

Botany Guide

Waimangu Volcanic Valley hosts a wide variety of unique thermal plants in many habitats ranging from acid to alkaline soils, hot wetlands and bare warm ground. All of the thermal plants known in New Zealand are represented at Waimangu Volcanic Valley. All plants at Waimangu have arrived through natural succession since the 1886 Tarawera eruption.



That is, there has been no planting by man. Birds and wind and the action of the eruption itself have deposited the seeds and spores here, and this accounts for the exotic species that are present with the natives.

Waimangu is a good example of an ecosystem naturally re-establishing in an area following devastation by volcanic eruption. It is protected by the Department of Conservation with **Scenic Reserve** status.

The uniqueness of the botanical environment Waimangu has evolved through several events.

Firstly, it is an area of new soil, and that soil resulted from the **Tarawera eruption** on 10 June 1886. Superheated ejecta from the eruption, mixed with sand, ash and water, fell on up to 15,000 square kilometres of land, leaving deposits to a depth of 40 metres near the source and (on average) up to 20 metres thick through Waimangu Valley. All flora and fauna present were extinguished on that day. Around 1900, when through the settling effects of erosion the new soil had stabilised, plants were able to begin re-colonising the site.

The flora of Waimangu have been further disturbed by later eruptions. In 1917 a large area between **Echo Crater** and the Waimangu Visitor Centre was again disrupted by a blast out of Echo Crater. As late as 1973 a small area of plants to the southwest of the same crater were killed by the "**Trinity Terraces**" eruption.

Hydrothermal Vegetation Zones

In hydrothermal areas plants have to cope with excessive heat, acidic soil and toxic minerals. The upper limit for plant cell activity generally lies between 45° and 55° C (113 - 132°F), therefore heat has a direct effect on where plants can grow. The vegetation in hydrothermal areas grows in *four zones* which are based on the temperature between 5cm depth and the surface.

Zone One

Sites where the temperature is greater than 90°C (195°F). These sites will generally be devoid of plants.

Algae may occur in the cooler parts.

Zone Two

Temperature 50-70°C (121-161°F). The vegetation is restricted to moss hummocks and scattered lichens.

Zone Three

Temperature 40-50°C (105-132°F). Prostrate kanuka is the dominant species with some fern allies and ferns possibly present.

Zone Four

The coolest of the hydrothermal vegetation zones. Also dominated by kanuka which generally exceeds 50cm in height, with some ferns and other species present.

Trees, Scrub and Ferns

In hydrothermal areas such as Waimangu Valley, trees, shrubs and ferns develop characteristics peculiar to these sites. In Zones Three and Four the plants are very shallow rooting and, once loosened, a whole mat of plants could be peeled away from the ground.

Some plants have developed ways to cope with the heated soils, for example the prostrate form of **kanuka** (*kunzea ericoides* var. *microflora*). While the normal form of kanuka grows into a tall tree, on hydrothermally heated soils the prostrate form grows into a low shrub with a wide spread of flattened branches. Its roots behave in a similar manner, spreading through the top few centimetres of cooler soil.

Other naturally erect plants not so well suited to these sites (such as **Kamahi**) are easily blown over, because their root systems are unable to penetrate the hot soil and fail to give good anchorage. If roots penetrate too deeply they can allow steam to escape to the surface, also killing the tree. Acidic hydrothermal sites generally favour hardy heath-like plants with small leaves. On these sites **manuka** (*Leptospermum scoparium*), **mingimingi** (*Leucopogon fasciculatus*) and **prickly mingimingi** (*Cyathodes juniperina*) frequently mingle with prostrate kanuka.

On less acidic sites the vegetation is usually more mixed. Frost intolerant tropical ferns such as lader fern (*Dicranopteris linearis*), and soft fern (*Christella* sp.) occur. In New Zealand these ferns are restricted to the hydrothermal areas about Rotorua and Taupo.

Plants such as swamp fern (*Cyclosorus interruptus*), the fern ally *Psilotum nudum* and a comb fern *Schizaea dichotoma* also grow in warmer parts of the country as well as in hydrothermal areas.

Mosses, Algae and Bacteria

The only one of these plant species local to the Rotorua - Taupo region and confined to the heated soils in *Campylopus holomitrium*.

In hydrothermal areas many different kinds of bacteria live in dense mats together with blue-green *algae*. Patterns created by these carpets of minute plants enhance the beauty of these thermal areas with vivid splashes of contrasting colours - dark blue - greens, browns, pinks, reds, and orange.



Marble Terrace

These microscopic plants live as single cells no more than a few thousandths of a millimetre long or wide, or may be assembled into threads of colonies visible to the naked eye. Floating cells are called *phytoplanktons*; anchored cells and threads are called *phytobenthos*. In geothermal areas their presence is determined mainly by temperature and sulphide tolerance.

The most conspicuous growths are formed in overflow paths below hot springs and geysers with neutral or alkaline water chemistry. These mats, cushions and threads of blue - green algae (often blackish in appearance), are intermingled with orange trails of gliding bacterial threads called *Chloroflexus*.

The velvety green cushions of *Mastigocladus* and mats of filamentous *Phormidium* can withstand bombardment by almost boiling droplets which would kill them if the flow was continuous. At higher temperatures, they can grow freely without being grazed by animals such as the larvae of flies and other insects adapted to these habitats.

Plants species occurring at Waimangu

Recorded from Waimangu are 49 different trees and shrubs (including 16 exotic species), 4 lianes (including 2 exotic), 51 ferns and fern allies (1 exotic), 25 grasses (20 exotic species), 10 sedges (1 exotic), 7 rushes (3 exotic), 88 herbs (57 exotic), 7 orchids and 3 mosses.

Traditional Uses of some Plant Species

Rahurahu (*Pteridium esculentum*)

Bracken fern which yields its underground stems (called aruhe when roasted) for food. This was regarded as the most sustaining nourishment for warriors on the warpath and had the added advantage of being light to carry. Fronds were used to trap fresh water crayfish (koura).

Toe-Toe (*Cortaderia fulvida*)

Fluffy seed heads were applied to stop bleeding. Toe-toe was also used in association with raupo to make wall linings.

Mamaku Tree Fern (*Cyathea medullaris*)

The pith of this tree fern was used as a food, and the fronds were used as a dressing to draw boils.

Rangiora (*Brachyglottis repanda*)

Its large leaves, dark green on top and white underneath, are known as "Bushman's Toilet Paper". Leaves were traditionally used as an antiseptic dressing.

Kanuku (*Kunzea ericoides*) and

Manuka (*Leptospermum scoparium*)

The wood was made into bird spears. For sprains, strains and swelling, the bark was boiled and used as a soak. Leaves were applied to large cuts and severe wounds, but only as a last resort as this was very painful. Leaves were boiled and the liquid drunk to help bladder and kidney function. Liquid was also used as a mouth wash and throat gargle. Inhalation of the steam would help to alleviate bad headaches, flu and bad coughs as well as helping with breathing problems such as blocked sinus, hay fever and to some extent bronchitis and asthma. Tea tree is a natural antiseptic.

Harakeke (*Phormium tenax*)

New Zealand Flax can be taken in a variety of forms to heal rheumatism, sciatica, chapped hands and feet, cuts and abrasions, burns, poisoning, constipation, toothache, bruising, chilblains, ringworm, dysentery, skin rashes, scabies, kidney and liver problems. The fibre from this plant was used to make baskets, cloths, mats and fishing lines and nets.

Koromiko (*Hebe stricta*)

Another plant with many traditional medicinal uses, including use as a muscle relaxant - for example it was used with expectant mothers to facilitate rapid and easy labour - and to promote healing of chafing, rashes, dysentery, bowel complaints, abscesses, stimulation of the kidneys. Leaves were chewed to cure diarrhoea.



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