Learn more about the environment and find out what Environment Southland's scientists are up to.

Mitigating on-farm losses and land use change

Continuing intensification of agricultural land, particularly land use conversion from traditional sheep and beef to dairy farming and increasing production on existing dairy farms, is putting additional pressure on Southland's waterways.

To manage these effects on water quality, the effectiveness of on-farm mitigation measures and implications of intensification must be clearly understood.

Environment Southland scientists have looked at a variety of mitigation measures and their effectiveness in reducing farm nutrient losses and maintaining or improving water quality. This reduction in nutrient losses was then used to calculate additional capacity for further conversion and intensification of dairy production.

What were the scientists looking at?

To further understand mitigation methods and nutrient contaminant loads in Southland, scientists looked at eight large catchments across the region.

Eight large catchments were assessed, including areas draining into the Waiau River Estuary, Jacobs River Estuary, New River Estuary, Toetoes Harbour, Bluff Harbour, Lake Brunton, Haldane Estuary and Waikawa Harbour. They included Southland's four major rivers; the Waiau River, Aparima River, Oreti River, and the Mataura River.

Three key questions were assessed for each catchment:

1. How much could farms reduce their nutrient losses by if they implemented a variety of mitigation measures?
2. With those savings in nutrient loads, how much additional capacity could be created for conversion to dairying while maintaining water quality?
3. With those savings in nutrient loads, how long will this additional capacity last if production on dairy farms continued to intensify by 2% per year?

This study used modelled nitrogen and phosphorus loss data which was estimated by the Ministry for the Environment for every farm in the region.

Data were based on the Overseer farm nutrient budgeting model, which separated dairy, sheep and beef and forestry farm types. The effects of three different levels of farm mitigation measures on nutrient loss were also modelled using Overseer.

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Mitigation level	Name	Sheep & Beef	Dairy
Mitigation level 1	M1	• Optimised nutrient inputs • Low solubility P • Wetlands	• Stock exclusion from streams • Improved nutrient management • Improved farm dairy effluent (FDE) management
Mitigation level 2	M2	• Stock exclusion from streams • Reduced stocking rates, improved productivity	• Wetlands • Improved FDE management • Reduced stocking rates, improved per animal productivity.
Mitigation level 3	M3	• Grass buffer strips • Feed pad for beef cattle	• Restricted grazing strategies • Grass buffer strips • Improved FDE management

Mitigation measures were divided into three levels that are cumulative. That is, Mitigation level 2 (M2) includes Mitigation level 1 (M1) and Mitigation level 3 (M3) includes M1 and M2. The different levels have different implications for nutrient loss rates and cost.

What did the scientists find?

Loads for the eight catchments were totalled at approximately 16,100 tonnes/year for nitrogen and 374 tonnes/year for phosphorus. Sheep and beef farms were the dominant source of nitrogen and phosphorus loads in most catchments. However, loads from dairy farms were disproportionately large, when compared with the amount of land they use.

Mitigation modelling – reducing nutrient loads

- Nitrogen loads were reduced by between 18 and 32% when all farms adopted M1, while phosphorus loads were reduced by between 0 and 31%.
- M2 made very minor differences in reducing nitrogen and phosphorus loads when compared to M1.
- M3 made more substantial reductions in loads in all catchments.

When mitigations were adopted by dairy farms only, the reductions of nutrient loads were significantly lower than when applied by all farms.

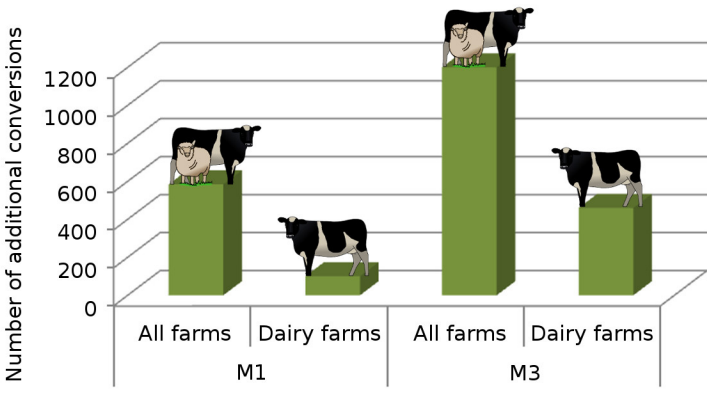
- M1 mitigations on dairy farms reduced nitrogen loads by between 1 and 6% and phosphorus loads by between 4 and 29%.
- Adoption of M3 on dairy farms reduced nitrogen loads by between 2 and 18% and phosphorus loads by between 5 and 32%.

Additional capacity – conversions

The additional capacity created by applying M1 on all farms to reduce the nutrient load and maintain current water quality was equivalent to the conversion of 137,572 hectares of sheep and beef farms to dairying, or 584 individual dairy farms, across the eight catchments.

Additional capacity created when only dairy farms applied M1 was considerably less and represented conversion of 24,000 hectares, or 100 farms to dairying.

When M3 was applied on all farms, an additional 293,000 hectares or 1200 farms could be converted to dairying, while maintaining water quality. However when M3 was applied only to dairy farms, 108,000 or 460 farms could be converted from sheep and beef to dairying.



Additional Capacity – increased production

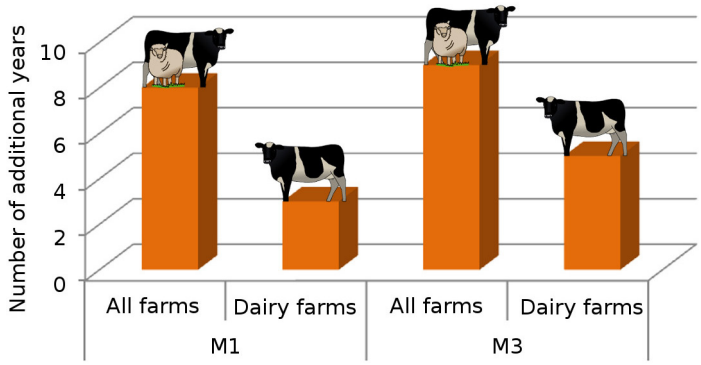
Recent research has shown that on-farm intensification is increasing dairy nitrogen and phosphorus losses by 2% per annum.

When M1 was adopted by all farms it was found water quality improvements would be eroded by on-farm intensification within eight years.

When M1 was applied on dairy farms only, additional capacity would be eroded within three years.

When all farms adopted M3, nine years of additional capacity would be created, and when only dairy farms adopted M3, up to five years of additional capacity would be created.

Additional capacity refers to the water quality gains made by adopting mitigations and how much extra room this creates for further dairy conversions, while still not exceeding current water quality levels.



Challenges for farming in Southland

This study further highlights the importance of using mitigation measures on farms to reduce nutrient loads and protect waterways from further degradation. However, these reductions could be eroded in the future through ongoing conversion of sheep and beef farms and increased intensification of dairy farms.

For mitigation measures to be effective in reducing nutrient loads, it's important that they be adopted by sheep, beef and dairy farms. Sheep and beef farms remain the dominant land use by area in Southland. However, losses from dairy farms are greater per hectare. Overall the losses from both farm types are significant.

Setting limits for catchment nutrient loads and then managing discharges to meet these limits appears to be the most appropriate method for ensuring that the goal of maintaining and improving water quality in Southland is achieved.

What next?

Water and Land 2020 & Beyond proposes that 'limit setting' processes be cooperative and that catchments with the most significant land and water management issues be prioritised first.

*For further information, or to read the **Assessment of Farm Mitigation Options and Land Use Change on Catchment Nutrient Contamination Loads in the Southland Region** report, go to www.es.govt.nz/environment/land/technical-reports.*

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