# Section 32 Evaluation Report for the Proposed Otago Land and Water Regional Plan

## Chapter 14: Farming and Forestry

**This Section 32 Evaluation Report should be read together with the Proposed Otago Land and Water Regional Plan**

Otago Regional Council

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# Abbreviations

| | |
|---|---|
| FMU | Freshwater Management Unit |
| NES | National Environmental Standard |
| NESF | National Environmental Standards for Freshwater 2020 |
| NES-CF | National Environmental Standards for Commercial Forestry 2023 |
| NOF | National Objectives Framework |
| NPS | National Policy Statement |
| NPSFM | National Policy Statement for Freshwater Management 2020 |
| ORPS | Otago Regional Policy Statement 2019 |
| pORPS | Proposed Otago Regional Policy Statement 2021 |
| pLWRP | Proposed Otago Land and Water Regional Plan 2024 |
| RPS | Regional Policy Statement |
| RPW | Regional Plan: Water |
| RMA | Resource Management Act 1991 |

# Farming and Forestry: Assessment of Provisions

# 1. Farming

## 1.1. Introduction

1. The nature of the landscapes, topography, climate, and soils in Otago mark the region out from the rest of New Zealand (Moran (Ed.), 2022). The region has some limitations in relation to flat land and annual rainfall (away from the Southern Alps and the Catlins). The differing combinations or mixes of characteristics in each locality create differing patterns of rural land uses across the region, and a variable texture to the production systems that occur within each land use, even down to a property-scale. It is these differing mixes of characteristics that help make farming and growing in Otago particularly diverse.

2. The Farming and Forestry (FF) chapter of the pLWRP manages farming activities and practices known to adversely affect the health and well-being of water bodies and freshwater ecosystems. Some topics in other chapters of the pLWRP are also relevant to farming, including agrichemicals and pesticides in the OTH – Other Discharges chapter, wetland management in the WET – Wetlands chapter, and water takes, and allocation in the EFL – Setting environmental flows, levels, and take limits chapter.

3. Forestry activities and practices are also managed within the Farming and Forestry Chapter of the pLWRP and they are discussed in later in this chapter of the s32 report.

4. The types of discharges are largely 'diffuse' or 'non-point source', where contaminants reach water indirectly[1]. Contaminants are discharged to land first and transported as runoff to surface waterbodies or via leaching through the soil profile to groundwater. This situation is complex to manage, but it is important because of the contribution to water quality issues that affects the region's ability to achieve water quality target attribute states and environmental outcomes in FMUs and rohe.

5. Farming in Otago is largely pastoral farming and the growing of crops, with arable farming usually being a combination of both pastoral and cropping phases. These production systems are outlined in the Farmers and Growers in Otago report (Moran (Ed.), 2022). Other livestock farming, such as pig, goats, and poultry are also present in the region but to a far lesser extent. Some rural businesses are more limited than others and there can be strong interconnections between production systems (e.g., between the breeding of livestock on one property and its finishing on another) (Moran (Ed.), 2023).

6. Within each land use there are a range of productions systems, which together with their various mix of enterprises, begin to give an indication of the complexity and diversity in farming and growing (Moran (Ed.), 2022). In general terms, these production systems are as follows:

    a. Sheep and beef commercial farm businesses in Otago are classified into four of the eight Beef + Lamb NZ farm classes for New Zealand: Farm Class 1 – South Island High

[1] Point source discharges are discharges of contaminants into a waterbody from a single fixed point, such as a pipe or drain from sewerage, factory and dairy shed outfalls.

Country, Farm Class 2 – South Island Hill Country, Farm Class 6 – South Island Finishing-Breeding, and Farm Class 7 – South Island Finishing. The most common in Otago is Farm Class 6 Finishing-Breeding farms, which comprise 54% of the region's commercial sheep and beef farms (Moran (Ed.), 2022). Within Otago, sheep and beef farming is carried out on a myriad of soil types, climatic zones, and topographies[2].

b. Deer farms are usually described in terms of their production system, which place an emphasis on either venison, velvet, or stud, and in some cases include trophy. From its production system, a deer farm generates a range of income streams from either deer products or the breeding of stock. As a more recent industry, new products are still being developed. Each production system has various mixes of age classes[3].

c. Dairy farms tend to be identified as one of DairyNZ's five main dairy systems that sit on a continuum based on an increasing proportion of imported feed used. The most common dairy farm system in Otago is System 3 (41%), where between 10% and 20% of total feed is imported, but the most dominant system varies across the region. In South Otago, 79% of farms are System 2 or System 3, as they tend to export more of their herd off-farm and/or bring in feed for winter grazing, while in Waitaki 82% of farms are System 3 or System 4. The milking platform is supported by the grazing of replacement dairy cattle and/or dairy cattle not being milked.

d. Arable farms in Otago are usually a 'mixed cropping' system that combines cropping and livestock enterprises where two to four years of arable crops (including small seeds) are followed by two to four years of pasture for a four-to-eight-year full rotation. Otago, like Southland, has a greater degree of livestock integration compared to Canterbury.

e. Horticulture – a diverse range of fruit and vegetable crops are grown in Otago and each crop can have various production systems. Central Otago is generally known for summerfruit and pipfruit, which are perennial crops. Waitaki tends to focus on fresh vegetables (e.g., brassicas, potatoes, and lettuce) and some fruit (e.g., tomatoes), which as annuals can shift quickly to meet market demand. There are also a small number of hydroponic and covered cropping operations.

f. Viticulture – the Central Otago wine growing region is unique in New Zealand (inland and higher altitude) and includes 7 distinct sub-regions: Gibbston, Wānaka, Bannockburn, Bendigo, Lowburn, Pisa, and Alexandra. Vineyard production systems are influenced by their size and the varietals grown.

7. The topography of many pastoral farms in Otago is mixed, with any Land Use Capability (LUC) 1-4 land usually being central to the farming system (Moran (Ed.), 2023). In horticulture, vegetable growing tends to focus on LUC 1 and 2 while the free-draining properties of the soils on the higher LUC classes are well suited to orchard crops. For viticulture, prime grape growing soils are typically shallower and less fertile soils, often in the higher bands of the LUC classification system.

[2] A calendar of sheep and beef farming activities is available on page 42 of Moran (Ed.) (2022).

[3] A deer farming production calendar is available on page 79 of Moran (Ed.) (2022).

8. In-depth descriptions of each of the main farming land uses in Otago can be found in the Farmers and Growers in Otago Report (Moran (Ed.), 2022) with additional information contained in the Otago's Rural Businesses and Environmental Actions for Freshwater (Moran (Ed.), 2023). These descriptions, and the accompanying case study research, were contributed by members of the Council's Industry Advisory Group (refer to section 2.5) but for ease are just referred to here using the overall report citation.

9. Using StatsNZ data and definition of a 'farm'[4], Figure 1 shows 'farms' in Otago for 2022 grouped by land area categories and industry. Most farms in the region are pastoral (e.g., drystock 60%, dairy 13%) or cropping (7%). Horticulture and viticulture operations together account for 10% of StatsNZ 'farms' in the region, and forestry roughly 8%. Around 48% of 'farms' in Otago are less than 100 hectares and another 27% have an area between 100 and 400 hectares (a total of 75%). Just under 12% of farms are in excess of 1,000 hectares (almost all of which are drystock).

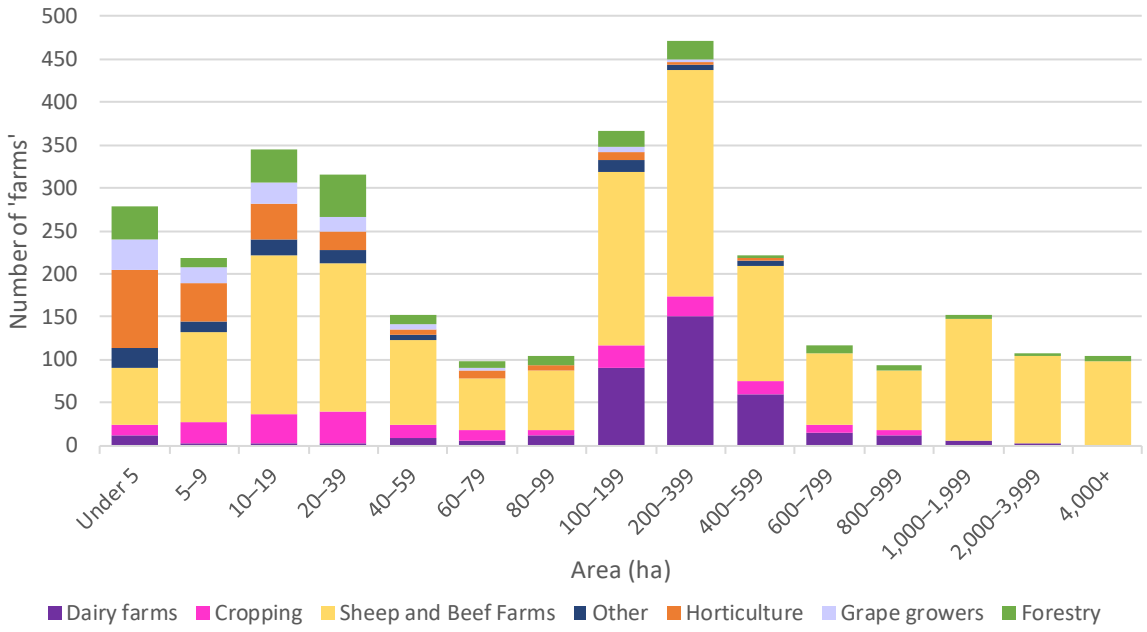


Figure 1: Distribution of farms by area and land use in Otago in 2019

10. Land area is one perspective of many in considering a farm's size. Other relevant perspectives include (but are not limited to) employment, expenditure, production, profitability, and environmental footprint.

11. There are 17 rules directly relevant to farming in the Farming and Forestry Chapter of the pLWRP that, together with the Chapter's policies and objectives, form the proposed policy approach in Otago.

[4] StatsNZ define a 'farm' for its Agricultural Production Survey as a business that is: 1) classified by StatsNZ's Business Frame as being engaged in horticulture, cropping, livestock farming, or exotic forestry operations; and 2) goods and services tax (GST) registered and earn over $60,000 during a financial year. In that context, earn is assumed to refer to a business' 'turnover' (i.e., its gross revenue). However, a commercial farm business usually needs a turnover in excess of $60,000 to be viable. Inland Revenue describes 'turnover' as the amount of money made from selling goods or services over a particular period (https://www.ird.govt.nz/gst/registering-for-gst), which is not the same as profit.

12. The relevant rules assessed within the farming provisions are:

    a. The use of land for farming activities

       FF-R1 – Feedlots and stockholding areas for cattle
       FF-R2 – Intensive Winter Grazing
       FF-R3 – Sacrifice paddocks
       FF-R4 – Pasture-based wintering of cattle
       FF-R5 – Silage production and storage
       FF-R6 – Offal pits
       FF-R7 – Farm refuse pits
       FF-R13 – Land use for components of animal effluent system
       FF-R14 – Land use for existing animal effluent storage facilities
       FF-R15 – Land use for new animal effluent storage facilities

    b. Discharge of agricultural waste, fertiliser, and animal effluent

       FF-R8 – Agricultural waste
       FF-R9 – Fertiliser
       FF-R16 – Discharges of solid animal effluent
       FF-R17 – Discharges of liquid animal effluent

    c. Freshwater Farm Plans

       FF-R10 – Freshwater Farm Plans

    d. Land use expansion

       FF-R11 – Controls on land use expansion

    e. Stock exclusion

       FF-R12 – Stock exclusion

    f. Cultivation

       CAT2-R1 – Cultivation in Dunstan rohe
       CAT3-R1 – Cultivation in Manuherekia rohe
       CAT4-R1 – Cultivation in Roxburgh rohe
       CAT5-R1 – Cultivation in Lower Clutha rohe
       FMU2-R1 – Cultivation in Taiari FMU
       FMU4-R1 – Cultivation in Dunedin & Coast FMU
       FMU5-R1 – Cultivation in Catlins FMU

13. Of the 17 proposed rules, five relate to animal effluent (FF-R13, FF-R14, FF-R15, FF-R16, and FF-R17) and are carried over from Plan Change 8 to the Water Plan, with minor amendments to fit style and terminology of new pLWRP. The 12 remaining rules relate to specific farming activities, six of which focus on pastoral farming (FF-R1, FF-R2, FF-R3, FF-R4, FF-R5, FF-R6, and FF-R12) and six are more generally applicable across the land uses (FF-R7, FF-R8, FF-R9, FF-R10, and FF-R11 as well as the FMU-specific set for cultivation).

14. As already noted at the start of this section, there are also topics in other Chapters of the pLWRP are also relevant to farming.

## 1.2. Issues

15. Otago has experienced marked changes in its land use patterns over the past 30 years, as has occurred in many other regions throughout New Zealand. While the overall trend in the region is a reduction in pastoral farming, dairy farming and dairy support have expanded. Lowland sheep and beef farming, deer farming, arable farming, and vegetable growing have all declined. Viticulture has expanded and there have been marked changes in orcharding, particularly from pipfruit towards summerfruit, especially cherries. More recently, plantation forestry has started to expand and now includes carbon-sink forests.

16. Many farming activities, particularly when poorly managed, can have detrimental effects on the health of fresh waterbodies and downstream receiving environments through issues such as increased turbidity, sedimentation, and excessive algae and plant growth. Management decisions that do not account for the land's inherent capabilities can lead to increased risks of erosion and losses of sediment, excess nutrients (to both groundwater and surface water), and pathogens (as indicated by *E.coli*). The presence of sediment in waterbodies often represents a loss of the region's productive soil resources and the multitude of ecosystem services that they provide (Dymond, 2014).

17. Multiple studies have shown that water quality is adversely affected by excess nitrogen and phosphorus from fertilisers and livestock, as well as sediment, and faecal matter into waterbodies (e.g. Monaghan, et al., 2007; Dymond, Ausseil, Parfitt, Herzig & McDowell, 2013; Larned, Moores, Gadd, Baillie, & Schallenberg, 2019).

18. The relationship between farming activities and water quality in New Zealand has been well-established through the Our Land and Water National Science Challenge[5]. example, science modelling indicates that long-term changes in river quality measured nationwide between 1990 and 2017 were closely associated with the proportion of upstream land dedicated to pastoral agriculture and plantation forestry, the type and intensity of the pastoral agriculture upstream, and how these factors changed over time (Snelder et al., 2022).

19. The issues that the Farming and Forestry Chapter of the pLWRP seeks to address are:

    a. Water quality is degraded in some parts of Otago, or there are declining trends;

    b. Many farming activities can negatively affect water quality by contributing to contaminants entering water bodies;

    c. Poor water quality can have adverse effects on the health of water bodies and associated ecosystems;

    d. Poor water quality is a risk to human health and wellbeing; and

    e. The loss and degradation of water bodies has resulted in material and cultural deprivation for Kāi Tahu ki Otago.

[5] https://ourlandandwater.nz/

### 1.2.1. Water quality is degraded in some parts of Otago

20. Both surface and ground water quality in Otago, as described above, is variable and ranges from excellent to poor. All FMU/rohe have at least one monitored attribute that does not meet its proposed target attribute state, or multiple degrading trends indicating that improvement is required for at least one attribute (Augspurger J. , 2024d). Freshwater pollution threatens our native species and habitats as well as having a high risk to human health and cultural wellbeing, practices, and knowledge (Ministry for the Environment, 2019b).

### 1.2.2. Farming activities have the potential to negatively affect water quality by contributing to contaminants entering water bodies.

21. In a report from 2013, the Parliamentary Commissioner for the Environment used modelling to show annual nitrogen loads on fresh water were continuing to rise in virtually every region in New Zealand. Figure 2 from the report showed "how these increasing nitrogen loads correlate with the expansion of dairy farming. Canterbury, Southland, and to a lesser extent, Otago, stand out" (PCE, 2013: p66). In an update report in 2015, the Parliamentary Commissioner for the Environment concluded that the 2013 modelling was "likely to have underpredicted the nutrients that will be lost from land into water" (PCE, 2015: p21).

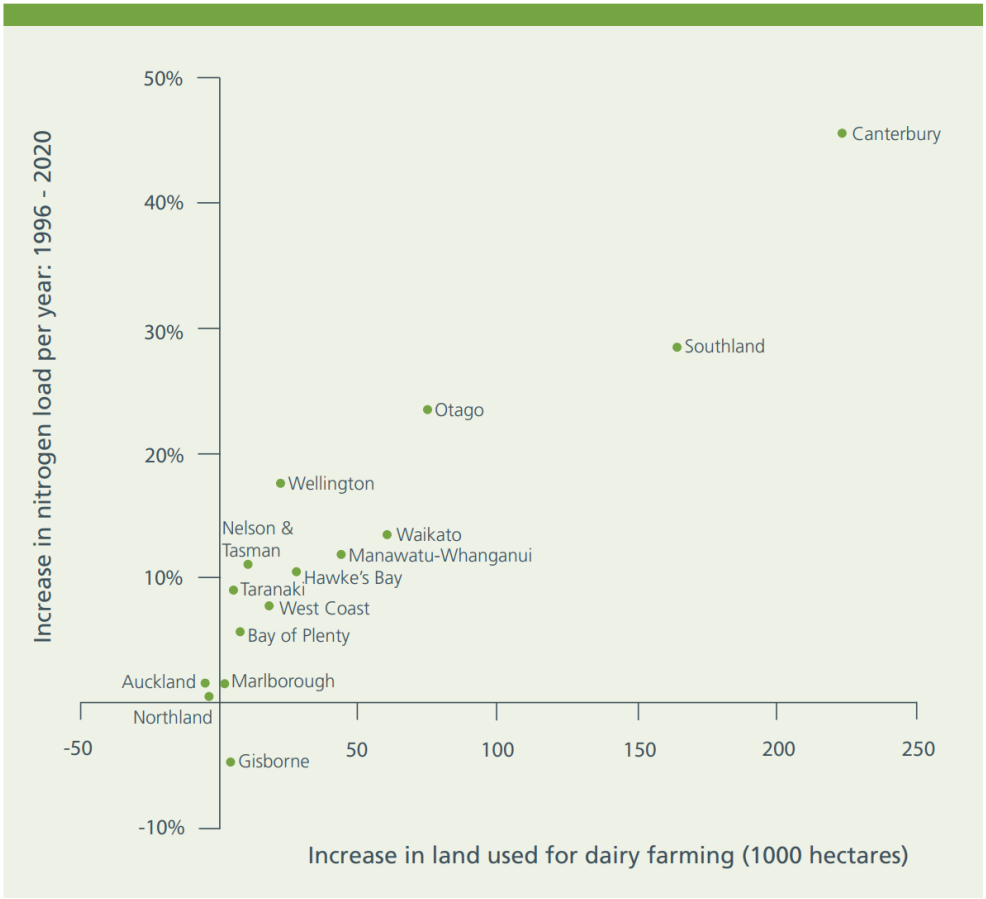


Figure 2: Predicted changes in land use and nitrogen loads between 1996 and 2020 (Source PCE, 2013)

22. The most recent state of the environment water quality for Otago was published in 2023 (Ozanne, Levy, & Borges, 2023) and covers states and trends to June 2022. Water quality for each river and lake site was graded based on the attribute bands in the NPSFM and is described in Chapter 2. General water quality patterns for each FMU across the region are also described in Chapter 2 of this report.

23. Trend analysis included in Otago's State of the Environment (Ozanne, Levy, & Borges, 2023) report provides context on whether sites are improving or degrading across a 10- and 20-year period. The 20-year trends show sites in many FMUS have degrading trends indicating that nitrate levels have increased. Ten-year trends show a much more varied result, indicating there are sites which have improving trends but there are also sites which have degrading trends. However, trends at the 10-year time scale are more strongly influenced by climatic variation within the time period than 20-year trends (Snelder T. , et al., 2022).

24. A regional aggregation of trend results indicates that, over the 20-year trend period, dissolved inorganic nitrogen and total nitrogen are showing degrading trends indicating nitrate levels have increased (Snelder, 2024). Over the 10-year trend period, the outcomes from total nitrogen and dissolved inorganic nitrogen are uncertain. An uncertain regional trend result does not mean strong trends are not present at a finer spatial scale. Instead, they mean there are sites which have improving trends but there are also areas which have degrading trends (Augspurger & Dyer, 2024).

25. The connectivity between groundwater and surface water across Otago is variable (Ozanne, Levy, & Borges, 2023). Certain areas in the region under intensive farming activity and located on strongly porous soils are showing higher nitrate levels.

26. Using StatsNZ data[6], the total land area of 'farms' in Otago decreased between 2002 and 2019 by 10% from 2.38 million ha to 2.14 million ha, while dairy cattle and beef cattle numbers increased. The region contains an estimated 1,905,000 ha of grazeable land (Pearson, 2024), which equates to 89% of the extent of farmland reported for 2019. Of the total grazeable land, just over 60% is in the Clutha FMU, just under 23% is in the Taiari FMU, and roughly 10% is in the North Otago FMU.

27. The almost 8-fold increase in dairy cattle is most notable, from approximately 44,000 animals in 1990 to around 350,000 in 2019 (StatsNZ data as cited in previous paragraph). The region's milk production has grown over the last 20 years, driven mainly by the increase in cow numbers and, to a lesser extent, an increase in milksolids per cow (Moran (Ed.), 2022). Milksolids production grew by 371% during the period 1995-2015, 56% of which can be attributed to improved milk production per cow and 316% from more cows (Moran (Ed.), 2022). Crops and imported supplements eaten per cow have gradually increased since 2007-98 while harvested supplements declined slightly (Newman & Davidson, 2019).

28. Figure 3 shows livestock trends using 'stock units', with the calculation simply based on stock types (not breeds or age classes) using the B+LNZ standardisation of one stock unit is the equivalent of one ewe with a lamb at foot (Moran (Ed.), 2023). The assumptions used

[6] https://www.stats.govt.nz/indicators/farm-numbers-and-size; https://www.stats.govt.nz/indicators/agricultural-and-horticultural-land-use

in this calculation were: 1 stock unit for all sheep, 2 stock units for all deer, 5.5 stock units for all beef cattle, and 7.5 stock units for all dairy cattle.

29. In the B+LNZ standardisation, mixed age beef cows are the equivalent of 5.5 stock units while hoggets, wethers, and rams are less than 1 stock unit. By comparison, Jersey cows are 6.5 stock units, Holstein-Friesian cows are 8.5 stock units, and grazing dairy cattle are 4.5 stock units. An ORC science memo (Crawford M. , 2023d) provides a discussion of the use of stock units and stocking rates in the Otago context.

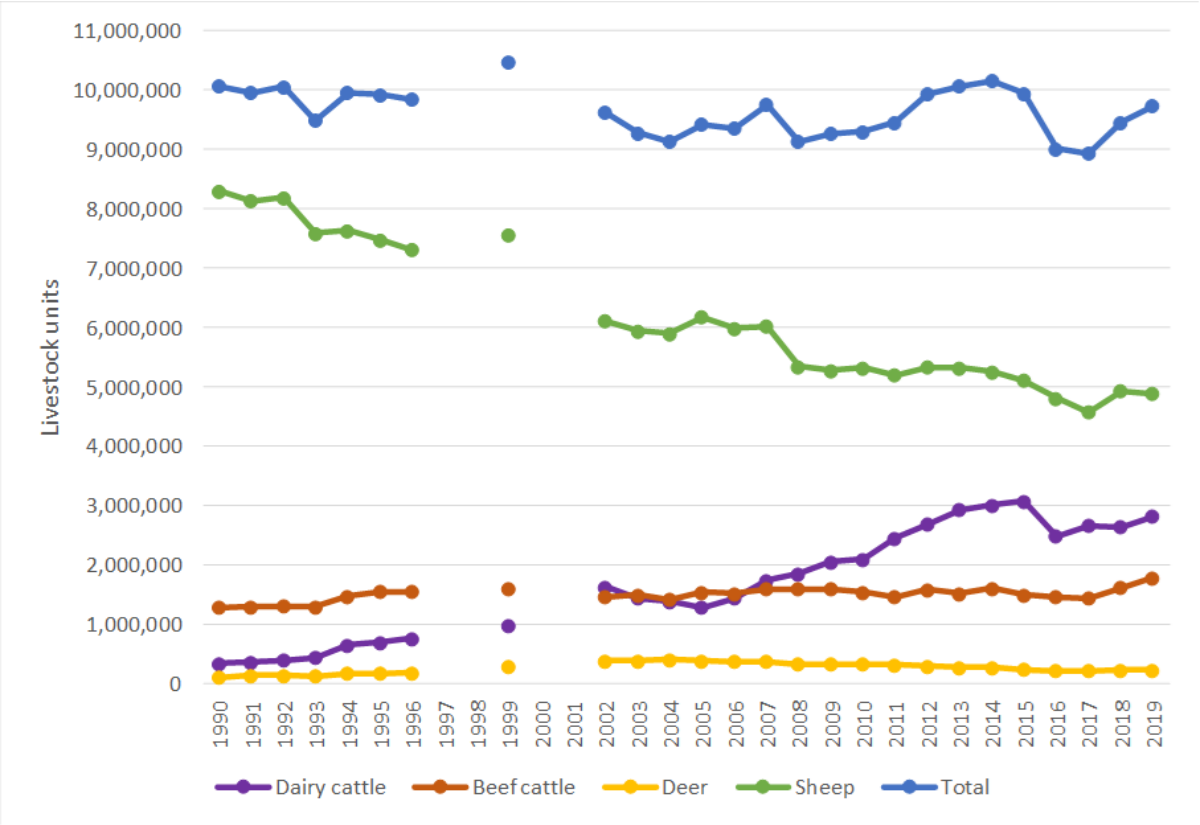


Figure 3: Livestock units in Otago 1990 – 2019 (source data StatsNZ)[7]

30. More nitrogen is lost to the environment from dairy farming (on a kg per ha basis) than any other pastoral farming practice in the region, largely due to high synthetic and animal-derived (faeces and urine) fertiliser use (Dengg & Button, 2023). These losses primarily occur as nitrate through the soil, which leaches into groundwater. Additional nitrogen losses from dairy farming occur in runoff directly to waterways, mostly as organic and ammoniacal nitrogen forms. Runoff also transports sediment, dissolved and particulate phosphorus, and microbial contamination (i.e. faecal coliforms[8] such as E.coli). Dairy farming's high demand for water can also put pressure on waterbodies.

[7] https://www.stats.govt.nz/indicators/livestock-numbers.

[8] Faecal coliforms (i.e., bacteria) are associated with all types of livestock farming and their concentrations in water often increase after rain events when significant amounts of faecal matter are washed from pastures into streams. Faecal matter persists on pastures after animals have been moved and contamination of waterways by faecal bacteria can therefore occur up to two years later (Dengg & Button, 2023).

31. Sheep and beef cattle farming is the most predominant land use in Otago and the region is home to roughly 20% of New Zealand's sheep flock (the highest share of any region in the country) and 9% of its beef herd (Moran (Ed.), 2023). As such, sheep and beef farming occurs across many different types of landscapes. The main environmental risks from sheep and beef cattle farming on water quality occur largely in run-off (i.e., overland flow). The risks are losses of sediment, sediment-bound nutrients (particulate phosphorus, organic and ammoniacal nitrogen), microbial contamination, and dissolved nutrients.

32. Deer farming (specialist and majority) is less widespread in Otago than sheep and beef farming or dairy farming, and it also occurs as an enterprise within a mixed livestock operation. The environmental risks have similarities with those associated with sheep and beef farming, and largely occur in run-off. They are losses of sediment, sediment-bound nutrients, dissolved nutrients, and microbial contamination. Additional risks can result from the natural behaviours of deer at different age classes, such as wallowing and (when stressed) excessive pacing, especially along fence lines (Moran (Ed.), 2023).

33. Horticulture (including vegetable operations, orchards, and vineyards) and arable farming cover comparatively small areas of Otago (Moran (Ed.), 2022). When poorly managed, the main pressures from vegetable growing on the environment, in no particular order, are the use of pesticides, herbicides, fertilisers, water for irrigation, and soil disturbance and loss (Dengg & Button, 2023). Longer periods of fallow (bare soil) and soil mineralisation are the two key drivers of contaminant loss for vegetable and arable systems.

34. The environmental risks of mixed arable farm systems largely come from the joint management of the crops and the stock (D. Mathers in Moran, Pearson, & Couldrey, 2019). No arable crop is markedly better or worse than others in terms of nutrient and sediment losses and risks occur more through poor management practices, either related to crop production or the grazing management of the crop (D. Mathers in Moran, Pearson, & Couldrey, 2019).

35. Many land uses also rely on irrigation, especially in more arid localities in Otago. Water takes used for irrigation can lead to lower than natural flows in streams and rivers and negatively affect ecosystem health. Changing natural water levels has also been linked to degrading river habitats.

36. For all production systems, poor fertiliser use, heavy machinery plus poor cultivation methods (combined with their overuse) results in soil degradation and losses of soil organic matter. Soil erosion leads to increased sediment loads in waterbodies. Other contaminants can be bound to, and transported with, this sediment, particularly where it originated from more intensively farmed areas. In other words, sediment quality is often an issue in addition to sediment quantity.

### 1.2.3. The loss and degradation of water bodies has resulted in material and cultural deprivation for Kāi Tahu ki Otago

37. The pORPS sets out the resource management issues of significance to iwi in the region. The issues relevant to this topic are:

    a. RMIA–WAI–I1 – The loss and degradation of water resources through drainage, abstraction, pollution, and damming has resulted in material and cultural deprivation for Kāi Tahu ki Otago.

b. RMIA–WAI–I3 – The effects of land and water use activities on freshwater habitats have resulted in adverse effects on the diversity and abundance of mahika kai resources and harvesting activity.

c. RMIA–MKB–I1 – The diversity and abundance of terrestrial and aquatic indigenous species has been reduced due to adverse effects of resource use and development.

38. Deterioration of water quality and habitats as a result of pollution from point and non-point sources has a direct impact on iwi practices. A loss of mahika kai places and species has meant that Kāi Tahu have had to adapt and change their use of the environment. Whanau are unable to access traditional mahika kai and taoka species and places because in many cases they no longer exist, or no longer provide resources that were once abundant there. This loss of Kāi Tahu culture also has ongoing impacts on the intergenerational transfer of knowledge.

## 1.3. Status quo policy context (including operative plan provisions)

39. From a policy perspective, the status quo for farming activities includes relevant provisions in two regional plans for Otago, as well as existing regional and national policy direction. The current planning framework for the pLWRP is discussed in Chapter 3 of this report and the full policy context is discussed in Chapter 5. This section surveys the following documents in relation to farming activities:

a. The Regional Plan: Water for Otago

b. The Regional Plan: Waste for Otago

c. The operative Regional Policy Statement for Otago 2019

d. The proposed Regional Policy Statement for Otago

e. National Policy Statement for Freshwater Management 2020

f. National Environmental Standards for Freshwater 2020

g. Resource Management (Stock Exclusion) Regulations 2020

h. Resource Management (Freshwater Farm Plans) Regulations 2023

### 1.3.1. The Regional Plan: Water for Otago (the RPW)

40. As discussed in Chapter 3, the approach taken in the Rural Water Strategy and the RPW for managing discharges of contaminants to water was intended to reduce the adverse effects of land use practices on water quality, without imposing unnecessary costs on land managers. This approach was ineffective for managing adverse effects on the environment because it required discharges to occur before compliance could be assessed and implementing a framework that meant that compliance could vary on a day-to-day basis and may be impossible to determine at all. Plan Change 6AA sought to address the issues that had been identified in Plan Change 6A by delaying the implementation of Rule 12.C.1.1A, which now does not come into effect until 2026 (previously 2020), by which time it was anticipated that a new LWRP would be in place.

41. There has previously been a lack of detailed information held by ORC on local or catchment scale land use change or land management practice changes. Land use activity and land resources have not been monitored by ORC, thus significantly restricting the ability to

investigate the effect of land use activity on water quality. This issue makes is difficult to quantify how many resource consents may be required under PC6A should it become operative. However, the s32 report for PC6A states that a large number of consent applications can be expected to be lodged in advance of Rules 12.C.1.1(g), 12.C.1.1A (Schedule 16) and 12.C.1.3 (Overseer) coming in to force. This expectation is because many land users are likely to seek consents to ensure they can continue their activities, even when their discharges have minor environmental effects, and comes at a cost for those land users (PC6A s32 Report).

42. ORC's Science team is addressing this data deficiency and is developing a land science programme to enable ORC to comment on drivers of water quality trends across Otago in coming years. This is also being addressed by requirements in the NPSFM (2020), which requires freshwater to be managed in an integrated way and considers the effects of the use and development of land on a whole-of-catchment basis, including the effects on receiving environments. Part of that response includes managing land in the proposed LWRP (Ozanne, 2021).

43. There are few provisions in the RPW managing land use. In 2011, in response to water quality monitoring showing a decline in water quality in some parts of Otago, ORC released its Rural Water Quality Strategy that set out an effects-based approach to managing rural discharges (primarily diffuse discharges) to water. The Strategy outlined the Council's decision to control the discharge of contaminants from land to water instead of controlling land use activities and nutrient inputs. It was considered that this would reduce the effects of land use practices on water quality, without imposing unnecessary cost on land managers (Otago Regional Council, 2011).

44. Plan Change 6A did introduce a suite of provisions that sought to manage diffuse discharges from rural land uses in 2014. However, by 2018, it was apparent that the permitted activity rules were ambiguous, unenforceable and uncertain. Plan Change 6AA delayed the implementation of the problematic PC6A provisions from 1 April 2020 to 1 April 2026, by which time it was assumed that a new LWRP would be in place. These plan changes are further discussed in Chapter 3.

45. In accordance with section 9 of the RMA, uses of land are allowed unless otherwise managed by a national environmental standard, a rule in a regional or district plan, or resource consent. As such, most farming activities have been unconditionally permitted in Otago. Any discharges associated with these activities are managed by the general discharge provisions in section 12 of the RPW. This framework has not stopped degradation in Otago. While some areas may be improving over the most recent 10-year period, others are degrading and there is potential for further degradation to occur. Therefore, to improve water quality, measures which stop further degradation are required regardless of whether sites fall below national bottom lines.

46. The RPW does contain provisions managing livestock access to water. However, these have now been largely superseded by the Resource Management (Stock Exclusion) Regulations 2020 (Stock Exclusion Regulations).

47. Plan Change 8 (PC8) to the RPW did introduce land use provisions for some activities in 2022. PC8 introduced a suite of rules managing animal effluent storage and application to land. The management framework seeks to permit existing storage facilities that meet good practice standards or are lower risk to the environment and require resource consent

for others. It requires resource consents for discharges of liquid animal effluent to land. The implementation of these provisions is staged over a three-year period that commenced in June 2022.

48. The RPW does not contain any specific policies for managing the discharge of fertilisers, instead relying on the general water quality policies set out in Chapter 7 (Water Quality). The relevant rule (Rule 12.B.1.5) permits the discharge of fertiliser as long as all reasonable measures are taken to minimise any discharge of the fertiliser to water in any water body, drain or water race, or to the coastal marine area, the discharge is carried out in accordance with the manufacturer's directions, and there is no damage to fauna or New Zealand native flora, in or on any Regionally Significant Wetland. If the activity cannot meet these conditions, then it is a discretionary activity.

### 1.3.2. The Regional Plan: Waste for Otago (the Waste Plan)

49. Some farming activities, such as farm landfills, offal pits and silage storage are currently managed under both the RPW and the Waste Plan, leading to inefficiencies and unnecessary duplication in consenting processes.

50. Offal pits on production land, farm landfills and discharges from silage production are permitted activities under the Waste Plan when certain conditions are met. Conditions include avoiding seepage to groundwater and leaching to surface water, setbacks from waterbodies, wells, and property boundaries, and only material from the property is deposited into the pit/landfill. A further condition is that they should not cause a nuisance or be offensive, dangerous or objectionable beyond the property boundary.

51. Most of the provisions of the Waste Plan have not been reviewed since it became operative in 1997 (27 years ago). The permitted activity conditions for the activities are out of date and several are no longer aligned with current practice.

### 1.3.3. The proposed Regional Policy Statement for Otago (pORPS)

52. There are several chapters of the pORPS that are relevant to the management of all natural and physical resources. The IM – Integrated Management Chapter seeks that activities are managed in a way that embraces ki uta ki tai and to achieve the long-term vision of a healthy and resilient natural environment that supports the well-being of present and future generations. The LF – Land and Freshwater Chapter is the most directly relevant to the FF Chapter and sets out expression of Te Mana o te Wai in Otago (LF-WAI-O1) and contains the long-term visions (and the timeframes for achieving them) for freshwater in Otago's FMUs and Rohe (LF-FW-O1A and LF-VM-O2 to O6)[9]. The LF-LS – Land and Soil Chapter contains more specific direction on the management of land and soils and in particular seeks to recognise the connection between activities on the land and their effects on freshwater. Of particular relevance to the FF Chapter are:

a. LF–FW–P6A provides direction for recognising that changes to practices and activities will need to occur over time and managing the adverse impacts of changes

[9] LF-FW – Fresh water Chapter of the pORPS.

on peoples and communities can be achieved by phasing implementation of new requirements and enabling innovation and development of new practices.

b. LF–FW–P16 requires that the adverse effects of direct and indirect discharges containing animal effluent are minimised.

c. LF–LS–O12 requires that the use, development and protection of land and soil contributes to achieving environmental outcomes while recognising the role of these resources in providing for the social, economic, and cultural well-being of Otago's people and communities.

d. LF–LS–P20 encourages the promotion of changes in land use or land management practices that support and improve: the sustainability and efficiency of water use, resilience to the impacts of climate change, the health and quality of soil or water quality.

e. LF–LS–P21 requires that the health and well-being of water bodies and freshwater ecosystems is maintained to meet environmental outcomes set for Freshwater Management Units and/or rohe by reducing or otherwise maintaining the adverse effects of direct and indirect discharges of contaminants to water from the use and development of land.

### 1.3.4. The operative Regional Policy Statement for Otago 2019 (ORPS)

53. The ORPS requires that ORC maintain good water quality and improve it where it is degraded and set limits and targets to give effect to the National Policy Statement for Freshwater Management 2014. Of particular relevance to the FF Chapter are:

a. Objective 1.1 states that Otago's resources are used sustainably to promote economic, social, and cultural wellbeing for its people and communities.

b. Objective 3.1 states that the values (including intrinsic values) of ecosystems and natural resources are recognised and maintained, or enhanced where degraded.

c. Policy 3.1.1 requires that the life-supporting capacity of fresh water is safeguarded and managed for a number of reasons including for existing drinking water and stock water supplies.

d. Policy 3.1.3 requires the management of allocation and use of fresh water by recognising and providing for the social and economic benefits of sustainable water use, avoiding over-allocation, and phasing out existing over-allocation, resulting from takes and discharges.

e. Objective 5.3 states that sufficient land is managed and protected for economic production.

f. Policy 5.3.1 requires the management of activities in rural areas, to support the region's economy and communities by enabling primary production and other rural activities that support production.

g. Objective 5.4 provides direction so that the adverse effects of using and enjoying Otago's natural and physical resources are minimised.

h. Policy 5.4.1 requires the management of offensive or objectionable discharges

i. Policy 5.4.2 provides direction for the use of adaptive management approach to avoid, remedy or mitigate actual and potential adverse effects that might arise and that can be remedied before they become irreversible by setting appropriate indicators for effective monitoring and thresholds to trigger remedial actions.

j. Policy 5.4.3 provides direction for the use of a precautionary approach to activities where adverse effects may be uncertain but are potentially significant or irreversible.

### 1.3.5. National Policy Statement for Freshwater Management 2020 (NPSFM)

54. The NPSFM contains provisions that are relevant to the FF Chapter.

55. Policy 5 directs a key outcome for water quality: to improve degraded water bodies, maintain the health and well-being of all other water bodies, or improve them if communities so choose. 'Degraded' water bodies are those that do not meet a prescribed national bottom line, or if a target attribute state has been set, it is not being achieved. The NPSFM also requires that the condition of waterbodies and freshwater ecosystems are systematically monitored over time, and action is taken where freshwater is degraded, and to reverse deteriorating trends (sections 3.18-3.20).

56. Section 3.5 requires an integrated approach to freshwater management, ki uta ki tai, recognising the interactions between freshwater, land, water bodies, ecosystems, and receiving environments in order to manage freshwater, and land use and development in an integrated and sustainable way to avoid, remedy, or mitigate adverse effects, including cumulative effects, on the health and well-being of water bodies, freshwater ecosystems, and receiving environments.

57. Section 3.12 sets out direction on how to chieve target attribute states and environmental outcomes by identifying limits on resource use and including those limits as rules in regional plans. Regional councils may also prepare action plans or impose conditions on resource consents to achieve target attribute states.

58. Section 1.6 requires that in giving effect to the NPSFM, local authorities must use the best information available at the time. This means using complete and scientifically robust data where it is available. Best information may include information obtained from modelling, as well as partial data, local knowledge, and information obtained from other sources. Local authorities must prefer sources of information that provide the greatest level of certainty and take all practicable steps to reduce uncertainty. They must not delay making decisions solely because of uncertainty about the quality or quantity of the information available and if the information is uncertain, must interpret it in the way that will best give effect to the NPSFM.

### 1.3.6. National Environmental Standards for Freshwater 2020 (NESF)

59. The National Environmental Standards for Freshwater 2020 (NESF) introduced restrictions on certain farming activities that pose risk to freshwater and freshwater ecosystems.

60. The standards are designed to set minimum requirements for feedlots and other stockholding areas, improve intensive winter grazing practices, limit the discharge of synthetic nitrogen fertiliser to land and require reporting of its use.

61. Feedlots that hold cattle over four months old or weighing more than 120kg require a resource consent. To be a discretionary activity, the feedlot must be sealed and effluent must be collected, stored and disposed of in accordance with a rule in a regional or district plan or a resource consent. Younger and smaller cattle are considered to be less of an environmental risk.

62. Stockholding areas, other than feedlots, that hold cattle less than four years old or 120kg or older and heavier cattle where the stockholding area is sealed and effluent is collected, stored and disposed of in accordance with a rule in a regional or district plan or a resource consent, or the farm has a certified freshwater farm plan that applies to the stockholding area.

63. The Intensive Winter Grazing regulations apply to the grazing of livestock on annual forage crops between 1 May and 30 September. It provides a permitted activity status for lower impact winter grazing practices where the conditions are met. The conditions relate to area being grazed, slope, setbacks from water bodies and proactively managing critical source areas. Reasonably practicable steps must be taken to minimise adverse effects on freshwater of pugging and land must be revegetated as soon as possible after grazing has finished. A certified freshwater farm plan pathway is provided for.

64. The Resource Management (Freshwater and Other Matters) Amendment Bill was introduced to Parliament in May 2024 and proposes to revoke the provisions regulating intensive winter grazing as a permitted activity (regulations 26 and 27 to 31). The Pugging standard and ground cover standard (regulations 26A and 26B) remain.

65. The discharge of synthetic nitrogen is a permitted activity provided the maximum annual application (discharge) of synthetic nitrogen fertiliser is at or below 190 kg N/ha (the "fertiliser cap").

66. The NESF also restricts further agricultural intensification until the end of 2024, on the basis that by that date regional councils should have regional plans that give effect to the NPSFM 2020.

67. Until December 2024, the NES requires a resource consent for the following:

    a. To convert more than 10 hectares of farmland to dairy farming

    b. To convert more than 10 hectares of land from plantation forestry to pastoral farming

    c. To expand irrigation by more than 10 hectares on dairy farms

    d. To expand the area of intensive winter grazing on forage crops above a historical baseline, and

    e. To expand the area of dairy support above a historical baseline.

68. Conversion of land and associated discharges below these thresholds are permitted activities under the NESF. The NESF allows for more stringent rules to be included in regional plans.[10]

[10] Clause 6(1), NESF 2020

### 1.3.7. Resource Management (Stock Exclusion) Regulations 2020 (the Stock Exclusion Regulations)

69. The Resource Management (Stock Exclusion) Regulations 2020 (the Stock Exclusion Regulations) manage the access of livestock to water bodies across New Zealand.[11] Stock must be excluded from specified wetlands, lakes and wide rivers (with a bed that is wider than 1 metre anywhere in a land parcel) in specific circumstances. Stock must be excluded from a setback of three metres to the edge of the bed of a lake or wide river, unless a permanent fence or riparian vegetation already effectively excludes stock.

70. The Stock Exclusion Regulations require that:

    a. Dairy cattle, dairy support cattle and pigs are excluded from lakes and wide rivers regardless of the terrain.

    b. Beef cattle and deer are excluded from lakes and wide rivers regardless of the terrain if they are break-feeding or grazing annual forage crops or irrigated pasture. Otherwise, the requirements apply to beef cattle and deer only on mapped low slope land, unless other restrictions apply.

    c. Stock are excluded from any natural wetlands that:

        i. are identified in an RPS or a district or regional plan that was operative on 3 September 2020, or

        ii. support a population of threatened species as described in the compulsory value for threatened species in the NPSFM, or

        iii. have an area of 0.05 hectares or more and are located on low slope land.

71. Stock, except deer, may only cross a river or lake by using a dedicated bridge or culvert, unless they cross no more than twice in any month. The regulation sets out circumstances when cattle and pigs can cross without a dedicated culvert or bridge. Deer are not subject to restrictions for crossing water bodies.

72. The Resource Management (Freshwater and Other Matters) Amendment Bill amends the Stock Exclusion Regulations by revoking the provisions regulating the grazing of beef cattle and deer on low slope land and the provisions requiring stock on low slope land to be excluded from natural wetlands of 0.05 hectares or more.

73. Within the Upper Taiari Scroll Plain, the requirement to exclude all stock from natural wetlands and non-intensively grazing beef cattle and deer from lakes and wide rivers on low slope land does not apply. This exception is due to the size and complexity of these wetlands and the practical challenges with excluding stock. It has been provided on the basis that ORC implements suitable provisions in its regional plan for managing grazing within the wetlands, as soon as reasonably practicable and no later than 1 July 2025.

74. The Stock Exclusion Regulations allow for more stringent rules to be included in regional plans.[12]

[11] Under the Stock Exclusion Regulations, the term 'stock' includes beef cattle, dairy cattle, dairy support cattle, deer and pigs, but excludes any feral animal.

[12] Regulation 19, Stock Exclusion Regulations.

### 1.3.8. Resource Management (Freshwater Farm Plans) Regulations 2023

75. Freshwater farm plans have been legislated under Part 9A of the Resource Management Act 1991 (RMA) and the Resource Management (Freshwater Farm Plans) Regulations 2023. They are a farm planning process that puts the health of the land and water at the centre of farm decision making.

76. A farm, orchard or block must have a Freshwater Farm Plan if it has:

    a. 20 or more hectares in arable or pastoral land use, or

    b. 5 or more hectares in horticultural land use, or

    c. 20 or more hectares in mixed use (of any two or more of the above).

77. The Freshwater Farm Plan process requires farmers and growers to identify on-farm risks to freshwater and to determine actions to manage those risks based on the:

    a. Farm's landscape features and natural environment;

    b. Farming activities;

    c. Environmental health and cultural and community values of the local catchment (identified in the catchment context, challenges and values information supplied by regional councils).

78. Freshwater Farm Plans will need to be certified and audited. The results of certification and auditing will be reported to the regional council.

79. Freshwater farm plans will tie into regional council plans and will be a way for farmers to document actions they are taking to meet council rules and requirements. They do not replace resource consents or rules. However, Freshwater Farm Plans may, in some cases, be used instead of obtaining a resource consent. The farm operator will need to show that any adverse effects caused by the activity are no greater that those allowed for under the permitted activity (default) conditions.

80. Freshwater Farm Plans will be commenced region by region, across the country. Each region will determine how the system is phased in within their region. This may mean that sub-regions are commenced at different times. Farmers and growers will have 18 months from the day of the system commencement to submit a plan for certification.

81. In Otago, Freshwater Farm Plans are being phased in FMU by FMU from February 2024 as shown in Table 1.

Table 1: Phasing order for Freshwater Farm Plan in Otago

| Order | Catchment | Commencement date | Anticipated Number of farms | Approximate area to be covered by Freshwater Farm Plans (ha) |
|---|---|---|---|---|
| 1 | North Otago FMU | February 2024 | 756 | 265,000 |
| 2 | Lower Clutha rohe | August 2024 | 821 | 337,000 |
| 3 | Rest of Clutha FMU (Upper Lakes, Dunstan, Manuherekia, and Roxburgh rohe) | February 2025 | 913 | 1,033,000 |

| Order | Catchment | Commencement date | Anticipated Number of farms | Approximate area to be covered by Freshwater Farm Plans (ha) |
|---|---|---|---|---|
| 4 | Taiari FMU | August 2025 | 520 | 485,000 |
| 4 | Catlins FMU | August 2025 | 185 | 84,000 |
| 5 | Dunedin and Coast FMU | December 2025 | 342 | 86,000 |

82. Government ministers have stated an intention to amend the Freshwater Farm Plan Regulations but at the time of writing, it is unclear what these changes may be or how they may be staged.

## 1.4. Objectives

83. Section 32(1)(b) of the RMA requires an examination of whether the provisions in a proposal are the most appropriate way to achieve the objectives. Chapter 6 of this s32 report evaluates the objectives included in the pLWRP by chapter. Although there are no specific objectives for the FF Chapter, those that are relevant to farming include the integrated management objectives as well as the environmental outcomes contained in the specific FMU chapters.

## 1.5. Option development process

84. In order to achieve the target attribute states, regional councils are required to identify limits on resource use and include those limits as rules in their plans. Development of the options for the farming provisions of the pLWRP followed a basically sequential process (with the last two steps being iterative). Each step listed here is described in more detail below (they were not always sequential) – the options themselves are outlined in section 1.6 of this chapter:

a. Review of existing policy framework for Otago (RPW, Waste Plan and national direction) and gap analysis

b. Desktop review of other councils' approaches

c. Development of a suite of possible actions based on Good Management Practices (GMP, GMP+ and GMP++) and scientific modelling

d. Engagement on the suite of possible actions (e.g., Stage 2 community engagement and Stage 3 community engagement)

e. Economic assessment of actions relevant to Otago farms (including growing operations)

f. Consideration of whether Regionwide vs FMU-based provisions were most appropriate for an action

g. Consideration of Permitted Activity, Consents, Freshwater Farm Plans pathways for the actions

### 1.5.1. Review of existing framework and gap analysis

85. As discussed in 2.3 of this Chapter and in Chapter 3, most of the provisions of the RPW and the Waste Plan are now out of date and no longer fit for purpose. While there are some parts of the RPW that are appropriate, such as the recently developed effluent management provisions, many provisions relevant to farming have substantial deficiencies, an example being the PC6A nutrient management framework. The effluent management provisions were made operative in 2022 following an Environment Court process and only minor changes for clarity or consistency are needed.

86. Considering the existing national regulations and consultation with ORC staff (in particular from consents and compliance teams), some gaps in the NESF were identified that need to be addressed for the Otago context. For example, minimum standards (including setbacks) for feedlot construction for small and young cattle, and management of pasture-based winter grazing for cattle and sacrifice paddocks.

87. The intensification regulations in the NESF are temporary and will expire on 1 January 2025. If on-farm practices prove to be not sufficient in achieving target attribute states, then more stringent management, including changes in land use (refer to section 1.5.8 of this Chapter), will be needed in the long-term. While it is not the intent that such a step be included in the pLWRP, it is beneficial that this possible future change is signalled now. Limiting further intensification in the interim period will help resource users avoid investing in activities that may be further constrained in the future.

### 1.5.2. Desktop review of other councils' approach

88. A desktop exercise was undertaken to review the provisions that other councils have included in their regional plans. As Otago Regional Council's neighbours, the farming provisions in the Environment Canterbury and Environment Southland plans were analysed, particularly the recent Environment Court decisions on those plans[13]. While it is useful to learn from other approaches, it is important that the pLWRP is specific to Otago and that management of activities is based on risk. Risk includes consideration of the leniency of the pLWRP compared with plans in neighbouring regions to avoid creating an incentive for people to move high-risk activities into Otago, which could exacerbate any existing water quality issues or create new ones.

### 1.5.3. Development of a suite of actions (GMP, GMP+ and GMP++) and scientific modelling

89. The ORC Science Team started with a published suite of environmental actions that can be adopted on-farm to reduce losses of excess nitrogen and phosphorous (McDowell, et al., 2020; Monaghan, et al., 2021; Monaghan, et al., 2021a). These nutrients are mainly associated with dairy farming as well as sheep and beef farming (Mackey, 2022). The suite of actions was refined and used in farm models and management scenarios for Otago by Sise et al. (2021). Modelled baseload nutrient losses for farming 'typologies' (Srinivasan et al., 2021) were then adapted for the Otago region by Marapara (2022c), based on technical

[13] Decision No. [2022] NZEnvC 265; Decision No. [2023] NZEnvC 051 and Decision No. [2023] NZEnvC 87

expert advice from Dr. Ross Monaghan, before being applied to the farm models and management scenarios.

90. A summary of the farm based modelling is contained in the report "Review of mitigation modelling and assumptions for Otago Regional Council" (Doole, 2023; Srinivasan, et al., 2021; McDowell, et al., 2020; Monaghan, et al., 2021; Monaghan, et al., 2021a) are all published papers from the Our Land and Water National Science Challenge.

91. In this context, Good Management Practices (GMP) are a subset of the refined suite of environmental actions identified. Good Management Practice Plus (GMP+) is a more stringent set of practice controls that could be applied in addition to GMP, to further reduce contaminant losses. These actions are generally more difficult, expensive, or take longer time frames to implement (Marapara, 2022c). Good Management Practice Plus Plus (GMP++) includes additional 'outside of the box' activities that are less acceptable, due to technology, cost, and time. GMP++ includes limited land use change. These types of environmental actions will not be included in the pLWRP at this stage. However, if they are to be implemented in the future, it is helpful if the pLWRP signals this longer term direction.

92. The results of water quality scenario modelling indicate that the combination of GMP and GMP+ actions may achieve large 'on-land' reductions in nutrients. These reductions generally result in improvements in water quality trends or movement within an attribute band rather than changing attribute bands. Therefore, where a target attribute state is set at, or near, the baseline state, GMP and GMP+ actions are likely to result in achieving the targets. Reductions beyond those possible through GMP+ actions may be needed to comply with the target attribute state where it is set above the baseline state (Augspurger J. , 2024b; Augspurger J. , 2024c).

93. In addition to this science modelling, a series of memos were prepared between 2022 and 2024 for the policy process on mitigations and specific farming activities. The series included:

    a. Mitigations for minimising nutrient loss from farming systems (Marapara, 2022b).

    b. Silage Impacts to the Environment (Crawford M. , 2023a)

    c. Feedlot Standoff pads – Impermeable layer and setback distances (Crawford M. , 2023b)

    d. Nitrogen limits and their impact within Otago region (Crawford M. , 2023c)

    e. Stocking Rate definitions and threshold values (Crawford M. , 2023d) and

    f. Winter Grazing and Sacrifice paddocks (Crawford, 2023e)

### 1.5.4. Engagement on the suite of actions (GMP, GMP+, and GMP++)

94. The full sets of GMP, GMP+ and GMP++ actions were consulted on in Stage 2 community engagement, which was a community engagement phase that occurred from October to December 2022. There was high-quality engagement with the community on the suite of actions, which highlighted a number of practical issues with translating the actions into the Plan. These are discussed below.

95. Generally, the rules in the pLWRP are activity-based and seek to ensure GMP are implemented on-farm. There is no simple correlation of these rules to the actions. Many

of the actions are generally applicable across activities and have been applied over a number of the rules, for example buffer strips are GMP actions that correlate to setbacks across many of the rules.

96. Some of the actions identified as GMP are not well-suited to being generally prescribed in regulation (i.e., they may be unduly prescriptive) and it can be more effective to tailor management of the activities that they relate to while minimising effects. For example, the use of less soluble fertiliser, catch crops or on/off grazing are often best managed according to the needs of a specific farm, the climate and weather conditions. In such cases, they are better suited to individual assessment within Freshwater Farm Plans or consents.

97. It can be challenging, from a compliance perspective, to include some of the actions within rules. For example: for on/off grazing, it would be impractical and inefficient to have compliance trying to measure how many hours in a day that cows have been in a paddock, but by setting minimum standards on stockholding areas and sacrifice paddocks, on/off grazing can occur and the effects on the environment can be minimised.

98. Consequently, the pLWRP is the first step in a long-term transition towards achieving environmental outcomes and long-term visions[14]. Although it will represent a significant change in Otago's existing approach to managing freshwater resources, it will not be sufficient on its own to achieve the desired outcomes for water quality in the long-term. Decisions about timeframes will depend on the gap between current and future states, the costs involved in changing practices and production systems, and the appetite of the community to change. It is not necessarily feasible to require significant change within a short time period, and the NPSFM recognises this – target attribute states and the timeframes for achieving them may include interim states and timeframes.

### 1.5.5. Economic assessment of actions relevant to Otago farms and growing operations

99. Alongside the science modelling, in late 2021 the Council formed a group of industry-good organisations to undertake economic research on farming and growing through a collaborative process within ORC's Economic Work Programme (described in Chapter 4). This group was known as the Industry Advisory Group and its membership included (in addition to ORC and MPI): Beef + Lamb New Zealand, Deer Industry Association, DairyNZ, the Foundation of Arable Research, Central Otago Winegrowers Association, and Horticulture New Zealand.

100. The research first characterised farming and growing across Otago (Moran (Ed.), 2022) and then tested actions relevant to specific farms and growing operations (Moran (Ed.), 2023). Critical to this research was the use of high quality data for real rural businesses in Otago (refer to Table 2 below). Through the MPI Farm Monitoring Programme, MPI provided funding to support industry organisations for the collation of sufficient detailed farm level data from Otago farmers and growers to assist with this research.

101. Also included in section 2.4 of (Moran (Ed.), 2022) is a brief overview of Māori agri-business in Otago. Māori agribusiness consists of a broad range of enterprises typically

[14] LF-FW – Fresh water Chapter of the pORPS.

involving collectively owned and managed Māori freehold land, general land that is owned and farmed together with Māori freehold land, and Māori farming general land on their individual account (MAF, 2011 as cited in Moran (Ed.), 2022).

102. All of the other research undertaken within the Economic Work Programme is also relevant to the farming provisions of the pLWRP: *Otago Catchment Stories Summary Report* (Reilly, 2022), *The Regional Economic Profile* (Yang & Cardwell, 2023), and *Wai Māori and Kāi Tahu Economy* (Timms-Dean, McIntyre, Duncan, & Moran, 2024).

103. The *Otago Catchment Stories Summary Report* (Reilly, 2023) was available early in the policy process and provided ORC with the views of representatives of catchment groups: on current progress, challenges, key lessons, and what success looks like. A map showing the catchments represented is included in Chapter 4.

104. Of particular note from the report (Reilly, 2023) was that:

a. Typically, it was the activation of community members that make a difference when it comes to achieving goals on the ground, and therefore that keeping the community working together on solutions, and sharing lessons, challenges and opportunities ensures the best chance of success.

b. Most interviewees had positive views of the involvement of stakeholders in their catchment groups and projects. In particular, there was a common desire to foster stronger iwi relationships and more active rūnaka connection with groups across the board. Some groups had connections with individuals affiliated to papatipu rūnaka in relation to some of their work programmes and this was also really valued.

105. The bulk of the Economic Work Programme (including the Industry Advisory Group's economic research) occurred slightly ahead of policy development for the farming section of the pLWRP, although some early policy thinking was provided as a guide. The reason for this timing was so the results of that research would be available to inform the development of policy options. The results and findings have provided the Council with a general knowledge base to draw on across many topics related to farming in the pLWRP. It is this knowledge that was important in the assessment of options, rather than whether the exact policy settings within each option were specifically tested.

106. Table 2 summarises the topics covered by the environmental actions tested for 56 farms and growing operations from a sample size of 105 that was included in the Industry Advisory Group's economic research. The main research findings are available in Moran (Ed.) (2023).

107. The suite of actions (GMP, GMP+, and GMP++) used in the science modelling also informed the dairy analysis (refer to pages 217-220 in Moran (Ed.), 2023)[15]. However, industry groups considered that the specified actions were not necessarily well-suited across drystock farming in Otago because of the complexity and diversity of these farms. Nationally Agreed Good Farming Practice Principles were used instead in the sheep and beef farming analysis (refer to pages 46-54 in Moran (Ed.), 2023).

[15] Good management practices (GMPs) are complex and evolve over time. The suite of 'GMPs' and 'GMP+s' referred to in Moran (Ed.) (2023) does not necessarily reflect those that may actually be required by the pLWRP.

Table 2: Summary of the Industry Advisory Group's economic research for 105 real rural businesses in Otago

| Industry | Research | Topics covered by environmental actions tested in economic research |
|---|---|---|
| Sheep and beef farms | 16 case studies from a sample of 41 farms, which also reported on.<br>The sample size is roughly 4.5% of the commercial sheep and beef farms in Otago. | Phosphorus fertiliser<br>Waterway protection<br>Biodiversity<br>Irrigation<br>Nitrogen fertiliser<br>Tussock lands<br>Farm system change |
| Deer farms | 5 case studies from a sample of 17 farms, which are also reported on.<br>The sample size is roughly 8.5% of the deer farms in Otago. | Stock exclusion from gullies<br>Wintering sheds<br>Irrigation<br>Intensive winter grazing<br>Farm system change |
| Arable farms | 4 case studies from a sample of 16 farms, which are also reported on.<br>The sample size is roughly 16% of the arable farms in Otago. | Nitrogen fertiliser<br>Riparian fencing and critical source areas<br>Variable rate fertiliser<br>Intensive winter grazing |
| Dairy farms | 10 case studies representing 3 dairying areas of Otago.<br>The sample size is roughly 2.3% of the dairy farms in Otago. | Nitrogen use efficiency<br>Phosphorus fertiliser<br>Effluent management<br>Irrigation<br>Cropping (intensive winter grazing)<br>Wintering barns<br>Farm system change |
| Orchards and vegetable growing operations | 5 representative models based on 14 in-depth grower surveys.<br>The 14 operations represent a cross-section of crops grown and range of property and business sizes in Otago for each growing system (pipfruit, summerfruit, and vegetables). | Good Management Practice +<br>Reduction in fertiliser use and irrigation water availability<br>Short-term vs long-term consents<br>Provision of root stock survival water<br>Innovations |
| Vineyards | 3 representation models based on 7 growers.<br>The sample size is roughly 3.2% of the vineyards in Otago. | Nutrient losses<br>Reducing consented water<br>Restrictions on access to frost protection<br>Surety of consent conditions |

108. Figure 4 shows the conceptual relationships between 1) the environmental actions tested by the Industry Advisory Group in the economic research, 2) the actions in the provisions of the pLWRP and/or 3) those in Freshwater Farm Plans. This diagram is intended to be a stylised, rather than actual, representation of the differing degrees of overlap that exist between the three elements.

109. Some environmental actions tested in the economic research are similar to those that are included in the pLWRP. Other actions were initially considered for the pLWRP but rejected during the option development process for various reasons (e.g., low cost-effectiveness,

compliance monitoring practicalities). Some of those actions may eventually be implemented in Freshwater Farm Plans. In certain cases, actions may be both included in the pLWRP as well as implemented via Freshwater Farm Plans (i.e., the centre of the diagram).

110. There are also other environmental actions included in the pLWRP and/or Freshwater Farm Plans that were not tested in the economic research. Examples of these actions relate to the storage and discharge of animal effluent and silage, as well as the disposal of solid waste (e.g., farm refuse pits, offal pits).

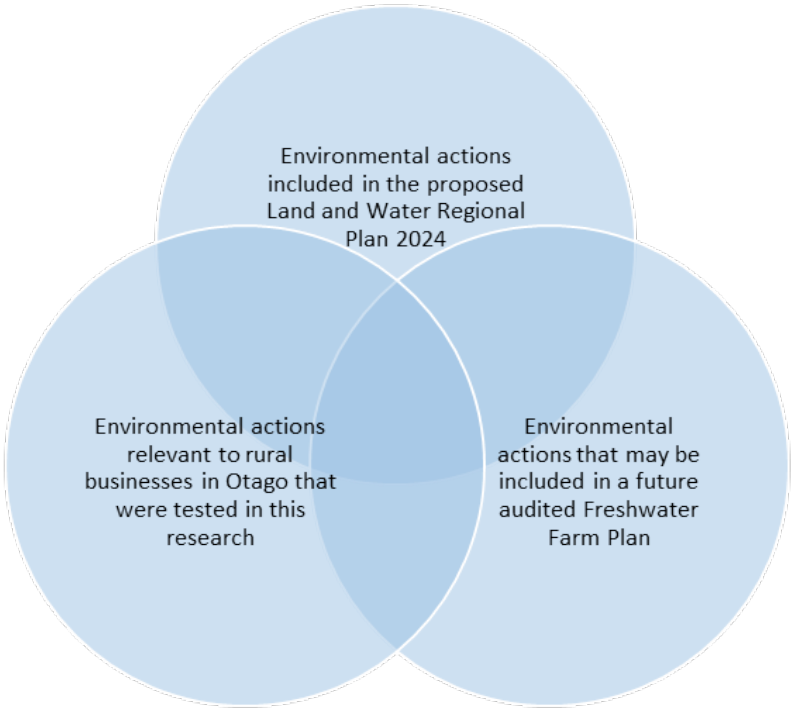


Figure 4: Conceptual relationships between economic research, the pLWRP, and Freshwater Farm Plans (source Moran (Ed.), 2023)

111. Two particularly salient findings of the research were that 1) the high levels of diversity and connectivity between rural businesses in Otago will influence the costs and benefits of different policy options and 2) the costs and benefits of new expectations for fresh water will be influenced by the level of progress towards meeting current policy direction. The first finding highlights the value of being able to tailor environmental actions to a particular situation (e.g. via a robust Freshwater Farm Plan). The second finding underlines the need to both recognise past investment in environmental actions and acknowledge where it may have been lacking.

112. These two findings mean that the assessments in this report largely rely on the economic research undertaken in the Economic Work Programme, rather than repeating it here. Importantly, each farm characteristic has its own distributional curve and the seemingly endless combinations of these multiple distributions across farms are explanatory for the complex range of impacts of policy (Moran (Ed., 2023). This reality makes it extremely challenging to 'scale up' costs and benefits to a district or region in any meaningful way. All efforts have been made to include relevant references to this research where possible.

### 1.5.6. Region-wide vs FMU-based provisions

113. During the development of the farming provisions, the visions, outcomes, and more particularly the target attribute states were front of mind. While the outcomes are consistent across FMUs, often there is marked variation between the baseline state and target attribute states as well as rural land use patterns.

114. To allow for this variation, some FMUs may need different management to other FMUs so an important consideration was whether provisions needed to be region-wide or FMU-based. A range of FMU-based provisions were developed and tested through consultation phases for:

a. Dairy farming

b. Fertiliser use

c. Dairy support

d. Intensive winter grazing, and

e. Cultivation

115. While FMU-based controls were actively investigated and will likely need to be part of the package of solutions to achieve the target attributes states in the future, they were generally not progressed. The main reasons were 1) the focus of the pLWRP on GMP and GMP+ actions, largely implemented through Freshwater Farm Plans, 2) the significant opposition to some of these FMU-based controls through consultation, and 3) the potential for unintended consequences in pushing some of the higher risk activities into other FMUs.

### 1.5.7. Freshwater farm plans

116. Farming systems in Otago are particularly diverse and complex because of the range of landscapes across the region. This diversity leads to variability in effects on fresh water (Moran (Ed.), 2023). Farmers and growers already need to have a Freshwater Farm Plan and it is a practical way for farmers and growers to identify, manage, and reduce the effects of farming on freshwater environments. Making use of these Freshwater Farm Plans through pathways in the provisions related to farming aims to ensure that the actions required are as effective and efficient as possible.

117. The pLWRP proposes a Freshwater Farm Plan pathway for some farming activities as an alternative to gaining a resource consent. This approach allows some flexibility, while still providing more management of higher risk activities. In general, the Freshwater Farm Plan pathway has been made available where the kinds of risks involved are (a) likely to be within the sphere of knowledge of a certifier, (b) capable of being mitigated by location and farm-specific alternative measures, and (c) respond to pro-active measures to reward good planning, including contingency planning.

### 1.5.8. Discounted option – land use change

118. Continuing with the relevant provisions in the Regional Water Plan and the Regional Waste Plan was not an option that was available because those provisions do not give effect to the NPS-FM 2020 or the proposed Otago Regional Policy Statement. As is explained in Chapter 3 of this report and, more specifically to farming, in section 1.3 in this chapter,

many of these provisions in the two regional plans are outdated, do not implement good management practices, and are misaligned with iwi and community aspirations for water quality. The one discounted option was land use change.

#### 1.5.8.1. Land use change

119. One possible option was an approach designed to encourage land uses that put less pressure on the assimilative capacity of waterbodies to achieve the objectives in the near-term. This option may have included fixed contaminant reduction targets, and/or property-scale contaminant limits, with a focus on higher loss activities or identification of areas within the region where higher loss activities would not be permitted to continue.

120. While land use change may be more likely to achieve the outcomes of the plan than those described in the next section, the option was discounted at this time as not practicable. Reasons included its high social and economic costs (particularly in the short to medium term), a limited ability to adequately identify the land use changes likely to be most effective and efficient, and an inability to determine how much change would be needed to achieve the outcome (and avoid over-shooting).

121. To illustrate the point, farm system change for sheep and beef farms was investigated to understand the impacts in the report titled Otago's rural businesses and environmental actions for fresh water (Moran (Ed.), 2023). Within the topic of farm system change, 3 environmental actions were tested: 1) remove cattle and replace with sheep, 2) exclude cattle from steeper areas, and 3) retire some areas to pines or native trees. The results can be found in section 2.5.8 of that report and the findings in section 2.6.4 of the same report.

122. Many of the representatives of catchment groups interviewed acknowledged the inevitability of some land use change in their areas, noting that this is not new to Otago (Reilly, 2023). However, the current stress arises from not knowing what future land use change might look like, and how well the community would be supported through transition.

123. Consequently, there is a lack of acceptability to the community, and particularly those resources users who may be most impacted, without sufficient scientific certainty that the actions would achieve the outcomes. Related to community acceptability, is the level of community support for policy, which can influence the level of its success during the implementation process (Moran, McDonald, & McKay, 2022).

## 1.6. Options

124. Through the option development process, seven broad topics were identified as the main design elements in a policy approach to the farming section of the Farming and Forestry Chapter of the pLWRP. GMP and GMP+ are core components across these topics. The topics, and options within each topic, were explored in-depth over the course of numerous Council workshops, with close attention being paid to the science reporting of environment issues, an awareness of the possible socio-economic impacts, and feedback from engagement processes.

125. Topic 1 forms the basis of the policy approach as it carries over the activities that are already managed in the Water Plan and the Waste Plan as well as adding others to address the regulatory gap in relation to managing land use (refer to section 1.3). Topics 2 to 7

cover stock exclusion, intensive winter grazing, cultivation, farming intensification and intensity, and implementation. The options within Topics 2 to 7 were each viewed as being additional to those for Topic 1 and are assessed as such in the following sections of this chapter.

126. The 7 topics, as well as the options within each topic, are as follows (Council's preferred options are identified in blue):

a. **Topic 1 – Common farming activities**:

Option 1 – Continue managing specific farming activities with updates:

Solid waste activities (offal pits, farm refuse pits)

Animal effluent (storage and discharges)

Silage storage

Fertiliser

Option 2 **– Also manage other farming activities (particularly those involving the use of land)**:

Feedlots and stockholding areas for cattle

Sacrifice paddocks

Pasture-based wintering for cattle (using supplementary feed)

Agricultural waste

b. **Topic 2 – Stock exclusion from water bodies on low slope land**:

Option 1 – Specifically includes sheep, 5m setbacks for continually flowing rivers and 10m setbacks for wide rivers and lakes, 10-year transition time for existing fences, and relies on low slope map.

Option 2 – 3m setbacks for continually flowing rivers and 5m setbacks for wide rivers and lakes, varying transition times for existing fences, and ORC definition of low slope land (up to 10 degrees).

Option 3 – 3m setbacks for continually flowing rivers and lakes, transition for existing fences 'on renewal', and ORC definition of low slope land (up to 5 degrees).

c. **Topic 3 – Winter grazing of livestock on annual forage crops**:

Option 1 – Replace NESF Intensive Winter Grazing regulation if repealed.

d. **Topic 4 – Cultivation risks (FMU-specific re sediment and phosphorus issues)**:

Option 1 – Manage cultivation risks based on slope of the land.

e. **Topic 5 – Land use intensification and increasing land use intensity**:

Option 1 – Extend and update NESF limits on land use intensification due to expire on 1 November 2024.

Option 2 – Include a limit on increases in the intensity of a land use in addition to the area expansion limits in Option 1.

f. **Topic 6 – Dairy land use intensity (FMU/rohe-specific re nitrogen issues or region-wide)**:

Option 1 – Existing dairy farms and dairy support farms are either a discretionary or a controlled activity depending on their intensity.

Option 2 – Controlled activity for all existing dairy farms region-wide.

g. **Topic 7 – Looking towards implementation**:

Option 1 – Provide Freshwater Farm Plan pathways for relevant permitted activities.

Option 2 – Recognise environmental actions.

### 1.6.1. Clause 3 consultation feedback

127. Feedback on the draft farming provisions was received from 13 organisations. There was both support for, and opposition to, the draft farming provisions in the feedback. The feedback is summarised below.

128. With regard to the regionwide (permitted activity) rules, some organisations consider the rules are generally acceptable and achievable with the exception of restrictions on intensification, including 'mob stocked sheep' in the stock exclusion rule. Other organisations consider the provisions are not stringent enough to prevent further degradation nor provide for the scale of reductions that are required to achieve the target attribute states and environmental outcomes. In particular, these organisations considers that too many permitted activity rules will not manage cumulative effects, setbacks are inadequate, fertiliser application needs to be more strictly regulated, and there should be more stringent limits on intensification of land use.

129. Feedback on the FMU rules was split between those organisations who support proactively managing farming intensity input controls such as stock numbers, fertiliser use and limits on land use, larger setbacks and having more stringent regulation than NESF, and those organisations who oppose requiring dairy farmers to gain a land use consent, the use of input controls or intensity thresholds such as stocking rate, restrictions on cultivation, and restricting limiting the area of land for dairy support.

130. Feedback on Freshwater Farm Plan provisions was also split between those organisations who supported the use of Freshwater Farm Plans and considered that there should be more reliance on them, and those organisations who considered that Freshwater Farm Plans are being relied on too much. In particular these organisations were concerned that the use of Freshwater Farm Plans in lieu of requiring consent is not appropriate in degraded catchments.

131. Many amendments were made to provisions in response to the feedback received, generally to improve their practicality, certainty, and clarity. Examples of these changes are provided within each topic.

### 1.6.2. Clause 4A consultation feedback

132. The key feedback received through clause 4A consultation sought amendments to:

a. include phased pathways for achievement of targets in degraded catchments, and provision for additional consent requirements in heavily degraded catchments;

b. ensure the policy framework clearly explains how both regulatory and non-regulatory actions are intended to work together to achieve the targets;

c. provide clarity as to what the chapter, which was initially titled 'Primary Production', covers as it does not cover all the topics within the National Planning Standards definition of 'Primary production';

d. include reference to environmental outcomes, attribute targets and alternative criteria, and APP9;

e. clarify which policies apply to farming and which apply to forestry, in particular FF-P1 and FF-P2 should both apply to farming and forestry;

f. ensure that discharges of animal effluent only occur when there is a suitable water deficit;

g. restrict activities in 'all wetlands' not just 'natural inland wetlands';

h. include a vertical separation distance from groundwater for some activities;

i. prohibit burning of waste in farm refuse pits;

j. include critical source areas and groundwater as matters of discretion in Rule FF-R17-RDIS1 - Discharges of liquid animal effluent; and

k. include restrictions on stock access to wetlands and springs in Rule FF-R16-PER1 - Stock exclusion.

133. In response to clause 4A feedback, amendments have been made to:

a. the title of the chapter from 'Primary Production' to 'Farming and Forestry'. The other activities mentioned in the National Planning Standards definition of 'Primary production' (e.g., mining, quarrying and aquaculture) are covered by other provisions in the pLWRP such as EARTH, BED, DAM, OTH;

b. Policy FF-P1 to include reference to forestry activities;

c. Policy FF-P3 to clarify the intent of the provision;

d. Policy FF-P7 Managing and operating animal effluent systems, Rules FF-R16-Discharges of solid animal effluent and FF-R17 Discharges of liquid animal effluent to ensure that effluent is only applied to land when there is a suitable water deficit;

e. Rule FF-R7 – Farm refuse pits to prohibit burning of waste; and

f. Rule FF-R17-RDIS1 Discharges of liquid animal effluent to allow for consideration of the degree of application uniformity as a measure of the evenness with which the soil receives water across the irrigated area.

### 1.6.3. Topic 1: Common farming activities

134. Topic 1 is the management of a set of common but higher risk farming activities relevant to discharges and/or the use of land. It is intended to provide an enabling approach for these activities where previously the focus in the RPW was on managing their discharges. These activities were generally grouped within two options – those that are specifically managed in either the Water Plan or Waste Plan, and those that not:

a. Option 1: Animal effluent storage and application, fertiliser, farm refuse pits, silage pits, and offal pits

b. Option 2: Feedlots/feed pads/stockholding areas, pasture-based wintering for cattle, and sacrifice paddocks

135. Option 1 was to continue managing those activities already specified in the Regional Water Plan and the Regional Waste Plan. New provisions updated those that already exist for the activities to reflect GMP and GMP+ (as appropriate). These provisions are intended to complement the policies of the NPSFM, the regulations of the NESF[16], and the Stock Exclusion Regulations.

136. The provisions managing animal effluent storage and its application to land remain largely the same as those recently developed through the Plan Change 8 Environment Court process, with only minor amendments to reflect the new format of the pLWRP. This continuity reflects the high level of engagement and collaboration across affected parties in Otago throughout that process.

137. Table 3 gives the processing costs for resource consent applications that resulted in at least one effluent discharge to land permit being issued. The "number of examples" column shows how many applications resulted in that number of consents being issued. For instance, in the 2022/23 financial year, there were 14 resource consent applications that resulted in three resource consents being issued (at least one of which was a discharge to land permit - effluent). The median cost for an application that resulted in only one consent being issued was $3,011 in 2023/24 (based on 9 examples). Overall, the median costs of processing applications resulting in effluent discharge to land permits ranged from $1,538 to $14,853.

Table 3: Processing costs for discharge to land permit: effluent

| Financial year | Number of consents issued | Minimum cost | Maximum cost | Median cost | Number of examples |
|---|---|---|---|---|---|
| 2022/23 | 2 | $1,393 | $1,684 | $1,538 | 2 |
| | 3 | $2,221 | $5,060 | $4,242 | 14 |
| | 4 | $3,415 | $3,777 | $3,596 | 2 |
| | 5 | $7,961 | $8,996 | $8,479 | 4 |
| 2023/24 | 1 | $1,673 | $5,024 | $3,011 | 9 |
| | 2 | $110 | $7,583 | $2,710 | 21 |
| | 3 | $3,076 | $5,511 | $4,273 | 7 |
| | 4 | $3,541 | $4,732 | $4,017 | 6 |
| | 5 | $4,889 | $8,973 | $5,034 | 5 |
| | 6 | $5,895 | $6,743 | $5,895 | 3 |
| | 12 | $9,457 | $9,457 | $9,457 | 4 |
| | 14 | $14,853 | $14,853 | $14,853 | 5 |

[16] Section 44A of the RMA states that a plan is not able to duplicate the contents of an NES. Therefore, the pLWRP does not have rules applying to some farming activities, as these activities are addressed in the NESF.

138. Table 4 gives the processing costs for resource consent applications that resulted in at least one effluent storage consent being issued. The "number of examples" column shows how many applications resulted in that number of consents being issued. For instance, in the 2022/23 financial year, there were five resource consent applications that resulted in three resource consents being issued (at least one of which was an effluent storage consent). Overall, the median cost of processing an applications resulting in one or more effluent storage consent ranged from $2,892 to $7,961.

Table 4: Processing costs for effluent storage consents

| Financial year | Number of consents issued | Minimum cost | Maximum cost | Median cost | Number of examples |
|---|---|---|---|---|---|
| 2022/23 | 1 | 2,892 | 2,892 | 2,892 | 1 |
| | 3 | 2,444 | 4,486 | 4,081 | 5 |
| | 5 | 7,961 | 7,961 | 7,961 | 1 |
| 2023/24 | 4 | 4,168 | 4,168 | 4,168 | 1 |
| | 5 | 5,273 | 5,273 | 5,273 | 1 |

139. The remaining choices within Option 1 largely focused on 1) matching the level of management to environmental risk via the activity status of rules (e.g., permitted, controlled, discretionary) and 2) shaping conditions for permitted activity rules to reflect current GMPs. More specifically, the permitted activity conditions explored various performance standards as well as design and construction standards. Volume and/or size thresholds were also considered for farm refuse pits, offal pits, and silage pits to create an easier pathway for these activities when they are smaller scale.

140. **Fertiliser:** Stage 3 community engagement considered an updated permitted activity rule for the discharge of fertiliser. Possible conditions on this rule at the time included: 1) no direct discharge into wetland, open drain, bore, soak hole, CMA, lake or river, 2) no discharge when soil moisture exceeds field capacity, and 3) a 3-metre setback from bed of lake or river or wetland. The fertiliser rule was later amended to provide for incidental wind-blown fertiliser dust as it cannot be considered as a direct discharge to water and is difficult to control. A Freshwater Farm Plan pathway was also added.

141. **Farm refuse pits:** In Stage 3 community engagement, an updated permitted activity was considered for farm refuse pits where no local authority collection is available, and the landholding is more than 50 km from the nearest transfer station. The possible conditions also included:

a. Landholding is greater than 20 hectares,

b. Maximum volume of the pit is 50 cubic metres,

c. Preventing surface runoff entering the pit,

d. Restrictions on type of refuse discharged, e.g. must be from the property the pit is located on and not include agrichemicals (or their containers), agricultural plastic wrap, septic tank sludge, dairy farm sludge or animal carcasses,

e. Setbacks from wetland, open drain, bore, soak hole, CMA, or bed of lake or river (50 metres for farm landfills, 20 metres for discharge of agricultural waste), and

f. Not in drinking water protection zone, CSA. Finally, the refuse pit is covered over to a depth of 0.5 metres when no longer in use.

142. Following Stage 3 community engagement, the requirement for the landholding being more than 50 km from the nearest transfer station or no local authority collection was removed as there was some uncertainty as to 1) the practicality of this provision and 2) whether municipal landfills could handle farm waste. A Freshwater Farm Plan Pathway was added to the rule. Other changes were also made:

a. The rule's name was amended from 'farm landfills' to 'farm refuse pits' to ensure that this activity is caught by rules in the WASTE chapter,

b. Dairy farm sludge was amended to sludge generated from animal effluent systems, and

c. Two provisions were added to ensure farm refuse pits are not located within areas subject to natural hazards or within 7 m of ORC controlled flood protection or drainage assets.

143. **Silage storage and offal pits:** Stage 3 community engagement considered updated permitted activity rules for silage storage and offal pits subject to conditions, including: 1) either a 250 cubic metre or 500 cubic metre volume restriction (silage only), 2) preventing liquid from the activity entering a surface water body (silage only), 3) preventing animal access, 4) preventing rain (silage only) and surface runoff entering the pit or stack, 5) a 50-metre setback from wetland, open drain, bore, soak hole, CMA, or bed of lake or river, 6) Not in drinking water protection zone, CSA or flood prone area.

144. Following Stage 3 community engagement, the volume threshold for silage pits was discarded and replaced with a permitted activity condition that the silage pit is sealed and the leachate is contained and appropriately disposed of. A FW-FP pathway, as an alternative to getting a resource consent, was provided for locating within the setbacks for both silage pits or stacks and offal pits.

145. Later, the requirement for offal pits that only dead animals or animal parts from the landholding where the offal pit is located are placed into the pit was amended to no dead animal material originating from an industrial or trade premise is disposed of into the pit to better reflect the intent of the provision. As well, an addition was made to prevent the offal pits being located within seven metres of ORC controlled flood protection or drainage assets.

146. Option 2 for Topic 1 was to also manage other farming activities, particularly those involving the use of land and/or were not covered by the NESF. Historically there are no land use provisions in the Water Plan managing farming activities, meaning these activities have been permitted activities in accordance with section 9 of the RMA. Any discharges associated with these activities are managed by the general discharge provisions in section 12 of the Plan.

147. **Feedlots, feed pads, and stockholding areas:** ORC staff advice (science / consents / compliance) was the NESF provisions were not sufficiently comprehensive, particularly for the Otago context. There was a lack of requirements for design standards for young and

smaller cattle and setbacks from water bodies as well as not locating these activities within CSAs and drinking water protection zones.

148. A new permitted activity rule for feedlots, feed pads, and stockholding areas was considered in Stage 3 community engagement. The possible conditions on this rule included:

a. A 50 metre setback from a wetland, the Coastal Marine Area (CMA), or the bed of a lake or river;

b. A 20 metre setback from a bore or soak hole;

c. Not within a critical source area (CSA), above subsurface drainage or in a drinking water protection zone; and

d. Standards for construction.

149. Examples of construction standards given were for smaller/young cattle a base of 400 mm of bark, woodchip or similar material and for older/larger cattle, as well as sealed and effluent collected and disposed of in accordance with effluent rules. Following Stage 3 community engagement, a Freshwater Farm Plan pathway was added to the rule for feedlots, feed pads, and stockholding areas.

150. Table 5 gives the processing costs for resource consent applications under the NESF that resulted in at least one stockholding area land use consent being issued. The "number of examples" column shows how many applications resulted in that number of consents being issued. For instance, in the 2023/24 financial year, there were two resource consent applications that resulted in four resource consents being issued (at least one of which was a stockholding area land use consent). Overall, the costs of processing applications resulting in two or more stockholding area land use consent ranged from $3,541 to $5,273.

Table 5: Processing costs for NESF land use consent – stockholding areas in 2023/24

| Number of consents issued | Minimum cost | Maximum cost | Median cost | Number of examples |
|---|---|---|---|---|
| 4 | $3,541 | $4,168 | $3,854 | 2 |
| 5 | $5,273 | $5,273 | $5,273 | 1 |

151. In addition, the Option 2 included developing provisions for pasture-based winter grazing of cattle and sacrifice paddocks to complement the NESF regulations for intensive winter grazing. The grazing of livestock on an annual forage crop during winter is discussed in Topic 3 below.

152. **Sacrifice paddocks:** a new permitted activity for sacrifice paddocks was considered in Stage 3 community engagement. Possible conditions on this rule included:

a. Restrictions on slope (10 degrees or less), time used (max. 60 days per year) and size (5 ha for landholdings less than 500 ha or 1% or 30 hectares for landholdings greater than 500 ha, whichever is lesser),

b. Not within a critical source area or in forage crop,

c. A 20 m setback from a wetland, open drain, bore, soak hole, coastal marine area, or bed of lake or river,

d. A 50 m setback from sensitive water bodies (including outstanding water body), and

e. A requirement to revegetate as soon as practicable (where significant de-vegetation has occurred).

153. Following Stage 3 community engagement, a Freshwater Farm Plan pathway was added to the sacrifice paddocks rule. Later, the restriction on the number of days a sacrifice paddock could be used was removed as it failed to account for the variability in weather conditions and grazing needs, which can fluctuate greatly from year to year.

154. **Pasture-based wintering for cattle:** a new permitted activity for pasture-based winter grazing of cattle subject (using supplementary feed) was considered in Stage 3 community engagement. Possible conditions on this rule included:

a. Not within a critical source area,

b. A 10 m setback from a wetland, open drain, bore, soak hole, coastal marine area, or bed of lake or river,

c. A 20 m setback from sensitive water bodies (including outstanding water body), and

d. A requirement to revegetate as soon as practicable (where significant de-vegetation has occurred).

155. Following Stage 3 community engagement, a Freshwater Farm Plan pathway was added to the pasture-based wintering rule, and setbacks were reduced to 5 metres to be consistent with other intensive winter grazing provisions. Pasture based grazing is considered to be an activity that is lower risk than intensive winter grazing on forage crops or the use of sacrifice paddocks.

156. Later, the requirement for revegetation was expanded by removing the word ‘significant’, as it would be difficult to define what was ‘significant devegetation’ and what was not. The rule now requires revegetation wherever devegetation occurred.

157. Clause 3 feedback and ORC staff advice indicated a preference for the term ‘baleage-based wintering’ as there was concern that the rule might capture cattle that are only grazing on grass (i.e., not being more intensively grazed with supplementary feed). The Council consider that ‘baleage-based wintering’ was not well understood and significant supplementary feed included other options than just baleage (e.g., hay). As long as there was a clear definition the option should be referred to as pasture-based wintering.

158. In general terms, pasture-based wintering refers to the break feeding of cattle (but not dairy cows in milk) on pasture between 1 May and 30 September where supplementary feed offered is more than 10,000kg of dry matter per hectare (DM/ha). The 10,000kg DM/ha is in addition to pasture over a period of 153 days. Pasture-based wintering is not intended to capture basic ‘feeding out’ of conserved pasture.

159. **Agricultural solid waste:** A new permitted activity was considered in Stage 3 community engagement for agricultural solid waste. Possible conditions included:

a. Restrictions on type of waste discharged, e.g. must not contain any hazardous substance or any waste from a human effluent treatment process,

b. Application depth of less than 50 millimetres,

c. 20 metre setbacks from wetland, open drain, bore, soak hole, coastal marine area, or bed of lake or river, and

160. Following Stage 3 community engagement, a Freshwater Farm Plan pathway was added. Feedback from this engagement indicated that the definition of agricultural solid waste was unclear and later the definition was amended to clarify that agricultural solid waste is defined as organic plant material left from the producing and harvesting of crops and trees, it does not include animal effluent.

161. An important aspect of the performance standards in Options 1 and 2 of Topic 1, as well as those in the remaining farming topics, is the use of setbacks. Setbacks are a type of buffer that either direct or restrict the location of an activity within a property. Other types of buffers include those that either direct or restrict the timing of an activity.

162. In general terms, the costs of a setback stem from how a property's inherent versatility is constrained in some way, while the benefits arise from the associated reduction in risk to the environment and people from this constraint. A reduction in risk now can mean that damage and remediation costs are avoided later (i.e., a stitch in time saves nine).

163. The degree to which costs and benefits occur usually depends on the nature of the activity in question, the flexibility of the conditions (which can depend on the way it is applied), the characteristics of each landholding and its other activities, and the availability of alternatives. A setback's costs will tend to be higher for those properties with more riparian margins and/or smaller areas of easier land (all other things being equal).

164. Some permitted activity rules include a setback from critical source areas. Such areas within a farm can contribute a disproportionately large quantity of contaminants to water (relative to their extent) and environmental actions that target these areas are usually highly cost-effective (Ministry for the Environment, 2023b)

165. In general terms, a critical source area has three basic elements: a landscape feature (e.g., a gully, swale, or depression) where run-off can accumulate, a source of the contaminants that may be contained in that run-off, and a possible connection between the landscape feature and a waterbody. For the pLWRP, a farm's critical source areas are determined by the combination of biophysical characteristics (as specified in the definition) and the location of the farming activities in question (as identified by the rules). It is anticipated that Freshwater Farm Plans will identify contaminant sources and pathways across most of a farm, which includes its critical source areas.

166. A general estimate of intermittently flowing or ephemeral rivers (using River Environment Classification stream order 1) on low slope grazeable land in Otago is included in Table 10 in section 1.6.4 of this chapter (below). However, when considering the information in Table 10 it is important to note that in general terms, such rivers need the addition of a source of contaminants to be a critical source area.

#### 1.6.3.1. Topic 1 Efficiency and Effectiveness Assessment

167. Table 6 below identifies and assesses the environmental, cultural, social, and economic benefits and costs anticipated from implementing the proposed options for Topic 1. The two options for Topic 1 are included in the assessments for all subsequent topics for farming (i.e., Topics 2-7). Resource consent cost information is available in section 4 of Chapter 7.

168. An explanation of the economic research on environmental actions relevant to Otago farms and growing operations is available in section 1.5 of this chapter. However, the common farming activities in Topic 1 were largely not a focus of the economic research.

169. For farming, the distribution of benefits and costs of options within each topic are likely to be strong variable. Some local communities may be more impacted by and/or are less resilient to certain topics (and options within those topics) than others. Information for local communities, including population, employment and socio-economic deprivation, is available in a series of snapshots (Yang A. , 2022a; Yang A. , 2022b; Yang A. , 2022c; Yang A. , 2022d; Yang A. , 2022e; Yang A. , Roxburgh Rohe, Manuherekia Rohe and Upper Taieri Economic Snapshot, 2022f).

170. General information on the costs and benefits freshwater management approaches to the Kāi Tahu economy is included in section 3 of Chapter 7. There will also be more specific costs and benefits of the farming provisions in the pLWRP for Māori agribusiness. The benefits in Table 6 related to mahika kai practices and taoka species apply across all of the farming topics.

Table 6: Benefits and costs for Topic 1 – Common farming activities

| OPTION | BENEFITS | COSTS |
|---|---|---|
| **Option 1:** Continuing to manage common farming activities with updates | ▪ Updating the existing rules for common activities to 1) match the levels of management to environmental risk and 2) reflect various performance standards as well as design and construction standards will contribute to improvements in the health and well-being of water bodies and freshwater ecosystems.<br>▪ For example, silage leachate is highly toxic but silage pit runoff areas are not adequately covered by in existing planning provisions, plus the impervious layer and time limitations were problematic for compliance.<br>▪ Meeting performance standards will improve the environmental sustainability of farms and growing operations and may avoid future costs. Some are being implemented in Otago and should not have a significant budgetary impact.<br>▪ Improving freshwater quality (and quantity) will enhance mauri, mahika kai and taoka species, and better provide for Kāi Tahu cultural and spiritual beliefs, values, and uses, and broader social values within communities.<br>▪ Mahika kai practices are a central part of the Kāi Tahu economy, providing food and | ▪ Option 1 introduces more stringent permitted activity requirements than what is currently required by the Regional Water Plan or Regional Waste Plan will come at a cost for many farmers. Such costs may reduce their profitability, as the costs are internalised these within their production systems. Some farmers will face consenting costs.<br>▪ The financial costs of Option 1 are difficult to quantify as they will vary from farm to farm, depending on their unique mix of farming practices as well as their farming situation (e.g., farm size, topography, climate, access to services). Those that involve setbacks can result in weed and pest control costs. |

| OPTION | BENEFITS | COSTS |
|---|---|---|
| | other resources for sustenance and trade and also serving wider social, economic, and political needs including: 1) development and transfer of knowledge, 2) opportunities for trade and for building alliances and relationships, and 3) the ongoing expression of mana and connection to place, supporting cultural identity.<br>▪ Reducing discharges of contaminants, such as those associated with farm landfills, silage leachate, or excess fertiliser will improving freshwater quality and quantity, habitats and passage for desired fish species will support these populations and halt the decline of threatened species.<br>▪ Updating rules around waste is timely. There is some progress around waste reduction and increasing the community's awareness of recovery and recycling programmes (Reilly, 2023). For example, winegrowers are working towards zero waste by 2050.<br>▪ Resolving regulatory ambiguity, and what were perceived as unworkable or impractical government regulations, should help reduce uncertainty, stress, apathy, and inertia in some farmers (this issue was cited in Reilly, 2023).<br>▪ The permitted activity pathway for farming activities will enable these activities to occur while providing certainty around expectations relating to water quality.<br>▪ Option 1 provides continuity by retaining the provisions for animal effluent storage developed through the Plan Change 8 Environment Court process (with minor changes), recognising the high level of engagement and collaboration by affected parties. Option 1 will also replace PC6A provisions, which would otherwise come into force on 1 April 2025. | |
| **Option 2:** Also manage other farming activities (particularly | ▪ The new permitted activity rules for farming activities address identified gaps in regional plans, particularly where they relate to the use of land, which should | ▪ Farmers will need to identify contaminant sources and pathways for specific activities, but this expectation largely already exists |

| OPTION | BENEFITS | COSTS |
|---|---|---|
| those involving the use of land) | improve the management of these activities.<br>▪ Introducing design standards for feedlots, feed pads, and stockholdings areas that apply to young and smaller cattle as well as setbacks from water bodies, CSAs and drinking water protection zones will help ensure that such facilities are more 'future-proofed'.<br>▪ Improving management of pasture-based wintering for cattle (that involves the use of supplementary feed) and sacrifice paddocks, complements that for the intensive winter grazing of forage crops where good progress has already been made in Otago through the NESF.<br>▪ By identifying contaminant sources and pathways, particularly for more intensive wintering activities, environmental actions will be more targeted than 'blanket' approaches that restrict farming practices across catchments. However, other actions than setbacks from critical source areas may be needed for nitrogen losses where there is subsurface drainage.<br>▪ More certainty around the expectations for the discharge of agricultural waste will help prevent further land contamination in Otago, which is beneficial for human health and ecological health. It also helps to protect groundwater and land resources for future generations.<br>▪ Requiring revegetation helps avoids increased erosion, loss of topsoil and reduction in productivity, loss of soil biodiversity, and loss of soil nutrients (changed nutrient cycling) (Manaaki Whenua Landcare Research, 2024). | via Freshwater Farm Plans. None of the farming activities included in either Option 1 or 2 are likely to be farm wide.<br>▪ Continuing education is likely to be needed to improve understanding of critical sources areas. A simple way to identify them is to walk around a farm after a heavy rain event and mark out potentially problematic areas (e.g., with warratahs).<br>▪ Regulating new activities tends to create more work for people, which they either do themselves or employ others. This choice tends to depend on factors such as skills, time, inclination, and finances. Where any of these factors are limited, regulation will create opportunities costs.<br>▪ In general terms, labour on the farms tends to remain consistent because it is a 'lumpy' input and many farms (especially smaller ones) are run by owner/ operators with very few (if any) staff.<br>▪ Regulation can contribute additional stress. There are clear links between stress and mental health, which is a recognised issue in rural communities and needs support during the implementation process.<br>▪ A concern raised by catchment group representatives in Reilly (2023) was that regulation risked leaving communities behind, and stifled opportunities for positive future changes, or otherwise risked perverse outcomes.<br>▪ Achieving design standards may add to the cost of feedlots, feedpads, and stockholding areas, at least in the short-term. |

171. The assessment also needs to take into account the risk of acting or not acting if there is uncertain or insufficient information. There is some uncertainty about the full impacts of implementing Options 1 and 2 as to date most farming activities have been unconditionally permitted in Otago and any discharges associated with these activities are managed by the Regional Water Plan's general discharge provisions. However, there is sufficient information about current water quality issues and trends to indicate that updating management of the farming activities and addressing key gaps in the status quo (described in section 1.3) is essential. Continuing with the relevant provisions in the Regional Water Plan and the Regional Waste Plan was not a reasonably practicable option because they do not give effect to the NPS-FM 2020 or the proposed Otago Regional Policy Statement.

172. There is some uncertainty regarding Freshwater Farm Plans, as the government has indicated it will be making changes to the Freshwater Farm Plan system and it is unknown at this time what those changes will be. However, Freshwater Farm Plans are a useful tool for reducing the adverse effects of farming activities on freshwater quality (the alternative being a consenting pathway).

173. Overall, the information supporting Options 1 and 2 is suitably certain and sufficient that there is a minimal risk of acting compared to not acting and even less risk with Option 1.

Table 7: Effectiveness and efficiency assessment for Topic 1 – Common farming activities

| | |
|---|---|
| **Effectiveness** | |
| **Option 1:** Continuing to manage common farming activities with updates | Option 1, if relied on solely, will have low effectiveness in achieving the objectives of the pLWRP. The available science indicates that it will not, on its own, achieve water quality outcomes in most catchments. However, the updated provisions in Option 1 will be far more effective than the corresponding provisions in Otago's Regional Water Plan and the Regional Waste Plan. As well, it provides a firm basis from which to build in managing higher risk farming activities. Over time, it should make a positive contribution to managing contaminant losses from farming activities, and so will support achieving the objectives of the pLWRP. |
| **Option 2:** Also manage other farming activities (particularly those involving the use of land) | Option 2 adds to the foundation provided in Option 1 but the available science indicates that the two options will still not be sufficient to achieve water quality outcomes in many catchments. By resolving identified gaps in Otago's Regional Water Plan and Regional Waste Plan and the NESF it will improve on the effectiveness of Option 1 in achieving the objectives of the pLWRP. Again, Option 2 should make further positive contributions to managing contaminant losses, and so will support achieving the objectives of the pLWRP over time. |
| **Efficiency** | |
| **Option 1:** Continuing to manage common farming activities with updates | Option 1 (with the inclusion of the Freshwater Farm Plan pathways) is considered to be efficient as a starting point for achieving the objectives of the pLWRP. With education, it is likely to have a high uptake amongst rural land users given the reliance on good management practices, some of which have been developed and promoted via non-regulatory mechanisms in New Zealand for at least two decades. The continuity provided by retaining the Plan Change 8 provisions relating to animal effluent storage and its application to land largely unchanged adds to this efficiency. |
| **Option 2:** Also manage other | Option 2 increases the efficiencies of Option 1 by making the set of farming activities being managed under the pLWRP more complete, as well as being complimentary with |

| | |
|---|---|
| farming activities (particularly those involving the use of land) | relevant existing national regulations. Given the extent of farmland in Otago, introducing activities that involve the use of land, such as pasture-based wintering of cattle and sacrifice paddocks, should be efficient in achieving the objectives of the pLWRP. As well, it is more efficient to make sure that infrastructure, such as feedlots, feed pads and stockholding areas, meet necessary design standards when being constructed. Focusing management on contaminant sources and pathways, including critical source areas, builds on knowledge in Freshwater Farm Plans and is more efficient than 'blanket' approaches. |

### 1.6.3.2. Stringency justification for feedlots and stockholding areas

174. FF-R1 is more stringent than the equivalent provisions in the NESF. The NESF enables regional plans to contain rules that are more stringent than the regulations.[17]

175. The justification for greater stringency over the NESF in the circumstances of the Otago Region is assessed in Table 8.

Table 8: Stringency justification for feedlots and stockholding areas

| Summary of relevant rule | NESF regulations | Summary of additional stringency | Justification |
|---|---|---|---|
| Rule FF-R1-PER1 requires that:<br>For cattle on a feedlot or stockholding area that are less than 4 months old or weigh no more than 120kg, the base of the feedlot or stockholding area must be a minimum 400 mm depth of bark, wood chip, saw dust, post-peelings or similar absorbent organic material, and<br><br>For both young/small and older/larger cattle the feedlot or stockholding area must be:<br>1) 50 m away from any waterbody, bore or natural inland | The NESF does not have any requirements for feedlots for cattle that are less than 4 months old or weigh no more than 120kg.<br>For older/larger cattle the stockholding area must be at least 50 m away from any water body, any water abstraction bore, any drain, and the coastal marine area. | Rule FF-R1-PER1 is more stringent than the NESF because it applies 1) a standard for the base of a feedlot or stockholding area for younger/smaller cattle and 2) setbacks from natural inland wetlands, any dwelling or place of assembly on another property and 3) restrictions on locating above subsurface drainage, or in a critical source area or drinking water protection zone. | The NESF lacks requirements for design standards for young and smaller cattle and setbacks from water bodies as well as not locating these activities within critical source areas and drinking water protection zones or above subsurface drainage.<br>It is important that these matters are considered because while the benefits for contaminant loss offered by feedlots and stockholding areas are driven by less urine patches on wet soils and less contaminant loads in runoff from saturated or disturbed soils, these benefits can be reduced through the losses of nitrogen in drainage effluent and runoff from a poorly constructed and managed standoff pad. Potential benefits from stand-off pad use (40% less loss) can be reduced by about a third if the effluent drainage is not managed correctly. Stand-off pads with no effluent management could potentially increase whole farm of |

[17] NESF Regulation 6(1)

| Summary of relevant rule | NESF regulations | Summary of additional stringency | Justification |
|---|---|---|---|
| wetland, or coastal water,<br>2) 100 metres away from any dwelling or place of assembly on another property. and<br>3) not above subsurface drainage or in a critical source area or drinking water protection zone. | | | nutrient losses by up to 35% (Fenton, 2011). Their location in regard to waterbodies and other sensitive areas (e.g., drinking water supply sites, surface water bodies and critical source areas) is also critical (Crawford M. , 2023b).<br>The stringency in the pLWRP is considered justified to manage all the potential adverse effects of these activities on water quality. |

#### 1.6.3.3. Topic 1 Conclusion

176. As a set, Options 1 and 2 will make positive contributions to managing contaminant losses in the region, when implemented and used in combination with other options proposed in the Farming and Forestry Chapter in the pLWRP and non-regulatory options such as catchment action plans. They will update existing rules in the Regional Water Plan and the Regional Waste Plan and resolve gaps related to farming activities. Together, the two options will provide a firm foundation for the other options in the remaining farming topics to build on in the Farming and Forestry Chapter. Given their potential efficiency and effectiveness, they are considered to be the most appropriate way to achieve the objectives of the pLWRP and ORPS.

### 1.6.4. Topic 2: Stock exclusion from waterbodies

177. Topic 2 is about managing the access of livestock to waterbodies and riparian margins. It includes 3 main options that were developed sequentially. The topic is relevant to most farms in Otago that include livestock enterprises within their production systems, as well as other properties that may have livestock grazing on their land (e.g., lifestyle properties, orchards and vineyards).

178. While riparian management is not a 'silver bullet' for all issues across agricultural landscapes, it has a key role to play in resolving biodiversity and waterbody health issues (Fenemor & Samarasinghe, 2020). The efficacy of riparian setbacks depends on their design and situation, and it takes time to develop (Fenemor & Samarasinghe, 2020). Improvements in lowland rivers will usually need riparian management further up in the headwaters, including streams. Managing contaminants in groundwater is also important because of the contribution that groundwater can make to base flows (Fenemor & Samarasinghe, 2020).

179. The research that informed the *Otago Catchment Stories Summary Report* (Reilly, 2023) found that many catchment groups across the region had made good progress on riparian protection, including an increasing focus on restoring wetlands:

> "For many groups and sectors, fencing and planting of waterways has been a key focus and an early opportunity to get the community involved, and to get 'runs on the board'. Multiple groups had put a strong focus on reducing stock access to waterways

> and other sensitive areas, particularly those in high visibility areas (often even when regulations did not require it). There was an understanding by many that if it was feasible and affordable to reduce stock access, this should be done. Similarly, work was underway in many areas in both assessing fish populations within waterways, and in protecting indigenous fish habitat."

180. In Plan Change 8 to the Regional Water Plan, an amendment was proposed relating to stock access to waterbodies. The s32 report for Plan Change 8 noted that:

> Broadly, the current approach taken by the Water Plan is to allow stock access to waterbodies as a permitted activity where visible damage does not occur. If the permitted activity conditions are not met, consent is required as a discretionary activity. This has proved difficult to enforce as it required ORC Compliance officers to be on site when the damage is occurring to assess compliance with the rule. It also means that if damage does occur, the requirement to seek resource consent is redundant as the activity has already occurred.

181. The Plan Change 8 amendment was discarded when Central Government gazetted its Stock Exclusion Regulations on 3 September 2020. The Stock Exclusion Regulations require stock exclusion from wide rivers, lakes and specific natural wetlands. A 'wide river' means a river with a bed that is wider than 1 metre anywhere in a land parcel (the definition of a river is as defined in the RMA and is discussed below Table 9). A 'natural wetland' here has the NPSFM meaning of natural inland wetland, except that the exclusion of wetlands in the coastal marine area does not apply.

182. The Stock Exclusion Regulations apply to all dairy cattle (including dairy support), pigs, and 'intensively grazing' beef cattle and deer on any terrain. In this context, 'Intensively grazing' means (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.

183. In addition, the Stock Exclusion Regulations currently apply to beef cattle and deer on low slope land, as identified in a Ministry for the Environment map (with some exclusions, such as for the Upper Taiari Scroll Plain). In 2023 amendments to these regulations changed the method used in the map for identifying low slope land and adjusted the slope from 10 degrees to roughly 5 degrees. In addition to the exclusion of livestock as described, the regulations require 3 m setbacks from the beds of wide rivers and lakes (but not natural wetlands).

184. Table 9 outlines the Council's 3 options for Topic 2. The overall intent is to build on the approach taken in the Stock Exclusion Regulations by expanding where stock exclusion and setbacks apply on low slope land. Option 1 was included in the Council's Stage 3 community engagement. However, in March 2024 the Government began the process of revoking the map of low slope land and associated regulations.

185. Options 2 and 3 both seek to retain the differentiation between low slope land and non-low slope land in riparian management. This differentiation is more consequential for cattle and deer as fewer dairy cattle are grazed on steeper slopes. In Option 2 low slope land is generally defined as 0-10 degrees and in Option 3 it is roughly 0-5 degrees. The 3 options are discussed in more depth below Table 9.

Table 9: Comparison of the 3 options for Topic 2 – Stock Exclusion **(in addition to the Stock Exclusion Regulations)***

| **Options** | **Continually flowing rivers on low slope land (no minimum size)** | **Wide rivers and lakes on low slope land (stock exclusion with a 3 m setback is already required)** | **Livestock types (stock exclusion is already required for all dairy cattle, pigs, and intensively grazing beef cattle and deer)** | **Terrain** |
|---|---|---|---|---|
| **Option 1** (developed for Stage 3 community engagement i.e., before March 2024) | Stock exclusion and a 5 m setback | 10 m setback (with 10 year transition time for shifting existing permanent fences)[18] | Sheep on low slope land* | Low slope land as identified in MfE map |
| **Option 2** (developed following Stage 3 community engagement) **Includes a Freshwater Farm Plan pathway** | Stock exclusion and a 3 m setback (with various transition times for shifting existing permanent fences) | 5 m setback (with varying transition times[19] for shifting existing permanent fences) | Non-intensively grazing beef cattle and deer on low slope land | Low slope (ORC definition based on 0-10 degree slope) with a stocking rate exclusion of 6 SU/ha |
| **Option 3** **Includes a Freshwater Farm Plan pathway** | Stock exclusion and a 3 m setback (with existing permanent fences to be shifted on renewal) | No additional setback | Non-intensively grazing beef cattle and deer on low slope land | Low slope (ORC definition based on 0-5 degree slope) and below 500 m altitude, with a stocking rate exclusion of 6 SU/ha |

** The Stock Exclusion Regulations applied to non-intensively grazing beef cattle and deer on low slope land when the regulations include low slope land. Option 1 note what is additional in comparison to the Stock Exclusion Regulations as they existed before the and Options 2 and 3 note what is additional when compared with the Stock Exclusion Regulations*

186. In the RMA, a river means "a continually or intermittently flowing body of fresh water; and includes a stream and modified watercourse; but does not include any artificial watercourse (including an irrigation canal, water supply race, canal for the supply of water for electricity power generation, and farm drainage canal)".

187. An important way that the 3 options for this topic look to build on the Stock Exclusion Regulations is by expanding the application from 'wide' rivers to 'continually flowing' rivers – but only on low slope land. When compared as sets, the main difference between the wide rivers and the continually flowing rivers is that the later includes those that are

[18] In the Stock Exclusion Regulations a 'permanent fence' means— (a) a post and batten fence with driven or dug fence posts; or (b) an electric fence with at least 2 electrified wires and driven or dug fence posts; or (c) a deer fence.

[19] The transition times reflect the timeframes in the pORPS long-term visions, ranging from 2030 in the Upper Lakes rohe to 2050 in the Manuherekia rohe and the Taiari and North Otago FMUs (refer to LF-FW – Fresh water Chapter of the pORPS).

narrow (width of 1 m or less). For clarity, stock exclusion does not generally apply to an intermittently flowing river unless it is also wide (more than 1 m).

188. Figure 5 shows the estimated spatial distribution of narrow continually flowing rivers in Otago as well as low slope land (roughly 0-5 degrees)[20]. In the map narrow continually flowing rivers are represented by second-order streams (i.e., stream order 2)[21]. When considering this map, it is important to note the extreme differences in scale: the rivers in question are 1 m wide or less while the region is 32,000 $km^2$ (or 3.2 million ha). The narrow rivers appear disconnected because the other stream orders are not shown on the map.

[20] The information on this map is just not intended to identify continually flowing rivers of 1m in width or less definitively.

[21] A measure of stream or river size defined by the degree of branching in a drainage system (https://www.lawa.org.nz/learn/glossary/s/stream-order). For example, a first-order stream has no tributaries, while a second-order stream has at least two first-order tributaries. A third-order stream must have at least 2 second-order tributaries.

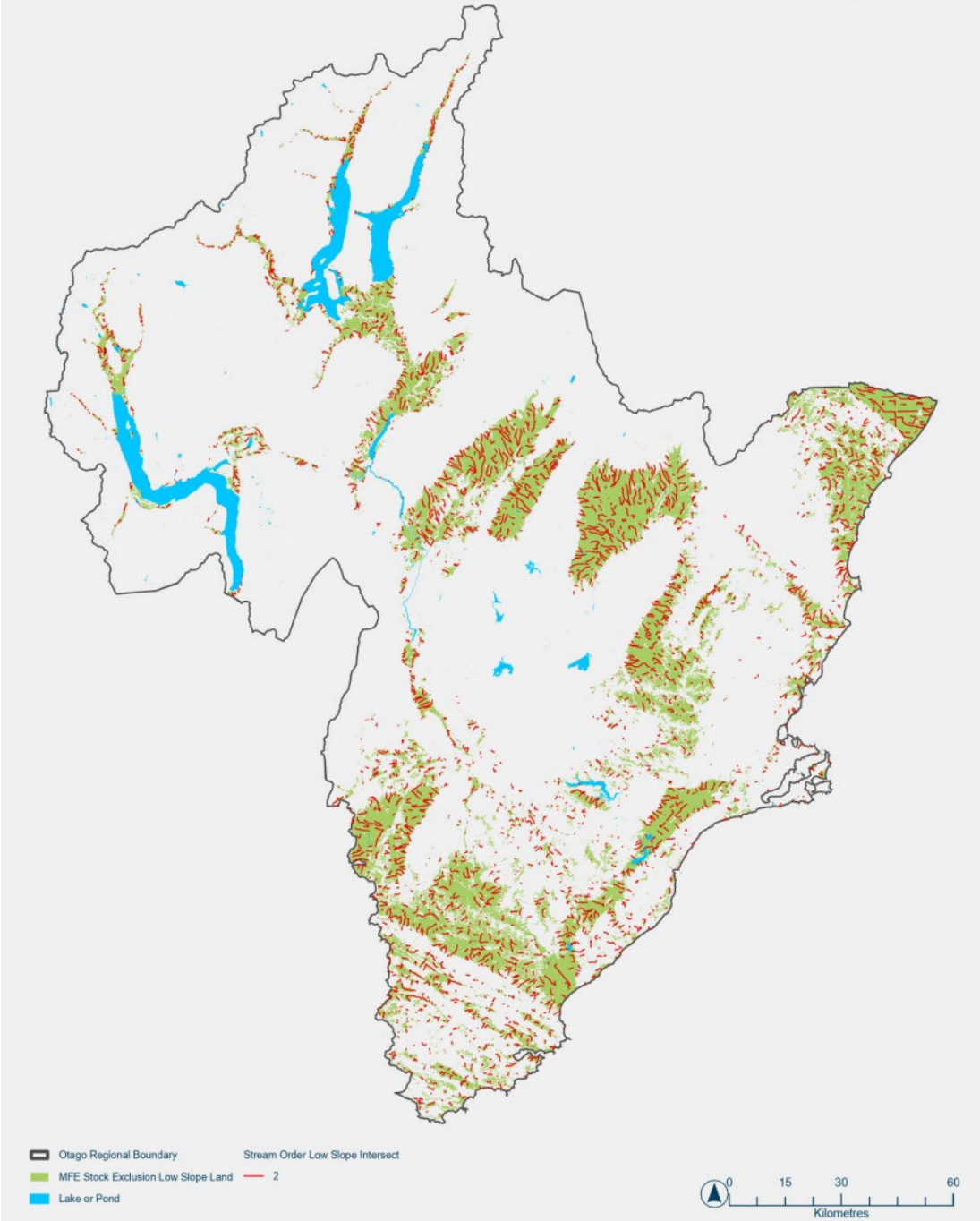


Figure 5: Stream order 2 rivers on low slope land in Otago (as identified in MfE map for Stock Exclusion Regulations)

189. A catchment's contaminant loads vary by stream order as local characteristics (e.g., climate, topography, geology, land cover) influence both 1) inputs of contaminants and 2) their in-stream processing. Using time series data from 728 water quality monitoring sites across New Zealand, (McDowell, et al., 2020) tested these characteristics (using the national-scale River Environment Classification (REC) system and stream orders) for nitrogen (N) and phosphorus (P), suspended sediment, and *E. coli*. It was found that:

> "On average, the yields of all contaminants increased with increasing stream order in catchments dominated by agriculture (generally lowland and pastoral REC land cover classes). Loads from low-order small streams (<1m wide, 30cm deep, and in flat catchments dominated by pasture) … accounted for an average of 77% of the

national load (varying from 73% for total N to 84% for dissolved reactive P). This means that to substantially reduce contaminant losses, other mitigations should be investigated in small streams, particularly where fencing of larger streams has low efficacy."

190. The 3 options for Topic 2 also included conditions on the permitted activity rule to protect the beds and banks of rivers when livestock do access them that were carried over from the Regional Water Plan. All 3 options rely on the Stock Exclusion Regulations in relation to wetlands. The provisions relating to natural wetlands in the pLWRP exclude other 'heavy' livestock that can damage wetlands, such as such as cattle, buffalo, pigs, deer, horses or like species; and goats.

191. Within Otago's grazeable land area, roughly half of the 'rivers' (as represented by all stream order classes) are on land that is identified as low slope (roughly 0-5 degrees). In Otago there is relatively less low slope grazeable land than in neighbouring Southland and Canterbury, and this land is distributed unevenly across the region. Much of the low slope grazeable land is farmed fairly intensively (where water does not act as a constraint), particularly in lowland parts of the region (e.g., lower Clutha, north Otago, and lower Taiari).

192. The largest shares of low slope (0-5 degrees) grazeable land are found in the Lower Clutha rohe and the Taiari FMU (both have roughly 27% each of the regional total). Yet the length of riparian margins of continually flowing rivers (as represented by stream orders 2-8), lakes, and wetlands (as identified for this analysis) are more concentrated in the Upper Lakes rohe (48 m/ha) and the Catlins FMU (42 m/ha), as well as the Dunedin & Coast FMU (35 m/ha) and the Roxburgh rohe (32 m/ha). The average concentration of riparian margins on grazeable low slope land between FMU and rohe across Otago is around 21 m/ha.

193. Table 10 and Figure 6 (below) show how riparian margin lengths are distributed by 1) different types of waterbodies on grazeable land that is low slope and 2) FMU and rohe across the region. The margins were calculated for this analysis using a 1 m setback, which produced results as an area that was then converted to a linear distance (1 ha = 10 km or 10,000 m). The data used in the analysis was sourced from Otago's Setback Quantification Tool for Agriculture (Pearson, 2024)[22].

194. While the results of this analysis are indicative of the spatial distribution of riparian margins on low slope land, the GIS task to identify where these margins occur on grazeable land, along with the land use associated with them within each property, was a complex exercise. Consequently, simple multiplication of the results cannot be used to estimate the areas of land affected by different setback widths across the 3 options.

195. The GIS task was at an FMU/Rohe scale of 1:50,000 and relied on a digital elevation model of 25 metres. It also relied on the River Environment Classification (REC) stream orders. On ORC science advice, the following assumptions were made:

    a. Stream order 1 is likely to be ephemeral to intermittently flowing rivers,

[22] The Otago Setback Quantification Tool was specifically developed to support the assessment of options for farming activities in this s32 evaluation.

b. Stream orders 2 to 8 are likely to be continually flowing rivers,

c. Stream order 2 can be used to represent narrow (1 metre or less anywhere in a land parcel) continually flowing rivers, and

d. Stream orders 3 to 8 can be used to represent wide rivers (wider than 1 metre anywhere in a land parcel).

196. Some more minor riparian situations are not included in this analysis, such as where grazeable land occurs within river and lake margins as well as within exotic plantation forestry, horticulture, non-agricultural land and on conservation land.

Table 10: Analysis of riparian margin lengths on low slope land (0-5 degrees slope) by waterbody type in Otago

| FMU or rohe | Low slope grazeable land | | Riparian margin lengths on low slope grazeable land (km) | | | |
|---|---|---|---|---|---|---|
| | Area (ha) | Share of this land in region | Wide rivers (stream orders 3-8) | Narrow continually flowing rivers (stream order 2) | Intermittently flowing or ephemeral rivers (stream order 1) | Lakes and natural wetlands (as could be identified) |
| Upper Lakes | 12,936 | 2.8% | 148 | 195 | 263 | 274 |
| Dunstan | 35,733 | 7.8% | 328 | 335 | 611 | 97 |
| Manuherekia | 57,717 | 12.5% | 485 | 524 | 869 | 242 |
| Roxburgh | 9,440 | 2.0% | 94 | 140 | 241 | 65 |
| Lower Clutha | 122,887 | 26.7% | 992 | 1,049 | 2,036 | 227 |
| North Otago | 66,375 | 14.4% | 459 | 559 | 917 | 108 |
| Taiari | 123,919 | 26.9% | 870 | 958 | 1,622 | 547 |
| Dunedin & Coast | 17,020 | 3.7% | 157 | 200 | 380 | 231 |
| Catlins | 14,583 | 3.2% | 168 | 201 | 389 | 239 |
| **Region** | **460,610** | **-** | **3,701** | **4,162** | **7,328** | **2030** |

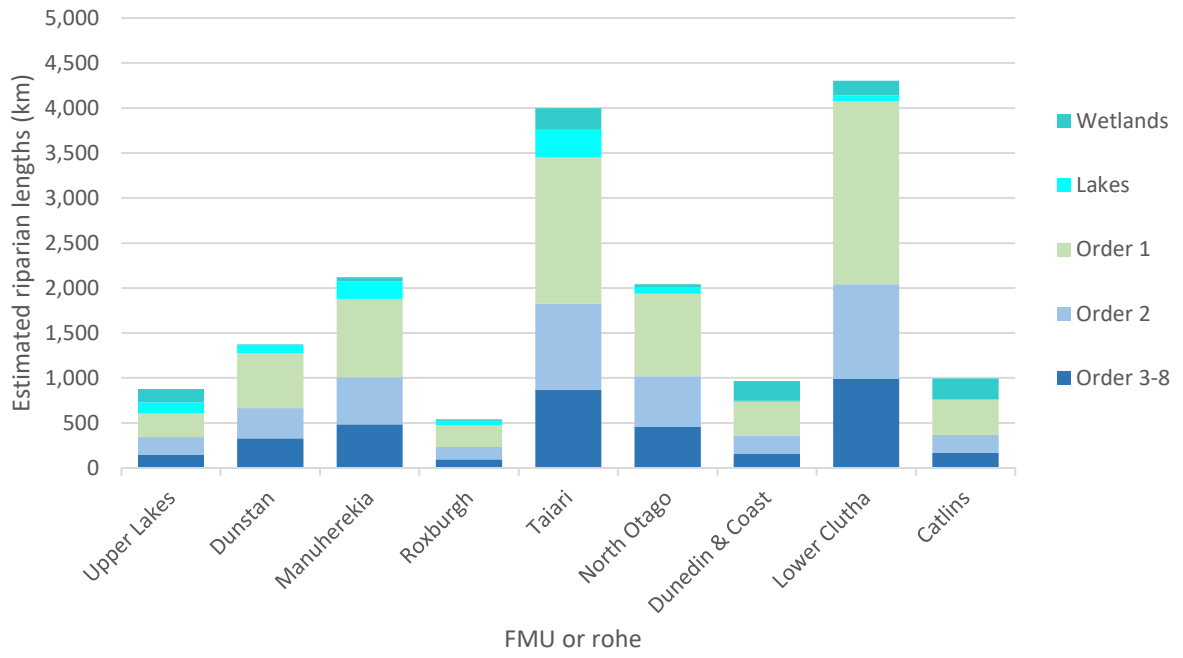


Figure 6: Distribution of 1 metre setback areas by waterbody type on low and medium slope grazeable land in Otago

197. As identified in Table 10 (above), there is an estimated 460,610 hectares of low slope (roughly 0-5 degrees) grazeable land in Otago. There is also another 220,832 hectares of grazeable land currently identified in the MfE map as medium slope (roughly 5-10 degrees). Grazeable land in Otago that is less than 10 degrees slope totals 681,441 hectares.

198. The grazeable land on medium slope (roughly 5-10 degrees) is a key difference in the geographical extent of Option 2 in comparison to Options 1 and 3. In Option 2 low slope land is based on a definition of 0-10 degrees slope while in Options 1 and 3 it is based on 0-5 degrees slope. In other words, Option 2 includes the low slope land AND the medium slope land identified in the MfE map. Another key difference in geographical extent between the options is that Option 1 applies to sheep on low slope land.

199. The addition of medium slope grazeable land increases the lengths of riparian margin in Option 2 for narrow continually flowing rivers by 556 km (e.g., stream order 2) and wide rivers (e.g., stream orders 3 to 8) and lakes by a total of 535 km. While 1,091 km of riparian margins is sizeable (similar in distance to the length of State Highway 1 in the South Island), their concentration on medium slope land is far more limited than on low slope land in Otago.

200. As a reminder, the 3 m setback in the Stock Exclusion Regulations applies to wide rivers and lakes (on any terrain) rather than to continually flowing rivers. In general terms, the increase in setback width in Option 1 from 3m up to 10m applies to more land than the inclusion of medium slope land (roughly 5-10 degrees) to the low slope land definition used in Option 2.

201. Without considering how stock exclusion applies to different livestock types, the following maximum estimates for grazeable land in Otago can be made:

a. A 3 m setback from all narrow (1 m or less) continually flowing rivers amounts to 1,746 ha on low slope land, and 422 ha on medium slope land – or a combined total of 2,168 ha of land.

b. A 10 m setback from all wide rivers and lakes on low slope land equates to 5,879 ha of land. This result represents an additional 4,163 ha of potential land over and above a 3 m setback for such waterbodies.

c. A 5 m setback from all wide rivers and lakes on low slope AND medium slope land 3,517 ha. This result represents an additional 1,433 ha of land of potential land over and above a 3 m setback for such waterbodies.

202. Table 11 (below) details many of the assumptions used to calculate the capital costs of stock exclusion and setbacks for Option 2 and Option 3 (rivers only). The assumptions relating to the costs of fencing and the share of rivers with existing permanent fenced are intended to be indicative-only and they will be variable across the region. The assumptions in Table 11 are for low slope land. The fencing assumptions used for narrow continually flowing rivers on low slope land are similar to those used for all continually flowing rivers on medium slope land (but are not reported here). The costs of fencing are based on those used for stock exclusion in the economic research (described below Figure 7), which was completed in early 2023.

203. In reality, stock exclusion costs are extremely variable and depend to a large extent on 1) the situation on the ground, 2) a farmer's preferences (influenced by finances), and 3) the supply (i.e., availability and pricing) of materials and labour. For example, there are choices around the use of standards (fibreglass, plastic, metal) or wooden fence posts (quarter rounds, half rounds, or full rounds), spacings between standards/posts, the number of wires on a fence, or netting (e.g., for sheep and deer). As well, prices for materials can differ markedly by supplier, customer, and locality. Ongoing inflationary pressures are likely to have continued increasing these costs since the research was completed in 2023, yet such pressures are unlikely to have markedly changed the understanding that it provides.

204. In developing the assumptions in Table 11, it was recognised that much of the existing permanent fencing will be weighted towards wide rivers on low slope land (0-5 degrees slope). It is also presumed that the existing permanent fencing used to exclude beef cattle and deer from wide rivers is likely to be where they are regularly intensively grazed. Some existing permanent fences, particularly on wider rivers, will be property boundary fences. Finally, the cost of shifting a fence is assumed to be roughly the same as building a new fence of similar type.

205. While some land uses are predominately focused on either cattle or deer, much of the land within other land uses in Otago is largely used for sheep grazing. In 2019-20, there were just under 4.9 million sheep in the region, just over 325,000 beef cattle, and around 121,000 deer (Moran (Ed.), 2022). Beef cattle are often run together with sheep – either in the same paddock or as part of a stock rotation within a block or farm. Sheep and/or beef cattle are also grazed on deer farms and deer enterprises are included with sheep and beef cattle on mixed livestock farms. Rotational grazing is discussed further on in this section.

206. The ratio of sheep to cattle varies from year to year but there is a long-term trend towards beef cattle (refer to Figure 10a in Moran (Ed.), 2022: p36). The average ratio of sheep to cattle on Farm Class 6: South Island Finishing and Breeding sheep and beef farms (the most

common Farm Class in the region) is roughly 26:1 (Moran (Ed.), 2023). However, with pressure from dairy farming, beef cattle and deer are now more likely to be extensively grazing in hill country situations than in the past (i.e., on non-low slope land).

207. To account for all of the possible situations where just sheep are grazed, a sizeable adjustment (using a nominal figure of -75%) was made to the results for land uses that are not predominately cattle or deer. The expansion in all 3 options from 'wide rivers' to 'continually flowing rivers' on low slope land is likely to mean that there are fewer paddocks where cattle or deer can graze within a farm that are not subject to stock exclusion. Such situations will increase the potential need for reticulated stock drinking water.

Table 11: Estimates of riparian margins (rivers only) on low slope grazeable land and fencing assumptions

| Land use | Continually flowing rivers (stream orders 2-8) (km) | Capital costs of permanent riparian fencing ($/m) | Share of 'narrow' rivers on low slope land that may be permanently fenced | Share of 'wide' rivers on low slope land that may be permanently fenced | Share of continually flowing rivers that are 'wide' (e.g., stream orders 3-8) |
|---|---|---|---|---|---|
| Dairy | 1,186 | $15 | 50% | 90%* | 43% |
| Dairy support | 61 | $15 | 50% | 90%* | 34% |
| Livestock support | 93 | $15 | 30% | 75%* | 51% |
| Beef | 198 | $20 | 25% | 60% | 52% |
| Sheep & beef | 3,458 | $20 | 25% | 60% | 42% |
| Mixed livestock | 629 | $25 | 20% | 50% | 41% |
| Deer | 112 | $30 | 20% | 50% | 44% |
| Arable | 112 | $20 | 20% | 50% | 56% |
| Unknown land use | 479 | $20 | 20% | 50% | 65% |
| Lakes & rivers | 365 | $20 | 20% | 50% | 92% |
| Other land uses | 581 | $20 | 20% | 50% | 52% |
| **Total** | **7,724** | **-** | **-** | **-** | **51%** |
| Sheep | 588 | - | - | - | 44% |

** It is assumed that (a) permanent fencing for dairy cattle is most likely to occur on dairy, dairy support, and livestock support land uses, and (b) all dairy cattle are excluded from rivers but in some cases, it is achieved by temporary fencing.*

208. Using the assumptions in Table 11, Table 12 compares indicative capital costs for different aspects of Options 2 and 3 (but not including reticulated stock drinking water). The overall difference in costs between the two options is $41.3 million (44%). These costs are weighted towards beef cattle and deer compared to dairy cattle by a ratio of roughly 3:1, for reasons such as: 1) the existing permanent fencing on dairy farms, 2) the extent of beef cattle and deer farming in Otago, and 3) the high cost of deer fencing. For Option 3, the

value of land in setbacks relevant to beef cattle and deer on narrow continually flowing rivers was estimated to be $14.3 million and on wide rivers it was $5.1 million.

209. A key driver of the additional capital costs of Option 2 is associated with shifting permanent fences on wide rivers by 2 m to increase the width (and so the effectiveness) from the minimum 3 m setback in the Stock Exclusion Regulations to a 5m setback. This cost ($19.4 million) is similar to the value of the additional land in a 5 m setback on wide rivers ($19.2 million). Based on the assumptions used (detailed in Table 11), unfenced wide rivers (stream orders 3-8) represent roughly one-third of the total unfenced rivers (stream orders 2-8) on low slope land (0-5 degrees).

210. The results in Table 12 do not factor in access to finance and interest costs, ongoing management costs (e.g., repairs and maintenance, weed control), the costs of shifting fences and increased setbacks for lakes (Option 2) nor the costs of installing stock drinking water reticulation (Options 2 and 3). As permanent fencing is erected on more rivers, the costs of repairs and maintenance is likely to increase in areas prone to high rainfall events.

211. The results in Table 12 also do not consider the benefits provided to farmers by Freshwater Farm Plan pathways and timeframes for shifting existing permanent fences: varying transition timeframes for Option 2 and 'on renewal' for Option 3. Both options include recognition of a farmer's existing investment in stock exclusion. All of these aspects will play a crucial role in providing farmers with flexibility in solutions for their property and so minimising unnecessary costs.

212. Setbacks for stock exclusion tend to permanently constrain the versatility of the land to a high degree, especially where their width is less than what is needed for other activities. Therefore, land values are a better proxy for the change in profitability over time for farmers than annual ongoing costs of imported feed. The use of land values is not intended to suggest that replacement land is available. The land values assumptions were $35,000 per hectare for low slope land and $25,000 per hectare for medium slope land. These values are intended to recognise that there can be marked variability within a paddock, between land uses, and across the region.

Table 12: Distribution of indicative capital costs to farmers of Options 2 and 3 (rivers only) for stock exclusion ($ millions)

| **Aspect** | **Capital cost Option 2 (low slope = 0-10 degrees)** | **Capital cost Option 3 (low slope = 0-5 degrees)** | **Option 3 difference from Option 2** |
|---|---|---|---|
| Additional permanent fences for unfenced continuously flowing rivers (narrow and wide) | $32.2 | $28.1 | -$4.1 |
| Additional land in setbacks for narrow rivers | $24.7 | $21.0 | -$3.7 |
| Shifting existing permanent fences to accommodate increased setback for wide rivers | $19.4 | N.A. | -$19.4 |
| Additional land in setbacks - wide rivers* | $19.2 | $5.1 | -$14.1 |

| Aspect | Capital cost Option 2 (low slope = 0-10 degrees) | Capital cost Option 3 (low slope = 0-5 degrees) | Option 3 difference from Option 2 |
|---|---|---|---|
| **Total** | **$95.5** | **$54.2** | **-$42.2** |
| Fencing costs for dairy cattle | $15.8 | $5.9 | -$10.0 |
| Value of setback land for dairy cattle | $10.7 | $6.6 | -$4.1 |
| **Total - dairy cattle (share of total)** | **$26.5 (28%)** | **$12.5 (23%)** | **-$14.0** |
| Fencing costs for beef cattle and deer* | $35.7 | $22.2 | -$13.5 |
| Value of setback land for beef cattle and deer* | $33.2 | $19.5 | -$13.7 |
| **Total - beef cattle and deer (share of total)** | **$68.9 (72%)** | **$41.7 (77%)** | **-$27.2** |

** Includes 3 m setbacks for currently unfenced wide rivers where beef cattle or deer are non-intensively grazed on low slope land. Note: There are minor differences in the results reported because of rounding. Where relevant, the results are adjusted by -75% for where there are likely to be 'just sheep' grazing, as discussed above Table 11.*

213. Option 1 contrasts with Options 2 or 3 by requiring stock exclusion for sheep. An important benefit of stock exclusion for sheep is reducing the risk of direct microbial contamination to waterbodies, which in the case of lambs can be quite high. Sheep and lambs excrete considerably less faeces per day than dairy cattle (sheep 1-2 kg; cattle 20 kg approx.), but their faeces contain more E. coli per gram (Moriarty, 2013). As well, lambs excrete higher concentrations of E. coli, enterococci and Campylobacter than adult sheep (Moriarty, Karki, Mackenzie, Sinton, Wood, & Gilpin, 2011). However, the sheep aspect of Option 1 is consequential because of their predominance in Otago.

214. Sheep were not specifically included in Options 2 and 3 because the high costs of excluding them from waterbodies on low slope land viewed as outweighing the benefits that may be gained at this time. As an example, if the 'just sheep' adjustment is removed from the results for Option 3 in Table 12 then the capital costs of fencing unfenced continually flowing rivers increases from $22.2 million to $75.4 million. From a farm management perspective, some farmers may choose more expensive sheep fencing rather than cattle fencing as their preferred method of stock exclusion (to avoid sheep getting caught up in the wires).

215. The benefits and the costs of additional setbacks in Options 1, 2, and 3 are likely to differ across the region, depending on a complex set of factors. Such factors include land use activities and practices, soil erodibility, the extent of overland flow (a mix of rainfall patterns, slope, as well as natural and artificial drainage), and the sensitivity of receiving environments downstream. As an example, Central Otago has a lower annual rainfall than the Catlins but the Catlins has less low slope land than in Central Otago and more rain.

216. As an illustration, Figure 7 shows the distribution of annual average rainfall across Otago in comparison to the occurrence of land identified in the MfE map as low slope (0-5 degrees). Other considerations are relevant as well, including the seasonal distribution in this rainfall, particularly when it occurs during the most vulnerable months environmentally, which also may differ across the region. Rainfall distribution and frequency across the region is likely to alter in the future with the effects of a changing climate.

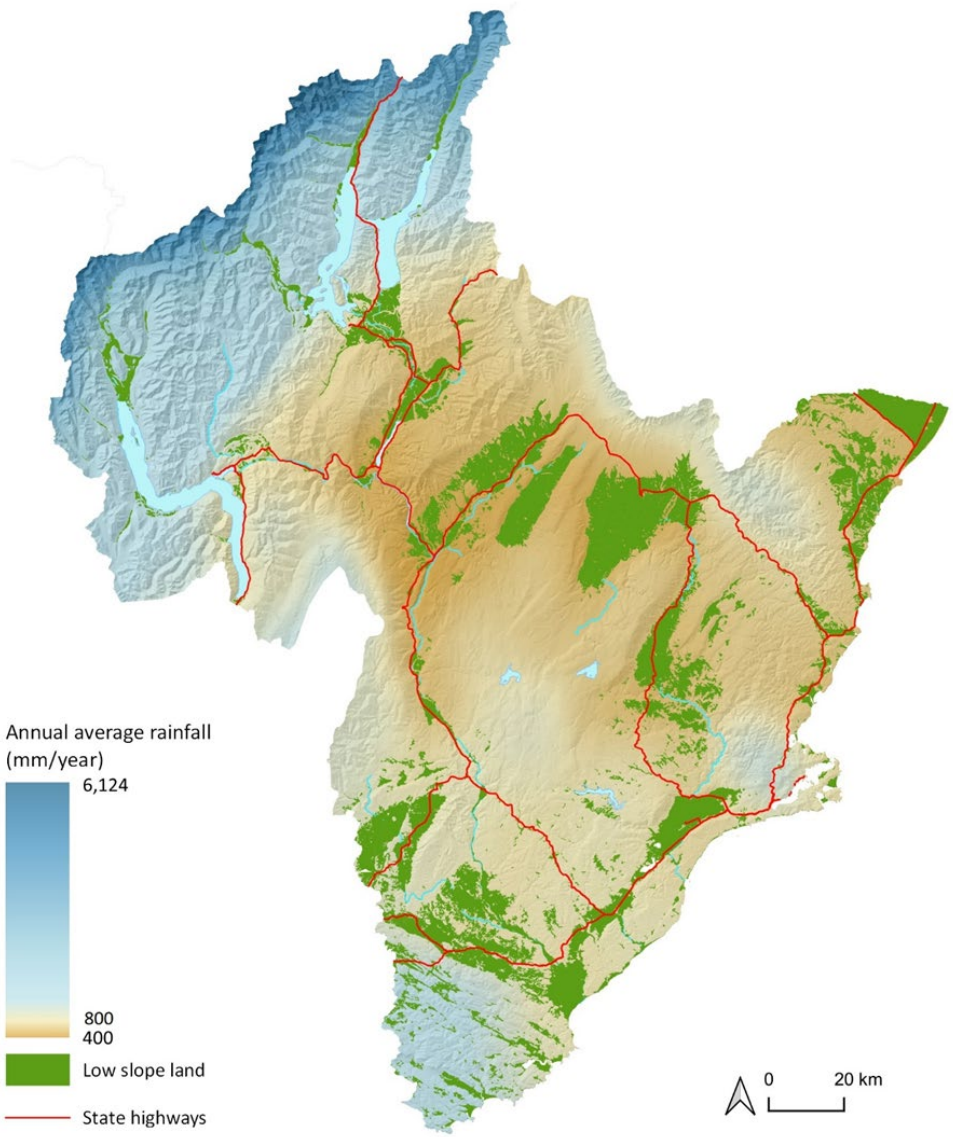


Figure 7: Low slope land (roughly 0-5 degrees) and annual rainfall in Otago

217. As a general topic, riparian management (stock exclusion, setbacks, and planting for biodiversity) were covered extensively in the Industry Advisory Group's economic research for sheep and beef cattle farming (sections 2.5.2 and 2.5.3), deer farming (sections 3.5.2, 3.5.3, and 3.5.4), and arable farming (sections 4.3.2 and 4.5.2) (Moran (Ed.), 2023). The sheep and beef farming research covered many farms while that for deer farming and arable farming was more in-depth for a handful of farms. Except for wetlands, the focus of the sheep/beef/deer research was generally on steeper slopes (greater than 10°)[23]. This economic research is described in general terms in Section 1.5.5 of this chapter of the s32 report.

[23] In the research it was assumed that the waterways on slopes greater than 10 degrees on Class 1 (High Country) farms were almost impossible to fence due to the steep terrain thus these farms were not included in the analysis (Moran (Ed.), 2023).

218. As an example, 3 environmental actions were tested on up to 9 sheep and beef farms to further protect waterways (section 2.5.2 of Moran (Ed.), 2023). These actions prevented cattle and deer from having direct access to waterbodies and streambanks that are not already required to be fenced under the Stock Exclusion Regulations:

    1. Fence off wetlands,

    2. Fence off rivers and streams second-order or wider on slopes greater than 10 degrees, and

    3. Fence off all waterways on slopes greater than 10 degrees.

219. The economic research for sheep and beef farming and deer farming also explored situations where the removal of an enterprise from a farm's production system as an alternative action to fencing for achieving stock exclusion on higher slopes (sections 2.5.8 and 3.5.2 of Moran (Ed.), 2023). Stock exclusion for sheep (including mob-stocking) was not tested in the economic research, except for arable farming.

220. In the research for sheep and beef cattle farming, the fencing of rivers on non-low slope land was costed based on a post and netting fence at $15 per metre with the landowner providing some labour (Moran (Ed.), 2023). Wetland fencing was costed at $22 per metre to allow for the additional strainers needed. For deer farming, it was anticipated in the economic research that exclusion fencing will require more strainers and stays (multiple short strains and corners). The cost of fencing on slopes steeper than low slope land was assumed to be $30 per metre to cover deer fencing of this type. Dairy fencing was not costed in the research, as stock exclusion already exists for all but the smallest streams, but the cost for cattle is usually much lower than it is for sheep and deer.

221. The economic research found that solutions were most efficient when tailored to the context of the landscape and the farm system (Moran (Ed.), 2023). Total stock exclusion has higher costs where there is a lack of reticulated water for on-farm livestock drinking than where it is already installed. Partial or targeted solutions for stock exclusion and riparian planting (e.g., focusing on one side of a waterway or the use of edge-of-field technologies) are two ways of managing impacts. The costs of additional weed and pest control (e.g., for broom and gorse) can be reduced with expert advice and assistance.

222. The economic research was available to the Council in mid-2023. When it came to developing options for stock exclusion, the Council did not seriously consider requiring additional management of livestock on steeper slopes (i.e., above 10 degrees) through the permitted activity rule. A risk-based approach to riparian management on all topographies is anticipated via Freshwater Farm Plans.

223. As already noted, Options 2 and 3 included a new definition of low slope land for when all references to low slope land in the Stock Exclusion Regulations are revoked, as is proposed by the Resource Management (Freshwater and Other Matters) Amendment Bill. In general terms, this definition is based on that used in the Stock Exclusion Regulations but without low slope land being identified in a map.

224. Various rules in the pLWRP are dependent on slope. The Freshwater Farm Planning process is expected to be a key method used for assessing slope risks and identifying appropriate environmental actions. On-site, slope will be able to be assessed with commonly available hand-held measurement tools. The Council also has LIDAR information for parts of the region, particularly areas where there is a high proportion of low slope land, and coverage

will continue to expand over 2025 and 2026. With LIDAR information, ORC will be able to produce guidance maps that are verified on-site. Freshwater Farm Plan processes can be followed if those maps are not seen as suitable.

225. The definitions of low slope land in Options 2 and 3 both contain a "6 stock units / ha" exclusion. This stocking rate is roughly equivalent to the annual average stocking rate for Farm Class 2 Hill Country farms (discussed below). However, its use in the definition is instantaneous (i.e., it is measured at the time), at the paddock-scale, and only applies to the livestock in question (i.e., does not include sheep). To illustrate the number of beef cattle or deer possible per hectare, the Beef + Lamb New Zealand Benchmarking Tool gives information on stock unit values: a weaner heifer is 3.5 stock units, a heifer or steer is 5.5 stock units, a breeding hind is 1.9 stock units, and an immature stag is 2.2 stock units[24].

226. By convention, stocking rates are usually measured at mid-winter (close of the production season on 30 June) when pasture production is at its lowest (Moran (Ed.), 2023). Detailed information on stocking rates for sheep and beef farms and deer farms as well as an explanation of the importance of rotational grazing (along with set stocking at certain times) for pasture productivity was included in the economic research (Moran (Ed.), 2022; Moran (Ed.), 2023).

227. On sheep and beef farms, stocking rates tend to be lower on larger farms and higher on smaller farms where there is improved pasture species and a greater proportion of flat land (Moran (Ed.), 2023). Figure 16 (Moran (Ed.), 2023: p 61) shows a continuum of stocking rates for the 41 sheep and beef farm sample in the economic research (ordered from lowest to highest stocking rates). Average stocking rates ranged from 1.6 SU/ha for Farm Class 1 High Country farms, 5.7 SU/ha for Farm Class 2 Hill Country farms, to 8.4 SU/ha for Farm Class 6 Finishing and Breeding farms, and 11.1 SU/ha for Farm Class 7 Finishing farms. Stocking rates on Farm Class 6 varied depending on rainfall or access to water.

228. Similarly, Figure 35 (Moran (Ed.), 2023: p 129) shows the stocking rates for the 17 deer farm sample in the economic research. On almost two-thirds of the farms, livestock were grazed at a density of between 8 and 14 stock units per hectare. Those farms with stocking rates below 8 SU/ha all had grazeable areas in excess of 1,000 hectares. However, there is strong variability both between farms and within each farm. Some farms with low overall stocking rates have highly productive flatter areas with forage crops and irrigation. On deer farms, stocking rates are influenced by stock classes and the time of year (e.g., hinds during fawning or stags during mating).

229. Figure 8 shows the annual stock units per hectare of individual blocks within each farm, which shows the carrying capacity of different blocks. These data are sourced from Overseer and indicate the range in block carrying capacity (or stocking rate) within a farm. The marked differences in how a farmer stocks their farm, both within a farm and between farms, is a response to levels and quality of pasture production and feed supply that varies across a year. As mentioned above, rotational grazing means that stocking rates within each of a farm's blocks are likely to vary throughout a year, particularly on low slope grazeable land.

[24] https://tools.beeflambnz.com/benchmarking-tool

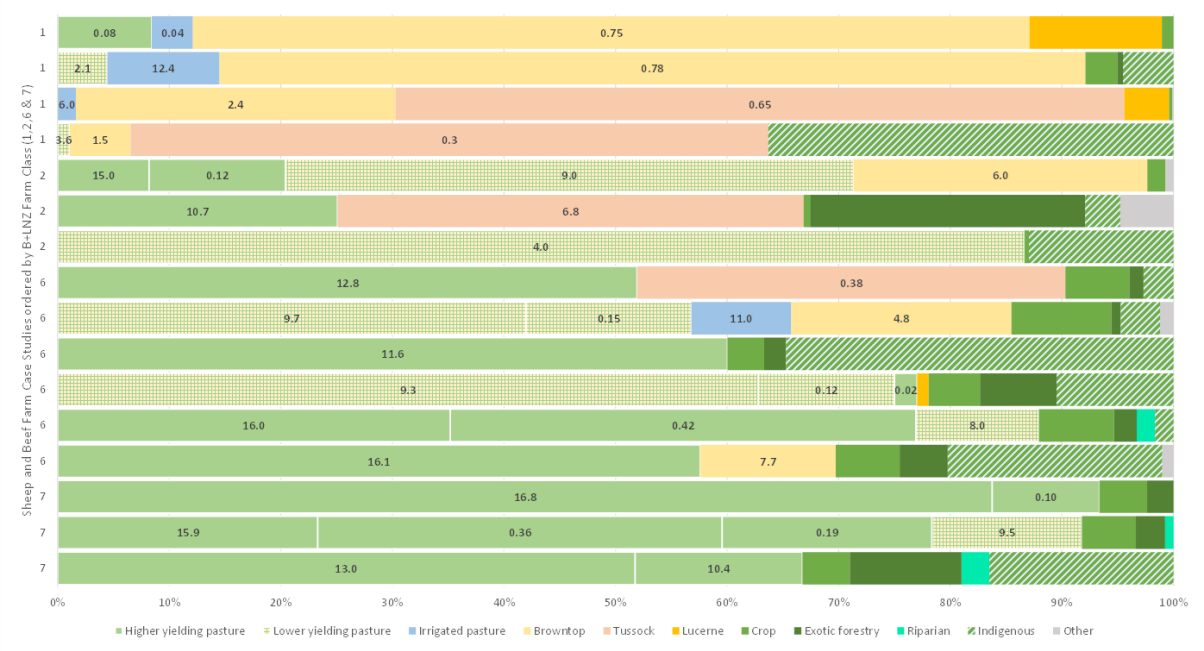


Figure 8: Distribution of average block stocking rates (as reported in Overseer) within 16 sheep and beef farms in Otago 2020-21 (source Moran (Ed.), 2023)
Note: A larger version of this graph is available on page 86 in Moran (Ed.) (2023)

### 1.6.4.1. Topic 2 Efficiency and Effectiveness Assessment

230. Table 13 below identifies and assesses the environmental, cultural, social, and economic benefits and costs anticipated from implementing the proposed options for Topic 2. The options for Topic 2 (and those for each subsequent topic for farming) are assessed as being in combination with those for Topic 1. Resource consent cost information is available in section 4 of Chapter 7. Information on the costs and benefits to the Kāi Tahu economy related to freshwater management approaches is included in section 3 of Chapter 7.

231. For farming, the distribution of benefits and costs of options within each topic are likely to be strong variable. Some local communities may be more impacted by and/or are less resilient to certain topics (and options within those topics) than others. Information for local communities, including population, employment and socio-economic deprivation, is available in a series of snapshots (Yang A. , 2022a; Yang A. , 2022b; Yang A. , 2022c; Yang A. , 2022d; Yang A. , 2022e; Yang A. , Roxburgh Rohe, Manuherekia Rohe and Upper Taieri Economic Snapshot, 2022f).

232. The analysis here considers the benefits and costs of the potential change that the options represent from current policy settings. In some cases, there may be a gap between those policy settings (e.g., Stock Exclusion Regulations or Freshwater Farm Plans) that apply nationally and the environmental actions that have been fully implemented on the ground

in Otago[25]. Where such a gap exists, it is indirectly relevant to this analysis because it will influence the benefits and costs of any additional change[26].

233. General information on stock exclusion in New Zealand (including shifting fences) is available in the reports titled the Stock Exclusion Costs (MPI, 2016) and Economic Evaluation of Stock Water Reticulation on Hill Country (Journeaux & Van Reenen, 2016) as well as Modelling of Mitigation Strategies on Farm Profitability: Testing Ag Package Regulations on-Farm (Journeaux, 2019). The applicability of stock drinking water reticulation across the 3 options for Topic 2 varies by stock type, river width, and the slope of the land.

234. Since these reports were prepared significant inflation pressures have occurred in farming (well in excess of the consumer price inflation). While prices have increased for all categories of farm inputs, items such as timber posts and interest rates have seen particularly sharp rises and are both particularly relevant to achieving the exclusion of livestock from waterbodies.

Table 13: Benefits and costs for Topic 2 – Stock exclusion from water bodies

| OPTIONS | BENEFITS | COSTS |
|---|---|---|
| **Option 1:** Includes sheep, 5m setbacks for low slope continually flowing rivers, 10m setbacks for low slope wide rivers and lakes, 10-year transition time for existing fences, and reliance on MfE low slope map. | ▪ Expanding riparian management on low slope land will contribute to resolving biodiversity and waterbody health issues.<br>▪ Option 1 (as well as Options 2 and 3) introduces stock exclusion and setbacks for narrow continually flowing rivers on low slope land. It also increases wetback widths for wide rivers and lakes on low slope land (as does Option 2).<br>▪ Increased management of narrow streams in catchments dominated by improved pasture is important because the contaminant loads in such streams can account for the bulk of the nitrogen and phosphorus loads from pastoral farming.<br>▪ Option 1 is also likely to be more beneficial than Options 2 and 3 in reducing losses of E. coli from sheep and lambs. Lambs, in particular, | ▪ Option 1 is likely to apply to land within most productions systems for dairy and dairy support farms, sheep and/or beef farms, mixed drystock farms, deer farms, and pig farms (although there are currently very few in Otago). Other farms include mixed arable and livestock support. It is also anticipated that other types of properties, such as small landholdings and lifestyle properties.<br>▪ As indicated in the discussion above, the costs of applying Option 1 to sheep were seen to be prohibitive at this time because of the extent of sheep farming in Otago, and far outweighed the benefits to be gained.<br>▪ The value of this loss in versatility is generally measured as any resulting reduction in income, which will be strongly variable from one farm to the next in Otago, for a multitude of reasons (e.g., farm size, length of riparian margins, natural tortuosity of rivers, amount of low |

[25] As an example, the Water Plan may have no setback for a specific activity, a new national regulation requires a three metre setback, and a rule in the pLWRP proposes a five metre setback. The gap between the current policy and fully implemented policy is three metres and change to be assessed is the addition of two metres.

[26] For an explanation of this point refer to the Progress, Priorities and Planning section of the Executive Summary of Moran (Ed.) (2023).

| OPTIONS | BENEFITS | COSTS |
|---|---|---|
| | excrete high concentrations of E. coli, enterococci and Campylobacter. This option may also improve animal welfare by reduce stock losses in water.<br>▪ Larger setbacks than those in Options 2 and 3 may contribute to preventing stream-bank collapse caused by larger livestock grazing in riparian zones, which have been identified as a major source of sediment in pasture catchment streams (e.g., McDowell & Wilcock, 2008). However, without sheep to graze pasture within a setback, the contribution of long grass and weeds to maintaining stream bank stability can be limited.<br>▪ The larger setbacks can also offer protection for permanent fences from streambank erosion, avoiding some repairs and maintenance costs with stock exclusion fencing over time. In other words, the broader filtration zone will increase a river's corridor, giving it more room to move, particularly during high rainfall events. This outcome may improve the health of the waterbody, which is likely to be beneficial across all four wellbeings.<br>▪ The benefits of the additional stock exclusion and setbacks for low slope land are likely to differ across the region, depending on a range of factors. Some of these factors are noted in the discussion above, such as land use activity and the amount and timing of rainfall.<br>▪ By not adding to the Stock Exclusion Regulations in relation to non-low slope land, Option 1 (and Option 2 and Option 3) leave some issues to be addressed through tailored riparian management solutions in Freshwater Farm Plans. This flexibility may help avoid (or at least | slope land, type of production system, enterprise mix, current profitability, access to capital, type of fencing needed).<br>▪ A common measure to quantify the costs associated with the loss in pasture and/or crop at a paddock-scale is the reduction in dry matter per hectare. However, as the loss is permanent a farmer may choose not to replace it with imported feed. In some cases, feed may be able to be conserved and transported to within the paddock (assuming the feed production is not dependent on irrigation), which has a labour cost. In other cases, the loss may result in an adjustment in livestock numbers, which will depend on 1) the amount of land within the setback and 2) stocking rates for that land. Stocking rates vary by block, farm, and land use.<br>▪ In some cases, a farm may contain very limited low slope land, and constraining some of it within wider setbacks may be as impactful for their production system as a farm with more low slope land. As another example, potential conflicts between deer fencing and centre pivot irrigation may pose specific challenges for deer farmers.<br>▪ Detailed information on the ranges in profitability per grazeable (or effective) hectare for farming in Otago is extensively reported in Moran (Ed.) (2022 and Moran (Ed.) (2023). However, it is safe to assume that the financial costs for each farm will be higher under Option 1 than Options 2 and 3.<br>▪ In addition to the reduction in land versatility and what this may mean for a farm's production system, many farmers will incur both capital costs and management costs for the additional stock exclusion from waterbodies, controlling weeds beside water, and where any existing permanent fences need to be shifted within 10 years. Weed control is discussed across the land uses in Moran (Ed.) (2023).<br>▪ The costs of shifting any existing |

| OPTIONS | BENEFITS | COSTS |
|---|---|---|
| | minimise) some of the costs highlighted in the economic research (refer to the case studies in the economic research relevant to this topic that were highlighted in the discussion above this table). | permanent fences to accommodate additional setbacks are likely to be similar to that of installing a new fence. There will be some cost-savings where materials can be reused but there will be additional labour costs and earthworks in the recovery process. Land contour is an important factor in the costs when shifting fences (Journeaux, 2019).<br>▪ Fencing will create demand for labour that will either be undertaken by the farmer and/or as a service that is purchased. Both options can have opportunity costs on-farm in terms of other priorities that are delayed. The costs associated with all farm fencing (except for stockyards) are tax deductible to a farmer.<br>▪ The costs of Option 1 are not just financial. They may contribute to increasing farmer stress and cause a loss of momentum around stock exclusion as an environmental action. A loss of momentum may already be an issue where stock exclusion fences are at more risk from high river flows during high intensity and/or prolonged rainfall events.<br>▪ Some farmers who are unable to meet the permitted activity conditions may choose to follow the resource consent pathway (rather than via a Freshwater Farm Plan), which will incur the costs of a consenting process. |
| **Option 2:** 3m setbacks for low slope continually flowing rivers & 5m setbacks for low slope wide rivers and lakes, varying transition times for existing fences, and ORC definition of low slope land (up to 10 | ▪ As noted in Option 1, expanding riparian management on low slope land will help resolve biodiversity and waterbody health issues.<br>▪ While the additional setbacks in Option 2 are less than the previous option, Option 2 expands the definition of low slope land to 0-10 degree but does not apply to sheep. Consequently, it applies to different land geographically and the patterns of environmental improvements across the region will also vary.<br>▪ In contrast to Option 1, Option 2 does not automatically manage | ▪ Many of the costs for Option 1 also apply to Options 2, such as the farm and property types affected, the costs of shifting any existing permanent fences, and variability in any loss of income – but not necessarily those relating to sheep. Indicative capital costs of Option 2 (and Option 3) are presented in the discussion above this table.<br>▪ By expanding the definition of low slope land from 0-5 degrees to also include 5-10 (i.e., medium slope land in the MfE map) but by not applying specifically to sheep, Option 2 is likely to impose costs on a somewhat different set of farms than |

| OPTIONS | BENEFITS | COSTS |
|---|---|---|
| degrees). | sheep access to rivers, lakes and wetlands, which is a benefit for farmers. Sheep-only farms are likely to avoid the direct costs of Option 2 unless sheep access causes slumping, pugging, or erosion, or result in a change in the visual clarity of water. This requirement is carried over from the Regional Water Plan.<br>▪ Option 2 also includes varying transition timeframes (between 2030 and 2050) for shifting existing fences, which are longer overall than those for Option 1. This aspect of Option 2 helps to prioritise effort where it is needed. The costs to farmers from shifting fences are partially offset by being able to graze the additional land to be included in the setbacks for longer.<br>▪ Where the permitted activity conditions are not able to be met, Option 2 (and Option 3) include a Freshwater Farm Plan pathway that allows for some flexibility in the actions needed to address water quality issues. This pathway gives farmers an alternative to a resource consent process.<br>▪ Other benefits of Option 2 are broadly consistent with Option 1. An additional benefit for farmers is that sheep may be able to graze within the setback, which is savings of pasture and weed management in comparison to Option 1 (although pasture renewal is likely to be problematic and stock may be lost).<br>▪ Options 2 and 3 include a 6 SU/ha exclusion. This instantaneous stocking rate exclusion potentially avoids capturing very extensive beef cattle and deer grazing, such as where there is high elevation and dry conditions. | Option 1. While the costs of Option 2 will be lower for many farms they may not be for some.<br>▪ As described in Option 1, the loss in the versatility of this land may constrain the production systems of some farms, and costs will be incurred where any existing permanent fences need to be shifted in the future.<br>▪ The social costs described in Option 1 relating to increasing farmer stress and low of momentum around stock exclusion still exist in Option 2 - for a gain of +2 m in setback width by wide rivers and lakes.<br>▪ As with Option 1, the costs of the setback constraint will be highly variable from one farm to the next for a multitude of reasons (examples in Option 1).<br>▪ The shift in all 3 options from 'wide rivers' to 'continually flowing rivers' is likely to mean that there are fewer paddocks where cattle or deer are grazed within a farm that are not subject to stock exclusion – increasing the potential need for reticulated stock drinking water.<br>▪ As Option 2 (and Option 3) do not specifically apply to sheep, other environmental actions may be needed in the future to manage losses of *E. coli*, particularly from lambing paddocks. Such actions will help avoid risks to human health. |
| **Option 3:** 3m | ▪ Many of the benefits of Options 1 | ▪ Many of the costs detailed above also |

| OPTIONS | BENEFITS | COSTS |
|---|---|---|
| setbacks for low slope continually flowing rivers and lakes, 'on renewal' transition for existing fences, and ORC definition of low slope land (up to 5 degrees). | and 2 are also relevant to Option 3.<br>▪ Option 3 expands riparian management on low slope land, which will help resolve biodiversity and waterbody health issues, even though the additional setbacks are less than Option 1 and 2, and it applies to less land geographically than the other options.<br>▪ The main benefits from Option 3 are gained from the application of stock exclusion and setbacks to narrow continually flowing rivers surrounded by more intensive pastoral farming.<br>▪ In Option 3 there is limited need to shift existing permanent fences, and then only 'on renewal'.<br>▪ By not adding to the Stock Exclusion Regulations in relation to non-low slope land, Option 3 (as with Options 1 and 2) leaves some issues to be addressed through tailored riparian management solutions in Freshwater Farm Plans. | apply to Option 3. However, with a less expansive approach to setbacks and less need to shift existing permanent fences, the costs of Option 3 – while still considerable – will be far lower than those associated with Option 1 or Option 2. Indicative capital costs for stock exclusion from rivers are presented in the discussion above this table.<br>▪ Option 3 will largely impose costs where dairy cattle, beef cattle and deer are grazed by narrow, continually flowing rivers on low slope land. The costs may also impact how non-intensively grazing beef cattle and deer are managed where they are 1) above the instantaneous stocking rate of 6 stock units per ha at the paddock scale and 2) below 500m in altitude.<br>▪ Sheep are less likely to be able to graze within a 3 m setback than the 5 m or 10 m setbacks in Options 2 and 1 so weed management issues may increase in comparison to the other options. The use of agrichemicals, such as herbicides, near water is carefully managed by the other provisions in the pLWRP.<br>▪ The costs of stock exclusion depend, to a large extent, on the method used to achieve it. Alternatives to the use of permanent fencing include nature-based solutions, farm management decisions, and developing new technologies. An example of a nature based solution used in south Otago and Southland is thick plantings of flax. However, such plantings take years to establish and need protection during this time with temporary fencing.<br>▪ Narrower setbacks on rivers reduce the protection for permanent fences from streambank erosion, possibly increasing maintenance costs over time. A smaller filtration zone decreases a river's corridor, giving it less room to move (refer to the benefits for Option 1). |

235. In addition to benefits and costs, this assessment also needs to take into account the risk of acting or not acting if there is uncertain or insufficient information. There is considerable information about the adverse environmental effects of livestock access to water, a requirement to comply with the Stock Exclusion Regulations, and the effectiveness of increasing riparian setbacks in managing the overland flow of contaminants. However, there is some uncertainty as to the number of farms that have already implemented the Stock Exclusion Regulations by installing permanent fencing on wide rivers. As such, there is considerable uncertainty regarding the full impacts of implementing either Option 1 or Option 2. Overall, the information supporting Option 3 is more certain and sufficient, that there is less risk of acting compared with Options 1 and 2.

Table 14: Effectiveness and efficiency assessment for Topic 2 – Stock exclusion from waterbodies

| **Effectiveness** | |
|---|---|
| **Option 1:** Includes sheep, 5m setbacks for low slope continually flowing rivers, 10m setbacks for low slope wide rivers and lakes, 10-year transition time for existing fences, and reliance on MfE low slope map. | This option for stock exclusion (in combination with those for Topic 1), is likely to be moderately effective in achieving the objectives of the pLWRP. With large setbacks for narrow continually flowing rivers, a sizeable increase in setbacks for wide rivers (many of which are also continually flowing), and the inclusion of sheep, Option 1 is anticipated to be more effective for water quality (at a regional scale) than Options 2 and 3. However, with its reliance on the low slope map and the inclusion of sheep, Option 1 applies to a different land area than the other options. Also, increasing setbacks on wide rivers is less likely to be as effective as introducing setbacks for narrow continually flowing rivers on intensively grazed low slope land. |
| **Option 2:** 3m setbacks for low slope continually flowing rivers & 5m setbacks for low slope wide rivers and lakes, varying transition times for existing fences, and ORC definition of low slope land (up to 10 degrees). | As indicated above, this option (in combination with Topic 1) may also be moderately effective in achieving the objectives of the pLWRP. Its effectiveness is lower than Option 1 for the terrains where it applies geographically because of the lesser increase in setback width for wide rivers and the exclusion for sheep. However, the extent of low slope land is much broader (0-10 degrees). The de-motivating effect of have to shift newly erected fences for stock exclusion on wide rivers is anticipated to have reduced the effectiveness of Option 2 (and Option 1). |
| **Option 3:** 3m setbacks for low slope continually flowing rivers and lakes, 'on renewal' transition for existing fences, and ORC definition of low slope land (up to 5 degrees). | Option 3 is best viewed as another step towards the objectives, in that it will contribute to achieving many target attribute states in low slope areas of the region, where most of the more intensively grazing livestock occurs. Its effectiveness is likely to be less where livestock are extensively grazed. This option increases the extent of riparian setbacks on narrow continually flowing rivers across many locations in the region. Nutrient loads from low-order small streams (<1m wide, 30cm deep, and in flat catchments dominated by pasture) … accounted for an average of 77% of the national load (varying from 73% for total N to 84% for dissolved reactive P) (McDowell et al., 2017). |
| **Efficiency** | |

| | |
|---|---|
| **Option 1:** Includes sheep, 5m setbacks for low slope continually flowing rivers, 10m setbacks for low slope wide rivers and lakes, 10-year transition time for existing fences, and reliance on MfE low slope map. | Although Option 1 is likely to be moderately effective in achieving the objectives, it imposes a far greater economic cost than Option 3. These costs include those for sheep exclusion and reticulated stock drinking water, wider setbacks, and moving existing permanent fences within relatively short transition timeframes. Where resources, such as fences posts and wire, cannot be recovered it may increase solid waste. Such costs make Option 1 far less efficient than Option 3 as the costs are likely to outweigh much of the additional benefits. |
| **Option 2:** 3m setbacks for low slope continually flowing rivers & 5m setbacks for low slope wide rivers and lakes, varying transition times for existing fences, and ORC definition of low slope land (up to 10 degrees). | Similar to Option 1, Option 2 is likely to be moderately effective in achieving the objectives, but its efficiency is lower.<br>Option 2 necessitates the shifting of existing permanent fences by wide rivers across more land for a far smaller increase in setbacks compared to Option 1. This situation is partially managed through the use of varying transition times, more recognition of investment in existing permanent fences. As well, the inclusion of a Freshwater Farm Plan pathway provides a degree of flexibility for its implementation.<br>The shift in all 3 options from 'wide rivers' to 'continually flowing rivers' is likely to mean that there are fewer paddocks where cattle or deer are grazed within a farm that are not subject to stock exclusion - so water reticulation. High rainfall events can damage fencing (as is the case in Options 1 and 3), although the difference in setbacks for wide rivers means the corridors are narrower than the previous option. |
| **Option 3:** 3m setbacks for low slope continually flowing rivers and lakes, 'on renewal' transition for existing fences, and ORC definition of low slope land (up to 5 degrees). | The efficiency of Option 3 is higher than Options 1 and 2 because it limits the potential for having to shift existing permanent fences, many of which are likely to have been recently erected, while still increasing the extent of riparian setbacks across many locations in the region. As with the effectiveness assessment, the efficiency of Option 3 (and Options 1 and 2) will partly depend on how stock exclusion is achieved (i.e., nature-based solutions, farm management decisions, new technologies) and how it impacts extensively grazing beef cattle and deer above the stocking rate exclusion threshold. This risk may be able to be managed, to some extent, through the Freshwater Farm Plan pathway (similar to the approach for non-low slope land). |

#### 1.6.4.2. Topic 2 Conclusion

236. The effectiveness and efficiency assessment indicates that, overall, managing the access of livestock to waterbodies and riparian margins through Option 3, will be far more effective and efficient in achieving the objectives of the pLWRP and ORPS than relying solely on Options 1 and 2 in Topic 1. Without improving the management of narrow continually flowing rivers, particularly in locations with more intensive livestock farming, it is unlikely that sufficient progress will be made. The permitted activity provides more clarity and certainty around minimum expectations for stock exclusion in Otago during the lifetime of the pLWRP, which is important when investment in infrastructure is involved. Therefore,

the addition of the Option 3 for stock exclusion (in combination with those for the other farming topics) in the proposal is considered to be the most appropriate way to achieve the objectives of the pLWRP.

### 1.6.5. Topic 3: Winter grazing of livestock on annual forage crop

237. The grazing of livestock on an annual forage crop during winter, together with sacrifice paddocks and pasture-based wintering of cattle (covered in Option 2 of Topic 1) are all intensive winter grazing activities. They are activities that are high risk, particularly in the south of New Zealand where pasture growth is slower for longer. Science advice puts the risks as highest for bare soil and stock treading damage and for adult dairy cattle given the stocking density and liveweights (Crawford, 2023e):

> "As a region, Otago has a higher environmental risk due to management practices used to manage the winter feed gap that exists with grazed pastoral systems compared to much of the rest of New Zealand. This is due both to the greater extent of grazed hill country on steeper slopes and rolling downland overlaying Pallic soils plus the area of winter forage crop relative to other regions within New Zealand. However, despite the importance of soils and terrain in soil losses, this can be overshadowed by impacts of poor grazing management and high stocking densities that degrade soil and remove ground cover. Thus, all winter activities are activities which are of higher risk to the environment, which may necessitate regulation."

238. During the early policy development process, the grazing of livestock on an annual forage crop was managed through specific NESF regulations as 'intensive winter grazing'. The activity was permitted (subject to conditions), with winter grazing plans assessed within Freshwater Farm Plans, unless on slope (>10 degrees) and beyond 50 ha or 10% of farm area (whichever is the greater).

239. Initially additional controls were considered relating to wider setbacks, slopes over 10 degrees, and continue with controls on the expansion of intensive winter grazing land after NESF Agricultural Intensification regulations expire (refer to Topic 5 below). However, further work was needed at the time to assess the effectiveness of the NESF Intensive Winter Grazing regulations and where more management may be needed.

240. A total of 338 consents were granted for NESF intensive wintering grazing over the 3 years from 1 July 2021 to 30 July 2024 (85% of which were in the second year). Currently, a consent of this type has a fixed charge of $1,600.

241. A summary of interviews with representatives of catchment groups was (Reilly, 2023):

> "Most groups noted a strong focus over the past 18 months towards improving IWG practices. Support has also been provided from ORC (field days and workshops), OCC, and industry groups, providing information on good management practices (GMPs), regulatory expectations and consent requirements. Each group talked of visible improvements of IWG in their area, and this was a point of pride. Multiple interviewees talked about improved locations of cropping becoming second nature now – although concerns remained around the difficulties associated with regulatory restrictions on IWG on over 10-degree slopes. There is a strong ongoing commitment to improving IWG practices, and all of those interviewed are aware of the need to show improvements and have a greater awareness of public perception issues."

242. Consequently, the NESF Intensive Winter Grazing regulation were relied on for stock grazing on forage crops over winter, which limited the Council's regulatory input, and this topic was not specifically included in Stage 3 community engagement. The Council's focus then for intensive winter grazing as a broader topic was on sacrifice paddocks and pasture-based wintering of cattle using supplementary feed (refer to Topic 1 above). There is also a close relationship between this topic and cultivation (refer to Topic 4 below).

243. In April 2024, the Government provided some details regarding proposed changes to resource management law. These changes include repealing the NESF Intensive Winter Grazing regulations. Removing these regulations leaves it to regional councils to manage the adverse effects of these activities based on risk. The RMA Amendment Bill is expected to be enacted in late 2024.

244. An option to replace the NES Intensive Winter Grazing if they are repealed became a focus after Clause 3 consultation. In developing this option, feedback was sought from industry stakeholders. They appeared generally receptive to the continuation of winter grazing management plans and some regulatory backstop to ensure good practice. Their specific feedback focused on area and slope thresholds, setback widths, gathering of information, the relevance of some Freshwater Farm Plan information for sheep and beef farming, and terminology in the winter grazing management plans. The area and slope in the amended NESF regulations were highlighted in relation to the large number of consents for this activity in Otago last winter.

245. Some changes were made as a result this feedback, particularly for clarity, but no changes were made where it was not supported by science advice. The option for intensive winter grazing was to provide a permitted activity where:

    a. It is on less than 10 ha of land within a landholding,

    b. The slope of the land used is 10 degrees or less,

    c. It is within a drinking water protection zone or critical source areas, and

    d. It has 5m setbacks from waterbodies, wetlands, coastal water, and any bores

246. Where these conditions are not met then either a winter grazing management plan is needed or a resource consent.

247. Figure 9 shows the possible extent of intensively grazed paddocks in Otago in 2023 by land use using the 10 degree slope threshold. It considers all land cover classes (e.g., bare soil, forage crop, and pasture) but does not capture all winter grazing activities. If a paddock containing a winter forage crop appeared to still have vegetative cover in late winter/early spring, then it is not included. If a paddock was grazed in the autumn, but remained bare soil in the winter, then it is included.

248. The data is derived from Manaaki Whenua Landcare Research's satellite image time series between March to September 2023 (using 'low', 'medium', and 'good' data certainty levels) (Belliss, Amies, & North, 2023). Therefore, the results are a rough approximation of scale but need to be calibrated further. Low and medium sloped land is identified from the Stock Exclusion Regulations. The total area of land under 10˚ slope shown in Figure 9 was around 38,500 ha and above 10˚ slope was just over 9,400 ha.

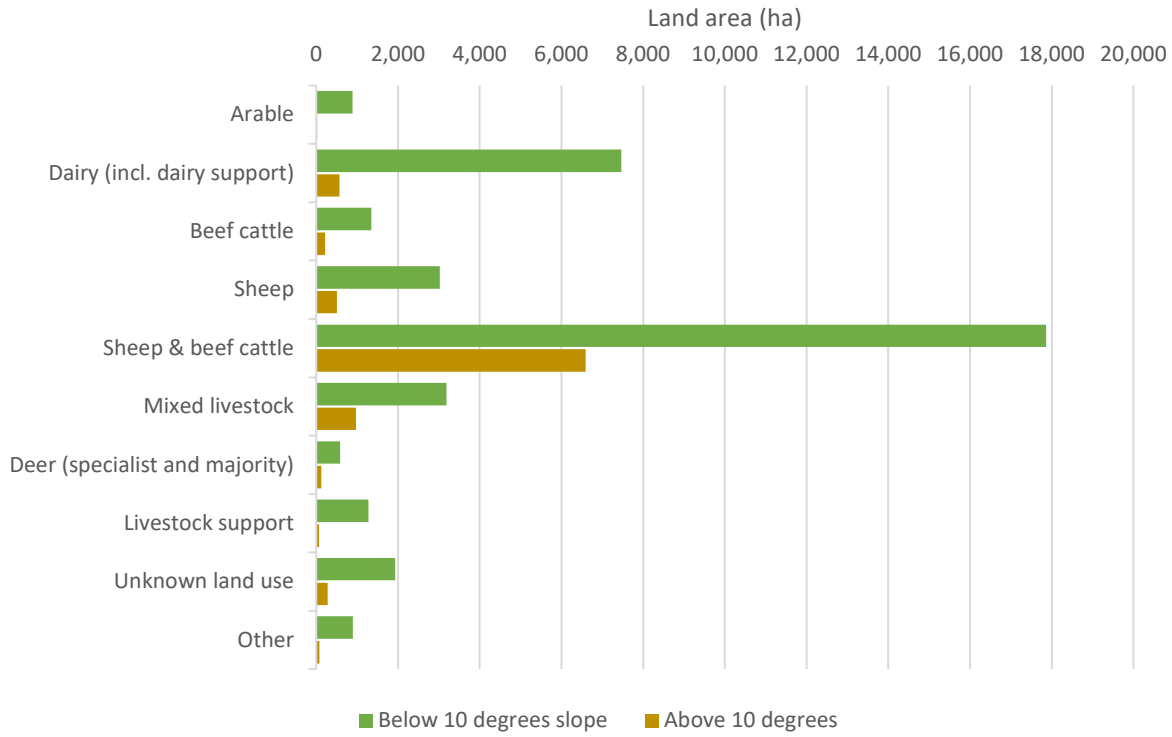


Figure 9: Intensively grazed paddocks (including forage crops) over winter 2023 in Otago (source data Pearson, 2024)

249. Intensive winter grazing was a common topic across the economic research for sheep and beef farming, deer farming, arable farming, and dairy farming (Moran (Ed.), 2023). The case studies in this research were modelled in such a way that existing regulations, such as the NESF Intensive Winter Grazing, were either assumed to be occurring or were applied to a farm before additional environmental actions were tested.

250. For example, good progress had been made for the 16 sheep and beef case study farms to meet recent policy changes and thus were not tested in this analysis (Moran (Ed.), 2023):

> Most farms with winter grazing were meeting the NESF 2020 intensive winter grazing regulations. Farmers in the group of 16 case studies, and those in larger B+LNZ Otago Survey appear to be well aware of NESF intensive winter grazing rules and are incorporating these into their farm system. Similarly, these farmers are removing heavy cattle from steep hillsides during winter months. These actions have benefits to the farm business, such as not pugging up the land, maintaining pasture growth and soil structure. Farmers with very low intensity production systems that farm to the pasture grass curve are likely to be most vulnerable to environmental actions as regulation.

251. A sheep and beef farm's winter forage crop is central to its production system and their management is a complex topic. Section 2.4.2.4 of the economic report (Moran (Ed.), 2023) discusses crops for feeding livestock in includes information on winter feed area in Otago. In the research, the impacts of 4 environmental actions were tested in relation to winter forage crops and discussed in-depth in section 2.5.4 of the same report (Moran (Ed.), 2023). The environmental actions tested in the economic research were:

    a. A maximum winter crop area of 50 hectares or ten per cent of the farm area.

b. Where winter cropping is on a slope >10° provide 20 metre buffer to any waterway and where it is <10° provide a 10-metre buffer to any waterway.

c. Use direct drilling or minimum till for winter crop on all farms.

d. Use a standoff pad and limit cattle-grazing of winter forage crops to a maximum of 8 hours per day

252. Environmental actions were also tested for deer farming (Moran (Ed.), 2023). Case studies Deer 1 and Deer 2 (sections 3.5.1 and 3.5.2 of the economic report) tested the impacts of reduced winter grazing area and wintering sheds as possible responses to risks arising from intensive winter grazing. Deer 5 shifts its feed into winter, through the use of crops and other supplements to improve the farm's productive efficiency. The farm's production system is designed around winter supplements because the winter feed deficit is predictable (i.e., it is temperature related) than summer deficits, which are very unpredictable (i.e., they are soil moisture related).

253. Intensive winter grazing, usually on forage crops, occurred on all 17 deer farms sampled (the crops are reported in Topic 3 – Cultivation). The area ranged between five and 276 ha, which was between 1% and 23% of each farm's total area. On average the area of winter grazing was 68 ha or 8.4% of the farm's total area. However, on 6 of the 17 deer farms, more than 10% of the total area was used. Information for on-farm feed and alternative wintering systems is available in section 4.4.1 of Moran (Ed.) (2022).

254. A total of 213 blocks were planted in winter crop on the 17 deer farms in the deer sample (Figure 10) (Moran (Ed.), 2023). Within this total, 130 blocks (61%) were accounted for by four types of feed. Kale was the most common winter crop planted, then swedes, fodder beet and rape. Other common winter crops on the deer farms were raphno, annual rye grass, turnips, and forage barley. Crop yields varied widely, being influenced heavily by inputs of nutrients and water.

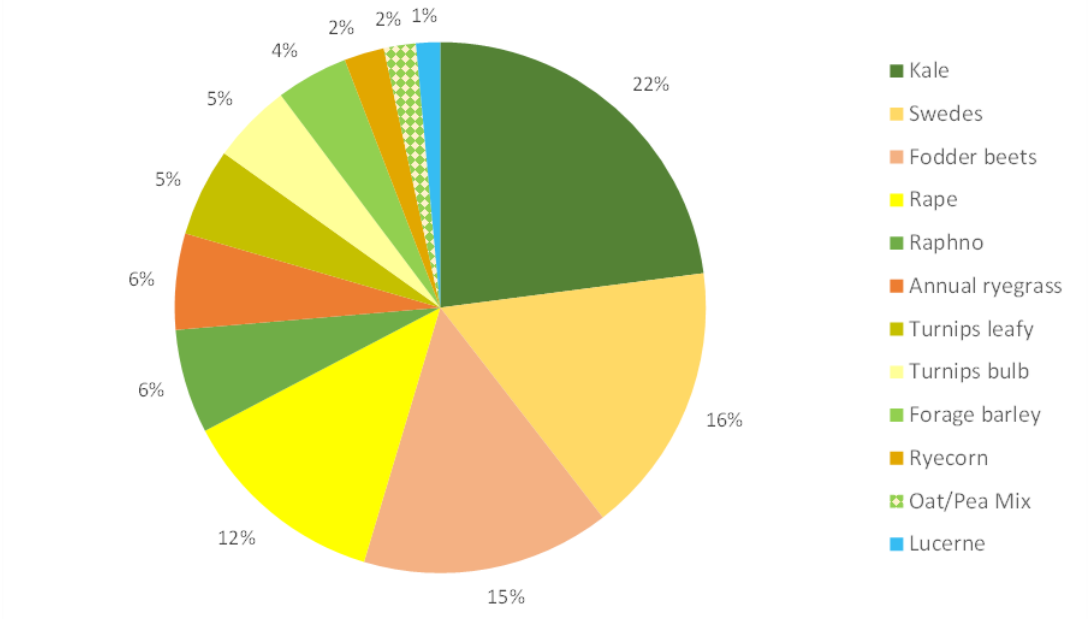


Figure 10: Frequency of crops grown across 17 deer farms in Otago 2020-21 (source Moran (Ed.), 2023)

255. Environmental actions were tested for arable farming (Moran (Ed.), 2023)[27]. The 4 arable case studies were adjusted for the NESF Intensive Winter Grazing regulation (where relevant and lacking). For example, the Arable 3 farm (section 4.5.3 of the economic report) was adjusted, such as some critical source areas excluded, extra temporary fencing hardware, and extra labour for the intensive winter grazing period. A discussion of the impacts across the 4 case studies is available in section 4.6.1.4 of the same report. The Arable 4 case study (section 4.5.4 of the report) had additional requirements modelled similar to those in the partially operative Southland Water and Land Plan. This case study included variations based on fixed and flexible approaches intended to be indicative of a permitted activity pathway and a Freshwater Farm Plan pathway respectively.

256. For dairy farming, a 'system approach' was used in the economic research rather than testing the impacts of individual environmental actions, reflecting dairying's higher use of inputs (Moran (Ed.), 2023). While wintering practices were partially covered in the modelling, it is challenging with the information available from this research to identify just those that apply to this topic.

#### 1.6.5.1. Topic 3 Efficiency and Effectiveness Assessment

257. Table 15 below identifies and assesses the environmental, cultural, social, and economic benefits and costs anticipated from implementing the proposed options for Topic 3. The options for Topic 3 are assessed as being in combination with those for Topic 1. Resource consent cost information is available in section 4 of Chapter 7. Information on the costs and benefits to the Kāi Tahu economy related to freshwater management approaches is included in section 3 of Chapter 7.

258. For farming, the distribution of benefits and costs of options within each topic are likely to be strong variable. Some local communities may be more impacted by and/or are less resilient to certain topics (and options within those topics) than others. Information for local communities, including population, employment and socio-economic deprivation, is available in a series of snapshots (Yang A. , 2022a; Yang A. , 2022b; Yang A. , 2022c; Yang A. , 2022d; Yang A. , 2022e; Yang A. , Roxburgh Rohe, Manuherekia Rohe and Upper Taieri Economic Snapshot, 2022f).

Table 15: Benefits and costs for Topic 3 – Intensive Winter Grazing

| OPTION | BENEFITS | COSTS |
|---|---|---|
| **Option 1:** Replace the NESF Intensive Winter Grazing if they are repealed | ▪ Option 1 is largely an adaptation of the NESF Intensive Winter Grazing regulations for the Otago context, as provided for by the Government in its repeal of the national approach so these is broad consistency.<br>▪ The main benefit of Option is retaining the momentum that has created over | ▪ The possible extent of intensively grazed forage crop paddocks on land within a 10˚ slope in Otago in 2023 was around 38,500 ha. Roughly 58% of this extent occurred on sheep and/or beef cattle farms, 19% on dairy and dairy support farms, and 10% on deer farms and mixed livestock farms. The possible |

[27] A more general discussion of winter grazing in Otago is available for arable farming in section 5.5.3 and section 6.4.4 for dairy farming Moran (Ed.) (2022).

| OPTION | BENEFITS | COSTS |
|---|---|---|
| | recent years through considerable investment that has been made to date by the community, industry, and Otago Regional Council on behalf of ratepayers. Continuity will help avoid any confusion around the expectations for managing this practice.<br>▪ A secondary benefit of replacing the NESF regulations if repealed is avoiding a situation where there is an increase in demand for the intensive winter grazing of livestock on forage crops in Otago from other regions that have more stringent expectations.<br>▪ Option 1 will support improvements in soil health. For catchment groups, soil health is an increasing focus – from erosion control, soil biology health, and the importance of minimising topsoil losses (Reilly, 2023). Many catchment groups are building on sector and council field days and the wider provision of information around improving Intensive Winter Grazing practices. | extent of intensively grazed forage crop paddocks above a 10˚ slope was just over 9,400 ha – 89% of which is estimated to have occurred on drystock farms (sheep/beef/and or deer).<br>▪ The costs of Option 1 are minimal in comparison to not replacing the NES Intensive Winter Grazing regulations. The main costs for farmers will relate to the differences between the two approaches, particularly in relation to the 10 ha area for the permitted activity.<br>▪ To avoid potential confusion, more education will be needed during the transition phase to explain the changes in approach from national to regional and differences in management, which is likely to be a cost to ratepayers. |

259. In addition to benefits and costs, this assessment also needs to take into account the risk of acting or not acting if there is uncertain or insufficient information. There is considerable information about the adverse environmental effects of the intensive winter grazing of stock on forage crop and the effectiveness of riparian setbacks in managing the overland flow of contaminants. There is some certainty that farmers have already been implementing the NESF for Intensive Winter Grazing. The risk of not acting would be little or no oversight in a key risk activity for all farm types, particularly in Otago. It would also undermine the good work that has followed on from the consenting work already undertaken by the farming community. Overall, the information supporting Option 1 is suitably certain and sufficient, that there is less risk of acting with this option compared with not acting.

Table 16: Effectiveness and efficiency assessment for Topic 3 – Intensive Winter Grazing

| Effectiveness | |
|---|---|
| **Option 1:** Replace the NESF Intensive Winter Grazing regulations if | The intent of repealing the NESF for Intensive Winter Grazing is that it is more effective to manage the practice at a regional level. Option 1 is, in effect, implementing this policy intent and will build on existing progress for this topic. While there are likely to be some queries about the detail, there is some evidence to expect that industry stakeholders and catchment groups will be broadly supportive. Consequently, it will be highly effective |

| | |
|---|---|
| they are repealed | achieving the objectives of the pLWRP in combination with other options (noted under the efficiency summary below). |
| **Efficiency** | |
| **Option 1:** Replace the NESF Intensive Winter Grazing regulations if they are repealed | For the reasons given in the discussion, the benefit cost table, and the risk of acting versus not acting (e.g., consistency, momentum, avoiding more importing of the practice), Option 1 for Topic 3 will be a highly efficient option for achieving the objectives of the pLWRP. The alternative is to largely rely on managing the environmental risks associated with wintering practices through Options 1 and 2 in Topic 1, particularly pasture-based winter grazing of cattle and the use of sacrifice paddocks, as well as Topics 2 and 4 (i.e., Stock Exclusion from Waterbodies and Cultivation). |

#### 1.6.5.2. Topic 3 Conclusion

260. The effectiveness and efficiency assessment indicates that if the NESF Intensive Winter Grazing regulations are repealed then managing intensive winter grazing of forage crops specifically within the Otago context is the only option. It is important to retain the existing progress and momentum in relation to intensive winter grazing in the region. Overall, it will be far more successful than relying solely on the sacrifice paddock and pasture-based wintering grazing of cattle in Option 2 of Topic 1. It will also complement the cultivation option in Topic 4. Therefore, the addition of the intensive winter grazing option (in combination with those for the other farming topics) in the proposal is considered to be the most appropriate way to achieve the objectives of the pLWRP and ORPS.

### 1.6.6. Topic 4: Cultivation risks (FMU-specific)

261. Topic 4 focuses on managing environmental risks related to cultivation, based on the slope of the land. The topic has one option and is specific to certain FMUs and rohe. Cultivation exposes large areas of soil, and inherently has a higher risk of sediment and phosphorus losses, particularly on steeper land. Some FMUs in Otago have a large gap between the current sediment and phosphorus states, and the target attribute states. The FMUs or rohe that this option would apply to are Dunstan rohe, Manuherekia rohe, Roxburgh rohe, and Lower Clutha rohe in the Clutha Mata-Au FMU, as well as the Taiari, Dunedin & Coast, and Catlins FMUs.

262. “Cultivation” in the National Planning Standards means the alteration or disturbance of land (or any matter constituting the land including soil, clay, sand and rock) for the purpose of sowing, growing or harvesting of pasture or crops. As this is a National Planning Standards definition, it is not able to be altered. The cultivation of forage crops for intensive winter grazing is covered in Topic 4 (above).

263. Cultivation is an extremely complex topic that is relevant across pastoral farming, arable farming, horticulture, and viticulture. It is an activity used to produce crops for human consumption, livestock feed, weed or pest control, pasture improvement, and/or soil amelioration. General information is available on this topic for sheep and beef farming,

deer farming, arable farming, and dairy farming (Moran (Ed.), 2022[28] and Moran (Ed.), 2023) and case studies for these land uses (Moran (Ed.), 2023), as indicated in section 1.5.5 of this chapter and the Topics 2 and 3 above.

264. To illustrate the complexity, Figure 11 shows how each of 16 arable farms in the economic research have a differing ratio of crops, pasture, and intensive winter grazing within their production systems[29]. Across these 16 farms, at least 36 different crops were grown, with farms often having more than one crop rotation occurring simultaneously (refer to Figures 53 and 54 in Moran (Ed.), 2023). Some of the arable farms are dryland while others are irrigated. Despite the diversity in arable farming, the number of farm case studies was limited to 4, because of the effort involved where there is such a high level of complexity. The four case study farms are identified on Figure 11 as A1, A2, A3, and A4.

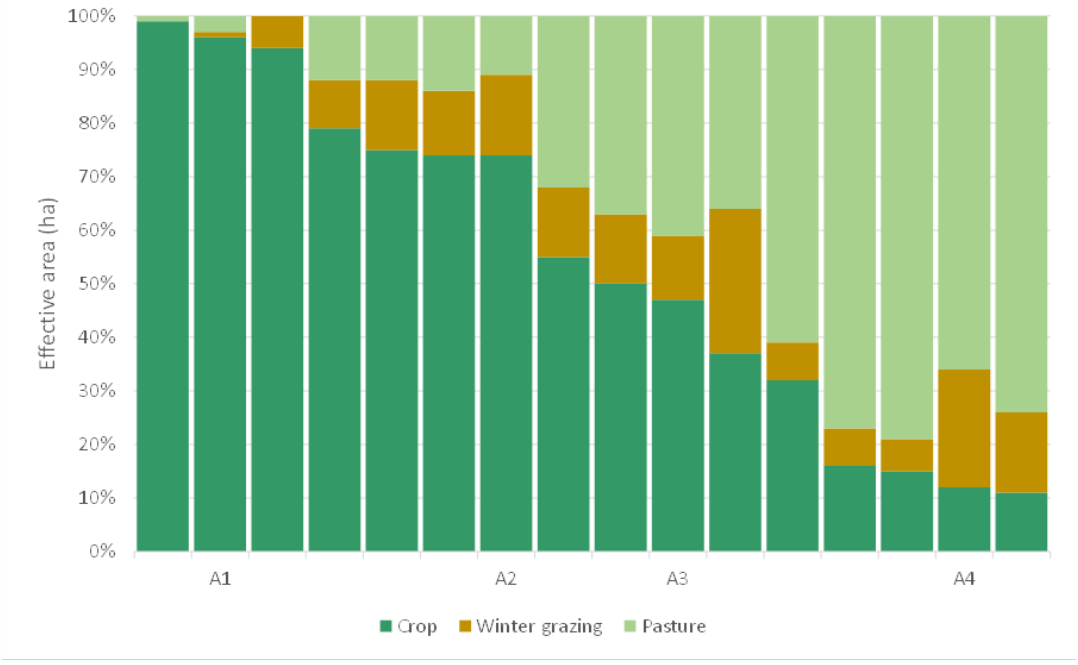


Figure 11: Proportion of arable crop sown on 16 arable farms in Otago 2020-21 (source Moran (Ed.), 2023)

265. In Option 1 the permitted activity for cultivation focused on four key aspects in the FMUs where there are large gaps between current and target attribute states for sediment and phosphorus. These aspects are:

a. Cultivation does not take place within a lakebed, continually or intermittently flowing waterbodies, or wetland, and there are:

1) 5 metres setbacks on slopes less than 10 degrees, and

2) 10 metres setbacks on slopes between 10 and 20 degrees;

[28] For example, cropping and winter practices for sheep and beef farming are described in section 3.4.7 of Moran (Ed.) (2022) and size and distribution of arable farming by district in Otago is described in section 5.3.1 of the same report.

[29] A more general discussion of crop rotations and their integration with livestock is available in sections 5.5.1 and 5.5.2 of Moran (Ed.) (2022).

b. Critical source areas are identified before cultivation and 1) are not cultivated with forage crops for intensive winter grazing, 2) sediment detention is first established;

c. The setbacks and management of critical source areas do not apply if cultivation is undertaken by direct drilling of seeds or fertilisers or no tillage practices or is tree planting.

d. An alternative Freshwater Farm Plan pathway for cultivation less than 20 degree but cultivation is not permitted to occur on slopes over 20 degrees.

266. Option 1 initially included a condition on the permitted activity to require no tillage practices for cultivation on land with a slope of greater than 20 degrees. This aspect was later adjusted to also be within the ambit of a Freshwater Farm Plan.

267. Table 17 estimates the areas of land that can potentially be cultivated in Otago (based on grazeable land) by the 3 slope categories in Option 1 using the Setback Quantification Tool for Agriculture (Pearson, 2024). This assessment should be considered as an absolute maximum as it does not consider many of the constraints that will limit this potential from one location to the next (e.g., climatic factors). Figure 12 shows the distribution of this land (indicatively only) for the lower 2 slope categories in Option 1.

268. In Otago there is a considerable proportion of land in higher Land Use Capability Classes and consequently the usual delineation between what is 'grazeable' and 'non-grazeable' areas in pastoral systems is often blurred (Moran (Ed.), 2023). This type of land also has fewer alternative land use options. In practice, some parts of a farm that are categorised as 'grazeable' may not be grazed by livestock, while other areas may be grazed infrequently or at low stocking rates (e.g., grazing hoggets in a tussock block for one month in spring) (Moran (Ed.), 2023).

269. The total land area in Otago that can potentially be used for cultivation and has slopes of less than 20 degrees amounts to just over 1.5 million ha. The amount of land in one year that is under cultivation, or is bare ground, is estimated to be between 38,000 to 45,000 ha.

270. There is considerable variation in the amount of potentially cultivatable land in Otago. The share of cultivatable land by FMU ranges from 7% in the Upper Lakes Rohe to 72% in Manuherekia rohe.

Table 17: Estimated total land area (by slope class) that can potentially be cultivated in Otago (source data Pearson, 2024)

| Slope category | Area (ha) | % of cultivatable land by slope class | % of cultivatable land in region |
|---|---|---|---|
| Slope 0 - 10 degrees (ha) | 681,441 | 36 | 21 |
| Slope 10 - 20 (ha) | 830,382 | 44 | 26 |
| Greater than 20 degrees (ha) | 387,801 | 20 | 12 |
| Total land (ha) | 1,899,625 | 100 | 60 |

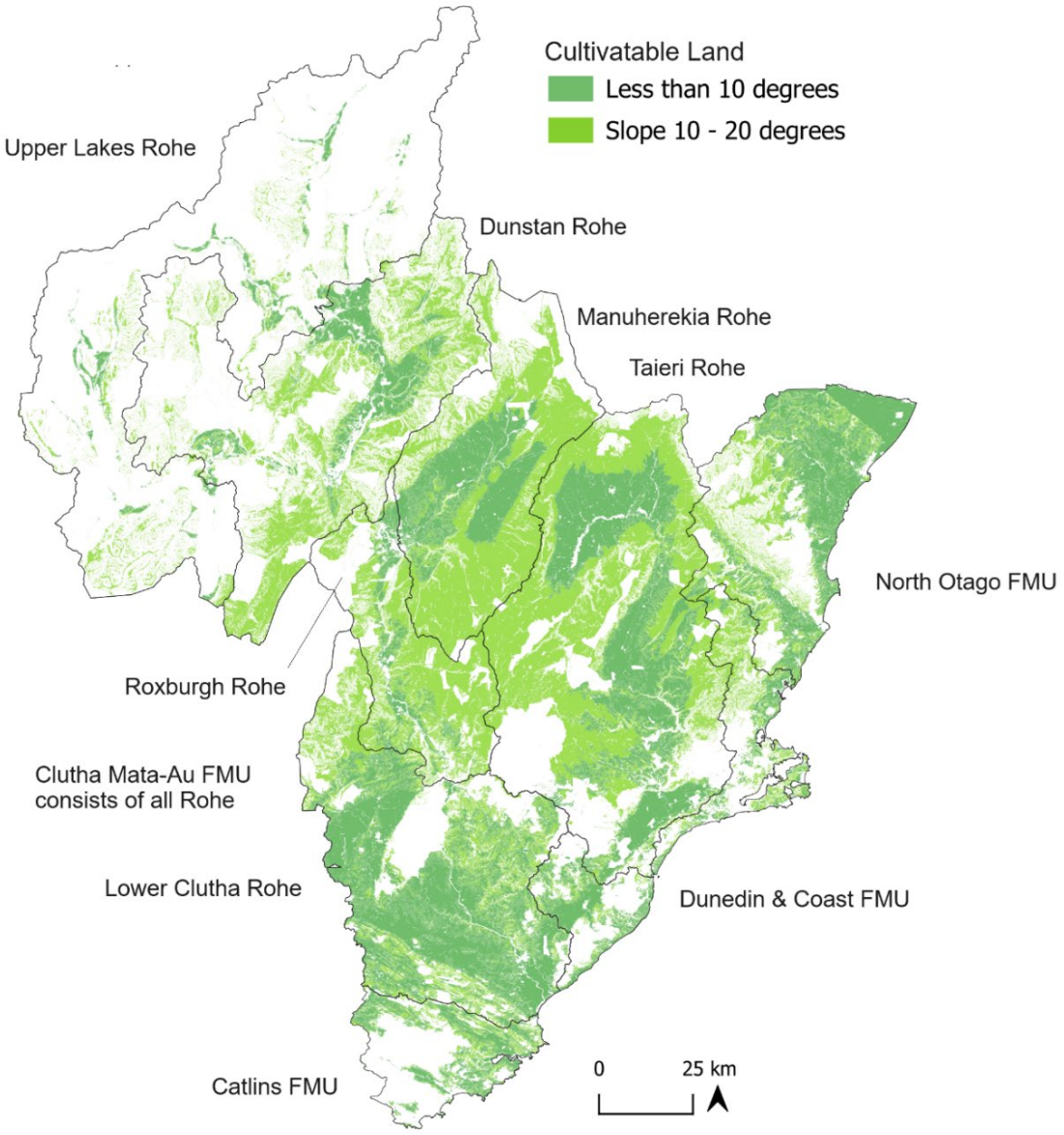


Figure 12: Potentially cultivatable land in Otago (grazeable land at or below 20 degree slope) (Source Pearson, 2024)

271. Table 18 estimates the total amount of land where the setbacks in Option 1 might apply if all of the land was used for cultivation using the Setback Quantification Tool for Agriculture (Pearson, 2024). The assessment only includes the FMUs and rohe where Option 1 is applicable. Presumably, only a small proportion of this land is cultivated at any one time. In other words, Table 18 estimates the amount of setback land that may be relevant – not how much will be affected at any one time.

272. The estimated total area of land that the setbacks in Option 1 may be relevant to totals just under 27,000 ha (1.4% of the region's 'cultivate-able' land). The Taiari FMU has the largest possible area with 7,793 ha for all waterbodies, followed by Dunstan rohe (5,208 ha), Manuherekia rohe (4,784 ha), and Lower Clutha rohe (4,539 ha).

273. Of this land, 53% occurs within more ephemeral waterways. Actions that prevent the transfer of contaminants through these waterways will likely be particularly effective in reducing the overall contaminant load to the region's waterbodies.

274. The analysis in Table 18 is at an FMU/Rohe scale of 1:50,000 and relies on a digital elevation model of 25 metres. The river network used for this analysis does not specify whether a waterway is intermittent or continuous therefore the following assumptions have been made:

a. Stream order 1 is likely to be ephemeral to intermittently flowing

b. Stream orders 2 to 8 are likely to be continually flowing

275. At this resolution it is not possible to identify critical source areas. A network analysis using a higher resolution digital elevation model (e.g., LiDAR) and a more resolved hydrological network (and well as more detailed information about land use activities within a property) is needed to identify critical source areas.

Table 18: Estimated areas of land relevant to the setback distances in Option 1 – Cultivation (source data Pearson, 2024)

| FMU or rohe | Slope Class | Intermittently flowing rivers (stream order 1) (ha) | Continually flowing stream rivers (stream orders 2-8) (ha) | Lake (ha) | Wetland (ha) | Total (ha) |
|---|---|---|---|---|---|---|
| Clutha Mata-Au – Dunstan | 0 - 10˚ | 848 | 1,062 | 31 | 105 | 2,046 |
| | 10 - 20˚ | 2,028 | 1,072 | 8 | 55 | 3,162 |
| Clutha Mata-Au – Manuherekia | 0 - 10˚ | 1,724 | 1,724 | 146 | 171 | 3,765 |
| | 10 - 20˚ | 713 | 295 | 7 | 4 | 1,019 |
| Clutha Mata-Au – Roxburgh | 0 - 10˚ | 713 | 618 | 28 | 130 | 1,490 |
| | 10 - 20˚ | 714 | 306 | 28 | 9 | 1,057 |
| Clutha Mata-Au – Lower Clutha Rohe | 0 - 10˚ | 2,009 | 1,772 | 43 | 84 | 3,908 |
| | 10 - 20˚ | 487 | 120 | 3 | 22 | 631 |
| Taiari FMU | 0 - 10˚ | 2,893 | 2,572 | 221 | 528 | 6,214 |
| | 10 - 20˚ | 1,070 | 466 | 5 | 38 | 1,579 |
| Dunedin & Coast FMU | 0 - 10˚ | 429 | 380 | 12 | 139 | 960 |
| | 10 - 20˚ | 201 | 74 | 3 | 35 | 313 |
| Catlins FMU | 0 - 10˚ | 345 | 270 | 3 | 134 | 752 |
| | 10 - 20˚ | 28 | 4 | 0 | 10 | 42 |
| **Total potential area of land (ha) relevant to the setbacks in Option 1** | | **14,203** | **10,734** | **538** | **1,463** | **26,937** |
| **Share across water bodies** | | **53%** | **40%** | **2%** | **5%** | **100%** |

276. The case studies references highlighted in Topic 3 for intensive winter grazing are not necessarily directly relevant to the topic of cultivation because Option 1 does not apply to forage crops established for intensive winter grazing. The Arable 2 case study (section 4.5.2 of Moran (Ed.), 2023) focused on the management of overland flow. It considered variations in setbacks for critical source areas and waterways based on a fixed approach and a risk-assessment approach intended to be indicative of a permitted activity pathway and a Freshwater Farm Plan pathway respectively.

277. As noted in Topic 3, a 'system approach' was used in the economic research for dairy farming because of its higher use of inputs. However, improved farm specific tillage practices were modelled on Dairy 2, Dairy 5 and Dairy 9 where direct drilling was considered out of the 10 dairy farm case studies. The modelling showed relatively small reductions in nitrogen loss across all three farms, with no change in operating profit. It was also noted that direct drilling results in less soil disturbance and so a reduced risk of sediment loss from the paddock, while catch crops reduce run-off and reduce the direct impact of raindrops on soil, thereby reducing the risk of sediment losses.

#### 1.6.6.1. Topic 4 Efficiency and Effectiveness Assessment

278. Table 19 below identifies and assesses the environmental, cultural, social, and economic benefits and costs anticipated from implementing the proposed options for Topic 4. The options for Topic 4 are assessed as being in combination with those for Topic 1. Resource consent cost information is available in section 4 of Chapter 7. Information on the costs and benefits to the Kāi Tahu economy related to freshwater management approaches is included in section 3 of Chapter 7.

279. For farming, the distribution of benefits and costs of options within each topic are likely to be strong variable. Some local communities may be more impacted by and/or are less resilient to certain topics (and options within those topics) than others. Information for local communities, including population, employment and socio-economic deprivation, is available in a series of snapshots (Yang A. , 2022a; Yang A. , 2022b; Yang A. , 2022c; Yang A. , 2022d; Yang A. , 2022e; Yang A. , Roxburgh Rohe, Manuherekia Rohe and Upper Taieri Economic Snapshot, 2022f).

Table 19: Benefits and costs for Topic 4 – Cultivation (FMU-specific)

| OPTION | BENEFITS | COSTS |
|---|---|---|
| **Option 1:** Manage cultivation risks | ▪ Reducing sediment and phosphorus losses from exposed soils should improve local and downstream water quality, and reduce adverse effects on freshwater habitats, and biodiversity. It will also help limit the sedimentation of estuarine and coastal ecosystems. Important to this benefit is the focus on ephemeral streams and critical source areas.<br>▪ Sediment discharges result in deep sediment layer on the beds of waterbodies, which is one of the environmental conditions that discourage harvest of mahika kai species. Reducing sedimentation avoids costs for Ngai Tahu associated with loss of mahika kai (e.g., loss of food source, costs of human health impacts, loss of knowledge base, and the socio-economic costs of lost connections).<br>▪ The permitted activity pathway provides | ▪ Increased use of some good management practices will likely have time and cost implications for landowners (Moran (Ed.), 2023).<br>▪ As identified above, 27,000 ha (1.4% of the region's cultivatable land) adjacent to waterbodies and in critical source areas may become less versatile as a result of Option 1. However, as between 38,000 ha to 45,000 ha of land is either under cultivation or bare ground annually, only a small share of the 27,000 ha is affected at any time.<br>▪ For different reasons, a loss in versatility is likely to impact those landowners with smaller areas of 'arable land' (i.e., Land Use Capability Classes 1 to 4), those with larger areas of 'arable land' and those with |

| OPTION | BENEFITS | COSTS |
|---|---|---|
| | more certainty and clarity for farmers and growers around the good management practices that are expected.<br>▪ The inclusion of a Freshwater Farm Plan pathway as an alternative to having to gain a resource consent allows for some flexibility in management, which benefits farmers and growers, as well as local communities, while still reducing losses of contaminants.<br>▪ The include of this pathway increases the value to be gained from the investment in Freshwater Farm Plans, which is an existing cost. As indicated by the identified case studies in Moran (Ed.) (2023), in some cases the flexibility will reduce the potential costs of Option 1 and so may reduce stress for landholders.<br>▪ Retaining topsoil on land has long-term benefits for the productivity of the land in question and ecosystem health. The creation of topsoil is essentially a non-renewable resource (in terms of loss) if it erodes at a faster than it forms.<br>▪ For example, while winegrowers in Otago use very little nitrogen fertiliser, there is an increased awareness and focus on protecting and enhancing soil health through initiatives like the use of cover crops between vine rows to provide a protective layer for microbial communities, reducing the use of herbicides, and reducing the use of cultivation, with some adopting regenerative, organic and biodynamic practices (Reilly, 2023).<br>▪ Phosphorus typically binds to sediment, so a reduction in sediment losses will, by association, result in some reduction in phosphorus losses. In many situations (e.g., where intensive pastoral or mixed arable farming occurs) other contaminants will also be attached to sediment (e.g., organic and ammoniacal nitrogen, faecal coliforms, and pesticides). | relatively more riparian margins and critical source areas.<br>▪ Larger setbacks may pose particularly challenges for growers of small seeds, which are used domestically and exported, because of the need to keep their crops free of other material. At present these growers are largely located in Waitaki District (in Otago) but small seeds are seen as a growth opportunity in other districts.<br>▪ As identified in the relevant cases studies in Moran (Ed.) (2023), this loss in the versatility of some of this land may result in a reduction in cultivation activities, which for could have significant implications for some farms and growers – but may not for others. The Freshwater Farm Plan pathway is likely to help minimise the costs.<br>▪ Where resource consents are required, or certification processes specifically related to cultivation need to be followed for Freshwater Farm Plans, direct costs will be incurred by farmers and growers. |

280. This assessment also needs to take into account the risk of acting or not acting, if there is uncertain or insufficient information. There is a high level of scientific certainty about the

efficacy of good management practices for cultivation associated with Option 1. There is also a large body of knowledge about how sediment moves through critical source areas to waterbodies and the potential for large-scale natural contributions of sediment from upland waterbodies. However, there is considerable uncertainty around sediment monitoring, especially at catchment and sub-catchment scales as most sediment is transported during event flows which monitoring often does not capture. There are also some risks in requiring actions when the effectiveness of the actions is not universal between different farm systems, topography and climate. These risks have sought to be minimised by application in areas with known sediment issues and by enabling local risk assessments and solutions through certification under a Freshwater Farm Plan. Overall, the information supporting the management of cultivation is sufficiently certain, that there is low risk of acting.

Table 20: Effectiveness and efficiency assessment for Topic 4 – Cultivation (FMU-specific)

| | |
|---|---|
| **Effectiveness** | |
| **Option 1:** Manage cultivation risks | This Option, in combination with Options 1 and 2 in Topic 1, is moderately effective in achieving the objectives of the pLWRP. Losses of sediment from exposed soils are a known source of nutrient-rich sediment in waterbodies. Option 1 should improve local and downstream water quality, and reduce adverse effects on freshwater habitats, and biodiversity as well as promoting long-term benefits for the productivity of the land in question. However, the effectiveness of managing cultivation will very much depend on how critical source areas and overland flow paths are managed on-farm, which may often occur through Freshwater Farm Plans. There may also be overwhelming sediment losses from other sources, such as bank erosion or natural processes, that can limit the effectiveness of managing cultivation in achieving the objectives of the pLWRP. |
| **Efficiency** | |
| **Option 1:** Manage cultivation risks | Setbacks from waterbodies and critical source areas are known to be successful for managing the overland flow of contaminants from farming activities. The rule framework responds to the needs of Otago's diverse land uses and farming systems. This diversity is recognised in how Option 1 allows for some flexibility in the methods of cultivation and of compliance (permitted, certified Freshwater Farm Plan or resource consent). The efficiency of Option 1 depends, in part, on continuing education around the identification and management of critical source areas. For these reasons and other discussed above, it is likely to be moderately efficient in achieving the pLWRP objectives. |

### 1.6.6.2. Topic 4 Conclusion

281. The assessment above indicates that, overall, managing cultivation through Option 1 in specific FMUs where there are particular sediment and phosphorus issues, will be far more effective and efficient in achieving the objectives of the pLWRP and ORPS than relying solely on Options 1 and 2 in Topic 1. Cultivation exposes large areas of soil, and inherently has a higher risk of sediment and phosphorus losses, particularly on steeper land. The inclusion of the cultivation option in the proposal (in combination with the preferred options for the other farming topics) is considered to be the most appropriate way to achieve the objectives of the pLWRP.

### 1.6.7. Topic 5: Land use intensification and increasing intensity

282. Topic 5 looks to manage land use intensification (i.e., a change in land use) as well as the increases in intensity of existing land uses across Otago. Managing the current intensity of existing land uses, particularly dairy farming and dairy support farming, is reserved for Topic 6. In essence, Topic 5 is about limiting the choices that resource users have available to them for the conversion or diversification of their production systems.

283. As already noted in section 1.2 of this chapter, there has been a marked expansion in the extent of dairy farming in many regions in New Zealand since the 1990s. Information is available in section 6.4 (Moran (Ed.), 2022) on dairy farming trends for effective area (2002-2020) and number of milking cows (1998-2020) by district. The largest increase in dairy farmland occurred in the Clutha and Waitaki districts, where the number of dairy cows has increased by 144% and 189% respectively from 1998 to 2020.

284. Further expansion is currently restricted under existing NESF Agricultural Intensification regulations until the end of 2024. By this time, regional councils were to have given effect to the NPSFM 2020 in their regional plans. Until this date the NESF for agricultural intensification requires a resource consent for the following:

a. To convert more than 10 ha of farmland to dairy farming

b. To convert more than 10 ha of land from plantation forestry to pastoral farming

c. To expand irrigation by more than 10 ha on dairy farms

d. To expand the area of intensive winter grazing on forage crops above a historical baseline, and

e. To expand the area of dairy support above a historical baseline.

285. Several parts of Otago have degraded water quality due to excess nutrients, sediment or microbial contaminants. As noted in section 1.2.1 above, all FMU/rohe have at least one monitored attribute that does not meet its proposed target attribute state, or multiple degrading trends. For example, in North Otago some sites are below national bottom lines (i.e., in the 'D' band) for periphyton, total nitrogen and total phosphorus and must be improved to at least C band (the national bottom line). In other areas, existing water quality is not as degraded, and there is more emphasis on its maintenance (i.e., not allowing it to decline), such as in the Roxburgh rohe. It is also likely that, all other things being equal, applying GMP and GMP+ practices in these areas will improve water quality.

286. A memo (Augspurger & Dyer, 2024) summarising the Council's water quality science programme concluded that:

a. The current water plan has not stopped intensification in Otago. While some areas may be improving over the most recent 10-year period, others are degrading and there is potential for further degradation to occur. Therefore, to improve water quality, measures which stop further degradation are required regardless of whether sites fall below national bottom lines.

b. On-farm reductions achieved through a mitigation-based actions can lead to improvement in water quality. This improvement is expected to be realised as improvement in trend or within band improvement for nutrients and, in many locations, sediment.

c. In the short to medium term (5-10 years), it is unlikely that uncertainties associated with these studies can be significantly reduced. While additional nuance may be added, the overall conclusions from the suite of studies are unlikely to change.

287. Two options were developed for this topic: one option for land use intensification and a second option for land use intensification as well as increases in intensity.

288. Option 1 for Topic 5 was to generally avoid further intensification. This option recognises that the pLWRP is the 'first step' in a longer-term process to achieve environmental outcomes for Otago. While land use change was discounted as an option because it was practicable at this stage (refer to section 1.5.8), it may need to be a future direction if insufficient progress is made over the life of the pLWRP.

289. Option 1 was intended to continue discouraging large-scale expansion of land uses that typically lead to greater losses of contaminants. The option restricts the area of land that can be converted to a higher intensity land use:

a. Irrigated land (other than for orchards and vineyards) is no more than 10 ha greater than the maximum area of the land irrigated at any time in the year prior to 2 September 2020; and

b. Dairy farm land is no more than 10 ha greater than at 2 September 2020; and

c. Dairy support land is no more than either 1) the maximum area of the land on that was dairy support land in the period 1 July 2014 to 30 June 2019; or 2) 10 percent of the landholding (which ever was greater); and

d. Pastoral use is no more than 10ha greater than the area as at 2 September 2020, where that additional area of land was in forestry.

290. Option 2 was developed to control increasing intensity in addition to intensification. There is well-established research to show a positive relationship between increases in milk production and increases in losses of nitrogen to water and to air[30]. The inclusion of a reference to "…the use of land or an increase in stocking rate…" was considered in the following policy direction for intensification:

> "Avoid granting land use consent applications for changes in land use that involve an increase in the intensity of the use of land compared to the existing use of the land unless the applicant demonstrates that granting the consent will not result in an increase in the contribution to contaminant loads in the catchment, compared with the existing contribution up until 2 September 2020.

291. Option 2 evolved with the reference to stocking rates being removed from the policy direction and increasing intensity to be managed via Freshwater Farm Plans. Some of the challenges around the use of stocking rates in regulation are discussed in Topics 2 and 6.

292. Planning advice to the Council on intensification in May 2024 was informed by the science reporting on the state and trends of Otago' water bodies and drew on a Manaaki Whenua Landcare Research policy briefing paper (Greenhalgh, Daigneault, & Samarasinghe, 2015a),

[30] Monaghan and De Klein (2014) found that (i) milk production increases of 7–30% were associated with increased nitrogen leaching and nitrous oxide (N2O) emission losses of 3–30 and 0–25%, respectively; and (ii) integrating a range of strategic and tactical management and mitigation options could offset these increased nitrogen losses.

which was accompanied by technical documentation (Daigneault, Greenhalgh, & Samarasinghe, 2015b). The policy briefing paper was seen as useful for possible policy tools relating to nutrients and their implications, and essentially indicated that there is no 'best' approach[31].

293. The planning advice noted: There is a clear tension between enabling growth and development individually and regionally but also maintaining existing water quality and improving it where it is degraded. Achieving both can be difficult, especially where that growth and development leads to activities that might increase losses of contaminants.

294. A survey of the views of catchment group representatives on land use change are available in Reilly (2023). For example, forestry was polarising and perceived as both an opportunity and a strong negative or concern. Some areas, particularly those that are water-short, noted that there are climatic constraints that will impact the diversification opportunities available to them. It was felt that access to sufficient water was a critical component to the extent of their likely future available choices.

295. The focus in Options 1 and 2 is on pastoral farming (i.e., dairy and drystock) and irrigated land. The options constrain the pastoral phase of arable farming but not necessarily the cropping phase (depending on its irrigation). For the purposes of analysis, the two options are assumed to largely focus on Otago's more versatile land, which is generally Land Use Capability classes 1 to 4[32]. It would only make a marginal difference to the analysis if this assumption was extended to include class 5, which is largely located in the Catlins. Unlike the NESF Agricultural Intensification regulations, no timeframe is specified in Option 1 so it applies for at least the life of the pLWRP.

296. An explanation of Land Use Capability classes in Otago is included in Moran (Ed.) (2023) and more information, with consideration of irrigation, is included in Yang and & Cardwell (2023). While irrigation was a topic in many case studies (as identified in Table 26 of Chapter 13 of this s32 report), possible constraints on either land use intensification or increasing intensity were not specifically tested in the economic research. The nitrogen modelling for the dairy case studies did make assumptions around not markedly increasing phosphorus losses or the level of GHG emissions from a farm (Moran (Ed.), 2023).

297. Table 21 estimates the distribution of drystock farming (i.e., sheep and/or beef cattle and/or deer) on LUC classes 1-4 grazeable land across Otago. In addition to the factors considered in Land Use Capability assessments, the analysis here includes an average annual rainfall of at least 800 mm to indicate natural water availability (i.e., assumes

[31] Since this policy briefing paper was written, natural capital approach has evolved to focus more on physiographic science rather than the land use capability proxy (e.g. Parliamentary Commissioner for the Environment, 2024). The policy briefing paper informed a subsequent review of allocation methods to control contaminant loads from land that was prepared as part of Southland's NPSFM process (Greenhalgh, Wiercinski, & Samarasinghe, 2019).

[32] Agricultural businesses tend to have a mix of topography, with any LUC 1-4 land usually being central to the farming system (Moran (Ed.), 2023). In horticulture, vegetable growing tends to focus on LUC 1 and 2 while the free-draining properties of the soils on the higher LUC classes are well suited to orchard crops. For viticulture, prime grape growing soils are typically less fertile soils, often falling into the higher bands of the LUC classification system.

without irrigation)[33] but not other probable constraints, such as district land zoning rules, or protections for wetlands.

298. Regionally, the total area of drystock farming on more versatile land reported in Table 21 is 126,700 ha. The natural availability of water is an important current constraint in this analysis. With a 1,000 mm average annual rainfall threshold the total area lowers to around 35,000 ha but it rises to just over 482,000 ha with no consideration of rainfall. Overall, the analysis suggests that discouraging the intensification of pastoral land (without an increase in irrigation) is likely to largely occur in south Otago (i.e., Lower Clutha rohe and Catlins FMU). In the case of sheep and beef farming, it will presumably apply to Farm Class 6: South Island Finishing – Breeding farms and Farm Class 7: South Island Finishing farms.

299. Using the same analysis of more versatile land (with the 800 mm rainfall indicator) for dairy support land (owned by dairy farmers but not included in a milking platform) and livestock support land (stock type is unknown but likely to be dairy cattle) is estimated to be 5,534 ha of land regionally. Arable farmland in Otago is estimated to be roughly 7,300 ha (not including the arable crops grown on pastoral farms). A relevant discussion on irrigated vs dryland arable farming is available in section 5.5.4 of Moran (Ed.) (2022).

Table 21: Distribution of more versatile drystock grazeable land (LUC 1-4 AND ≥ 800 mm average annual rainfall) in Otago (source data Pearson 2024)

| Catlins FMU | Lower Clutha rohe | Roxburgh rohe | Manuherekia rohe | Dunstan rohe | Upper Lakes rohe | Dunedin & Coast FMU | Taiari FMU | North Otago FMU |
|---|---|---|---|---|---|---|---|---|
| 15,653 ha | 71,614 ha | 3,597 ha | 39 ha | 4,481 ha | 10,260 ha | 12,686 ha | 7,433 ha | 937 ha |
| 12.4% | 56.5% | 2.8% | 0.0% | 3.5% | 8.1% | 10.0% | 5.9% | 0.7% |

Note: Percentages reported in table are the area in a FMU or rohe as a share of total area of this land in region.

300. Research on farm debt and farm viability for Southland indicated that the NESF Agricultural Intensification regulations appeared to be impacting farm sale options and land values for some drystock farms, as well as labour efficiencies and economies of scale for small dairy farms (Moran, McDonald, & McKay, 2022). The research noted that, while some land values may decline as a result of those temporary controls, overall land values will not be as predictable in the future as environmental limits 'start to bite'.

301. A farm's value consists of the total farm capital or assets, not just its land value. However, it is primarily determined by the most profitable land use that is practical, feasible and legally permissible (Moran (Ed.), 2022)[34]. The relationship between profitability and land

[33] An in-depth assessment of irrigable water demand by land use is available in Aqualinc (2022), which updated guidelines reasonable irrigation water requirements for pastoral land uses in Otago. Annual demand for water (mm/yr) was based on soil water deficit thresholds (e.g., 80$^{th}$%ile and 90$^{th}$%ile) to account for factors, such as seasonal variation and monthly demand.

[34] Farms may increasingly be viewed as two businesses: a production business that creates value from pasture and crops, and an asset management business where assets can increase in value independently of the production (Moran, McDonald, & Mckay, 2022).

values is explored for dairy farming in Muller & Neal (2019). Ranges in profitability for farming in Otago are extensively reported in the economic research (Moran (Ed.), 2022 and Moran (Ed.), 2023).

302. The extent to which the profitability of dairy farming and dairy support farming is currently factored into the land values of other land is unknown. By September 2024, three consents had been applied for under the NESF Agricultural Intensification regulations. Two applications were withdrawn and one was returned under section 88 (Making an application) of the RMA. Once the NESF expires there may be pent up demand for land use conversions or diversification, from within Otago or other regions.

303. It is anticipated that from 2025, Options 1 and 2 will constrain the potential (or unrealised) land uses that are otherwise legally permissible for some farms, and so may impact land values. Other land uses may become more possible in the future, such as arable and horticultural crops. For example, some growers also see the potential for growth in small seeds in South Otago. However, these opportunities may rely on water availability (either through rainfall or irrigation).

304. Some Māori agribusinesses are exploring land use change that is viewed as more complementary to Te Ao Māori views of land management (Moran (Ed.), 2022)[35]. In addition to the general impacts described above, there is potential for specific impacts on Māori-owned rural land and Māori agribusinesses. Some of the reasons are described in section 2.4 of Moran (Ed.) (2023) and others may be highlighted during the submission process.

#### 1.6.7.1. Topic 5 Efficiency and Effectiveness Assessment

305. Table 22 below identifies and assesses the environmental, cultural, social, and economic benefits and costs anticipated from implementing the proposed option for Topic 5. The option for Topic 5 is assessed as being in combination with those for Topic 1.

306. Resource consent cost information is available in section 4 of Chapter 7. In addition to the potential for specific circumstances noted at the end of the previous section, information on the costs and benefits to the Kāi Tahu economy related to freshwater management approaches is included in section 3 of Chapter 7.

307. For farming, the distribution of benefits and costs of options within each topic are likely to be strong variable. Some local communities may be more impacted by and/or are less resilient to certain topics (and options within those topics) than others. Information for local communities, including population, employment and socio-economic deprivation, is available in a series of snapshots (Yang A. , 2022a; Yang A. , 2022b; Yang A. , 2022c; Yang A. , 2022d; Yang A. , 2022e; Yang A. , Roxburgh Rohe, Manuherekia Rohe and Upper Taieri Economic Snapshot, 2022f).

308. General information on land intensification for New Zealand is available in the report titled Modelling of Mitigation Strategies on Farm Profitability: Testing Ag Package Regulations on-Farm (Journeaux, 2019).

[35] Māori agribusinesses where the main asset is Māori freehold land can face particularly challenges around the use of farm debt as a business management tool (Moran (Ed.), 2022).

Table 22: Benefits and costs for Topic 5 – Land use intensification and increasing intensity

| OPTIONS | BENEFITS | COSTS |
|---|---|---|
| **Option 1:** Control on additional area of higher intensity activities | ▪ Option 1 is expected to help prevent further decline in water quality, as high-risk farming activities likely to increase contaminant losses will need to show no increase in those losses through a resource consent framework.<br>▪ It gives a high level of certainty for existing activities and some parts of the farming community. The option will help avoid new more intensive land uses that later may be required to make marked reductions in their contaminant losses.<br>▪ A discretionary activity pathway for resource consents and firm policy direction allows for innovative on-farm solutions for mitigating the adverse effects of intensification on downstream receiving environments.<br>▪ The option is based on a well-known policy framework, given the use of this approach in the NESF Agricultural Intensification regulations. In adding to this framework by discouraging increases in irrigation area beyond dairy and dairy support, it supports steps to manage the over-allocation of water through the setting of environmental flows, levels, and takes.<br>▪ The exclusion relating to horticulture and viticulture for additional irrigation area will be beneficial to these land uses. Most vineyards in Otago are small scale (below 10 ha) and they tend to have slightly less planted area with irrigation and are less likely to have available land for water storage (Moran (Ed.), 2022).<br>▪ By discouraging agricultural intensification, Option 1 is expected to help prevent increased erosion, degradation of soil quality, and a loss of soil biodiversity. These are | ▪ The costs of Option 1 are likely to focus on the more versatile drystock farmland in Otago (similar to the options in Topic 2). The total area of this farmland is estimated to be 126,700 ha, much of which is in south Otago (Lower Clutha rohe and Catlins FMU). However, the extent may range anywhere from 35,000 ha upwards to 482,000 ha across the region, depending on water availability. Land used for dairy support, livestock support, and arable farming is additional to this estimate.<br>▪ The costs during the life of the pLWRP will primarily be borne by those farmers looking to 1) convert towards a more intensity land use, 2) use farm debt as a business management tool, and 3) sell their farm.<br>▪ There are likely to be implications for farm succession, new entrants into an industry, and land use consolidation. Such implications may reduce opportunities for economic growth and put additional pressure on some rural communities, particularly in localities with a narrow band of alternative land uses.<br>▪ Continuing to limit conversions from forestry to farmland is likely to result in opportunity costs for some communities as ongoing annual expenditure within the local economy is foregone. It may also result in unintended consequences if it increases fire risk in drier parts of the region (the effects of climate change are a consideration in the NPSFM 2020).<br>▪ Until reductions are also required for existing intensive land uses, these costs are likely to increase. As land-use patterns become more constrained and there is a risk of unintended consequences. A different planning framework will be needed in the future to drive the reductions in contaminant losses that will achieve target attribute states and |

| OPTIONS | BENEFITS | COSTS |
|---|---|---|
| | particular issues for intensive farming areas on flat to rolling land (Manaaki Whenua Landcare Research, 2024). | environmental outcomes.<br>▪ Where resource consents are required, costs will be incurred by farmers, and the costs of demonstrating no increases in contaminant losses will likely be considerable.<br>▪ Limited areas of irrigation, primarily those that are for sheep/beef and cropping, that have expanded in the preceding 4 years (as a permitted activity) may require a resource consent. The NESF has irrigation expansion restrictions for dairy and dairy support only. |
| **Option 2:** Control additional area extent of high-risk activities PLUS increasing intensity | ▪ The benefits for Option 1 also apply to Option 2.<br>▪ Increases in intensity regularly occur on existing farms (often to keep pace with increasing costs) and typically lead to increased environmental risks. Managing within-farm intensity will help protect the gains made for water quality made by farmers and growers through the adoption of on-farm environmental actions. | ▪ The costs for Option 1 also apply to further develop within the farming system in Option 2.<br>▪ Managing increases in intensity within a production system is a significant constraint on existing farms, particularly if there is season to season variability or other reasons why current intensity decreases.<br>▪ Control on increasing intensity within a farm's production system is perceived to be highly inequitable amongst the rural community. Costs may include increased mental health issues, increasing social division and isolation.<br>▪ Difficult to monitor compliance with controls on increasing intensity, particularly for dairy support. |

309. In addition to costs and benefits, this assessment also needs to take into account the risk of acting or not acting, if there is uncertain or insufficient information. There is information about the current extent of high-risk land use activities, and a need to have complied with the NESF in the past. There is considerable uncertainty about increasing intensity within production systems, particularly for dairy support. There are some unknowns about the unintended consequences of limiting within-system intensity and the efficacy of these controls. The risks associated with managing increasing intensity via stocking rates (i.e., Option 2) currently appear to outweigh the risks of not doing so. Overall, the information supporting Option 1 is suitably certain and sufficient, such that there is a minimal risk of acting compared to Option 2.

Table 23: Effectiveness and efficiency assessment for Topic 5 – Land use intensification

| | |
|---|---|
| **Effectiveness** | |
| **Option 1:** Control on additional area of higher intensity activities | This Option, in combination with Options 1 and 2 in Topic 1, is moderately effective in achieving the objectives of the pLWRP. It is best perceived as an additional step towards the objectives, in that it will protect other efforts to achieve the target attribute states. However, without these controls, there is a significant risk that gains from other regulatory and non-regulatory actions will be eroded by increased areas of higher-risk activities. The controls largely carry over the framework from the NESF Agricultural Intensification regulations, so are familiar and shorter-term consequences are known. |
| **Option 2:** Control additional area extent of high-risk activities PLUS increasing intensity | The controls over within-system intensification, as well as additional area, are likely to be marginally more effective in achieving the objectives. However, the effectiveness may be eroded by public perceptions of unfairness and inequity, and some unintended consequences such as the maintenance of existing levels of intensity due to fear of losing 'rights' to discharge contaminants. |
| **Efficiency** | |
| **Option 1:** Control on additional area extent of high-risk activities | Option 1 is reasonably efficient, over the life of the pLWRP, as it largely recognises existing land use patterns in Otago and provides more certainty that they can continue. A small amount of flexibility is enabled for dairy support, which will provide a modest ability to adapt to changing circumstances for existing farm operators. Longer term, the option does not enable intensification in areas where risks may be more easily managed or, or adapt well to technological changes, more information or innovation. Similarly to Topic 2, the costs are likely to focus on the region's more versatile drystock farmland. |
| **Option 2:** Control additional area extent of high-risk activities PLUS increasing intensity | Option 2, which focused on policy direction controlling within-system increases in intensity, as well as additional area of more intensive activities, is likely to be less efficient than Option 1 in the short term. Reasons include the potential for unintended consequences and challenges around monitoring and compliance. In the longer term, the efficiency assessment is more nuanced and uncertain. Option 2 may risk reducing opportunities for diversification within production systems, but it may also help prevent resources users from 'using up' gains made by others in reducing contaminant losses. |

### 1.6.7.2. Topic 5 Conclusion

310. The assessment above indicates that, overall, Option 1 will be more effective and efficient in achieving the pLWRP and ORPS objectives than relying solely on the options in Topic 1. The continuation of controls on the expansion of land uses associated with higher risks for water quality (i.e., land use intensification) across Otago will help avoid putting more pressure on waterbodies. It will also help ensure that any further land use intensity occurs in a way that has a more certainty longer-term. However, this assessment is dependent on the Council's ability to successfully manage higher risk land uses where they already exist in Otago (i.e., land use intensity in Topic 6). Consequently, the inclusion of land use intensification controls in the proposal (in combination with those for the other farming topics, and particularly Topic 1) is considered to be the most appropriate way to achieve the objectives of the pLWRP.

### 1.6.8. Topic 6: Dairy land use intensity

311. Alongside the two aspects considered in Topic 5: 1) land use intensification and 2) increases in intensity of existing rural land uses, Topic 6 focuses on how to manage the current intensity of existing land uses. To be clear, increasing intensity is covered in Topic 5 while Topic 6 is about current intensity.

312. This topic specifically considers dairy farming and risks related to nitrogen. The nature of pasture-based dairy farming systems in New Zealand is creating elevated risks for water quality (refer to section 1.2 in this chapter and Chapter 2). Those farms with high nitrogen losses face challenges in managing this contaminant given it is highly mobile as nitrate. The ten case studies for dairy farming (Dairy 1 to Dairy 10) as well as section 5.3.1.2 in Chapter 5 of Moran (Ed.) (2023) are relevant to this topic.

313. Initially other land use activities were considered in this topic, such as commercial vegetable production, as well as intensive arable cropping and beef finishing. However, these activities are harder to define with sufficient certainty and do not occur at the same scale in Otago as dairy farming and dairy support farming. The information and case studies for arable farming (sections 4.4.2, 4.5.1.3 and 4.5.1.4), vegetable growing (section 6.7.2.1), and sheep and beef farming (sections 2.4.2.5 and 2.5.6) in the economic research are relevant to this topic (Moran (Ed.) (2023).

314. The topic included two main options:

a. **Option 1** (included in Stage 3 community engagement): In this option, existing dairy farms and dairy support farms are either a discretionary activity when above stocking rate and fertiliser thresholds or a controlled activity when at or below those thresholds. The first option was specific to FMU or rohe where nitrogen levels are poor or there is a declining trend. The FMUs and rohe identified at the time were North Otago, Dunedin & Coast, Taiari, Manuherekia, and Lower Clutha.

b. **Option 2** (developed after Stage 3 community engagement): In this option existing dairy farms are a controlled activity across the region with a 12 month transition period during which it is permitted subject to conditions. The activity status for Option 2 was eventually changed to include dairy farming with dairy support farms and other farming land uses as a permitted activity (subject to conditions that may include a Freshwater Farm Plan) or as a discretionary activity.

315. The basic intent of Option 1 was to manage increases in the intensity of dairy farming and dairy support farming as a system rather than controlling specific inputs, such as fertiliser or imported feed separately. The benefits of a consent pathway are a reduction in environmental risk compared to relying on a permitted activity subject to conditions or via a Freshwater Farm Plan. The main differences between a controlled and a discretionary activity status are 1) the types of conditions that can be set and 2) whether or not an application for a consent can be declined.

316. Option 1 was to manage higher intensity dairy farms and dairy support farms through a discretionary activity resource consent, which was to be required if a farm was above certain input thresholds. The thresholds consider during Stage 3 community engagement were either (a) 100 kg synthetic N fertiliser per hectare or (b) 2.5 cows per total hectare in FMUs where nitrogen levels are poor or there is a declining trend. Essentially, the thresholds were intended to act as a 'drafting gate' for less intensive dairy farms and dairy

support farms. To manage the number of resource consents anticipated, the rule framework may be staged by FMU to spread the consenting load over three years.

317. The analysis provided by ORC's science team is available in two memos: Stocking Rate definitions and threshold values (Crawford M. , 2023d) and Nitrogen limits and their impact within Otago region (Crawford M. , 2023c). Table 24 considers DairyNZ's analysis of the stocking rate threshold. Table 25 considers dairy support farming in Otago as relevant to this topic.

318. A stocking rate of 2.5 cows per total hectare is roughly equivalent to between 16 and 21 stock units, depending on the mix of breeds. As a comparison, the average stocking rate for a Class 7 Finishing sheep and beef farm (the most relevant farm class for land used for dairy farming) is roughly 11 stock units per effective (or grazeable) area in Otago. This stocking rate is indicative of the carrying capacity of more versatile land when farming to the pasture growth curve (i.e., without an ongoing reliance on imported feed). There is a distinction between the stocking rates needed for optimal pasture management and those that are supported by the use of imported feed.

Table 24: Analysis of a stocking rate threshold for managing dairy farming in Option 1

| |
|---|
| In their written feedback on Consultation #3, DairyNZ included an analysis of Option 1 (as they understood it at the time). It estimated that in 2021-22: just over 80% of dairy farms will have a stocking rate of over 2.5 cows per effective hectare; and around 50% of dairy farms receive applications of more than 100 kgs of synthetic nitrogen fertiliser per effective hectare per year[36]. In combination, they found 85% to 95% of dairy farms will either have a stocking rate of over 2.5 cows per hectare or a synthetic nitrogen fertiliser rate exceeding 100 kgs per hectare per year.<br><br>In their analysis, DairyNZ noted that 1) the farm sample from DairyBase is not a representative sample, 2) dairy support is excluded because that information is not available, and 3) their figures are for the Otago region, not specific FMU/rohe. However, DairyNZ concluded that "an overwhelming majority" of dairy farms will be managed as a discretionary activity.<br><br>While DairyNZ's conclusion was not incorrect, the analysis likely overstated the share of dairy farms impacted for two reasons. First, the stocking rate of 2.5 cows per hectare being considered was in relation to total area, not effective area[37]. Second, the finding of 85% to 95% of dairy farms appears to suggest that some dairy farms have lower stocking rates but higher synthetic nitrogen fertiliser use or vice versa but the reasons for this being the case are unclear.<br><br>Using the Otago Land Use Map, it is estimated that in 2020-21 there were 455 dairy farms in Otago across 94,422 hectares of farmland (dairy platform only). Almost all of the dairy farms in Otago (up to 96%) are located in the eastern part of the region on the most versatile land (Moran (Ed.), 2022). For the same year DairyNZ estimated the effective area for dairy farming in the region as 91,748 (Moran (Ed.), 2022). Effective area is used to calculate feed supply and does not usually include things like houses, gardens, sheds, lanes and races, trees, water bodies and steep areas. The estimate of total area is equivalent to 12.5% of the LUC 1-4 developed land in the region. Currently, the availability of fresh water (rainfall or irrigation) constrains the extent of dairy farming in the region.<br><br>While these estimates of dairy farmland are from two separate sources, together they suggest the effective area is roughly equivalent to 97% of the total area. However, there will be some variability at a farm and district scale, particularly where there are differences in topography. In Southland where dairying largely occurs on flat land, and there is a higher level of certainty in the information, the ineffective area for dairy farmland in |

[36] It is unclear whether DairyNZ's estimate relating to fertiliser application is effective area or total area but it is assumed here to be the former.

[37] For example, a 300 hectare farm with a stocking rate of 2.63 cows per effective hectare and an effective area of 95% of the farm will have a stocking rate of 2.5 cows per total hectare.

2014-15 was 4.5% (Moran, Pearson, Couldrey, & Eyre, 2019). As dairying tends to occur on rolling country in lower Clutha and Catlins, it is assumed here that the average ineffective area of a dairy farm in Otago is around 5% of total area.

Once the difference in effective versus total area is considered, it is estimated that roughly 75% of dairy farms would have been managed as discretionary activity and 25% of dairy farms as a controlled activity. If this requirement was applied to all dairy farms in Otago (rather than being FMU specific) then the conditional activity pathway would have benefited the 114 dairy farms that have relatively low stocking rates. This estimate is possible conservative because the pathway may have also incentivised some dairy farmers to drop their stocking rates below the threshold of 2.5 cows.

As stocking rates for dairy farms vary by district and change over time (refer to Table 12 and Figure 50 in section 6.4 of Moran (Ed.), 2022), more farms may be managed as a controlled activity in Clutha and more farms may be managed as a discretionary activity in Waitaki and Dunedin. This is likely to be broadly consistent with the distribution of dairy systems across Otago (Moran (Ed.), 2022).

The 10 dairy farm case studies in the economic research (Moran (Ed.), 2023) show the complexity of this topic. The farm stocking rates ranged from 1.7 / eff. ha to 3.7 cows / eff. ha and six of the 10 farms were likely to be below the 2.5 stock units / total ha. Several of the case studies are particularly notable.

Dairy 1 had the highest proportion of bought in feed, a stocking rate of 2.6 cows, was highly profitable ($4,600), yet had the lowest losses of nitrogen to water (as measured in Overseer)[38]. This farm was in south Otago.

Dairy 5 had a stocking rate of 1.9 cows, as well as a wintering barn and a covered stand-off pad, and all cows are wintered inside. The farm was amongst the lowest for nitrogen losses and nitrogen surpluses of the 10 farms but also the lowest profitability ($770) – whereas Dairy 4 had a lower stocking rate of 1.7 cows and higher profitability ($1,700).

Dairy 6 and Dairy 10 both had high stocking rates (3.3 cows and 3.7 cows respectively), border dyke irrigation, high nitrogen losses, and high profitability ($4,100 and $5,600 respectively). These farms were in north Otago.

The environmental actions tested made far more of a difference for the nitrogen losses of the higher loss farms (above 30 kg N/ha) than for the farms that already had lower nitrogen losses (below 30 kg N/ha).

Table 25: Analysis of possible extent of dairy support in Otago for Option 1

As a general rule, for every hectare of dairy platform land there is roughly 0.4 hectares of dairy support land, which suggests that there may be around 38,600 eff. ha of land used for dairy support in Otago. In other words, dairy farming in Otago, with milking platforms and support blocks combined, roughly totals just over 135,000 hectares of land.

Of the 10 dairy farm case studies in the economic research (Moran (Ed.), 2023), all the South Otago farms (Dairy 1-5) and one North Otago farm (Dairy 9) were relatively 'self-contained', with all livestock grazed on these properties during winter. The modelling results for these farms included the milking platform and support block. Nutrient discharges on these farms continue throughout the season, whereas some farms with higher stocking rates may 'winter off' stock, reducing the diffuse nutrient losses on the farm.

Research for Southland (Moran, Pearson, Couldrey, & Eyre, 2019) suggested that nitrogen losses from a dedicated dairy support block can be similar scale to that of a milking platform. This finding indicated that there may be value in treating dairy support farms in a similar way to dairy farms in policy. However, the nitrogen losses for drystock farms with dairy grazing tended to be lower than dairy support blocks.

If Option 1 had applied to dairy support generally (i.e., not just dedicated dairy support farms) then the costs were likely to increase without a similar increase in benefits. A farm that primarily focuses on dairy support can differ markedly from a drystock farm that includes dairy grazing as an enterprise. Moran (Ed.) (2023) showed that all 41 sheep and beef farms included in the research use nitrogen fertiliser on pasture at rates below 40 kg per hectare and only three use it on crop at rates of more than 100 kg per hectare – but they did

[38] Overseer largely focuses on the nitrogen that travels through the soil profile as nitrate and tends to omit losses of nitrogen in ammoniacal and organic forms via overland flow and bypass flow pathways (Science Advisory Panel, 2021).

not include dairy cattle. These rates are only for the area where fertiliser was applied – not all pasture or all crops.

Dairy grazing in Otago is an important source of revenue for some sheep and beef farmers (Moran (Ed.), 2022; Moran (Ed.), 2023). Four farms in the B+LNZ Otago Survey (or 10%) earned income from dairy grazing: one farm was wintering cows and all four had annual revenue from grazing young dairy heifers. The proportion of sheep and beef farms with dairy grazing revenue has fluctuated between zero and 11% during the decade from 2010-11 to 2020-21 (but is typically close to 10%).

319. Option 2 for Topic 6 was comparatively simple, in that it required a controlled activity resource consent for all existing dairy farming (as of 2 September 2020). In this option, the Council reserved its control to the following matters:

a. The content of, and compliance with, the farm's Freshwater Farm Plan; and

b. The extent and timing of any actions to achieve the environmental outcomes set out in FMU1-O1 to FMU1-O14; and

c. Methods to avoid or mitigate adverse effects of the activity on surface water quality, groundwater quality and sources of drinking water; and

d. Contribution to community-scale methods to reduce contaminant loss, including catchment scale projects and other off-site mitigations; and

e. Stocking rates and the amount of contaminant losses; and.

f. The lapsing period and duration of the resource consent; and

g. Review of the conditions of the resource consent; and

h. The collection, recording, monitoring, and provision of information about the exercise of the resource consent.

320. To manage the large number of resource consents (an estimated 400-500), Option 2 was to be staged by FMU and rohe to spread the consenting load over three years. Existing dairy support was to be a permitted activity subject to conditions.

321. Clause 3 engagement with stakeholders and further Council workshops highlighted that there were uncertainties around the gains to be had (given the matters of control listed above) over those that can be achieved by a certified Freshwater Farm Plan, with the additional elements and information gathering as part of that process (per the Freshwater Farm Plan process in APP29 of the pLWRP).

322. The use of the Freshwater Farm Plan pathway for dairy farms with high nitrogen losses has some potential risks associated with it. Many of these risks are highlighted in the Ashburton Lakes Lessons learned report (Ministry for the Environment, 2023a). Addressing these risks may put undue pressure on the pathway itself in successfully delivering outcomes, which in turn may impact other farms with lower baseline nitrogen losses unless care is taken.

323. An overall finding of the economic research for dairy farming (Moran (Ed.), 2023: p209) was that "both the cost of implementing relevant environmental actions and the reductions in nutrient losses that result are largely specific to each farm. Each farm is unique in terms of the existing state and what may be practically achievable. What may be effective and viable for one farm may not be for another."

#### 1.6.8.1. Topic 6 Efficiency and Effectiveness Assessment

324. Table 26 below identifies and assesses the environmental, cultural, social, and economic benefits and costs anticipated from implementing the proposed options for Topic 6. The options for Topic 6 are assessed as being in combination with those for Topic 1. Resource consent cost information is available in section 4 of Chapter 7. Information on the costs and benefits to the Kāi Tahu economy related to freshwater management approaches is included in section 3 of Chapter 7.

325. For farming, the distribution of benefits and costs of options within each topic are likely to be strong variable. Some local communities may be more impacted by and/or are less resilient to certain topics (and options within those topics) than others. Information for local communities, including population, employment and socio-economic deprivation, is available in a series of snapshots (Yang A. , 2022a; Yang A. , 2022b; Yang A. , 2022c; Yang A. , 2022d; Yang A. , 2022e; Yang A. , Roxburgh Rohe, Manuherekia Rohe and Upper Taieri Economic Snapshot, 2022f).

Table 26: Benefits and costs for Topic 6 – Land use intensity

| OPTIONS | BENEFITS | COSTS |
|---|---|---|
| **Option 1:** In FMUs and rohe where nitrogen levels are poor or there is a declining trend, existing dairy farms and dairy support farms are either a discretionary or a controlled activity depending on their intensity | ▪ Option 1 is expected to reduce losses of excess nitrogen (and possible other contaminants), which is likely to contribute to improvements in water quality in FMUs and rohe where nitrogen is a particular concern. Nitrogen causes excessive algae and plant growth but can also be toxic at high concentrations.<br>▪ Such improvements are likely to be particularly beneficial to ecosystem health, including mahika kai species, in sensitive downstream receiving environments such as estuaries. They will also help avoid some human health issues by helping to protect groundwater resources used for drinking water supplies, either now or by future generations.<br>▪ Lower intensity dairy farming (platform and support blocks) would have an easier consenting pathway as a controlled activity, reflecting their likely lower environmental risks in relation to nitrogen.<br>▪ Information gathering and | ▪ In Option 1 all dairy farms and dairy support farms in specific FMUs and rohe will incur costs both for the consenting process and to reduce losses of excess nitrogen from their production system. It may be more problematic to account for some forms of nitrogen than others, depending on the tools used.<br>▪ 10 examples of the economic costs to dairy farmers of reducing losses of excess nitrogen (and phosphorus) are reported in the dairy chapter of Moran (Ed.) (2023) (specific results are included in Chapter Appendix 1 on page 240).<br>▪ An estimated 75% of dairy farms in these FMU and rohe were likely to need a discretionary consent and 25% of them a conditional consent. There may be a spatial distribution to this split that impacts some communities more than others.<br>▪ Those farmers needing a discretionary consent were likely to face some uncertainty about their future, which increases stress. As Option 2 only applied to dairy farming, it could reinforce any existing perceptions of |

| OPTIONS | BENEFITS | COSTS |
|---|---|---|
| | monitoring of consented farms would be comprehensive, far more so than the information gathered through FWFPs.<br>▪ By not including existing intensive arable farming and beef finishing, as well as vegetable growing. Option 1 leaves management of these land uses to be addressed through tailored solutions in Freshwater Farm Plans. This flexibility may help avoid (or at least minimise) some of the costs highlighted in the economic research (refer to case studies in the economic research relevant to this topic as highlighted in discussion above this table). | being 'singled-out'.<br>▪ By not applying regionally, Option 1 may incentivise increases in dairy farming intensity in other FMU and rohe. It may also encourage intensification in other FMU and rohe (assuming it is not controlled via Option 1 of Topic 5). An example of this type of situation occurred with dairying farming in the Mackenzie Basin in Canterbury.<br>▪ This is considerable uncertainty about 1) where thresholds should be set, and 2) the correlation between those thresholds, nitrogen losses, and changes in water quality. In particular, the fertiliser threshold was likely to be unworkable. |
| **Option 2:** Existing dairy farms are a controlled activity across the region | ▪ The benefits of Option 2 are similar to Option 1.<br>▪ In applying regionally, this option is more likely to contribute to improvements in water quality more widely and avoid unintended consequences and uncertainty associated with Option 1.<br>▪ The more intensive dairy farms have more certainty than under Option 1. This option avoids using Freshwater Farm Plans as a tool to manage higher risk activities, which may reduce their usefulness as a tool if it adds undue complexity to the system.<br>▪ The controlled activity status recognises the significant levels of investment in existing dairy farms, many of which are likely to be carrying substantial debt. | ▪ Option 2 has similar costs to Option 1. However, these costs apply to dairy farms across the region (not just those in specific FMUs) but they do not apply to dairy support farms, which are managed either as a permitted activity subject to conditions or via a Freshwater Farm Plan.<br>▪ By treating all dairy farms as a controlled activity and dairy support farms as a permitted activity, Option 2 potentially limited the council's ability to effectively manage those farms with the highest losses of excess nitrogen. It may delay improvements in water quality, and so adversely affect ecosystem health and mahika kai species. |

326. In addition to the benefits and costs, this assessment also needs to take into account the risk of acting or not acting, if there is uncertain or insufficient information.

327. There is information about the current extent of dairy farming and dairy support activities, and a need to have complied with the NESF in the past. There is considerable uncertainty about within-system intensity on individual farms, particularly for dairy support, and how

that is trending over time. There is also very limited information on what mitigations have been implemented and actual losses from these activities. There are some unknowns about the efficacy of Freshwater Farm Plan processes and the additional requirements imposed through APP29 of the pLWRP.

328. Overall, the information supporting a decision to rely on Option 1 is suitably certain and sufficient, such that there is a minimal risk of acting compared to Option 6.

Table 27: Effectiveness and efficiency assessment for Topic 6 – Land use intensity

| | |
|---|---|
| **Effectiveness** | |
| **Option 1:** In FMUs where N levels are poor or there is a declining trend, existing dairy farms and dairy support farms are either a discretionary or a controlled activity depending on their intensity | This option is moderately effective in achieving the objectives of the pLWRP in specific FMUs and rohe. However, its effectiveness is potentially limited 1) its acceptability to the dairy farming community, as there was considerable feedback questioning the technical justification, including of the thresholds, and 2) the input thresholds do not necessarily have a direct link to contaminant losses, as a poorly run lower intensity operation may pose more environmental risks than a well-managed higher intensity operation. It is expected that the Freshwater Farm Plan would be a key delivery mechanism. |
| **Option 2:** Existing dairy farms are a controlled activity across the region | This option has some additional effectiveness in achieving the objectives of the pLWRP in comparison to Option 1 because it is region-wide but no longer applies to dairy support. While the Council has oversight through compliance monitoring, its ability to manage adverse environmental effects and require reductions in contaminant losses is more limited than in Option 1. It is anticipated that the Freshwater Farm Plan would remain a key delivery mechanism. |
| **Efficiency** | |
| **Option 1:** In FMUs where N levels are poor or there is a declining trend, existing dairy farms and dairy support farms are either a discretionary or a controlled activity depending on their intensity | Option 1 will be efficient in achieving the objectives of the pLWRP because it focusses attention on more intensive (i.e., higher input) farming operations rather than dairy farms. However, the topic is complex and there is a risk of poorly targeting farms around where a simple threshold is set. Some farms may have already implemented environmental actions (either on or off-farm) to reduce their effects on water quality, while other farms with higher contaminant losses, may face less scrutiny. When compared to the outcomes under a robust Freshwater Farm Plan process (including information gathering), the marginal gain from the consent pathways is limited as most dairy farms and dairy support farms will still be required to implement actions through such a process for the foreseeable future. |
| **Option 2:** Existing dairy farms are a controlled activity across the region | Option 2 is likely to be less efficient than Option 1 in achieving the objectives of the pLWRP because 1) it requires dairy farms to gain consents in FMUs and rohe where nitrogen levels are less of an issue at this time, and 2) the risk of incentivising dairy farming in such areas is discouraged through Topic 5. The marginal gains from a more involved process (including information gathering) are thought to be limited when compared to those possible from a robust Freshwater Farm Plan process. This assessment assumes that the Freshwater Farm Plan pathway can be used successfully to manage dairy farms with high nitrogen losses without undermining the tool |

| | |
|---|---|
| | itself. |

#### 1.6.8.2. Topic 6 Conclusion

329. In general terms, resource consent options were considered in this assessment for either 1) existing dairy farms and dairy support farms in FMUs where nitrogen is a particular issue or 2) managing existing dairy farms as a controlled activity across the region. The effectiveness and efficiency assessment indicates that, overall, either option for Topic 6 may be marginally more effective in achieving the objectives of the pLWRP and ORPS than relying solely on Topic 1 in the proposal. However, the 2 resource consent options are currently considered to be less efficient, at least over the lifetime of the pLWRP, than the combination of Option 1 in Topic 5 (i.e., controls on land use intensification) with a robust Freshwater Farm Plan process (together with options from other topics). The reasons for this assessment are detailed in Table 27.

### 1.6.9. Topic 7: Looking towards implementation

330. Topic 7 focuses on the importance of considering specific circumstances when implementing the policy approach for farming. The topic considers the consequences of high levels of diversity in farming across Otago and the implications of existing investment (both financial and in-kind) in environmental actions. The importance of implementation process in reducing the impacts of policy was a key finding of the Industry Advisory Group's 2nd report (refer to the Research Themes section and the Limitations section of the Executive Summary in Moran (Ed.), 2023).

331. Option 1 for Topic 7 was to make use of the existing national requirement for Freshwater Farm Plans as an alternative for farmers to either 1) having to meet more general performance standards within a permitted activity or 2) having to gain a resource consent. The option allows for a farm's individual situation to be considered and gives some flexibility in how the environmental effects of these activities are managed, within the farm's catchment context.

332. Where relevant to an activity, pathways to certified Freshwater Farm Plans are included in a permitted activity rule. Option 1 relies on the current certification and auditing processes for Freshwater Farm Plans to confirm the successful adoption of environmental actions. These certification and audit processes are necessary to avoid industry capture.

333. These pathways are supported by an appendix, which sets out the requirements of a Freshwater Farm Plan and the process for meeting them. The appendix requires information to be recorded and provided to the Council on request. The types of information include stocking rate, arable cropping, fertiliser use, use of supplementary feed, effective farming area, nutrients, the wintering of livestock, and the use of land for dairy farming or dairy support farming.

334. The appendix also sets out expectations for a range of activities to be addressed in a Freshwater Farm Plan and specific on-farm outcomes to be achieved. Finally, it requires a certification of risk equivalence. All of this knowledge will improve understanding of farming in Otago and help with monitoring the effectiveness of environmental actions for future planning processes.

335. This option will help address perceptions of a 'consent mindset', which was a concern highlighted in the *Otago Catchment Stories Summary Report* (Reilly, 2023). However, providing this flexibility can increase the uncertainty of achieving outcomes (Ministry for the Environment, 2023a). Freshwater Farm Plan pathways are typically better suited to lower intensity farms. Relying on them to manage high risk farming activities and practices may reduce their usefulness as a tool if it adds undue complexity to the system.

336. Option 1 includes policy direction to recognise that a Freshwater Farm Plan is complementary to, but cannot replace, other methods to reduce losses, particularly where those methods involve actions that go beyond commonly accepted good management practices or manage activities that have a higher risk profile.

337. Freshwater Farm Plans are most successful and lowest cost when farmers are encouraged to be as involved as possible in their preparation as it builds understanding and promotes 'ownership' of them. As already highlighted in Topics 3 and 4, the fixed versus flexible approaches tested in Arable 2 and Arable 4 case studies showed there are considerable benefits for farmers and for the environment (Moran (Ed.), 2023).

338. Option 2 for Topic 7 was to include a policy that recognises existing investment in environmental actions when considering timeframes for the completion of further actions. In this context 'investment' was intended to mean either financial or in-kind contributions, as in some cases people will have chosen to undertake work themselves while in others the work may have been purchased. In addition, specific reference is included in the stock exclusion options (Topic 2). It is also consistent with the existing consideration given for the value of the existing investment in the animal effluent systems.

339. Two aspects of challenges raised by representatives of catchment groups (Reilly, 2023) were 'moving of goalposts' and the importance of trust:

> Concerns were raised with the 'moving of goalposts' by regulators, and the introduction of new or changed requirements and expectations, often before earlier rules had a chance to show effect. One interviewee noted that this "discouraged investment in solutions or projects and took away clarity in where groups needed to spend their time and energy."

340. The option was included in Clause 3 engagement with stakeholders (and it is reflected in a policy in the Integrated Management Chapter that facilitates transition):

> When considering the timeframe for a new environmental action that necessitates investment and is required by Freshwater Farm Plans or as a condition within a consent, recognise the level of existing investment in environmental actions that has occurred on the landholding in the last ten years, provided that is still consistent with the timeframes for achieving the target attribute states and interim target attribute states.

341. Following feedback, the scope of Option 1 was expanded to all activities and the time limit on recognised actions was removed:

> Recognise investment in actions beyond good management practices when considering further obligations and timeframes to be imposed in Freshwater Farm Plans and resource consent conditions.

### 1.6.9.1. Topic 7 Efficiency and Effectiveness Assessment

342. Table 28 below identifies and assesses the environmental, cultural, social, and economic benefits and costs anticipated from implementing the proposed options for Topic 7. The options for Topic 7 are assessed as being in combination with those for Topic 1. Information on the costs and benefits to the Kāi Tahu economy related to freshwater management approaches is included in section 3 of Chapter 7.

343. For farming, the distribution of benefits and costs of options within each topic are likely to be strong variable. Some local communities may be more impacted by and/or are less resilient to certain topics (and options within those topics) than others. Information for local communities, including population, employment and socio-economic deprivation, is available in a series of snapshots (Yang A. , 2022a; Yang A. , 2022b; Yang A. , 2022c; Yang A. , 2022d; Yang A. , 2022e; Yang A. , Roxburgh Rohe, Manuherekia Rohe and Upper Taieri Economic Snapshot, 2022f).

Table 28: Benefits and costs for Topic 7 – Looking towards implementation

| OPTIONS | BENEFITS | COSTS |
|---|---|---|
| Option 1: Freshwater Farm Plans as an alternative to resource consents. | ▪ A Freshwater Farm Plan pathway for some activities, gives farmers and growers some flexibility in the management needed to address their property's contaminant losses, as well as still providing for improvement in water quality. There are benefits from this flexibility in Otago because of the high level of diversity within the region's rural land uses.<br>▪ The inclusion of a Freshwater Farm Plan pathway may allow a farming activity to continue where it does not meet all of a permitted activity's conditions, rather than through a specific resource consent. It may encourage faster uptake of Freshwater Farm Plans.<br>▪ Requirements for the provision of information to ORC for Freshwater Farm Plans will improve the information currently held by the council, particularly in respect to the location of activities and potential cumulative effects, making future policy making more certain and effective.<br>▪ As all farms and growing operations are currently required to have a | ▪ The need for a certified and audited Freshwater Farms Plan is an existing requirement under the RMA (i.e., it is part of the status quo). In other words, it is already a cost of doing business. Ultimately, the pathways will add more value to this sunk cost for many farmers and growers.<br>▪ As discussed above this table, there are potential environmental costs related to the risk of delays in achieving outcomes. Delays in achieving outcomes can also have social, economic, and cultural costs associated with them. These costs can be partly addressed by encouraging farmers to be as involved as possible in the preparation of their Freshwater Farm Plan. A certification and auditing process also helps to minimises these costs.<br>▪ For some farmers and growers there may be a lack of certainty about the management needed for particularly activities ahead of gaining a certified Freshwater Farm Plan, which may add stress. However, it is likely to be less |

| OPTIONS | BENEFITS | COSTS |
|---|---|---|
| | Freshwater Farm Plan, any additional costs to a farmer or grower in choosing to manage their activity through a Freshwater Farm Plan should be relatively minimal and less than via a resource consent. | uncertainty and stress than having to gain a consent. |
| Option 2: Recognise environmental actions | ▪ This option supports stewardship, which is one of the 6 principles of Te Mana o te Wai that relate to people's roles in the management of freshwater, and these principles inform the NPSFM and its implementation.<br>▪ It will help address concerns raised about the 'moving of goalposts' by regulators and loss of trust.<br>▪ Another of the 6 principles of Te Mana o te Wai is Kaitiakitanga. Option 2 should be beneficial to Māori agribusinesses, which often do not have access to capital when the main asset is Māori freehold land (Moran (Ed.), 2022). | ▪ There are few identified costs of Option 2. The main one is there may be some uncertainty around defining what good management practices to recognise as they are likely to vary by farming industry and evolve over time. For example, the sheep and beef industry may be better suited to the National Good Farm Practice Principles, the deer industry has its Environmental Management Code of Practice, while horticulture has its GAP Environment Management System, and viticulture has Sustainable Wine New Zealand. |

344. In addition to costs and benefits, the assessment also needs to take into account the risk of acting or not acting if there is uncertain or insufficient information. There is certainty that farmers and growers in Otago have already been investment in environmental actions and the risk of not recognising this investment outweighs any risks (if any) from doing so.

345. There is some uncertainty regarding Freshwater Farm Plans, as the government has indicated it will be making changes to the freshwater farm plan system but it is unknown at this time what the changes will be. However, Freshwater Farm Plans are considered to be a useful tool to reduce the effect of farming activities on freshwater quality. Overall, the information supporting the use of Freshwater Farm Plan pathways in the pLWRP is suitably certain and sufficient that the risk of acting (i.e., including these pathways) is less than not doing so.

Table 29: Effectiveness and efficiency assessment for Topic 7 – Looking towards implementation

| Effectiveness | |
|---|---|
| **Option 1:** Use Freshwater Farm Plans as an alternative to resource | Freshwater Farm Plans provide a practical way to identify, manage and reduce the impact of farming on the freshwater environment, tailoring mitigations based on local catchment, farm landscape and climate, and farming systems (Ministry for the Environment, 2023). Providing Freshwater Farm Plan pathways to permitted activity rules will contribute to their effectiveness. Setting out clear expectations in an |

| | |
|---|---|
| consents | appendix ensures environmental actions will support improved outcomes.<br>If the impacts of an environmental action are more than necessary to manage a freshwater issue then there may be less support for such an action 'on the ground'. In some cases, the extra impacts may unnecessarily limit the use of that action or other actions, and so change the overall calculus of effectiveness. |
| **Option 2:** Recognise environmental actions | As indicated in the assessment for Option 1, the concepts of effectiveness and efficiency can be closely linked. The efficiency gains from recognising existing investment in environmental actions, are likely to support the overall effectiveness of the policy approach for farming activities. On-farm, recognising what has already been done will help prioritise effort towards what may still need to be done. |
| **Efficiency** | |
| **Option 1:** Use Freshwater Farm Plans as an alternative to resource consents | As discussed in the benefit cost table above, the inclusion of pathways for Freshwater Farm Plans (as appropriate) is likely to improve productive efficiency as well as allocative efficiency. A Freshwater Farm Plan is a sunk cost for farmers and growers so making as much use of the tool as possible will add value. The most efficiencies will be gained where farmers are actively engaged in the preparation of these plans. However, there are limits to a Freshwater Farm Plan as a tool and its efficiency (and so its effectiveness) may decline if it is used for activities that are not appropriate. |
| **Option 2:** Recognise environmental actions | The impacts of new environmental actions for fresh water will be influenced by the level of investment in existing actions (among other things). Such actions may have either been put in place voluntarily or to meet other recent policy changes at a national or regional level. Where farmers and growers have done so there are efficiency gains to be had from encouraging rather than discouraging people from being proactive. As well, more value from the existing actions is gained and resources are not unduly wasted. |

### 1.6.9.2. Topic 7 Conclusion

346. The above assessment indicates that, overall, supporting the implementation of the farming provisions through Option 1 (the use of Freshwater Farm Plans) and Option 2 (recognising financial and in-kind investment in environmental actions) across the region will be more effective and efficient than not doing so. Together, the options recognise the importance of the implementation process, particularly given the high levels of diversity in farming across Otago and existing investment (both financial and in-kind) in environmental actions. Therefore, the inclusion of Options 1 and 2 in the proposal (in combination with the preferred options for other farming topics) is considered to be the most appropriate way to achieve the objectives of the pLWRP and ORPS.

# 2. Forestry

## 2.1. Introduction

347. There are three main types of forest cover in Otago: indigenous forest, exotic plantation forest, and continuous-cover exotic forest. Both exotic plantation forest and continuous-cover exotic forest are deliberately planted, with the difference between them being that continuous-cover exotic forest (also known as permanent forest or carbon forest) is not intended to be harvested and replanted, or is only used for low-intensity harvesting.[39]

348. The area of indigenous cover in the region is approximately 685,000 hectares.[40] Commercial forestry, as either plantation forestry or exotic continuous-cover forestry, covers an estimated 138,000 hectares (Ministry for Primary Industries, 2024). Figure 13 below indicates the spatial spread of exotic and indigenous forestry cover.

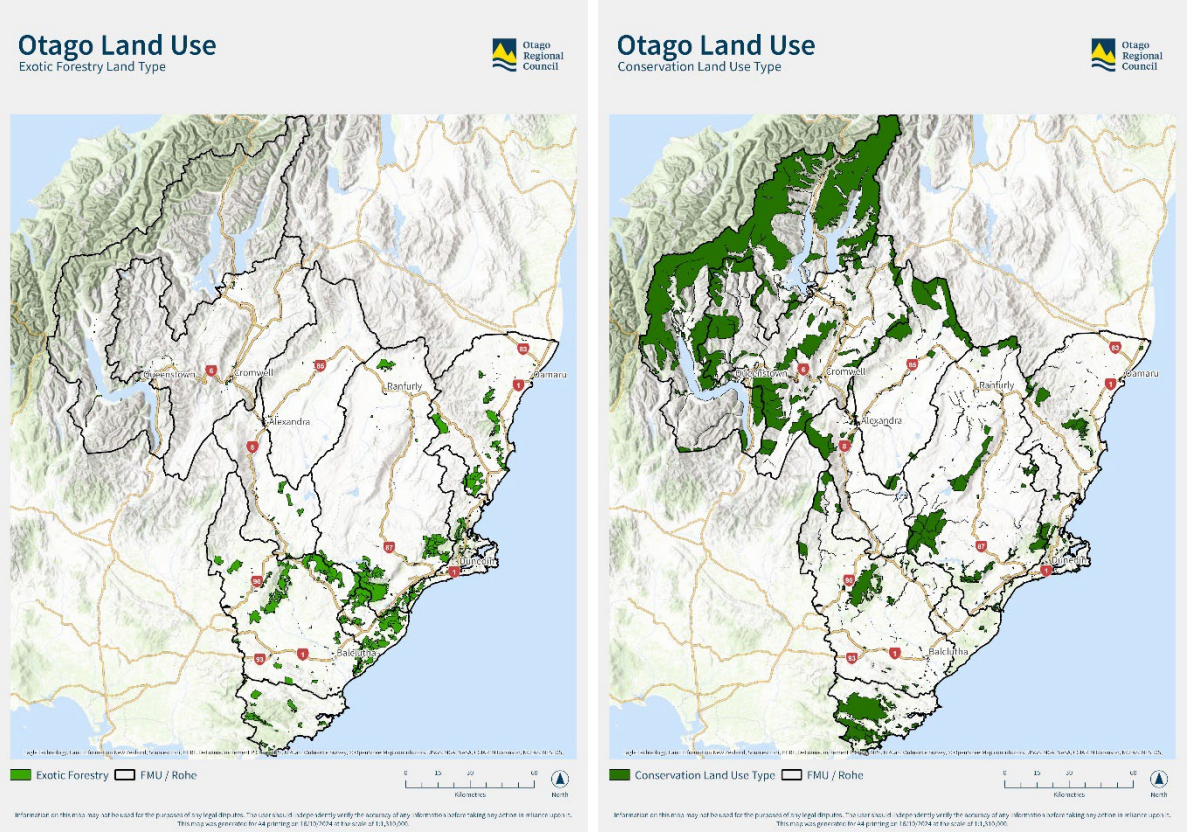


Figure 13: Map of Otago showing area of exotic forestry (left) and conservation cover (right)

349. There is evidence that forest cover of all types has benefits for water quality and biodiversity, over the use of land for pastoral farming. (Baillie & Neary, 2015) found that afforestation of pastoral land significantly improved a wide range of water quality attributes, and water quality generally improved from pasture to planted forest to

[39] Low-intensity harvesting is where a minimum of 75% canopy cover is maintained at all times for any given hectare of forest land (as defined in the NESCF)
[40] This is the sum of the areas of conservation land and indigenous cover from the ORC Land Use GIS layer.

indigenous forest. However, much of Otago's pastoral farming occurs in areas of tussock grasslands, where the benefits of forestry for water quality are not as clear cut.

350. Similarly, (Brockerhoff, Jactel, Parrotta, Quine, & Sayer, 2008) found that plantation forests can be valuable as habitat for valued species. Natural forests usually offer superior habitat for native forest species compared with plantation forests, as plantation forests usually have less habitat diversity and complexity. But longer-rotation plantation forests (or indeed, exotic continuous-cover forests) may differ little in habitat value from managed natural forests.

351. Forestry is often used as a way to stabilise erosion-prone land and reduce the risk of landslides, because it can attenuate flash-flooding and reduce soil erosion during the growing phase. The reduction in landslide probability by woody vegetation is modelled at 90% by commonly used regional soil erosion models in New Zealand. However, this has been called into question since Cyclone Gabrielle where it was found that the actual reduction in probability is more variable. (Manaaki Whenua Landcare Research, 2023) for example, found that in the southern Hawke's Bay and northern Wairarapa hill country, the expected reduction was largely observed for both indigenous forest (90% reduction) and exotic forest (80%). In northern Hawke's Bay, exotic forestry was less effective than expected (60%), while indigenous forest maintained expected reduction (90%). In the Gisborne coastal hill country, exotic forestry was ineffective at reducing landslide probability, with indigenous forest resulting in a moderate reduction (50%). This is due to the specific soil characteristics in these areas, and is likely to be different in Otago.

352. Despite forests of all types potentially having environmental benefits when well-managed, there are mixed views in the community about plantation forestry as a land use. The Otago Catchment Stories work from the Economic Work Programme found that:

> Forestry was polarising and perceived as both an opportunity and a strong negative or concern. In Upper Taiari it was felt that forestry was not a viable option for their area, given existing landscape zoning restrictions. In Tahakopa and East Otago, there were concerns with the potential for further whole farm sales to forestry, noting that the social impacts fell on rural communities, schools and wider support sectors, in addition to the environmental impacts such as increased sedimentation, impacts on water yield, spread of animal pests and wilding conifer issues. *(Reilly, 2023, p. 10)*

353. The long-term viability of plantation forestry in some parts of Otago is likely to be affected by climate change. (Scion, 2021) has found that climate change will increase the frequency, severity and season length of fire weather conditions in New Zealand until at least mid-century. The highest fire dangers were found in the country's currently seasonally drought-prone and arid locations, including Central Otago. The Scion work included a case study of the northern Wānaka/ Albert Town area that found an average of a 32% increase in fire season length is expected by 2095. Forestry is especially susceptible to increased fire risk.

### 2.1.1. Exotic plantation forestry

354. Plantation forestry land use covers around 138,000 hectares (or 4.6% of the region), as shown by the figures in Table 30 (Ministry for Primary Industries, 2024). Currently, it is concentrated along the coastal regions of Clutha, Waitaki and Dunedin City districts.

Forestry and logging is the seventh largest industry in the Clutha District (Yang & Cardwell, 2023).

Table 30: Plantation forestry areas in Otago

| Territorial Authority | Area (ha) as at 1 April 2023 |
|---|---|
| Central Otago District | 7,412 |
| Clutha District | 89,423 |
| Dunedin City | 16,416 |
| Queenstown Lakes District | 718 |
| Waitaki District* | 24,286 |
| **Total** | **138,255** |

355. According to MPI (2024), Radiata pine is the predominant exotic species used in commercial plantation forestry in Otago, followed by a sizeable area of Douglas fir, and smaller areas of eucalypts and cypress.

356. In Otago, approximately a third of the plantation forestry area is run by small to medium sized owners (those that have less than 1,000 hectares of forestry), while there are five large companies operating in the region (New Zealand Farm Forestry Association, 2011). Ngāi Tahu Farming also has an afforestation programme where 4,800 hectares are being planted as part of its hill country afforestation programme in the Waihemo and Shag catchments (800 ha planting per year) (Ngāi Tahu Farming, 2024).

357. MPI's 2022 Afforestation and Deforestation Intentions Survey estimated that in 2021 there was a total of 41,500 ha of exotic species afforestation across New Zealand, with 6,900 ha of this being permanent forest. MPI (2022) found that Otago's share of the total afforestation was 13%, which equates to 5,385 ha. It is not known what proportion (if any) was permanent forest. Similarly, it is unclear whether any plantings of indigenous forest are occurring in Otago. The 2021 Intentions Survey records indigenous forest planting as 0% in Otago, but notes that the survey will have missed some of the area planted in tall indigenous species due to the many small projects involved.

358. The Wood Availability Forecast – Otago and Southland (Margules Groome Consulting Limited, 2021) notes that the timing of each forest harvest is driven by a range of factors, including individual forest owner's objectives, forest age, log prices, demand by local wood processing plants, and perceptions about future log prices and future wood supply. However, in general it is assumed that the optimal harvest age for radiata pine is at age 28. Figure 14 shows that there is a large area of forestry that is likely to be harvested in the next ten years. Note that the age needs to be adjusted to account for the four years since this graph was produced.

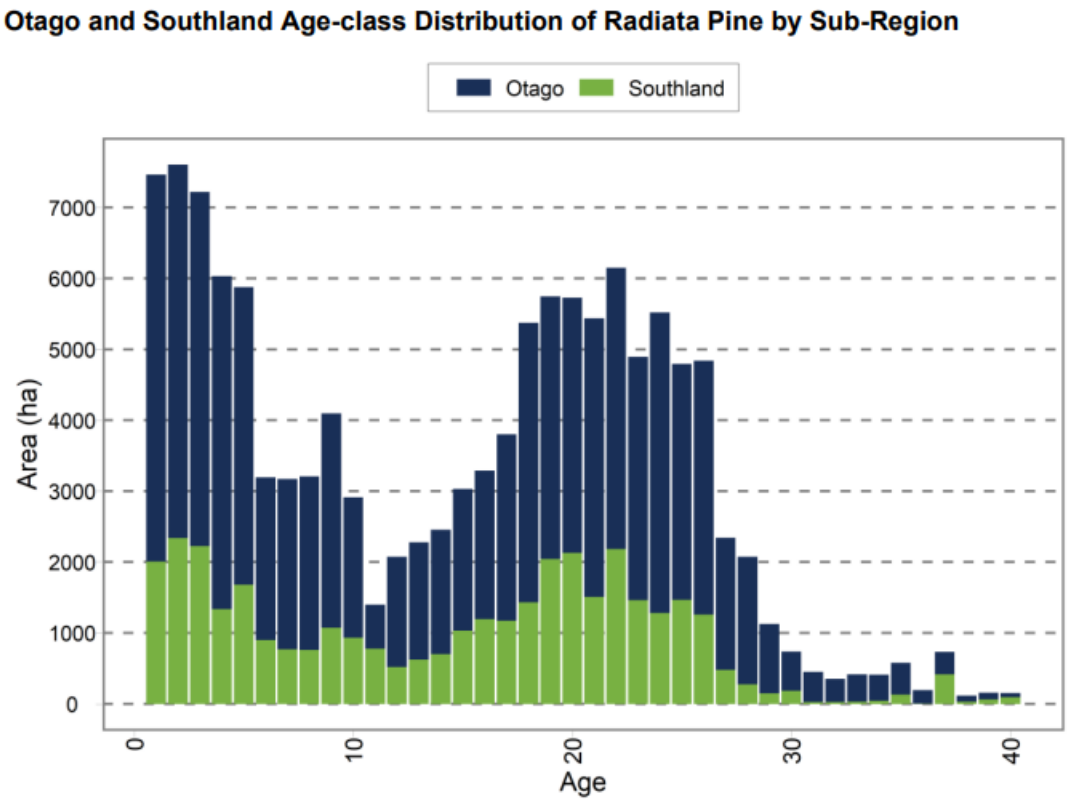


Figure 14: Otago and Southland age-class distribution of radiata pine by sub-region *(Margules Groome Consulting Limited, 2021)*

359. The Wood Availability Forecast – Otago and Southland (Margules Groome Consulting Limited, 2021) notes that the target rotation age is 43 years for Douglas-fir. Figure 15 below shows that there are relatively few Douglas-fir plantations that are approaching harvest, but harvest is likely to start occurring in approximately 15 years time.

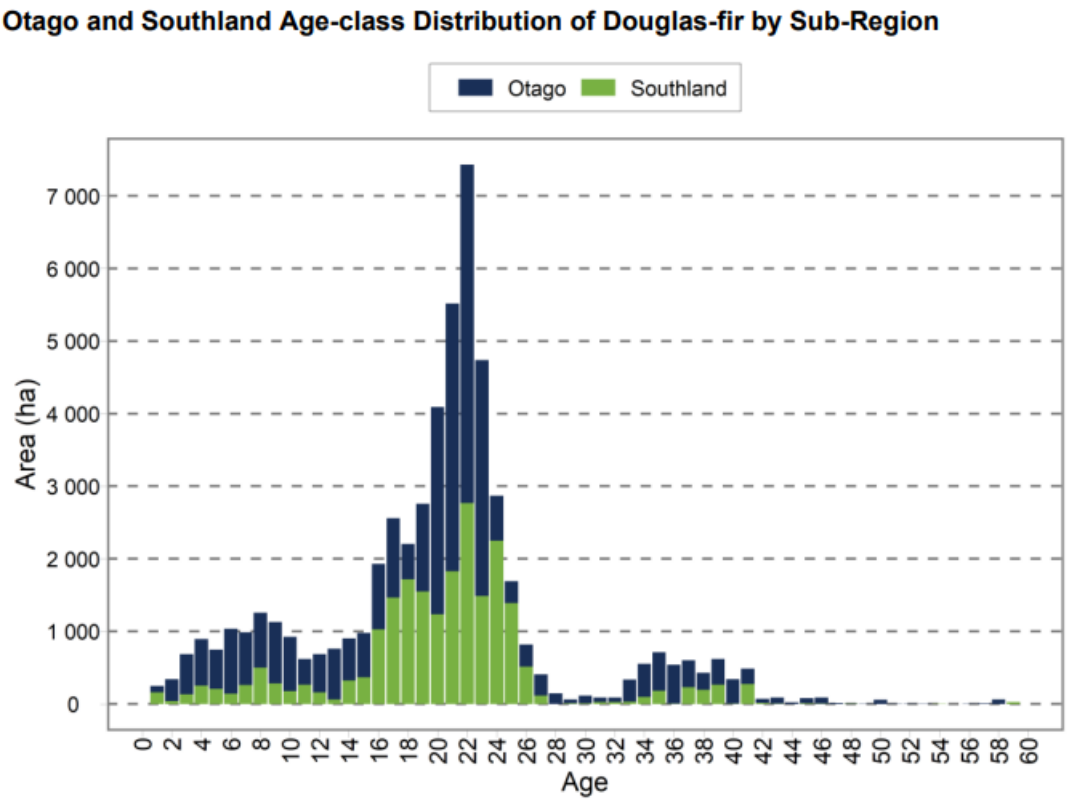


Figure 15: Otago and Southland age-class distribution of Douglas-fir by sub-region *(Margules Groome Consulting Limited, 2021)*

360. Approximately 40% of New Zealand's forestry products are exported (New Zealand Forest Owners Association Incorporated, 2023). The other 60% is processed and used domestically as inputs in construction, furniture, flooring, pilings, fencing, energy generation, pallets, paper, gardening and landscaping, and stock bedding (Ministry for the Environment, 2023b).

361. In the year ending March 2020, forestry and logging accounted for $270 million gross output and $81 million value added in the Otago economy, with forestry support services (e.g., forest planting, reafforestation, silvicultural service, pruning and thinning) being additional. The gross output is approximately 11% of the total gross output of the agriculture, horticulture and forestry sector (Yang & Cardwell, 2023). Wood product manufacturing accounts for $140 million, with $38 million in the Clutha District alone.

362. Employment in forestry and logging in 2020 was estimated to be 330 people employed in the industry (this measure is full time equivalents adjusted to account for people who are owner operators). As such, it represented approximately 2.8% of the total employment of the agriculture, horticulture and forestry sector. Employment in wood product manufacturing was 610 people (Yang & Cardwell, 2023). In addition is employment in forestry support services, which was included in the data available with other primary production support services. Employment numbers are likely to increase as harvesting and replanting of the large area of radiata pine forest in Otago occurs.

### 2.1.2. Continuous-cover exotic forest

363. The NES CF was amended in November 2023 to cover both exotic plantation forestry and exotic continuous-cover forestry, which is also known as permanent or carbon forestry.

Activities associated with both types of forestry are mostly managed in the same way, with the exception of harvesting provisions. However, there are considerable differences between these two types of forestry, including where they might be profitable to be undertaken, the level of management anticipated once planted, and the types of businesses that are likely to do them.

364. Continuous-cover forestry does not have the same economic constraints about where in the landscape it occurs as plantation forestry, which must be sufficiently profitable to harvest, and close enough to market or export. There are also physical constraints on where harvesting can occur as roads and bridges may need to be built to access the trees. For these reasons, continuous-cover exotic forestry could be more widespread in Otago than plantation forestry.

365. In 2019, the Parliamentary Commissioner for the Environment's report "Farms, forests and fossil fuels: The next great landscape transformation?" (Parliamentary Commissioner for the Environment, 2019) suggested that Otago could see a significant increase in permanent exotic forest planting in an effort to offset carbon emissions. The Council currently does not have data about the amount of permanent exotic forest planting that has already occurred, nor what is planned in the future.

366. The Wood Availability Forecast (Margules Groome Consulting Limited, 2021) assumes that 'over-mature' radiata pine (trees aged over 35 years) in large-scale owners' estate is non-commercial and therefore will not be harvested.

## 2.2. Issues

### 2.2.1. The adverse effects of forestry on the environment

367. Activities throughout the forestry cycle can have adverse effects on the environment, which can be considerable if not managed appropriately.

368. The current planning framework and policy related issues with the status quo for forestry activities is provided in targe of the Status quo policy context.

### 2.2.2. Sediment

369. Forestry activities, particularly those associated with land disturbance or earthworks, and periods of bare land between harvesting and replanting, can cause or exacerbate soil erosion, resulting in sediment discharges to water. These discharges can result in adverse effects on water quality and mahika kai in receiving waterbodies (Mackey, 2024). Soil erosion can also result in a decrease in soil quality, through the loss of top soil. Baillie and Neary (2015) found that impacts of timber harvesting on water quality attributes were greatest when clear-cut harvesting up to the stream edge. Harvest impacts were mediated by the retention of intact riparian buffers and to a lesser extent by retention of moderate quantities of logging slash across small stream channels.

370. The Erosion Susceptibility Classification (ESC) is a national model that is used to identify the susceptibility of land to erosion and set thresholds in the NESCF for various commercial forestry activities. However, the ESC may not be accurate enough to predict erosion in Otago, as the datasets it is based on is at a coarser scale, and therefore fails the test of being effective as outlined by guidance material on applying environmental models in a

regulatory context (Ministry for the Environment, 2023c). It also does not take into account the higher connectivity to waterways, which can cause erosion in loess and colluvium through under runners, gullying and more active siltation (Harris, 2021).

371. Harris (2021) considers that if a more detailed scale map was developed in Otago, it would highlight more susceptible sites where deeper loess and colluvium are. Harris' view is that this would enable a review of the severity of erosion (in particular the siltation) in the ESC e.g., from moderate rating (yellow) up to high (orange) in some cases. For example, the following areas are largely classified as low in the ESC, but Harris considers that they would be susceptible to erosion:

    a. Raes Junction-Edievale to Heriot north faces and Downlands district Kelso to Waikoikoi

    b. Millers Flat both sides of Clutha River (East of Island Block), north face Ettrick to Dumbarton

### 2.2.3. Catchment water yield

372. Established forestry can also result in a decrease in catchment water yield when compared to non-forested catchments, which may result in changes to flows in downstream waterbodies.

373. In the Glendhu paired study, Fahey and Payne (2017) determined that the annual water yield from a forest catchment, when compared to the neighbouring tussock catchment, declined as trees matured. They estimated a reduction in water yield of 273mm (or 33%) after canopy closure between 1991 and 2013. If all of the catchment had been planted, the reduction in water yield would have been approximately 50%. The authors noted that this result was comparable to the reduction in water yield observed following conversions of pasture to plantation forestry elsewhere in New Zealand.

374. The primary mechanism by which tall vegetation affects the water balance is through evaporation of intercepted rainfall, thereby reducing the amount of water available for runoff and streamflow. Generally, trees have a high capability for interception due to a large leaf area and high aerodynamic roughness above the canopy. Increasing the vegetation canopy cover affects the water balance through an increase in evapotranspiration, thereby reducing the amount of water available for runoff and streamflow. Transpiration is generally the more important component, especially in areas of moderate to low annual rain. However, Fahey and Payne discussed that in higher rainfall zones (>1,000mm/year), evaporation is attributed to increased interception rather than transpiration following afforestation. This circumstance was the expected case for Glendhu, due to the average annual rainfall of 1,300mm. In relation to peak flows and stormflows, Fahey and Payne (2017) found that although maturing forests contribute to a reduction in peak flows from small to medium size storms, the reduction is less pronounced for larger storm events.

375. Afforestation in catchments where water quantity is over-allocated, and the associated adverse effects on water yield, has been raised with the Council by local communities as an issue of concern, particularly in North and South Otago.

376. The New Zealand-based Forest Flows research programme is currently investigating the relationship between planted forestry and water, including water use compared to other

sectors, water storage in forested catchments, water release, whether forests are a source of water during summer, and whether forestry can improve water quality (Scion, 2024). ORC understands that preliminary results about catchment yield differ from those seen by Fahey and Payne (2017), but notes that these results have not yet been peer-reviewed nor made publicly available. Further, the 10 case study sites used are all north of Christchurch, and all but one are above 800 mm annual rainfall, so may be less relevant to the Otago context.

### 2.2.4. Issues of significance for Kāi Tahu

377. The issues of significance for Kāi Tahu in relation to forestry are set out in the pORPS and the Kāi Tahu ki Otago Natural Resource Management Plan 2005. These are outlined below.

#### 2.2.4.1. pORPS

378. The pORPS sets out the resource management issues of significance to iwi in the region. In particular, the adverse effects of forestry are emphasised in the provisions discussed below.

a. RMIA-MKB-I1 – The diversity and abundance of terrestrial and aquatic indigenous species has been reduced due to adverse effects of resource use and development.

b. The explanation of this issue notes that the effects on mahika kai and taoka species diversity and abundance affect the relationship of Kāi Tahu with these species, and whanau are unable to access traditional mahika kai because in many cases they no longer exist, or no longer provide resources that were once abundant there. The specific concern in relation to forestry is about the impact of inappropriate forestry developments.

c. RMIA-WTU-I1 – The values of wāhi tūpuna are poorly recognised in resource management in Otago.

d. The explanation of this issue notes that the values of wāhi tūpuna can be adversely affected by inappropriate use and development, and by a range of activities that affect land, freshwater and coastal environments when those activities are poorly managed. The specific concerns in relation to forestry are about:

   i. changes to the recognisable character of wāhi tūpuna resulting from spread of exotic wilding trees and other woody weeds, and forestry;

   ii. impacts on wāhi tapu and archaeological sites from earthworks; and

   iii. sedimentation of water bodies within wāhi tūpuna from earthworks.

#### 2.2.4.2. Iwi Management Plan

379. In addition to the issues in the pORPS, the Kāi Tahu ki Otago Natural Resource Management Plan (2005) contains several policies related to forestry, being:[41]

a. To encourage the identification of mahika kai sites on forestry operational plans.

[41] Identified in Section 5.5.4 Mahika Kai and Biodiversity General Policies.

b. To require that access to mahika kai sites is provided for through a permit system as agreed to between Kāi Tahu ki Otago and forest management companies.

c. To require certification of all forestry operators in the Otago region in accordance with the Forest Stewardship Council's principles and criteria.

### 2.2.5. Indigenous biodiversity

380. Forestry activities can adversely affect indigenous biodiversity in several ways, including the clearance of indigenous vegetation before afforestation or harvesting, an increase in pests and diseases due to monoculture forestry plantation, the loss of habitat as a result of harvesting, and the spread of wilding conifers (Peltzer, 2018).

381. Note that while the council has functions in relation to indigenous biodiversity, the proposed Otago RPS ECO-M1 sets out that the regional council is responsible for specifying objectives, policies and methods in regional plans in the coastal marine area, in wetlands, lakes and rivers, and in, on or under the beds of rivers and lakes. All other areas are the responsibility of territorial authorities unless there is an agreement between the regional council and territorial authority, and a transfer of powers. There is currently no such agreement, so the analysis does not consider this matter further.

### 2.2.6. The adverse effects of forestry on local communities

382. As discussed above in the Introduction section, there is concern within communities about commercial forestry (both plantation forestry and carbon forestry). More recently, this has been highlighted by the findings of the Our Land and Water National Science Challenge (Kaye-Blake, Webster-Brown, Aporo, & McAleer, 2024). That report of Kaye-Blake et al (2024) notes that the impacts of plantation forestry include:

a. Threat to the identity of sheep and beef farmers and their intergenerational connection to their land, with serious consequences for their mental health;

b. Potential flow-on impacts for rural communities including decreasing employment, population, support industries, schools, clubs and infrastructure;

c. "Hollowing out" of smaller rural communities and consequent reduction in the health and wellbeing of those left behind; and

d. Loss of locally grown food and implications on food security and food access.

383. Note that the ability of the regional council to control the use of land is set out in section 30 of the RMA. These matters fall outside of these functions, and therefore they are not further addressed in this analysis.

## 2.3. Status quo policy context (including operative plan provisions)

384. This section provides an overview of the status quo (RPW and NESCF), as well as describing the issues associated with the status quo.

### 2.3.1. Overview of the NESCF provisions

385. Commercial forestry is primarily managed by the NESCF, which covers both plantation forestry and exotic continuous-cover forestry, but not indigenous forestry. Existing native

or exotic planting that was not established for commercial purposes is not managed by the NESCF. The NESCF contains regulations to manage the environmental effects of eight core forestry activities, being:

a. Afforestation,

b. Pruning and thinning to waste,

c. Earthworks,

d. River crossings,

e. Forestry quarrying,

f. Harvesting,

g. Mechanical land preparation,

h. Replanting.

386. The NESCF also manages ancillary activities, such as slash traps and non-indigenous vegetation clearance,[42] and other general activities. Other general activities managed by the NESCF are discharges, disturbances and diversions, dust, indigenous bird nesting and fuel storage and refuelling associated with commercial forestry.[43]

### 2.3.2. Overview of the RPW provisions

387. The RPW does not contain any specific provisions to manage forestry activities. The current regional provisions relevant to forestry activities in the beds of lakes and rivers are contained across multiple chapters of the RPW.

a. Chapter 5 contains the policy framework for protecting natural and human use values supported by Otago's lakes and rivers and their margins.

b. Chapter 7 sets out the objectives and policies for managing water quality, with a focus on discharges to water. Many of the objectives and policies are either general in nature, or specific to particular types of discharges.

c. Chapter 8 provides the policy framework for managing the beds and margins of Otago's lakes and rivers for, including structures, bed disturbance, vegetation planting and removal, deposition on the bed and drainage or reclamation of waterbodies.

d. Chapter 12 includes rules which manage the take, use, damming, and diversion of water, as well as discharges of water and contaminants to water and to land.

e. Chapter 13 includes rules which manage land use on lake or river beds or Regionally Significant Wetlands.

[42] Subpart 9 of the NESCF.

[43] Subpart 10 of the NESCF.

388. Schedule 17 of the RPW identifies rules in the plan which apply to plantation forestry as managed under the NESCF.[44] These are:

a. Rules in Chapter 12.C relating to the discharge of water or any contaminant to water, or to land where the contaminant may enter water.[45] These rules are more stringent than the permitted activity conditions relating to sediment in the NESCF, so effectively replace the specified NESCF provisions in Otago.

b. Rules 13.5.1.1(g) and 13.5.3.1 managing the disturbance of the bed of any lake, river of regionally significant wetland and the resulting discharge of deposition of bed material. These rules apply in addition to regulations relating to earthworks, river crossings, hauling harvested logs through streams, slash traps and discharges arising from commercial forestry activities.

### 2.3.3. Relationship between the NESCF and the pLWRP

389. While regional plans must not duplicate provisions in the NESCF,[46] the NESCF enables ORC to include more stringent controls in the pLWRP in the following specific circumstances:

a. to give effect to an objective that gives effect to the NPSFM,[47]

b. to give effect to particular policies in the NZCPS,[48]

c. for the protection of outstanding natural features and landscapes or significant natural areas,[49]

d. to protect unique or sensitive environments (such as drinking water supplies),[50]

e. for afforestation activities. [51]

390. The options for including forestry provisions in the Farming and Forestry chapter of the pLWRP include whether to provide additional stringency over the NESCF for afforestation, replanting and harvesting activities of commercial forestry in the circumstances of the Otago region. Where necessary, the options evaluation includes specific justification for the stringency over the NESCF provisions, in accordance with s32(4) of the RMA.

### 2.3.4. Issues with status quo

391. There are two main issues with the status quo approach for managing forestry activities. These issues are categorised as:

[44] The advice notes in the RPW refer to the National Environmental Standards for Plantation Forestry, however the numbering for the relevant provisions in the NESCF has not changed from the previous iteration of the standards.

[45] Permitted activity rule 12.C.1.1, restricted discretionary rules 12.C.2.1, 12.C.2.2 and 12.C.2.4, and discretionary activity rule 12.C.3.2.

[46] Section 44A of the RMA.

[47] Regulation 6(1)(a) of the NESCF.

[48] Regulation 6(1)(b) of the NESCF.

[49] Regulation 6(2) of the NESCF.

[50] Regulation 6(3) of the NESCF.

[51] Regulation 6(4A) of the NESCF.

a. Some adverse effects of commercial forestry are not adequately managed by the NESCF in the circumstances of the Otago region, including where and how afforestation occurs, the effects of forestry and harvesting on erosion, and the associated sediment discharges into waterbodies.

b. Some adverse effects of commercial forestry are not managed at all by the NESCF or RPW, including the effect of forestry on water yields and flow regimes, and impacts on cultural values and practices, such that greater stringency is required in the circumstances of the Otago region.

#### 2.3.4.1. Some adverse effects of forestry are not adequately managed by the NESCF in the circumstances of the Otago region

392. Although the NESCF manages many of the adverse effects of forestry activities, it does so through a largely permissive framework, which has limited opportunities for Council review or input. The NESCF requires management plans to be prepared for afforestation, replanting, forestry earthworks, quarry erosion and sediment, and harvest activities. Although these plans must be provided to the Council on request, there is no requirement for the Council to review or approve the plans.

393. Schedules 3, 4, 5 and 6 of the NESCF set out the information that must be included in the NESCF management plans. For afforestation and replanting, the key information that Schedule 3 requires includes:

a. Maps showing the areas to be planted, land contour, erosion susceptibility, waterbodies, wetlands, all forestry infrastructure,

b. A description of:

i. How significant natural areas will be avoided, including any operational restrictions on all forestry activities,

ii. The risks of mobilised material on downstream sensitive sites (including infrastructure, dwellings and waterbodies), and the proposed heavy rainfall contingency and response measures, including the triggers for action, and remedial works,

iii. The erosion and sedimentation effects of the planting, and the measures used to monitor those effects,

c. The wilding tree risk score, and a description of wilding conifer inspections and removals.

394. For harvesting, Schedule 6 requires:

a. Maps showing the areas to be harvested, land contour, erosion susceptibility, waterbodies, wetlands, all forestry infrastructure,

b. A description of:

i. How harvesting is to be undertaken, including the harvesting method and any proposed staging,

ii. How significant natural areas will be avoided, including any operational restrictions on all forestry activities,

iii. The risks of mobilised material on downstream sensitive sites (including infrastructure, dwellings and waterbodies),

iv. The management practices that will be used to avoid, remedy or mitigate erosion and sedimentation risks due to harvesting,

v. The management practices that will be used to avoid, remedy or mitigate risks relating to slash, including procedures for specified risks,

vi. Any relevant fish species, and confirmation and description of how disturbance of the relevant areas will be avoided,

vii. Procedures to identify, and mitigate adverse effects on any threatened or at-risk indigenous fauna,

viii. Heavy rainfall contingency and response measures.

395. The management plans require a significant level of judgement by forestry operators, and are not required to demonstrate the efficacy of the proposed management practices, either in terms of whether they are suitable for the site and conditions, or whether they are effective once implemented. The NESCF essentially requires the industry to self-regulate, with third-party audit processes that are not transparent.[52]

396. In addition to the management plans, several forestry activities, including afforestation and replanting are required to be setback from specified waterbodies and wetlands. Setbacks put in place during afforestation and replanting help to prevent adverse effects from activities occurring throughout the forestry cycle near waterbodies. These activities include works occurring within or near waterbodies such as pruning and thinning, mechanical land preparation, earthworks etc. The NESCF does not specify any permitted activity conditions on how the setbacks are to be managed. Poor management could exacerbate pest and weed issues within the setbacks.

397. While there have been some isolated reports of forest slash transport to waterbodies, this is not a widespread issue in Otago. Some instances of slash have been generated by felling of wilding trees and their subsequent transport downstream. It is also understood there is some collection and processing of slash in Otago.

398. There is evidence that riparian buffers have positive impacts on water quality. Quinn (2005) found that compared to harvesting with no riparian buffers, where intact riparian buffers were maintained through the forestry cycle, stream bank erosion was reduced, and conditions beneficial to freshwater ecosystems were maintained, supporting the diversity, richness and community composition of instream invertebrates and native fish. These buffers can also act as filters of sediment and associated nutrients in runoff from harvested areas and forest roads. Quinn recommends a minimum setback width of 10 m. Zhang (2010) supports Quinn's findings, noting that vegetated buffers are generally effective in removing sediment from run-off, and that on steeper slopes the efficacy of buffers is reduced. Establishing setbacks at planting that also positively benefit effects related to

[52] See for example https://www.rnz.co.nz/news/on-the-inside/509799/unanswered-questions-over-why-forestry-giant-ernslaw-one-lost-environment-label

harvesting is consistent with the matters of discretion for afforestation under the NESCF, which provide for the consideration of future harvesting and earthworks effects.[53]

399. Fenemor and Samarasinghe (2020) and Baillie and Neary (2015) both note that riparian widths as narrow as 10 metres were effective at limiting input of organic matter from harvesting activities and contributed to the maintenance of channel bank stability.

400. Due to the extent of commercial forestry in Otago, it is not possible to have Council compliance staff on the ground at all times to monitor compliance with the permitted activity requirements, nor gather sufficient information to demonstrate non-compliance if it occurs. Although the NESCF enables the Council to charge forestry owners for the monitoring of some permitted activities,[54] compliance inspections only provide a snapshot in time of forestry activities. This means that Council does not have assurance that the ongoing activity complies, or that the mitigations were effective once works are complete (O'loughlin, 2024).

401. In addition to the Council's limited opportunities for oversight of some activities under the NESCF, there is evidence to show that some activities that are (or are likely to be) compliant with the NESCF can still have adverse effects on the environment. Experience in Otago shows that, while management practices required by the NESCF may be in place, they may not be sufficient or adequate for the particular location, so the forestry activities may still result in adverse effects (O'loughlin, 2024). Examples of this include forestry activities near the Waianakarua River and Pleasant River, where controls complied with the NESCF, but were not sufficient to avoid sediment discharges from entering water (O'loughlin, 2024). The best way to avoid these types of effects is to prevent afforestation in sensitive areas and/or manage how it occurs so that effects throughout the forestry cycle can be appropriately managed.

402. The NESCF (and its predecessor, the National Environmental Standards for Plantation Forestry) has been in effect since 2017. This means that, although more recent afforestation, harvesting and replanting activities will have been managed under the national standards, these standards are yet to be in place for a full forestry rotation (24 to 32 years for radiata pine Pinus radiata (Ministry for Primary Industries, 2024)). In other words, their efficacy in the context of a full forestry rotation is yet to be fully tested.

#### 2.3.4.2. Some adverse effects are not managed at all by the NESCF

403. The NESCF does not manage all adverse effects associated with plantation forestry. Of particular note in Otago, it does not manage effects on water yield (water quantity). There are no specific rules in the RPW that manages the effects of commercial forestry on these matters.

404. The effect of afforestation on water yields has been studied in New Zealand and internationally, with evidence generally showing a reduction in annual water yield from forested catchments, when compared to similar pasture catchments, as discussed previously in relation to forestry issues.

[53] Regulations 17(4)(e) of the NESCF.

[54] Regulation 106 of the NESCF. The ability to charge for monitoring of afforestation permitted activities was added in November 2023. Harvesting was already covered, but replanting is not.

## 2.4. Objectives

405. Section 32(1)(b) of the RMA requires an examination of whether the provisions in a proposal are the most appropriate way to achieve the objective. The objectives relevant for this topic are set out below.

Table *31*: Objectives of relevance to Farming and Forestry (Forestry)

<table>
<tr><td>IO-O1 – Te Mana o te Wai</td><td>The management of land and water gives effect to Te Mana o te Wai which is a fundamental concept underpinning this plan.</td></tr>
<tr><td>IO-O2 – Relationship of Kāi Tahu to freshwater</td><td>The relationship of mana whenua with freshwater in Otago is sustained through:<br>(1) recognising and enabling the exercise of rakatirataka and kaitiakitaka; and<br>(2) protecting and restoring the mauri of water bodies; and<br>(3) upholding mātauraka and tikaka in management and decision-making affecting freshwater and freshwater ecosystems; and<br>(4) enabling mahika kai and other customary practices, and<br>(5) recognising and providing for mana whenua aspirations as land and water users in accordance with the provisions of this plan.</td></tr>
<tr><td>IO-O3 – Long-term visions[55] and environmental outcomes</td><td>Otago’s land and water are managed to achieve:<br>(1) the long-term visions within the timeframes specified in those visions; and<br>(2) the environmental outcomes for each FMU and rohe set out in chapters FMU1 to FMU5 of the plan and in Table 32 below.<br>Table 32 Environmental outcomes for FMU and rohe
<table>
<tr><th>Value</th><th>Environmental outcome</th><th>FMU/ rohe</th></tr>
<tr><td>Ecosystem health</td><td>Freshwater bodies support healthy and resilient freshwater ecosystems and habitats for indigenous species, and their life stages.</td><td>All</td></tr>
<tr><td>Human health</td><td>Water bodies are clean and safe for human contact activities and support the health of people and their connections with water bodies.</td><td>All</td></tr>
<tr><td>Threatened species (habitat)</td><td>The habitats of threatened species are protected and restored, to the extent practicable, to support the recovery of threatened species.</td><td>All</td></tr>
</table></td></tr>
</table>

[55] LF-FW – Fresh water Chapter of the pORPS.

| | | | | | |
|---|---|---|---|---|---|
| | | Threatened species (recovery) | Threatened species are recovering throughout their range to be resilient, viable, and functioning. | All | |
| | | Mahika kai (condition) | Populations of mahika kai species valued by Kāi Tahu are self-sustaining and plentiful enough to support cultural take. | All | |
| | | Mahika kai (access, harvest, and use) | Mana whenua can safely access, harvest and use mahika kai resources now and in the future. | All | |
| | | Natural form and character | Freshwater bodies and their riparian margins behave in a way that reflects their natural form and character to the extent reasonably practicable and supports the natural form and character of connected receiving environments. | All | |
| | | Drinking water supply (source water) | Source water from waterbodies (after treatment) is safe and reliable for the drinking water supply needs of the community. | All | |
| | | Animal drinking water | Water sourced from water bodies is safe for the reasonable drinking water needs of stock and domestic animals. | All | |
| | | Wāhi tūpuna | Cultural associations with wāhi tūpuna are maintained, visible, and whānau are able to access, use and relate to wāhi tūpuna now and in the future. | All | |
| | | Taoka species | Habitats for indigenous species are restored and sustained so that they are thriving and connected, and their mauri is intact. | All | |
| | | Fishing | Fish are safe to eat and, insofar as it is consistent with the protection of indigenous species, the spawning and juvenile rearing waters for trout and | All | |

| | | | | | |
|---|---|---|---|---|---|
| | | | salmon are provided for. | | |
| | | Irrigation, cultivation, and production of food and beverages | The cultivation and production of food, beverages and fibre is enabled, while supporting the health and wellbeing of water bodies and freshwater ecosystems and human health needs are met. | All | |
| | | Commercial and industrial use | Commercial and industrial activities are enabled, while supporting the health and wellbeing of water bodies and freshwater ecosystems and human health needs are met. | All | |
| | | Hydro electricity generation | Hydro-electricity generation contributes to achieving the national target for renewable electricity while supporting the health and well-being of water bodies and freshwater ecosystems. | All | |
| **IO-O4 – Ki uta ki tai/integrated management** | The connections and interactions between water bodies (including between surface water and groundwater) as well as between land, fresh water, and coastal water across the whole of a catchment are recognised and provided for through integrated management of land and water. | | | | |
| **IO-O6 – Fish passage** | Fish passage within and between catchments is maintained or improved except where it is desirable to prevent the passage of some fish species in order to protect desired fish species, their life stages, or their habitats. | | | | |
| **IO-O7 – Freshwater species** | In water bodies in Otago:<br>(1) the habitats of indigenous freshwater fish species with life stages dependent on water bodies are protected; and<br>(2) the habitats of trout and salmon are protected to support a healthy sports fishery insofar as this is consistent with (1). | | | | |
| **IO-O8 – Land and soil resources** | Land and soil support biological diversity and healthy habitats for indigenous species and ecosystems and their use and development ensures that:<br>(1) to the extent reasonably practicable, their life-supporting capacity and productive capacity is not permanently reduced; and<br>(2) the role of these resources in providing for the social, economic, and cultural well-being of Otago's people and communities and for their health and safety is recognised. | | | | |

### 2.4.1. Options for managing forestry activities

406. The following sections set out the options for managing forestry, to respond to the issues identified above. The options have been separated out into sub-topics, being:

a. Afforestation;

b. Ongoing land use for forestry under the pLWRP and replanting; and

c. Harvesting;

407. For each of these sub-topics, options have been identified and discussed, alongside clause 3 and clause 4A feedback, and an efficiency and effectiveness assessment.

408. For all options, policy direction is recommended to be included in the pLWRP. The NESCF does not contain policy direction and is not supported by an associated National Policy Statement, so there are currently no forestry-specific policies in the national direction. The policies seek to:

a. Manage the adverse effects of forestry activities on land stability and water quality,

b. Avoid the spread of wilding conifers,

c. Avoid, where practicable, adverse effects of harvesting, access and vegetation clearance on water quality and freshwater ecosystems, and

d. Require the establishment of vegetation cover as soon as practicable following harvest.

409. The policy direction will provide guidance for all activities that require consent, regardless of whether the consent requirement stems from the pLWRP or NESCF.

### 2.4.2. Clause 3 consultation feedback

410. Clause 3 feedback was received from ten parties on the forestry provisions. In relation to the forestry chapter generally, the feedback received has been summarised below:

a. One submitter considers that the forestry policy direction does not align with FF-O1 or the policy objectives of the NESCF. On this basis they oppose all of the forestry specific policy direction and request that it is deleted. They also seek that the forestry rules be deleted so that forestry activities are managed solely under the NESCF regulations.

b. There was some support for additional controls on forestry, including the consideration of forestry on catchment water yield, the management of adverse effects of sediment in waterbodies, setbacks with indigenous vegetation and the direction on the management of wilding conifers. Additional direction was sought to protect threatened species from the loss of flows and habitat, and to strengthen policy direction to avoid significant sedimentation effects on receiving waters.

c. There was some opposition to the inclusion of additional stringency over the NESCF, with questions around the science used to support the stringency, the absence of Otago specific justification for the stringency, and quantification of the costs associated with the stringency. In particular:

i. Some parties noted that Otago does not have the same highly erodible soils (as defined by the Erosion Susceptibility Classification) as other regions, and that they have experienced few issues with forestry in Otago.

ii. The avoid direction in relation to wilding species would in effect prevent the planting of species that are prone to wilding. This is more stringent than the NESCF, which requires a wilding assessment, and control of wilding conifers on a regular basis.

d. Greater clarification, by way of advice notes, of the relationship between the LWRP and the NESCF.

e. Questioning of the reference to bonds in the matters of control and discretion throughout the forestry rules.

411. Feedback that is more relevant to the specific sub-topics has been discussed in the relevant sub-topic sections below, alongside changes to the provisions.

### 2.4.3. Clause 4A consultation feedback

412. The feedback received through Clause 4A sought that:

a. Additional measures be considered to reduce the effects of existing forestry in catchments where water quantity is over-allocated.

b. The policy direction on wilding conifers be amended to clarify whether it is a requirement on forest operators or ORC.

c. FF-R21 relating to bed disturbances from forestry activity be amended to address effects on habitats of indigenous species that are not currently threatened.

d. A change be made to FF-P12 to authorise, rather than enable afforestation.

413. In response to clause 4A feedback:

a. No changes have been made to policy direction on the management of existing forestry in over-allocated catchments, because it is considered that over-allocation is unlikely to be resolved through forestry rules.

b. FF-P11 has been amended to clarify that forest owners are required to manage wilding pines.

c. FF-P12 has been removed as the result of the preferred option for afforestation being amended.

d. The management of habitats of indigenous species has not been included in the permitted activity rule, on the basis that the NESCF already requires the use of the Fish Spawning Indicator, and no additional stringency in relation to this tool is recommended for spawning habitats of fish species, including indigenous species.

## 2.5. Options: Afforestation

414. Four reasonably practicable options were identified to achieve the objectives:

- **Option 1:** Manage afforestation under the NESCF only (status quo)

- **Option 2:** Require resource consent for all new forestry over 10ha in water-short catchments, with effects consideration limited to surface water flows (preferred)
- **Option 3:** Require resource consent for all new forestry over 10ha
- **Option 4:** Require resource consent for all forestry over 10ha, and 20-50m setbacks from waterbodies for forestry under 10ha

### 2.5.1. Discounted options

415. One option was discounted, being Option 4 but with different setbacks required based on the type of vegetation cover within the setback. This option was discounted given the technical evidence regarding the use of buffers is somewhat uncertain with regards to vegetation, due to the variation in both the type of vegetation and the contribution of other factors such as slope and underlying soils.

416. A second discounted option was to implement the equivalent of a Freshwater Farm Plan for commercial forestry activities. This would have enabled there to be a permitted activity pathway for forestry activities if they were managed in a certified "Freshwater Forest Plan". This option was discounted at this time as it was deemed too difficult to set up an equivalent system for forestry in the absence of a national system as for Freshwater Farm Plans. In future, this could be a viable alternative.

### 2.5.2. Option 1: NESCF (the status quo)

417. Option 1 is the status quo, which is the NESCF provisions, and does not include any additional stringency over the NESCF for afforestation.

418. Regulation 9 of the NESCF permits afforestation where permitted activity criteria are met. The most relevant criteria are:

a. An afforestation management plan is prepared;

b. Afforestation is not within:

i. 5 m of a perennial river less than 3 m wide or a wetland larger than 0.25 ha;

ii. 10 m of a perennial river wider than 3 m, a lake larger than 0.25 ha, an outstanding freshwater body, a water body subject to a water conservation order or a significant natural area; or

iii. 30 m of the coastal marine area.

419. If notice is not provided to Council within the required timeframes, the afforestation activity is controlled. Afforestation that does not meet any other permitted activity conditions becomes a restricted discretionary activity, with the matters of discretion dependent on the reason for consent. If the setbacks are not complied with, discretion includes effects on ecosystems, fresh water and the coastal environment.

### 2.5.3. Option 2: Require resource consent for all new forestry over 10ha in fully or overallocated catchments, with effects consideration limited to surface water flows (preferred)

420. Option 2 would include two new rules for afforestation, being a permitted activity rule for small-scale (less than 10 ha on a landholding) afforestation, and a restricted discretionary consent requirement for afforestation over 10ha in water-short catchments. Water-short catchments are those where surface water or groundwater are either at allocation or over-allocated.

421. Where consent is required, the matters of discretion would be limited to the effects on surface water yield and groundwater recharge, including effects on other water users. These rules apply in addition to Regulation 9 of the NESCF (afforestation).

422. Option 2 manages effects on water quantity, which are not managed by the NESCF. It does not manage effects on water quality, and as such does not include setbacks from water bodies and wetlands in the permitted activity rule, nor include a matter of discretion relating to effects on water quality.

### 2.5.4. Option 3: Require resource consent for all new forestry over 10ha

423. Option 3 is similar to Option 2, but expands the requirement for resource consent for afforestation over 10 hectares, such that it would apply across all catchments. Option 3 would include two new rules for afforestation, being a permitted activity rule for small-scale (less than 10 ha on a landholding) afforestation, and a restricted discretionary consent requirement for all other afforestation. These rules would apply in addition to Regulation 9 of the NESCF (afforestation).

424. Where the permitted activity pathway cannot be complied with, the activity would be restricted discretionary, which aligns with the status afforded by Regulation 17 of the NESCF. The additional matters of discretion under the pLWRP include the content of and compliance with the NESCF management plan(s), effects on water yield, management of critical source areas and the nature of setbacks (e.g., the size of the setback, and the vegetation contained within setbacks). These matters of discretion capture effects that are not managed by the NESCF, or are required to be considered in the Otago context in order to give effect to the objectives of the pLWRP, and therefore the NPSFM.

### 2.5.5. Option 4: Require resource consent for all forestry over 10 ha and 20-50 m setbacks from waterbodies for forestry under 10 ha

425. Option 4 includes two new rules for afforestation, being a permitted activity rule for small-scale (less than 10 ha on a landholding) afforestation, subject to 20-50 m setbacks to waterbodies, depending on slope, and a restricted discretionary consent requirement for all other afforestation. These rules would apply in addition to Regulation 9 of the NESCF. For permitted afforestation of slopes of less than 10 degrees, setbacks of 20 m are required to any river, lake or wetland. On slopes greater than 10 degrees, the setback distance increases to 50 m.

426. Both the size of the setback, and the requirement to apply that setback to all lakes, rivers and wetlands is more stringent than the NESCF, which requires a maximum setback of 10 m, and only applies to rivers that are perennial, and lakes and wetlands larger than 0.25 ha.

427. Under Option 4, the setbacks were designed to:

a. Slow and attenuate sediment and debris laden run-off, and

b. Limit the effects of forestry shading on riparian vegetation along water bodies.

### 2.5.6. Clause 3 consultation feedback

428. Clause 3 feedback was received from eleven parties on the forestry provisions. The afforestation provisions most closely aligned with Option 4 above. In relation to this sub-topic, the feedback received has been summarised below:

a. The permitted area threshold for afforestation is noted as being relatively small, particularly in terms of the feasibility of establishing commercial forestry into existing farming operations. For replanting, this area is noted as being contrary to the NESF, which has provisions limiting the conversion of plantation forestry to pastoral land use.

b. The requirement to establish setbacks greater than those in the NESCF is generally opposed. The requirement to establish and maintain vegetated setbacks for afforestation, including setbacks based on slope are noted as differing from the permitted activity limits in the NESCF, with no clear reason provided. For replanting in particular, the setbacks will have implications under the Emissions Trading Scheme, if the area of forestry replanted is less than that harvested.

c. Some parties support the vegetated setbacks for permitted activity, with one seeking that the slope threshold is removed, while another questions whether the setbacks are sufficient, particularly to protect waterways during harvest.

d. A request for weed and pest management plans was made for the permitted activity rules, to ensure that plantation forestry will not adversely affect neighbouring properties.

e. The policy direction stating a preference for the use of indigenous vegetation over non-indigenous vegetation was opposed, on the basis that it does not take into account the financial and practical realities of forestry, and the time difference in economic returns, compared to exotic forestry.

429. In their Clause 3 feedback, Kāi Tahu ki Otago sought that the consent requirements should be more stringent for forestry in over-allocated catchments, where the forestry activity may affect water yield.

430. In response to clause 3 feedback:

a. The setbacks for permitted activity afforestation were reduced from 10-20 m depending on the vegetation in the setback, to 10 m on all slopes greater than 10 degrees. These setbacks were subsequently removed as the additional stringency was unable to be justified.

### 2.5.7. Clause 4A consultation feedback

431. There was no clause 4A feedback specific to the afforestation rules.

### 2.5.8. Effectiveness and efficiency assessment

432. Table 33 below identifies and assesses the environmental, cultural, social, and economic benefits and costs anticipated from implementing the proposed options.

Table 33: Benefits and costs for afforestation

| | Benefits | Costs |
|---|---|---|
| Option 1 – Manage afforestation under the NESCF only (status quo) | • Will use the existing known framework under the NESCF, which has efficiencies for forestry operators who work in different parts of New Zealand.<br>• Would promote afforestation in areas not currently forested, with benefits to landowners in the form of carbon credits, and contributions to New Zealand's emissions reduction targets. | • Limited council oversight of where and how afforestation occurs. This means there may not be adequate protection of water quality or quantity in forested catchments, particularly if the afforestation activity and subsequent forestry activities are permitted under the NESCF.<br>• Known issues with overallocated catchments in Otago could be further worsened with significant afforestation.<br>• Community concerns about the amount of agricultural land being converted to forestry, and impacts on rural communities would persist.<br>• Increased fire risk and pest burden associated with increased afforestation.<br>• Would not address Kāi Tahu concerns about the impacts of forestry on wāhi tūpuna and mahika kai. |
| Option 2 – Require resource consent for new forestry over 10ha in fully or overallocated catchments, with effects consideration limited to surface water flows (preferred) | • Enables consideration of effects of forestry on water quantity, which is not currently managed under the NESCF. Council would be able to limit forestry in locations where it could have downstream effects on water yield.<br>• A consent requirement for large scale afforestation may result in less new forestry being established in overallocated catchments, which could have social, cultural and economic benefits in at least maintaining the status quo of water availability in downstream catchments.<br>• Consent requirement may lead to a reconsideration of the species used for afforestation, particularly if there is technical knowledge around the impacts of different species in terms of both their water use, and their impact on | • Large scale afforestation activities in water-short catchments will require a resource consent, which will come at a cost to forestry operators. This would apply in approximately 35 catchments. Non-notified and limited-notified consent application deposits are $3,000, while publicly notified application deposits are $25,000. These costs do not include the cost to prepare a consent application, nor any processing costs that may be incurred over and above the deposit.<br>• Some locations may be considered inappropriate for forestry, leading to reduced opportunities for landowners, including reduced carbon credits.<br>• A consent requirement in water-short catchments only may result in more forestry in other |

| | Benefits | Costs |
|---|---|---|
| | water yield and groundwater. | catchments, leading to increased impacts in those catchments. These impacts would include community concerns about the amount of agricultural land being converted to forestry, and exacerbate impacts on some rural communities.<br>• Would not address Kāi Tahu concerns about the impacts of forestry on wāhi tūpuna and mahika kai in catchments that are not fully or overallocated. |
| Option 3 – Require resource consent for all new forestry over 10ha | • A consent requirement for large scale afforestation will increase Council oversight of the activities through the consent process and subsequent monitoring of resource consents. Council would be able to tailor consent conditions to suit the risk profile of the particular site, and limit forestry in locations where it is not appropriate.<br>• A consent requirement for large scale afforestation may result in less new forestry being established, which could have social, cultural and economic benefits, particularly in rural communities where forestry replaces pastoral, arable or horticultural farming activities that have significant benefits for local communities.<br>• The permitted activity pathway for small scale afforestation will enable these activities, which will allow farming operations to diversify, reduce nutrient use and loss intensity, and offset carbon emissions.<br>• Would allow Kāi Tahu concerns about the impacts of forestry on wāhi tūpuna and mahika kai to be considered. | • All large scale afforestation activities will require a resource consent, which will come at a cost to forestry operators. The cost of the consent process and complying with its conditions is likely to vary, based on whether the EFL take limits have been exceeded, and the nature of setbacks proposed.<br>• Consent conditions that are additional to NESCF permitted activity requirements may increase the cost of undertaking afforestation, by requiring greater setbacks or management approaches. This cost is expected to vary depending on the specifics of the site.<br>• A consenting regime for afforestation may result in less new forestry being established, which could have environmental and economic costs, particularly related to New Zealand's climate change commitments.<br>• Some locations may be considered inappropriate for forestry, leading to reduced opportunities for landowners, including reduced carbon credits.<br>• Requiring a resource consent for afforestation does not acknowledge that during the growth phase of forestry, the adverse effects on water quality may be less than those compared with a pastoral use on the same land. |
| Option 4 – Require resource | • A consent process for large scale afforestation will enable consideration of the forestry | • Increased setbacks for small-scale forestry to be permitted may discourage farming operations |

| | Benefits | Costs |
|---|---|---|
| consent for all forestry over 10ha and 20-50m setbacks from waterbodies for forestry 10ha or less | activity, including effects on water yield, and site specific setbacks.<br>• A consent requirement for large scale afforestation will increase Council oversight of where and how the activities occur through the consent process and subsequent monitoring of resource consents.<br>• Permitted activity requirements relating to indigenously vegetated setbacks to water bodies will have benefits for indigenous biodiversity and water body health.<br>• Greater setbacks at planting for small scale afforestation will reduce the need for disturbance of the riparian margin throughout the forestry cycle, including harvesting, which will reduce the likelihood of works occurring within or near water bodies, and the resulting impacts this can have on bed and bank stability and water quality.<br>• Locations that are inappropriate for forestry may not meet policy requirements and therefore forestry should not occur in these places.<br>• Would allow Kāi Tahu concerns about the impacts of forestry on wāhi tūpuna and mahika kai to be considered. | from these activities. Farm forestry is used to manage unproductive, marginal or steeper land. Being unable to manage these types of land in this way may have unintended consequences for the rest of the farming operation.<br>• Complying with a 20 m setback has been estimated as resulting in a 12% loss of commercial planting area[56].<br>• All large scale, and most small scale afforestation activities will require a resource consent, which will come at a cost to forestry owners. The cost of applying for and complying with the consent is likely to vary, based on a number of factors including whether it is in an over-allocated catchment, upstream of a sensitive receiving environment, and the nature of setbacks proposed.<br>• Consent conditions that are additional to NESCF permitted activity requirements may increase the cost of undertaking afforestation operations.<br>• Some locations may be considered inappropriate for forestry, leading to reduced opportunities for foresters. |

433. Table 34 below assesses the effectiveness and efficiency of the options in achieving the objectives. Where an option is evaluated as being effective in achieving the objectives in the pLWRP they are subsequently evaluated for their efficiency.

Table 34: Effectiveness and efficiency assessment for afforestation

| Effectiveness | |
|---|---|
| Option 1 | It is uncertain whether this option will be effective in achieving the objectives, as the NESCF is not required to give effect to the pLWRP objectives.<br>The uncertainty relates to whether compliance with the NESCF permitted activity conditions is sufficient to achieve the objectives of the pLWRP, as Council has limited ability to influence how and where afforestation happens within the Otago context. |
| Option 2 | This option will be effective in achieving the objectives as they relate to water |

[56] Information received from Southern Wood Council as part of clause 3 feedback

| | |
|---|---|
| | quantity. As with Option 1, there is uncertainty as to whether this option will be effective in achieving the objectives as they relate to water quality, as it relies on the NESCF provisions for managing the effects of afforestation on water quality. |
| Option 3 | These options will be effective in achieving the objectives, as they will allow Council to have some say in how and where forests are established in Otago, and manage downstream effects on water quantity and quality. A consent requirement for all large scale afforestation activities will enable site specific consideration of the activity, and the mitigations, including setbacks from waterbodies, that are appropriate, both in terms of the afforestation activity, and the longer term effects, including harvesting of the planted area. |
| Option 4 | |
| **Efficiency** | |
| Option 1 | Based on the uncertainty around whether Option 1 will be effective in achieving the objectives, there is also uncertainty around whether Option 1 will be efficient in achieving those objectives. The risk of not acting associated with Option 1 is that there are impacts on society in the Otago context that are unmanaged. Some of these impacts are irreversible (or nearly so), such as changes to the landscape, establishment of wilding conifers, and impacts on the social dynamics in Otago. |
| Option 2 | This option is the most efficient way to achieve the water quantity objectives in water short catchments, by ensuring that the water yield impacts are appropriately managed. However, the risk of unintended consequences on catchments that are not currently at allocation or over-allocated means that it is not the most efficient option overall. As for Option 1, there will be impacts on society in the Otago context that are unmanaged. |
| Option 3 | This option is not the most efficient way to achieve the objectives, due to the increased costs associated with a resource consent process for large-scale afforestation across the region, without commensurate benefits to water quality. Compared to Option 4, Option 3 will be more efficient, as it is less likely to require consents for small scale afforestation that would not have significant adverse effects, due to the smaller setbacks required. |
| Option 4 | This option is not an efficient way to achieve the objectives. It is less efficient than Option 3 as it is more likely to require consents for small scale afforestation that would not have significant adverse effects, due to the larger setbacks required. This will cause unnecessary costs for some applicants, which is not efficient. |

### 2.5.9. Conclusion

434. The effectiveness and efficiency assessment indicates that, overall, Option 2 will be effective at achieving the objectives of the pLWRP and ORPS and more efficient than the status quo (Option 1) and Options 3 and 4. Given the efficiency and effectiveness of this option, Option 2 is considered to be the most appropriate way to achieve the objectives of the pLWRP.

## 2.6. Options: Ongoing land use for forestry under the pLWRP and replanting

435. Once afforestation has occurred in a particular location, the question of how replanting of harvested forestry should be managed arises. The NESCF should improve forest planning, as a replanting management plan is required, which requires water quality, sediment and wilding tree risks to be considered and managed.

436. Three reasonably practicable options were identified to achieve the objectives:

- **Option 1: (preferred)** Manage under the NESCF or any granted resource consents only.

- **Option 2:** Require consent for all replanting, subject to same controls as afforestation.

### 2.6.1. Option 1: Manage under the NESCF or any granted resource consents only (status quo, preferred)

437. Option 1 uses the NESCF provisions and any granted resource consents and does not include any greater stringency over the NESCF for the ongoing use of land during the growth phase of the forestry cycle (after planting, but prior to harvesting).

438. The NESCF does not manage the ongoing land use associated with forestry activities after afforestation but before harvesting. It does manage discrete activities that may occur during this time, including pruning and thinning to waste, earthworks, river crossings and forestry quarrying (although it is noted that the latter three activities are likely to be associated with harvesting).

439. Regulation 77 of the NESCF permits replanting with similar requirements to afforestation, including a requirement that the re-planting cannot be any closer to a riverbed.

### 2.6.2. Option 2: Require consent for all replanting

440. Option 2 would include two new rules for replanting, being a permitted activity rule for small-scale (less than 10 ha on a landholding) replanting, and a restricted discretionary consent requirement for all other replanting. These rules would apply in addition to Regulation 78 of the NESCF.

441. The setbacks required would be consistent with the afforestation rules.

### 2.6.3. Clause 3 consultation feedback

442. Clause 3 feedback was received from eleven parties on the forestry provisions. The plan provisions provided to Clause 3 parties mostly closely resembled Option 3, with rule framework that managed afforestation and replanting, subject to setbacks. In relation to this sub-topic, the feedback received has been summarised below:

a. For replanting, the permitted area is noted as being contrary to the NESF, which has provisions limiting the conversion of plantation forestry to pastoral land use.

b. The requirement to establish setbacks greater than those in the NESCF is generally opposed. For replanting in particular, the setbacks will have implications under the Emissions Trading Scheme, if the area of forestry replanted is less than that harvested.

c. Some parties support the vegetated setbacks for permitted activities, with one seeking that the slope threshold is removed, while another questions whether the setbacks are sufficient, particularly to protect waterways during harvest.

d. The restricted discretionary status is of concern, as it introduces the potential for ORC to decline a consent application for replanting, which could impinge on forester existing use rights, increase compliance costs and have implications under the Emissions Trading Scheme.

e. A request for weed and pest management plans was made for the permitted activity rules, to ensure that plantation forestry will not adversely affect neighbouring properties.

f. The policy direction stating a preference for the use of indigenous vegetation over non-indigenous vegetation was opposed, on the basis that it does not take into account the financial and practical realities of forestry, and the time difference in economic returns, compared to exotic forestry.

443. In response to Clause 3 feedback:

a. The rule managing replanting subject to the same limits as afforestation was removed, and replaced with a permitted activity rule requiring that replanting maintains or increase the setbacks that were required at the time the forest was established, and any other water quality, water quantity or wilding tree mitigations required at the time the forest was established.

### 2.6.4. Clause 4A consultation feedback

444. The clause 4A feedback sought that additional measures be considered to reduce the effects of existing forestry in catchments where water quantity is over-allocated. This feedback was considered, but no changes were made because the Plan does not require changes to land uses to manage over-allocation, and it would be unfair for forestry to be the only activity where this applied.

### 2.6.5. Effectiveness and efficiency assessment

445. Table 36 below identifies and assesses the environmental, cultural, social, and economic benefits and costs anticipated from implementing the proposed options.

Table 35: Benefits and costs for forestry ongoing land use and replanting

| | Benefits | Costs |
|---|---|---|
| Option 1 Manage under the NESCF and resource consents only (preferred) | • Will use the existing known framework under the NESCF, which has efficiencies for forestry operators.<br>• Provides certainty for existing forestry operators that replanting will be possible following harvest, subject to compliance with the NESCF. | • May result in previous setbacks and mitigations applied at the planting stage being lost or degraded during forest growing phase, or on replanting. This will have an environmental cost.<br>• Would not address Kāi Tahu concerns about the impacts of existing forestry on wāhi tūpuna and mahika kai. |
| Option 2 Require consent for all replanting | • A consent process for large scale replanting will enable consideration of the forestry activity, including site specific setbacks and effects on water quantity and quality.<br>• Would provide greater consistency with afforestation in terms of managing effects.<br>• Would allow Kāi Tahu concerns about the impacts of forestry on wāhi tūpuna and mahika kai to be | • A consent requirement for large scale replanting may result in less replanting, which could have environmental, social, cultural and economic costs, depending on the land use that is implemented in place of plantation forestry.<br>• Obtaining a resource consent will come at a cost to forestry operators, and result in uncertainty for existing forestry operations. Non-notified and |

| | | |
|---|---|---|
| | considered. | limited-notified consent application deposits are $3,000, while publicly notified application deposits are $25,000. These costs do not include the cost to prepare a consent application, nor any processing costs that may be incurred over and above the deposit.<br>• If the consent process results in setbacks that are greater than those required by the NESCF, and greater than those in established forestry where the replanting will be subject to the LWRP provisions will result in a loss of carbon credits, which comes at an economic cost to forestry operators. This represents a loss of carbon sequestration, and liability created under the Emissions Trading Scheme. The forestry industry has identified very significant potential costs of this, with a 20 m setback resulting in an approximately 12% loss in commercial planting area (which equates to 15,000 ha across Otago). The industry considers that this will have significant economic impacts for the industry, and the wider region. |

446. Table 37 below assesses the effectiveness and efficiency of the options in achieving the objectives.

Table 36: Effectiveness and efficiency assessment for ongoing land use

| Effectiveness | |
|---|---|
| Option 1 | This option will be somewhat effective in achieving the objectives, to the extent that it will retain the status quo under the NESCF or resource consents granted. |
| Option 2 | This option will be effective in achieving the objectives. A consent requirement for all large scale replanting activities would enable site specific consideration of the activity, and the mitigations, including setbacks to waterbodies, that will may be appropriate, both in terms of the replanting activity, and the longer term effects, including harvesting of the planted area. However, it may result in unintended consequences. |
| Efficiency | |
| Option 1 | Option 1 will be efficient in achieving the objectives, subject to the limitations described in relation to effectiveness. |
| Option 2 | This option will be inefficient in achieving the objectives, as all replanting will require resource consent – even if it is not increasing the risk of the activity.<br>A resource consent process can be costly (particularly when compared to permitted activity pathways), and for the most part, the effects of the forestry activity have been established. In addition, any reduction in planted area would create a considerable potential cost (in terms of Emissions Trading Scheme credits) |

| | |
|---|---|
| | to forest owners. |

447. This assessment also needs to take into account the risk of acting or not acting, if there is uncertain or insufficient information.[57]

448. Given many forestry activities are permitted under the NESCF, there is a level of uncertainty regarding the full impacts of implementing Option 1. However, there is sufficient information about current water quantity and quality issues and the associated environmental, social and cultural impacts in Otago.

449. Overall, the information supporting Option 1 is suitably certain and sufficient.

### 2.6.6. Conclusion

450. The effectiveness and efficiency assessment indicates that, overall, Option 1 will be effective at achieving the objectives of the pLWRP and ORPS and more efficient than the other option. Given the efficiency and effectiveness of this option, it is the most appropriate way to achieve the objectives of the pLWRP.

## 2.7. Options: Harvesting of plantation forestry

451. Note that the options presented here apply only to harvesting of plantation forestry. Harvest of exotic continuous-cover forestry would continue to be managed under the provisions of the NESCF only. Briefly, these provisions provide for low-intensity harvesting (where a minimum of 75% canopy cover is maintained at all times) as a permitted activity, with any additional harvest requiring discretionary consent.[58]

452. To manage the effects of harvesting of plantation forestry, three reasonably practicable options were identified to achieve the objectives:

- **Option 1:** Manage under the NESCF only.
- **Option 2:** A controlled activity consent for harvesting (preferred option).
- **Option 3:** A discretionary activity consent for harvesting.

### 2.7.1. Option 1: Manage under the NESCF only

453. Option 1 relies on the NESCF provisions and does not include any stringency over the NESCF for harvesting.

454. Regulation 63 of the NESCF permits harvesting subject to specific conditions to manage sediment and slash, including setbacks for harvesting machinery and a harvest management plan to identify the risks associated with earthworks. For activities that do not comply with the NESCF permitted activity regulations, Regulations 70 and 71 provide a controlled and restricted discretionary status.

[57] Section 32(2)(c), RMA

[58] Regulations 71A, 71B and 71C of the NESCF.

### 2.7.2. Option 2: A controlled activity consent for harvesting plantation forestry (preferred option)

455. Option 2 includes a rule for harvesting of plantation forestry that is more stringent than regulation 63 of the NESCF. It requires all harvesting of commercial forestry to have a controlled activity consent. The matters of control cover the quality, content and implementation of the NESCF harvest management plan and forestry earthworks management plan, the management of critical source areas, riparian areas, sediment and slash, and the timing of replanting or regrassing.

456. Option 2 would mean that, compared to the current permitted activity pathway for many plantation forestry harvesting activities under the NESCF, all harvesting activities will require resource consent under the pLWRP. As a controlled activity status, there would be no ability for Council to decline consent.

### 2.7.3. Option 3: A discretionary activity consent for all harvesting

457. Option 3 includes a rule for harvesting that is more stringent than regulation 63 of the NESCF. Option 3 provides a discretionary activity pathway for harvesting commercial forestry, with no restriction on the matters of discretion.

458. Option 3 will mean that, compared to the current permitted pathway for many commercial forestry harvesting activities under the NESCF, all harvesting activities will require resource consent under the pLWRP. As a discretionary activity status, there would be the possibility that consent could be declined.

### 2.7.4. Clause 3 consultation feedback

459. Clause 3 feedback was received from eleven parties on the forestry provisions. In relation to this sub-topic, the feedback received has been summarised below:

a. One party requested that the controlled activity rule be amended to have a permitted activity status, but subject to the same conditions, including being in accordance with a certified Harvest Management Plan.

b. Two parties requested that the controlled activity be amended to be at least restricted discretionary, given the risk of landslides and erosion, and the need for forestry activities to internalise environmental effects, including sediment.

c. The discretionary rule for harvesting that cannot meet the controlled activity conditions is of concern, given it means consent applications may be declined, removing the ability to harvest a timber crop, which was invested in as a revenue stream. This introduces a high level of uncertainty, and may be a deterrent for current and future forestry investment.

460. In response to Clause 3 feedback, the controlled activity rule for harvesting was amended to remove setbacks and other conditions, so that, in combination with the harvest plans required under the NESCF, all harvesting would be a controlled activity. This means that Council must grant all harvesting consent applications, but can impose conditions and can undertake or impose consent monitoring.

### 2.7.5. Clause 4A consultation feedback

461. There was no clause 4A feedback specific to the harvesting rules.

### 2.7.6. Effectiveness and efficiency assessment

462. Table 38 below identifies and assesses the environmental, cultural, social, and economic benefits and costs anticipated from implementing the proposed options.

Table 37: Benefits and costs for forestry harvesting

| | Benefits | Costs |
|---|---|---|
| Option 1 Manage under the NESCF only | • Will use the existing harvest plan requirements under the NESCF, which has efficiencies for forestry operators. | • Limited council oversight of harvesting and the quality of the harvest plan.<br>• May not provide adequate protection of water quality or quantity in forested catchments, particularly if the mitigations used are not appropriate.<br>• NESCF Erosion Susceptibility classification for Otago is acknowledged as not fit for purpose (see section 2.2.2 above), so NESCF does not manage harvest risks in Otago well.<br>• Would not address Kāi Tahu concerns about the impacts of forestry on wāhi tūpuna and mahika kai. |
| Option 2 Controlled activity consent for harvesting (preferred) | • The consenting regime is likely to result in more robust harvest plans, when compared to the NESCF status quo.<br>• A consent requirement for harvesting will increase Council oversight of the activities through the consent process and subsequent monitoring of resource consents.<br>• A controlled activity pathway, subject to complying with conditions of consent, provides certainty for foresters, as harvesting will always be able to be undertaken.<br>• Riskier practices, such as leaving soils exposed for long periods after harvest, as sometimes currently occurs in Otago, will be reduced.<br>• Would enable consideration of Kāi Tahu concerns about the impacts of forestry harvesting on wāhi tūpuna and mahika kai. | • Obtaining a resource consent will come at a cost to forestry operators. The cost of the consent process is likely to vary, based particularly on the quality of the harvesting plan. Non-notified and limited-notified consent application deposits are $3,000, while publicly notified application deposits are $25,000. These costs do not include the cost to prepare a consent application, nor any processing costs that may be incurred over and above the deposit. |
| Option 3: Discretionary | • The consenting regime is likely to result in more robust harvest plans, | • Obtaining a resource consent will come at a cost to forestry |

| | Benefits | Costs |
|---|---|---|
| activity consent for harvesting | when compared to the NESCF status quo.<br>• A consent requirement for harvesting will increase Council oversight of the activities through the consent process and subsequent monitoring of resource consents.<br>• A discretionary activity enables harvesting of forest in poor locations to be subject to strict requirements or even declined.<br>• Would enable consideration of Kāi Tahu concerns about the impacts of forestry harvesting on wāhi tūpuna and mahika kai. | operators. The cost of the consent process is likely to vary, based particularly on the quality of the harvesting plan. Non-notified and limited-notified consent application deposits are $3,000, while publicly notified application deposits are $25,000. These costs do not include the cost to prepare a consent application, nor any processing costs that may be incurred over and above the deposit.<br>• The uncertainty created by a discretionary activity may cause investment risk and potentially reduced plantings and/or forest value. |

463. Table 39 below assesses the effectiveness and efficiency of the options in achieving the objectives.

Table 38: Effectiveness and efficiency assessment for forestry harvesting

| Effectiveness | |
|---|---|
| Option 1 | It is uncertain whether this option will be effective in achieving the objectives, given the NESCF is not required to give effect to the pLWRP objectives.<br>Based on the advice from ORC compliance staff discussed previously in relation to the effects of harvesting activities that are compliant with the NESCF, it is unlikely that compliance with the NESCF permitted activity conditions is sufficient to achieve the objectives of the pLWRP. |
| Option 2 | This option will be effective in achieving the objectives.<br>The consent requirement for all harvesting activities will enable greater scrutiny of harvest plans, ensuring the actions they contain are appropriate to manage the effects of harvesting on water quality in particular. This option is anticipated to improve environmental outcomes associated with forestry. |
| Option 3 | This option will also be effective in achieving the objectives.<br>The consent requirement for all harvesting activities will enable greater scrutiny of harvest plans, ensuring the actions they contain are appropriate to manage the effects of harvesting on water quality in particular. This option is anticipated to improve environmental outcomes associated with forestry. |
| Efficiency | |
| Option 1 | Option 1 may be considered to be more efficient given it maintains the NESCF as the only document managing harvesting activities, with many harvesting activities in Otago being permitted. However the cost to the environment of an inadequate regime in Otago reduces that efficiency. |
| Option 2 | This option will be efficient in achieving the objectives, as the controlled activity status means that the consent process will be as simple as possible and provide certainty for consent applicants.<br>The cost per consent will be lower than for other activity statuses. It is the most efficient way to ensure harvest is managed in a way that is appropriate, taking into consideration site specific information and the receiving environment. |
| Option 3 | Option 3 is considered inefficient in achieving the objectives, due to the uncertainty and unintended outcomes created by a full discretionary activity status for harvest of forest. |

464. This assessment also needs to take into account the risk of acting or not acting, if there is uncertain or insufficient information.[59]

465. As described in section 2.1, there is information about the current extent of commercial forestry activities in the Otago region, with all plantation forestry requiring harvesting.

466. There is sufficient information about current water quality issues, as well as the environmental, social and cultural impacts in Otago of harvesting activities.

467. There is limited information on the current content of harvest plans, and the appropriateness of those plans for managing the potential adverse effects of harvesting plantation forestry. This means there is some uncertainty in terms of the review of harvest plans, and the additional information that may be required as part of the consent process, when compared to the status quo.

468. Overall, the information supporting Option 2 is suitably certain and sufficient that there is a minimal risk of acting compared to the status quo.

### 2.7.7. Stringency justification

469. Rule FF-R19 is more stringent than the equivalent provisions in the NESCF.

470. The NESCF enables regional plans to contain rules that are more stringent than the regulations if the rule gives effect to an objective developed to give effect to the NPSFM.[60]

471. The justification for greater stringency over the NESCF in the circumstances of the Otago Region is assessed in the following table:

Table 39: Justification for greater stringency over the NESCF in the circumstances of the Otago Region

| Summary of relevant rule | NES-CF regulations | Summary of additional stringency | Justification |
|---|---|---|---|
| FF-R19-CON1 requires a controlled activity resource consent for the harvest of plantation forestry. | The NESCF permits the harvest of forestry, subject to conditions, including the preparation of harvest management plans. | FF-R19-CON1 is more stringent, in that it does not permit harvest of forest without consent. | The additional stringency is considered to be justified in the circumstances of the Otago Region as:<br>• It is uncertain whether forestry activities that are undertaken in accordance with the NESCF permitted activity conditions would achieve the objectives in the pLWRP, particularly as they relate to achieving the long-term outcomes.<br>• There is evidence[61] to demonstrate that forest |

[59] Section 32(2)(c), RMA

[60] Regulation 6(1) of the NESCF.

[61] (Mackey, 2024), (O'loughlin, 2024)

| Summary of relevant rule | NES-CF regulations | Summary of additional stringency | Justification |
|---|---|---|---|
| | | | harvest activities in Otago, that are considered to be fully compliant with the NESCF are still likely to be having adverse effects on water quality in Otago, to the extent that water quality outcomes are not being met.<br>• Areas dominated by forestry in Otago often have ecosystems affected by sediment, reinforcing the view that the erosion susceptibility classification used in the NES-CF is not well suited to Otago conditions. |

### 2.7.8. Conclusion

472. The effectiveness and efficiency assessment indicates that, overall, Option 2 will be more effective at achieving the objectives of the pLWRP and ORPS and more efficient than the status quo. Given the efficiency and effectiveness of this option, it is likely to be the most appropriate way to achieve the objectives of the pLWRP.