History

For several centuries before the 10 June 1886 'Tarawera' eruption, two small lakes existed in the area now occupied by Lake Rotomahana. Maori had given them the names Rotomakariri (Cold Lake) and Rotomahana (Warm Lake), so distinguishing their most obviously contrasting characteristics. The shores of old Rotomahana were adorned by the siliceous sinter deposits of innumerable boiling springs, including the unique Pink and White Terraces, and the lake waters were warmed by their discharges. Both lakes drained into Lake Tarawera via an overflow stream to the North North East.

Approximately 600 to 700 years ago the Maori people arrived in New Zealand and migrated inland from the coast. It was the Arawa canoe that brought the tribal group who reached the Rotorua and Taupo districts. They quickly recognised the advantages the hot springs possessed for facilitating cooking and bathing, and for providing warmth, and the tribe settled permanently in the thermal region.

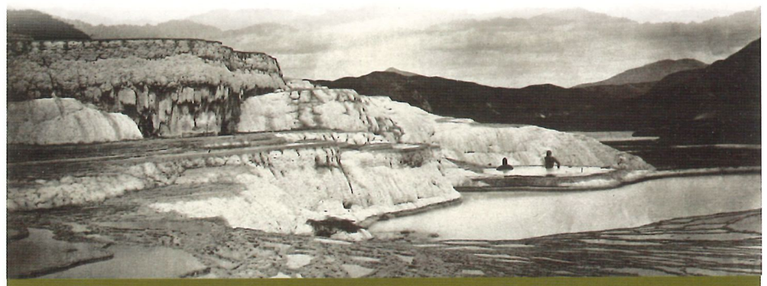
By the 1830s missionaries and occasional European traders had visited the Rotorua lakes district. In the next decade Lake Rotomahana and the Pink and White Terraces became known and their unique beauty and strange setting started to become widely publicised. In the following years and particularly after 1870 growing numbers of visitors began to arrive to see these magnificent natural structures. Local Maori villagers benefited from the revenue obtained from their services as guides and boatmen in the burgeoning tourist trade.

All this changed with the Tarawera eruption of 1886. In the earliest hours of 10 June 1886 persistent and increasingly felt earthquakes were noticed in the immediate vicinity of the mountain and as far as Rotorua. At about 2 o'clock in the morning a column of black ash suddenly erupted from Ruawahia, the mountain's highest dome. This column, illuminated with innumerable flashes of lightning, quickly became incandescent with the glow of red-hot lava and for the next two hours the whole length of the mountain-top presented the appearance of erupting a gigantic broad sheet of fire. At about 3 o'clock an enormous cloud was seen to rise above the site of Rotomahana. This was the first indication that the eruption was extending to the southwest. The eruption rift comprising the succession of craters across the mountain top eventually opened in both directions until a line almost 16 kilometres in length extending from a kilometre north-east of the mountain to Southern Crater at Waimangu was in violent upheaval. At Rotomahana it appears that rising basaltic magma (lava) triggered a tremendous explosion of the hydrothermal system that had fed the hot springs there. The resulting mass of ejecta is believed to have risen to a height of about 11 kilometres. It consisted of dust, sand, and rock, mixed with fragments of new lava and filled with steam and other gases. Much of the ejecta column collapsed, and, falling with great speed from the height to which it had risen, flowed across the surrounding country and inundated a circle of about 6 kilometres radius in a boiling flood. Further explosions of somewhat lesser magnitude continued for a few hours. Near the edge of the crater which formed at Rotomahana the deposit reached a maximum depth of about 40 metres. Altogether an area of about 15,000 square km received an appreciable covering as a result of the six-hour upheaval.

Seven small villages were destroyed during the eruption with around 105 lives being lost. All plant, bird and animal life in the area was extinguished by the Eruption.

By about 1910, the great crater at Rotomahana had more or less filled with water, mostly from rainfall within its catchment, to form the present-day lake. Today this lake has a surface area about twenty times greater than that of the previous lakes, and its water level is 40m higher due to the blockage of the former outflow valley.

In 1917, the last major event in the formation of the modern landscape occurred with the hydrothermal eruption of Echo Crater, in Waimangu Valley, and the consequent formation of Frying Pan Lake.



The White Terraces before the 1886 eruption of Tarawera.

World-wide Significance

Waimangu and Rotomahana lie within the Okataina Volcanic Centre which is part of the Taupo Volcanic Zone. This zone in turn is the New Zealand part of the Pacific 'Ring of Fire' where the Pacific Tectonic Plate meets the India-Australia Tectonic Plate. A feature of the Taupo Volcanic Zone is the relatively shallow depth - only a few kilometres beneath the surface - at which large masses of molten rock are believed to reside.

Many scientists (including geologists, volcanologists, botanists) visit Waimangu and Rotomahana. Among its attractions to such researchers is the fact that in its Waimangu section it is the only major hydrothermal system in the world whose surface activities commenced wholly within historic times and did so at a precisely known date as the result of a volcanic eruption. Scientists maintain extensive networks of monitoring equipment within the Valley, on Mount Tarawera, and indeed throughout the whole of the Taupo Volcanic Zone. Among the larger lakes in the North Island Rotomahana is the youngest and, at about 125 m, is the deepest in the Rotorua lakes district.

BOTANY Waimangu and Rotomahana are very important botanically because they are the only areas in New Zealand where there has been the opportunity to record the re-establishment of a native forest following complete destruction of all plant life. Rotomahana is comparatively free from exotic plants. This is due to the protection it receives from its Scenic Reserve status, the small rainfall catchment over farmland, and its fairly isolated location. Road access to the lake is limited with the result that private boats seldom visit it and so are not introducing weeds from other sites. All types of thermally adapted plants known in New Zealand are represented at Rotomahana.

BIRDS Wildlife Refuge status ensures that many bird species are often present at Lake Rotomahana including the Grey Duck, Scaup (or native Diving Duck), the Cormorant, Black Swan (predominant species), Mallard, Coot, Dab Chick or Grebe, White Faced Heron, Pukeko, Pied Stilt and various sea birds.

TROUT American steel-head Rainbow Trout were introduced into the lake in 1913 and are now prolific. Difficult public access conserves their population and the absence of a water filled channel between Tarawera and Rotomahana Lakes maintains the purity of the breed.

The Pink Terrace was a popular bathing site before the 1886 eruption of Tarawera.

Protection of Waimangu Volcanic Valley and Lake Rotomahana

The Scenic Reserve status and Wildlife Refuge status of this area largely protect it from interference, with activities such as farming and industrial development being prohibited. However tourism, with its impact being limited to establishing the tourist amenities including the footpath, bus road and boat jetties, is an allowed activity. The boat trips produce almost no environmental impact. Thus Lake Rotomahana is preserved in its natural state and such changes as have occurred in the physical features and the vegetation since 1886 have done so with little interference from man. The natural changes have been documented from the earliest days to the present.

MISSION STATEMENT He Taonga tuku iho. Sharing our kōrero, our history. Delivering exceptional experiences to our manuhiri in a sustainable way.

Facts, research and authenticating of copy provided by Prof. R.F.Keam, University of Auckland and Bradley Scott, Institute of Geological & Nuclear Sciences, March 2012.

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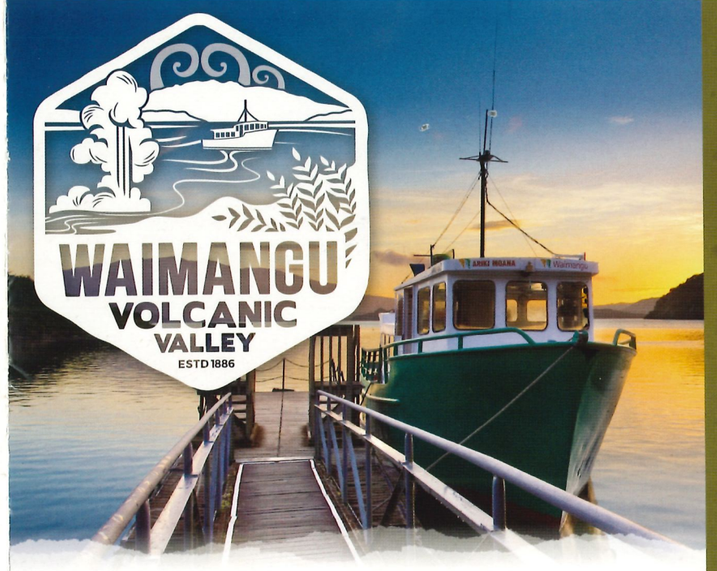


VOYAGER GUIDE

Haere Mai welcome

Explore this amazing, natural environment that has been unaltered by man since its creation in 1886. The youngest of New Zealand's large, naturally formed lakes, Lake Rotomahana is New Zealand's original tourist attraction. Visitors travelled to Rotomahana attracted by the legendary Pink and White Terraces which were covered by the 1886 eruption. Rotomahana is the deepest lake in the Rotorua region. It is protected as a wildlife refuge, and large numbers of birds live here all year round. Beautiful geothermal springs and geysers display along the south west shoreline. It will always remain as one of New Zealand's beautiful, unspoilt, natural wilderness areas.

Our Values

MANAAKITANGA Safety, Communication, Hospitality
We welcome you to our place, share the legacy and knowledge, we will look after you

KAITIAKITANGA Sustainable, Integrity, Authentic
Together we will look after this taonga and use tikanga, tika and matauranga to ensure its long term sustainability

WHANAUNGATANGA Teamwork, Support
We will respect each other and through shared experiences create a sense of belonging

IMPORTANT SAFETY MESSAGES

Waimangu is unique and fragile - please take care

- **Do not board the boat or leave the boat without the captain's consent.**
- **Ensure children are supervised at all times.**
- **Stay inside the boat handrails at all times**
- **Take care when moving around the boat.**
- **Report any concerns to the captain as soon as possible.**

Introduction to an active volcanic crater:

Research in January 2011 showed that many hot springs discharge into the bottom of Lake Rotomahana. Some of these possibly represent features that predate the 1886 eruption but many have formed since then. The research showed also that the Lake emits about 500 tonnes of carbon dioxide gas every day. The presence of the hot springs, but particularly the emission of such huge quantities of gas, are indicators that Rotomahana is located within a basin with the characteristics more of an active volcanic crater than of just a hydrothermal system. However, unlike the situation before the 1886 eruption, and because of the enormously increased volume of the post-eruption lake, the hot springs make little difference to its water temperature.

WAIMANGU.CO.NZ

Points of interest on your cruise

1. HOT STREAM From the back of the boat, as the cruise begins, you can see where the stream from Waimangu enters the lake. Its warm mineralised water enriches the lake in this area, encouraging vegetation to grow and providing plentiful food for the bird life. The shallowness of the delta allows the birds easily to reach the food (and indeed the propeller from this boat stirs it up, increasing its accessibility). This is a wildlife refuge, which means that all bird species are protected, whether native or introduced.

2. ROCK WALLS Thick layers of yellowish compact volcanic rock ('ignimbrite'), clearly visible along the southern shore of the lake, are here exposed in the face of a fault-scarp. This scarp here forms one side of the volcanic rift that opened in 1886. The grey-coloured band of material overlaying the yellow rock is the 1886 eruption deposit.

3. PATITI ISLAND This island is composed of rock about 18,000 years old, the same as the oldest parts of Tarawera volcano. Before 1886 it appeared as a small hill. It is the remnant of a lava plug or dome that had solidified after being extruded here during that much earlier eruption. During the 1886 eruption much of it was blown away, exposing and somewhat shattering its original solid lava core.

4. TARAWERA VOLCANO Prominent to the north-east is the south-western end of Mount Tarawera. The summit of Tarawera volcano is 1111m (3363ft) above sea level and approximately 772m above the level of Lake Rotomahana. The edifice we see today has been built by at least four separate eruptions which have been dated to have occurred about 18,000, 15,000, 11,000, and 650 years ago.

The eruption about 650 years ago gave the mountain its highest three domes and also probably created the surface features at Rotomahana which allowed the Pink and White Terraces to form.

The 10 June 1886 eruption commenced near the mountain summit and spread north-east and south-west as the 16km long fissure progressively opened. In the visible end of the mountain is the crater known as Tarawera Chasm measuring 500m wide and 500m deep. It was the last crater to start erupting on the mountain on 10 June 1886.

The three skyline domes of Tarawera Volcano are not all visible from Rotomahana. Tarawera (burnt cliff or peaks), Ruawahia (split or cloven hole or cave), and Wahanga (bursting open) were all seemingly named in antiquity, and it is intriguing to consider whether or not such evocative names could have meant that early Maori were witnesses to its previous outburst about 650 years ago.

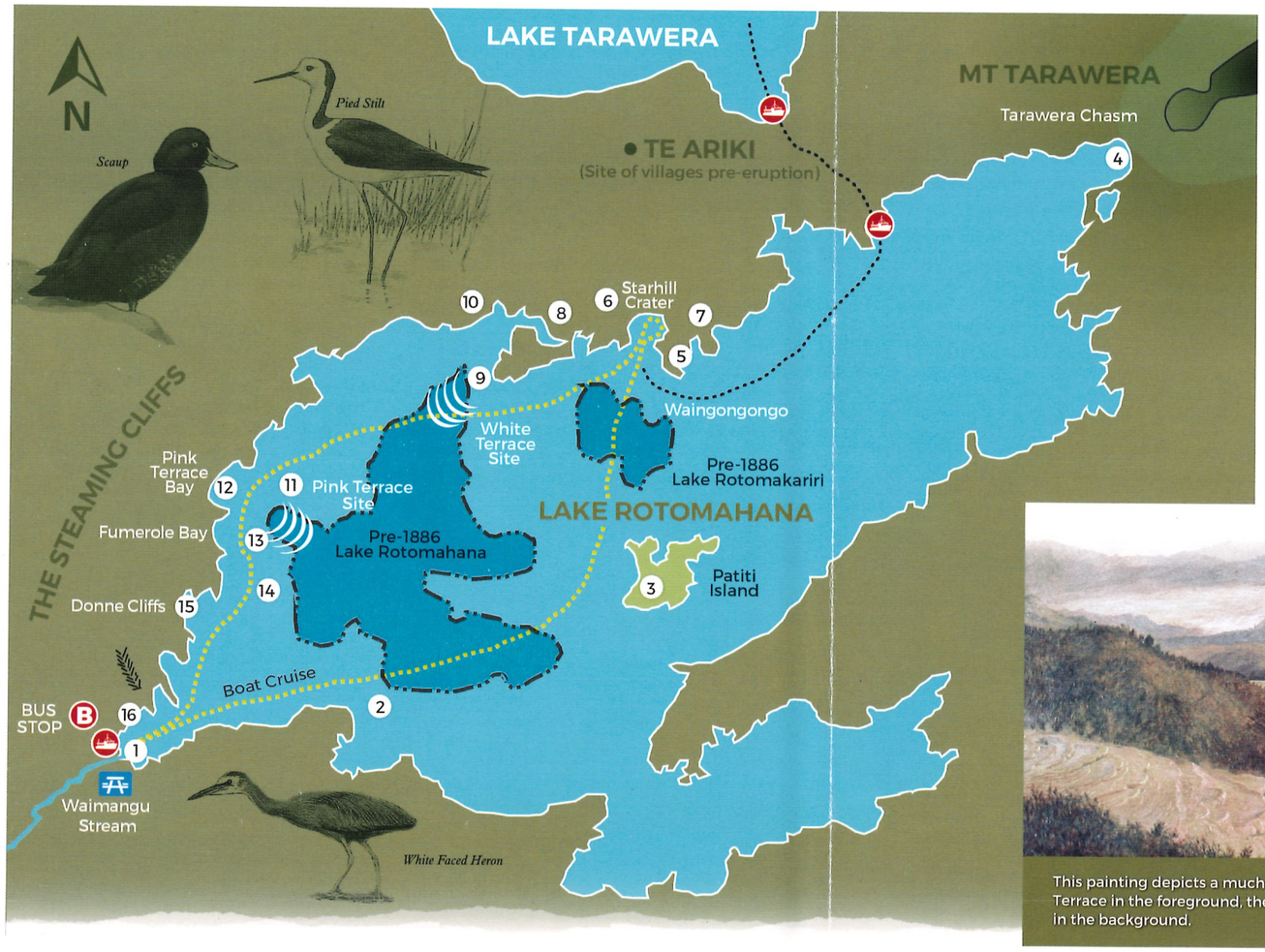
Tarawera is privately owned by the Maori sub tribes who have occupied the region since long before the 1886 eruption.

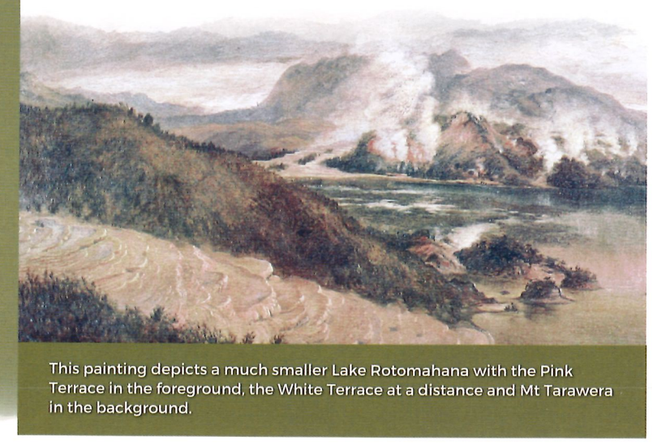
5. LAKE LEVEL All hills between this point and the volcano are part of subsidiary lava domes related to Tarawera and deeply buried beneath the deposits of 1886. In many places there is evidence of water seeping from Rotomahana into Lake Tarawera 1.5km away. Other than this seepage, the level of Lake Rotomahana is entirely evaporation - and rainfall - controlled. Lake level will normally rise and fall approximately 1m between winter and summer but, depending upon the varying annual rainfall, it can sometimes progressively rise or fall. For instance, in the 1930s the lake level was recorded at approximately 332m above sea level and in 1976 approximately 341m above sea level, a difference of 9m.

6. STAR HILL CRATER This small crater, formed during the 1886 eruption, was originally separate from the main Rotomahana crater but is now linked to Rotomahana lake by a narrow passage. Today the crater is 70m deep, approximately 20m below the water and 50m above. The hill in which it is located was christened Star Hill because it was first reached after the 1886 eruption by a member of an exploratory expedition funded by the Auckland Evening Star newspaper. Because of its very sheltered position, Star Hill Crater has a warm micro-climate which has encouraged the re-establishment of plants.

7. RE-ESTABLISHMENT All plant and bird life in this region was extinguished in 1886. But during a research visit to the Rotomahana Crater during the summer 1886 / 87 Professor A.P.W. Thomas was surprised to find a patch of green ferns growing in the walls of Star Hill crater – "...an unexpected and remarkable sight in a crater which had been so active, especially as no other trace of vegetable life was to be seen for miles around in the waste of steaming water and volcanic ash." And now the vegetation and wildlife has regenerated to the extent you see. Evident here is re-establishing native forest in the second stage. The first, or primary, stage is ground cover such as kanuka and manuka, typified by small pointy leaves with a very hard, robust nature. The second stage is the growth of the first new canopy now seen developing here as bushy, shiny leafed trees. The third stage of re-establishment is marked by growth of the podocarps with their high canopy. Reaching the second stage has taken from 1886 to the present. Full development of the podocarps may take a hundred years more.

8. TE ARIKI AND THE TERRACES The land between Rotomahana and Tarawera is known as Te Ariki. This area was settled by Maori, perhaps 600 years ago. It was an important area for collecting food, and, over time, several small villages were established. At the time of the Maori people's first arrival, the Pink and White Terraces would probably been at the earliest stage of their development. However by the time European interest began, the Terraces were in their full glory. The local Maori owned and operated the associated tourism business. By the mid 1880s, visitors to the Terraces





This painting depicts a much smaller Lake Rotomahana with the Pink Terrace in the foreground, the White Terrace at a distance and Mt Tarawera in the background.

numbered perhaps 5000pa. After the 1886 eruption there was no visible trace of the Terraces and it was thought probable that they had been destroyed. However research in 2011 discovered that a small remnant of both the White Terrace and the Pink Terrace do exist. These are approximately 60 metres beneath the water surface. In 2012, a second, small, piece of the Pink Terrace was also discovered.

9. WHITE TERRACE SITE Before the eruption the White Terrace (Te Tarata "Tattooed Rock") was located at the north-east corner of old Lake Rotomahana, and covered 3ha (7 ¼ acres). It rose about 30m (100ft) above the lake. Composed of sinter deposited from the hot water discharging from a great boiling cauldron at its summit, this grand natural structure comprised hundreds of arcuate silica terraces ranging from millimetres to 3.5 metres in height. In many places basins lay behind the terrace fronts and a few contained water of sufficient depth and at such a temperature as to be suitable for bathing. Sometimes the cauldron emptied and when it commenced to refill the boiling water rising from the central vent was often projected high into the air to form a magnificent geyser. The Pink Terraces were built in a similar manner .

10. BASE SURGE DEPOSIT This inlet is the site of the deepest deposit (40m) produced by the 1886 eruption. Here, as is the situation all round the present lake, massive flows of debris were borne along and deposited by steam and other gases all flowing outwards at high speed from around the base of the eruption column. It is this deposit that dammed the former outflow from the Rotomahana basin and has allowed Rotomahana lake to rise to its existing level. The green grassy area indicates the overflow point for Rotomahana to empty into Lake Tarawera. For safety reasons a culvert was introduced here some years ago as an artificial discharge channel when it appeared possible that a sudden uncontrolled overflow from the lake might occur, but in fact lake water has seldom if ever flowed through it.

11. PINK TERRACE SITE The famous Pink Terrace which, together with the White Terrace, was renowned as one of the natural wonders of the world, once draped the hill slopes bordering old Lake Rotomahana. The Pink Terrace (Otukapuarangi "Cloudy Atmosphere") covered 2.2ha (5 acres) and rose about 26m (85ft) above the old lake. The salmon-pink colouring of the silica deposit is believed to have been due to the presence of rare sulphides being incorporated within the sinter. The basins near the top contained shimmering blue water at exactly the right temperature for bathing and to take personal advantage of this was the final culminating experience of pre-eruption visitors during their day at Rotomahana.

THE STEAMING CLIFFS Hot water springs, geysers and steaming vents display along the steep south west side of the lake. Collectively known as the Steaming Cliffs, these features are the current day surface expression of the geothermal system which had existed since prior to the 1886 eruption. (Note : While the 1886 outburst mostly destroyed the surface features that existed in this area at that time, the Geothermal System itself was remarkably unaffected by the eruption.) Sometimes one or another of two geysers can be seen playing onshore here not far from the lake edge.

12. 1886 MUD DEPOSITS The parallel bedding lines in the exposed bank at the southern corner of Pink Terrace Bay show how successive waves of mud accumulated layer upon layer during the 1886 eruption, up to 22m deep in places near here.

13. ROTOMAHANA EROSION For about twenty years after the 1886 eruption little plant life grew on the new deposit because of its instability and the lack of accessible organic material. Over that time erosion produced the razor-back ridges and short blind gullies evident in this bay. Unfortunately this terrain is almost impossible to walk through so it offers the ideal of an undisturbed environment for animals such as feral pigs, deer, wallabies and possums, pests which eat the native forest or prey on birds.

14. FUMAROLE BAY An area of intense steam vents, or 'fumarolic' activity. Surface temperatures of the rock walls range from 40 to 70°C, the lower extent of this range allowing thermally adapted plants to live on the banks. Temperatures 10cm beneath the surface can reach up to 100°C. The large fumarole at the east end of the bay emits steam at 101.7°C. A hydrothermal eruption in 1951 occurred near this bay. This event sent a wave of water across the entire lake and, near the source, disturbed shoreline vegetation to approximately 1.5 metres above the lake.

15. DONNE CLIFFS This magnificent near-vertical face has hot earth from lake edge to cliff top. Thermal plants proliferate in the cooler places. In this area there are several geysers whose activities depend closely upon lake level. Red colouring in the cliffs is caused largely by iron oxide.

16. FRACTURE A line of bare, coloured ground extends a short distance along the crest of the ridge. This represents the surface expression of a fracture up which thermal gases are percolating. In this particular case there is no displacement between the two sides of the fracture, but in many cases relative movement has occurred producing 'faults'. The Rotorua Taupo region is generously supplied with faults and many are associated with the thermal activities and with the locations of the volcanoes.