

Regulatory Impact Statement: Changes to the map of low slope land in stock exclusion regulations

Coversheet

Purpose of Document	
Decision sought:	<i>Approval to amend the map of low slope land, incorporated by reference in Resource Management (Stock Exclusion) Regulations 2020</i>
Advising agencies:	<i>Ministry for the Environment, Ministry for Primary Industries</i>
Proposing Ministers:	<i>Minister for the Environment, Minister of Agriculture</i>
Date finalised:	<i>16.11.22</i>
Problem Definition	
<p>The Resource Management (Stock Exclusion) Regulations 2020 (the Regulations) were gazetted on 3 August 2020 and require the exclusion of livestock from rivers wider than one metre, lakes and natural wetlands (water bodies).</p> <p>The Regulations incorporate by reference a map of low slope land (the map), which identifies land across New Zealand with an average slope of less than or equal to 10 degrees (low slope land). Beef cattle and deer on land identified by the map must be excluded from water bodies from 1 July 2025 (or from 3 September 2020 on any new pastoral system).¹</p> <p>Following the introduction of the Regulations, stakeholders raised concerns that the map:</p> <ul style="list-style-type: none">• captured land that was greater than 10 degrees in average slope (high slope land);• did not capture some low slope land; and• captured land that is used for extensive high country farming.² <p>Subsequent analysis confirmed the map is inaccurate. We estimate that up to 11.5 per cent of the total area captured in the current map will be greater than 10 degrees in slope. This will create costs in situations that were not intended, and which are higher relative to the environmental benefits of excluding stock.³</p>	

¹ "new pastoral system" is defined in the Regulations as any land that has been converted to pastoral land use.

² Extensive farming generally refers to a system that uses fewer inputs (eg, labour, fertilisers, etc) relative to the land area being farmed. For the purpose of this analysis, the term is used interchangeably with lower intensity farming.

³ Estimated fencing costs vary by fence type and steepness of terrain (among other factors). Costs are highest for deer fencing and typically increase with steepness for all fence types. See National Stock Exclusion Study: Analysis of the costs and benefits of excluding stock from New Zealand waterways July 2016: <https://www.mpi.govt.nz/dmsdocument/16513-National-Stock-Exclusion-Study-Analysis-of-the-costs-and-benefits-of-excluding-stock-from-New-Zealand-waterways-July-2016>.

The steepness of terrain is also a limitation which will affect productivity and land management options. Alongside other factors, it is used to calculate land use capability and carrying capacity – eg, the ability of the land to support higher

Executive Summary

The Resource Management (Stock Exclusion) Regulations 2020 (the Regulations) were gazetted on 3 August 2020 and require the exclusion of livestock from rivers wider than one metre, lakes and natural wetlands (water bodies).

Requirements to exclude stock are intended to manage the environmental risks associated with stock entering water bodies, particularly in relation to sediment and *E.coli*, which can adversely impact freshwater ecosystems, human health and cultural values.⁴

Cabinet did not intend the Regulations to apply to lower intensity high country farming because the impact on water bodies is lower, and the cost of fencing can be high.⁵ When they were put in place, Cabinet agreed the Regulations would require exclusion of beef cattle and deer on low slope land only.⁶

That is why the Regulations incorporate by reference a map of low slope land (the map), which identifies land across New Zealand with an average slope of less than or equal to 10 degrees (low slope land). Beef cattle and deer on land identified by the map must be excluded from water bodies from 1 July 2025 (or from 3 September 2020 on any new pastoral system).⁷

Requirements relating to the map are only a partial picture of requirements to exclude beef cattle and deer from water bodies. For example, if beef cattle and deer are “intensively grazing”, they must be excluded from water bodies regardless of the terrain (including on land with an average slope greater than 10 degrees).⁸

Concerns raised about the map

Following the introduction of the Regulations, stakeholders raised concerns that the map:

- captured land that was greater than 10 degrees in average slope (high slope land);
- did not capture some low slope land; and
- captured land that is used for extensive high country farming.⁹

stocking rates. As such, excluding stock from waterbodies on flatter land is expected to have greater environmental benefits. Some intensive farming practices including fodder-cropping, break-feeding, and grazing of irrigated pasture can still occur on high slope land, however this is addressed through existing requirements in the Regulations when intensively grazing beef cattle and deer.

⁴ See *Regulatory Impact Statement – Action for healthy waterways Part II: detailed analysis*: <https://environment.govt.nz/what-government-is-doing/cabinet-papers-and-regulatory-impact-statements/regulatory-impact-statement-action-for-healthy-waterways-part-ii/>.

⁵ See *Essential Freshwater – Public consultation on national direction for freshwater management*: <https://environment.govt.nz/assets/Publications/essential-freshwater-public-consultation-national-direction-freshwater-management.pdf>.

⁶ See *Action for Healthy Waterways – Decisions on national direction and regulations for freshwater management*: <https://environment.govt.nz/assets/publications/Cabinet-papers-briefings-and-minutes/cab-paper-action-for-healthy-waterways-decisions-on-national-direction-and-regulations-for-freshwater-management.pdf>. Detailed recommendations relating to stock exclusion are contained in Appendix 1 of that Cabinet paper: <https://environment.govt.nz/assets/Publications/Files/appendix-1-policy-and-recommendations-action-for-healthy-waterways-cab-paper.pdf>.

⁷ “new pastoral system” is defined in the Regulations as any land that has been converted to pastoral land use.

⁸ “intensively grazing” is defined in the Regulations as:

- (a) break feeding,
- (b) grazing on annual forage crops; or
- (c) grazing on pasture that has been irrigated with water in the previous 12 months.

⁹ Extensive farming generally refers to a system that uses fewer inputs (eg, labour, fertilisers, etc) relative to the land area being farmed. For the purpose of this analysis, the term is used interchangeably with lower intensity farming.

Subsequent analysis confirmed the map is inaccurate. We estimate that up to 11.5 per cent of the total area captured in the current map will be greater than 10 degrees in slope. This will create costs in situations that were not intended, and which are higher relative to the environmental benefits of excluding stock.¹⁰

Proposed amendments to the map

Following further discussions with regional councils and primary sector bodies in late 2020 and early 2021, officials developed an improved mapping methodology to identify low slope land and other options to address these issues. The Minister for the Environment and Minister of Agriculture publicly consulted on proposed amendments to the map from October to July 2021.¹¹

In addition to retaining the status quo (Option 1), the consultation proposed to address issues with the map by making a suite of changes to the underlying mapping methodology based on expert opinion (Option 2):

- Using a new mapping methodology where the average slope is calculated using 'local terrain averaging'. Under this approach, the average slope is not averaged across the LINZ primary parcel layer. Instead, slope is averaged across a 15 x 15 metre grid where the edges are then smoothed to the underlying terrain.
- Reducing the slope threshold from 10 to 5 degrees in the map, with a presumption that land with an average slope between 5 and 10 degrees will be managed via freshwater farm plans.
- Removing land above 500 metres elevation from the map. Exclusion requirements for land above 500 metres altitude will be managed via other provisions within the Regulations¹² or freshwater farm plans.
- Removing areas mapped as depleted grassland and tall tussock in the latest version of the Land Cover Database (LCDB5). These areas will instead be managed via other provisions within the Regulations or freshwater farm plans.

The main themes raised in submissions on the proposed changes to the map were:

- The new approach was an improvement, but the map was still too inflexible in that the requirements to exclude stock remain regardless of the unique characteristics of their pastoral system and whether other management options could be used.
- Concerns that the revised map was still inaccurate, and therefore an ineffective tool to accurately identify the average slope of the underlying land. Submitters noted that a 'buffering' effect occurred when low slope land was directly adjacent to high slope land, and that areas which submitters considered to be low slope had not been captured accurately.

¹⁰ Estimated fencing costs vary by fence type and steepness of terrain (among other factors). Costs are highest for deer fencing and typically increase with steepness for all fence types. See *National Stock Exclusion Study: Analysis of the costs and benefits of excluding stock from New Zealand waterways July 2016*: <https://www.mpi.govt.nz/dmsdocument/16513-National-Stock-Exclusion-Study-Analysis-of-the-costs-and-benefits-of-excluding-stock-from-New-Zealand-waterways-July-2016>

The steepness of terrain is also a limitation which will affect productivity and land management options. Alongside other factors, it is used to calculate land use capability and carrying capacity – eg, the ability of the land to support higher stocking rates where excluding stock would have greater environmental benefits. Some intensive farming practices including fodder-cropping, break-feeding, and grazing of irrigated pasture can still occur on high slope land, however this is addressed through existing requirements in the Regulations when intensively grazing beef cattle and deer.

¹¹ See *Stock exclusion regulations: Proposed changes to the low slope map*: <https://consult.environment.govt.nz/freshwater/stock-exclusion-regulations/>

¹² Regulations 12 and 13 require beef cattle and deer that are intensively grazing on any terrain to be excluded from lakes and wide rivers by 1 July 2023 (or from 3 September 2020 if in relation to a new pastoral system).

- The proposed change to remove depleted grassland and tall tussock from the mandatory stock exclusion on land captured by the map would prevent environmental protections of sensitive ecosystems in the high country.

Following public consultation, officials refined proposed changes to the map before making recommendations to Ministers, including the following modifications to Option 2:

- Retaining areas of depleted grassland and tall tussock within the map;
- Removing the Chatham Islands from the map; and
- Further improvements to the mapping methodology following a technical review by Manaaki Whenua Landcare Research.

Option 2 (with the above modifications) is the preferred option. It is expected to address current issues with the map, particularly the unintended capture of high slope land and high country farming. The proposed changes will better reflect Cabinet's intent, and manage the environmental risks associated with stock entering water bodies more efficiently.

While there is a marginal reduction in environmental benefits, Option 2 is expected to result in more significant reductions in costs and improvements to the map's accuracy. As such, this option represents a reduced, but more efficient, investment in improving environmental outcomes through the exclusion of beef cattle and deer.

In order to manage environmental risks on higher slopes between 5 and 10 degrees and altitudes above 500 metres, Option 2 relies on the implementation and future regulation of freshwater farm plans (see limitations). While this is an important limitation, freshwater farm plans are also an opportunity to take a more risk-based approach tailored to individual circumstances.

Option 1 is not preferred. Without changes to the map, up to 11.5 per cent of the total area captured in the map will be greater than 10 degrees in slope. This will create costs in situations that were not intended, and which are higher relative to the environmental benefits of excluding stock.

Further policy work will consider an exception for extensive farming captured by the map, based on land use (eg, stocking rate), to better achieve Cabinet's original intent. This is beyond the scope of this analysis and will be subject to future Cabinet decisions.

A summary of submissions is attached as Appendix 1. The report setting out officials' post-consultation recommendations is attached as Appendix 2. In addition, Appendix 3 summarises views expressed by Māori submitters, and is provided here to help assess options against specific criteria in Section 2 of this analysis.

Limitations and Constraints on Analysis

Ministers and Cabinet directed officials to improve the mapping methodology used to identify low slope land and address specific issues relating to the map. While wholesale removal of the map and reliance on freshwater farm planning was suggested by some submitters, such changes would require a more fundamental redesign of the Regulations and are beyond the scope of this analysis. We also note the current approach – ie, the map determining whether specific requirements in the Regulations apply – was the subject of extensive public consultation and analysis before being put in place in 2020, alongside alternatives such as freshwater farm planning. This analysis does not seek to re-assess decisions that were made at that time, and is focussed on addressing issues with the current map.

While only two options are examined in this analysis, it is important to note that Option 2 represents a suite of options, ie, many discrete changes to the mapping methodology, which have been iteratively developed over time. This suite of options was informed by engagement with stakeholders and the outcome of public consultation, but is otherwise based on expert opinion about how issues with the current map can be addressed (eg, when selecting appropriate changes to slope thresholds and other aspects of mapping methodology). For detailed information on proposed changes to mapping methodology, their rationale, and how these have developed over time, please refer to *Proposed changes to mapping methodology* (Appendix 4).

Despite changes to the map, there will still be instances where it captures extensive high country farming, and it will continue to be inefficient in this regard. This is because the map is based on the characteristics of land (eg, slope), and is an imperfect proxy for land use and the intensity of farming. It is not feasible to address this limitation through further changes to the map – we do not have sufficient information on land use. Land use is also subject to change over time, so any map based on it would not provide a durable solution.

Further policy work will consider an exception for extensive farming captured by the map, based on land use (eg, stocking rate), to better achieve Cabinet's original intent. This is beyond the scope of this analysis and will be subject to future Cabinet decisions.

The Regulations do not require water bodies to be fenced – they require that stock be excluded. This can be achieved in whatever way is the most efficient (eg, as a result of vegetation or topography, fencing, or otherwise). However, for the purpose of estimating costs, fencing water bodies is considered the most likely form of exclusion.

While it is relatively straightforward to locate lakes and rivers passing through pastoral land in low slope areas, we have limited information on how many of these water bodies are already fenced. In addition, we have limited information on the location of wetlands. This makes it difficult to estimate the total cost of any changes to the map, and estimates are subject to a range of assumptions. These are detailed in *Stock Exclusion Regulations: Fencing Costs associated with amendments to the Stock Exclusion low slope land map* (Appendix 5).

Similarly, the lack of information about the existence of fencing limits our ability to monitor and evaluate implementation of the Regulations. This is mitigated to some extent by:

- Ongoing engagement between officials and regional councils responsible for compliance, monitoring and enforcement, who are likely to collect relevant

information – some of which is routinely provided and analysed as part of the National Monitoring System.¹³

- Monitoring and reporting on the state of the environment required under section 35 of the Resource Management Act 1991 and reporting under the Environmental Reporting Act 2015, which may indicate changes in key indicators affected by stock exclusion (eg, *E. coli* and sediment).¹⁴
- Voluntary reporting by industry, for example the *Sustainable Dairying: Water Accord* reports on progress in fencing water bodies.¹⁵

Option 2 would amend the map by reducing the current slope threshold from 10 to 5 degrees and introducing an altitude threshold of 500 metres, relying on freshwater farm plans to manage stock exclusion beyond those thresholds. However, whether or not stock need to be excluded on higher slopes will depend on the implementation and future regulation of freshwater farm plans.¹⁶ For this reason, when assessing proposed changes, this analysis does not attribute costs or benefits to stock exclusion on slopes above 5 degrees.

¹³ <https://environment.govt.nz/what-government-is-doing/areas-of-work/rma/national-monitoring-system/>

¹⁴ <https://environment.govt.nz/facts-and-science/environmental-reporting/>

¹⁵ <https://www.dairynz.co.nz/environment/environmental-leadership/sustainable-dairying-water-accord/>

¹⁶ Freshwater farm plans are a legal instrument established under Part 9A of the Resource Management Act 1991 (sections 217A to 217M). All farm systems that meet specific area thresholds will need a freshwater farm plan, which will include practical actions to manage environmental effects and comply with other regulatory requirements, and be subject to certification and audit. Regulations to create the farm planning system are currently being developed, however this will not include specific provisions relating to stock exclusion – which would be subject to future policy development and Cabinet decisions. For more information see: <https://environment.govt.nz/acts-and-regulations/freshwater-implementation-guidance/freshwater-farm-plans/>

Responsible Manager(s) (completed by relevant manager)

Nik Andic
Manager, Land and Water Systems
Ministry for the Environment



16.11.2022

Mackenzie Nicol
Manager, Water Policy
Ministry for Primary Industries



16.11.2022

Quality Assurance (completed by QA panel)

Reviewing Agency:	Ministry for the Environment and the Ministry for Primary Industries
Panel Assessment & Comment:	<p>A quality assurance panel with members from the Ministry for the Environment and the Ministry for Primary Industries has reviewed the Regulatory Impact Statement. The panel considers that it meets the Quality Assurance criteria.</p> <p>The Regulatory Impact Statement clearly sets out the context for the issues that it analyses and shows adequate consultation with affected parties. Furthermore, the Regulatory Impact Statement contains a clear analysis of the options relative to the selected objectives. The quality assurance panel found the impact and cost-benefit analyses to be comprehensive. Overall, the quality assurance panel considers it to be convincing, and more than sufficient to support informed and effective decision-making from Ministers.</p>

Section 1: Diagnosing the policy problem

What is the context behind the policy problem and how is the status quo expected to develop?

Current state

1. Livestock entering water bodies causes a range of environmental effects, including increased contaminant losses (eg, pathogens, nitrogen) and damage to the banks and beds of water bodies. These effects can adversely impact freshwater ecosystems, human health, and cultural values.¹⁷
2. Existing regional plans have stock exclusion requirements, though these are highly variable in scope and effectiveness. Industry initiatives (eg, *Sustainable Dairying: Water Accord*) have increased the uptake of voluntary stock exclusion in recent years, however large stretches of water bodies remain unfenced.
3. In August 2020, as part of the *Essential Freshwater* package, the Resource Management (Stock Exclusion) Regulations 2020 (the Regulations) were gazetted, requiring the exclusion of livestock from rivers wider than one metre, lakes and natural wetlands (water bodies).
4. Alongside the Regulations, the *Essential Freshwater* package also comprised:
 - a) the Resource Management (National Environmental Standards for Freshwater) Regulations 2020 (NES-F)
 - b) the National Policy Statement for Freshwater Management 2020 (NPS-FM)
 - c) amended Resource Management (Measurement and Reporting of Water Takes) Regulations 2010.
5. Further background and analysis relating to the *Essential Freshwater* package can be found on the Ministry for the Environment's (the Ministry) website,¹⁸ including regulatory impact analysis that supported the development of the Regulations in 2020.¹⁹
6. The *Essential Freshwater* package is now being implemented. Together, the Ministry and the Ministry for Primary Industries have been engaging with stakeholders to identify issues as they arise, and to ensure they have the support needed to effectively implement the package. This has included partnering with regional councils and the primary sector on key areas of work; establishing a cross-sector Freshwater Implementation Group; and appointing Freshwater Commissioners to facilitate the preparation of freshwater planning instruments by regional councils.

Key features and objectives of the Regulations

7. The Regulations were gazetted on 3 August 2020 and require the exclusion of livestock (dairy cattle, dairy support cattle, pigs, beef cattle, deer) from specified water bodies (rivers wider than one metre, lakes and natural wetlands).
8. Requirements to exclude stock are intended to manage the environmental risks associated with stock entering water bodies, particularly in relation to sediment and *E.coli*, which can adversely impact freshwater ecosystems, human health and cultural

¹⁷ See *Regulatory Impact Statement – Action for healthy waterways Part II: detailed analysis*: <https://environment.govt.nz/what-government-is-doing/cabinet-papers-and-regulatory-impact-statements/regulatory-impact-statement-action-for-healthy-waterways-part-ii/>.

¹⁸ <https://environment.govt.nz/what-government-is-doing/areas-of-work/freshwater/work-programme/supporting-evidence-for-government-freshwater-work-programme/>

¹⁹ <https://environment.govt.nz/assets/publications/essential-freshwater-ria-part-ii-detailed-analysis.pdf>

values. These provisions are critical for meeting the Government's objective to halt further degradation of freshwater.

9. A factsheet describing the key features of the Regulations is available on the Ministry's website and is attached for completeness as Appendix 6.²⁰
10. This analysis focuses on requirements to exclude beef cattle and deer on low slope land, and specifically:
 - a) Regulations 14 and 15 require beef cattle and deer on low slope land to be excluded from lakes and wide rivers by 1 July 2025 (or from 3 September 2020 if in relation to a new pastoral system).²¹
 - b) Regulation 18 requires all livestock on low slope land to be excluded from natural wetlands (0.05 hectares or greater in size) by 1 July 2025.
11. The Regulations incorporate by reference a map of low slope land (the map), which identifies land across New Zealand with an average slope of less than or equal to 10 degrees (low slope land). Beef cattle and deer on land identified by the map must be excluded from water bodies from 1 July 2025 (or from 3 September 2020 on any new pastoral system).
12. Requirements relating to the map are only a partial picture of requirements to exclude beef cattle and deer from water bodies. For example, if beef cattle and deer are "intensively grazing", they must be excluded from water bodies regardless of the terrain (including on land with an average slope greater than 10 degrees).²² As above, this analysis focuses on requirements to exclude beef cattle and deer on low slope land, and other requirements are not discussed further.
13. Requirements to exclude stock under the regulations are a minimum requirement. Regional plans and, once available, freshwater farm plans are able to impose more stringent requirements.

Feedback from stakeholders

14. Following the introduction of the Regulations, stakeholders raised concerns that the map:
 - a) captured land that was greater than 10 degrees in average slope (high slope land);
 - b) did not capture some low slope land; and
 - c) captured land that is used for extensive high country farming.²³
15. Officials subsequently met with regional councils and primary sector groups to understand the scale of the concerns with the map. These conversations helped inform officials' approach to developing options to address the concerns (discussed further below, under [Nature, scale and scope of the problem](#)).
16. The changes proposed to the Regulations were publicly notified through a discussion document.
17. Together, the Ministry and the Ministry for Primary Industries undertook public consultation from 26 July to 7 October 2021, seeking feedback on proposed

²⁰ <https://environment.govt.nz/assets/Publications/Files/essential-freshwater-stock-exclusion-factsheet.pdf>

²¹ "new pastoral system" is defined in the Regulations as any land that has been converted to pastoral land use.

²² "intensively grazing" is defined in the Regulations as:

- (a) break feeding,
- (b) grazing on annual forage crops; or
- (c) grazing on pasture that has been irrigated with water in the previous 12 months.

²³ Extensive farming generally refers to a system that uses fewer inputs (eg, labour, fertilisers, etc) relative to the land area being farmed. For the purpose of this analysis, the term is used interchangeably with lower intensity farming.

amendments to the map, as set out in the discussion document.²⁴ This discussion document also included an interim regulatory impact statement.

18. Consultation on proposed changes to the Regulations occurred simultaneously with consultation on freshwater farm plans and amendments to the intensive winter grazing regulations in the NES-F, and included a series of public meetings and hui.
19. A summary of submissions is attached as Appendix 1. The report setting out officials' post-consultation recommendations is attached as Appendix 2. In addition, Appendix 3 summarises views expressed by Māori submitters, and is provided here to help assess options against specific criteria in Section 2 of this analysis.

How is the status quo expected to develop if no action is taken?

20. Beef cattle and deer will have to be excluded from the specified water bodies based on the current map, even if the actual slope of the land captured by the map is greater than 10 degrees.
21. We estimate up to 11.5 per cent of the total area captured in the current map will have a slope greater than 10 degrees. We have also estimated the total area of specific Land Use Classification (LUC) and land cover captured in the current map (see Table 1 below), which can be used as a proxy for land use. For example, we estimate 13 per cent of the total area is in low-producing grassland, which is associated with high country farming.

Table 1: Land use classes and land cover captured by current low slope map (as per the Regulations)

Total area (million hectares)	8.2
Total grassland area (million hectares)	6.0
Total low-producing grassland (million hectares)	1.05
Percent low-producing grassland	13%
REC ²⁵ river length covered (km)	148,832
Number of land parcels captured	583,315
Number of properties captured	440,875
LUC 1-3 captured	87%
LUC 1-3 not captured	13%
Layer LUC 5+	35%
Land over 10 degrees captured	11.5%

²⁴ <https://consult.environment.govt.nz/freshwater/stock-exclusion-regulations/>

²⁵ River Environment Classification

22. Under the status quo, any beef cattle and deer farms captured by the map on higher slopes would be required to exclude their stock and are likely to incur higher costs without an expected increase in environmental benefits.
23. Estimated fencing costs vary by fence type and steepness of terrain (among other factors). Costs are highest for deer fencing and typically increase with steepness for all fence types. Other significant costs for such beef cattle and deer farms would include:
 - a) stock water reticulation, although it is not known how many of New Zealand's waterways are currently used as a source of stock drinking water, and
 - b) the opportunity costs of retiring productive land as a result of fencing.²⁶
24. Detailed estimates of expected costs under the status quo are included in Appendix 5. We estimate a total of 25,604km of river will require fencing under the status quo, with associated loss of productive land due to setbacks. The present value of total costs over 2023-2050 is approximately \$1.091 billion under a 3 per cent discount rate.²⁷

Relevant prior Government decisions, legislation and Regulatory Impact Statements

25. The Regulations were gazetted on 3 August 2020 and require the exclusion of livestock from water bodies.
26. Requirements to exclude stock are intended to manage the environmental risks associated with stock entering water bodies, particularly in relation to sediment and *E.coli*, which can adversely impact freshwater ecosystems, human health and cultural values.²⁸
27. Cabinet did not intend the Regulations to apply to lower intensity high country farming because the impact on water bodies is lower, and the cost of fencing can be high.²⁹ When the Regulations were put in place, Cabinet agreed the Regulations would require exclusion of beef cattle and deer on low slope land only.³⁰
28. That is why the Regulations incorporate by reference the map, which identifies low slope land. Beef cattle and deer on land identified by the map must be excluded from

²⁶ See National Stock Exclusion Study: Analysis of the costs and benefits of excluding stock from New Zealand waterways July 2016: <https://www.mpi.govt.nz/dmsdocument/16513-National-Stock-Exclusion-Study-Analysis-of-the-costs-and-benefits-of-excluding-stock-from-New-Zealand-waterways-July-2016>

²⁷ Scenario 1 in the *Stock Exclusion Regulations: Fencing Costs associated with amendments to the Stock Exclusion low slope land map* calculates total costs associated with the status quo at \$852m. However, this figure does not factor in revised cost assumptions for fencing and inflation, which are applied to other scenarios. We have therefore multiplied this figure to account for revised cost assumptions for fencing and inflation (ie, by a factor of 1.28, estimated by comparing total costs for scenarios 2 and 3).

²⁸ See *Regulatory Impact Statement – Action for healthy waterways Part II: detailed analysis*: <https://environment.govt.nz/what-government-is-doing/cabinet-papers-and-regulatory-impact-statements/regulatory-impact-statement-action-for-healthy-waterways-part-ii/>.

²⁹ See *Essential Freshwater – Public consultation on national direction for freshwater management*: <https://environment.govt.nz/assets/Publications/essential-freshwater-public-consultation-national-direction-freshwater-management.pdf>.

³⁰ See *Action for Healthy Waterways – Decisions on national direction and regulations for freshwater management*: <https://environment.govt.nz/assets/publications/Cabinet-papers-briefings-and-minutes/cab-paper-action-for-healthy-waterways-decisions-on-national-direction-and-regulations-for-freshwater-management.pdf>.

Detailed recommendations relating to stock exclusion are contained in Appendix 1 of that Cabinet paper: <https://environment.govt.nz/assets/Publications/Files/appendix-1-policy-and-recommendations-action-for-healthy-waterways-cab-paper.pdf>.

water bodies from 1 July 2025 (or from 3 September 2020 on any new pastoral system).

29. Further background and analysis relating to the *Essential Freshwater* package can be found on the Ministry's website,³¹ including regulatory impact analysis that supported development of the Regulations in 2020.³²

Other government work programmes with interdependencies and linkages

30. The Regulations are expected to reduce faecal contamination and support the NPS-FM's national target to increase proportions of specified rivers and lakes that are suitable for primary contact (ie, swimming) to at least 80 per cent by 2030, and 90 per cent no later than 2040.
31. The NPS-FM requires regional councils to map natural inland wetlands that are 0.05 hectares or larger, or of a type that is naturally smaller and known to contain threatened species. This mapping will in turn support the implementation of requirements to exclude stock on low slope land from natural wetlands 0.05 hectares or greater in size by 1 July 2025.
32. Freshwater farm plans are a legal instrument established under Part 9A of the Resource Management Act 1991 (RMA) (sections 217A to 217M). All farm systems that meet specific area thresholds will need a freshwater farm plan, which will include practical actions to manage environmental effects and comply with other regulatory requirements. Stock exclusion is a straightforward way to manage the effects of stock entering water bodies and may be required as a result of farm planning, including in situations where the Regulations do not require it (ie, on higher slopes). New regulations to create the farm planning system are currently being developed.³³
33. Recently proposed changes to the Resource Management (National Environmental Standards for Sources of Human Drinking Water) Regulations 2007 (NES-DW) are aimed at improving the protection of drinking water sources used for human consumption.³⁴ Mapping criteria introduced under the NES-DW could overlap with the Regulations, and impose additional requirements. Proposed changes to the NES-DW are still subject to final decisions.

What is the policy problem or opportunity?

Nature, scale and scope of the problem

34. Following the introduction of the Regulations, officials have continued to engage with stakeholders to identify issues as they arise.
35. Initial feedback from regional councils and the primary sector indicated that the map:
 - a) captured land that was greater than 10 degrees in average slope (high slope land);
 - b) did not capture some low slope land; and
 - c) captured land that is used for extensive high country farming.
36. Feedback also indicated that adjacent farms with similar terrain had been captured inconsistently. This is particularly relevant in areas with variable terrain across Land Information New Zealand (LINZ) primary parcel blocks (land parcels) that vary in size and shape, and has created an issue of fairness between farm properties. The

³¹ <https://environment.govt.nz/what-government-is-doing/areas-of-work/freshwater/work-programme/supporting-evidence-for-government-freshwater-work-programme/>

³² <https://environment.govt.nz/assets/publications/essential-freshwater-ria-part-II-detailed-analysis.pdf>

³³ <https://environment.govt.nz/acts-and-regulations/freshwater-implementation-guidance/freshwater-farm-plans/>

³⁴ <https://consult.environment.govt.nz/freshwater/nes-drinking-water/>

likelihood that high slope land is captured increases with one large area of land within a single land parcel (compared to a large area of land divided into multiple smaller parcels) due to the averaging approach.

37. Subsequent analysis has confirmed the map is inaccurate. We estimate that up to 11.5 per cent of the total area captured in the current map will be greater than 10 degrees in slope. This will create costs in situations that were not intended, and which are higher relative to the environmental benefits of excluding stock (for more detailed information on the scale of this issue see [How is the status quo expected to develop if no action is taken?](#) above).³⁵

Overall regulatory burden

38. There is an overall regulatory burden to consider relating to implementation of any changes to the Regulations, namely:
- Farmers will be managing implementation of simultaneous regulations from central and regional government.
 - There is confusion between the different requirements from different regulations introduced under the *Essential Freshwater* package.
 - There are overlapping requirements with other regulations such as intensive winter grazing regulations which include reference to slope thresholds, as well as setbacks from water bodies, and potentially regional plans which are able to impose more stringent requirements.

What objectives are sought in relation to the policy problem?

39. The consideration of objectives is guided by the purpose of the RMA and the objectives of the *Essential Freshwater* package. The key objectives are that changes to the Regulations must be:
- effective** in giving effect to the principles of Te Mana o te Wai and preventing further degradation and loss of the country's freshwater resources, waterways and ecosystems (and if possible, reversing past damage);
 - practical** in enabling farmers subject to the Regulations to meet their obligations as intended within required timelines;
 - equitable** in allocating the costs of implementing the Regulations appropriately.

³⁵ Estimated fencing costs vary by fence type and steepness of terrain (among other factors). Costs are highest for deer fencing and typically increase with steepness for all fence types. See National *Stock Exclusion Study: Analysis of the costs and benefits of excluding stock from New Zealand waterways July 2016*: <https://www.mpi.govt.nz/dmsdocument/16513-National-Stock-Exclusion-Study-Analysis-of-the-costs-and-benefits-of-excluding-stock-from-New-Zealand-waterways-July-2016>

The steepness of terrain is also a limitation which will affect productivity and land management options. Alongside other factors, it is used to calculate land use capability and carrying capacity – eg, the ability of the land to support higher stocking rates where excluding stock would have greater environmental benefits. Some intensive farming practices including fodder-cropping, break-feeding, and grazing of irrigated pasture can still occur on high slope land, however this is addressed through existing requirements in the Regulations when intensively grazing beef cattle and deer.

Section 2: Deciding on an option to address the policy problem

What criteria will be used to compare options to the status quo?

Following the objectives above, the following criteria are used to evaluate the options in this document:

- **effective:** does the option avoid, remedy, or mitigate the effects of farming and/or horticultural land use on freshwater, by ensuring that the Regulations specify stock exclusion from those waterways where it will have the greatest environmental benefits (and in so doing, give effect to the principles of Te Mana o te Wai and the requirements of the RMA, the NPS-FM and the NES-F)?
- **practical:** does the option:
 - provide farmers and regional councils with clear information about the waterways from which stock must be excluded?
 - provide farmers with flexibility to implement solutions (especially through freshwater farm plans) that are appropriate to the specific circumstances of their farm?
 - set realistic timeframes for measures to be implemented to meet these obligations?
- **equitable:** does the option:
 - allocate the costs of implementing the Regulations towards landowners with waterways at most risk of degradation?
 - avoid imposing costs on landowners with waterways at low risk of degradation or where costs of exclusion would be excessive relative to environmental benefits?
- **consistent with the Treaty of Waitangi (Te Tiriti o Waitangi):** does the option:
 - take into account the principles of Te Tiriti o Waitangi?
 - promote partnership and protect Māori rights/interests and relationships with their taonga?
 - acknowledge opportunities that may arise for Māori to exercise rangatiratanga and kaitiakitanga?

What options are being considered?

Option One – Status Quo / Counterfactual

40. The current map is retained. The mapping methodology is unchanged.
41. The existing mapping methodology averages slope across LINZ land parcels and applies to areas with an average slope of 10 degrees or less. The map is designed to capture land that could be grazed, and areas where land use could potentially be changed to grazing ie, depleted pasture that is improved to allow grazing by livestock.
42. If the map is not changed, up to 11.5 per cent of the land captured by the map will be greater than 10 degrees average slope.

Option Two – Changes to the map

43. Under Option Two, the map is updated to incorporate changes to the methodology that identifies land with an average slope of 5 degrees or less.
44. The methodologies consulted on were:
 - a) a new mapping methodology is used called 'local terrain averaging' to calculate the average slope of land;

- b) the slope captured by the map is changed to 5 degrees or less and land between 5 and 10 degrees is managed by freshwater farm plans;
 - c) land above 500 metres altitude is removed from the map and that land is instead managed via freshwater farm plans;
 - d) depleted grassland and tall tussock are removed from the map and those areas are instead managed via freshwater farm plans. However, in response to submitter feedback and further analysis, it is now proposed to retain depleted grassland and tall tussock in the map; and
 - e) In response to submitter feedback and further analysis, it is now proposed to remove the Chatham Islands from the map.
45. While only two options are examined in this analysis, it is important to note that Option 2 represents a suite of options, ie, many discrete changes to the mapping methodology, which have been iteratively developed over time. This suite of options was informed by engagement with stakeholders and the outcome of public consultation, but is otherwise based on expert opinion about how issues with the current map can be addressed (eg, when selecting appropriate changes to slope thresholds and other aspects of mapping methodology). For detailed information on proposed changes to mapping methodology, their rationale, and how these have developed over time, please refer to *Proposed changes to mapping methodology* (Appendix 4).

What option is likely to best address the problem, meet the policy objectives, and deliver the highest net benefits?

46. Option 2 is the preferred option to address the problems identified with the status quo regarding the inclusion of high slope land and high country farming.

Lowering the threshold from 10 degrees to 5 degrees and setting the altitude threshold at 500 metres

47. The local terrain approach, with the incorporated adjustments suggested following the Manaaki Whenua Landcare Research (MWLR) technical review, captures land more accurately. This approach addresses concerns that the map was capturing land above 10 degrees, and the associated issue of fairness between farms with similar terrain. In addition, by lowering the slope threshold captured in the map to between 0 to 5 degrees sets a more conservative baseline to further minimise the likelihood that land above 10 degrees is captured by the map.
48. Setting the altitude threshold at 500 metres minimises the extent to which extensive high country farming operations are included in requirements for stock exclusion.
49. Updating the map to make it more accurately represent the intent of the Regulations means that less total length of rivers will need to be fenced: 22,258km under Option 2, compared to 25,604km under the status quo (a reduction of 13 per cent). While this will make the map more targeted and reduce associated costs to farmers, this will also reduce the environmental benefits of excluding stock from waterbodies.
50. This reduction in benefits is highlighted by some submissions, including Te Ao Marama Incorporated (on behalf of Waihopai Rūnaka, Te Rūnanga o Oraka Aparima and Te Rūnanga o Awarua) and Te Rūnanga o Ngāi Tahu who did not agree that grazing on land above 500 metres and on depleted grassland and tall tussock is always extensive and has a low impact on water bodies.
51. We agreed with suggestions to retain depleted grassland and tall tussock (see Appendix 4 for more detail). However, as the costs of fencing per km remain higher on steep land (because of access, topography etc) and benefits lower (because of generally lower stocking rates and fewer animals), retaining the altitude threshold was

considered appropriate. This position is consistent with submissions acknowledging the current map is inaccurate and highlighting concerns about associated costs.

52. We note Tairāwhiti Whenua also highlighted concerns about costs associated with the proposed changes to the map and future freshwater farm plan requirements, as well as productive land being removed from Māori landowners. They note the requirement to exclude livestock in accordance with the proposed changes to the map (and alongside freshwater farm plans) will add additional costs, complexity and bureaucracy for Māori landowners. They do not consider the proposed changes will meet the criteria of Te Mana o te Wai or Te Tiriti criteria noted in the consultation discussion document.
53. As above, proposed changes to the map are expected to reduce costs compared to the status quo, and we would expect those cost reductions to apply to Māori owned land. For example, we estimate that Māori operate up to 25 per cent of Aotearoa New Zealand's sheep and beef farms³⁶, and expect those will see cost reductions as a result of the proposed change. However, this should also be seen in the context of Māori submitter concerns about a reduction in environmental benefits described above, and differing views as to whether the trade-off is appropriate.
54. However, changes to the map can only partially address the inclusion of extensive pastoral systems. Feedback from consultation indicates that in some farm operations across New Zealand, particularly South Westland, land has still been mapped as low slope land which will require mandatory stock exclusion. Given the remote location of these farms, permanent fencing would often be the only option to exclude livestock. Many of these farm systems are extensive, the environmental benefit of excluding livestock versus the cost of fencing is considered low.
55. For these reasons, Option Two may still result in fencing requirements in these regions for little environmental benefit – ie, it will partially address this problem but not eliminate it entirely.
56. Further policy work will consider an exception for extensive farming captured by the map, based on land use (eg, stocking rate), to better achieve Cabinet's original intent. This is beyond the scope of this analysis and will be subject to future Cabinet decisions.

Freshwater farm plans

57. Freshwater farm plans are a legal instrument established under Part 9A of the Resource Management Act 1991 (sections 217A to 217M). All farm systems that meet specific area thresholds will need a freshwater farm plan, which will include practical actions to manage environmental effects and comply with other regulatory requirements, and be subject to certification and audit. Regulations to create the farm planning system are currently being developed, however this will not include specific provisions relating to stock exclusion – which would be subject to future policy development and Cabinet decisions.
58. There is an opportunity for freshwater farm plans to manage stock exclusion where it is not required by the Regulations, taking a more risk-based approach tailored to individual circumstances.
59. For example, Option 2 would amend the map by reducing the current slope threshold from 10 to 5 degrees and introducing an altitude threshold of 500 metres, relying on freshwater farm plans to manage stock exclusion beyond those thresholds. However, whether or not stock need to be excluded on higher slopes will depend on the implementation and future regulation of freshwater farm plans. For this reason, when

³⁶ See *Pricing Agricultural Emissions Consultation document*: [Pricing-agricultural-emissions-consultation-document.pdf](https://www.environment.govt.nz/consultation/consultations/2022/pricing-agricultural-emissions-consultation-document.pdf) ([environment.govt.nz](https://www.environment.govt.nz))

assessing proposed changes, this analysis does not attribute costs or benefits to stock exclusion on slopes above 5 degrees.

Removal of the map is beyond the scope of this analysis

60. Some submissions suggested removing the map entirely – albeit for different reasons. For example, some considered the map was still too inflexible in that the requirements to exclude stock remain regardless of the unique characteristics of their pastoral system. Others were concerned that the revised map was still inaccurate, and therefore an ineffective tool to achieve desired outcomes.
61. Te Rūnanga o Ngāi Tahu noted there could be confusion as a result of differing requirements to exclude livestock in the Regulations and under the freshwater farm plans, and requested the map be removed from the Regulations and that the Regulations instead list or explain the requirements for stock exclusion.
62. While these are valid concerns about the Regulation's reliance on the map, such a change is beyond the scope of this analysis. Ministers and Cabinet directed officials to improve the mapping methodology used to identify low slope land and address specific issues relating to the map. Wholesale removal of the map and reliance on freshwater farm planning would require a more fundamental redesign of the Regulations and is beyond the scope of this analysis. We also note the current approach – ie, the map determining whether specific requirements in the Regulations apply – was the subject of extensive public consultation and analysis before being put in place in 2020, alongside alternatives such as freshwater farm planning. This analysis does not seek to re-assess decisions that were made at that time, and is focussed on addressing issues with the current map.

What are the marginal costs and benefits of the option?

63. Detailed estimates of expected costs are included in Appendix 5: *Stock Exclusion Regulations: Fencing Costs associated with amendments to the Stock Exclusion low slope land map*.
64. We estimate a total of 25,604km of river will require fencing under the status quo, with associated loss of productive land due to setbacks. The present value of total costs over 2023-2050 is approximately \$1.091 billion under a 3 per cent discount rate.
65. Changes to the map will reduce the amount of fencing required and total costs associated with the status quo by 13 per cent.³⁷
66. As a result of reduced costs, changes to the map are also expected to reduce the overall economic burden on rural communities, with associated benefits for mental health of rural people. The social impacts of freshwater reforms, including on the mental health of rural people, was explored in detail in 2020. This found pressure on farmers from increased costs of production and requirements to adopt new technologies and change farm management practices are likely to increase pressure on farmers and farm families to cope psychologically, at least in the short term. It's important to note that costs associated with the Regulations are one small contributor to this pressure, and the changes it brings about can also have longer term benefits.³⁸
67. Estimates of land captured by the current and proposed map indicate improvements in the accuracy of the map are significant (see Table 2). For example, the proposed map will capture less land with a slope greater than 10 degrees (0.02 per cent compared to

³⁷ This compares scenarios 1 and 2 in *Stock Exclusion Regulations: Fencing Costs associated with amendments to the Stock Exclusion low slope land map*.

³⁸ See *Understanding the Social Impacts of Freshwater Reform: A Review of Six Limit-Setting SIAs*: <https://environment.govt.nz/assets/Publications/Files/understanding-social-impacts-freshwater-reform.pdf>

11.5 per cent), and less low-producing grassland which is associated with high country beef and deer farming (0.37 million hectares compared to 1.05 million hectares).

68. However, the above reduction in fencing is also expected to reduce the environmental benefits of excluding stock from waterways. Previous modelling estimates reductions in *E. Coli* and sediment across a range of scenarios. While these scenarios are not directly comparable to proposed changes to the map, they can be used to infer the scale of reduced environmental benefits. This indicates proposed changes to the map could mean <5.2 per cent fewer kilometres of river becoming suitable for primary contact in terms of *E. coli*, and <0.8 per cent foregone reduction in sediment load compared to the status quo. However, it is important to stress these inferences likely overestimate reductions in environmental benefits.³⁹
69. Overall, while there is a marginal reduction in environmental benefits, proposed changes to the map are expected to result in more significant reductions in cost and improvements to the map's accuracy. As such, proposed changes represent a reduced, but more efficient, investment in improving environmental outcomes through the exclusion of beef cattle and deer.
70. Reductions in costs will generally be experienced in areas of higher slope and altitude (ie, they stem from changes to the map that mean stock do not need to be excluded in specific areas). Other impacts, on the mental health of rural people and reductions in environmental benefits will be experienced more widely across the relevant communities and catchments.

³⁹ See *Modelling the impacts of the Draft Stock Exclusion Section 360 Regulations on river water quality*: <https://www.mpi.govt.nz/dmsdocument/50149-Modelling-the-impacts-of-the-Draft-Stock-Exclusion-Section-360-Regulations-on-river-water-quality>

For *E. coli*, this figure represents the reduction in kilometres of river entering A B or C bands in the *E. coli* attribute table, and therefore being considered suitable for primary contact under the national target in Appendix 3 of the NPS-FM.

For sediment, this figure represents the change in sediment load reductions.

These estimates are based on a comparison of scenarios 1a, 1b, 3a, and 3b in the above analysis, and the largest possible reduction in benefits. In addition, scenarios factor in changes to requirements to exclude dairy cattle, which are not proposed here and may have a significant effect on how those scenarios perform. As such, it is important to stress these figures likely to overestimate reductions in environmental benefits, and should only be used to estimate the *potential scale* of reductions (not actual reductions).

Table 2: Comparison of land captured by the current (as per the Regulations) and proposed map.

	1: Current low slope map (as per the Regulations)	2: Proposed low slope map
Slope averaging method	LINZ land parcel layer	MWLR 3x3 majority filter
Slope threshold (degrees)	10	5
Altitude cut-off (metres)	none	500m
Tall tussock and depleted grassland included?	no	yes
Total area (million hectares)	8.2	5.8
Total grassland area (million hectares)	6.0	4.2
Total low-producing grassland (million hectares)	1.05	0.37
Low-producing grassland (%)	13%	6%
REC ⁴⁰ river length covered (km)	148,832	130,174
Number of land parcels captured	583,315	736,061
Number of properties captured	440,875	463,325
LUC class 1-3 captured (%)	87%	81%
LUC class 1-3 not captured (%)	13%	19%
Layer LUC class 5+ (%)	35%	24%
Land over 10 degrees captured (%)	11.5%	0.02%

⁴⁰ River Environment Classification

Table 3: Overview of marginal costs and benefits

Affected groups	Comment	Impact	Evidence Certainty
Additional costs of the preferred option compared to taking no action			
Regulated groups	Some farmers with land now covered by the new map will incur costs of stock exclusion	Low	Medium
Regulators (regional councils)	There will be no additional costs to regulators	None	Medium
Māori	There will be less protection from sediment loss and protection of waterways provided by the new map, increasing the ecological impact and human health risk from <i>E. Coli</i> .	Low	Low
The wider community	As for Māori above.	Low	Medium
Total monetised costs	-	Low	Low
Non-monetised costs	-	Low	Low
Additional benefits of the preferred option compared to taking no action			
Regulated groups	Changing the low slope map reduces river length required to be fenced by these Regulations from 25,604km in the status quo to 22,258km in the preferred option, with reductions in associated costs for fencing and loss of productive land, .	Medium	High
Regulators (regional councils)	Regional councils will have approximately a third less total area to monitor for compliance, this will reduce the cost of compliance checking.	Medium	Medium
Māori	As for regulated groups above. To the extent that Māori landowners are disproportionately impacted by issues with the current map because they are more likely to own sheep and beef farms, this option is expected to perform better than the status quo.	High	Low
The wider community	Reduced overall economic burden on rural communities, with associated benefits for mental health of rural people.	Low	Low
Total monetised benefits	A 13 per cent reduction in costs associated with fencing and loss of productive land compared to the status quo (approximately \$142 million over 2023-2050 under a 3% per cent discount rate).	Medium	High
Non-monetised benefits	-	Medium	Medium

How do the options compare to the status quo/counterfactual?

	Option One – the map does not change in the Regulations	Option Two – Update the low slope map in the Regulations (using proposed changes)
Effective	<p>0</p> <p>The current map does not accurately capture land above and below 10 degrees average slope, and includes large areas of extensive high country farming operations. This will mean requirements to exclude stock from waterbodies will apply to large areas of extensive high country farming in situations where environmental benefits of excluding stock are reduced (ie, compared to flatter land).</p>	<p>-</p> <p>The proposed map is more effective at capturing the slope of land, including low slopes. The map is also more targeted to highly productive grassland and avoids extensive high country farming by excluding land above 500 metres altitude. Eg, it would capture less low-productivity and LUC 5+ land, which is also a proxy for extensive farming.</p> <p>However, as highlighted by some submissions, including from Māori, proposed changes will result in a marginal reduction of environmental benefits under this option (see <i>What are the marginal costs and benefits of the option?</i> for more detail). Overall, proposed changes are still considered an effective way to avoid, remedy, or mitigate the effects on freshwater.</p>
Practical	<p>0</p> <p>The current map unintentionally captures areas with a slope greater than 10 degrees where it is expected to be more costly and difficult to exclude stock.</p> <p>Some criticism of the current map has focused on the use of land parcels as the unit of measurement, noting this had effectively separated farmers from their intuitive understanding of the slope of their own land.</p>	<p>+</p> <p>This option is more practical than the status quo. The new map will be clearer to understand as it averages slope using topographical data (not averaged across land parcels); local terrain averaging is considered easier to explain to farmers, and simpler to implement and enforce (per feedback from regional participants in the development of proposed changes); and it is more flexible on land between 5 and 10 degrees slope, where land would be managed via freshwater farm plans.</p> <p>However, local terrain averaging means the map captures smaller areas of land such as ‘fingers’ extending up river valleys, and may lead to situations where parts of a paddock or land parcel require exclusion.</p> <p>This option does not affect implementation timeframes, and relevant requirements to exclude beef cattle and deer will take effect from 1 July 2025. Although some time has passed since the current map was introduced in 2020, this still provides a significant amount of time to construct fences where necessary, and is considered as practical as the status quo in this respect.</p>
Equitable	<p>0</p> <p>The current map does not accurately capture land above and below 10 degrees average slope, and includes large areas of extensive high country farming operations, which would mean some farmers incur excessive costs relative to environmental benefits.</p> <p>Low slope land has also been captured inconsistently between farms due to the size and shape of land parcels, meaning some land from which stock should be excluded has not been identified, and similar terrain between farms is treated differently.</p>	<p>++</p> <p>This option treats regulated parties more equitably as more accurate identification of low slope land means that farmers are not required to incur excessive costs relative to environmental benefits. It significantly reduces unintentionally captured areas with a slope greater than 10 degrees and land cover associated with lower intensity farming, where costs of exclusion can be disproportionately high compared to the environmental benefits of doing so. While there is a marginal reduction in environmental benefits (see effectiveness above), proposed changes are expected to result in more significant reductions in cost and improvements to the map’s accuracy, and therefore represent a more proportionate response to the environmental risks of beef cattle and deer entering waterbodies.</p> <p>As a corollary there will also be farmers who will have to incur costs under this option where the new map has identified low slope land not previously mapped (eg, where similar terrain between farms was treated differently). However, this distribution of costs is considered more equitable as it stems from the map more accurately capturing the slope of land.</p> <p>This option provides greater scope for regional plans and freshwater farm plans to manage beef cattle and deer when grazing. Because these are able to factor in individual circumstances when determining appropriate actions, this may lead to more equitable outcomes for those individuals (ie, when compared to the current map and issues we have identified with it).</p>
Takes into account Te Tiriti o Waitangi	<p>0</p> <p>The Regulations are inherently limited and cannot allow for discretion or decision making at the local level. As such, there is limited opportunity to promote partnership and enable Māori to exercise rangatiratanga through the Regulations.</p> <p>Anecdotally we understand (although there is limited evidence available to support this analysis) Māori own a high proportion of marginal land in the high-country. It is estimated that Māori operate up to 25 per cent of Aotearoa New Zealand’s sheep and beef farms, which means they could be disproportionately affected by issues with the current map.</p>	<p>0</p> <p>To the extent that regional planning and, in future, freshwater farm plans will be able to allow for discretion or decision making at the local level, proposed changes to the map will mean there is more opportunity to promote partnership and enable Māori to exercise rangatiratanga.</p> <p>To the extent that Māori landowners are disproportionately impacted by issues with the current map, this option is expected to perform better than the status quo.</p> <p>Proposed changes have been developed through public consultation, including a series of public meetings and hui, and should be seen in the context of broader consultation that led to their initial development in 2019. However, we received only a small number of submissions from Māori on proposed changes to the map (approximately four submissions from iwi entities, and individual submissions with limited detail). As such, there has been limited partnership in developing proposed changes to the map. We also note the objectives of proposed changes are not necessarily focussed on Māori relationships with freshwater as affected by stock exclusion, and they will continue to provide limited opportunity for Māori to exercise their rangatiratanga.</p> <p>Where Māori submitters expressed a view, these generally related to reductions in environmental benefits (see effectiveness above) and costs (see practicality above).</p>
Overall assessment	<p>0</p> <p>Concerns raised by regional and primary sector stakeholders about the map’s fitness for purpose indicate that it would be challenging to successfully implement the Regulations with it. Due to averaging slope across large areas, the map captures land that was not intended to be captured and vice versa.</p>	<p>+</p> <p>The proposed changes address issues raised about the current map. While the marginal costs and benefits of this option indicate there is a trade-off between environmental benefits and efficiency, proposed changes are still considered an effective and more efficient way to avoid, remedy, or mitigate the effects of beef cattle and deer entering waterbodies.</p>

Key				
++	+	0	-	--
Much better than doing nothing/the status quo/counterfactual	Better than doing nothing/the status quo/counterfactual	About the same as doing nothing/the status quo/counterfactual	Worse than doing nothing/the status quo/counterfactual	Much worse than doing nothing/the status quo/counterfactual

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Section 3: Delivering an option

How will the new arrangements be implemented?

71. The Regulations are made under section 360 of the RMA, meaning they are administered by regional councils as part of their functions and roles under the RMA. The Ministry will help regional councils in their role by working with them and industry groups to develop guidance.
72. The Policy Implementation and Delivery team at the Ministry is actively developing guidance and provides implementation across the entire Essential Freshwater package.⁴¹ Subject to decisions on whether to proceed with proposed changes to the map, officials will determine what guidance products are needed to support implementation for delivery in 2023 (in advance of the relevant requirements to exclude beef cattle and deer taking effect on 1 July 2025).
73. Regional councils are responsible for enforcing compliance with the Regulations, and administering the imposition of any infringement fees. Compliance with regional rules relating to farm activities is already an established part of regional council work, including the enforcement of their existing rules for stock exclusion.
74. Non-compliance with the Regulations is an infringement offence, and subject to a fee set under Schedule 1A of the Resource Management (Infringement Offences) Regulations 1999⁴² (the infringement regulations). The fees set under the infringement regulations are based on a 'per animal' basis, up to specified maximums.
75. A potential risk to the successful implementation of the Regulations is opposition from some farmers and industry groups. This risk will be mitigated by active engagement with industry groups through ongoing engagement regarding the Regulations and development of guidance material to support implementation. The Ministers and senior management will start this process before any announcements are made, and engagement will continue once the Regulations are drafted.
76. The Policy Implementation and Delivery team at the Ministry has an ongoing role in developing and maintaining relationships with councils and industry groups. This will involve discussing issues and concerns regarding implementation, and how these can be resolved.

Transitional arrangements and implementation timeframes

77. There are no transitional arrangements regarding the implementation of changes to the map in the Regulations. As mentioned above, active engagement with key stakeholders and guidance material will be key to the successful implementation of changes to the map.
78. Beef cattle and deer that are not intensively grazing must be excluded from water bodies from 1 July 2025 (except for new pastoral systems, where this applies from 3 September 2020). Table 4 below outlines the implementation timeframes for the regulations (with the map timelines highlighted in yellow).

⁴¹ <https://environment.govt.nz/acts-and-regulations/freshwater-implementation-guidance/>

⁴² [Resource Management \(Infringement Offences\) Regulations 1999 \(SR 1999/359\) \(as at 03 September 2020\) – New Zealand Legislation](#)

Table 4 Key implementation timelines for the Regulations

	2020-21	2023	2025 and beyond
Excluding all cattle, deer and pigs from lakes and rivers with a bed wider than one metre, with a three-metre minimum setback	From 3 September 2020, the requirements apply to any new pastoral system.	By 1 July 2023 , the requirements apply to: <ul style="list-style-type: none"> dairy cattle (except dairy support cattle) and pigs. all beef cattle and deer that are break feeding or grazing on annual forage crops or irrigated pasture. (See extra restrictions for winter grazing.) 	By 1 July 2025, the requirements apply to: <ul style="list-style-type: none"> dairy support cattle (regardless of land slope) beef cattle and deer when the land is low slope as shown on the map.
Requiring cattle and pigs crossing rivers more than twice per month to use a dedicated culvert or bridge.		By 1 July 2023 , the requirements apply to: <ul style="list-style-type: none"> dairy cattle (except dairy support cattle) and pigs. 	By 1 July 2025 , the requirements apply to: <ul style="list-style-type: none"> dairy support cattle (regardless of land slope)
Excluding all cattle, deer and pigs from natural wetlands.	From 3 September 2020, the requirements apply to any new pastoral system.	By 1 July 2023 , the requirements apply to natural wetlands identified in an operative regional plan, district plan, or regional policy statement as at 3 September 2020.	By 1 July 2025, the requirements apply to: <ul style="list-style-type: none"> Natural wetlands that support a population of threatened species as described in the National Policy Statement for Freshwater Management 2020 Natural wetlands that are more than 500 square metres on low slope land as shown on the map.

How will the new arrangements be monitored, evaluated, and reviewed?

80. The effectiveness of the Regulations will be assessed in 2023 and again in 2026 using the reports on the state of New Zealand's freshwater prepared under the Environmental Reporting Act 2015. This assessment will also be able to take into account the effectiveness of any alternative approaches, such as targeting critical source areas with mitigation measures specified in freshwater farm plans, to evaluate whether the Regulations are contributing to improvements as predicted, and whether they should be changed.
81. A key aspect of monitoring, evaluating and reviewing the regulations is to identify performance indicators to gauge regulation effectiveness (eg, monitoring of *E. Coli.* and sediment in waterways). Monitoring of the map will be part of the wider *Essential Freshwater* monitoring, as well as standard compliance, monitoring and enforcement functions of regional councils. The Ministry and Ministry for Primary Industries will ensure that a monitoring programme encompasses a set of key performance indicators tailored to changes to the map.
82. Other key monitoring sources will aid in the evaluation, review and overall effectiveness of the regulations, namely:
 - a) Monitoring and reporting on the state of the environment required under section 35 of the Resource Management Act 1991 and reporting under the Environmental Reporting Act 2015, which may indicate changes in key indicators affected by stock exclusion (eg, *E. coli* and sediment).⁴³
 - b) Voluntary reporting by industry, eg, the *Sustainable Dairying: Water Accord* reports on progress in fencing water bodies.⁴⁴

⁴³ <https://environment.govt.nz/facts-and-science/environmental-reporting/>

⁴⁴ <https://www.dairynz.co.nz/environment/environmental-leadership/sustainable-dairying-water-accord/>

Appendix 1: Proposed amendments to the low slope map for stock exclusion: Summary of Submissions

The report is available on the Ministry's website at:

<https://environment.govt.nz/publications/proposed-amendments-to-the-low-slope-map-for-stock-exclusion-summary-of-submissions>.

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Appendix 2: Report and Recommendations: Proposed amendments to the low slope map for stock exclusion in the Resource Management (Stock Exclusion) Regulations 2020

The report is available on the Ministry's website at:

<https://environment.govt.nz/publications/proposed-amendments-to-the-low-slope-map-for-stock-exclusion-report-and-recommendations>.

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Appendix 3: Summary of views expressed by Māori submitters

This appendix summarises views expressed by Māori submitters, and is provided to help assess options against specific criteria in [Section 2](#) of this analysis.

As a result of submissions received, and the wider consultation process involving public meetings and hui, we understand issues of particular interest to Māori submitters include the following:

1. Te Ao Marama Incorporated (on behalf of Waihopai Rūnaka, Te Rūnanga o Oraka Aparima and Te Rūnanga o Awarua) support stock exclusion from water bodies. However, they do not agree that grazing on land above 500 metres and on depleted grassland and tall tussock is always extensive and has a low impact on water bodies. They note that these areas do contain sensitive water bodies that can be impacted by grazing livestock and that stock exclusion in these areas needs to be determined on a case-by-case basis.
2. Te Rūnanga o Ngāi Tahu acknowledge that the current map is inaccurate, for example, the fact that the map unintentionally captures land that has an average slope greater than 10 degrees which can often be impractical to fence (if required). They consider that any mapping of land at a national scale will be prone to inaccuracies and must be ground-truthed. They do not agree that land above 500m and in depleted grassland and tall tussock country has a low impact on water bodies. They note that these areas do contain sensitive water bodies that can be impacted by grazing livestock and that stock exclusion in these areas needs to be determined on a case-by-case basis.

In addition, they note there is a risk that people will be confused by differing requirements to exclude livestock in the Regulations and under the freshwater farm plans regulations. They request the map be removed from the Regulations and that the Regulations instead list or explain the requirements for stock exclusion.
3. Tairāwhiti Whenua are broadly concerned with the costs (upon people) associated with the proposed low slope map and freshwater farm plan requirements, as well as productive land being removed from Māori landowners. They note the requirement to exclude livestock in accordance with the proposed changes to the map (and alongside freshwater farm plans) will add additional costs, complexity and bureaucracy for Māori landowners. They do not consider the proposed changes will meet the criteria of Te Mana o te Wai or Te Tiriti criteria noted in the consultation discussion document.
4. An individual submitter raised concerns that the installation of fencing to exclude livestock may impede public access to land. They support the introduction of an improved map and a map that is applied across all of New Zealand. They agree that more flexibility should be provided for in the Regulations by further enabling freshwater farm plans to play a role in the management of stock exclusion.

Appendix 4: Proposed changes to mapping methodology

This Appendix provides analysis of mapping methodologies considered for changes to the low slope map (the map), which is incorporated by reference in the Resource Management (Stock Exclusion) Regulations 2020 (the Regulations).

Proposed changes were informed by engagement with stakeholders and the outcome of public consultation, but are otherwise based on expert opinion about how issues with the current map can be addressed (eg, when selecting appropriate changes to slope thresholds and other aspects of mapping methodology).

For more information about issues raised during consultation and how these influenced proposed changes, please refer to the summary of submissions attached as Appendix 1, and the report setting out officials' post-consultation recommendations attached as Appendix 2.

Managing stock exclusion through freshwater farm plans

1. One reason that the changes to the map are proposed is to ensure an appropriate balance between the Regulations and freshwater farm plan regulations. These two sets of regulations are intended to be complementary ways to manage risks to freshwater associated with pastoral farming.
2. The proposed map applies to areas with an average slope up to and including 5 degrees. This change removes a mandatory requirement for stock to be excluded in areas between 5 and 10 degrees slope. It also provides for greater flexibility, for example, as freshwater farm plans enable a more risk-based approach tailored to individual circumstances.
3. We note that for areas with an average slope between 5 and 10 degrees, there is an expectation that stock will still be excluded from waterways through freshwater farm plans. However, whether or not stock need to be excluded will depend on the implementation and future regulation of freshwater farm plans (eg, developing practice standards for stock exclusion under section 217M of the Resource Management Act 1991). Such regulations would be subject to future Cabinet decisions, and this is recognised as a limitation for regulatory impact analysis (ie, the analysis does not attribute costs or benefits to stock exclusion on slopes above 5 degrees).
4. At this stage, Cabinet is being asked to agree to proposed changes to the map, and to note its expectation is that stock will be excluded on slopes between 5 and 10 degrees (subject to farm planning processes and individual circumstances), and that this expectation will inform the development of any future practice standards.

Incorporation of an altitude threshold

5. Another reason why changes are proposed to the map is to give effect to Cabinet's stated intention, when introducing the regulations, that the map would not apply to areas of extensive high country farming.
6. Officials proposed an altitude threshold as a proxy for areas where extensive high country farming is likely to occur.
7. The altitude threshold is intended to 'draw a line' on the map above which stock exclusion would be managed by way of freshwater farm plans rather than the map (as discussed below, other parts of the Regulations would still apply).
8. Numerous factors contribute to the altitude at which intensive grazing may occur, such as climate, latitude, soil etc. In order to provide a first estimate, the altitude of mapped

high-producing grassland in Land Cover Data Base (LCDB) and the Land Use Carbon Analysis System Land Use Management (LUCAS LUM) maps was examined.

Table 2: Altitude of high-producing grassland in New Zealand

Data set: LCDB 5.0							
	Area (ha)	mean altitude	minimum	maximum	std dev	mean + 2sd	mean + 3sd
All NZ	8,684,362	233	0	1587	185	603	788
North Island	5,239,713	232	8	1340	184	600	784
South Island	3,440,068	234	0	1587	185	604	789
Data set: LUCAS LUM2016 v008							
	Area (ha)	mean altitude	minimum	maximum	std dev	mean + 2sd	mean + 3sd
All NZ	6,821,302	202	1	1315	160	522	682
North Island	4,004,085	204	8	1307	168	540	708
South Island	2,814,605	199	1	1206	148	495	643

Source: Manaaki Whenua Landcare Research - 15m digital elevation model (based on 20m contours).

- The data shows no significant difference between the North Island and South Island mean altitudes. Some submissions on the discussion document opposed the proposal to introduce a national altitude threshold, on the basis that climate and other conditions vary greatly from one end of the country to the other.

Officials initially considered a 700-metre altitude threshold

- Officials used a threshold of 700 metres to develop initial options.
- This broadly aligned with the mean plus 3 standard deviations, capturing most of the high-producing grassland in the Land Use and Carbon Analysis System (LUCAS) Land Use Map (LUM) data. This was considered to be more reliable than Land Cover Database (LCDB) in the mapping of high-producing grassland owing to the mapping method employed.⁴⁵

Rationale for 500 metre threshold

- The purpose of proposing an altitude threshold is to remove extensive pastoral systems in the high country from the map. Stakeholders indicated that farming above 500 metres is likely to be extensive in some regions (for example in Canterbury).
- Taking stakeholder feedback into account, officials proposed a 500-metre altitude threshold. This was in part to appropriately balance the management of stock access by the Regulations and freshwater farm plans. The 500-metre threshold is also more consistent with the mean plus 2 standard deviations in LUCAS LUM mapping of high-producing grassland.
- There is no generally-accepted definition of “extensive” or “intensive”. The term “intensively grazing” is defined in the Regulations, and captures irrigated grazing land,

⁴⁵ Manderson, A., Hoogendoorn, c. and Newsome, P. (2019), *Grassland improvement mapping using Innovative Data Analysis (IDA) techniques*, Contract report prepared for the Ministry for the Environment, February 2019.

grazing on annual forage crops, and breakfeeding, at any altitude - including above 500 metres.

15. The 500-metre altitude threshold makes the map more of a conservative “bottom-line” for mandatory stock exclusion requirements.

Local terrain averaging

16. The current map was based on average slope across land parcels. The main reason this was used is because the map had to include a land ownership boundary to identify who was responsible for livestock management. Land parcels were the only way to identify who is responsible for excluding livestock from waterways, because paddock scale mapping was not considered practicable.
17. Officials proposed a new mapping approach called ‘local terrain averaging’. This method calculates slope across the average slope of an aggregated 4.5-hectare area comprising 15 by 15 metre cells. Each 15-metre cell with a local average of 5 degrees or less is selected and the edges of the resulting layer are smoothed to give the map its boundary.
18. Local terrain averaging more closely resembles the surrounding landscape and better aligns with farmers’ intuitive understanding of their own land.
19. The LINZ primary parcel layer still needs to be laid over top of the proposed map to identify land ownership. The Regulations apply to those who own or control stock.

Retaining tall tussock and depleted grassland in the map

20. In the consultation discussion document, we proposed removing tall tussock and depleted grassland from the map. The intention of this proposed change was that stock exclusion requirements on land above 500 metres in altitude and on land with tall tussock or depleted grassland land covers will be addressed through freshwater farm plans.
21. This was to contribute to ensuring that land with a low carrying capacity and that is stocked at a lower intensity is managed appropriately through freshwater farm plans. That is, the rationale for proposing to remove tall tussock and depleted grassland was based on pasture productivity data, which suggests that these land covers are unlikely to be able to support high volumes of stock.
22. However, a range of submitters expressed concern that the proposed change removes necessary environmental protections.
23. After further consideration, it is now proposed that tall tussock and depleted grassland land covers be retained in the map. This is primarily in response to submitters’ concerns that their removal would send an undesirable signal that they are somehow less worthy of environmental protection. It could appear to counteract regulatory protections for natural wetlands. We recognise that removing these land cover types could also risk inconsistency with the purpose of the map as a map of potential areas that could be used for grazing.
24. We note that most areas with these land covers will not be subject to mandatory stock exclusion requirements due to being at altitudes above the proposed 500 metre threshold.

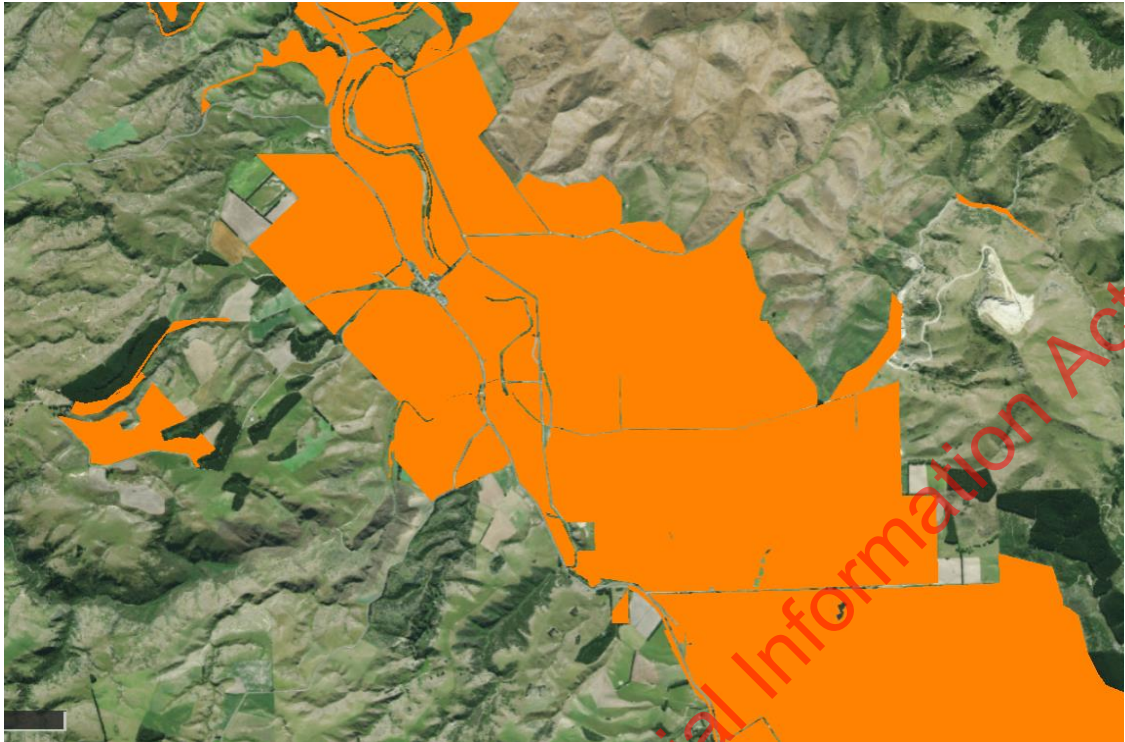
Removing the Chatham Islands from the map

25. Some submissions sought removal of areas from the map on the basis that the impact on people and communities would be disproportionately great, given the challenges of excluding stock in these areas, as well as the relatively low benefit for the environment due to the extensive way in which they are farmed.
26. Of these, we agreed with the points made in the Chatham Islands council submission that farming on the islands shares the features of lower intensity high country farming as were described in the consultation discussion document. We also considered that there are special circumstances associated with the geographic isolation of the Chatham Islands community that would make the impact of the map disproportionately felt.
27. As such, we have proposed for the Chatham Islands to be removed from the map.

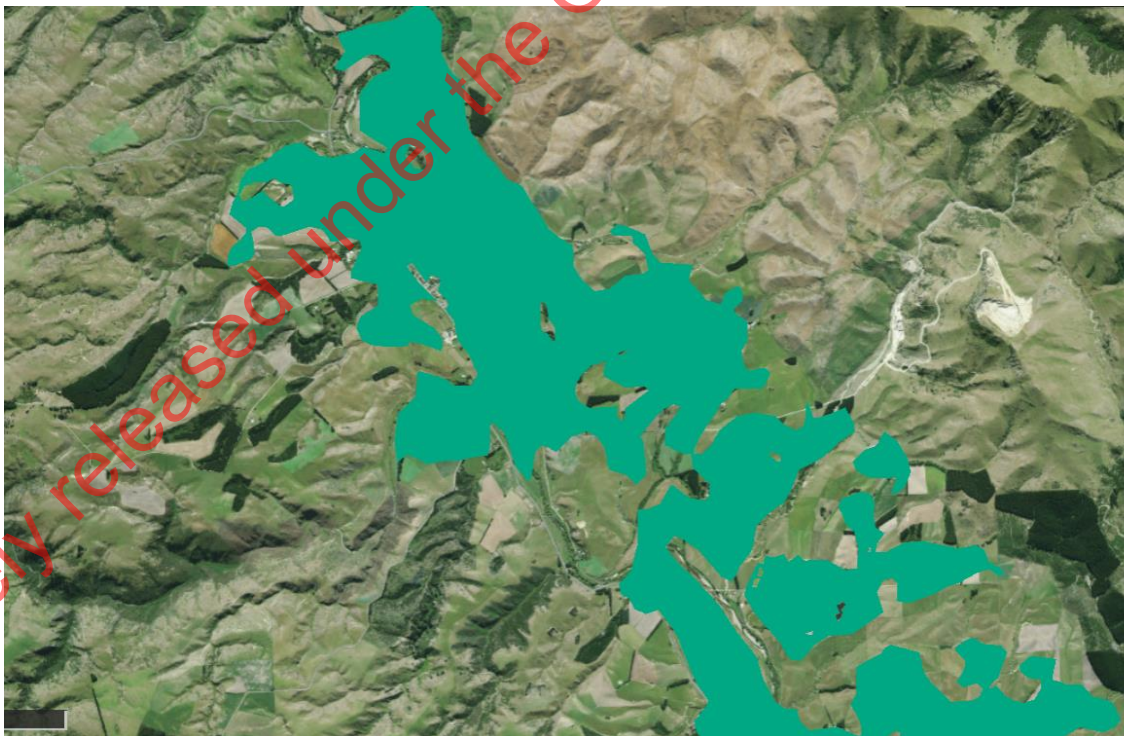
Post-consultation refinement of the map (technical review)

28. At the time of public consultation, local terrain averaging was proposed to apply at a scale of 15 by 15 metre grids across a 120-metre focal point that 'moves' across the landscape.
29. Feedback during consultation suggested that the proposed map would benefit from an independent technical review.
30. Officials recommended that the proposed map should undergo a technical review to investigate whether further refinements could be made to the mapping methodology. Ministers agreed with this recommendation.
31. Officials commissioned Manaaki Whenua Landcare Research (MWLR) to undertake a technical review. MWLR's review suggested additional refinements to the data and methodology. It indicated that the focal average could be reduced to remove the 'buffering' effect on low slope land adjacent to steep sided terrain.
32. Officials incorporated the proposed technical changes to produce an updated map. This map is more precise relative to the map used for public consultation. As it captures additional non-contiguous land, it may be more complex to implement.
33. The maps below use the same area of land to illustrate the differences between:
 - a) the current map (as per the Regulations), using the LINZ parcel layer (Map 1);
 - b) the map publicly consulted on in 2021 (Map 2);
 - c) the map post-public consultation including MWLR's recommended technical changes (Map 3); and
 - d) a combination overlay of Maps 2 and 3 comparing changes in the mapping approach between the 2021 consultation and the map following the MWLR technical review (Map 4).

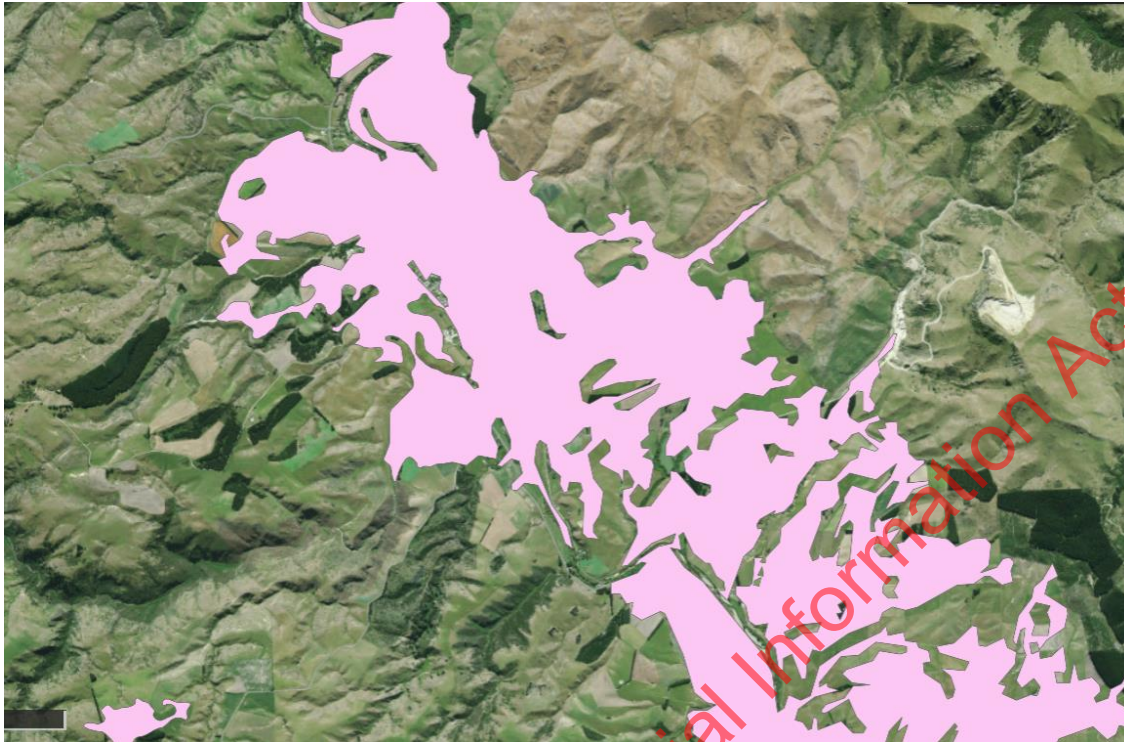
Map 1: Current map (as per the Regulations)



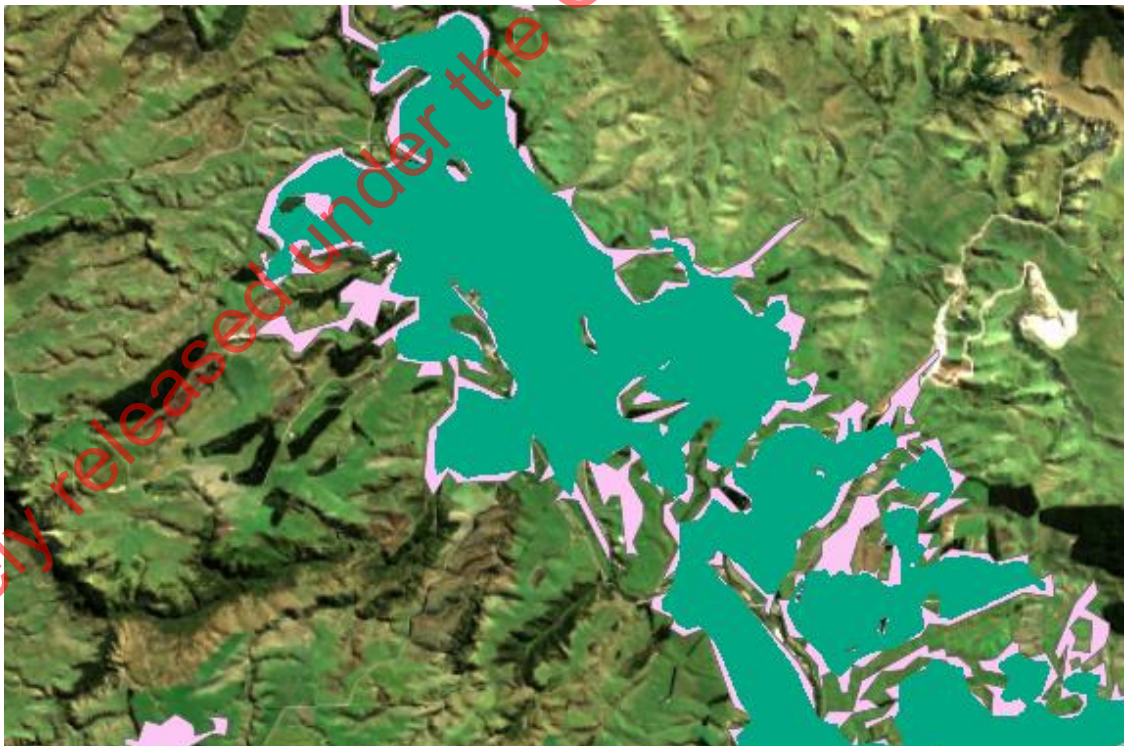
Map 2: Map publicly consulted on in 2021



Map 3: Map incorporating MWLR's recommended technical changes



Map 4: Overlay of Maps 2 and 3



34. Table A includes a breakdown of the land extent and land types captured by the current map in the Regulations (Map 1), the map consulted on in 2021 (Map 2), and the map produced post-consultation which incorporates MWLR's recommended technical changes (Map 3).

Table A: Comparison of land extent and type by various mapping methodologies

	<i>Map 1: Current map (as per the Regulations)</i>	<i>Map 2: Map publicly consulted on in 2021</i>	<i>Map 3: Map incorporating MWLR's recommended technical changes</i>
Slope averaging method	LINZ land parcel layer	Local terrain 120m radius	MWLR 3x3 majority filter
Slope threshold (degrees)	10	5	5
Altitude cut-off (metres)	none	500m	500m
Tall tussock and depleted grassland included?	Yes	no	yes
Total area (million hectares)	8.2	5.1	5.8
Total grassland area (million hectares)	6.0	3.7	4.2
Total low-producing grassland (million hectares)	1.05	0.28	0.37
Low-producing grassland (%)	13%	6%	6%
REC ⁴⁶ river length covered (km)	148,832	98,588	130,174
Number of land parcels captured	583,315	642,634	736,061
Number of properties captured	440,875	407,385	463,325
LUC class 1-3 captured (%)	87%	76%	81%
LUC class 1-3 not captured (%)	13%	24%	19%
Layer LUC class 5+ (%)	35%	21%	24%
Land over 10 degrees captured (%)	11.5%	0.02%	0.02%

What Map 3 captures differently

35. Changing the map so that it captures land up to 5 degrees in slope and implementing a 500-metre altitude threshold has meant a reduction in total area of 8.2 million hectares to 5.8 million hectares.
36. Map 3 captures much less high slope land. An estimated 11.5 per cent of the land captured in the current map will have a slope greater than 10 degrees. Under Map 3,

⁴⁶ River Environment Classification

the proportion of land captured with a slope greater than 10 degrees is around 0.02 per cent.

37. The current map treated parties unequally. Because it was based on land boundaries, it applied requirements differently depending on the size and shape of land parcels. The new map solves this problem by using the underlying topography.
38. Map 3 is now more targeted to high producing grassland. The total area captured has been significantly reduced, but the number of properties and land parcels captured has increased. The map captures 81 per cent of land use capability (LUC) class 1-3 land, and Map 3 shows how the increase in targeted land extends the map out into river valleys.
39. Map 3 fails to capture 19 per cent of LUC class 1-3 land, this is an increase of 6 per cent from the current map. This increase may be due to high producing land sitting above the 500-metre altitude threshold. More information is needed to understand why this number has increased.
40. Map 3 captures less low-producing grassland. The current map captured 1.05 million hectares of low producing grassland as opposed to 0.37 million hectares captured in Map 3. While this is an improvement, it is still a significant amount of low producing grassland captured. Officials have been asked to develop an exemption for extensive farming systems to better exclude these systems.

Remaining issues with the map

41. Any map based on the characteristics of the land cannot be a perfect proxy for the intensity of farming.
42. Despite improvements to the map, there are still instances where the map captures extensive systems (ie, on flat land below the altitude threshold, or fails to capture higher intensity operations on land greater than 10 degrees and/or above the altitude threshold). However, it is important to also note:
 - a) beef cattle and deer that are intensively grazing must be excluded, irrespective of terrain
 - b) the map was designed as a map of potential land use, intended to capture all land that could be stocked in a way that would put particular pressure on water bodies – the capture of existing lower intensity beef cattle and deer farming systems is therefore not an issue with the mapping methodology, because it is based on the nature of the land rather than the current activity taking place on it
 - c) freshwater farm plans or more stringent regional rules will require stock exclusion in situations that have not been captured by the map.
43. We do not have robust land use and land management mapping data. This means it is difficult to determine the extent of extensive pastoral farming systems captured by the improved mapping methodology. Using land cover as a proxy (ie, low producing grassland) we estimate the area of extensive farming captured by the map could be 0.37 million hectares.
44. To account for the issues with the map, Ministers have asked officials to develop an exemption for extensive farming systems.

Appendix 5: Stock Exclusion Regulations: Fencing Costs associated with amendments to the Stock Exclusion low slope land map

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m.e consulting



Ministry for the Environment
Manatū Mō Te Taiao

**Stock Exclusion Regulations:
Fencing Costs associated with amendments
to the Stock Exclusion low slope land map**

for

Ministry for the Environment

November 2022

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1 INTRODUCTION

1.1 Background

In 2020, as part of its Essential Freshwater package, Central Government introduced regulations requiring farmers to exclude stock from waterways (the Stock Exclusion Regulations or Regulations)¹. The Stock Exclusion Regulations apply to any person who owns or controls deer, pigs, dairy-support cattle, dairy cattle and beef cattle and took immediate effect for new pastoral systems. Existing farms have until either 1 July 2023 or 1 July 2025 to comply, depending on stock type and practices.

A map of low slope land (the map) is incorporated by reference in the Stock Exclusion Regulations. The map identifies areas where those who own or control beef cattle and deer must exclude them from access to waterways from 1 July 2025. Within the current stock exclusion regulations, this is land with an average slope less than or equal to 10 degrees across a land parcel.

As part of the Regulatory Impact Analysis (RIA) that supported the 2020 Essential Freshwater package, an analysis of the costs associated with the exclusion of stock was undertaken². Given the multitude of assumptions that are necessary to derive a cost estimate and the limited information to support some assumptions, the costing approach focussed on the fencing of waterways and opportunity cost of retired productive land contained within those fences that were associated with dairy and beef/lamb land uses. This methodology is outlined in the RIA and summarised in section 2 of this report.

In late 2021, the Government consulted on changes to the map aimed at addressing stakeholder concerns that it:

- was capturing large areas of land that had a slope greater than 10 degrees; and
- extensive pastoral systems at high altitudes had been captured, contrary to Cabinet's intent when introducing the regulations³.

The primary changes to the low slope land map that have resulted from this review are:

- A change in the method of determining average slope, from an averaging over a land parcel to a local averaging method called 'local terrain averaging';
- A reduction in the slope range captured by the regulations to 0 to 5 degrees, with slopes between 5 and 10 degrees being addressed through farm plans⁴; and
- A maximum altitude of 500m for land captured in the low slope land map.

Given the significance of this proposed change and time since the initial RIA, a further assessment of costs associated with the change in low slope land map is required as part of the RIA before proposals go to Cabinet for final decisions.

1.2 Scope of Work

The scope of work that has been requested is as follows:

- An analysis of fencing and associated costs to land owners associated with the amendments to the low slope land map – that is, estimates of total fencing and opportunity costs informed by a spatial analysis.

¹ Resource Management (Stock Exclusion) Regulations, 2020

² Regulatory Impact Analysis: Action for healthy waterways, Part II: Detailed Analysis, 6 May 2020 – Chapter 20.

³ Stock Exclusion Low Slope Land Map, Version 2: Review. Prepared for Ministry for the Environment. Manaaki Whenua – Landcare Research, March 2022

⁴ The consultation document for the proposed changes states "This will significantly reduce the likelihood that high slope land is captured by the low slope map. Stock exclusion on this land will be addressed through a risk-impact assessment in a certified freshwater farm plan, with a presumption that stock will need to be excluded from waterways", pg.9.

- An analysis that takes in account feedback received on the previous estimate of fencing and associated costs and how inflation has affected costs since that time.
- A scope of analysis that is limited to the marginal difference in costs between the existing map and the latest version of the low slope land map (taking inflation into account).

The scope of this analysis is also limited to the fencing/ costs associated with beef cattle and deer as those are the only stock types to which the low slope land map applies⁵. That is while the RIA assessed the cost of excluding dairy from rivers, this cost does not change as a result of the changes to the low slope land map.

Additionally, the scope of the assessment does not include wider costs including to regulators, rural communities and other parties nor the provision of stock water supplies necessary to replace stock access to waterways.

The assessment is a refresh and update of the existing analysis of fencing low slope land (as defined in the proposed changes to the low slope land map) rather than a reassessment and is therefore focused on assessing the expected costs of fencing the remaining river lengths not currently fenced, to the extent that is possible, across beef cattle and deer farms.

1.3 Project Team

4Sight Consulting (part of SLR) has teamed with Market Economics (M.E) to prepare this updated fencing and associated cost assessment. In broad terms:

- 4SightSLR has undertaken the GIS analysis of the proposed changes and the approach to largely replicate the earlier 2020 methodology;
- M.E has updated the cost information to reflect current fencing and opportunity costs; and
- 4SightSLR, M.E and the Ministry for the Environment have engaged on options to update and improve the cost assessment in light of the significant assumptions that are necessary.

2 THE 2020 STOCK EXCLUSION REGULATIONS AND RIA COST ESTIMATE

2.1 Stock Exclusion Regulations

The Stock Exclusion Regulations were gazetted in 2020 as part of several national directions intended to⁶:

- Stop further degradation of freshwater.
- Start making immediate improvements so water quality improves within five years.
- Reverse past damage to bring our waterways and ecosystems to a healthy state within a generation.

The Regulations apply to any person who owns or controls deer, pigs, dairy-support cattle, dairy cattle and beef cattle and took immediate effect for new pastoral systems. Existing farms have until either 1 July 2023 or 1 July 2025 to comply, depending on stock type and practices.

The following stock are required to be excluded from lakes and wider rivers⁷ with a 3 metre setback from the edge of the bed:

- 1) All dairy cattle, dairy support cattle and pigs, regardless of intensity or terrain;
- 2) Beef cattle and deer, if they are intensively grazed, on any terrain; and
- 3) Beef cattle and deer if they are located on the 'mapped low slope land'.

⁵ dairy, dairy support cattle and pigs are required to be excluded from wide rivers on any terrain

⁶ <https://environment.govt.nz/what-government-is-doing/areas-of-work/freshwater/work-programme/>

⁷ Wide river is defined as being one that is greater than one metre wide

All stock must also be progressively excluded from natural wetlands (with the timing subject to identification of natural wetlands).

2.2 RIA Fencing and Associated Costs Estimate

The RIA estimated the cost of excluding stock from waterways together with the lost productivity of the excluded land within the required 3 metre setback.

It is important to acknowledge that the Regulations do not require rivers to be fenced – they require that stock is excluded. This can be achieved in whatever way is most efficient (e.g. terrain, vegetation, etc). However, for the purpose of estimating costs, fencing waterways was considered the most likely form of exclusion and associated costs can be estimated with relative ease. Accordingly, estimating fencing cost was used as the method for the purpose of the RIA.

The methodology to estimate the costs of the Regulations is set out in the RIA and is not repeated in detail here. However, in order to assess the difference in fencing costs between the original and the revised low slope land map, it was necessary to understand (and as far as possible recreate) the methodology and key assumptions used in the 2020 assessment so that they could be applied to the new 0 - 5 degree slope layer, and updated and refined as required by the scope.

A summary of the approach used to estimate costs of the regulations in the RIA, as deduced from the RIA and discussions with ministry staff, is as follows:

- 1) Estimate the costs based on:
 - a) The fencing of rivers (but not lakes and wetlands) due to the very limited information on the latter;
 - b) Consider fencing costs only and not other costs (for example providing alternative water supplies for stock or fence maintenance over time).
- 2) Estimate the length of rivers that would require fencing (low slope land approach):
 - a) Assess the total length of rivers nationally (RIA - 425,000 km);
 - b) Assess total length of rivers that are potentially accessible to stock as they are located within grassland or annual cropping landscapes at the time of the assessment⁸ (143,000km);
 - c) Apply the 0-10 degree low slope land map and take account of land use to estimate the river lengths that have the potential to require stock exclusion of (81,000 km);
 - d) Estimate and remove the length of river that is either already fenced or otherwise required to be fenced by regional rules (ie this fencing is required irrespective of the Regulations and hence isn't a cost of those Regulations). To estimate existing stock exclusion measures, the 2020 RIA used results reported from the 'Survey of Rural Decision-Makers' that "*indicated that approximately 60% of streams would have existing stock exclusion measures, meaning far lesser length – 32,000 km of streams – would be impacted by the stock exclusion proposal*". It was noted that this estimate of existing stock exclusion measures was consistent with a separate analysis undertaken by NIWA;
- 3) Estimating fencing costs: Fencing costs were estimated at \$5 per linear metre (for dairy), \$14/m for sheep¹⁰ and beef and \$20/m for deer farms. The fencing length to dairy (minimal length), sheep and beef (vast majority of

The result of this assessment was an estimated **31,721** km of rivers would require fencing⁹.

⁸ The RIA analysis assumes no further conversion to pasture.

⁹ It is noted that the sum of the regional breakdown of river length requiring fencing in Table 10 of the RIA sums to 28,024km and not 31,721km as reported.

¹⁰ The regulations do not apply to sheep. That is, they are not required to be excluded from waterways. However, exclusion would be required on farms that run both sheep and beef cattle.

area), and deer (minimal length) has been calculated according to proportion of catchment in that land use¹¹. Fencing costs were assumed to be financed (spread) over a 25 year loan period (at a 3% interest rate).

- 4) Setbacks and opportunity costs: the estimated opportunity costs from the 2020 analysis was based on a 3m setback and profit/ha of \$2,238 for dairy farms and \$520 for sheep and beef and other farms. The RIA also estimated that near river areas in the setback area are 90% as productive as typical paddock pasture¹².
- 5) A 3% discount rate was applied (with associated sensitivity testing between 0% and 6%) as indicated in the RIA to get present values of costs.

The high-level national cost estimate provided in the RIA is presented in Figure 1.

Table 7. Assumptions and estimated costs per sector

	Dairy sector	Sheep and Beef	Dairy support	Other	Total NZ
Fencing cost \$ per metre	\$5.00	\$14.00	Excluded from the policy	As for sheep and beef	
Profit \$ per hectare	\$2,230	\$520	Excluded from the policy	As for sheep and beef	
Total fixed capital expense \$m	\$74.9m	\$668.3m	N/A	\$30.2m	\$773.4m
Opportunity cost \$m p.a.	\$10m	\$7m	N/A	\$0	\$17m
PV (2023 to 2050), total costs \$m					\$1,118m

Figure 1: Estimated national stock exclusion costs from 2020 RIA.

As indicated previously, the RIA assessed the costs of implementing the Stock Exclusion Regulations, and hence includes the cost of exclusion of dairy cattle. However, as this analysis only applies to changes to the low slope land map (which is not relevant to dairy farming as exclusion from waterways is required irrespective of slope), the estimate of costs below only relate to beef cattle and deer farming.

3 ANALYSIS OF FENCING COSTS ASSOCIATED WITH THE NEW LOW SLOPE LAND MAP

3.1 Approach

The approach taken to assessing the costs of the Stock Exclusion Regulations on low slope land, based on the proposed new low slope land map, was undertaken in four steps (scenarios) as follows:

- Scenario 1: Replicate (as far as possible)¹³ the existing (2020) river length and cost estimate to establish the base case for comparison.

¹¹ Semadeni-Davies et al 2020. Modelling the impacts of the draft stock exclusion section 360 regulations on river water quality – E. coli and sediment. Prepared for the Ministry for Primary Industries and the Ministry for the Environment. March 2020

¹² RIA referenced LIC 2020. Pasture Growth Mapping Report. Client Report for MPI

¹³ Spreadsheets showing the working of the RIA cost calculations have not been able to be supplied.

Scenario 2: Apply the same methodology to the new 0 – 5 degree low slope land layer to enable a ‘like for like’ comparison using the same assumptions and cost information.

Scenario 3: Update Scenario 2 using new costs for fencing and productivity costs to reflect inflation and other cost changes and estimates.

Scenario 4: Update and refine assumptions to address some of the concerns that have been raised in submissions and provide an indicative assessment of the potential cost of fencing the remaining lengths of rivers.

As such the assessment provided is an update of the 2020 assessment for beef cattle and deer farming using the new low slope land map, largely utilising the same or similar assumptions, rather than a new assessment. The scenarios and their outputs are presented below.

3.2 The Low Slope Land Maps

The key change that is being assessed is the change to a new low slope land map that:

- Defines low slope as 0-5 degrees (compared to 0-10 degrees);
- Utilises a local slope averaging methodology (compared to a parcel-based average); and
- Removes land above 500m in elevation.

The current and proposed low slope land maps are presented in Appendix A. In terms of the total land identified as low slope, the differences between the various low slope land maps is shown in Table 1.

Region	Area of land in low slope land maps (Ha)		
	0-10 degree (original) (parcel)	0-5 degree (new) (local averaging)	0-10 degree (new) (local averaging)
Northland	408,099	248,925	412,949
Auckland	152,720	96,419	171,774
Waikato	881,982	620,627	841,232
Bay of Plenty	178,533	116,707	160,526
Gisborne	41,854	34,685	69,627
Hawkes Bay	280,674	175,483	309,557
Taranaki	247,897	218,014	265,391
Manawatu-Whanganui	457,741	345,280	479,499
Wellington	139,977	127,235	171,185
West Coast	138,332	138,486	146,281
Canterbury	1,123,941	837,462	980,424
Otago	850,953	451,905	654,949
Southland	743,805	628,017	766,499
Tasman	71,995	54,378	75,235
Nelson	1,196	1,107	1,623
Marlborough	52,379	43,964	62,384
National	5,772,077	4,138,693	5,569,135

Table 1: Area of land classified as 'low slope land' under the different mapping

At a national level, the total area of land captured under the original (0-10 degree) low slope land map is **5,772,077 Ha** compared to **4,138,693 Ha** for the new 0-5 degree low slope land map (72% of the area of the original low slope land map at a national level). This is to be anticipated given the smaller slope range. For the 0-10 degree low slope land maps the difference between parcel averaging (2020 method) and local terrain averaging (2022 method) is minimal (4% variance).

3.3 Scenario 1: Replicating Existing River Length Cost Estimate

As this project is primarily a refresh and updating of the existing cost estimate using the new proposed low slope land map, the first step in the assessment process was to replicate the original 2020 river length and cost estimate.

Unfortunately, while the method of determining the length of rivers requiring fencing was outlined in the RIA, the exact methodology and spreadsheets/GIS files and full assumptions were not available, nor fully documented, and hence it was necessary to recreate the methodology with only partial information to enable a 'like-with-like' cost assessment. In addition, it is noted that some GIS databases supplied, for example the Rivers REC and LUCAS Land use databases, were updated versions of the original databases used. Accordingly, it was anticipated that there would be some deviation from the original assessment. This was considered acceptable as the primary purpose of this assessment is to assess the difference in costs resulting from the 2020 and 2022 low slope land maps.

3.3.1 GIS Assessment

The methodology and data sets used for the GIS component of the assessment largely followed the approach outlined that described in the RIA and summarised above as follows:

- 1) The REC2V5 NIWA NZ river lines Geodatabase was used as the river base for the assessment. The relevance of using this layer to assess rivers of widths of more than one metre was assessed in NIWA (2020)¹⁴, which concluded that 99% of river segments within the REC2 drainage network have an estimated bank-full width of 1m or greater. This assessment identified 413,140 km of rivers in New Zealand, excluding the Chatham Islands.
- 2) To assess the lengths of rivers potentially available for access by stock, the LUCAS NZ Land use Map 2016 v011 (Attributes selected= Grassland High Producing, Grassland Low Producing) was utilised and intersected with the river lines. This resulted in 159,944 km of potentially accessible river length.
- 3) The areas resulting from the first two assessments were clipped and then intersected with the LS_10DEGREE_2020 (original 0-10 degree low slope land layer). This resulted in 93,705 km of rivers where fencing of the waterways would be required. This length was higher than that assessed in the RIA (81,000 km of river length).

3.3.2 Existing Fencing and Regional Plan Requirements

A significant assumption associated with the assessment is the length of river that is either already fenced (for example under initiatives such as the Dairy Accord) or is otherwise required to be fenced under the requirements of a regional plan. The latter is important in the context of assessing the costs of implementing the Stock Exclusion Regulations, as this fencing is required to be undertaken irrespective of whether the Regulations are applied or not and hence are not a cost attributable to the Regulations themselves.

It was not clear what information was utilised to assess the percentage of rivers that are already fenced or require fencing through other statutory requirements. The RIA indicated that the *'results reported from the Survey of Rural Decision Makers indicated that approximately 60% of streams would have existing stock exclusion measures'*¹⁵. Applying an 'across the board' 60% reduction in river length to reflect existing and required fencing gave a total remaining length of river similar to that calculated in the RIA at a national level, but resulted in substantial variance at a regional scale. This indicated that rather than applying a national average percentage, a regional approach was adopted in the RIA.

Accordingly, the information from Table 1 of Chapter 20 of the RIA¹⁶ was utilised for this assessment. While the source of the percentages in Table 1 is not specified, utilising the indicated *per region* percentages of existing and required

¹⁴ Modelling the impacts of the Draft Stock Exclusion Section 360 Regulations on river water quality E. coli and Sediment. Prepared for Ministry for Primary Industries and Ministry for the Environment. NIWA, October 2020

¹⁵ RIA, page 328

¹⁶ RIA, page 312

fencing provided a significantly better correlation with both the regional and total (national) river length requiring fencing derived in the RIA.

3.3.3 Excluded Productive Land Area

The Stock Exclusion Regulations require fencing to be placed at a minimum of 3 metres from the riverbank. To calculate this setback area, the RIA simply multiplied the river length by a width of 6 metres (3 metres either side of the river), and assumes that the fencing will be uniformly at 3m from the riverbank.

This approach was tested in the GIS assessment by placing a polygon around each river length, with a buffer of 3 metres either side of the river and adding combined areas of the polygons. This GIS method produced a similar area to the simpler multiplication method (<1% variance). Hence the latter (multiplication method) was adopted for ease of calculation – particularly in the final cost scenario where this area was amended to reflect that a uniform 3 metre setback is not realistic.

3.3.4 Output of GIS Assessment

Table 2 provides the result of the approximate recreation of the RIA estimate of river length requiring fencing and the area of land excluded from stock access and use. As indicated previously, the detailed methodology was not available and it was necessary to recreate assumptions and associated datasets, such that the recreated river length assessment was an approximation of the RIA estimate, rather than an exact duplicate. However, at 33,295 km, the total remaining river length required to be fenced compares favourably with the RIA assessment of 31,721 km (a variance of 5%). The recreated setback area is estimated at 19,977 ha.

Region	River Length Requiring Stock Exclusion (km)	Already Fenced or Regulated	Remaining River Length Requiring Stock Exclusion (km)	Excluded Area @ 3 m (Ha)
Auckland	2,017	64%	722	433
Bay of Plenty	2,792	83%	466	280
Canterbury	18,640	62%	7,046	4,228
Gisborne	922	29%	657	394
Hawke's Bay	4,431	45%	2,433	1,460
Manawatu-Wanganui	7,772	62%	2,938	1,763
Marlborough	1,307	34%	869	521
Nelson	45	0%	45	27
Northland	6,143	71%	1,757	1,054
Otago	13,550	48%	7,114	4,268
Southland	11,687	76%	2,817	1,690
Taranaki	4,355	77%	989	593
Tasman	1,545	59%	633	380
Waikato	13,554	80%	2,738	1,643
Wellington	2,470	52%	1,195	717
West Coast	2,475	65%	876	526
Total	93,705		33,295	19,977

Table 2: Scenario 1 – Summary of River Length Requiring Fencing

3.3.5 Assessment of Costs

In order to apply the appropriate fencing and productivity costs to the setback area, a critical step in the cost analysis is distributing the river length requiring stock exclusion under the regulations to farm type. Specifically, dairy (including dairy support), beef cattle (captured as sheep and beef farming in the RIA) and deer farming.

As discussed above, the RIA states that it relies on data provided in the NIWA analysis (Semadeni-Davies et al 2020) on the proportion of catchment land in each farm type. The NIWA analysis split pastoral land cover in the REC2 sub-catchments by stock type using percentages supplied from the MPI FarmsOnLine dataset (FOL, 2015). Given the limitations of the data, it was assumed that those stock type proportions in each sub-catchment applied pro-rata to low-slope and high-slope land. The NIWA report (2020) does not disclose the data used, nor is it reported in the RIA.

There has been insufficient time to source the NIWA data inputs. As such, we have had to rely on a very high-level national breakdown of farm type deduced from the RIA for this assessment. This simply shows that dairy land use makes up 23.1%, sheep and beef farms make up 73.6% and other/deer farms make up the balance at 3.3%. These shares will not apply at the regional level, and so the modelling can only progress at the aggregate national level. This is set out in Table 3 below.

	Beef Cattle	Deer	Total
Total Estimated Kms of River Requiring Fencing Under the Regulations	33,295 Km		
Share of Impacted Farm Area by Stock Type (Excluding Dairy)	73.6%	3.3%	76.9%
Implied Kms of River Requiring Fencing by Stock Type	24,505 Km	1,099 km	25,604 Km
Implied Kms of Fence Length (i.e. double)	49,010 Km	2,197 km	51,208 Km
Fence Price per metre	\$14	\$14 *	
Implied Fence Cost (\$m)	\$686.1m	\$30.8m	\$716.9m
<i>Variance from RIA</i>	+3%	+2%	+3%
<i>* Table 7 of the RIA indicates that Other (Deer) Farms are based on 'as for Sheep and Beef' for fence costs and not the \$20/m stated.</i>			

Table 3: Scenario 1 –Summary of Total National Fencing Costs

While the RIA identified a deer fence price per metre, this does not appear to have been applied. The RIA states that it tested two fencing cost scenarios and two setback area productivity figures: “*These reflect sheep and beef (high fencing costs and low productivity) and dairy (low fencing costs and high productivity)*”. The total fencing costs in the recreated model come to \$716.9m for beef cattle and deer attributable to the Regulations. This was within a 3% tolerance of the RIA results for beef cattle and deer reported (Table 3).

Table 4 sets out the recreated RIA annual setback opportunity costs, using the same approach as for fencing costs. The RIA does not specify an average productivity for deer/other farms and adopts the productivity for sheep and beef farms as discussed above. The total annual opportunity cost associated with excluding beef cattle and deer stock from grazing the setback area of 3m either side of rivers >1m in width is estimated at \$7.2m in the recreated model. This was within a 3% tolerance of the RIA results reported for beef cattle and deer (Table 3).

	Beef Cattle	Deer	Total
Total Estimated Kms of setback area	19,997 ha		
Share of Impacted Farm Area by Stock Type (Excluding Dairy)	73.6%	3.3%	76.9%
Implied Ha of River Setback by Stock Type	14,703 ha	659 ha	15,362 ha
Average Farm Productivity/ha/year (EBITD) (\$)	\$520	\$520 *	
90% of Productivity for River Margins (\$)	\$468	\$468 *	
Implied Forgone Annual Gross Profit (\$m)	\$6.9m	\$0.3m	\$7.2m
<i>Variance from RIA</i>	-2%	N/A	+3%
<i>* Table 7 of the RIA indicates that Other (Deer) Farms are based on 'as for Sheep and Beef' for productivity.</i>			

Table 4: Scenario 1 – Summary of Total National Setback Opportunity Costs Per Annum

The RIA spreads the fencing cost (\$716.9m) out over 25 years (assuming it is wholly loan funded at an interest rate of 3%). This equates to an estimated principal and interest payment of \$41.2m per annum across the country. This has been applied to years 2023 to 2047 in the model. The annual opportunity cost for excluded grazing land (\$7.2m/annum) is applied to years 2023 to 2050 in the model, as indicated in the RIA. **The present value (PV) of total costs over the 2023-2050 period is calculated at \$852m under a 3% discount rate.** This cannot be directly compared with the stated RIA result in Table 9 of the RIA as that PV result included costs to dairy farms over the period to 2050. It is however assumed to be generally consistent as per fencing and annual opportunity costs discussed above.

3.3.6 Discussion

The cost analysis recreated from the RIA indicates that the methodology and assumptions applied broadly correlate. Minor variations are to be expected because of the different river length calculated from GIS analysis for the 2020-10 degree low slope land map compared to the original analysis in 2020.

The cost approach is considered very high-level and therefore sensitive to assumptions, particularly when single productivities and fence prices are used for the whole country. A regional level analysis would be more robust. As discussed above, the RIA only reveals national level inputs for some variables, but we accept that this does not mean that a more spatially explicit cost model did not sit behind the RIA. MfE were unable to confirm this. We are reliant on information provided on river length that is already fenced, or would be required under existing regional plan rules and how this relates to rivers that fall within the original low-slope land map area.

This is a critical input that determines the overall impact of the stock exclusion regulations on selected farm types on low slope terrain. It is not practical to verify the data used (i.e. from Table 1 of the RIA) although we have compared it with survey (sample) data in the 2017 and 2019 Survey of Farm Decision Makers (SRDM) which provides averages for each region (or grouped regions in some cases). The Survey asked respondents what share of large and small streams they had fenced on their farms. The results are summarised in Table 5 below.

Region	RIA Table 1 (applied)	Large Streams (Weighted Average)		Small Streams (Weighted Average)	
		SRDM 2017	SRDM 2019	SRDM 2017	SRDM 2019
Auckland	64%	86%	94%	71%	66%
Bay of Plenty	83%	89%	87%	74%	86%
Canterbury	62%	79%	85%	69%	76%
Gisborne	29%	51%	87%	23%	86%
Hawke's Bay	45%	71%	79%	53%	62%
Manawatu-Wanganui	62%	70%	74%	68%	59%

Marlborough	34%	81%	82%	44%	64%
Nelson	0%	82%	82%	63%	64%
Northland	71%	76%	87%	65%	78%
Otago	48%	57%	77%	55%	59%
Southland	76%	80%	82%	77%	68%
Taranaki	77%	84%	87%	79%	80%
Tasman	59%	82%	82%	63%	64%
Waikato	80%	83%	84%	69%	71%
Wellington	52%	82%	86%	65%	61%
West Coast	65%	88%	82%	81%	64%
Total	N/A	78.4%	N/A	68.9%	N/A

Table 5: Adopted RIA Percentages of Rivers Already or Required to be Fenced by Region
(Compared to SRDM Survey Results 2017 and 2019)

Care is needed as the SRDM is only a sample of respondents and the streams referred to may not match whatever criteria has been applied in Table 1 of the RIA. However, the regional comparison suggests that the percentages applied in the Scenario 1 model from the RIA Table 1 are potentially conservative compared to 2017 large stream survey data, but somewhat closer to the 2017 small stream data (and in some cases higher). A steady improvement in the share of large and small streams being fenced in most regions between 2017 and 2019 is also likely as indicated in Table 5 above. Some decreases are likely attributable to different survey samples.

It is not clear why deer fencing costs were not applied in the RIA. We note that if \$20/m replaced \$14/m for the implied rivers requiring fencing on deer farms, then the total PV of costs would increase from \$852m to \$865m (a 1.5% increase on the Scenario 1 modelled result). As an equivalent productivity for deer farms was not stated in the RIA, we have not tested what impact that might have (but we discuss this further in relation to Scenario 4 below).

3.4 Scenario 2: New Low Slope Land Map

This second scenario utilises the methodology described for Scenario 1, with the replacement of the original 0-10 degree low slope land map with the new 0-5 degree low slope land map. All other assumptions are unchanged. Hence this is a 'like for like' assessment that provides the change in fencing length, fencing costs and opportunity costs associated with the new proposed low slope land map.

3.4.1 Estimated River Length

The estimated river length and excluded area from this assessment is provided in Table 6. As can be seen from this assessment, the total area of river remaining to be fenced is 28,994 km, which is 4,351 km less than (and 87% of) the 0-10 degree original remaining river length. We note that at 87%, the reduction in river length is less than the percentage difference between the total areas of the two low slope land maps (2020-10 degree and 2022-5 degree).

While not part of this assessment, and hence not presented in detail here, the local slope averaging 10 degree low slope land map results in a remaining river length to be fenced of 37,396 km, which is 12 % higher than that estimated in Scenario 1. That is, adopting the new method of determining the low slope land map would result in an increase in the length of river that is required to be fenced if the 0-10 degree slope range was to be retained.

Region	River Length Requiring Stock Exclusion (km)	Already Fenced or Regulated	Remaining River Length Requiring Stock Exclusion (km)	Excluded Area @ 3 m (Ha)
Auckland	1,940	64%	695	417
Bay of Plenty	2,294	83%	383	230
Canterbury	15,023	62%	5,679	3,407
Gisborne	1,210	29%	863	518
Hawke's Bay	3,856	45%	2,117	1,270
Manawatu-Wanganui	7,402	62%	2,798	1,679
Marlborough	1,259	34%	837	502
Nelson	46	0%	46	28
Northland	6,066	71%	1,735	1,041
Otago	9,101	48%	4,778	2,867
Southland	11,211	76%	2,702	1,621
Taranaki	4,202	77%	954	572
Tasman	1,445	59%	592	355
Waikato	12,343	80%	2,493	1,496
Wellington	2,794	52%	1,352	811
West Coast	2,599	65%	920	552
Total	82,792		28,944	17,367

Table 6: Scenario 2 – Summary of River Length Requiring Fencing

3.4.2 Assessment of Costs

When applying the same methodology and assumptions as for Scenario 1 above, the total fencing costs for the new low slope land map area comes to \$623.2m attributable to the Regulations. This is a reduction of 13% in national fencing costs compared to Scenario 1 (original low slope land map).

	Beef Cattle	Deer	Total
Total Estimated Kms of River Requiring Fencing Under the Regulations	28,994 Km		
Share of Impacted Farm Area by Stock Type (Excluding Dairy)	73.6%	3.3%	76.9%
Implied Kms of River Requiring Fencing by Stock Type	21,303 Km	955 km	22,258 Km
Implied Kms of Fence Length (i.e. double)	42,606 Km	1,910 km	44,516 Km
Fence Price per metre	\$14	\$14 *	
Implied Fence Cost (\$m)	\$596.5m	\$26.7m	\$623.2m
<i>Variance from Scenario 1</i>	-13%	-13%	-13%
<i>* Table 7 of the RIA indicates that Other (Deer) Farms are based on 'as for Sheep and Beef' for fence costs and not the \$20/m stated.</i>			

Table 7: Scenario 2 – Summary of Total National Fencing Costs

Table 8 sets out the annual setback opportunity costs for Scenario 2 for beef cattle and deer. The total annual opportunity cost associated with excluding stock from grazing the setback area of 3m either side of rivers >1m in width is estimated at \$6.3m in the recreated model. This is also a reduction of 13% compared to annual opportunity costs in Scenario 1 for beef cattle and deer.

	Beef Cattle	Deer	Total
Total Estimated Kms of setback area	17,367 ha		
Share of Impacted Farm Area by Stock Type (Excluding Dairy)	73.6%	3.3%	76.9%
Implied Ha of River Setback by Stock Type	12,782 ha	573 ha	13,355 ha
Average Farm Productivity/ha/year (EBITD) (\$)	\$520	\$520 *	
90% of Productivity for River Margins (\$)	\$468	\$468 *	
Implied Forgone Annual Gross Profit (\$m)	\$6.0m	\$0.27m	\$6.3m
<i>Variance from Scenario 1</i>	-13%	-13%	-13%

* Table 7 of the RIA indicates that Other (Deer) Farms are based on 'as for Sheep and Beef' for productivity.

Table 8: Scenario 2 – Summary of Total National Setback Opportunity Costs Per Annum

Spreading the fencing cost (\$623.2m) out over 25 years (assuming it is wholly loan funded at an interest rate of 3%). This equates to an estimated principal and interest payment of \$35.8m per annum across the country. This has been applied to years 2023 to 2047 in the model. The annual opportunity cost for excluded grazing land (\$6.3m/annum) is applied to years 2023 to 2050 in the model. **The present value (PV) of total costs over the 2023-2050 period is calculated at \$741m under a 3% discount rate.**

3.5 Scenario 3: Updated Cost Assessment

This scenario applies updated and refined cost modelling to the Scenario 2 river lengths and excluded setback area. Accordingly, the river length assessment is not repeated.

3.5.1 Assessment of Costs

In order to provide more current fencing estimates that retain the approach used in the RIA, it is necessary to examine the origin of the RIA figures applied in more detail.

The RIA does not specifically identify the source of its adopted fencing figures. However, Journeux (2019) utilised a \$5/m figure for a 2-wire electric fence for dairy farming and a \$14/m figure for an 8-wire conventional post and batten fence for sheep and beef farming. The RIA therefore adopts Journeux's approach. Journeux in turn referenced the Ministry for Primary Industries Stock Exclusion Costs Report (January 2016) prepared by AgriBusiness Group.

That 2016 fencing analysis considered fencing labour costs per metre across 5 fencing types and three terrain (slope) types by region (excluding ongoing maintenance costs) as well as fencing material costs per metre for those same fencing types (with no variation by slope). The report noted that the 'flat' terrain type related to slopes between 0-7 degrees, and the 'rolling' terrain type related to slopes of 7-35 degrees. Steep terrain was greater than 35 degrees. Further detail on the scope of costs considered in the calculations is contained in that report, but is not repeated here.

Table 9 summarises the relevant combined labour/materials costs for flat and rolling terrain, showing the national averages. There is a close correlation between these figures and those stated in the RIA.

Region	Combined labour and material Costs per Metre (NZ average)		
	Dairy Cattle Electric 2 Wire Fence	Sheep & Beef Non-Electric 8 Wire Fence	Deer Non-Electric Netting Fence
Original figures (2014/2015)			
Flat	\$4.60	\$13.00	\$18.60
Rolling	\$5.20	\$13.60	\$19.40
RIA Adopted	\$5.00	\$14.00	\$20.00*
Inflated figures (June 2021) Based on Capital Goods Price Index – Fencing			
Flat	\$6.36	\$18.18	\$25.97
Rolling	\$7.32	\$19.00	\$27.11
Scenario 3 Adopted	\$6.36	\$18.18	\$25.97*
* While the RIA stated \$20 for deer fencing costs/metre, it adopted the sheep and beef cost of \$14/m. Scenario 3 also adopts the inflated sheep and beef cost in keeping with the scope of scenario 3 (i.e. \$18.20/m)			
Source: Agribusiness Group (2016), StatisticsNZ, M.E.			

Table 9: Scenario 3 – Summary of Original and Inflated Fencing Costs by Farm Type (\$/m)

To inflate those same fencing costs to current dollars, the Capital Goods Price Index – which has a specific fencing category – has been adopted¹⁷. This is a business price index maintained by StatisticsNZ that is specifically focused on costs that contribute to fixed capital formation and infrastructure development. The latest results of the index are for June 2022. On the basis that the Agribusiness report collected data in 2015, the change in the index between June 2015 and June 2022 (+40%) has been used to adjust the base fence prices. Table 9 shows the inflated figures. On the basis that the new low slope land map relates to slopes of 0-5 degrees, only the 'Flat' terrain fence prices have been adopted for Scenario 3. These are \$18.18/m for sheep and beef farms and \$25.97/m for deer farms (although Scenario 3 opts for the sheep and beef farm fence price for other (deer) farms as per the RIA approach).

Applying the same methodology as for Scenario 1 and 2 above, but using current estimates of equivalent fencing costs per metre, total fencing for the new low slope land map area comes to \$809.5m attributable to Regulations¹⁸ (Table 10). This an increase of 30% in national fencing costs compared to Scenario 2 (original fence costs applied).

	Beef Cattle	Deer	Total
Total Estimated Kms of River Requiring Fencing Under the Regulations	28,994 Km		
Share of Impacted Farm Area by Stock Type (Excluding Dairy)	73.6%	3.3%	76.9%
Implied Kms of River Requiring Fencing by Stock Type (Excluding Dairy)	21,303 Km	955 km	22,258 Km
Implied Kms of Fence Length (i.e. double)	42,606 Km	1,910 km	44,516 Km
Fence Price per metre	\$18.18	\$18.18 *	
Implied Fence Cost (\$m)	\$774.8m	\$34.7m	\$809.5m
Variance from Scenario 2	+30%	+30%	+30%
* Table 7 of the RIA indicates that Other (Deer) Farms are based on 'as for Sheep and Beef' for fence costs. The same approach is retained here.			

Table 10: Scenario 3 – Summary of Total National Fencing Costs

¹⁷ The Perrin Ag Consulting Limited (2020) report for MfE titled 'Estimated on-farm economic impacts of selected mitigation options' inflated the same fence prices using the Farm Expense Index. This is not specifically tied to fencing costs, so was not preferred over the Capital Good Price Index.

¹⁸ Low slope land component

In order to provide more current profit/ha estimates that retain the approach used in the RIA, it is necessary to examine the origin of the RIA figures applied in more detail.

The RIA applied a figure of \$520/ha for sheep and beef farms to apply to beef cattle. It is understood that this figure is sourced from Journeux 2019, Table 48. That table records EBITD (Earnings before Interest, Tax and Depreciation, \$/ha) annually from 2009 to 2018 for sheep and beef farms sourced (or derived)¹⁹ from the Sheep & Beef Farm Survey (prepared by Beef & Lamb NZ). Specifically, it references the North Island Class 5 Finishing value. This is described as “Easy contour farmland with the potential for high production. Mostly carrying between 8-15 stock units per hectare.... These tend to be smaller farms focussed on high production per hectare and may have some cash cropping”. The Farm Survey provides a weighted average of North Island Class 5 finishing farms across Northland/Waikato/BOP, Taranaki/Manawatu and East Coast catchments. There is reasonable variation in that EBITD (\$/ha) value year on year between 2009 and 2018. The 2018 value relied on in Table 48 was a provisional figure of \$650/ha but the actual value for 2018 was subsequently revised to \$714/ha. The report took an average over the previous 10 years (inclusive of the provisional 2018 figure), which generated the \$520/ha applied in the RIA.

The latest farm surveys contain actual data up to an including 2020/2021 (i.e. 2021). Taking the same weighted average North Island Class 5 finishing EBITD figures for the 10 year period 2012-2021 gives an updated average of \$620/ha. This figure is adopted for Scenario 3 for sheep and beef (beef cattle) opportunity costs, and also deer farm opportunity costs as per the RIA approach (Table 11).

Year	Journeux, 2019 Table 48 with 2018 Provision	Journeux, 2019 Table 48 with 2018 Actual	Scenario 3 Update
2009	\$397	\$397	
2010	\$352	\$352	
2011	\$495	\$495	
2012	\$567	\$567	\$567
2013	\$432	\$432	\$432
2014	\$552	\$552	\$552
2015	\$677	\$677	\$677
2016	\$555	\$555	\$555
2017	\$527	\$527	\$527
2018	\$650	\$714	\$714
2019			\$742
2020			\$825
2021			\$607
10 Year Average	\$520	\$527	\$620

Table 11: Scenario 3 – Summary of Original and Inflated Profit/ha (EBITDrw) Costs for Sheep & Beef Farms

Table 12 sets out the annual setback opportunity costs for Scenario 3. The total annual opportunity cost associated with excluding stock from grazing the setback area of 3m either side of rivers >1m in width is estimated at \$7.5m while

¹⁹ The farm surveys do not report EBITD as a line item, but it can be approximately replicated from ‘Farm Profit before Tax’ plus ‘Interest’ and ‘Depreciation’ expenditure/ha. Upon checking the values in Table 48, it was apparent that the figure used also included ‘Rent’ and ‘Managers Salaries’ expenditure/ha. As such, the value is more accurately summarised as EBITDrw. This is the value we have recreated for consistency.

keeping all other assumptions the same as in Scenario 2 but increasing the profit/ha values to 2021 dollars. This is an increase of 19% compared to annual opportunity costs in Scenario 2.

	Beef Cattle	Deer	Total
Total Setback Area	17,367 ha		
Share of Impacted Farm Area by Stock Type (Excluding Dairy)	73.6%	3.3%	76.9%
Implied Ha of River Setback by Stock Type	12,782 ha	573 ha	13,355 ha
Average Farm Productivity/ha/year (EBITD) (\$)	\$620	\$620 *	
90% of Productivity for River Margins (\$)	\$558	\$558 *	
Implied Forgone Annual Gross Profit (\$m)	\$7.1m	\$0.32m	\$7.5m
<i>Variance from Scenario 2</i>	+19%	+19%	+19%
<i>* Table 7 of the RIA indicates that Other (Deer) Farms are based on 'as for Sheep and Beef' for productivity. The same approach is retained here.</i>			

Table 12: Scenario 3 – Summary of Total National Setback Opportunity Costs Per Annum

Spreading the fencing cost (\$809.5m) out over 25 years (assuming it is wholly loan funded at an interest rate of 3%). This equates to an estimated principal and interest payment of \$46.5m per annum across the country. This has been applied to years 2023 to 2047 in the model. The annual opportunity cost for excluded grazing land (\$7.5m/annum) is applied to years 2023 to 2050 in the model.

The present value (PV) of total costs over the 2023-2050 period is calculated at \$949m under a 3% discount rate. While this figure is greater than that of Scenario 1, the increase is associated with revised cost assumptions for fencing and inflation (and not an increase in fencing length). Scenario 1 (recreation of the 2020 RIA cost estimate) would similarly be significantly higher if revised cost assumptions and inflation were applied.

3.6 Scenario 4: Revised Assessment

3.6.1 Review of Assumptions

The analysis undertaken for the RIA included significant assumptions, which was inevitable given the limited geospatial data that is available in respect of the real world situation.

Through the analysis, we have identified a number of key assumptions that we have reviewed to assess whether more relevant/accurate data could be applied. We also note that submissions also challenged a number of the assumptions in the methodology and consequential estimates, with the most detailed being that provided by Beef and Lamb²⁰ and the associated report prepared by BakerAg²¹. The identified key assumptions are:

- 1) The percentage of rivers that are already fenced.
- 2) Contiguous fencing
- 3) Area of exclusion
- 4) Proportion of sheep/beef to dairy
- 5) Fencing wetlands and rivers

²⁰ Submission to the Ministry for the Environment & Ministry for Primary Industries on the Certified Freshwater Farm Plans Regulations and Stock Exclusion Regulations: Proposed changes to the low slope map. Beef and Lamb, September 2021

²¹ Freshwater Discussion Document Analysis. BakerAg, 20th August 2021 (included in the Beef and Lamb submission)

Percentage of rivers already fenced or subject to requirements

More up to date information is available on the extent of waterway fencing that has been undertaken. For example, the 2021 Rural Decision Makers Survey²², assessed the percentage of waterways that were fenced in six selected regions. This indicates a relative high extent of completed fencing of minor and major streams and wetlands in dairy farms, with a lesser extent of fencing on sheep and beef farms (Table 13), which is consistent with the RIA statement that the majority of the remaining fencing and associated costs are associated with beef cattle.

Region	Dairy			Sheep and Beef		
	Small streams	Large streams	Wetlands	Small streams	Large streams	Wetlands
Northland	66%	93%	95%	36%	52%	79%
Waikato	77%	86%	90%	41%	61%	73%
Manawatu-Wanganui	65%	83%	89%	29%	52%	68%
Taranaki	83%	84%	98%	46%	48%	74%
Canterbury	80%	87%	93%	25%	34%	65%
Southland	83%	95%	97%	36%	46%	86%

Table 13: Percentage of waterways fenced in selected regions
(Percentages taken from 2021 Rural Decision Makers Survey)

While the 2021 SRDM stream fencing summary provides more detail than the previous survey in 2019 (i.e. by stock type) - which would be useful if we were building an entirely new and detailed cost model of the Regulations (which is outside of the scope of this report) – the incomplete nature of the latest data means that it is difficult to integrate into the model that has been recreated from available RIA information. However, we consider that it is important not to assume a static share of fencing has been completed and/or required by existing regional rules. If nothing else, the SRDM surveys highlight that steady progress is being made on fencing waterways (with the Regulations playing a part in that in addition to other industry standards/best practice over time).

In the absence of better data, we adopt a hybrid approach for Scenario 4 that applies the 2019 share of small streams/drains that have been fenced in each region *when that share is greater than the regional share* in Table 1 of the RIA applied in Scenarios 1-3. Both sets of regional percentages are shown in Table 5 above. This approach is deliberately conservative in that it takes small stream fencing²³ rather than large stream fencing shares (which are higher in all cases), and does not account for fencing progress between 2019 and today. However, the hybrid scenario attempts to account for some progress in fencing over and above the RIA assumptions. The key implication of this hybrid scenario is that in Gisborne, Hawke’s Bay, Marlborough, Nelson and Otago regions in particular, the fencing likely to still be required under the regulations (and not already required by regional rules) is substantially reduced compared to in Scenarios 1-3. In all other regions, it is reduced to a minor extent.

Contiguous fencing

A criticism of the approach taken in averaging slope at a parcel scale is that within that parcel there will be areas of higher slope captured as part of the average slope and hence require fencing (if the average slope is less than 10 degrees). While this is correct, we note that the converse effect can also occur. That is, parcels that have an average slope of *greater* than 10 degrees will result in river lengths that traverse low slope land within the parcel not requiring fencing under the mapping.

²² Adapted from: <https://www.landcareresearch.co.nz/discover-our-research/environment/sustainable-society-and-policy/survey-of-rural-decision-makers/srdm-2021/>

²³ We have not been able to find definitions of the two stream types identified in the SRDM.

Figure 2 shows an example (from Gisborne) of potential stream exclusion requirements under the current (parcel-based) low slope land map.

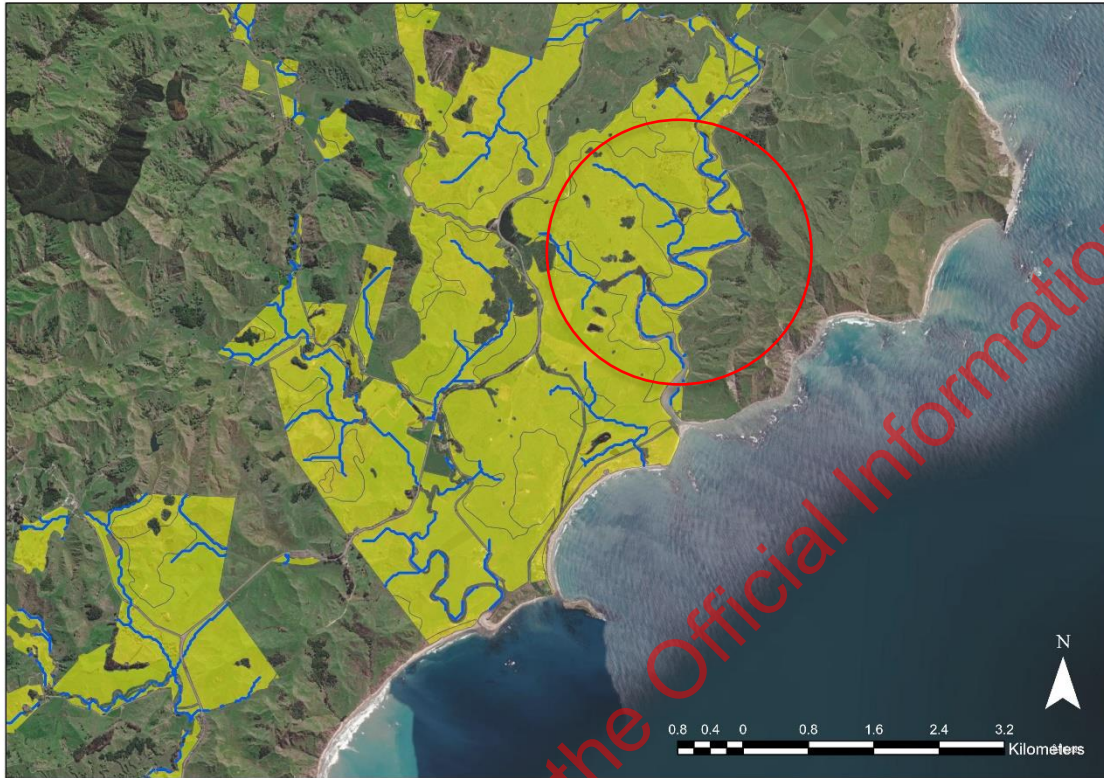


Figure 2: Potential river lengths requiring exclusion under current low slope land map

The revised low slope land map adopts a local terrain averaging to, in part, address this issue and to more accurately map low slope land. However, the use of the local averaging can also result in discontinuities in the length of river identified as requiring to be fenced. An example of this is shown in Figure 3 (new 0-5 degree low slope land map). For comparison purposes, the 0-10 degree low slope map using the new local averaging approach is also shown (Figure 4). These maps show that the river lengths that require stock exclusion/fencing generally become more discontinuous for the (new) 0-5 degree low slope land map when compared to the current map. Predictably, the discontinuities in river length requiring stock exclusion become less under the (new) 0-10 degree low slope land mapping as this map comprises a more extensive low slope land area.

We anticipate that the extent of discontinuities will depend on the nature of the topography and the granularity of the local averaging methodology and that this effect would be more pronounced in areas where the topography of the land is more variable (such as the Gisborne example presented) than in largely flat areas where topographical changes are less and more gradual. However it is unlikely that strict compliance with the regulations would be feasible or practicable, particularly over short lengths, and hence the methodology results in an underestimation of the total length of exclusion/fencing that would be required under the 0-5 degree low slope land map.

It is impossible to accurately determine the extent of the under-estimate from the data that is available without an extensive assessment. However, for the purposes of the assessment in Scenario 4 and based on a visual inspection of several areas of the low slope land map, we have assumed that on-the-ground fencing length would be at least 10% greater than the calculated length. We acknowledge that this is not a robust assessment; rather, it is applied in recognition that from a practical perspective the fencing length cannot be less than, and will almost inevitably be greater than, the minimum required to achieve compliance with the regulations.



Figure 3: Potential river lengths requiring exclusion under proposed low slope land map (0-5 deg)

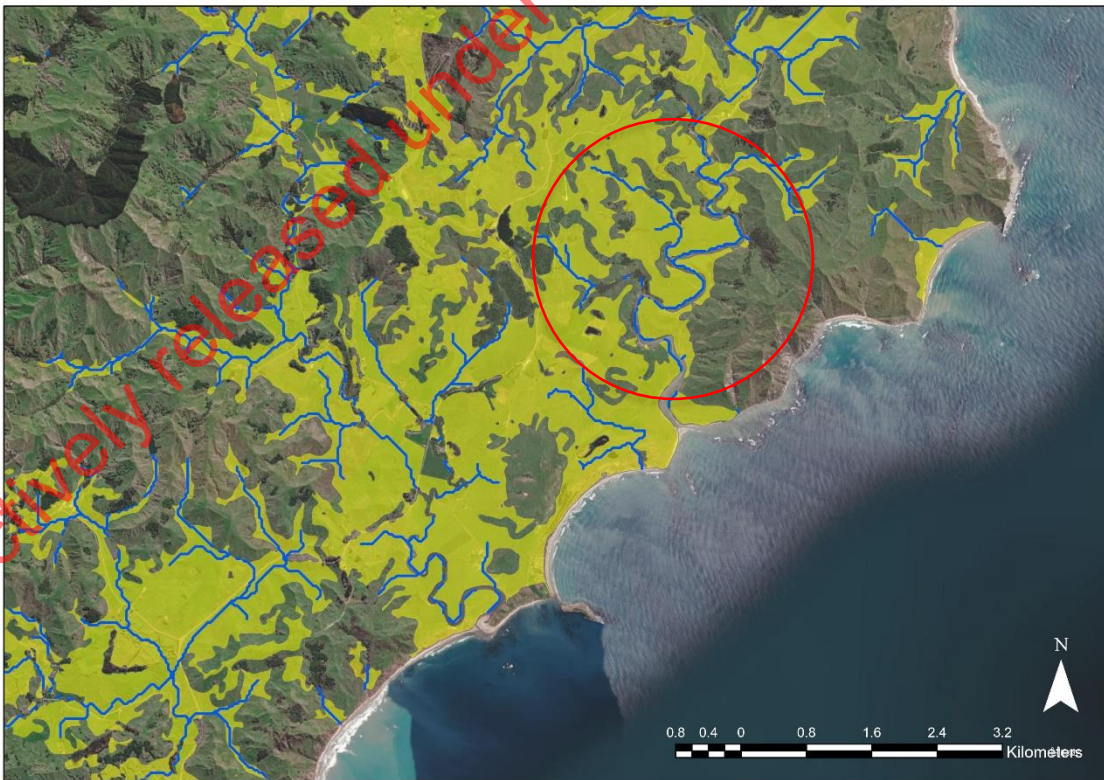


Figure 4: Potential river lengths requiring exclusion under new low slope land mapping (0-10 deg)

Area of exclusion

The regulations require a minimum 3 metre setback from the edge of a river and lake (but not a wetland). However, again from a practical a perspective, the average setback at a farm scale will almost always be greater than the minimum, as the location of fencing will be determined by on-the-ground considerations and cannot be less than 3 metres.

An assessment of the retired land (within the setback) was undertaken by BakerAg across four sample farms. This assessment located fencing based on the topography of the farms and not at the minimum 3 metre setback and calculated the area of land that was retired. This assessment concluded that the area retired from pastoral farming remains relatively constant (between the original 10 degree low slope land map and the new 0-5 degree low slope land map) when waterways are fenced strictly to the low slope areas. However, when waterways are fenced more logically as per the 2021 (0-5 degree) low slope land map, the area retired increases by 43.6%.

We are not able to assess the validity or representativeness of this assessment. However, we acknowledge that simply applying the 3 metre buffer will inevitably underestimate the area of the setback that is retired in practice. For the purpose of this assessment, we have applied a 25% increase in the setback area to reflect that the difference is more likely to be greater in areas where the terrain is more variable and less where the land is more even and flat.

Percentage of land carrying sheep and beef, deer and dairy

The percentage of land use affects the cost estimate due to the difference in fencing costs and that dairy farms are required to exclude stock from rivers irrespective of slope (and hence not affected by the changes to the low slope land map). The RIA indicated that the fencing length to dairy (minimal length), sheep and beef (vast majority of area), and deer (minimal length) was apportioned according to proportion of catchment in that land use according to Semadeni-Davies et al 2020. We have not been able to source or recreate that original analysis of land use type in the low slope area at a regional level (as discussed above).

We consider that given the regional variation in farm type by area across the country, regional assumptions are preferable to national level averages. For the purpose of Scenario 4, we adopt data in Table 14 below which is based on information from the 2021 Rural Decision Makers Survey²⁴, which provides the respective proportion of each major stock use (by land area) by region.

Region	Sheep/Beef/Grazing	Dairy	Deer
Auckland	79%	20%	1%
Bay of Plenty	49%	51%	0%
Canterbury	62%	32%	6%
Gisborne	96%	4%	0%
Hawke's Bay	94%	5%	1%
Manawatu-Wanganui	76%	22%	1%
Marlborough	83%	17%	0%
Nelson	80%	20%	0%
Northland	75%	25%	0%
Otago	77%	18%	5%
Southland	56%	39%	6%
Taranaki	35%	65%	0%
Tasman	76%	22%	2%
Waikato	40%	59%	1%

²⁴ Adapted from: <https://www.landcareresearch.co.nz/discover-our-research/environment/sustainable-society-and-policy/survey-of-rural-decision-makers/srdm-2021/>

Wellington	83%	15%	1%
West Coast	36%	64%	0%

Table 14: Percentage of area of stock land use by stock type 2021

A limitation of using this data, is that it is not specific to the farm area mix in the low slope land map area. In the absence of spatially explicit GIS layers that show farm types impacted by the regulations, the assumption is that mix of farm area by stock type at the regional level is representative of the mix of farms in the low slope area. In practice though, we would expect some geographic variation.

It is noted that adopting these percentages may lead to an underestimation of costs as the 2021 SRDM indicated that in six selected regions, on average dairy farms have fenced twice as many rivers (large and small) compared to sheep and beef farms²⁵. Thus the obligation to fence further rivers is even more likely to lie with sheep and beef land uses than able to be shown in Scenario 4.

However, for the purposes of the updated cost estimate under Scenario 4, the percentages of land use types in Table 14 has been adopted as the proportion of Sheep/Beef (Beef Cattle) and Deer fencing in each region.

Fencing Wetlands and Lakes

It is difficult to obtain robust information on the number of wetlands that may require fencing. The 2021 Rural Decision Makers survey indicated that in the six selected areas a high level of wetland fencing had been undertaken – on average 93.7% for dairy farms and 74.2% for sheep and beef farms. However, there was no information as to the criteria that determined what a wetland was and whether this correlated with the definition of a natural wetland under the National Policy Statement for Freshwater Management (NPS-FM) and National Environmental Standards for Freshwater (NES-F) – recognising that the Stock Exclusion Regulations require exclusion of stock from natural wetlands of 0.05 hectares or more, in addition to excluding stock from mapped wetlands (in a regional policy statement, regional plan or district plan). Furthermore, we have been unable to source a geospatial wetland layer that would enable an accurate assessment of the extent of wetland perimeters requiring fencing and are aware that most councils have yet to complete wetland mapping down to 0.05 Ha.

Similarly for lakes. While the perimeter of lakes adjacent within the 0-5 degree slope map and grasslands could potentially be calculated, we have been unable to source any information on the extent of existing fencing and hence any estimates would have a very low level of reliability.

As a consequence, we consider that rather than estimate fencing requirements for wetland and lakes with a very low level of confidence and reliability, it is preferable to simply recognise that fencing of wetlands and lakes would result in additional costs.

3.6.2 Output of GIS Assessment

Based on the above assumptions, the length of river requiring fencing and retired area within the setback are provided in Table 15 and Table 16. This indicates remaining fencing length and retired area of 31,839 km (that is, 10% more than in Scenario 3 to account for the likely need for contiguous fencing) and 23,879 Ha respectively.

Region	Length of River (km)	Length + 10 % for discontinuity (km)	% Existing and Required Stock Exclusion (Hybrid Scenario)	Additional River Length Requiring Stock Exclusion (km)	Area in Setback (3 m + 25%) (Ha)
Auckland	1,940	2,134	66%	728	546

²⁵ Adapted from: <https://www.landcareresearch.co.nz/discover-our-research/environment/sustainable-society-and-policy/survey-of-rural-decision-makers/srdm-2021/information-sheet-restricting-stock-from-waterways/>

Bay of Plenty	2,294	2,524	86%	366	274
Canterbury	15,023	16,526	76%	3,933	2,950
Gisborne	1,210	1,331	86%	193	145
Hawke's Bay	3,856	4,241	62%	1,616	1,212
Manawatu-Wanganui	7,402	8,142	62%	3,078	2,308
Marlborough	1,259	1,385	64%	503	377
Nelson	46	51	64%	18	14
Northland	6,066	6,672	78%	1,501	1,126
Otago	9,101	10,012	59%	4,125	3,094
Southland	11,211	12,332	76%	2,972	2,229
Taranaki	4,202	4,622	80%	906	679
Tasman	1,445	1,589	64%	577	433
Waikato	12,343	13,577	80%	2,743	2,057
Wellington	2,794	3,073	61%	1,202	901
West Coast	2,599	2,859	65%	1,012	759
Total	82,792	91,071		25,472	19,104

Table 15: Scenario 4 – River length and setback area

Region	Additional Fencing (Excluding Dairy) (km)		Retired Area (Excluding Dairy) (Ha)	
	Beef Cattle	Deer	Beef Cattle	Deer
Auckland	1,150	15	431	5
Bay of Plenty	359	-	134	-
Canterbury	4,877	472	1,829	177
Gisborne	371	-	139	-
Hawke's Bay	3,038	32	1,139	12
Manawatu-Wanganui	4,703	80	1,763	30
Marlborough	835	-	313	-
Nelson	30	-	11	-
Northland	2,252	-	844	-
Otago	6,352	412	2,382	155
Southland	3,299	327	1,237	123
Taranaki	634	-	238	-
Tasman	877	23	329	9
Waikato	2,194	55	823	21
Wellington	2,004	31	752	11
West Coast	729	-	273	-
Total	33,702	1,447	12,638	543

Table 16: Scenario 4 – Additional fencing and retired area by land use type

3.6.3 Assessment of Costs

In addition to the additional 10% of river length included, the additional 25% of setback area included, the revised percentage share of fencing already carried out by region and the revised percentage distributions of farms required

to address stock exclusion by stock type discussed above, we have made the following additional changes to the modelling of costs for Scenario 4:

- Applied regional fencing costs/m (Table 17). As per Scenario 3, these are inflation adjusted from the 2015 costs in the AgResearch report for MPI, but we adopt the regional data as set out in that research rather than national averages. Importantly, that research highlighted that timber fencing materials and labour costs varied across the country, while other fencing materials were more consistently priced across the country (although varied somewhat by company). It has been assumed that the inflation adjustments applied equally across all regions.
- We do not retain the same fencing typologies as per the RIA and other scenarios modelled. As the Regulations apply only to excluding beef cattle and deer from waterways in the low slope land map area, and not sheep, we have modelled a 2-wire electric fence cost (\$2021 by region) for beef cattle (as per the approach applied for dairy farms, Table 17) instead of the more costly 8-wire non-electric post and batten fence which is designed to contain sheep. This is the cost that we consider is directly attributable to the Regulations (with any fencing over and above a 2-wire electric fence a cost borne by the farmer, but not caused by the Regulations per se).
- Adopt the (regional) deer fencing cost for deer farm area impacted by the Regulations (Table 17). While it appeared that the RIA applied the sheep and beef fence cost (unable to be verified in the absence of the original models), the inflation adjusted deer fence price by region is adopted for Scenario 4.
- Applied regional/grouped regional profit/ha for sheep and beef farms rather than a national average (Table 17). For sheep and beef farms, we take the same EBITDrw value that generated the \$520/ha profit used in the RIA, but average this over 8 recent years of available data (2014-2021)²⁶. We also make use of the breakdown of Class 5 North Island Finishing financial data into three North Island catchments, rather than use the North Island average. For the South Island, we apply the EBITDrw for Class 6 South Island Finishing and Breeding farms for Canterbury, Marlborough, Nelson, Tasman and the West Coast region, and an unweighted average of EBITDrw of Class 6 South Island Finishing and Breeding farms and Class 7 South Island Finishing farms for Otago and Southland Regions.
- Changed the interest rate for amortizing fencing costs to 6% instead of 3% (which is possibly still conservative in the short term).
- Changed the discount rate to 5% instead of 3% as per current Treasury guidance.

Unless discussed above, other assumptions remain the same as in Scenario 3. This includes adopting the national average sheep and beef profit/ha (2020/21) for deer farms given that we were unable to find any national or regional data to improve on that approach (Table 17).

Region	Fencing Costs/m			Profit/ha	
	Sheep & Beef 8-Wire (Not Applied)	Beef Cattle / Dairy 2-Wire Electric	Deer	Sheep & Beef	Deer
Auckland	\$20.95	\$7.12	\$29.74	\$833	\$620
Bay of Plenty	\$17.32	\$5.31	\$24.30	\$833	\$620
Canterbury	\$15.50	\$4.75	\$21.65	\$502	\$620
Gisborne	\$20.11	\$7.26	\$30.30	\$564	\$620
Hawke's Bay	\$18.85	\$6.84	\$27.09	\$564	\$620
Manawatu-Wanganui	\$17.04	\$6.14	\$22.76	\$652	\$620
Marlborough	\$18.57	\$6.00	\$24.58	\$502	\$620
Nelson	\$18.57	\$6.00	\$24.58	\$502	\$620
Northland	\$17.18	\$6.84	\$24.58	\$833	\$620

²⁶ To avoid using provisional and forecast values that are subject to change, we opted for a shorter time period to calculate the average EBITDrw values.

Otago	\$17.87	\$5.73	\$27.65	\$591	\$620
Southland	\$14.24	\$5.03	\$21.65	\$591	\$620
Taranaki	\$18.01	\$5.87	\$27.79	\$652	\$620
Tasman	\$18.57	\$6.00	\$24.58	\$502	\$620
Waikato	\$18.99	\$6.14	\$27.51	\$833	\$620
Wellington	\$18.85	\$8.66	\$26.95	\$652	\$620
West Coast	\$21.09	\$7.40	\$27.09	\$502	\$620

Table 17: Scenario 4 – Fencing Cost and Profit/ha (EBITDrw) Assumptions by Region

When applying the assumptions set out above for Scenario 4, the total fencing costs for the new low slope land map area comes to \$239.1m attributable to the Regulations (Table 18). This is a reduction of 70% in national fencing costs compared to Scenario 3 (new low slope land map and inflated prices approach only) due largely to the cheaper fence price applied to exclude just beef cattle from waterways. We note that if the current cost/region of the 8-wire non-electric fence was retained then Scenario 4 national fencing costs would rise to \$623.3m and be 23% less compared to Scenario 3.

	Beef Cattle	Deer	Total
Total length of river requiring exclusion	25,472 Km		
Implied Kms of River Requiring Fencing by Stock Type (Excluding Dairy)	16,815 Km	724 km	17,575 Km
Implied Kms of Fence Length (i.e. double)	33,702 Km	1,447 km	35,150 Km
Fence price per metre	<i>Refer regional figures above</i>		
Implied Fence Cost (\$m)	\$204.4m	\$34.7m	\$239.1m
<i>Variance from Scenario 3</i>	<i>-74%</i>	<i>0%</i>	<i>-70%</i>

Table 18: Scenario 4 – Summary of Total National Fencing Costs

Table 19 sets out the annual setback opportunity costs for Scenario 4. The total annual opportunity cost associated with excluding beef cattle and deer from grazing the likely average setback area of 3.75m either side of rivers >1m in width is estimated at \$7.4m. This is a decrease of 1% compared to annual opportunity costs in Scenario 3.

	Beef Cattle	Deer	Total
Total area of setback	19,104 ha		
Implied Ha of River Setback by Stock Type	12,638 ha	543 ha	13,181 ha
Average farm productivity /Ha/yr (EBITD) (\$)	<i>Refer regional figures above</i>		
90% of Productivity for river margins (\$)	<i>Refer regional figures above (adjusted by 90%)</i>		
Implied Forgone Annual Gross Profit (\$m)	\$7.1m	\$0.3m	\$7.4m
<i>Variance from Scenario 3</i>	<i>0%</i>	<i>-5%</i>	<i>-1%</i>

Table 19: Scenario 4 – Summary of Total National Setback Opportunity Costs Per Annum

Spreading the fencing cost (\$239.1m) out over 25 years (assuming it is wholly loan funded at an interest rate of 6%), equates to an estimated principal and interest payment of \$18.7m per annum across the country. This has been applied to years 2023 to 2047 in the model. The annual opportunity cost for excluded grazing land (\$7.4m/annum) is applied to years 2023 to 2050 in the model. **The present value (PV) of total costs over the 2023-2050 period is calculated at \$374m under a 5% discount rate.** We note that if the current regional 8-wire non-electric fence cost was applied for beef cattle (on the assumption that they are sheep and beef farms and farmers would exclude sheep from waterways too), **then the PV increases to \$798 at a 5% discount rate.**

4 SUMMARY

The scope of this assessment is:

- An analysis of fencing and associated costs to land owners associated with the amendments to the low slope land map – that is, estimates of total fencing and opportunity costs for beef cattle and deer informed by a spatial analysis.
- An analysis that takes in account feedback received on the previous estimate of fencing and associated costs and how inflation has affected costs since that time.
- Limited to the marginal difference in costs between the existing map and the latest version of the low slope land map (taking inflation into account).

The assessment is a refresh and update of the existing analysis of fencing low slope land for beef cattle and deer (as defined in the proposed changes to the low slope land map) rather than a reassessment. We note that the scope of the assessment does not include wider costs including to regulators, rural communities and other parties nor the provision of stock water supplies or culverts necessary to replace stock access to waterways and provide for frequent river crossings.

The approach taken to assessing the costs of the Stock Exclusion Regulations, based on the proposed new low slope land map, was undertaken in four steps (scenarios) as follows:

- Scenario 1: Replicate (as far as possible) the existing (2020) river length and cost estimate to establish the base case for comparison for beef cattle and deer farming.
- Scenario 2: Apply the same methodology to the new 0 – 5 degree low slope land layer to enable a ‘like for like’ comparison using the same assumptions and cost information.
- Scenario 3: Update Scenario 2 using new costs for fencing and productivity costs to reflect inflation and other cost changes.
- Scenario 4: Update and refine assumptions to address some of the concerns that have been raised in submissions and provide an upper assessment of the potential cost of fencing the remaining lengths of river.

A summary and sensitivity test of the output from each of the scenarios is presented in Table 20.

Scenario	Discount Rate (Applied 2023-2050)			
	0%	3% *	5% **	6%
Scenario 1 (PV \$m)	\$1,231	\$852	\$687	\$623
Scenario 2 (PV \$m)	\$1,070	\$741	\$598	\$541
Scenario 3 (PV \$m)	\$1,371	\$949	\$766	\$694
Scenario 4 (PV \$m)	\$675	\$465	\$374	\$339
Scenario 4 (PV \$m) (8 wire fencing costs)	\$1,426	\$999	\$798	\$723
* Base discount rate adopted in the RIA.				
** Base discount rate recommended in this report.				

Table 20: Summary of Present Value Costs 2023-2050 by Scenario and Discount Rate (\$m)

This summary indicates that on a ‘like for like’ (same fencing and cost assumptions) basis the proposed changes in the low slope land map (Scenario 2) reduce the cost estimate of river fencing associated with the Stock Exclusion Regulations (Scenario 1) from \$687m to \$598m (5% discount rate). This is primarily a result of the smaller area associated with the 0-5 degrees low slope land range in the revised low slope land map and hence the shorter total length of rivers from which stock are to be excluded (fenced) under the Regulations.

However, as indicated in Scenario 3, updating the costs for inflation and other financial assumptions results in the cost estimate for fencing the low slope land areas for beef cattle and deer to increase above the cost estimates in the RIA for similar discount rates. It is important to stress that this is not a result of an increased length of fencing, but rather the application of inflation and other financial assumptions. The Scenario 1 (RIA estimate) costs would similarly increase if inflation and other assumptions were applied to those figures.

Scenario 4 has been included as a potentially less conservative approach to estimating the fencing costs in particular. Again, this is not a reassessment using a different approach and methodology but rather a testing of each assumption and determining whether the information used in the RIA remains the best information or whether some modification is appropriate. We stress that this scenario still contains a number of significant assumptions that cannot be refined further without a more extensive review and reassessment. However, we consider that this scenario goes some way to addressing concerns that have been made in respect to the practical on-the-ground implications of the regulations.

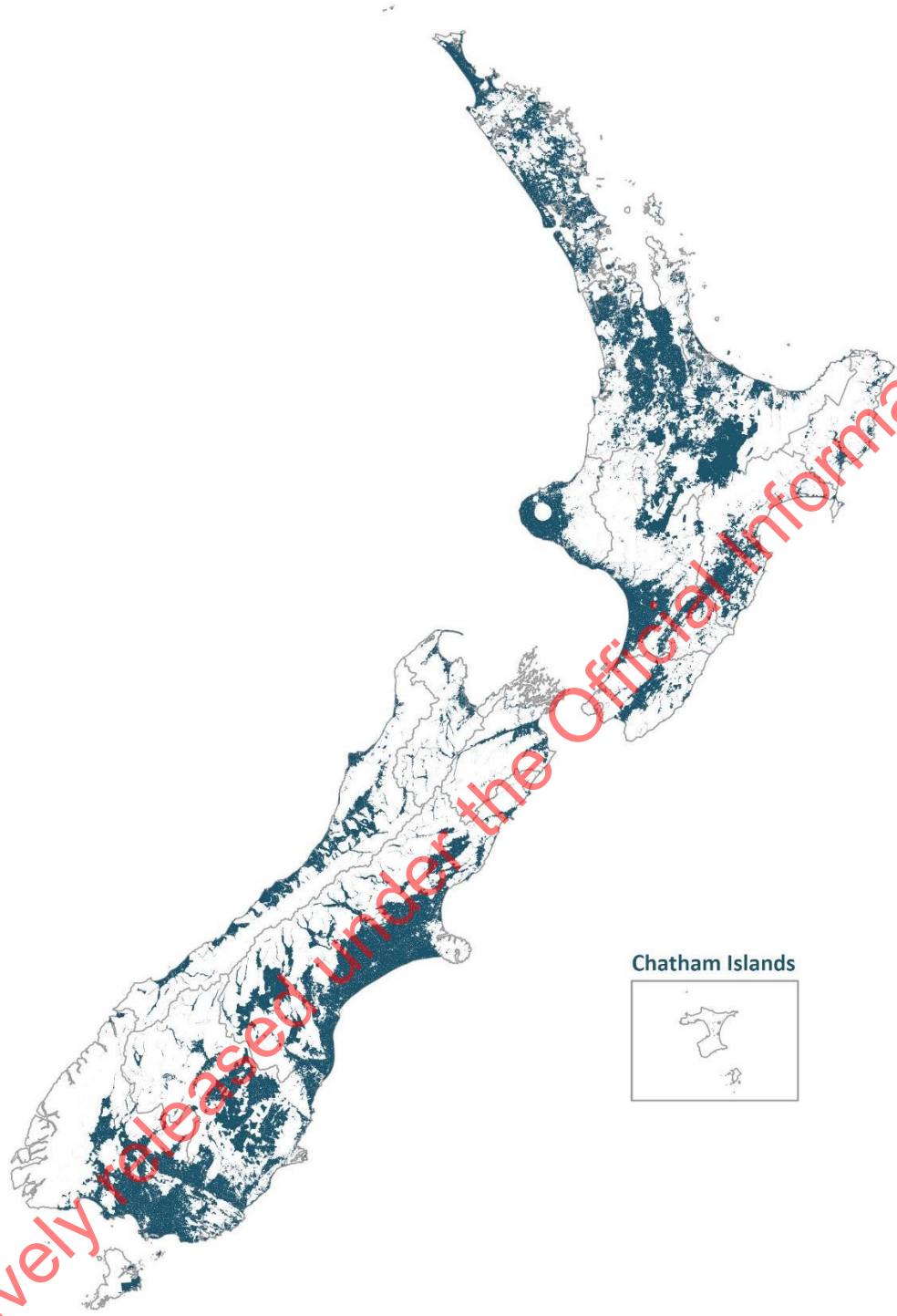
This scenario shows a significantly lower cost estimate than the previous scenario (\$374m @ 5% discount rate). This is primarily due to the cheaper fence price applied in this scenario to exclude just beef cattle and deer from waterways (and not sheep). This is the exclusion that is required by the Regulations and hence in our view is the most appropriate approach to take to estimating the costs of the Regulations (and low slope land map). We acknowledge that in practice, sheep and beef farmers may choose to also exclude sheep – in which case if the current cost/region of the 8-wire non-electric fence was retained then Scenario 4 national fencing costs would rise to \$623.3m and the PV increases to \$798 at a 5% discount rate. This is higher than any of the other scenarios, primarily due to factors applied to account for continuous fencing and a greater than 3 metre average setback on a farm and inflation (which was not applied to Scenarios 1 and 2).

Lastly we note that, consistent with the original RIA assessment, the assessment has not sought to evaluate the cost of excluding stock from lakes and natural wetlands due to the paucity of available data. This will increase the costs of implementing the regulations, particularly as natural wetlands are identified and mapped as required by the NPS-FM. Other costs associated with the Regulations in the low slope land map area, including to regulators, rural communities and other parties have also not been assessed.

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Appendix A:

Current and proposed low slope land maps



Current low slope land map

(reproduced from Ministry for the Environment and Ministry for Primary Industries. 2021. Stock exclusion regulations: Proposed changes to the low slope map. Wellington: Ministry for the Environment)



Proposed low slope land map – 0-5 deg

(reproduced from Ministry for the Environment and Ministry for Primary Industries. 2021. Stock exclusion regulations: Proposed changes to the low slope map. Wellington: Ministry for the Environment)

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Appendix 6: Stock Exclusion Factsheet

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Ministry for the
Environment
Manatū Mo Te Taiao

Ministry for Primary Industries
Manatū Ahu Matua



ESSENTIAL
FRESHWATER
WAI MĀORI
MĀTUATUA



Stock exclusion factsheet

Essential Freshwater is part of a new national direction to protect and improve our rivers, streams, lakes and wetlands. The Essential Freshwater package aims to:

- stop further degradation of our freshwater
- start making immediate improvements so water quality improves within five years
- reverse past damage to bring our waterways and ecosystems to a healthy state within a generation.

Te Mana o te Wai is fundamental to all freshwater management

Te Mana o te Wai recognises the vital importance of water. It expresses the special connection that New Zealanders have with freshwater. By protecting the health of freshwater we protect the health and well-being of people and our ecosystems. When managing freshwater, Te Mana o te Wai ensures the health and well-being of the water is protected and human needs are provided for before enabling other uses of water. Through discussions with regional councils, tangata whenua and communities will have a say on how Te Mana o te Wai is applied in freshwater management locally. More information can be found in the [Te Mana o te Wai factsheet](#).

Who should read this factsheet

This factsheet is part of a [series](#) and provides information on the new regulations for stock exclusion. It is primarily intended for council staff and land users, but may also be of interest to iwi, the wider agricultural industry, farm advisors and consultants, and anyone else with an interest in freshwater policy.

What are the regulations?

New regulations have been issued under section 360 of the RMA to exclude certain types of stock from waterways. For any pastoral system already in place as at 3 September 2020, the provisions take effect at varying dates depending on the stock type and situation (see below). For any new pastoral system established on or after 3 September 2020, the provisions take effect immediately.

Councils may adopt more stringent stock exclusion requirements in their regional plans and any existing rules that are more stringent continue to apply.

Who must comply?

The regulations apply to any person that owns or controls deer, pigs, dairy-support cattle, dairy cattle and beef cattle. Sheep are not subject to the requirements.

What must livestock be excluded from?

The regulations apply to any lake (as defined in the RMA), natural wetland (as defined in the regulations), and any river that is wider than 1 metre anywhere in the land parcel (measured as the bed width bank-to-bank).

Dairy, dairy-support and beef cattle and pigs must not cross lakes and rivers more than twice per month unless they cross by way of a dedicated culvert or bridge. If they are not crossing on a dedicated bridge or culvert, they must be driven across and supervised when crossing. Where the river has a highly mobile bed, and the stock need to cross the river more than twice per month, the stock do not have to cross with a dedicated bridge or culvert, but they still must be supervised and driven across.

How must livestock be excluded?

For all dairy, dairy-support and beef cattle, pigs, and deer there must be a minimum setback of 3 metres from the bed of a lake or river. Stock can enter the 3 metre set back area only when crossing the river or lake.

However, the regulations provide for an exception where an existing 'permanent fence'¹ or existing riparian planting already effectively excludes stock. These existing permanent fences established at 3 September 2020 do not have to be moved.

Where do the regulations not apply?

- To smaller streams (where the bed of the stream does not reach 1 metre wide at any point in the land parcel measured as the bed width bank-to-bank), drains, water races, irrigation canals or other artificial watercourses, and ephemeral flows².
- To stock that are not cattle, pigs or deer, e.g. sheep
- To beef and deer on land that is not low slope (as mapped and published on the Ministry for the Environment website) and are not break feeding, or feeding on annual forage crops or irrigated pasture
- To wetlands less than 500m² unless the wetland is identified in a regional plan as having threatened species, or was listed in a regional plan, district plan, or regional policy statement that is operative as at 3 September 2020

¹ Permanent fence means a post and batten fence with driven or dug fence posts, or an electric fence with at least two electrified wires and driven or dug fence posts, or a deer fence.

² Temporary flows that exist briefly and immediately only after a period of rainfall or snow melt

- To wetlands on land that is not low slope (as mapped) unless the wetland is identified in a regional plan as having threatened species, or was listed in a regional plan, district plan, or regional policy statement that was operative as at 3 September 2020
- Nothing in the regulations requires the erection of fencing specifically, or any other particular method, as a mandatory method of excluding stock. Any method that effectively excludes stock from the lake, river, or natural wetland and relevant setback is sufficient.
- Nothing in the regulations requires a barrier to be erected around or along an entire lake, river, or natural wetland. The obligation is to exclude particular livestock in particular circumstances. If the livestock are not going to be present at, or the circumstances do not apply to, a part of the lake, river, or wetland then no barrier is required.

Non-compliance

Each occasion of non-compliance with the regulations is an offence and carries an infringement fee of \$100 per animal (up to a maximum of \$2,000), or \$2000 per person, or \$4000 per non-natural person (for example, a company).

When do the regulations apply to which activities?

All land slopes

These explanations below apply to all existing pastoral systems. Any new pastoral systems (where land is converted to pastoral land use after the commencement date, 3 September 2020) must comply with the regulations as soon as the pastoral system is initiated.

Where beef cattle and deer are break feeding or grazing on annual forage crops or irrigated pasture they must be excluded from lakes, and rivers more than a metre wide (bank-to-bank) by **1 July 2023**.

Dairy cattle and pigs must be excluded from lakes and rivers more than a metre wide (bank-to-bank) by **1 July 2023**, regardless of land slope.

Dairy support cattle must be excluded from lakes and rivers more than a metre wide (bank-to-bank) by **1 July 2025**, regardless of land slope.

Low-slope

Beef cattle and deer must be excluded from lakes and rivers more than one metre wide (bank-to-bank) by **1 July 2025**, on **low slope land as mapped**. The maps form part of the regulations and are published on the Ministry for the Environment website.

Wetlands

All cattle, deer and pigs must be excluded from:

- Natural wetlands identified in an operative regional plan, district plan, or regional policy statement as at 3 September 2020 by **1 July 2023** (on any slope of land)

- Natural wetlands that support a population of threatened species, by **1 July 2025**. Councils must identify water bodies that support threatened species to give effect to the National Policy Statement for Freshwater Management 2020
- Natural wetlands more than 500m² in area on low slope land (as mapped) by **1 July 2025**.

What are the key timelines?

Table 1: Stock exclusion regulations by type of stock, waterbody, and slope

	2020–21	2023	2025 and beyond
Excluding all cattle, deer and pigs from lakes and rivers with a bed wider than one metre, with a three-metre minimum setback.	From 3 September 2020, the requirements apply to any new pastoral system.	By 1 July 2023, the requirements apply to: <ul style="list-style-type: none"> • dairy cattle (except dairy support cattle) and pigs. • all beef cattle and deer that are break feeding or grazing on annual forage crops or irrigated pasture. (See extra restrictions for winter grazing.) 	By 1 July 2025, the requirements apply to: <ul style="list-style-type: none"> • dairy support cattle (regardless of land slope) • beef cattle and deer when the land is low slope as shown on the maps on the Ministry for the Environment website.
Requiring cattle and pigs crossing rivers more than twice per month to use a dedicated culvert or bridge.		By 1 July 2023, the requirements apply to: <ul style="list-style-type: none"> • dairy cattle (except dairy support cattle) and pigs. 	By 1 July 2025, the requirements apply to: <ul style="list-style-type: none"> • dairy support cattle (regardless of land slope)
Excluding all cattle, deer and pigs from natural wetlands.	From 3 September 2020, the requirements apply to any new pastoral system.	By 1 July 2023, the requirements apply to natural wetlands identified in an operative regional plan, district plan, or regional policy statement as at 3 September 2020.	By 1 July 2025, the requirements apply to: <ul style="list-style-type: none"> • Natural wetlands that support a population of threatened species as described in the National Policy Statement for Freshwater Management 2020. • Natural wetlands that are more than 500 square metres on low slope land as shown on the maps on the Ministry for the Environment website.

How do the maps apply?

The **low slope maps** are part of the regulations. Low slope means land identified as low slope land in these maps.

Beef cattle and deer that are not break feeding, or grazing on annual forage crops or irrigated pasture, must be excluded from lakes and rivers more than one metre wide from 1 July 2025

(except for new pastoral systems, where this applies from 3 September 2020). Anyone can check any location on the maps by writing an address or river name in the map's search box.

The maps capture land where the average slope is less than or equal to 10 degrees across the land parcel or area of land parcel used for grazing. Large land parcels with a lot of flat land may include some steeper areas, and likewise large land parcels with significant areas of hill country may not trigger the regulations because the average slope is greater than 10 degrees.

For more information about the methodology used to create the maps, see *Method for deriving stock exclusion low slope land 2020 extent available* which is attachment 1 in pdf format here <https://data.mfe.govt.nz/layer/104827-stock-exclusion-low-slope-land-2020/>.

If you believe there is an anomaly or mistake on the map, you can email freshwater@mfe.govt.nz with information about the exact location of the land and any contact details so that the Government can investigate the extent of any issues.

Why these regulations?

Livestock entering water bodies contaminate the water directly, and damage the banks of the water body. This is particularly serious with cattle, deer and pigs. Stock also trample the banks and beds of water bodies, breaking down the streambank leading to sediment runoff and habitat damage.

Excluding stock from natural wetlands, lakes, and rivers more than one metre wide is intended to reduce freshwater pollution, prevent bank erosion and sediment loss, and allow riparian plants to grow. Fencing waterways is one of the simplest and most direct ways of keeping stock out of rivers, lakes, streams and their banks and margins.

More about the Essential Freshwater waterways package

The package includes a number of new provisions including:

- New **National Environmental Standards for Freshwater**
- New **stock exclusion regulations** under section 360 of the Resource Management Act 1991 (RMA)
- Amendments to the **Resource Management (Measurement and Reporting of Water Takes) Regulations 2010**
- The **National Policy Statement for Freshwater Management 2020** that replaces the NPS-FM 2017
- **Amendments to the RMA** to provide for a faster freshwater planning process
- **Amendments to the RMA** to enable mandatory and enforceable freshwater farm plans, and to allow the creation of regulations for the reporting of nitrogen fertiliser sales.

Factsheets in this series

The full set of Essential Freshwater factsheets is available [on our website](#).

Find out more and give us feedback

Contact us by emailing freshwater@mfe.govt.nz, or visit the [Essential Freshwater page](#) on our website.

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