

### 3. History and Culture Activities

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#### Relevant resources:

- Stitchbirds for Mokoia – video 158 – Department of Conservation Conservancy Office
- Rotorua Museum Education Resources
  - » Te Arawa – Mai Maketu ki Tongariro
  - » Legends, Landforms and Learning
  - » Tarawera photo kit
  - » Grandparents photo kit
  - » History of Tourism Rotorua Timeline
  - » Tarawera Resource kit
- The Story of Rangi and Papa – School Journal: 1994 Part 1 No. 5 – pgs 18–23
- Ihenga and the Turehu – School Journal: 1993 Part 2 No. 1 – pgs 31–35
- The Rock Warriors – D Stafford

Note: Rotorua Museum Photographic services offers photocopying of their wide selection of photos.



# Activity 3a Knowledge Map

## Curriculum links

English

Social Studies

Environment Education – about

Any level

**3**

English/  
Social Studies

## Method

- 1 Gather prior knowledge – mapping exercise, putting their knowledge onto a wall map (stickies, symbols, pictures etc).

### Focussing questions

- What was life like around the lakes in earlier times?
- How has the area changed over time?
- What can we learn from the historic sites around our city and lakes?
- What legends and stories remind us about the history of our lakes?

# Activity 3b Lakes and Legends

## Curriculum links

## Social Studies

## English

## The Arts

## Environment Education – about

Level 2–5

**3**

Social Studies/  
English/  
The Arts

## Resources required

- A variety of local legends

## Prior learning

- Discuss: What is a legend?
- What is the criterion for a legend?
- Where can we find local legends?

## Method

- 1 Have students look at a variety of legends. Break into groups.
- 2 Each group has to read, discuss and present their legend back to the class.  
Their presentation should show/explain:
  - the overall story of the legend
  - how it is linked to the Rotorua Lakes
  - where it is situated
  - is the legend relevant to today?Presentations may include: pictures, drama, dance, speech – decided upon by group.
- 3 Videoing presentation ensures legends may be used later.
- 4 Reflection:
  - Which presentations were best? Why?
  - What were the stories depicted by the presentations? Were they accurate representations?
  - Are the legends realistic?

## Acknowledgements

- Rotorua Museum of Art and History, Te Whare Taonga of Te Arawa, NZ for use of the following legends.

# Legends for History and Culture

## The Revenge of Tama-o-Hoi

On his arrival in Aotearoa, Ngatoroirangi the famous tohunga had many adventures while exploring the land of the Te Arawa region.

On the slopes of Tarawera Maunga an old wizard, Tama-o-Hoi, lived in his den. Often the wizard would attack travellers in the area, killing and then eating them.

On his travels Ngatoroirangi came to Tarawera. He ascended the mountain and at the top encountered the evil Tama-o-Hoi. A great battle took place between the two sorcerers.

Ngatoroirangi's powers were stronger than those of Tama-o-Hoi. Using ancient karakia and all his powers Ngatoroirangi opened the summit of the great mountain and forced Tama-o-Hoi deep down into the darkening depths of the mountain. Ngatoroirangi then closed the pit over Tama-o-Hoi entombing him inside the mountain.

For centuries Tama-o-Hoi lay asleep buried in Tarawera awaiting his time to resurface. Then in 1886 tohunga Tuhoto Ariki, a descendent of Tama-o-Hoi, called upon his ancestor to punish his people for turning their backs on their culture and becoming increasingly greedy. On 10 June 1886, Tarawera Maunga erupted scattering boiling mud, ash and lava over many miles of the countryside and claiming the lives of over 120 Māori and pakeha that lived in the area.

Tama-o-Hoi had been released and the destruction and devastation was his revenge for being imprisoned in Tarawera.

*Rotorua Museum of Art and History, Te Whare Taonga of Te Arawa, NZ*

# Murirangaranga

Tohi-te-Ururangi was a renowned Maketu leader who led Te Arawa into battle at Matata on 28 April 1864. He had in his possession a magical koauau (flute) called Murirangaranga. The koauau originally belonged to Tohi-te-Ururangi's ancestor, Tutanekai.

Murirangaranga was the tohunga who failed to complete the tohi (purification ritual after birth) over Tutanekai. He was immediately drowned by Whakaue who then fashioned the tohunga's arm bone into the flute Murirangaranga, which he gifted to his son Tutanekai.

Tohi was famous for his taiaha fighting ability and political astuteness. However, it was a musket shot that brought about his death as he led 800 Arawa warriors to victory over their traditional enemies, Ngati Awa.

After his death the koauau was hidden down his throat so no one would steal the precious taonga. Te Arawa brought Tohi-te-Ururangi back to Rotorua and buried him at Ohinemutu. Afterwards Murirangaranga was passed to Tohi's cousin Ngahuruhuru Pango of Ngati Tutanekai.

Six years later on 7 February 1870, a renowned pakeha, Gilbert Mair, arrived in Rotorua to defend the people from the murderous intentions of Te Kooti. Later the Ngati Whakaue people of Ohinemutu honoured Mair with gifts and greetings. At the end of the presentation ceremony the elderly leader Ngahuruhuru hung the tribe's most sacred taonga Murirangaranga around Gilbert Mair's neck.

Two decades later in 1890 Gilbert Mair's collection of taonga was sold to the Auckland museum. For almost 100 years Te Arawa was unaware that their most prized taonga was in the Auckland Museum. In the late 1960s Murirangaranga was rediscovered and on 28 April 1993, in commemoration of the battle at Matata, Murirangaranga was returned home to the people of Rotorua after an absence of 123 years.

*Rotorua Museum of Art and History, Te Whare Taonga of Te Arawa, NZ*

# Ihenga – Explorer and Name-giver

*(Narrated by Stanley Newton, a past elder of the Ngati Pikiao tribe of Lake Rotoiti)*

(Mr Newton often delighted groups of school children visiting the Te Takinga Marae at Mourea during the 1970s and 1980s with this 'favourite bedtime stories'. This is one favourite he told to a group of school children from Paengaroa in 1980)

About six hundred and fifty years ago, a very young Māori explorer called Ihenga discovered Lake Rotoiti. The circumstances of this discovery makes interesting reading and is also a very important part of the history of the Te Arawa people.

The Te Arawa canoe had voyaged for many weeks upon the ocean of Kiwa, from the Pacific Islands of Hawaiki. It eventually landed at Maketu with its crew of many men and women. They settled at Maketu to make this place their new home, a haven for themselves in this strange new land, which they named Aotearoa, the land of the long white cloud.

Ihenga, a very young man, was one of the voyagers. A boisterous and adventurous young fellow, he longed to see what was beyond the hills and mountains to the south of Maketu, which forever seemed to be veiled in mist and cloud. One day the urge became so strong that he decided that he must venture out.

For days he travelled with his white dog called Potakatawhiti, through the dense forest. He was aghast with wonder at the beautiful, stately and majestic children of Tane, the forest God, in totara, matai, rimu, pukatea and kahikatea. He was bewildered by their size and stature. They were enormous and reached many metres above the soft, green canopy of the forest itself. At night he and his dog would lie down and rest by a murmuring brook of champagne waters and listen to the dancing and the singing of the fairy folk of the forests, the patupaiarehe.

One morning he awoke to find his dog, Potakatawhiti standing over a mess of vomit, which the dog had just heaved up. To his surprise he noticed that the vomit contained nothing else but inanga, or fresh water whitebait. Ihenga then knew that somehow during the night his dog had strayed away and had feasted upon inanga at some nearby lake or river.

Making haste he continued his journey inland and before long he was standing on the edge of a cliff overlooking the bay of a beautiful lake. The lake was surrounded on all sides by hills and mountains that were covered in dense forest. From this vantage point he named the lake Te Roto-iti-kite-a-Ihenga (the little lake discovered by Ihenga), for that was how the lake appeared to him, a small lake. The high cliff on which he stood he named Pariparitetai, a place of high terrain. The lake's name has been shortened to Rotoiti, which is what it is called today.

The descendants of Ihenga thus came to occupy all the lands surrounding Lake Rotoiti, and this has remained so up to this present day.

Some time later, Ihenga ventured further inland and although he was not the first arrival there, he came to a large lake. He named this lake Te Rotorua-nui-a-Kahaumatamomoe (second and big lake of Kahumatamomoe). Today we call it Lake Rotorua.

Many of the places including rivers, streams, mountains, and so forth in the Rotorua Lakes district were named by Ihenga. Among them are Mokoia Island or Te Motu-tapu-a-Tinirau (sacred island of Tinirau), Ohinemutu (after his daughter who was killed there), Ohau, Ngongotaha and many others.

Ihenga is depicted in many carvings in Te Arawa meeting houses. You will know it is Ihenga because his little white dog Potaka is there sitting beneath him.

*Newton Family archives*

# Kataore of Tikitapu

The Blue Lake, Lake Tikitapu, is a favourite spot for water recreation. Lake Rotokahaki, the Green Lake, remains out of bounds as tapu (sacred), a rule, which is respected by both Pakeha and Māori alike.

There are many stories surrounding the two lakes and the ridge that separates them. They are mystical, tragic and sad. This tale involves a taniwha – Kataore of Lake Tikitapu.

Kataore was a well-mannered and quite young taniwha who had become a pet to the people around Lake Tikitapu. He was not a creature to fear and a pet taniwha was quite a novelty for the local chief.

Some years after the arrival of Kataore, travellers began to mysteriously disappear en route to, or from, Rotorua. Like many other creatures, while lovable as a youngster, his nature had changed as he grew older. He would creep through the trees surrounding the Blue Lake and as a traveller was walking on the forest path Kataore would, with a gulp of his vicious jaws, devour them.

One day, Kataore stole a high born young maiden by the name of Tuhi-karapapa. She was travelling to marry the young chief, Reretoi. Kataore had gone too far this time. Reretoi was overcome with grief and wanted revenge.

Reretoi gathered together more than 100 warriors who had fought taniwha before. They decided that the Tohunga (spiritual leader) would chant karakia (prayers) that had power over all taniwha. While they did so, the war party would plait flax into super strong ropes.

After finding Kataore's cave, Reretoi and Pikata, who were experienced in such work, took their freshly woven nooses and crept into the cave. At first all they could see were the eyes of Kataore gleaming like greenstone. Then they saw his body was still and how his fearsome, spiky scales dropped down his back. The karakia of the tohunga had sapped Kataore's strength.

The warriors edged forward carefully and slipped their flax ropes about the taniwha's huge head. They ran from the cave and when the other warriors saw them appear, they pulled on the ropes. As they dragged the taniwha from the cave, he began to stir. It was enough to put the fear into the bravest of men. But these were special warriors, chosen for their bravery. They pulled their ropes tighter and tighter until Kataore's strength began to fail and his thrashing tail grew weak.

The warriors leapt forward with their tools of greenstone and bone and stripped the flesh off the taniwha. Some of it was cooked and eaten, and some saved to give to the other tribes that had suffered at the taniwha's will.

Meanwhile, the many tohunga who had been with the war party cut out Kataore's heart. They cooked and ate it on the ridge, which separates the Blue and Green Lakes. That ridge has since been known as Te Ahi-Manawa (the place where the heart was cooked).

*Rotorua Museum of Art and History, Te Whare Taonga of Te Arawa, NZ*



# Hinemoa and Tutanekai

The story begins with a beautiful young maiden by the name of Hinemoa. She was the daughter of a very important Māori chief and lived at Owhata, on the eastern shores of Lake Rotorua.

Hinemoa was declared pūhi (sacred) due to her father's importance. Because of this, the elders in her hapu (sub-tribe) and her family could choose a husband for her when she was old enough to marry.

Many young men came from far and wide to seek the hand of Hinemoa, whose beauty and grace were well known. However, none of the suitors gained the approval of Hinemoa's tribe.

On Mokoia Island, in the centre of Lake Rotorua, there lived a family of several brothers. Tutaneki was the youngest of them all. Each of his elder brothers had declared their love for Hinemoa and had set out to win her hand. None of them, however, had won approval from Hinemoa's people.

Tutanekai first laid eyes on Hinemoa at a tribal meeting and instantly fell in love with her. It was Tutanekai's skills and his good looks that caught Hinemoa's eye and she fell instantly in love with Tutanekai.

There were many more meetings at which both Hinemoa and Tutanekai were present, however, they never once had the opportunity to speak to one another.

Neither Hinemoa nor Tutanekai could see any way their love could be shared. Tutanekai would sit on the shores of Mokoia Island and play sad music on his koauau (flute). On still evenings, the music would waft across the lake to where Hinemoa sat waiting. She was sad in knowing she would never want to marry anyone but Tutanekai, yet her tribe would never permit it.

Hinemoa's people began to suspect that she was madly in love with Tutanekai. To stop her from sneaking off to see her secret love, they pulled all the canoes up on the shore. The canoes were too heavy for Hinemoa to move so she decided that she would swim across the lake to be with Tutanekai.

The next night Hinemoa told her people that she was going to watch the evening entertainment. Instead, she took six calabashes from the cooking house and headed down to the lakefront. She made the calabashes into primitive style waterwings, slipped into the water and swam towards Mokoia Island.

It was incredibly dark that night, so Hinemoa used the sound of Tutanekai's flute to guide her across the lake. Finally she made it to Mokoia Island but she was very cold. There was a hot pool near Tutanekai's house, and Hinemoa warmed herself in this pool. Then, realising she was naked, felt too shy to go to Tutanekai's house.

It so happened, that at this time Tutanekai became thirsty. He sent a slave to fetch him a calabash of water. The slave passed by the pool Hinemoa was sitting in. In a gruff voice she called out "Mo wai te wai?" (For whom is the water?). The slave answered, "Mo Tutanekai" (For Tutanekai). Hinemoa demanded the calabash and then smashed it on the side of the pool. The slave returned to Tutanekai and told him what had happened.

Tutanekai sent him back but the same thing happened. Tutanekai was becoming very angry so he went down to the pool himself. He challenged whoever was in the pool to show themselves. Hinemoa stayed as still as a mouse, she had hidden herself under an overhanging rock to cover her naked body.

Tutanekai felt around the edge of the pool until he came to where Hinemoa hid. He grabbed her by the hair and pulled her out. "Who are you?" he cried, "Who dares annoy me?"

Hinemoa answered, "It is I, Hinemoa, who has come to you". Tutanekai couldn't believe his ears. When Hinemoa stepped out of the water, he was sure he had never seen such a beautiful woman. Tutanekai took off his cloak, wrapped it around her and they returned to his house to sleep.

The next morning the people of the pa rose to make breakfast and commented on Tutanekai sleeping late. He was always first up. His father sent a slave to check on him in case he was sick.

The slave returned to say that there were four feet not two sticking out from under the covers. He was sent back to investigate further and it was then that he recognised Hinemoa. He began to shout out in surprise; "It is Hinemoa. It is Hinemoa who lies with Tutanekai".

The brothers would not believe the slave but in the commotion, Tutanekai stepped from under his house with Hinemoa on his arm. It was then the people noticed canoes heading toward the island. Knowing it would be Hinemoa's people, they feared war.

It was thought that Hinemoa would be taken from Tutanekai forever. However, upon arrival there was much rejoicing between the two tribes, and a lasting peace was forged between the tribes.

*Rotorua Museum of Art and History, Te Whare Taonga of Te Arawa, NZ*

## The Legend of the Waimapu River

There was once a hill with no name among the many hills and ravines on the edge of the forests of Hautere. This nameless one was a slave to the great chief Otanewainuku, the forested peak to the south west of Tauranga. Further along from Otanewainuku was the shapely form of the hill Puwhenua, a woman clothed in all of the fine greens of the ferns, shrubs and trees of the forest of Tane.

The nameless one was desperately in love with Puwhenua. However her heart was already won by the majestic and chiefly mountain Otanewainuku. There seemed no hope for the lowly nameless slave to persuade her to become his bride. The nameless one sorrowed and in despair he decided to drown himself in the ocean. He called on the patupaiarehe, the people of the night with magical powers who dwelled in the forests of Hautere. They were his friends and agreed to help him drown himself.

The patupaiarehe dragged the nameless one from his place among the hills. They gauged out the valley where the Waimapu River now flows, the word Waimapu referring to the tears sobbed by the nameless one as he moved his way to the sea.

As the patupaiarehe dragged the nameless one to the sea, dawn began to break and the first rays of the sun lit up the summit of the nameless one. Because the patupaiarehe were people of the night and could not be about in daylight, they retreated to the forests of Hautere leaving the nameless one where he stood, fixed in place.

The patupaiarehe gave him a name, which is still used today by the iwi of Tauranga Moana when referring to him; Mauao...meaning caught by the dawn (also known as Mount Maunganui).

*Rotorua Museum of Art and History, Te Whare Taonga of Te Arawa, NZ*

# Activity 3c Maori Cultural and Spiritual Values

Curriculum links

Social Studies

English

Level 4–5

3

Social Studies/  
English

## Resources required

- Stanley Newton Article (Reading 1)

## Prior learning

- Understanding values: What are values? Understanding values differ from culture to culture

## Method

- 1 Read the article written by Ngati Pikiao elder (the late Stanley Newton) on 'Māori Cultural and Spiritual Values' (Reading 1). This article was submitted to the Waitangi Tribunal in 1972 to prevent the Rotorua District Council from piping sewage into the Kaituna River. It emphasises the spiritual value of water in streams, rivers and lakes and the importance of these to Māori. In pairs, groups or individually have students re-tell in their own words or with illustrations.
- 2 In groups, take a paragraph and answer the following questions:
  - What values in the article will still be important to people today?
  - Why do you think these values are still important to people today?
  - Do you share these values? Why or why not?
  - What values and beliefs do Māori have about rivers, lakes and waterways?

Groups report back to whole class.

- 3 Identify all the Māori words used in the article. Discuss their meaning. Using the vocabulary list link the Māori words with the correct meanings. Ensure students can pronounce all words correctly.
- 4 Discuss the different types of water mentioned in the article and match them with an English definition e.g. waitai – sea water.
- 5 Make up a chart to show when or where 'waiora' was used and the purpose it was used for.
- 6 What synonyms, adjectives and expressions does the writer use to describe the following?
  - Waiora – example – greatest sustainer of life.
  - Spiritual strength – example – mana and power.

Create your own list of words, synonyms and expressions.

## Related Concepts

- Water Cycle – Waioira, Activities 1.1 and 1.2, pages 45–47, Photocopy masters pages 102–107

## Possible next steps

- Waioira, Activity 1.3 Nga Momo Wai, page 48, Photocopy master page 108

## Teacher's notes: Māori Cultural and Spiritual Values

Our understanding of the cultural and spiritual value of water for Māori can be based on these ideas:

- a Fresh water is a life-giving gift.
- b The Māori concept of rivers is holistic.
- c Treated water is not considered to be 'pure'.
- d Only tangata whenua can determine the spiritual and cultural significance of a water resource to Māori.

# Reading 1: Maori culture and Spiritual Values

Water! Scientifically known as H<sub>2</sub>O, hydrogen and oxygen fused together to become one of the most important of all elements to sustain life on Earth.

Age may have dimmed my memory of many things gathered throughout an association with the University of Life – but Māori cultural and spiritual things remain clear and sharp in my mind. It becomes part of me, my taha Māori; my inner spiritual being; my taha wairua which only death can extinguish. For water, it is a deity unto itself. Our koroua and kuia called it waiora, the water of life, and let it be known to all that human existence in this world will persist only when man can maintain a perfect balance between himself and nature. Water as waiora, they observed, was and is the greatest sustainer of life, a precious and priceless gift from God; it dropeth as the raindrops of heaven, charged with mana and power to give life to all the things it makes contact with. Waiora is remarkably precious and as such Māori observance of this wai becomes very special.

In ritual prayers and incantations, water of waiora becomes the intermediary between Māori and his Gods. It becomes the means of spiritual contact; the power of transmission of mind and thought and spirit between man and his Atua or God. No prayer, ritual or karakia is complete with power and mana without the use of waiora or life-water. It is to be the purest of its kind, gathered from raindrops into special wooden receptacles and used most appropriately for particular ritual to purify and sanctify men and to comfort and recover lost families; to sanctify and bless a new meeting house or community hall; to purify and bless a mother and her new born baby; to appease Tangaroa, God of sea and water, when launching a new canoe. All in all the Māori concept of waiora is uniquely remarkable. It is tapu and dignified, humble in its observance, rapturous and captivating in itself, but truly most practical and fruitful.

Waiora is a deity in song and dance; expressed in waiata, moteate or pokeka the depth of its omnipotence is strikingly spiritual, sometimes beyond conception even by the sacred and reverend tohunga. In this respect much fortitude, courage and determination, a will to succeed is required for success, fasting for days or even weeks by the tohunga or priest; existing on waiora alone for spiritual recovery and strength becomes the order of the day if disaster, death or plague is to be averted. A war party moving into battle must have waiora or the kautiaki, the spirit from that blessed water, to carry it to victory!

Did not Hinemoa, the illustrious, the beautiful, murmur a karakia or prayer with wai-ora of Lake Rotorua to guide her on her swim to meet her lover Tutanekai on Mokoia Island? The night was dark and the waters were cold; two calabashes

tied together as lifebuoys gave her support and buoyancy in the water. Waiora, or that invisible power, responded miraculously somehow, to give her buoyancy, direction and stamina to reach Mokoia and Tutanekai. And again, having reached Mokoia, she bathed in the warm thermal waters of Waikimihia, the Waiora a Tutanekai – the blessed and power-giving bathing waters of Tutanekai.

Man's physical being depends much on waiora for personal hygiene and life sustenance. In this category, we find the Māori having less regard for the spiritual or his sacred association with waiora. It has become wai Māori. The ihi and wehi, and the tapu and matakū of waiora wanes into the more common use of wai Māori. Wai Māori becomes common water, free-running and pure. For domestic use, it must not be contaminated by human or animal contact.

Sources for this type of water are from lakes and rivers, but more particularly from springs. The famous Fairy Springs of Rotorua, named by Māori 'Te Waipuna o Tuhoe' or 'Tuhoe's Spring' is owned and perpetuated by Ngati Whakaue of Ohinemutu. Then you have waikino or waimate – bad water – and you can conjure up all sorts of situations where waikino or waimate can exist; contaminated waters, stagnant waters in wetlands, or any water debased by human pollution is waikino or waimate.

Then there is Waiariki. Waiariki is the very nice sound work of God's own water and you have many examples of this type of water in Rotorua. They are our thermal waters, natural springs of warm and steaming hot waters, which for bathing and home heating purposes are second to none. Its medical and curative properties are renowned throughout the world. And down by the sea you have waitai – sea water – salted down by Tangaroa to give marine life to a huge mass of water across the globe. I know of many songs or waiata depicting the processes or the evolution of waitai from waiora and wai Māori. *This is part only of a waiata by Ngati Pikiao:*

He Waiata – Taku Papa	English translation
Tangaroa i te wai e e I haoamai koe e e i Ki te mata harakeke Ka pae kei uta e e	Oh Tangaroa of the sea! Whence did you come? You were born on a blade of flax From waiora or wai Māori And cast upon the beach'

My people of Ngati Pikiao, the lakeside dweller of Lake Rotoiti, sad to say have relegated the waters of Lake Rotorua to waikino or waimate. Human degradation of the waters of this lake has continued for many years because the local authority had taken the easiest way for the disposal of Rotorua sewage. When nature warned, however, that this was harmful to our environment by displaying algae blooms and massive growth of exotic weed over Lake Rotorua, it was then that our responsible authorities began to search around for some other means to get rid of this menace.

There followed many meetings and wananga by Ngati Pikiao and finally it was resolved that the Kaituna pipeline scheme was totally unacceptable to our people. On spiritual and cultural grounds, the opposition to it was deep-seated and profound. To mix waters that had been contaminated by human wastes with waters that are used for gathering food is deeply objectionable on Māori spiritual grounds. The Kaituna River for centuries has always been sacred to Ngati Pikiao; many caves are found along the tortuous route of this river, secreted in deep gorges and precipitous cliffs; and these are the ancient burial places of our tupuna or ancestors. The mana of Kaituna therefore had to be maintained, and where could we look for guidance but to the Waitangi Tribunal!

*Written by Stanley Newton in 1972 (Kaumatua of Ngati Pikiao)*

# Useful Vocabulary: Maori Cultural Spiritual Values

waiora	healthy water, life-giving water
koroua	a respected older man
kuia	a respected older women
karakia	prayer
tapu	sacred
tohunga	high priest
kautiaki	spirit from blessed water
Waikimihia	the hot pool Hinemoa rested in on Mokoia Island
mana	power or prestige
mataku	fear or afraid
ihi	shudder power
wehi	fear/awe
waitai	sea water
waikino	bad water
waiariki	thermal water (hot spring)
waimate	dead/stale water
waimāori	common water
waiata	song
moteatea	lament
pokeka	poetic saying or expression

<b>waiora</b>	<b>koroua</b>	<b>healthy water, life-giving water</b>	<b>a respected older woman</b>
<b>prayer</b>	<b>kuia</b>	<b>karakia</b>	<b>sacred</b>
<b>tapu</b>	<b>fear or afraid</b>	<b>a respected older man</b>	<b>Waikimihia</b>
<b>mana</b>	<b>waikino</b>	<b>kautiaki</b>	<b>ihi</b>
<b>tohunga</b>	<b>sea water</b>	<b>waiariki</b>	<b>power or prestige</b>
<b>spirit from blessed water</b>	<b>bad water</b>	<b>wehi</b>	<b>shudder/power</b>
<b>dead/stale water</b>	<b>Mokoia Island hot pool Hinemoa rested in</b>	<b>waimate</b>	<b>thermal water</b>
<b>moteatea</b>	<b>waiata</b>	<b>common water</b>	<b>song</b>
<b>lament</b>	<b>waimāori</b>	<b>high priest</b>	<b>tupuna</b>
<b>fear/awe</b>	<b>mataku</b>	<b>ancestors</b>	<b>waitai</b>



# Activity 3d Mourea: Then and Now

## Curriculum links

## Social Studies

Level 2–5

**3**

Social Studies/  
English

## Resources required

- Field trip to the Ohau Channel area
- Te Amorangi Trust Museum – Looking at life and the land.

## Method

This unit involves in-class work and a field trip to Mourea.

### 1 In-class activities:

- Read “Mourea – then and now”
- Brainstorm the activities and special places the narrator remembers.
- Look at the “Mourea now” photo. Discuss:
  - » What has changed? What is the same?

### 2 Field trip activities:

- Visit Mourea.
- Look at present state of channel and position. Look at the land use. Sketch what you see and label what you can identify.
  - » What flora and fauna can you see?
  - » What wetlands can you see?

### 3 In-class activities:

- In pairs or groups, take a blank cultural map sheet (modern day) and complete the map using the information from your field trip and from the photo of present day Mourea.
- Discuss these focus questions in your group:
  - » What has changed between your maps?
  - » What would it be like living here now as an aquatic animal/as a person?
  - » What effect have the changes had on water quality?
  - » What macroinvertebrates would be found now?
  - » What are the long term effects of the changes?
  - » What activities/special places that the narrator remembered are still available to people now?

## Possible next steps

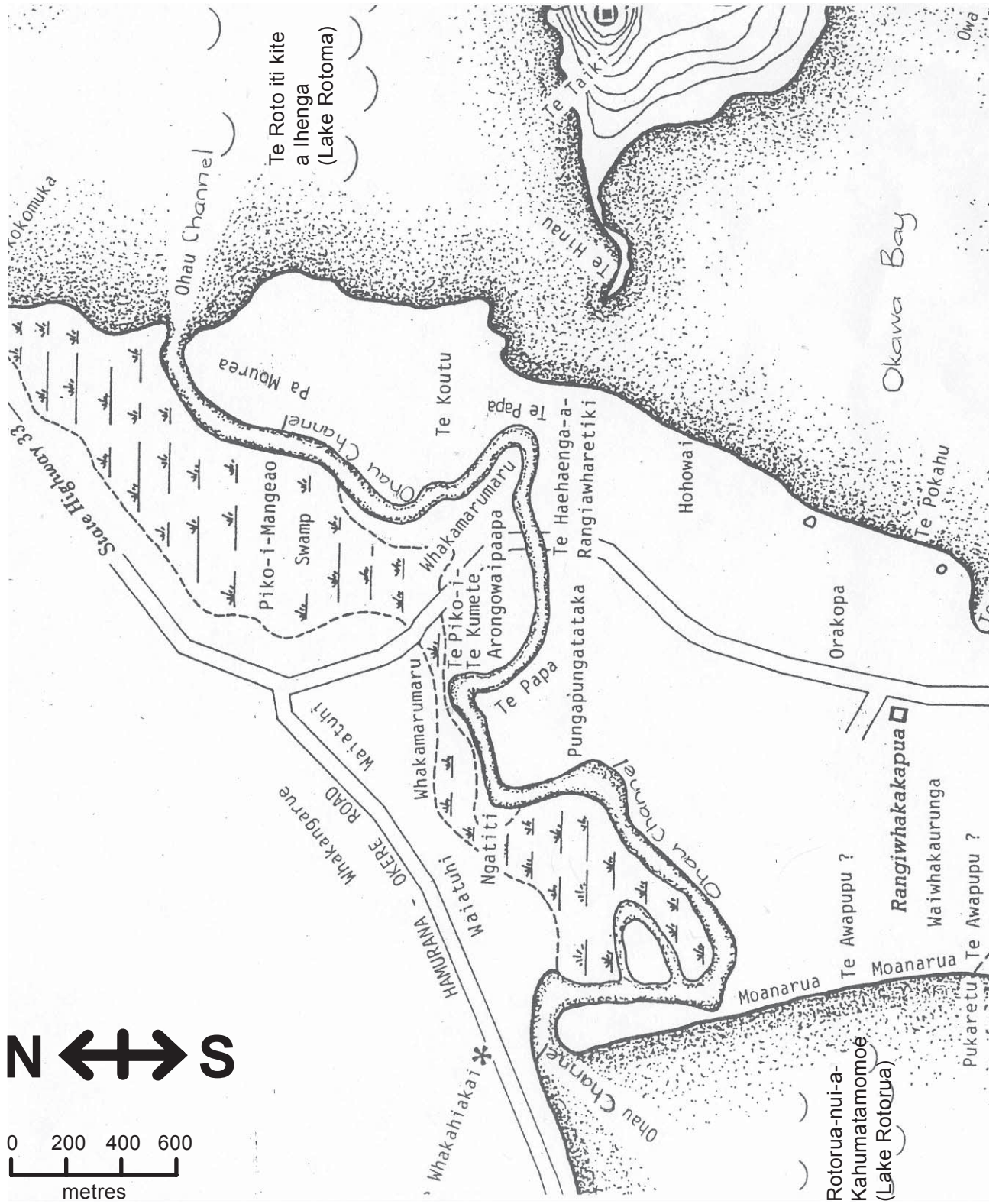
- “Traditional Lifestyles” unit, from Rotorua Museum Education Service
- Invite a guest speaker regarding local Māori history

# Mourea: Now



# Mourea: Then

## Cultural Map





# Mourea: Then and Now

## Growing up by the Ohau Channel in Mourea in the 1940s–1950s

An elderly person recalls her early childhood days living beside the Ohau Channel.

“A crystal, clear, swift flowing river fringed with raupo, manuka scrub, grassy banks and paddocks, overhanging willows and dotted here and there with the odd domestic wharf, boatshed and kainga. It was a haven for wildlife, a rich food basket, a natural environment of wetlands and a place of historical and spiritual significance.

It was a ‘paradise’ especially in the warmer months. Children would spend all their time swimming against the strong current, diving off banks, catching cockabullies in the shallows, hunting for frogs and tadpoles in the swamps, paddling the old Māori river canoes up and down and hunting for the best jackstones on the beds of shingle. Even then there were signs of human activity and land use upstream and downstream that would soon impact on this idyllic waterway.

From the mouth at Lake Rotorua to the outlet at Lake Rotoiti, the river twisted and turned carrying a strong current of crystal clear waters, which provided a host of water activities including trout-fishing, boating and swimming in contrast to the traditional methods of fishing for inanga and koura and the gathering of kakahi.

Swamps teemed with frogs and tadpoles while kotare above waited patiently to swoop down on unsuspecting prey. Noisy pukeko made untidy nests in the dense raupo, and fantails flitted among the manuka while the shy matuku stood still and erect perfectly camouflaged against a background of rushes and sedges. Pied stilts picked their way along the muddy flats while water rats hid among the debris and undergrowth.

The old red, painted, wooden bridge that spanned the main road from Rotorua to Tauranga was a popular ‘hangout’ for the local swimming and diving champions. Many households drew water from the channel for domestic use and the washing of clothes in the river was a normal activity. Food scraps and other rubbish were often thrown unwittingly into the river.

Night hunting for koura or ‘hi koura’ was popular with the kids, who used long manuka sticks baited with threaded worms to entice the koura out of their holes in the banks. As soon as a koura attached itself to the bait the stick would be slowly drawn up to the surface and grabbed with bare hands or netted.

Setting a ‘tau’ in the lake was the most popular method of gathering this delicacy. During the summer months bundles of raurauhe were cut, tied together and left to dry. These were then tied to a long main line and dropped into the lake bottom at about six metre intervals. Marker poles stood in the lake to identify the place of each family’s tau. After a few weeks the ferns would be carefully drawn up out of the lake and shaken onto a korapa. In no time a large quantity would be caught and taken home for the ‘weekend lunch or dinner’.

Glossary	
raupo – water reeds	kakahi – freshwater mussel
kainga – homes/houses	manuka – tea tree
raurauhe – bracken fern	inanga – smelt (freshwater whitebait)
korapa – flat oval shaped net	mataku – bittern (bird)
kotare – kingfisher	koura – freshwater crayfisher
tau – traditional device for catching koura	

# Activity 3e Lakes History

**Curriculum links**

**Social Studies**

Level 3–5

**3**

Social Studies

## Resources required

- Graphic organisers for inquiry/issues process – Template 6

## Method

- 1 Rotorua is particularly rich in Māori history and has strong tangata whenua relationships with streams and lakes.
  - Using the inquiry process, have students identify key questions related to the significant history attached to a Rotorua water feature such as a stream, lake or river.
  - Research avenues may include:
    - » using the internet
    - » asking whanau members
    - » accessing books e.g. Land of Te Arawa by Don Stafford
    - » articles from local papers
    - » inviting a guest speaker
- 2 Present this information in a way that communicates your understanding to the whole class.

## Possible next steps

- Compare historical water feature values, with those held today.
- Make an information leaflet or promotional article to inform people of the historical significance of the particular feature.

# Activity 3f Mokoia Island Field Trip

## Curriculum links

## Social Studies

## English

## The Arts

## Environment Education – in and about

Level 3–5

**3**

Social Studies/  
English/  
The Arts/

## Resources required

- Heritage Trail Sheet
- Value Grid
- Mokoia Island Map

## Prior learning

- What makes an effective brochure? Collect brochures and evaluate them. Create a list of criteria for effective brochures. Use this list when creating brochures for Mokoia Island.

## Method

- 1 Marketing Mokoia Island – your task is to prepare a brochure advertising Mokoia Island as a desirable tourist destination. Remember you must make Mokoia Island appeal to a wide range of people with differing interests.
- 2 Your brochure must advertise at least six reasons for visiting Mokoia. The reasons must include at least one point of interest from each of the following headings:
  - Spiritual
  - Environmental
  - Historical
  - Recreational
  - Scientific
  - Cultural
- 3 Your brochure must also advertise the means of travel to the island, include a map and name the guides.

The attached sheets will assist you in collecting some background information in order to complete your brochure. You will find the answer by listening carefully to your guide.

- 4 Reflection:
  - What impacts may there be from the success of your marketing campaign?
  - What impact could increased tourism have on the island?
  - What measures would you have to take to minimise the possible negative impacts?

# Heritage trail - Mokoia Island

## Te Motu Tapu a Tinirau (The Sacred Island of Tinirau)

Please treat Mokoia and all its plants and animals with care and respect. Mokoia has a long history and we must be careful not to damage sites and artefacts. We must also respect the mana of the people who in the past were born, played, worked and died on Mokoia Island.

- 1 On your map mark the landing wharf used by our boat.  
\_\_\_\_\_ , \_\_\_\_\_.
- 2 What is the name of the boat we used? When was it built and from what material?  
\_\_\_\_\_.
- 3 What is the name of the welcome we received when landing on Mokoia Island?  
\_\_\_\_\_.
- 4 Who are our guides?  
\_\_\_\_\_.
- 5 From which waka did the first Māori settlers come to Mokoia Island on?  
\_\_\_\_\_.
- 6 A Nga Puhī war party lead by a chief named \_\_\_\_\_ attacked Mokoia Island and killed many people. He brought many warriors with him who carried their own \_\_\_\_\_ from the sea to help them attack the people of Mokoia Island. They also carried with them new weapons called \_\_\_\_\_ of which Te Arawa had only few.
- 7 There are many Māori legends about famous people who have lived on Mokoia Island. Which legend do you think is the most famous?  
\_\_\_\_\_.
- 8 When the first Pakeha settlers came to Mokoia Island they came to trade. What did they offer the Māori, and what did the Māori offer them?  
\_\_\_\_\_.
- 9 Mokoia Island has always been known as an area for good gardening. Corn and potatoes were grown there. What was the crop for which Mokoia Island was most famous?  
\_\_\_\_\_.
- 10 A carved statue called Matuatonga has a special job to do with the island's most famous crop. Explain that job:  
\_\_\_\_\_.
- 11 Shade in on your map the areas of past cultivation. Try to find evidence of kumara pits, terracing and other signs of early cultivation. Mark these on your map as well.

- 12 The Pakeha settlers planted many fruit trees. Name some of the types planted:  
\_\_\_\_\_
- 13 Find the Totara of Hatupatu and mark the spot on your map.
- 14 What is the name of the famous hot pool of Mokoia Island and why is it famous  
\_\_\_\_\_
- 15 Mark the site of Tutanekai's whare on your map.
- 16 What evidence remains of the early mission site?  
\_\_\_\_\_
- 17 Currently the island is used to provide sanctuary for several species of \_\_\_\_\_. Name three of the species that have been transferred to Mokoia.  
\_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_.
- 18 Give an explanation of why Mokoia Island is a good place for a wildlife sanctuary.  
\_\_\_\_\_  
\_\_\_\_\_
- 19 Which animal had to be eradicated from Mokoia Island before native species could be introduced? What dangers does this animal present to the wildlife on Mokoia Island?  
\_\_\_\_\_  
\_\_\_\_\_

**Note any other interesting points about Mokoia Island that you would like to remember for later discussion.**

\_\_\_\_\_  
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\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_



# Marketing Mokoia - Value Grid

People concerned	Why they value Mokoia Island
Trustees	
Scientists	
Department of Conservation staff	
Te Arawa people About 2,000 owners	
Rotorua citizens	
Environmentalists	
Historians	
Boat operators, tour guides, helicopter pilots	
Forest and Bird Society	
Tourists/visitors	

# Mokoia Island map



# Activity 3g Exploring Rotorua

## Curriculum links

## Social Studies

## English

## The Arts

## Environment Education – in and about

Any level

# 3

Social Studies/  
English/  
The Arts/

## Resources required

- Rotorua Historic Trail sheets
- Street map of Rotorua

## Prior learning

- A prior knowledge and familiarity with place names in and around Rotorua.

## Method

- 1 Gather students' prior knowledge of history of the area (mapping exercise, brainstorming etc).
- 2 Go on an historic trail (a choice of three possibilities is provided here). Locate identified places and answer questions as you go.
- 3 Reflect on the experience upon your return – add any further information to the map.
  - What did you notice about many of the walkways?
  - How were they designed and constructed?
  - If you were to plan another walkway, what you could have to consider?  
(Refer to Rotorua District Council fact sheets in box file for more information.)

## Possible next steps

- **Read the story of 'Ihenga – Explorer and Name-giver'.**  
Discuss the story. Ask and answer questions about the story. On a map of the region locate Maketu. Trace Ihenga's journey inland. Find pictures of the native trees mentioned in the story. What other legends are associated with the patupaiarehe? Locate other places that Ihenga named. What do they mean? Ihenga is depicted in many Māori carvings and art works around Rotorua. There is usually a little clue that tells you it is Ihenga. Can you guess what it is?
- **View the video:** Out and About – From Te Ngae to Maketu with Don Stafford.

- **Arrange a visit to the Rotorua Museum.** Learn about the history of Te Arawa and how they lived in the Rotorua region. Contact the teachers at the museum and they will organise a programme to suit your needs. Download resources available from the Rotorua Museum website.
- **Organise a ‘Series of walks’ or ‘Historic trails’ around Rotorua.** Refer to the ‘Historic trail’ Units. Collect copies of brochures from the Rotorua District Council.
- **Rotorua walkways:** From Pukeroa Hill to Utuhina Stream, Kuirau Park
- **Natural Heritage Trail:** Lakefront around Sulphur Point to museum
- **Cultural Heritage Trail:** Around Government Gardens.
- **Plan a visit to ‘Nga Puia’ at Whakarewarewa:** Learn about carving and weaving, cooking in a ngawha, or study the origins of Māori music instruments and create your own. Many aspects of traditional Māori life can be learned here. Website: [www.tepuia.com](http://www.tepuia.com).
- **Buried Village Experience:** The Museum of Te Wairoa showcases the history of the area with displays of excavated items alongside accounts of the actual events of the time. The excavated sites give visitors an insight into the destruction caused by the eruption. It offers a wonderful glimpse into the history of Lake Tarawera and its surrounding villages. [www.buriedvillage.co.nz](http://www.buriedvillage.co.nz)
- **Te Amorangi Trust Museum – Hannah’s Bay wetlands:** A fascinating set of buildings, working engines, and a collection of artefacts and relics of the district’s past, set in lovely grounds on the edge of Lake Rotorua at Holden’s Bay. Open on Thursdays and Sundays 10 am to 4 pm.

# Rotorua Historic Trail I: Ohinemutu to Sulphur Point

1 Ohinemutu Village and thermal area. Tunohopu Marae – who was Tunohopu?

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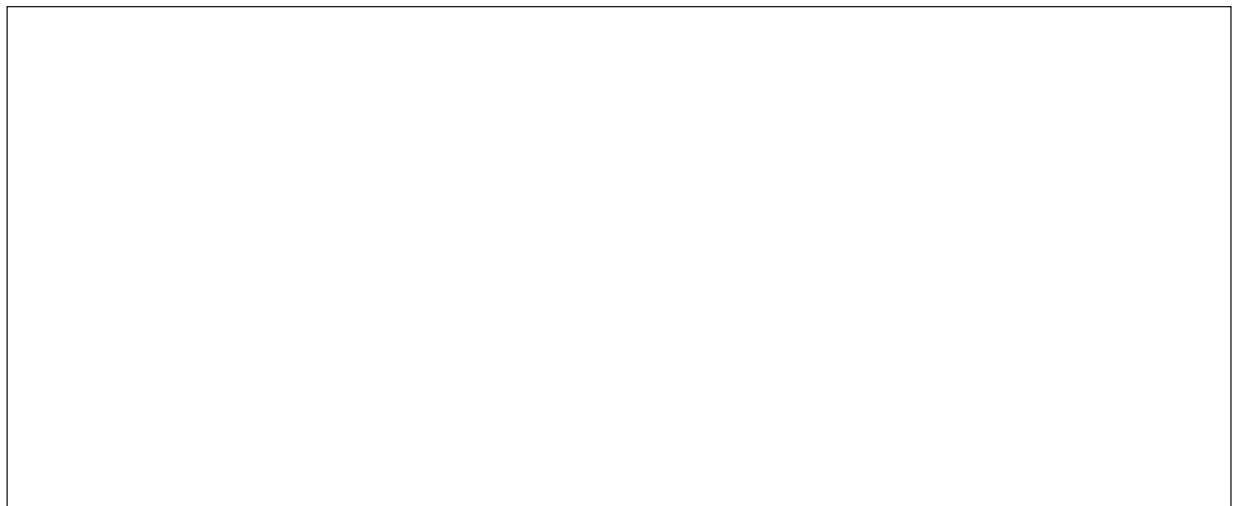
2 Ruapeka Bay – what is the legend about this bay?

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3 St Faith's Anglican Church and Muriuika. Major fortified pa site of Ngati Whakaue. Muriuika Peninsula is now:

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4 Tamatekapua Meeting House. Make a quick sketch. Look at the carvings. What do these carvings tell us?



5 Whakaturia – dining room

6 Te Papaouru (Marae complex)

7 Bell and flagpole and other monuments.

8 Lake Rotorua. Name three activities tourists could take part in at the lakefront.

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9. Mokoia Island. What do you know about this island?

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10. Queen Elizabeth Hospital. This hospital was originally built in 1942 for the convalescence of wounded soldiers. What is its main purpose today?

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11. Te Toto along the lakeshore. Find out about this place.

12. Stone where Māori sharpened their adzes.

13. Motutara Point and golf course. What significance does this area have for wildlife?

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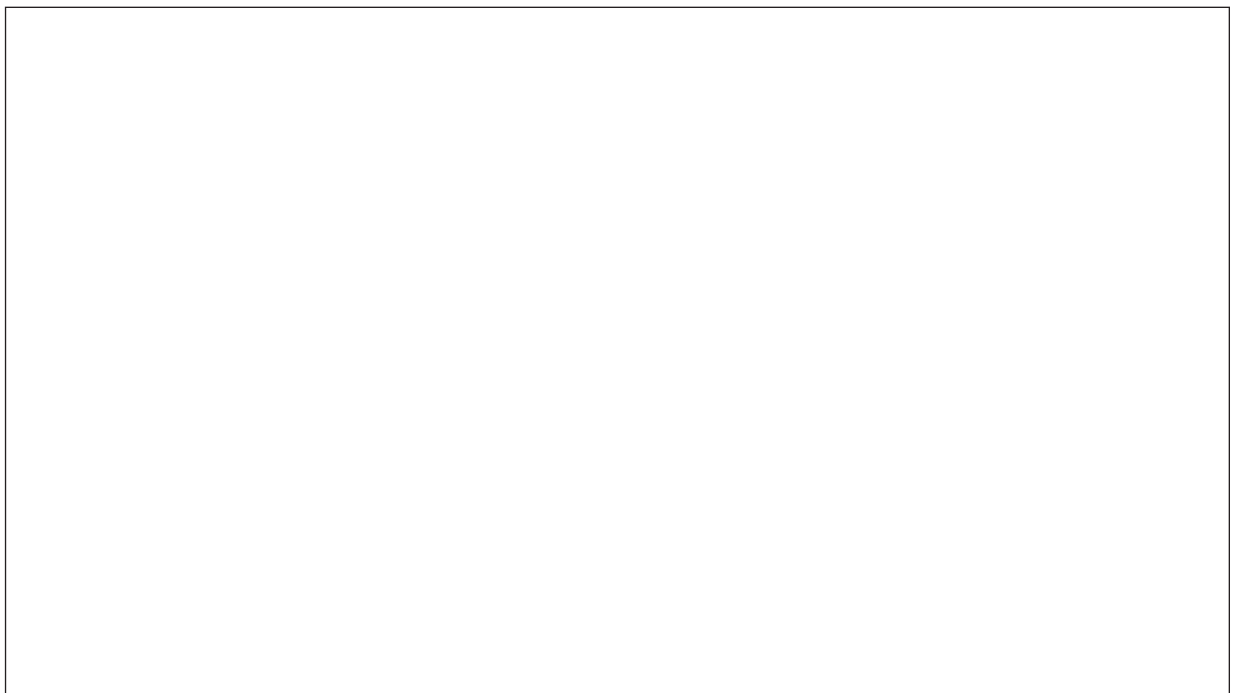
14. What year were the Postmaster Baths used? \_\_\_\_\_

15. Sulphur Point. What is the Māori name? \_\_\_\_\_

16. What are the names of the two small islands off Sulphur Bay?

1) \_\_\_\_\_ 2) \_\_\_\_\_

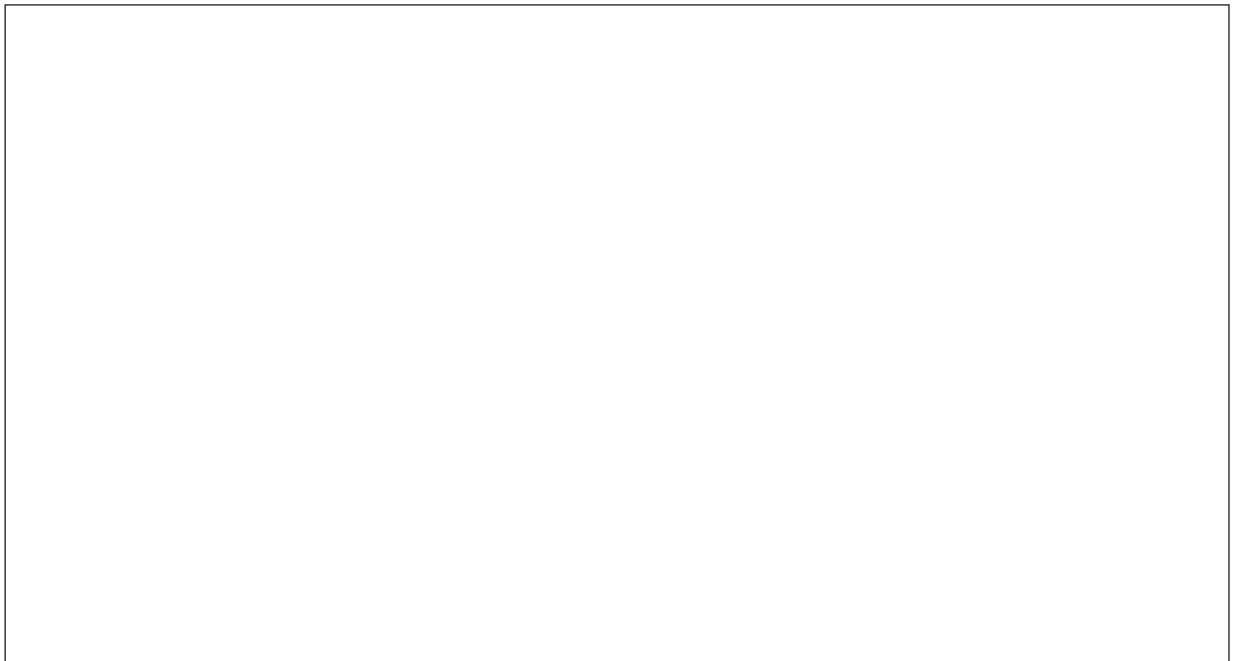
17. What protected birds are seen around this area? Draw some.



# Rotorua Historic Trail 2: Hospital Hill, Rotorua

This trail will take you along some of the most important sites in the inner city of Rotorua. Our journey begins in Arawa Street.

- 1 Arawa Street and the Old Oak tree. When was this tree planted? \_\_\_\_\_
- 2 Find Rotorua Primary School – bottom of Pukeroa Hill.
- 3 Pukeroa Hill – where it all began. An ancient pā site and location of numerous battles. In later years what else happened here?  
\_\_\_\_\_
- 4 Find Pukeroa Cottage – one of Rotorua’s earliest buildings.
- 5 The hospital – what was it originally built for?  
\_\_\_\_\_
- 6 Find Makawe – sacred monument of the Ngati Whakaue tribe.
- 7 Find Kuirau Lake and Park.
- 8 Trough – on junction of Randolph St and Lake Road. What was it used for in earlier days?  
\_\_\_\_\_
- 9 Find the Lake Rotorua Tavern – originally the site of the Ohinemutu Hotel a stop-over on the way to visit the Pink and White Terraces.
- 10 Rotorua District Council – the carving of Pukaki. Do a quick sketch.



11 Government Gardens – Arawa Soldiers Memorial. Name one event from Māori history or mythology depicted in this monument,

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12 Rachel Geyser – what is the Māori name? \_\_\_\_\_

13 Malfroy Geyser – these geysers were created from a hot spring known as Oruawhata by:

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# Rotorua Historic Trail 3: Central Rotorua historic trail

This trail will take you along some of the most important historic sites in the inner city of Rotorua, all within walking distance of Rotorua Primary School. Our journey begins in Arawa Street.

- 1 **Arawa Street** and the old 'Oak' tree. When was this tree planted?
- 2 **Rotorua Primary School** – bottom of Pukeroa Hill.
- 3 **Pukeroa Hill** – where it all began. Ancient pa site locations and place where numerous battles were fought. In later years what else happened here?
- 4 '**Pukeroa Cottage**' – one of Rotorua's earliest buildings. Who lived here?
- 5 **Hospital** – What was the original hospital built for?
- 6 **Makawe** – sacred monument of **Ngati Whakaue**. Ask an elder to explain its history.
- 7 **Kuirau Lake and Park** – Looking down from Pukeroa near the helipad. Find out about the taniwha that lived in this lake.
- 8 **Trough** on junction of Ranolf Street and Lake Road. What was it used for in early days?
- 9 **Lake Rotorua Tavern** – originally the Ohinemutu Hotel. It was first established in?
- 10 **Ohinemutu Village** and thermal area. Do people/tourists pay to visit here?
- 11 **Tunohopu Marae** – Who was Tunohopu? What was notable about his appearance?
- 12 **Ruapeka Bay** – There is a legend about it. What did it look like in earlier times?
- 13 **Muruika Peninsula is now a** \_\_\_\_\_. What was it in earlier times?
- 14 **Tamatekapua Meeting House** – Whakaturia Dining Room – Te Papaouru. What significant monuments/features can be seen in this area? Who was Tamatekapua?
- 15 **Queen Elizabeth Hospital**. Originally built in 1942 for what purpose?
- 16 **Te Toto** and **Te Pap o Te Arawa** – along lakeshore walkway. Find out about these places. Sanctuary for wildlife – stone where early Māori sharpened their adzes.
- 17 **Moututara Point** and golf course – **Sulphur Point**. What is its Māori name?
- 18 **Government Gardens** – find out about its history.
- 19 **Rotorua Art and History Museum** – **Oruawhata** – Blue Baths, etc.
- 20 **Rotorua District Council foyer** – **Pukaki** – carved figure of a very famous Ngati Whakaue chief.

## Streets of Rotorua

- **Research the names of our main streets** including Arawa, Ranolf, Hinemoa, Tutanekai, Pukuatua, Eruera, Haupapa, Whakaue, Rangiuru, Amohia, Fenton, Pukaki, Amohau, Hinemaru.
- **Local Māori legends – listen to or read** some of our popular legends like Hinemoa and Tutanekai, Hatupatu and Kurungaituku, Ihenga and the Fairies, Story of the Stilts.
- **Local place names** – early Māori explorers and people gave names to almost every natural feature – hill, streams, lakes, rivers, islands, rocks, springs, geysers, trees, bays, peninsulas, inlets, etc. Research the Māori names of some of these places around the Rotorua lakes.
- **Find these places on a map of the Rotorua Lakes district.**



# Activity 3h

## The Lakes: Now and Then

### Curriculum links

**Social Studies**

**English**

**Environment Education – about**

Any level

**3**

Social Studies/  
English

### Resources required

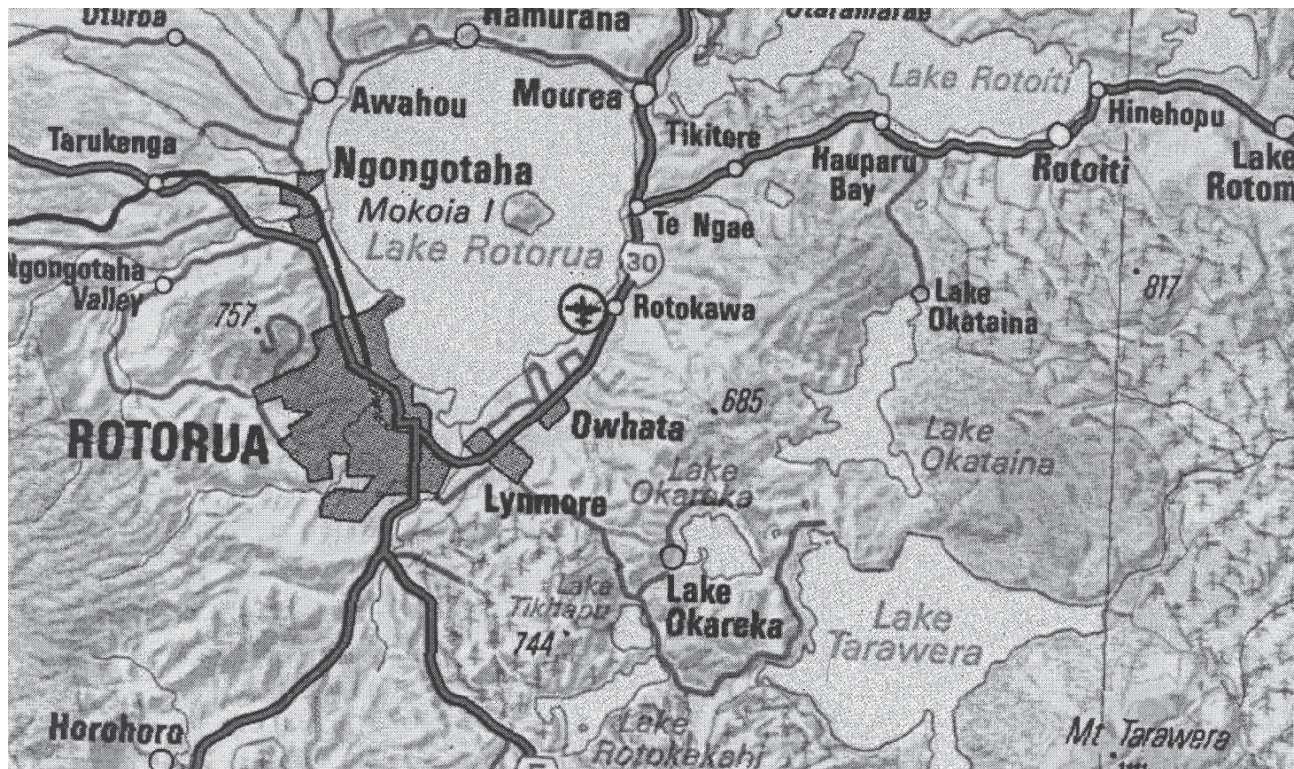
- Photo pack from file box
- Map of Rotorua catchment

### Method

- 1 Divide the class into pairs or small groups.
- 2 Each group is given one or more photos.
- 3 For each photo, discuss how the people are using the lake. You may like to use prompt questions such as these:
  - What is happening?
  - What impacts might this have on the lake?
  - Do people still do this activity in the same way today?
  - Why/why not?
  - If things aren't done the same way, what has changed and why do you think this change happened?



# Background information



Lake Rotorua has been an integral facet of Rotorua for its inhabitants. The uses have changed over time – from being a food/kai provider, to clothing/material harvesting. It's been through a stage of neglect and almost abuse to now, an era of respect and acknowledgement of its importance in the eco-balance of the community.

Here is a summary of the factors that are affecting the lake's health. These factors are to an extent 'natural' factors which have become unbalanced. This is because of the use or misuse of them or overloading in areas.

The lake's health is shown to be declining because of increasing levels of nitrate and phosphate in the water. These have a number of points of entry –

- Pasture fertilisation/pasture runoff
- Farming stock effluent
- Decomposing sewage – septic tanks and waste water seepage.

Following early lake water health decline, the Rotorua District Council stopped discharge of treated waste water into the lake in 1991 and instead sprayed it onto areas of forest. Sewage diversion in 1991 was followed by significant improvements in lake water clarity, nutrient and chlorophyll concentrations from 1993-1995, but since then lake water quality has again deteriorated.

Most of the decline is associated with increasing nitrate in streams that drain agricultural land. The lake also has an amount of nitrates that are locked up in the lake bed sediments. This is called the internal load. Internal nutrient loads (nutrient releases from the lakebed when the lake stratifies in calm, summer weather) may also be contributing to continued poor lake water quality and are likely to delay recovery if or when external nutrient loads (from sewage and/or the catchment) are reduced and stabilised.

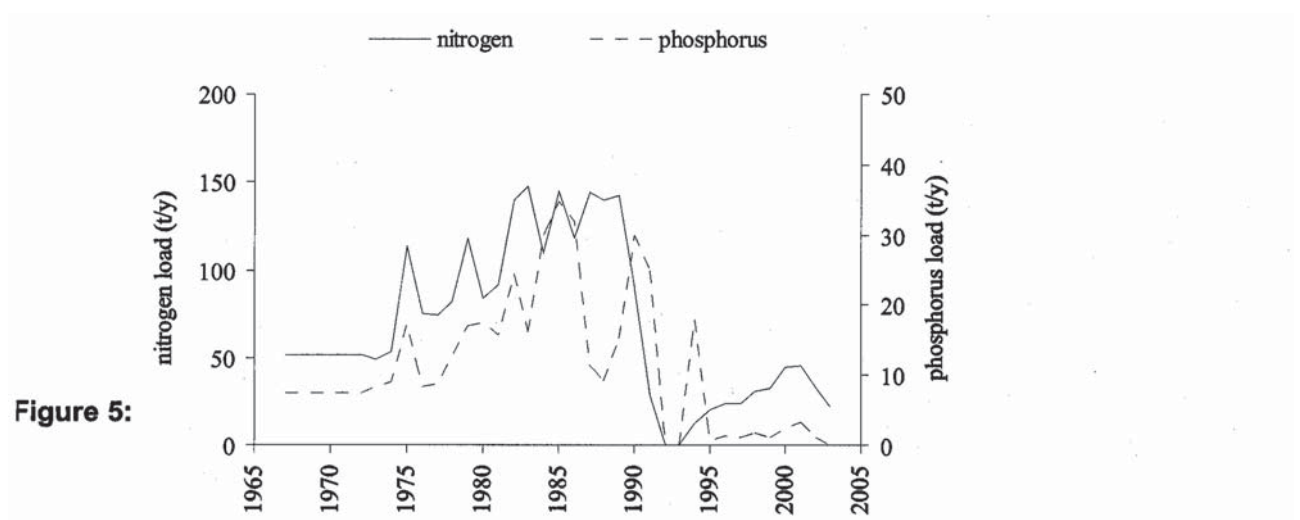
- It's believed that nitrate generated 30-70 years ago by land clearance is only now finding its way into the streams through deep groundwater. It's likely that similar land-use/groundwater links operate in the Rotorua catchment, and the most effective method to improve lake water quality control is to control the external loads of both nitrogen and phosphorus.

During the 1970s it was recognised that water quality was deteriorating in Lake Rotorua because of increased nutrient loads - notably from treated sewage, streams draining pasture, and aerial top-dressing. The water quality issues from this include:

- high chlorophyll concentrations (high algal (phytoplankton) biomass),
- low water clarity,
- rapid de-oxygenation during summer stratification, more rapid de-oxygenation leading to more frequent periods of anoxia (with adverse effects on aquatic organisms including fish),
- more frequent nutrient releases from the lakebed (termed 'internal loads'),
- sporadic blooms of nuisance blue-green algae. It was recognised that there was not a clear association between nutrient inputs and problems associated with rooted macrophytes ('aquatic weeds') although water clarity might have some effect.

During the 1980s lake water quality targets for Lake Rotorua were adopted by the regional council, the decision was made to stop directly discharging treated sewage to the lake, and nutrient load targets were set for sewage-derived nutrients.

Figure 5 shows the variation in TP (Total Phosphate) and TN (Total Nitrate) input from domestic sewage during the period 1967-2002. Inputs from 1967-1973 are based on estimates of the number of people connected to the municipal septic tanks that operated in Rotorua at that time. Inputs from 1973-1991 are based on monitoring results from the Rotorua sewage treatment plant to which an estimate of the TN input from septic tanks has been added. The assumption is made that no TP enters the lake from septic tanks. Inputs from 1991-2002 are estimated from monitoring results in the Waipa Stream below the Rotorua land treatment site (RLTS) in Whakarewarewa Forest.



**Figure 5:**

Lake Rotorua nutrient inputs and water quality 1965-1985. Source: Rutherford et al. (1989).



Lake Rotorua nutrient inputs and water quality 1965–1985. Source: Rutherford et al. (1989)

	1965	1976-77	1981-82	1984-85	Target
Population	25,000	50,000	52,600	54,000	-
<b>Phosphorus input</b>					
Raw sewage t/y	5	18	30	47	-
Treated sewage t/y	5	7.8	20.6	33.8	3
Stream t/y <sup>a</sup>	34	34	34	34	34
Internal t/y	ND	0	20	35	0 <sup>b</sup>
Total t/y	39	42	75	103	37
<b>Nitrogen input</b>					
Raw sewage t/y	34	100	170	260	-
Treated sewage t/y	20	73	134	150	30
Stream t/y <sup>a</sup>	455	485	420	415	405
Septic tanks t/y	50	80	15	10	0
Internal t/y	ND	0	140	>260	0 <sup>a</sup>
Total t/y	475	558	694	>825	435
<b>Average lake quality</b>					
Total phosphorus mg/m <sup>3</sup>		23.8	47.9	72.6	20

During the 1970–80s there was a steady increase in sewage nutrient load associated with reticulation in Rotorua City. This was partially offset by introducing phosphorus stripping at the sewage treatment plant, beginning in 1973. The low phosphorus loads during 1976–78 and 1987–88 correspond with periods when phosphorus stripping was effective, while the peaks occurred in years when stripping was either suspended or had low efficiency. Land disposal in 1991 resulted in a significant reduction of sewage derived nutrient inputs from 1991–1993. However, nutrient losses from the spray irrigation site increased from 1994–2001.

## The trophic level index

To help with the early detection of trends in lake water quality, Burns et al. (1999) developed the trophic level index (TLI). The TLI is a single numerical index calculated from four measured lake water quality parameters: total nitrogen (TN), total phosphorus (TP), and chlorophyll (CHLA) concentration, and secchi disc water clarity (SD). The TLI is used by Environment Bay of Plenty to monitor lake water quality and to help set goals for lake management (Burns, 1999; Gibbons-Davies 2003). The goal for Lake Rotorua is a three year average TLI = 4.2.

Table 2: Lake Rotorua water quality targets and associated TLI.

Date	CHLA mg/m <sup>3</sup>	SD m	TP mg/m <sup>3</sup>	TN mg/m <sup>3</sup>	TLc	TLs	TLp	TLn	average TLI
1960s	10	2.5 3	20	300	4.76	4.23	4.02	3.85	4.27 4.21