

ROTORUA BENCHMARKING: CHALLENGES AND PROGRESS

Simon Park¹ and Penny MacCormick²

¹Headway Ltd, Tauranga; ²Bay of Plenty Regional Council, Whakatane

Abstract

The Bay of Plenty Regional Water and Land Plan includes nutrient capping regulations, known collectively as “Rule 11”, which apply to rural properties in the catchments of five Rotorua lakes with degraded water quality: Lakes Okaro, Okareka, Rotoehu, Rotoiti and Rotorua. Preventing increases in the nutrient load from rural land is a key initial step towards eventual lake water quality improvement. Rule 11 directs landowners to provide specific property information for the three years from July 2001 to June 2004. Overseer® is then used to calculate a “nutrient benchmark” in terms of the property’s average annual nitrogen and phosphorus loss. Current and future land uses that stay within the nutrient benchmark are permitted, whilst a discretionary resource consent is needed to exceed the benchmark.

Nutrient benchmarking efforts initially focused on the three smallest lake catchments, reflecting practical logistics and the need to fully develop systems before tackling the larger Lake Rotorua catchment. In late 2009, Councillors directed that by mid-2011 staff should benchmark the “top 100” Lake Rotorua properties in terms of likely nutrient loss i.e. dairy farms and large dry stock farms. By the end of 2010, 38% of Lake Rotorua’s pastoral land had been benchmarked, with mean nutrient loss rates of: 16 kgN/ha/yr and 2.2 kgP/ha/yr for dry stock farms (n=16); and 51 kgN/ha/yr and 3.3 kgP/ha/yr for dairy farms (n=5). Factors impacting these loss rates and how they relate to other initiatives (ROTAN catchment modelling and farmers’ own nutrient assessments) are discussed.

The use of Overseer® within a regulatory context has been endorsed by the Environment Court in the interim Taupo Variation decision, at least for nitrogen. Some benchmarking challenges for Lake Rotorua properties are canvassed, including: the deadline for providing benchmark information; lack of records; landowner cooperation; phosphorus losses; issues arising from lease blocks, farm sales and subdivision; and the evolving policy framework.

Introduction

Lake Rotorua is one of 12 lakes situated in the Bay of Plenty Region. Most of the Rotorua lakes have degraded and/or declining water quality, with nutrient losses from pastoral land uses being a key driver of excessive algal and lake weed growth (see Park and A MacCormick 2009 for a fuller explanation). Land use in five of the Rotorua lakes is regulated by “Rule 11” of the Regional Water and Land Plan. This rule became operative in October 2005 as part of the regional council’s efforts to limit the decline in water quality associated with increasing nutrient loads derived from land use intensification.

Under Rule 11, every property over 0.4 ha has to be ‘benchmarked’ with nitrogen and phosphorus losses assessed. This is done using the Overseer® model and farm data from 2001 to 2004.

Three smaller lake catchments of Okaro, Okareka and Rotoehu have now been completed and the current focus is on Lake Rotorua. The target of benchmarking the “top 100” nutrient loss properties by mid-2011 has been set by Council.

Lake Rotorua catchment – the physical context

The Lake Rotorua surface land catchment is about 42,000 ha with an estimated additional 4600 ha (NIWA, 2011) within the groundwater catchment i.e. additional land that transports nitrate to the lake via groundwater but not surface-borne phosphorus. Rule 11 only applies to the surface catchment which is summarised in Figure 1 and Table 1 below in terms of land use (BOPRC, 2010a). The nearly 20,000 ha of pasture comprises about 13,000 ha drystock land and 6,000 ha dairy.

Land Use	Area (ha)
Pasture	19,890
Exotic forest	7,503
Native forest	8,012
Weeds, bare, other	3,172
Urban	3,399
Total	41,976

Table 1: Catchment land use

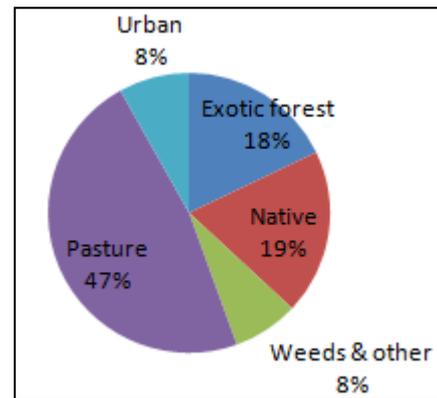


Figure 1: Catchment land use proportions

Rule 11 – the regulatory context for nutrient benchmarking

Rule 11 forms just one part of a broader programme to protect and restore the water quality of the 12 Rotorua lakes. The wider policy context is given in the Strategy for the Lakes of the Rotorua District (EBOP, RDC and Te Arawa, 2001), the objectives and policies within the Regional Water and Land Plan (EBOP, 2008) and the Proposed Regional Policy Statement (BOPRC, 2010b). The latter document refers to a sustainable catchment nitrogen load of 435 tonnes of nitrogen per year for Lake Rotorua. If current land uses were to continue unchanged indefinitely (or at least longer than the oldest groundwater lag times), the resulting “steady-state” nitrogen load has been estimated at 746 TN/year (Rutherford, 2008; EBOP, 2009). The implied reduction target of 311 TN/year will therefore require substantial actions and interventions well beyond the nutrient benchmarking of properties under Rule 11.

The intent of Rule 11 is to cap nitrogen and phosphorus losses, from individual properties over 0.4 hectare, to no more than the annual average losses that occurred during the benchmark period between July 2001 and June 2004. The nutrient benchmarking process uses information provided by landowners combined with slope, soils, rainfall and other data held by Council. This information is used in the Overseer® model to determine annual losses that are averaged over the benchmark period for the entire property i.e. the combined losses from pasture, fodder crops, bush, forestry and house septic tanks where applicable.

For the land use to comply as a permitted activity under Rule 11C (the part of Rule 11 applicable to most rural land), the landowner (or lessee) is required to (i) provide the specified information, and (ii) operate within a benchmark. The alternative is to apply for a resource consent under Rule 11E, although this has not occurred to date.

In principle, the capping of nitrogen losses is similar to Lake Taupo nutrient regulation (EW, 2011) in that both are “grand-parenting” approaches that effectively allocate nitrogen discharge rights based on historical land use. Key regulatory differences are that:

- A controlled activity resource consent is needed in the Lake Taupo catchment, except for defined low nitrogen loss land uses, in contrast to Rule 11’s generally permitted activity basis. The Taupo consent process entails a nitrogen discharge allowance (NDA) and a Nitrogen Management Plan, tailored for each property.
- Rule 11 applies to phosphorus, not just nitrogen, reflecting that most Rotorua lakes are “co-limited” i.e. lake algal growth will be limited by shortages in either N, P or both.
- Rule 11 uses three year averages for benchmarking, whereas the Taupo NDA uses the highest annual loss within a four year period (2001-2005).

Rule 11 includes a long-expired deadline of December 31 2005 for submitting property information to Council. With hindsight, it is apparent that there was over-optimism about the nature and scale of the benchmarking task. In order to retain the intended permitted activity status, Council staff assess and process a timeline waiver for the submission of the property information in terms of Section 37 of the RMA.

Benchmarking progress

Benchmarking commenced in late 2008 when riparian and wetland mitigation was incorporated into the Overseer® model. This allowed mitigation works by the landowner to be included in their benchmark assessment. Benchmarking was initiated in the Okaro catchment at this time and has now been completed, along with the two other smaller lake catchments of Okareka and Rotoehu. Within those three catchments, farming and other land uses continue as a permitted activity, subject to ongoing compliance with each property’s nutrient benchmark.

Within the Lake Rotorua catchment, there are approximately 2100 distinct land parcels greater than 0.4 hectares, although many farm and forestry properties comprise multiple land parcels and/or additional leasehold land (Park and A MacCormick, 2009). In October 2009, Council set a mid-2011 target of benchmarking the “top 100” nutrient loss properties i.e. all dairy farms and larger drystock farms. At the end of 2010, 55 Lake Rotorua properties totalling over 15,000 ha were benchmarked, equating to 38% of the catchment land area.

Lake Rotorua benchmarking – interim nitrogen and phosphorus losses

To generate interim estimates of the nitrogen and phosphorus losses from dairy and drystock properties within the Lake Rotorua catchment, data from five dairy farms and 16 drystock farms was analysed for the “effective” farm area – typically pasture and fodder crops only. The mean annual drystock nutrient losses were 16 kgN/ha/yr and 2.2 kgP/ha/yr, while corresponding dairy nutrient losses were 51 kgN/ha/yr and 3.3 kgP/ha/yr. The pattern of losses are shown as scatter plots in Figures 2 and 3 below. Due to the limited number of farms, especially dairy, these results must be regarded cautiously as interim results.

The results of the individual properties show distinct differences between dairy and drystock properties. While these differences were generally expected, it is interesting that both dairy and drystock properties show a similar range of about 20 kgN/ha/yr. There is a reasonable alignment in mean dairy N losses with the previous estimate of 56 kgN/ha/yr, as assessed by Smeaton and Ledgard (2007), as an average for all 26 dairy farms in the catchment. The latter figure has been used by NIWA in the ROTAN catchment land use model (see paper by

Palliser et al, 2011, this FLRC proceedings). The ROTAN model drystock N loss of 16 kgN/ha/yr matches the corresponding interim benchmark figure. The authors consider that more caution is warranted on interpreting mean benchmark phosphorus losses (see later “technical challenges” section).

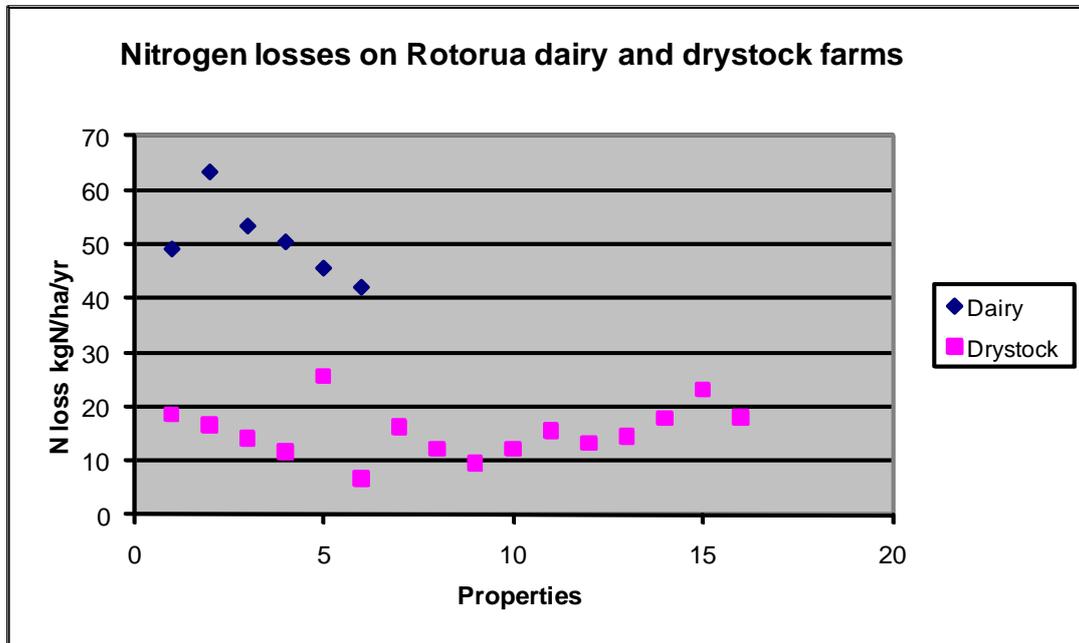


Figure 2: Nitrogen losses on benchmarked properties in the Lake Rotorua catchment

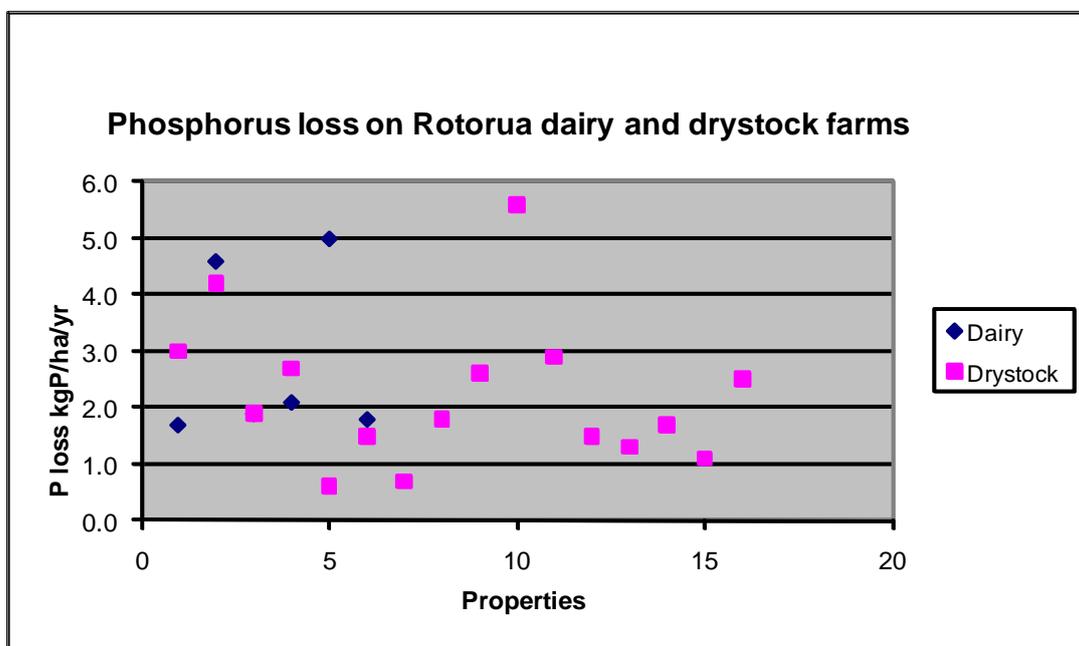


Figure 3: Phosphorus losses on benchmarked properties in the Lake Rotorua catchment

Process Challenges

Some of the challenges of the benchmarking process include: lack of written farm records; land ownership complexities; and limited staff resources i.e. only two dedicated officers carrying out nutrient benchmarking. It is now almost 10 years from the start of the benchmarking period (1 July 2001) and many farm records have been lost, destroyed or forgotten. This means that in some cases, to determine a nutrient benchmark for a property, staff need to determine what is fair and reasonable in terms of representing typical local farm systems, including checking annual dry matter production levels.

In terms of land ownership, many land parcels have changed hands, been subdivided or changed leases. In the case of subdivisions, the property is benchmarked as it was operated during the 2001-2004 period and the nutrient losses allocated according to the block setup. For instance, if a tree block was subdivided from a property, the nutrient discharge attributed to the tree block is reallocated from the parent property to the new “daughter” property as its nutrient benchmark.

Currently 55 properties in the Lake Rotorua catchment have been completed with many more at various stages in the process. Benchmarking can take from 20 to 40 hours (or more) per property to complete, depending on the complexity of the farm system and what farm data is available and in what form. With the current staffing level it would not be possible to achieve the council target of the top 100 properties by the mid-2011. Council has therefore outsourced some benchmarking to local consultants. This has the additional benefit of enabling the consultants to become familiar with the benchmarking process and rationale.

In addition to the above process challenges, it should be noted that some Rotorua farmers have been reluctant to provide benchmark information for a range of reasons, including uncertainty on privacy and future use of the data, and a desire for a collective approach. These issues are subject to ongoing discussion with Council management and they need to be resolved for benchmarking of the top 100 to be completed.

Technical Challenges

Benchmarking under Rule 11 means the nutrient losses from land uses other than pastoral uses need to be determined i.e. forestry land, lifestyle blocks without animals, Council properties (including public toilets) and Crown land. To do this, internal processes were developed to assign credible nitrogen and phosphorus losses for each non-pastoral use.

There are also technical issues with the Overseer® P model, specifically for podzols using data based on the Northland podzol. The Mamaku podzols in the north-west of the Rotorua catchment give very high P losses which appears to be an anomaly as these podzols are better drained with less runoff than the Northland podzols. A more general issue is the Overseer assumption of best practice when Critical Source Areas (e.g. gateways near ephemeral watercourses) can dominate phosphorus losses (McDowell, 2008).

Within Overseer®, the individual block losses per hectare, multiplied by the area, does not equal the total farm losses due to losses attributed separately to tracks and sheds etc i.e. this reflects that Overseer® is a whole farm model. For regulatory purposes, it is necessary to break down the whole farm losses into individual block losses using a spreadsheet that can redistribute the total farm losses between the individual blocks. Note that the adjustment is small at 1-3% of total property nitrogen and phosphorus losses.

A further technical challenge occurs with stock trading operations where it can be very difficult to determine the effective stock numbers by month. We have had to design a spreadsheet that enters by day the sales and purchases and calculates the effective stock numbers by month which is then entered into the Overseer® monthly stock sheet. This can be quite time consuming over the three year benchmarking period.

Benchmarking - what next?

Once the benchmarking of the top 100 has been completed, monitoring and compliance of the nutrient benchmark needs to be addressed, in addition to prioritising properties outside the top 100 category. The traditional Council monitoring and compliance process, such as used for dairy shed consents, is likely to be time consuming and resource intensive. There may be more effective alternatives centred on landowner responsibility. This could be by documenting nutrient losses on farm through nutrient management plans and/or environmental management systems.

There is a large nitrogen reduction target, estimated T 311 TN/yr, and capping is clearly not sufficient. Other policies and/or incentives will need to be developed and implemented. It has not been decided what, if any, links there will be between nutrient reduction policies and nutrient benchmarks. Nutrient trading has been researched with input from Council staff and local farmers (Lock and Kerr, 2008) and may be a future option. Both nutrient mitigation (within existing land uses) and land use change options are being assessed by policy makers to reach the nutrient target (for example, see BOPRC 2010c).

Knowledge of the whole catchment nutrient budgets and interaction with lake dynamics are important in assessing the effects of different actions and underpinning policies e.g. incentives. The development of the ROTAN (**R**otorua and **T**aupo **N**itrogen) model by NIWA is an important step to assist these policy decisions, noting that ROTAN uses Overseer-based nitrogen loss assumptions. As benchmarking proceeds and a clearer picture emerges of catchment nutrient losses, assumptions used in ROTAN and other models can be refined if necessary.

Conclusions

The benchmarking of properties within the Lake Rotorua catchment has a target of the top 100 properties by mid 2011. With 45 properties to go and just a few months to complete the target, it will be tight. The availability of the contracted consultants and the cooperation of farmers in submitting their benchmark data will be critical.

The nutrient benchmarking challenges faced by staff and landowners have been covered both process and technical matters. These challenges have largely been addressed and overcome as they arose in order to maintain progress. A key conclusion is that the Overseer® nutrient model is “fit for purpose” in a regulatory benchmarking role, provided a pragmatic approach is taken to determining input parameters.

This paper has not explicitly addressed the political and communication challenges that have delayed benchmarking. In particular, some landowner resistance and apparent misunderstandings of the limited scope of Rule 11 have impeded progress. The more substantive policy package which is needed to address the large nutrient loss reductions required should benefit from the technical and process lessons learnt during benchmarking, while also being cognisant of the broader issues which remain evident in the Lake Rotorua catchment and community.

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