BAY OF PLENTY REGIONAL COUNCIL TOI MOANA

# Geology and soil health of the Rangitāiki catchment

## Summary

The Rangitāiki catchment is dominated by pumice soils and ignimbrite bed rock. There are distinct areas of agricultural land located in large pockets within exotic and indigenous forests.

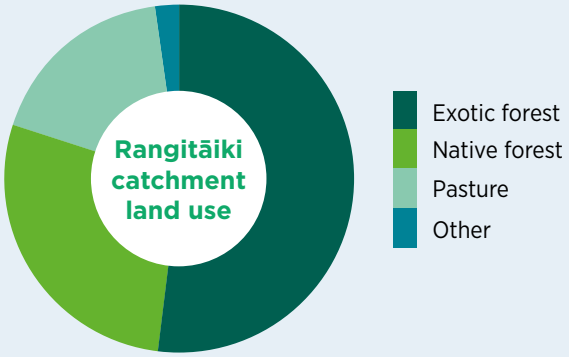
Nutrient concentrations (nitrogen and phosphorus) in the soil of monitored dairy sites are high and the number of dairy sites exceeding the phosphate and nitrogen requirements for pasture is increasing. Cadmium levels on dairy sites are approaching upper limits for human and animal safety and need to be carefully managed.

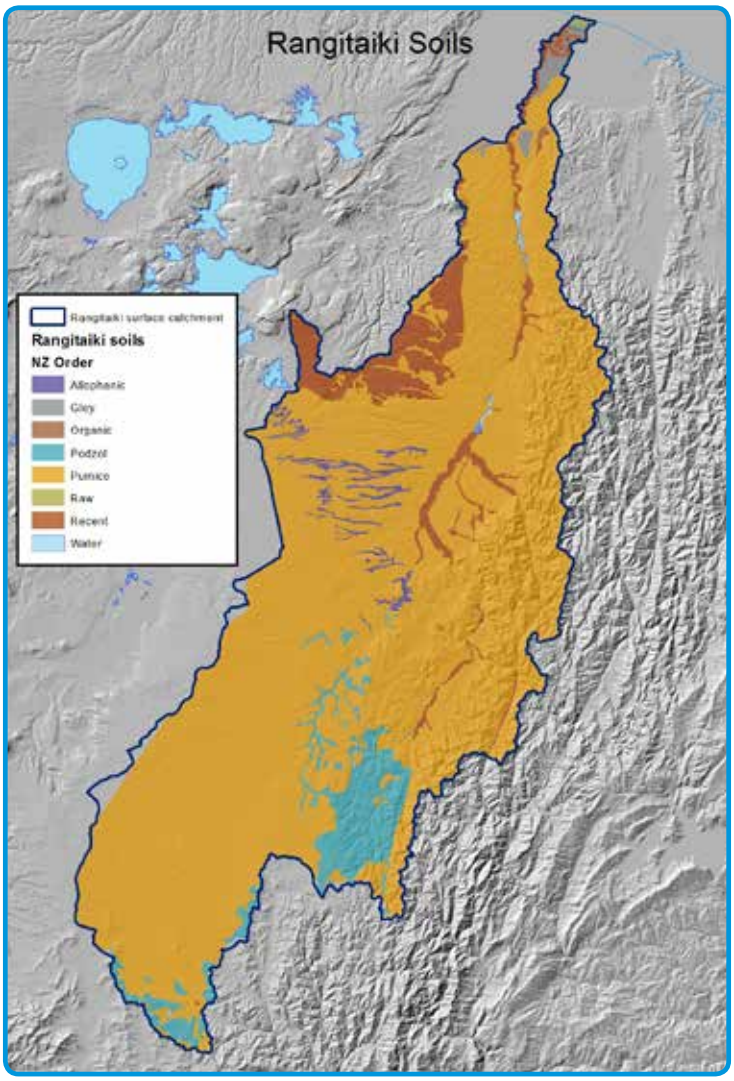
## Soil

Eighty-five percent of the Rangitāiki catchment is made up of pumice soils formed by flows of hot gas and rock from the many volcanic centres in the region. The numerous Taupō volcanic events had a major influence on the formation of the soils. High rainfall areas in the Urewera Ranges have caused excessive leaching of nutrients from the surface layers of the soil forming what are called podzol soils. These soils are very well drained.

The lower catchment is much smaller in size and is comprised of gley, organic and recent soils, which are common across the east coast of the Bay of Plenty. These soils typically have higher organic matter and drain much more slowly. In general, the soils in the lower end of the catchment can hold more water than the upper catchment. The climate also varies significantly across the catchment with higher rainfall (1600 - 2200mm) in the eastern ranges and drier weather in the upper catchment and near the coast (1100 – 1400mm average rainfall).

## Land use




## Geology

The Bay of Plenty region has a rich geological history from the Ōkataina and Taupō volcanic centres. Flows of hot gas and rock (pyroclastics) from the Ōkataina volcanic centre have formed large ignimbrite deposits throughout the Bay of Plenty. The geology of the Rangitāiki catchment is mainly ignimbrite with smaller gravel deposits forming around the estuary and coastal areas. Areas of gravel and peat have formed by eroded parent materials being deposited in low lying areas. These landscapes are very young in geological terms with some being only a few thousand years old.

## Pumice soils

Pumice soils are often very young and come from coarse rhyolitic and ignimbrite volcanic fragments. The parent materials were deficient in a number of trace elements, which led to difficulties in early agricultural development in the Bay of Plenty.

The coarse nature of some of these soils (particles over 2mm) can make it difficult to accurately measure the moisture and chemical properties of the soil. Large soil fragments have less sites for nutrients and elements to bind to and therefore have less ability to make these available to plants or pasture. Commonly used laboratory analysis methods remove large fragments before measurements are taken, which makes analysing these soils more difficult.

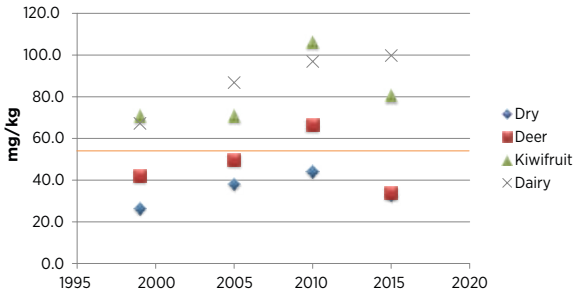
## Soil nutrients

The graphs below show nutrient levels found in the topsoil at 77 permanent monitoring sites in a range of land uses in the Bay of Plenty.

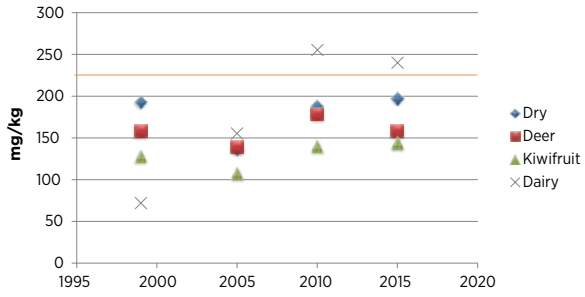
Higher concentrations of nutrients indicate the use of more intensive agricultural or horticultural systems.

The orange lines on the graphs indicate maximum plant requirements for phosphorus or nitrogen. Levels above this line generally exceed pasture requirements and indicate an increased risk of excess nutrients entering waterways through surface run-off or leaching.

### Average phosphorus concentration




### Average nitrogen concentration




## CASE STUDY

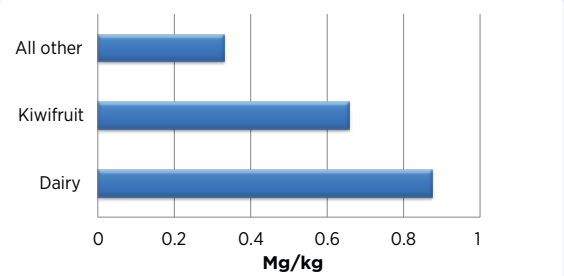
## Cadmium on dairy farms

Cadmium is a naturally occurring element that is an impurity of phosphate rock. It can accumulate over time in plants and animals (bioaccumulation) and can become toxic to livestock and humans at higher concentrations. The primary source of cadmium in New Zealand is as a by-product of superphosphate fertilisers applied to agricultural land.

It is important for land managers to understand the accumulation of cadmium on their land as food production is becoming increasingly monitored and regulated. The requirements for other land uses, such as lifestyle block development, are often below those acceptable for agriculture, so there may also be difficulties changing land use in the future.

Regional Council's 2015 NERMN monitoring shows that the average concentration of cadmium on dairy sites was 0.87mg/kg. Concentrations of the element are approaching the recommended safe maximum level guideline adopted in New Zealand of 1mg/kg. Almost one third (31 percent) of the sites monitored exceeded the guideline value in 2014. Land managers need to be aware of the accumulation of elements such as cadmium, and carefully manage the application of such fertilisers in the future.

### Average soil cadmium concentration by land use in Bay of Plenty region (2015 sampling)




12% of sites exceeded guideline value (1mg/kg)

GD154465

**For more information**

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