



REGIONAL FORUM

People Water and Land – *Te Mana o te Tangata, te Wai, te Whenua*

‘What if’ Scenarios

Testing ‘what if’ scenarios to better understand their implications for local communities can quickly get quite complicated. The purpose of this session is to introduce the topic, which is a core part of Phase Three of the Regional Forum, and it will be built on in subsequent workshops.

In 2019 we completed some scenario work¹ on the Government’s Action for Healthy Waterways Package (part of the Essential Freshwater Programme). The work for Southland covered stock exclusion, farm management plans, and a nitrogen cap for some catchments.

In the workshop we will focus on the stock exclusion, and specifically a set of scenarios that was developed to test various riparian buffers widths. The relevant chapter from this report (Chapter 6) is attached to this cover note. We will also be looking at the other chapters in future workshops. The report itself can be found at:

<https://www.lgnz.co.nz/assets/bcbc3efa29/RSWS-Advisory-Report-10-September-2019.pdf>

Stock exclusion example

The focus in this work was on the effective land within the setback (i.e. the land being taken out of agricultural production), rather than the fencing costs. The scenarios used timeframes: fencing must occur by 2023 for dairy and by 2025 for other pastoral systems.

The main setback scenario tested was similar to (but not the same as) the Government’s stock exclusion proposal: stock exclusion with a 5 metre setback: streams must be fenced with a 5 metre setback for flat farms and flat land on mixed slope or large farms².

An alternative (and hypothetical) setback scenario was also tested in the modelling purely to better understand setback distances: stock exclusion with a 10 metre setback – this alternative scenario is the same as above except the setback modelled is set at 10 metres rather than 5 metres.

¹ This work was completed by Environment Southland and Waikato Regional Council on behalf of the Regional Sector for Local Government New Zealand. It was followed up by a more in-depth report that was attached to the Regional Sector’s submission. This second report is also likely to be used as a reference at some point.

² Flat land on mixed slope and large farms was estimated to be an average of 25% of effective area.

The main points from this session will be understanding:

1. What is a 'what if' scenario exactly (imagine some everyday examples);
2. The process from science, to policy, to impacts (i.e. it is not science itself that has impacts but the policy response to science);
3. The interpretation (or translation) that needs to occur to develop a scenario (i.e. it is just the intent of a policy option that is modelled, not the detail); and
4. The aim isn't to come up with a magic number – it is to get a better understanding of how Southland works – so it is useful to test variations on a theme; and
5. Modelling is helpful but it isn't the whole story – and results always need explanation and context.

Local Government New Zealand Regional Sector Water Subgroup Initial Economic Advisory Report on the Essential Freshwater Package

Chapter 6 Stock Exclusion

NESFM and RMA section 360 Regulations – Stock exclusion

NZ will be divided into lowland areas and other areas.

In lowland areas:

- All lakes and intermittent rivers (but not ephemeral) >1 metre wide, stock is excluded within 12 months for all dairy and dairy support; and within 3 years for other pastoral systems;
- All permanent and intermittent rivers < 1 metre, stock is excluded within 3 years for all dairy and dairy support; and within 5 years for other pastoral systems;
- All wetlands, stock is excluded within 3 years;
- At least a 5 metre setback (averaged across the property with a minimum set back of 1 metre) from rivers and lakes; but no setback from drains;
- 10 years to move existing fencing; and
- An opportunity to apply to reduce setback and/or extend timeframe.

In other areas a risk-based approach is taken, with stock exclusion required where there is:

- Dairy/pig farming unless fully housed;
- Cattle or deer break-fed on fodder crops;
- Cattle or deer on irrigated pasture; and
- Cattle or deer where stocking rate exceeds 14 stocking units/ha.

All stock crossing points require bridge/culvert with two crossings per month permitted without bridge/culvert (exceptions for deer).

6.1 Introduction

As with farm environmental planning, good progress has been made on riparian management around the country, and particularly stock exclusion. The financial costs of the working draft proposal for stock exclusion are likely to be highly variable between regions. Pastoral farming is a more important component of some regions than others. Approaches to riparian management are not consistent within and between regions, in part because of the uniqueness of individual waterbodies and their surroundings (MPI, 2016). In general, the regions will fall into two groups: those regions where stock exclusion is well-established and the new proposal will mean shifting fences and extending setbacks, and those where stock exclusion is still developing and can take account of the requirements of the new proposal.

The proposal for stock exclusion replaces a previous draft proposal developed in 2016. The new proposal is in two main parts and has four essential differences to the 2016 version. Broadly, this proposal:

1. expands the types of waterbodies for stock exclusion in lowland areas
2. introduces minimum setbacks from waterbodies;
3. changes the timeframes for stock exclusion in lowland areas; and
4. introduces a risk-based approach for non-lowland areas.

Overall, the new Stock Exclusion proposal appears to be more stringent in lowland areas (increasing financial costs), and less stringent in non-lowland areas (decreasing financial costs). The inclusion of smaller streams appears to follow this research finding:

On average, the yields of all contaminants increased with increasing stream order in catchments dominated by agriculture (generally lowland and pastoral REC land cover classes). Loads from low-order small streams (<1 m wide, 30 cm deep, and in flat catchments dominated by pasture) exempt from potential fencing regulations accounted for an average of 77% of the national load (varying from 73% for total N to 84% for dissolved reactive P). This means that to substantially reduce contaminant losses, other mitigations should be investigated in small streams, particularly where fencing of larger streams has low efficacy.

McDowell, Cox and Snelder (2017)³

It is understood that “lowland” is still to be defined, but the working concept is “land with an average slope of less than or equal to 5 degrees when measured at the land parcel scale”. If the definition includes rolling land, in addition to flat land, then this will increase the financial costs. If it includes all lowland areas (i.e. no altitude constraint) then it may impact hill and high country farms, which are often mixed slope and have a sizeable proportion of lowland area. Regions may find that there are further financial costs to meet their swimmability targets if more stock exclusion is needed in non-lowland areas where there may be a higher proportion of lower-order streams, and especially in the upper catchments.

For many regions, the national approach to stock exclusion may change, rather than build on existing work. The financial costs of the draft proposal are the establishment and maintenance of fencing and riparian buffers created by the setbacks, and also the need for stock drinking water reticulation and more limited access to waterbodies. Reticulation of stock drinking water can lead to the subdivision of paddocks and some increases in stock numbers in the hill and high country (MPI, 2016)⁴.

The introduction of average minimum setbacks will increase a farm’s “ineffective” area, which may also reduce a farm’s nitrogen and phosphorus losses if the remaining effective area is not intensified as a result. The cost-effectiveness of the setback will depend on how the use of the 5 metre average minimum setback for a farm promotes variable widths between critical source areas and other areas. Use of an across-farm average may add to the complexity. There is also a risk of further costs where attention is focused on the minimum setback distance and it restricts the potential for larger widths on some stream reaches to manage other issues (e.g. biodiversity or carbon emissions).

³ <https://landwaterpeople.co.nz/wp-content/uploads/2018/02/Consideration-of-proposed-fencing-rules-in-New-Zealand-with-respect-to-contaminant-generation-at-the-national-scale.pdf>

¹³<https://www.mpi.govt.nz/dmsdocument/15478-economic-evaluation-of-stock-water-reticulation-on-hill-country>

⁴ <https://www.mpi.govt.nz/dmsdocument/15478-economic-evaluation-of-stock-water-reticulation-on-hill-country>

Where the proposal requires stock exclusion, the financial costs will be determined by the length and type of waterbody, the land use (i.e. types of stock), and how stock exclusion is achieved. Fencing in the lowlands usually has lower labour costs than in the hill and high country, and deer is the most expensive stock type to fence. Estimates of costs are influenced by assumptions and, while those used for labour and materials for different stock types are reasonably standard, there is large uncertainty around the length of each type of waterbodies and how these relate to land use.

The financial costs will also depend on how much stock exclusion work has already been done and how much it needs to change. For dairy farms, fencing is likely to have been completed for waterbodies > 1 metre on most dairy platforms but there is less for waterbodies on the run-off blocks, and smaller waterbodies and wetlands. Where waterbodies have been fenced, setbacks may be minimal. The extent of stock exclusion from waterbodies on other pastoral land uses is less clear. On drystock farms, fencing is more likely to occur on smaller properties - the length of fencing required on larger farms can be over 100 kilometres, making it very expensive. Stock exclusion is not a one-off cost; additional maintenance costs will be incurred over time.

An MPI stock exclusion cost report (2016)⁵ found labour costs vary across fencing contractors in different regions and tend to be cheaper in the South Island, while wooden fencing material costs tend to be cheaper in the North Island. Other fencing materials were the same price within companies across New Zealand, but there were price differences between companies. The tight timeframes in the proposal may create a short-term labour and material constraints, and increase prices. Consequently, any estimates of financial costs may be conservative. These constraints will differ between regions depending on the extent of existing fencing, and the type of livestock.

Depending on how it is achieved, stock exclusion may have future financial costs. MPI (2016) note that "(l)ow volume/flow waterways can become raging torrents during high rainfall events depending on the size of the catchment and their location in it. Careful fence and landscape design may be required to reduce the risk of physical damage to waterways as a result of debris trapped in fence-lines. In these situations, it may be more beneficial to use higher density planting, sediment traps, wetlands, buried drains or a combination of these and stock management strategies to enhance waterway health in the lower catchments."

In June 2016 Environment Southland moved to introduce stock exclusion requirements, based on the 2016 draft proposal, in the notified version of the Southland Water and Land Plan. At present the Southland Water and Land Plan is under appeal in the Environment Court. It is likely that when the proposed Plan becomes operative, any new proposal for stock exclusion in the Essential Freshwater Package will be added to its existing requirements. In such a situation, the most stringent controls will be the new draft proposal's requirements in lowland areas and Southland's existing requirements for dairy, dairy support, deer and beef cattle on slopes greater than three degrees (undulating/rolling and steeper land).

In Southland, the proposed risk-based approach in non-lowland areas may not be particularly relevant: the extent of dairying on hill country is relatively small and likely to be already fenced, and there is little or no pig farming, cattle or deer on irrigated pasture, or relatively intensive cattle or deer. The break-feeding of cattle or deer on fodder crops is captured by existing rules, although the setbacks may differ. The proposed risk-based approach will be more relevant in other regions.

⁵ MPI Stock Exclusion Costs Report (2016) <https://www.mpi.govt.nz/dmsdocument/16537/direct>

6.2 Modelling – Mataura (Southland)

To test the financial costs of the new draft proposal for stock exclusion, a Stock Exclusion scenario focusing on setback distances was developed and modelled for the Mataura Freshwater Management Unit in Southland.

The modelling compared the Counterfactual scenario (which includes the proposed Southland Water and Land Plan's stock exclusion provisions) to a new scenario that adds the additional requirements for lowlands (smaller streams, minimum average setbacks, and new timeframes).

The rules considered contain both more-strict and less-strict requirements for fencing when compared to the Southland Water and Land Plan. On the one hand, it is understood that the new rules do not require the same level of fencing on hill and high country, provided stocking rates are less than 14 stock units per effective hectare. On the other hand, on lowland properties more streams will be required to be fenced as there is no exception for streams less than 1 metre wide.

It was challenging to determine the extent of the implications of these changes in rules for Southland because of:

- Difficulty in mapping streams and identifying those either more or less than 1 metre wide;
- No easily available data on the proportion of streams in lowlands versus hill and high country properties; and the associated stocking rates on hill and high country properties
- Uncertainty around the quantity of existing fencing;
- Uncertainty around the quantity of existing fencing that will be compliant with new regulations; and
- Some incompatibility between the geographic definitions used in the new regulations (e.g. lowlands) with spatial definitions used in Southland datasets and economic models.

It was decided to focus the modelling on the effective land within the setback (i.e. the land being taken out of agricultural production), rather than the fencing costs.

The main setback scenario tested was similar to (but not the same as) the Stock Exclusion proposal:

1. **Stock Exclusion with a 5 metre setback** – For “flat” farms and flat land on “mixed slope” or “large” farms (estimated to be an average of 25% of effective area), streams must be fenced with a 5 metre setback. Fencing must occur by 2023 for dairy and by 2025 for other pastoral systems. If there are more stringent requirements under the Counterfactual scenario then those apply.

An alternative (and hypothetical) setback scenario was also tested in the modelling purely to better understand setback distances:

2. **Stock Exclusion with a 10 metre setback** – This alternative scenario is the same as above except the setback modelled is set at 10 metres rather than 5 metres. **This second scenario is NOT part of the Stock Exclusion proposal in the Essential Freshwater Package NOR is it being promoted by the Regional Sector.**

The farm classifications used in these scenarios are explained in section 4 and details about land uses in the Mataura Freshwater Management Unit are included in section 7.2.

There are at least two important caveats in the scenario modelling. At the time of modelling, no definition of lowland was available and it was understood that the lowland provisions applied to all pastoral systems: in the first instance to “dairy and dairy support” and later to “other pastoral systems”. In the Stock Exclusion scenarios:

- The reference to “other pastoral systems” was interpreted as including sheep, which it is now understood to not be the case. It may be possible to do further modelling work to omit sheep but it is complicated by the presence of other stock on these farms.
- The definition of lowland is lowland on all farms, including flat land on hill and high country farms, rather than the Ministry for the Environment’s working concept of lowland properties (i.e. land parcels with an average slope of less than or equal to 5 degrees).

For the modelling of the Stock Exclusion scenarios, the only available existing stream length dataset was that used in the modelling of the Counterfactual scenario. It is uncertain the proportion of streams less than 1 metre wide that is included in this dataset and conversely the proportion that is excluded. Consequently, it was not possible to model the implications of increasing the extent of streams included in the Stock Exclusion proposal. This is a possible area for further work.

In terms of timeframes, there do not seem to be major differences between the Counterfactual and Stock Exclusion scenarios. For the Counterfactual it was already assumed that fencing would be phased in over time, and it is reasonable to assume that the priority will now be given to lowland streams to comply with the earlier timeframe under the new proposal. The main difference is in relation to dairy farms, but most of the dairy platforms are already assumed to be fenced. It is likely that many of these fences will not comply with the new setback widths in either Stock Exclusion scenario, but the extent of non-compliance is unknown and was not assessed.

An important consideration is the loss of land in stream setbacks. Another is the cost of riparian planting if this is required. These aspects were not included in the modelling because of the time constraints but they are also a possibility for further work.

Setbacks are a form of land retirement (i.e. a change from developed to undeveloped land) that reduces the effective areas of a farm. As a result, both sectoral outputs (e.g. milk, lambs) and inputs (e.g. fuel, labour) are assumed to reduce. In calculating the number of hectares retired under the different scenarios the following assumptions are made:

- Existing regional rules (even before baseline) require that where cultivation occurs it is not less than 3 metre from a watercourse – so this restriction was considered;
- While in the Counterfactual scenario cultivation is not allowed near a watercourse, other activities are not prohibited and the setback is not ‘full’ land retirement; and
- The first metre next to a stream is considered to have negligible productive value.

Table 6 gives details on the estimated reductions in effective hectares as a result of the three stock exclusion scenarios for the Mataura Freshwater Management Unit. Only the total land retirement under each scenario is given below (i.e. the final), even though fencing and setbacks will be phased in over time. For the Stock Exclusion (5 metre setback) scenario, which is the scenario closest to the proposal, the estimated decrease in total effective area is 1,785 hectares. To give some context, this result represents less than 1% of agriculture’s total effective area on flat land in the Mataura Freshwater Management Unit. The corresponding annual changes to value added for the pastoral industries (i.e. dairy, sheep and beef, and deer) in the Mataura are -\$1 million in 2023, and then -\$2 million from 2025 onwards (in \$2015).

The results are dependent on how “lowland” is interpreted – here it was represented as lowland on all pastoral farms but in the Stock Exclusion proposal it may just be lowland pastoral farms.

The scenarios are a “first cut” and further modelling work can be done if required to test variations around the definition of lowland, timing, and adoption rates (low, medium and high). Other work may also consider the proposal relating to the costs of fencing, bridges and culverts.

Table 6: Land area in setbacks under Stock Exclusion scenarios for the Mataura Freshwater Management unit

Industry	Farm type	Counterfactual (eff. ha)	Stock Exclusion 5m setback (eff. ha)	Stock Exclusion 10m setback (eff. ha)
Dairy	Mixed slope	3	7	14
	Flat	71	475	1,156
Sheep and Beef	Large farms	24	59	117
Deer	Mixed slope	27	67	131
	Flat	122	804	1,959
Deer	Large	13	31	62
	Mixed slope	7	18	35
Total	Flat	49	328	800
		317	1,785	4,273

Note – rounding in the figures for each industry may mean their sum differs from the totals.