



Wastewater treatment



STEADY

Percentage of nitrogen (N) and phosphorus (P) removed at Wastewater Treatment Plant (WWTP) and by land treatment Sewage-derived nitrogen and phosphorus in Waipa Stream.

Purpose of indicator

Rotorua's wastewater is treated to a tertiary level. It is first treated at the wastewater treatment plant (WWTP) into a final effluent. This effluent is then sprayed onto forested land and wetlands for further removal of nutrients and other contaminants. This level of treatment ensures that treated water has been 'cleaned' before it enters a stream, groundwater chamber or a lake such as Lake Rotorua. This indicator is a measure of nutrients removed by the wastewater treatment process. The two nutrients that are monitored are nitrogen and phosphorus.

Current information and trend

Nitrogen

Over the past 5 years, the WWTP received an average of 327 tonnes of nitrogen per year. An average of 271 tonnes was removed at WWTP (83%) and a further 21 tonnes (6%) by land treatment from effluent sprayed onto the forest. Total nitrogen removed from wastewater was 290 tonnes per year, ranging from 86% to 91%, similar to the previous 5 year period.

Nitrogen which was not removed at WWTP or by land treatment (average 35 tonnes per year) passed through the forest and wetlands to the Waipa Stream, Puarenga Stream and into Lake Rotorua. The average load of nitrogen in the Waipa Stream in the past 5 years was 35 tonnes a year compared to 36 tonnes in the previous 5-year period. Removal was low in 2010/11 as a result of high rainfall.

The treatment plant will receive an additional 55-65 tonnes of nitrogen per year over the next 40 years as the reticulation system is extended to include lakeside settlements and as a result of some population growth. To accommodate this, the treatment plant is being upgraded to include an additional biological nutrient removal process that will operate in parallel to the existing Bardenpho and clarifiers. This is called a Membrane Batch Reactor (MBR), with membranes for solids/liquid separation. The MBR-upgrade will improve performance to the point where as much nitrogen as technologically possible will be removed at the treatment plant, reducing reliance on land treatment to remove nitrogen. The combined treatment processes will remove 90% of nitrogen from wastewater, one of the highest nitrogen removal rates for domestic wastewater in NZ.

Phosphorus

An average 52 tonnes of phosphorus a year was received at the WWTP over the past 5 years. Of this, 27 tonnes (52%) was removed at WWTP, and a further 23 tonnes (45%) by land treatment. Total phosphorus removal varied each year, ranging from 93% to 99%, which, like nitrogen, was similar to the previous 5 year

period. Over the past 5 years the load of phosphorus in the Waipa Stream has continued to range from 1 - 2.5 tonnes per year. The load of phosphorus in the Waipa Stream is expected to continue to be less than 3 tonnes a year.

It is anticipated that the treatment plant will continue to remove around half of the phosphorus from wastewater, and the land treatment system is likely to continue to be highly effective at retaining most of the remaining phosphorus.

The combined treatment process is expected to continue to remove up to 97% of the phosphorus from the wastewater, one of the highest removal rates of phosphorus from wastewater in NZ.

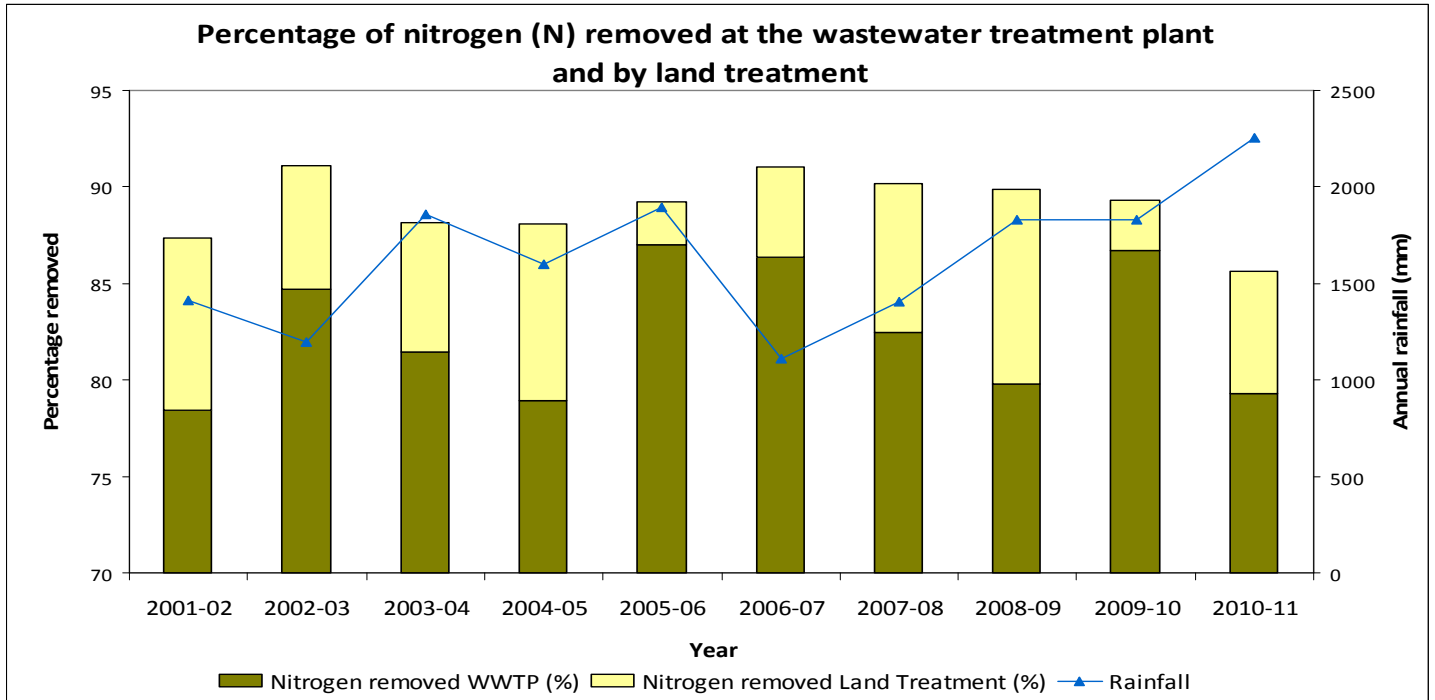


Figure 1.
Source: Rotorua District Council, 2011

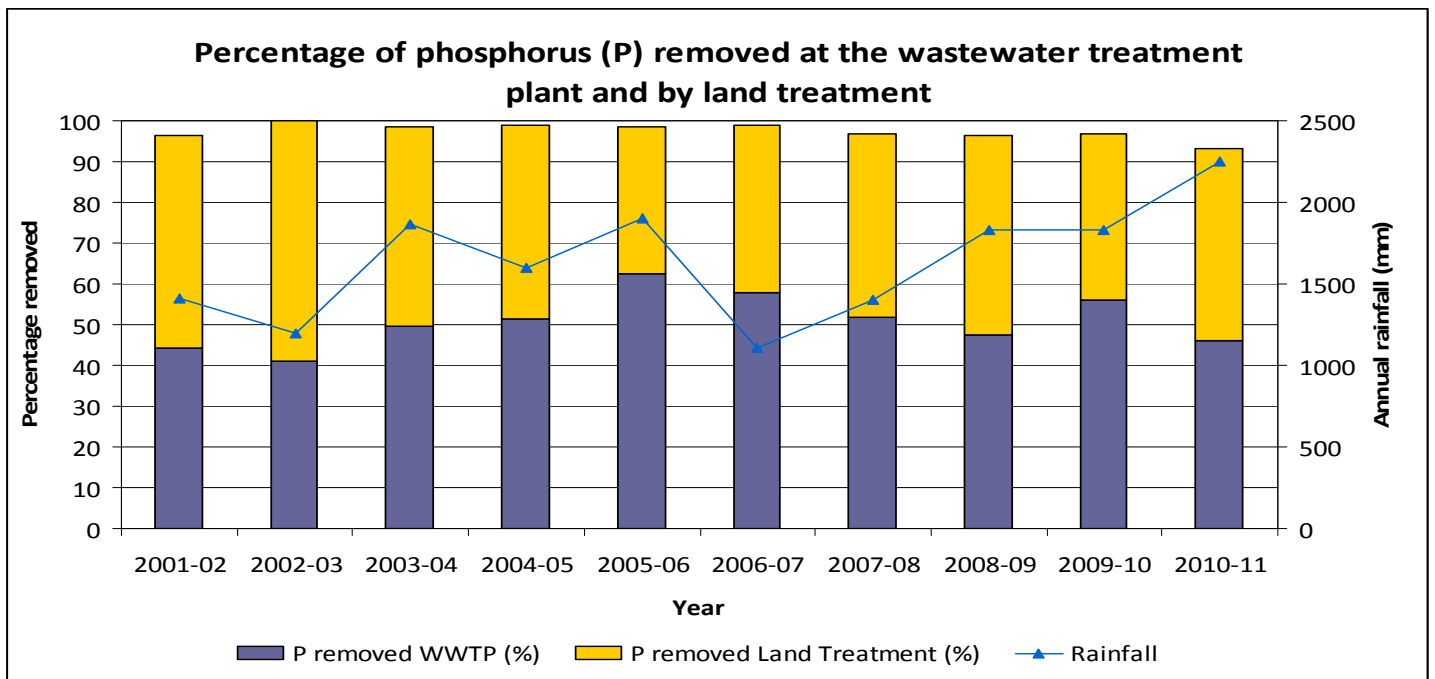


Figure 2.
Source: Rotorua District Council, 2011

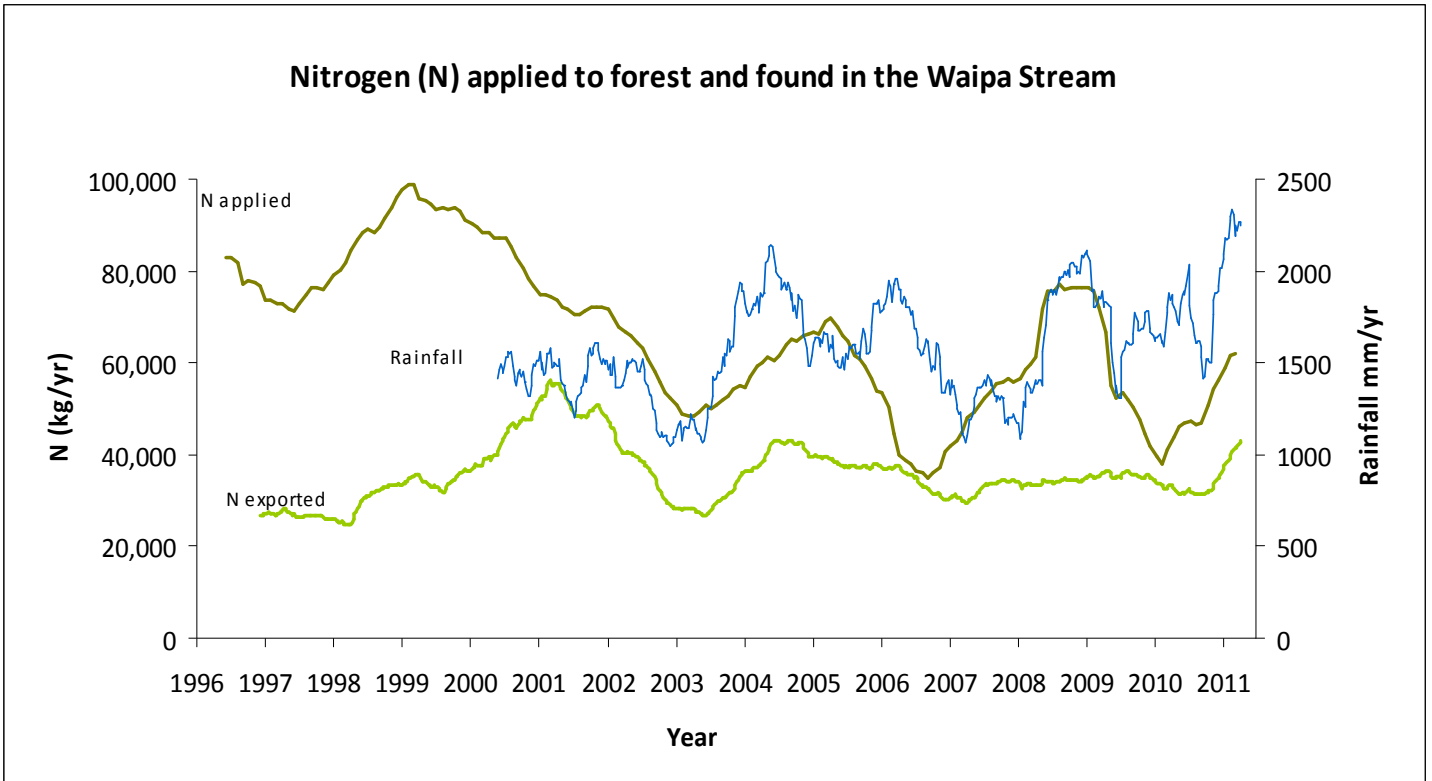


Figure 3.
Source: Rotorua District Council, 2011

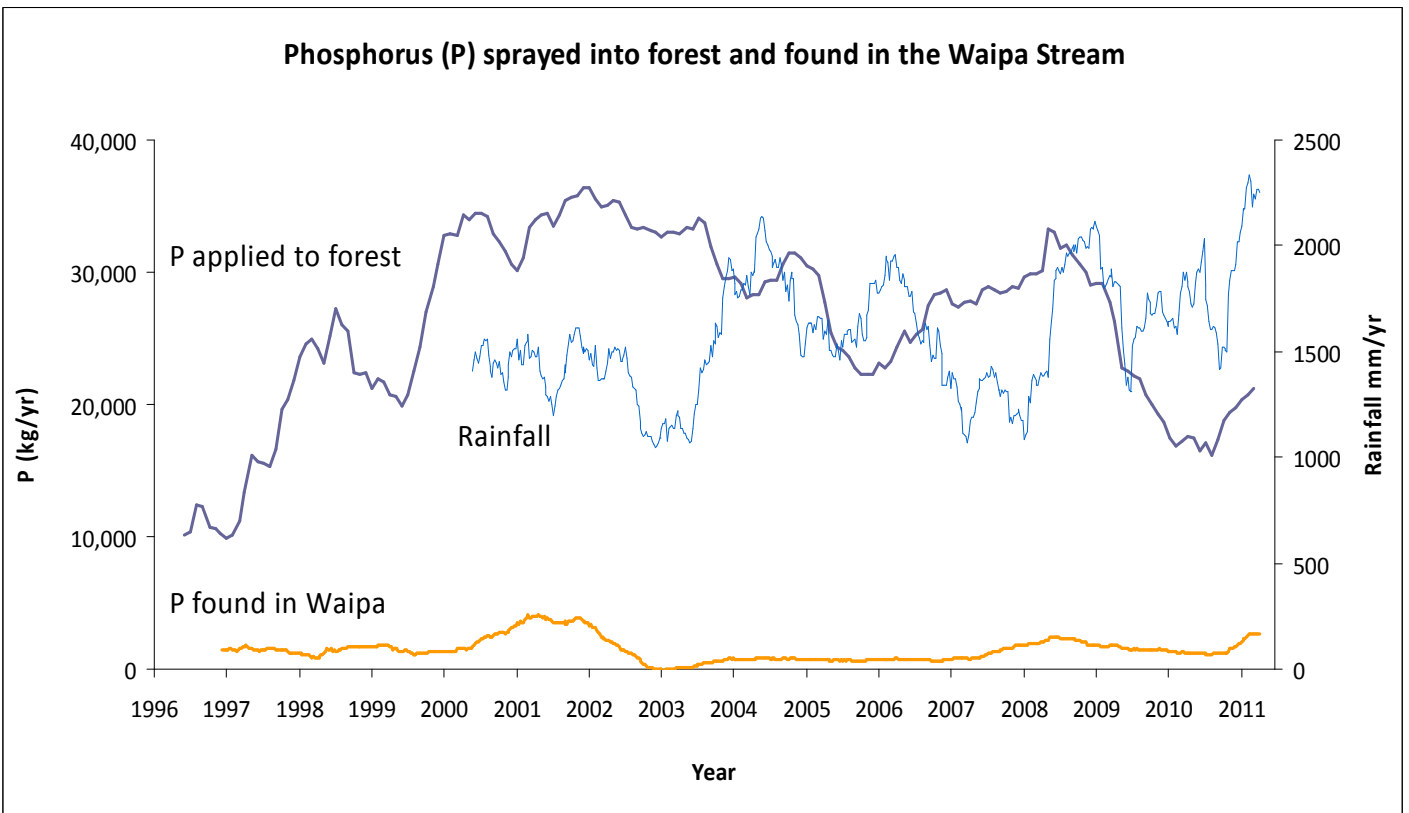


Figure 4.
Source: Rotorua District Council, 2011

In Summary

- An average of 271 tonnes of nitrogen was removed at the WWTP (83%) and a further 21 tonnes (6%) by land treatment of effluent sprayed onto the forest over the last 5 years.
- The average load of nitrogen in Waipa Stream in the past 5 years was 35 tonnes a year while total phosphorus ranged from 1 to 2.5 tonnes per year.
- 27 tonnes (52%) of total phosphorus was removed at WWTP, and a further 23 tonnes (45%) by the land treatment over the last 5 years.
- The treatment plant will receive an additional 55 to 65 tonnes of nitrogen per year over the next 40 years as the reticulation system is extended to include lakeside settlements and as a result of some population growth. The combined treatment processes are expected to remove up to 97% of phosphorus from wastewater, one of the highest removal rates of phosphorus from wastewater in NZ.

Further information sources

www.rdc.govt.nz