarry near the site of the present day Waipuku Hut to the crushing plant. The old crusher site and shunting areas are still reverting to forest and the York Track follows the otherwise overgrown route of the railway line (Mt Egmont branchline). Kaikawaka and mountain totara were used widely during this venture; to this day kaikawaka is extremely scarce in the vicinity of the quarry and sawn stumps of mountain totara can be found close by. A few pole stands of mountain totara have arisen where the forest was partially cleared, and exceptionally large individuals of the tree daisy *Olearia ilicifolia,* normally a species of the upper altitude scrub, now fringe a portion of the old railway line route.

In 1934, eleven years after quarrying had ceased, forest near the end of Kent Road and the Te Popo Gorge was the scene of a short-lived illegal logging operation. During the same period, the then privately owned forest on the lower slopes of the Pouakai Range bordering Carrington Road was logged for podocarps; the forest is now mainly composed of kamahi.

The translator road construction in 1965 damaged a considerable amount of vegetation, but most of the road cuttings are now clothed in native grasses, creeping herbs, and shrubs.

Although human activity in the park today is more strictly controlled, the vegetation in places suffers from "visitor pressure". The placing of board walks across parts of the Ahukawakawa Swamp has prevented additional damage to the vegetation there. However, damage to the vegetation of the upper slopes of Mt Taranaki still occurs as a result of summit climbs, especially by large groups of people.

1. View from Kaitake Range looking SSW along the Taranaki Volcanic Succession. Pouakai Range in the middleground and Mt Taranaki in the background.

B. D. Clarkson.

2. View of Kaitake Range looking SW from Paritutu, Centennial Reserve, New Plymouth.

B. D. Clarkson.

3. Pouakai Range and Ahukawakawa Swamp from the NW slopes of Mt Taranaki. The Pouakai peaks are (left to right) Hump, Maude Peak, and Henry Peak. The Dome is at the western end of Ahukawakawa Swamp.

M. R. Boase.

4. A late summer view of Mt Taranaki from Lincoln Road, Inglewood. Recent ash deposits, remnant lava outliers, deep gorges, and the upper ringplain are all apparent.

M. R. Boase.

ERRATUM

The colour illustrations for plates 2 and 3 are transposed.

5. Mt Taranaki from the look-out at Dawson Falls showing vegetation zones: forest, scrub and shrubland, tussockland, and herbfield.

M. R. Boase.

6. Semi-coastal forest with nikau at Davies Track (Weld Road), Kaitake Range. The peak Pioke is in the background.

B. D. Clarkson.

7. View from Jacksons Look-out carpark. Leatherwood and inaka scrub in foreground and tussockland and herbfield on the lower slopes of Fanthams Peak in the background.

M. R. Boase.

8. Red tussockland on the Round the Mountain Track, Mt Taranaki.

M. R. Boase.

9. Tussock–herbfield near Warwick Castle.

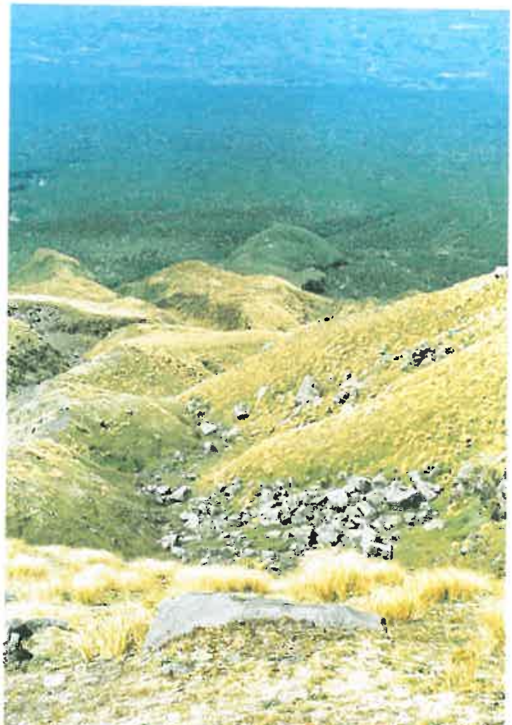
B. D. Clarkson.

10. Mossfield and moss–herbfield on the western slopes of Mt Taranaki.

M. R. Boase.

11. Red tussock and mountain tutu rings in mossfield on the western slopes of Mt Taranaki.

M. R. Boase.



12. View from 1 550 m of the York Track ridge showing vegetation zones: moss–herbfield, tussock–herbfield, tussockland, scrub, and shrubland and forest.

B. D. Clarkson.

14. Flax and mossfield at "Mangawhero Bog".

B. D. Clarkson.

13. Gravelfield and stonefield at 1 800 m on ridge overlooking Tahurangi Hut.

B. D. Clarkson.

15. Kokowai deposits at "Mangawhero Bog".

B. D. Clarkson.

16. Manuka scrub and rimu-kahikatea forest at "Potaema Bog".

B. D. Clarkson.

Previous botanical work

In spite of the early European settlement of New Plymouth (1840) and establishment of the park (1881), there are few substantial accounts of the vegetation, and the full extent of the vascular flora has been determined only in the last thirty years. Some of the main references are reviewed below.

Dieffenbach (1843), naturalist to the New Zealand Company, was the first to describe the vegetation in an account of his and James Heberley's ascent of Mt Taranaki. He listed some of the dominant species and collected several plants then unknown to science for further study. These plants were later deposited at Kew Herbarium in England and described by J. D. Hooker. The name of a small herbaceous member of the daphne family found in the upper herbfield zone, *Drapetes dieffenbachii*, commemorates Dieffenbach's contribution.

Buchanan (1869), botanist to the Otago Geological Survey and Colonial Museum, described the main vegetation types encountered on a journey from New Plymouth over the Pouakai Range to the northern slopes of Mt Taranaki. His species list included only about 180 different vascular plants and, rather inexplicably, the only plant mentioned from his crossing of the botanically rich Ahukawakawa Swamp was sphagnum (*Sphagnum cristatum*) moss.

Petrie (1912a, b), a school inspector, and Thomson (1917), a naturalist, both collected plants on Mt Taranaki and wrote brief newspaper articles describing the botany of the park. Petrie noted that the alpine flora of isolated Mt Taranaki was comparatively meagre and that the plants must have been "conveyed there by such haphazard agencies as the arms of the blasts and the flight of birds". Thomson also commented on the paucity of the flora, noting that "compared to the Otago mountains it is a singularly poor collecting ground".

The renowned plant ecologist, Dr Leonard Cockayne, made several trips to Mt Taranaki. The field notes he made describing the vegetation in 1919 and later used in his book "The Vegetation of New Zealand", are held in the Auckland Institute and Museum Library. Cockayne provided quite detailed descriptions of the main vegetation types and emphasised the importance of average winter snow-line as a causal factor of zonation. Cockayne (*c.* 1922) cautiously estimated the vascular flora of Mt Taranaki to be about 220 species.

Oliver (1931), a naturalist and former Director of the Dominion Museum, gave the first published account referring to the relatively recent volcanic eruptions of Mt Taranaki. The evidence he presented included the existence of a Maori oven (*umu*) beneath the upper layers of volcanic material, the presence of scoria and ash in the forks of large trees, and dead trees rooted in lower layers of volcanic material. These features were originally drawn to his attention by Mr A. W. Burrell of Stratford after whom the eruption, subsequently dated at 1655 A.D., was named. Oliver also noted that several plants, characteristic of mountain regions elsewhere in the North Island, including the beeches (*Nothofagus* spp.), were absent from Mt Taranaki.

Robbins (1942) provided a brief account of the vegetation of the Pouakai Range.

Millener (1946) suggested that the absence of many alpine species from Mt Taranaki was related not only to the isolation of the mountain but also to recent volcanic activity. He also warned of the likely detrimental effects of introduced goats, already well established at North Egmont, on the vegetation.

Gibson, Hatch, and Irwin (1953) reported on the native orchid species on Mt Taranaki and the nearby ranges.

Schweinfurth (1962) pointed out the floristic and physiognomic similarities between the montane forests ("goblin forest") of Mt Taranaki and Tasmania and the humid tropics.

A. P. Druce in a series of publications between 1953 and 1976 made the major contribution to the understanding of the vascular flora and vegetation of the park. Many of the features referred to by earlier authors were quantified for the first time, including the vegetation composition, extent of the vascular flora, and the "missing" taxa. Above all, Druce clearly established the significance of recent eruptions in determining vegetation composition and provided estimated dates for their occurrence. This work is referred to throughout The vegetation and substrate classes and Flora sections.

McGlone (1980) outlined the vegetation history of Mt Taranaki, based on the results of pollen analysis and examination of other plant fossils. His main findings were that about 18 000 years ago scrub, grassland, and bog vegetation predominated at low altitude over the entire region. Some of the species that were part of this ancient scrub, such as *Coprosma, Hebe, Dracophyllum, Brachyglottis,* and *Leptospermum* form the scrub on the upper slopes of Mt Taranaki and Pouakai today. But others, and among them the commonest plants recorded at this time, such as mountain toatoa (*Phyllocladus aspleniifolius* var. *alpinus*), pink pine (*Halocarpus biformis*), and bog pine (*Halocarpus bidwillii*) are now absent. About 14 000 years ago the climate began to warm and within perhaps less than 500 years the complete transition from scrub and grassland to forest occurred. About 10 000 years ago there was another major shift in climate with temperature and rainfall increasing eventually to levels exceeding those of today. The main effect was that rimu (*Dacrydium cupressinum*) superseded matai (*Prumnopitys taxifolia*) in importance and at the same time hutu (*Ascarina lucida*), a small understorey tree that prefers wet, mild climates, became very abundant. From about 5000 years ago, the climate gradually deteriorated, becoming cooler and subject to more variation. Hutu underwent a prolonged, fluctuating decline and kaikawaka waxed and waned in abundance as climate varied. The present day dominance of kamahi is a recent phenomenon coinciding with volcanic eruptions.

Waters (1982) surveyed the vegetation of the Ahukawakawa Swamp. The results of her work are reported on p. 45–47.