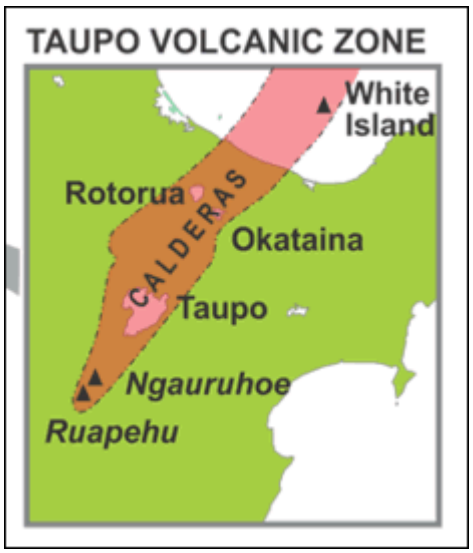
Geothermal Lesson

Rotorua is part of the Taupo Volcanic Zone. See picture below or follow link to GNS website. https://www.gns.cri.nz/Home/Learning/Science-Topics/Volcanoes/New-Zealand-Volcanoes This zone extends from Whakaari (White Island) to Ruapehu and includes volcanic activity and many geothermal fields.



It is estimated that Rotorua has a reservoir of water lying only 1 km below the surface of the earth. This reservoir is super-heated by magma flowing below it. These features create Rotorua's world famous geysers and hot springs.

Two things are required to make a geothermal feature: Heat and water.

The process begins when the tectonic plates meet. New Zealand is on a fault line where the Australian Plate and the Pacific Plate meet. The Pacific Plate is pushed downward (subduction) and the rock from the subducted plate melts to form magma.

Groundwater (mainly from rainfall) seeps through the porous rock and cracks (formed by previous volcanic and earthquake activity) within the Rotorua Caldera. Convection from the hot magma superheats the water which is under very high pressure. The deeper beneath the earth surface the water is, the more pressure it is under.

The superheated water rises as it is lighter than cold water and wants to move from an area of high pressure to low pressure. It rises quickly through cracks in the caldera; it rises slowly through porous rock. This rising water appears as hot springs, geysers, mud pools and steam from fumaroles.

Check out this link to the GNS website for more information https://www.gns.cri.nz/Home/Learning/Science-Topics/Geothermal-Ecosystems/Location-Location-Location

Main features of Geothermal Waters

Chloride Spring Features

- Deep and full of bubbling clear water
- Have overflow water coming out
- Alkaline – feel soapy

- Near boiling – 90 to 100 degrees
- Rises quickly through deep cracks or faults
- Whangapipiro (Rachel Spring) beside the Blue Baths is a chloride hot spring.

Geyser Features

- Water rises from a large underground chamber
- Narrow vent (outlet) lined with silica
- Column of steam and water shoots upward
- Erupts at different intervals. These intervals are often regular but change with time.
- Alkaline – feel soapy
- Very hot water – 90 to 100 degrees
- The Pohutu Geyser located at Te Puia is a famous example of a geyser

http://www.tepuia.com/rotorua-geothermal/

Mud Pool Features

- Depending on the mineral content, mud pools can vary in colour
- Murky and muddy looking
- Steam and water slowly rise through porous rock and mix with surface water, rocks and soil to make hot mud

- Can bubble and appear to be boiling. However this is gas rising from underground
- Lower in temperature – 30 to 70 degrees
- Thickness of mud pools depends on the season and amount of local rainfall
- There are many mud pools at Kuirau Park

http://www.waiotapu.co.nz/attractions/mud-pool/

Fumarole Features

- Vent of hole where steam and gases are released from underground
- Can be noisy, often hissing and roaring
- Black and/or yellow sulphur deposits can often be seen around the vent
- There are fumaroles at Kuirau Park as well as many other places around Rotorua.

Watch the You Tube clip below, created by GNS Scientists, for examples and explanations.

https://www.youtube.com/watch?v=CdNi43qQa7o – GNS Geothermal features in Rotorua

DISCUSSION POINTS

Do you know what creates the rotten egg smell?

That rotten egg smell in geothermal areas is due to hydrogen sulphide gas being released into the atmosphere. Fortunately if you live here, or visit often, you quickly get used to the smell!

What is geothermal used for today?

Heating, bathing, cooking, tourism, power generation

What are your favourite geothermal sites to visit?

How can we protect this precious gift?

ACTIVITY SUGGESTIONS

* Create a Geyser – Coke Bottle/Mentos Experiment https://www.youtube.com/watch?v=ZwyMcV9emmc - Watch this You Tube Video to see this simple but effective experiment in action.

* Use this website to find geothermal features. http://www.1000springs.org.nz/

* Sulphar Bay Resource http://www.doc.govt.nz/documents/getting-involved/students-and-teachers/field-trips-by-region/bop/sulphur-bay-teaching-resource/sulphur-bay.pdf

Geothermal for Parents

There are many geothermal sites around Rotorua that you can visit with your tamariki. Many are free. Take the opportunity to get out and about and discover these places, many of which have wonderful stories to learn about. Websites have been included where possible.

Free Activities

- Whakarewarewa Forest - Pohaturoa Track. This track overlooks Te Puia Thermal Village and Rotorua City. Great track, great views. Can be done with an all-terrain pram. This walk can be done in less than 2.5 hrs if you come back the way you came after reaching the lookout. See the information centre for a free map.

http://redwoods.co.nz/walk/long-walks/

https://motowalknz.wordpress.com/2015/12/21/the-redwoods-pohaturoa-track/

- Te Puia – Te Puia offers free local passes and is home to many geothermal features and family fun, including the Pohutu Geyser. Follow this link to the Te Puia site and fill in the online application http://www.tepuia.com/domestic-and-local-visitors/whanau-card-application-form/
- There are many free hot pools within the region follow this link to see a map of how to get to Butcher's Pool in Reporoa and Hot and Cold Waiotapu https://www.google.co.nz/maps/dir/Rotorua/butchers+pool/@-38.2950298,176.1690277,11z/data=!3m1!4b1!4m13!4m12!1m5!1m1!1s0x6d6e983d82f6b22b:0x500ef6143a39931!2m2!1d176.2497461!2d-38.1368478!1m5!1m1!1s0x6d6eaf36a135f61b:0x9afd9f50e479e80d!2m2!1d176.3429834!2d-38.4533784
- Kuirau Park – This free park located in the centre of Rotorua has many geothermal features including mudpools, fumaroles and hot pools. Take a leisurely walk and then stop to soak your feet in the foot pools. Why not read the story of Kuirau Lake before you go?! http://www.rotorualibrary.govt.nz/maori/Documents/Kuirau%20and%20the%20Taniwha%20-%20English.pdf
- Sulphur Point – Stroll or cycle along the boardwalk, which begins just beyond the Rotorua Museum and follow the lake shore to Motutara Point (Sulphur Bay). You will spot many fumarole and mud pools along the way and can walk right on top of an active geothermal area. Check out this teaching resource used in class to help spot points of interest. http://www.doc.govt.nz/documents/getting-involved/students-and-teachers/field-trips-by-region/bop/sulphur-bay-teaching-resource/sulphur-bay.pdf

Credit: Much of the information found in this lesson plan is taken from "Nga Puia me Waiariki o Rotorua". This resource was used with permission from Fran Blundell, being the author.