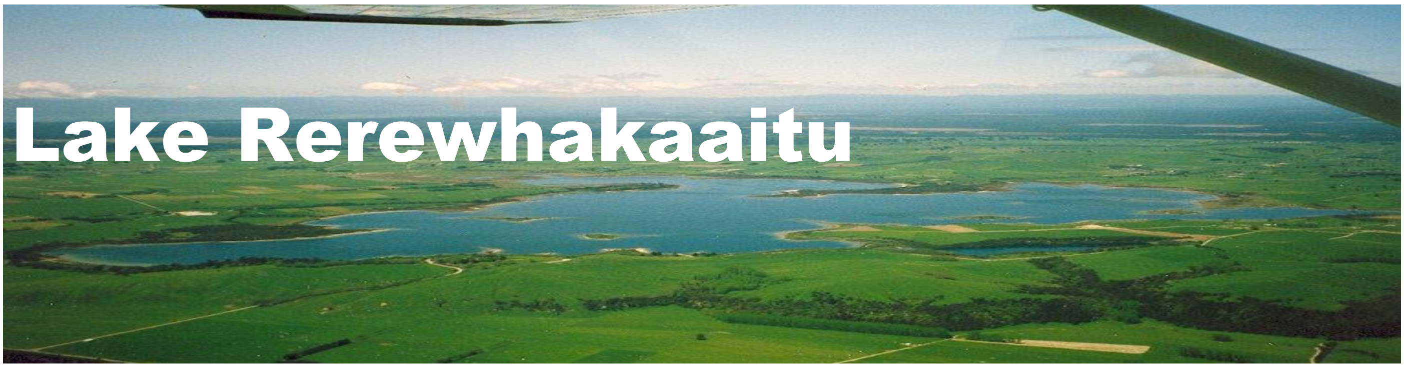

Lake Rerewhakaaitu

Environment Bay of Plenty produced a report on Lake Rerewhakaaitu in 2001. The report looked at farming practices in the catchment, water quality of the lake and its inflows, effectiveness of conservation plantings in retirement areas and points to be addressed in the future. The lake is shallow and has no permanent outflow, with one stream outlet flowing only when the lake water level is high. The report noted that Lake Rerewhakaaitu is unique among the Rotorua Lakes because the catchment is mostly in dairy farms. The lake margins are completely retired, typically for 100-200 metres but up to 800 metres.

The report noted that the lake water quality was satisfactory, but that it has been worse previously when the water level fluctuated. It also noted that the level of nutrients was increasing in streams flowing into the lake, with evidence suggesting this was associated with dairy farming activities. One of the action points in the report suggested tightening dairy shed disposal consent conditions and setting a ceiling level of nitrogen fertiliser application.

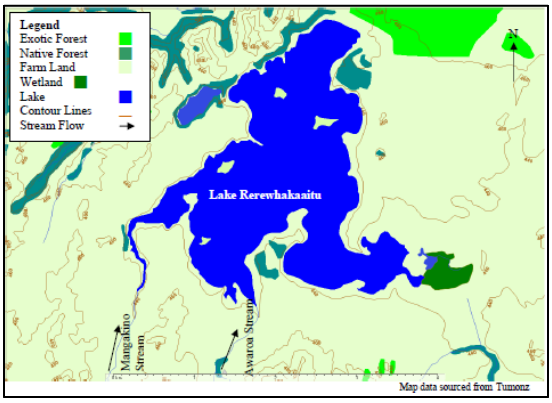

Figure 1: Lake Rerewhakaaitu Land Use, Contour & Stream Inflows

Farmers in the catchment of Lake Rerewhakaaitu were concerned both about the future condition of the lake and the possible imposition of constraints on their farming business. They were aware of a project managing farming practices around sensitive lake catchments in Northland, so farmers in the Lake Rerewhakaaitu catchment set up a project to address their water quality issues.

The project was funded by the Sustainable Farming Fund, FertResearch, Dairy Insight and the Bay of Plenty Regional Council. The project team included the farmers, a facilitator, science producers and the Regional Council. Farmers were able to direct science activities and discuss and dissect the findings at regular hall meetings and field days.

The aim of the project was to identify ways that pastoral management in the catchment of Lake Rerewhakaaitu could be changed to minimise the environmental impact pf the surrounding farms on Lake Rerewhakaaitu, while at the same time allowing for sustainable farm businesses to continue.

Part way through the project, a Regional Council study showed that groundwater in the catchment does not necessarily flow into Lake Rerewhakaaitu. The farmers decided to continue to address farm runoff and leaching anyway, and used the nutrient management software tool OVERSEER® as an aid to do this.

The process involved farmers having face-to-face conversations with the OVERSEER® development team. This interaction was valuable for both parties because it enabled them to understand how personalised farm information is included, the basis for assumptions made in the OVERSEER® programme and how new information can be incorporated into further development of OVERSEER®.

The project process made farmers aware of the nutrient flows from their farms and highlighted ways they could reduce them by making different decisions. Farmers were very open to the project results. Farmers began making farm management changes, based on the early project outputs, before the individual farm OVERSEER® analysis began. The farmers found OVERSEER® to be a useful tool for examining the nutrient impacts of management decisions on their individual farms, and some issues were highlighted on a range of farms. Farmers made more changes after they received the OVERSEER® analysis. They made changes that they found would have an environmental benefit, wouldn't reduce farm production and were inexpensive and practical to implement within their farming systems.

Some of the issues arising that impacted on nutrient management were: fertiliser management on different parts of the farm including soil analysis; fertiliser quantity and timing; effluent block size and nutrient management; consideration of supplements as an alternative to nitrogen fertiliser; the nutrient impact of different supplements; the role of feed pads; and grazing management of fodder crops.

Wider extension of the project was made via presentations to funders, newsletter circulation to interested people and organisations and presentations at two conferences. A follow-up project, particularly addressing phosphorus movement, began in July 2006.

Results

Figure 2 shows the variation in the amount of nitrogen estimated to be leached and the production generated from the farms. For example, of the farms producing between 900 – 1000 kg/ha milksolids, nitrogen leaching ranges from less than 20 kg/ha to over 60 kg/ha.

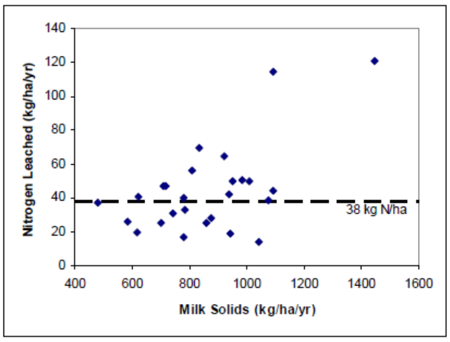

Figure 2: Relationship between Dairy Production (milksolids) & Nitrogen Leaching

Phosphorus is also important in groundwater quality. Analysis of soils from the dairy farms within the catchment showed a range of Olsen P (a measure of soil phosphate levels) from 20-83 with an average of 65. As Olsen P levels of the soil increase, so does the risk of phosphate runoff from those soils, which is shown in Figure 3. At this average of 65 for Olsen P, it is clear that these soils are at risk of high Phosphate runoff.

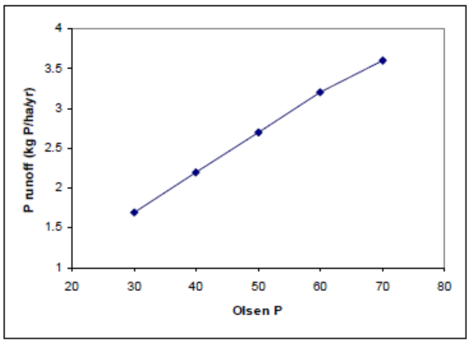

Figure 3: Relationship between Soil Phosphorus Level (Olsen P) & Phosphorus Run-off

Analysis of groundwater samples could find no relationship between the nitrogen applied to the land and the groundwater level of nitrogen detached. It was found that the high nitrogen groundwater levels were often associated with other contamination sources (Table 1).

Table 1: Information on Sites with High Groundwater Nitrogen Levels

EBOP Site Number	***Nitrate nitrogen Concentration (ppm)***	***Bore Depth (m)***	***Nitrogen Fertiliser Applied* (kg/ha/year)***	***Other possible Nitrogen Inputs***
17	7.8	30	42	Septic tank 7m away
25	7.4	60	0 (school)	Downhill and close to septic tank
26	6.2	Spring	182	Close to sheep yards
45	4.0	24	182	Close to dairy shed
44	3.9	62	229	Old bore
27	3.8	84	70	Upper side of cowshed and effluent ponds

Changes in farm management practices that were already occurring included the following:

- Autumn phosphate application had been stopped with no observed reduction in pasture growth.
- An accurate measure of the effluent areas had been made and as a result the effluent area was increased where appropriate to spread effluent over a larger area to reduce the leaching rate.
- More maize silage was being brought in (low nitrogen) as a supplementary feed and as an alternative to using nitrogen fertilisers (e.g. Urea) to boost pasture production.

Issues identified from the OVERSEER® analysis

The issues identified and discussed with farmers from the OVERSEER® analysis are detailed below. Not all issues applied to each farm.

Nutrient inputs from fertiliser

- Reduced nitrogen fertiliser inputs – there was recognition that reduced inputs of nitrogen fertiliser needed to occur, particularly on effluent blocks.
- Reduced phosphate fertiliser inputs – there was recognition of the need to reduce Olsen P levels in the soil to levels closer to the economic optimum and to apply less phosphate to the effluent block, to better match soil and pasture phosphate requirements and reduce the risk of phosphate runoff.
- Reducing phosphate runoff –mitigation options to avoid a high risk of phosphate runoff include, reducing fertiliser phosphate inputs, applying phosphate when risk of runoff is low (Sept-March) and fencing waterways.
- Monitoring nutrient levels on different parts of the farm – this analysis shows the need to monitor nutrients on different parts of the farm, because of the different inputs from fertilisers, effluent, fodder crops and supplementary feeds.
- OVERSEER® use – there was recognition that OVERSEER® can be used to help manage fertiliser requirements to obtain optimal production for least cost and minimise leaching and runoff losses of nitrogen and phosphate.

Area of effluent block

The effluent block describes the area allocated to the spreading of dairy shed effluent on the farm. It became clear through discussions with the farmers and on the farm walks that an accurate measurement of the effluent area was essential. In discussion with the farmers it became obvious that there was a variation between the actual area and what the farm had assumed to be the area. Examples of the causes for these discrepancies included:

- Some parts of the effluent block not being able to be used but still included in the measurement (e.g. steep areas in an otherwise flat paddock, swampy areas, rough areas, trees, streams).
- Areas close to buildings being included but not used.
- Paddocks had been taken out of the effluent rotation but were still included in the calculation.

When the calculation of the effluent areas is incorrect, there can be significant impacts on the amount of nutrient leaching.

Points noted from this analysis about effluent areas were:

- As production per cow increased the effluent output is increased and hence the effluent area needs to be increased.
- Farmers need to consider whether the effluent area is large enough to accommodate both nitrogen and potassium outputs.
- Farmers needed to increase the size of their effluent areas. Some areas were large enough to accommodate the nitrogen outputs, but all areas needed to be increased to accommodate the potassium outputs.
- If the effluent area cannot be increased, farmers need to reduce their potassium inputs to the effluent block.

Feed supplements

The use of maize silage, instead of pasture silage, lowers the amount of nitrogen and potassium going into the farm system, but has only a small influence on phosphate inputs. There is value in using low nitrogen supplements to reduce nitrogen leaching by reducing the amount of nitrogen coming into the farm.

Stand-off pads

Stand-off pads can reduce nutrient losses by keeping effluent off pasture during the high risk period for nitrogen leaching and phosphate runoff. However, the effluent must be collected and spread in a similar manner to dairy shed effluent. But it can be stored for application at a time when risk of nitrogen leaching and phosphate runoff is low. The effluent collected from the stand-off pad is a useful source of nutrients within the farming system.

Further Information

The full technical report- *Project Rerewhakaaitu* can be downloaded from, www.climatecloud.co.nz/CloudLibrary/02-032-final-report.pdf

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Ministry for Primary Industries
Manatū Ahu Matua

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