

Management of diffuse nutrient losses in the Lake Rotorua catchment

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Introduction

Bay of Plenty Regional Council (BOPRC) is a partner with Te Arawa Lakes Trust and Rotorua District Council in implementing the Strategy for the Lakes of the Rotorua District. The partners have been working together for over 10 years to develop and implement actions to protect and restore 12 lakes within the district. A number of these lakes have progressively become eutrophic while others are at risk of declining water quality due to inputs from land and human waste water in their catchments. The programme is underpinned by a significant research effort, which includes the University of Waikato, the National Institute of Water and Atmospheric Research and other Crown Research institutes. The Government is supporting restoration efforts for four priority lakes (Rotorua, Rotoiti, Rotoehu and Okareka) with a \$72.1 million funding package over 10 years (the “Deed”).

A key feature of the programme is that each of the 12 lakes has different individual water quality targets based on natural influences and community aspirations. These targets, expressed as “Trophic Level Indices” (TLI), are written into Regional Planning documents and form the basis for research and protection and restoration actions.

Lake Rotorua context

Lake Rotorua is easily the largest lake in the Rotorua District at ~80 km², a surface land catchment of ~440 km², groundwater lag times varying from 16 to 100+ years (within contributing sub-catchments) and a complex matrix of land uses including drystock farming, dairying, plantation forestry, native forest, urban and lifestyle. Lake Rotorua’s water quality TLI target is 4.2 which relates to the better conditions prevailing in the 1960s. To achieve this target, annual catchment nutrient loads need to be reduced by approximately 320 tonnes of nitrogen and 10 tonnes of phosphorus, plus additional reductions in phosphorus released from lake-bed sediments during stratification events.

In terms of diffuse nutrient loads, analysis of land use export coefficients and corresponding land use areas indicates that 72% of the total N load and 44% of the total P load come from pastoral farming. Within the pastoral sector, almost equal N load contributions derive from drystock and dairy farms, although the area proportions are roughly 3:1 (drystock:dairy).

A sophisticated research programme of catchment modelling, coupled with modelling in-lake responses, will provide more robust science on nutrient sources, loads, impacts and reductions from alternative land use scenarios. This work, led by NIWA and the University of Waikato, will help inform future policy aimed at achieving the large reductions in nutrient loads.

Meanwhile, in recognition of the community’s desire to see progress, a number of policy and operational steps have been taken to reduce nutrient loads to Lake Rotorua. Engineering actions include:

- Reticulation of properties on septic tanks and sewage plant upgrades

- Stormwater upgrades
- P-locking alum dosing plants on the Utuhina and Puarenga Streams
- Tikitere geothermal N removal pilot plant prior to full-scale plant development.

The combination of these engineering actions is expected to reduce annual N loads by up to 59 tonnes and P loads by 5-6 tonnes. Investigations into sediment management (e.g. capping, oxygenation), diverting the Hamurana Stream and a third P-locking plant are continuing.

Managing Diffuse Nutrient Losses

It is clear that substantive reductions in diffuse pastoral losses are needed. The key steps taken so far are:

- Capping N and P losses from rural properties to levels no greater than the annual average from July 2001 to June 2004, as calculated by the OVERSEER® nutrient budget model. This regulatory process is known as “Rule 11” nutrient benchmarking.
- Negotiating with willing landowners to reduce N and P losses in return for a financial incentive.

While such nutrient negotiations have been on an ad hoc basis to date, BOPRC has recently launched a “reverse auction” with \$750,000 of Deed funds. Landowners will nominate the method, dollar quantum and nutrient reduction amount (N only) relative to the properties approved nutrient benchmark. BOPRC will rank and approve the most cost-effective bids until the fund is exhausted. It is anticipated that reductions in N losses will cover a wide range of land use change and land management change methods, including converting pasture and gorse to forestry, retirement to bush, stocking and fertiliser strategies and winter grazing management.

BOPRC has flagged that more regulatory options will be needed to achieve large nutrient reductions from land use. Analysis of a wide range of policy options and associated economic impacts is currently underway, alongside catchment and lake modelling work.

References

- Bay of Plenty Regional Council, 2010b: Proposed Regional Policy Statement, <http://www.envbop.govt.nz/knowledge-centre/policies/the-next-regional-policy-statement.aspx>
- Environment Bay of Plenty, 2008: Regional Water and Land Plan, <http://www.envbop.govt.nz/knowledge-centre/plans/regional-water-and-land-plan.aspx>
- Palliser C, Rutherford K and Wadhwa S, 2011: Use of a model to predict the effects of land use changes on nitrogen delivery to Lake Rotorua, especially the lags involved with groundwater, 2011 FLRC proceedings.