



## 2.6 VOLCANIC AND GEOTHERMAL ENVIRONMENTS



Bay of Plenty Conservancy comprises a major part of the Taupo Volcanic Zone which extends from beyond Whakaari (White Island) to the central North Island volcanoes. The entire landscape of the conservancy has been moulded by active tectonic processes associated with rifting of the zone, and is characterised by extension faulting, thinned crust, volcanism and geothermal activity.


Bay of Plenty Conservancy's volcanic and geothermal environments are of international conservation significance. The region is one of the most distinctive in New Zealand, with features like boiling mudpools, thermal springs, spouting geysers, iconic volcanic domes, and caldera lakes surrounded by indigenous forests and shrublands.

The boundaries of the Bay of Plenty's volcanic and geothermal environments extend from the crest of the Mamaku Plateau south-east to Waiotapu and Rerewhakaaitu, before running north-east to Kawerau. The northern boundary lies north of lakes Rotorua, Rotoiti, Rotoehu and Rotoma.

Indigenous vegetation covers most of the volcanic landforms in this place - Mount Tarawera, Putauaki (Mount Edgecumbe), Ngongotaha, Makatiti, Haparangi, Mokoia Island, Maungaongaonga, the Rotorua volcanic caldera and Maungakakamea (Rainbow Mountain). These landforms are surface expressions of the violent forces at work deep within the earth. They give this place its identity and hold special historical and cultural significance.

The Te Arawa/Rotorua lakes are distinctive features of the volcanic and geothermal environments. They vary in size, shape and water quality but most have been formed through volcanic activity.

Tangata whenua have strong affiliations with this place. The origins of ahi tipua, the sacred or enchanted volcanic fire, are told in the legend



of explorer Ngatoro-i-rangi, who climbed Mount Tongariro to gain a view of the surrounding land and claim it for his people. On the snow-clad summit, Ngatoro-i-rangi was overcome by a bitter south wind and called on his sisters in Hawaiiki for help. They sent the fire gods Te Pupu and Te Hoata, who travelled underwater from Hawaiiki with the ahi tipua, surfacing at Whakaari (White Island), Rotorua and several other places, and bursting out at Tongariro to warm Ngatoro-i-rangi. At every place where the gods emerged en route, they left the fire, seen today in the region's thermal features.

For Maori, geothermal features with surface activity (such as geysers and hot pools) have traditional cultural and historical significance. These spiritually significant taonga are used for bathing, cooking, medicine and dyes. Easily cultivated soils derived from volcanic ash encouraged extensive kumara cultivation.

Rotorua's internationally renowned tourism industry is founded on the natural attractions and recreational opportunities of this place, including geothermal features, thermal waters for relaxation and therapeutic bathing, and the world-class trout fishery. There is potential for the Department of Conservation, as well as protecting the values of the volcanic and geothermal environments, to help realise the potential benefits of tourism to tangata whenua and the local community.

Volcanic and geothermal environments provide a range of recreational opportunities on (or via access to) public conservation lands and waters. These include hunting, fishing, bike riding, tramping, camping and birdwatching.

Management of volcanic and geothermal environments involves a range of organisations, including the department, tangata whenua, local authorities, and forestry and energy companies. Developing and strengthening collaborative working partnerships is critical to ensuring the long-term well-being of this place and the community it supports.


### **Outcomes - Volcanic and Geothermal Environments**

1. The diverse ecosystems and habitats of the volcanic and geothermal environments are healthy and sustain viable populations of indigenous flora and fauna.
2. Tangata whenua and communities of interest are connected to and actively involved in the management of the volcanic and geothermal environments.
3. The historical and cultural heritage of the volcanic and geothermal environments is valued and protected.
4. Visitors are attracted by the conservation values of the volcanic and geothermal environments and their experiences are enhanced by the services provided.

Refer  
1.4 Historical and cultural  
heritage: objectives and  
policies

The volcanic and geothermal environments place consists of:

- lakes - the department's management involvement is described in the Terrestrial and Freshwater Ecosystems, Habitats and Species section of



part one.

- volcanic and geologic landforms - the department's management involvement is described in the Geological Features, Landforms and Landscapes section of part one
- geothermal sites
- Te Arawa/Rotorua lakes indigenous forests.


The following section focuses on the department's management responsibilities for geothermal sites and forests. The outcomes for volcanic and geothermal environments apply, but the objectives and policies are specific to the management requirements of either the geothermal sites or the forests.

### **Geothermal Sites**

Geothermal systems are naturally rare. Protecting ecosystems influenced by geothermal activity is a national priority. The Bay of Plenty Conservancy has the highest remaining concentration of such ecosystems in the country.

The geothermal systems in the Bay of Plenty form the northern end of the Taupo Volcanic Zone which stretches from Mount Ruapehu to Whakaari (White Island). The most recent major eruption in the area was in 1886, when Mount Tarawera erupted in a cataclysmic explosion, splitting the centre of the mountain and forming a vast rift interspersed with three large craters. This eruption destroyed the world-famous Pink and White Terraces, which were often referred to as the eighth natural wonder of the world, and displaced the tangata whenua of the Tarawera area, Tuhourangi and Ngati Rangitahi.





The geothermal features in this place include geysers, hot alkaline chloride springs, mudpools, fumaroles, steaming ground and silica terraces and flats. Geothermal surface features within the Rotorua, Te Kopia, and Waiotapu/Reporoa geothermal systems are internationally important. Whakarewarewa's Geyser Flat in the Rotorua system ranks with Yellowstone National Park as one of few active geyser fields in the world: of New Zealand's five original geyser fields, it is the only one left.

Orakeikorako, on the northern edge of the Waikato River, is a largely privately-owned geothermal system of national significance. Some of this system was lost when the Waikato River was dammed to form Lake Ohakuri in 1961.

Geothermal sites support unique combinations of microbes and thermo-tolerant vegetation. Vegetation around active sites is often tinged dark orange by a fungus associated with geothermal areas. The most common vegetation association is prostrate kanuka shrubland. Other plants include rare orchids, frost-tender ferns with tropical affinities, soft mingimingi (*Leucopogon fasciculatus*), indigenous blueberry (*Dianella nigra*), arching clubmoss (*Lycopodiella cernua*) and the mosses *Campylopus* and *Dicranoloma*. The hottest geothermal areas, where the extreme conditions prevent plants from colonising, comprise large areas of non-vegetated raw-soilfield.

A number of geothermal systems within the conservancy have international significance. These are the geothermal fields at Rotorua, Waiotapu, Waimangu, Whakaari and Whakarewarewa. Of these, the first four have been recommended for complete protection. The Rotorua geothermal field is considered highly vulnerable to human activities.

The complex interactions and geological connections between geothermal systems and their influence on the expression of surface features and geothermal ecosystems are not well understood. More research is needed. Particular benefits may come from a better understanding of the adaptations made by extremophile microbes.

Many geothermal features have disappeared or have been modified through activities including the extraction of geothermal energy and fluid, urban and industrial development, pest plant encroachment, inundation from hydroelectric power development, altering of groundwater tables, exotic forestry plantations and grazing.

The special association of Ngati Tuwharetoa (BOP) with the Parimahana Scenic Reserve, a geothermal site with surface expression, has been recognised through their Treaty settlement legislation. This settlement requires the department to work with Ngati Tuwharetoa (BOP) to establish and implement protection principles in accordance with the Owhakatihi (statutory overlay), acknowledging the traditional, cultural, spiritual and historical values of the reserve.

The tourism industry in Rotorua is substantially based on geothermal sites. Major concessions at Waimangu and Waiotapu are on public conservation lands. Visitor opportunities should range from fully-serviced concessions to free access, to enable people to experience geothermal sites.



### **Management Objectives - Geothermal Sites**

1. To protect and enhance geothermal ecosystems and habitats including surface features at priority sites.
2. To provide visitor facilities which enable people to learn about and enjoy the conservation values of geothermal sites.
3. To work with tangata whenua and communities of interest to recognise and protect the sites and stories of historical and cultural significance.
4. To encourage a range of appropriate concession opportunities, such as ecotourism ventures and guided walks.

### **Management Policies**

1. Will undertake pest control at priority geothermal sites on public conservation lands, including Te Kopia, Maungakakamea, Waiotapu, Hot Water Beach and Waimangu.
2. Will work with tangata whenua, landowners, neighbours, local authorities, and forestry and energy companies to minimise any potential adverse effects of their activities on priority geothermal sites on public conservation lands.
3. Will work with tangata whenua, landowners, neighbours, local authorities, and forestry and energy companies to ensure the sustainable management of geothermal sites and the protection of significant geothermal surface features.
4. Will involve tangata whenua and communities of interest in geothermal site management, including planning, developing, establishing and promoting conservation and recreation opportunities.
5. Will work with Ngati Tuwharetoa (BOP) to protect and enhance the Parimahana Scenic Reserve.
6. Will ensure an appropriate range of opportunities enabling visitors to experience and enjoy geothermal sites on public conservation lands, including:
  - retaining access to Waimangu and Waiotapu geothermal sites as high quality concessions with full services
  - retaining free access to Waiotapu mudpools, Maungakakamea and Twin Rivers hotpools, and enhancing these sites
  - enhancing and improving access to Te Kopia and Whangapoa Springs
  - retaining Maungaongaonga and Parimahana as undeveloped sites.
7. Will facilitate and enable scientific research into geothermal resources on public conservation lands.



## Te Arawa/Rotorua Lakes Indigenous Forests

This place was originally covered by podocarp-hardwood forest, wetland, mire and geothermal vegetation. Fire and logging have cleared most of the larger trees but substantial areas of indigenous forest remain.

Major forest tracts occur mainly in the higher or cold sites, including those at Lake Tarawera, Te Kopia, Maungakakamea (Rainbow Mountain), Lake Okataina, Mount Ngongotaha, Kaharoa, Lake Rotoehu and Lake Rotoma. These forests are predominantly rimu, tawa and kamahi. On warmer sites the forest contains pukatea and mangaeao. On some wetland sites, especially at lake margins, groves of kahikatea remain.

The only inland stands of pohutukawa are found in this place and are restricted to lake margins. Northern rata was originally a common emergent tree species along with podocarps in the tawa-dominated forests. During the 20th century northern rata almost disappeared as a result of possum browse, fire and logging. Pohutukawa and rata have hybridised at several sites, including Lake Okataina and Tarawera Falls.

These forests support populations of threatened bird species including the North Island kokako and North Island brown kiwi, saddleback and weka. Long- and short-tailed bats are present in some of the forests. Threatened flora present includes several mistletoe species and New Zealand cress.

Possum browse has damaged these forests in the past, particularly those dominated by pohutukawa, fuchsia, rata and kamahi. Possums threaten the long-term survival of plants such as mistletoe and *Dactylanthus* and native birds.

The secondary forest and shrubland around Mount Tarawera and Lake Tarawera provide an opportunity to study the development of successional vegetation since the 1886 eruption.

The fragmented nature of the forest remnants lowers the quality of these habitats and makes them vulnerable to invasive pest animals and plants but they form an important ecological link between the higher inland forests and the coast.

## Te Arawa/Rotorua Lakes Trail Network

Central to increasing and enhancing visitor experiences in this place is the development of the Te Arawa/Rotorua Lakes Trail Network, which will provide tramping and biking opportunities in collaboration with tangata whenua, private landowners and regional and district councils.

A key objective is the establishment of a high quality multi-day trail network around the Te Arawa/Rotorua lakes. The first stage in developing this network is the trail around Lake Tarawera. This trail will eventually link up with the existing track network around other lakes.

Development of the multi-day trail requires access across land owned by local Māori trusts. Working collaboratively, the department, private landowners and tangata whenua have potential to realise their aspirations while establishing a trail that is different from others currently available in New Zealand.

## Management Objectives - Te Arawa/Rotorua Lakes Indigenous Forests

Refer  
1.3.1 Terrestrial and  
freshwater ecosystems,  
habitats and species: policy 1

Refer  
1.2 Public participation in  
conservation management:  
objective 1

Refer  
1.4 Historical and cultural  
heritage: objectives and  
policies

Refer  
1.5.2 Vehicles: objective 1,  
policy 4

1. To manage indigenous forests so that they can contribute to improving the water quality in the Te Arawa/Rotorua lakes.
2. To maintain or enhance the habitat quality and level of indigenous biodiversity.
3. To establish, maintain and improve ecological linkages with adjacent land and the surrounding environment.
4. To work with tangata whenua and communities of interest to recognise and protect the sites and stories of historical and cultural significance.
5. To develop and promote a range of recreational opportunities such as walking, tramping and mountain biking.
6. To encourage a range of appropriate recreation concession opportunities, such as ecotourism ventures, guided walks and ecotourism organised events.

## Management Policies

Refer  
1.5.2 Vehicles: objective 1,  
policies 5/6

1. Will undertake pest control at priority sites including Te Kopia, Rotoehu Forest, Okataina, Tarawera and Rotoma.
2. Should support community-led pest management projects including those at Mount Ngongotaha, Kaharoa and lakes Tikitapu and Okareka.
3. Will work with tangata whenua, communities of interest and other organisations to restore and enhance viable ecological connections linking indigenous forest tracts including Kaharoa, Rotoehu and Rotoma through to the coast via Manawahe, and with the Kaimai-Mamaku Forest Park.
4. Will involve tangata whenua and communities of interest in forest management, including planning, developing, establishing and promoting conservation and recreation opportunities.
5. Will develop the Te Arawa/Rotorua Lakes Trail Network, beginning with the Lake Tarawera Trail, in partnership with landowners, tangata whenua and communities of interest.
6. Should permit helicopter use for activities including recreation, hunting and infrastructure servicing.