Catlins **zone**

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REGIONAL COUNCIL
Te Taiao Tonga

Catlins zone

This document summarises scientific information, opportunities for action and the socioeconomic context for the Catlins zone.

This is one of twelve catchment summaries prepared for the Murihiku Southland region.

The scientific data presented in this summary has been collated at the catchment scale to provide an understanding of freshwater quality and quantity challenges and their underlying factors. The summary provides an evaluation of the current state of freshwater within the zone and highlights the magnitude of change necessary to meet freshwater aspirations.

The information in this document should be considered alongside other information sources, including mātauranga Māori.

Main features

Land area: 4,500ha

Major rivers and streams:
Longbeach Creek, Dummy's Beach Creek, Falls Creek

Aquifers:
Outside any recognised zone

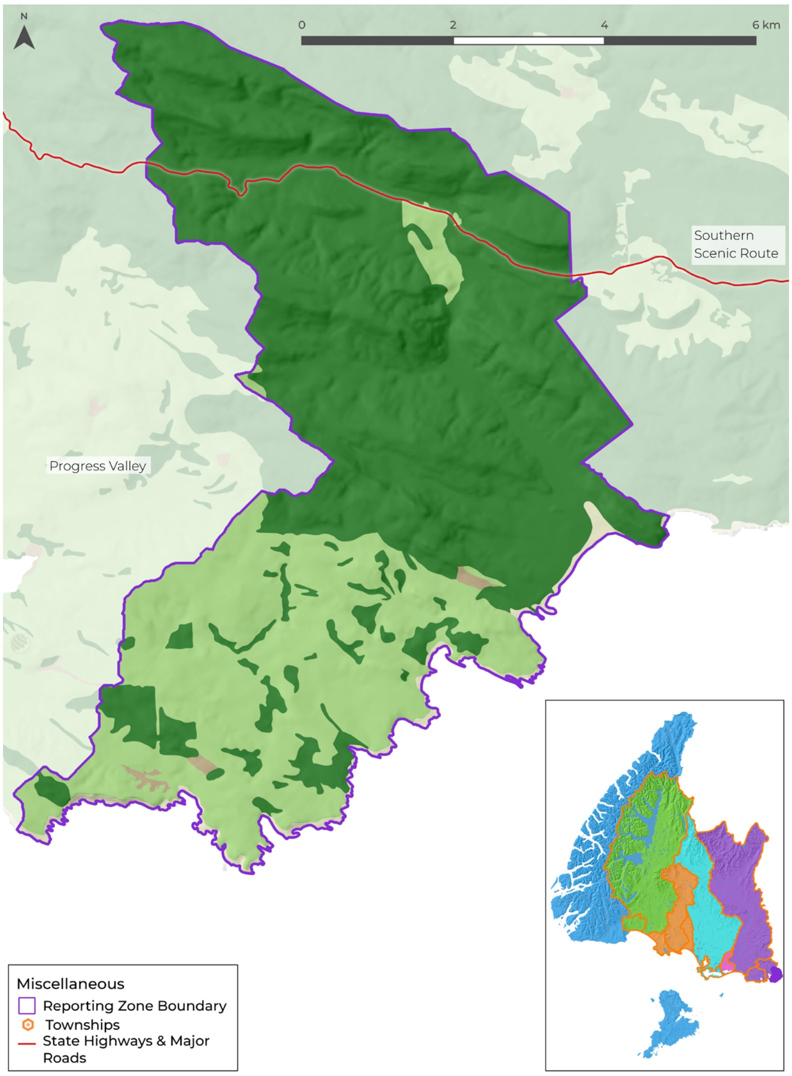
Lakes:
None

Estuaries:
None

Townships:
None

Population:
Less than 20

Catchment outline



For most attributes, current state is assessed using data from the 2018 – 2022 period.

Key messages

Issues

- No monitoring data is available for the Catlins zone. Modelling indicates that the contaminant load reductions required to achieve hauora targets are relatively small, with reductions required for phosphorus (17%), sediment (22%) and *E. coli* (69%).

Opportunities for action

- Apply property scale mitigations tailored to the physiographic characteristics of the land, the sensitivities of the receiving environments and the outcomes sought for the catchment.

Socioeconomic context for action

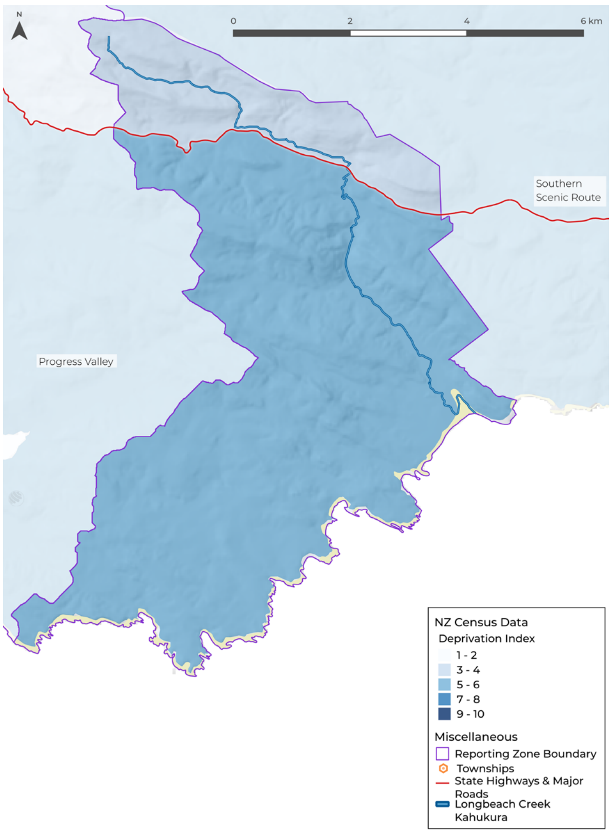
The Catlins zone is one of four catchments contained within the Wyndham-Catlins SA2 (Statistical Area 2) and is the least populated catchment. Therefore, many of the insights provided in this section extend beyond the Catlins zone.

Historic socioeconomic shifts in the late 20th century have impacted the Wyndham-Catlins area and its catchments. The impacts of neoliberal deregulation from the 1980s removed agricultural subsidies and export assistance, creating a period of austerity for many farming communities in the area. Other industry declines, such as timber, led to a further deterioration of socioeconomic conditions for local dependent townships, driving population decline. The rise in dairy farming across the region in the 1990s began to improve economic conditions for the wider zone, ushering in land use change and industry and demographic changes. However, the populations in the Wyndham-Catlins area remain closely associated with the agriculture and forestry industries (and, to a lesser extent, fishing), with around a third of the population directly involved in these industries.

Following a general population decline from the 1990s until the mid-2000s, the Wyndham-Catlins zones experienced steady population growth, peaking in 2020. The main demographic disparity in the zone is the lower number of younger people (aged 15-29), who often leave for tertiary education or employment opportunities outside the Murihiku Southland region. This is offset by a higher percentage of middle-aged residents (50-64) compared to other parts of the district.

The population in Wyndham-Catlins broadly follows regional demographic trends. Unemployment is very low in Murihiku Southland and even lower than average in Wyndham-Catlins.

Social Deprivation Index



Social Deprivation Index

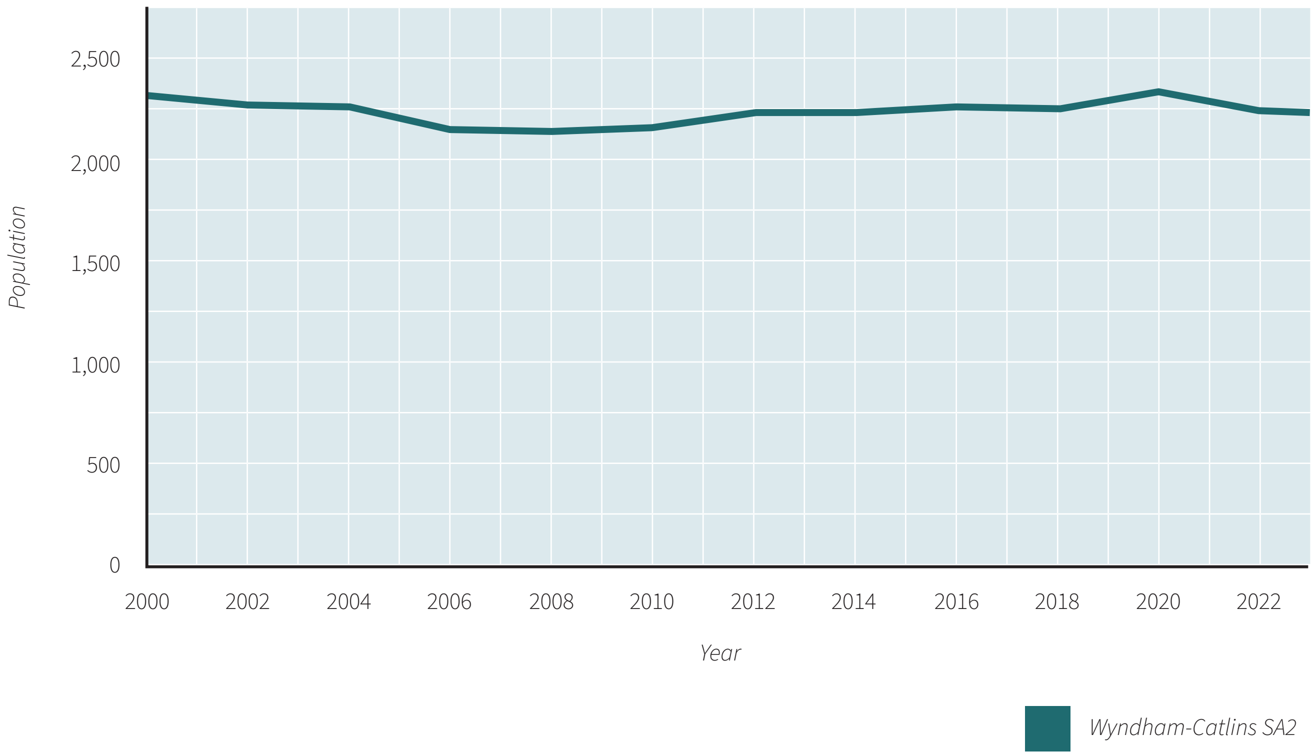
The Deprivation Index measures socioeconomic deprivation based on census information. It considers income, income benefits, communication access, employment, educational qualifications, home ownership, care support, living space and living conditions.

Although most people in the catchment were born in New Zealand, ethnicity is changing. Since the 2006 census, more than nine in ten residents were born in New Zealand, and a similar number identify with European ethnicity. The area has lower-than-district average Māori, Asian, and MELAA populations, but these populations are all increasing.

Although housing prices have increased regionally and nationally since 2020, the Murihiku Southland region, including many parts of Wyndham-Catlins, has remained among the most affordable places to buy or rent in New Zealand. Home ownership declined between 2006 and 2018, though the percentage of homeowners remains higher than in other parts of Murihiku Southland.

Although the Southland district area is among the least socioeconomically deprived areas in New Zealand, the Wyndham-Catlins zone has some of the most deprived areas in the district, as identified in the 2018 Census.

Estimated population trends (Dot Loves Data, 2024)



The Catlins zone comprises only a portion of the Wyndham-Catlins SA2, so this graph only indicates general population trends in the area.

Deprivation trends from 2014-2024 show that Wyndham-Catlins has experienced increases in crime victimisations (though this is more applicable to Wyndham Township than the rural areas). Higher levels of deprivation tend to correlate with less capacity, fewer resources, and higher vulnerability, along with poorer wellbeing outcomes for communities.

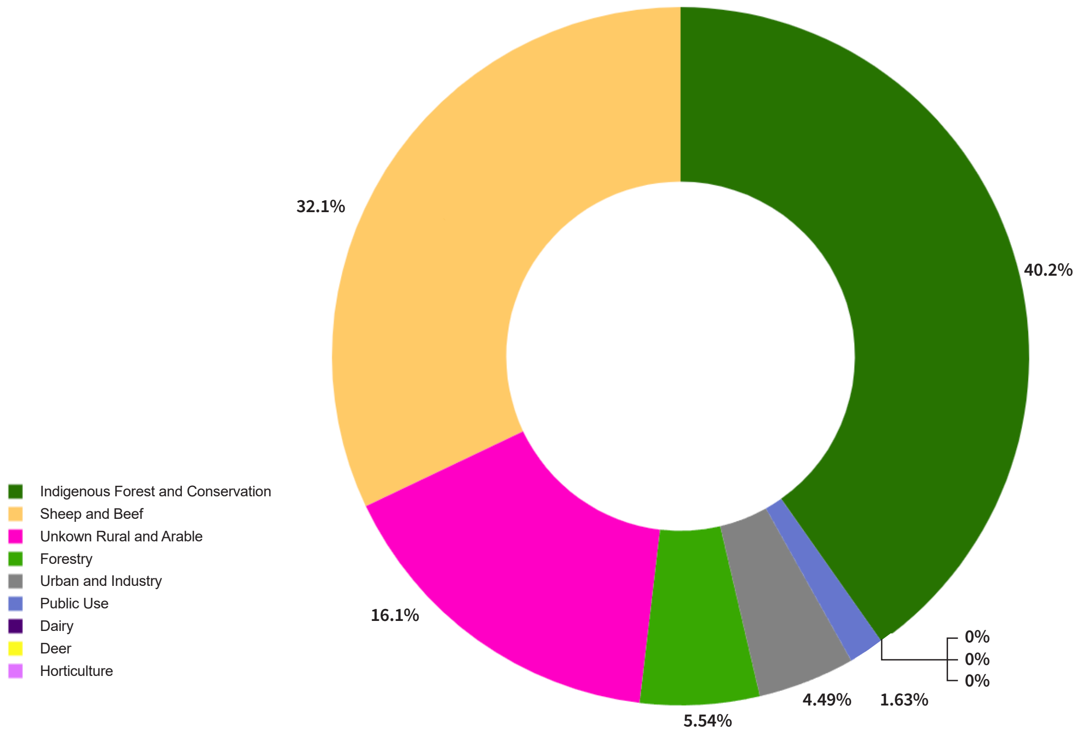
Catchment overview

The Catlins zone encompasses the coastal areas at the easternmost edge of Murihiku Southland. This zone includes the catchments that drain into the sea between White Head and Waiparu Head at the northern end of Long Beach.

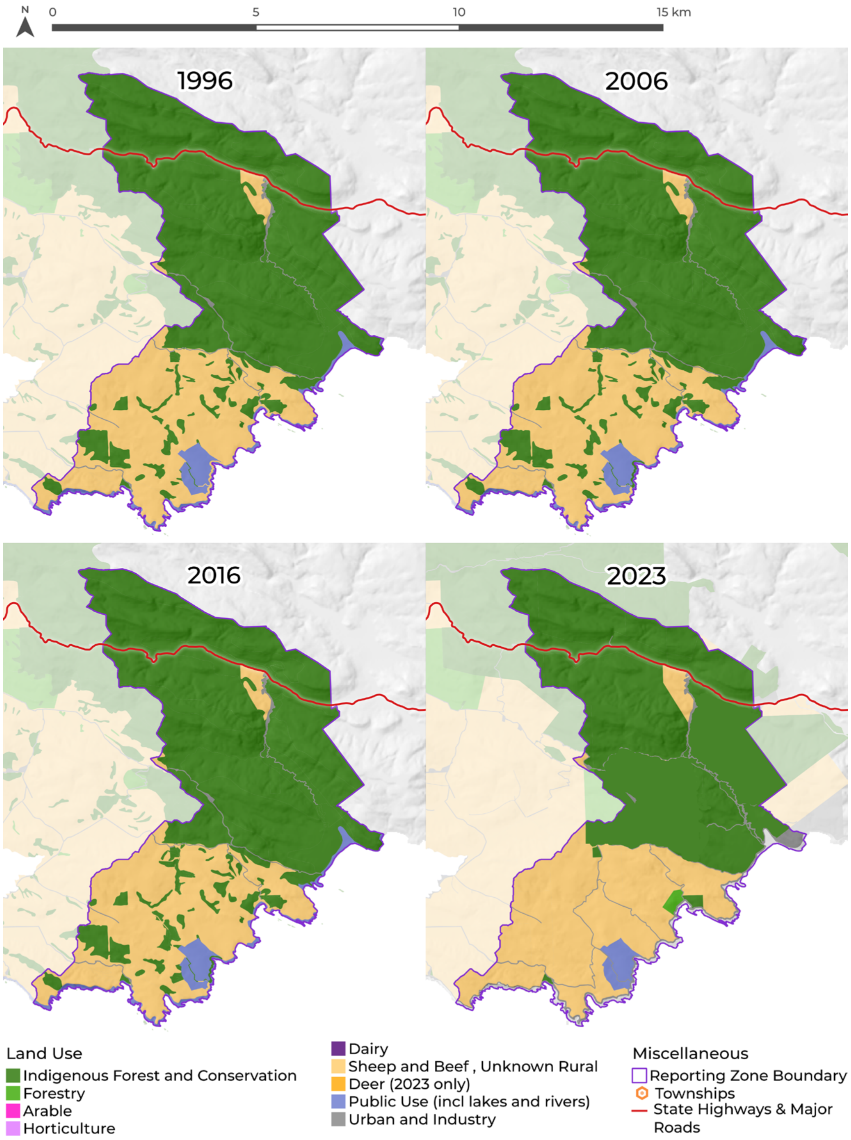
Land use

The Catlins zone covers approximately 4,500 ha, with about 1,800 ha (40%) in Indigenous Forest and Department of Conservation estate. Sheep and Beef farming account for approximately 1,440 ha (32%), with the remaining 1,260 ha classed as unknown rural (16%), forestry (6%), urban (4%) and public use (2%).

Land use changes in the last 25 years include increased pastoral land and ongoing development of marginal land, increasing land use intensity over this time.



Historic land use



Please note that these maps and figures are indicative only due to land use class aggregation and differences in mapping methods. In particular, the 2023 map uses a more simplified classification of forest and some changes shown will not reflect real forest loss.

Historic land use

	1996 to 2006	2006 to 2016	2016 to 2023	Overall 1996 to 2023
Pastoral land	No change	↓ 2%	↑ 66%	↑ 63%
Dairy	None	None	None	None
Drystock	No change	↓ 2%	↑ 66%	↑ 63%

Climate

Understanding climate at a catchment scale helps to explain spatial and temporal variation in landuse, water quality and quantity.

Current climate

The Catlins zone can typically be considered to have a cool-wet climate. On average, the mean annual temperatures are 9-11°C, summer in the 12-15°C range and winter between 3-6°C. Typically, the area sees 25-50 nights below 0°C annually.

Rainfall across the Catlins zone is consistent with an annual average rainfall (1,000-2000 mm/yr).

The average number of wet days per year (>1mm rainfall) ranges from 150-200 per year.

Future climate

The impacts of a changing climate on the Catlins zone have been explored through several scenarios based on representative concentration pathways (RCPs) 4.5 and 8.5. The potential changes to the climate are summarised in the table. Under these scenarios, in both the mid and late 20th century, river flows are expected to increase slightly in the lower/coastal parts of the zone. At the same time, decreases are anticipated in the headwaters.

Precipitation

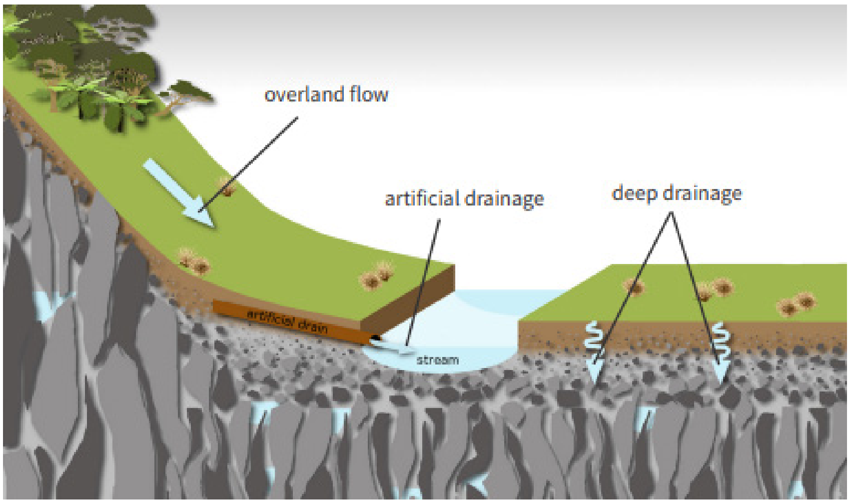
		Historic / now	RCP 4.5		RCP 8.5	
			Mid 21st century	End of 21st century	Mid 21st century	End of 21st century
Temperature	Daily mean (°C)		↑ 0.5-0.75	↑ 0.75-1.25	↑ 0.5-0.75	↑ 1.75-2
	Mean minimum (°C)		↑ 0-0.5	↑ 0.5-0.75	↑ 0.25-0.5	↑ 1-1.5
	Number of hot days		↑ 0-5	↑ 5-10	↑ 0-5	↑ 10-15
	Number of frosty nights		↓ 0-10	↓ 5-10	↓ 5-10	↓ 10-20
Rainfall	Annual rainfall change (%)		↑ 5-10%	↑5-10%	↑ 0-5%	↑ 15-20%
	Number of wet days	184	184	184	186	185
	5-Day maximum rainfall (mm)		↑ 0-15mm	↑ 0-15mm	↑ 0-15mm	↑ 15-30mm
	Heavy rainfall days	43	46	46	47	52
	Seasonal changes		Wetter spring and summer	Winter, spring and autumn wetter	Concentrated to winter/spring	Concentrated to winter/spring

Catchment landscapes and hydrology

The biogeochemical and physical processes occurring within a catchment influence water quality. Understanding hydrology, geology and soil types within a catchment helps explain variations in catchment yields, water chemistry and water quality outcomes that are independent of land use.

Catchment setting

Rain falling in the northern part of the zone flows through predominantly native vegetation in the Long Beach Creek area. The water interacts with shallow forest soils formed over Murihiku Terrane sandstone before Long Beach Creek flows into the sea at the northern end of Long Beach. Further south, the zone is dominated by low-intensity pastoral farmland, where water flowing through the hilly agricultural landscape carries nutrients, sediment, and microbes as it moves toward the coast. Flow lag times are relatively short (hours/days), due to limited subsurface flow pathways and the hilly topography.



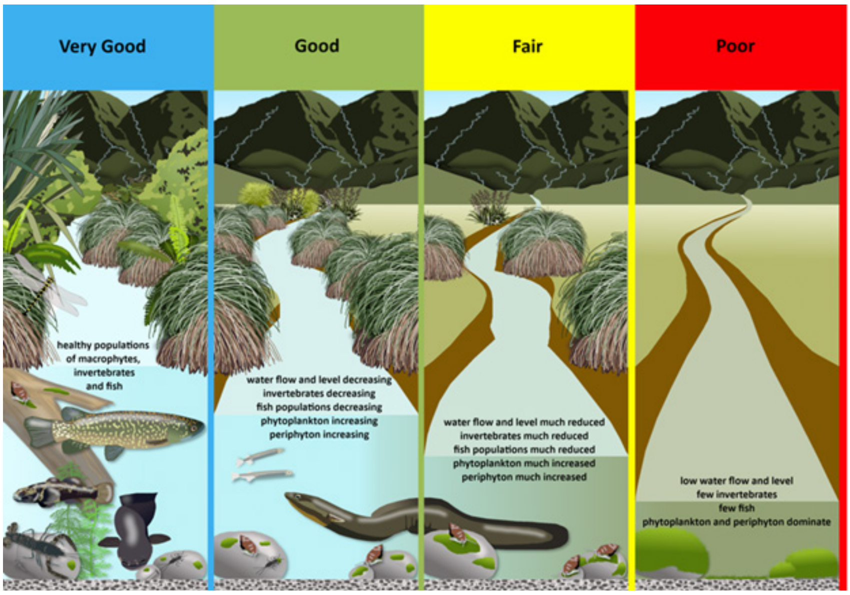
Conceptual illustration of the typical hydrological and landscape setting.

What are the water issues for this catchment?

Freshwater outcomes and how we measure them

Freshwater outcomes can be described from ‘very good’ to ‘poor’. This spectrum helps us understand the current state of the freshwater environment and what we might be trying to achieve in the future. The image below depicts this concept for rivers and streams.

Although many factors contribute to freshwater outcomes, we can only measure some of them to get an understanding of ecosystem health. We measure the aspects of the freshwater environment that can help us define and determine freshwater outcomes. These aspects are called ‘attributes’.



Attributes (the things we measure)

Attributes can relate to the ecosystem's physical or chemical environment or biological communities, such as periphyton, macroinvertebrates and fish. The measured state of an attribute tells us about some aspects of the environmental state, and together, they build a picture of the ecosystem's overall health. The more attributes we monitor, the more precise the picture can become.

Attributes may relate to ecosystem health or human health outcomes (e.g. *E. coli* or cyanobacteria concentrations). Some attributes are graded using ‘ABCD’ categories: A (very good), B (good), C (fair) and D (poor). In some cases, *E. coli* has an additional E (very poor) grade. Other attributes have simple ‘pass’ or ‘fail’ grades.

The more attributes with a higher grade, the better the overall ecosystem health. Conversely, when many attributes have poorer grades, the overall ecosystem health is poorer.

Hauora target attribute states

In 2020, Environment Southland and Te Ao Mārama Inc (TAMI) approved in principle the use of hauora as a freshwater target to be achieved within a generation. These targets provided the basis for the Regional Forum recommendations on how freshwater aspirations may be achieved.

The concept of hauora encompasses far more than the numeric attributes and targets described here. For simplicity, a reduced number of attribute states are presented in this document as they relate to ecosystem and human health. Hauora is a state of healthy resilience and is generally associated with the A 'very good' and B 'good' attribute states. However, attribute states that support hauora can be anywhere on the scale from A 'very good' to C 'fair', depending on the natural characteristics of that freshwater environment.

The natural characteristics have been differentiated through the use of classes.

All rivers within the Catlins zone are classed as Lowland.

Streams and rivers

River classes

‘River classes’ group rivers (or parts of rivers) with similar characteristics. Similarities can include natural characteristics of the rivers, such as climate, gradient and flow.

The river classes used in Murihiku Southland are: Mountain, Hill, Lowland, Spring-fed, Lake-fed and Natural State.

Target states can differ between attributes and between different river classes, which may have different target states for the same attribute.

Periphyton is an example of an attribute with different target states for different river classes.

The different target states reflect the differences in natural characteristics for each river class.

- C target state: Lowland class
- B target state: Hill class
- A target state: Mountain, Spring-fed and Lake-fed classes.

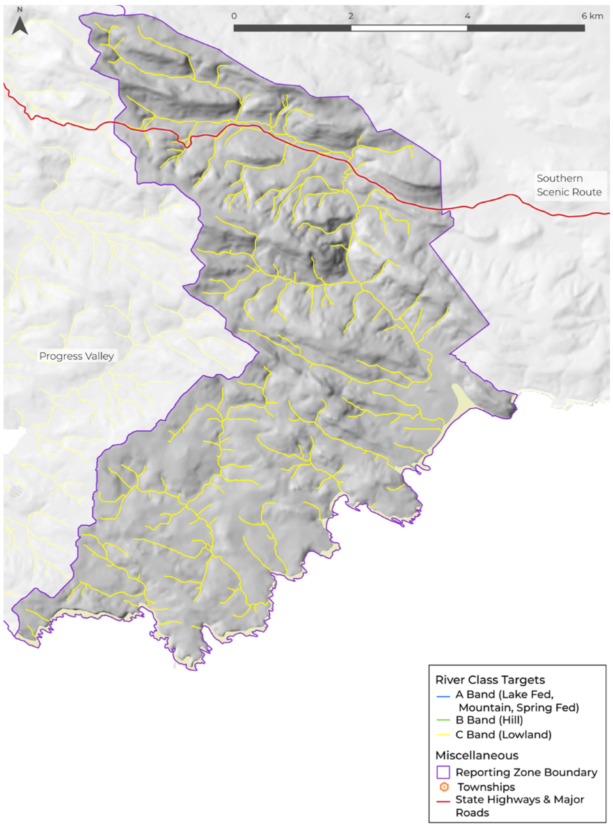
Natural State waterbodies can be identified for management purposes but are assigned attribute targets according to their underlying river classification (displayed here).

The map shows the distribution of periphyton targets for the Lowland river class within the Catlins zone.

Length of river network in each class

Lowland = 53,629m

River class hauora targets



Comparison of current state to targets for river classes

Hauora targets and current states for ecosystem and human health attributes are summarised in the table below for the zone's Lowland rivers. Table colours correspond to the 'ABCDE' grading for attributes described previously.

There are no monitoring data available for the rivers and streams in the Catlins zone to compare against the hauora targets.

Although direct data is lacking, modelled estimates suggest that reductions in phosphorus, nitrogen, and *E. coli* will be required to meet the hauora targets. These modelled reductions are presented in a later section.

Ecosystem health attributes	Lowland hauora target
Periphyton	C
Nitrate toxicity	A
Ammonia toxicity	A
Suspended fine sediment	C
Macroinvertebrates (MCI, QMCI)	C
Deposited fine sediment	A
Dissolved reactive phosphorus	B
Water temperature (summer)	C

Human contact attributes	
Benthic cyanobacteria	A
E. coli	A
E. coli at primary contact sites	A
Visual clarity	B

Groundwater

There are no records of groundwater use in the Catlins zone, and usable groundwater resources are likely very limited due to the presence of bedrock. Water and contaminants typically move through wet soils or as overland flow to surface water.

Physiographic data indicates that the risk of severe nitrate contamination in the Catlins zone is relatively low.

There are no groundwater monitoring sites in the Catlins zone.

Wetlands – how many do we have left?

Wetlands and water quality

Wetlands are increasingly being recognised for their functional values within the landscape. For example, their ability to intercept and attenuate agricultural runoff is now recognised as an important contribution to farm nutrient management.

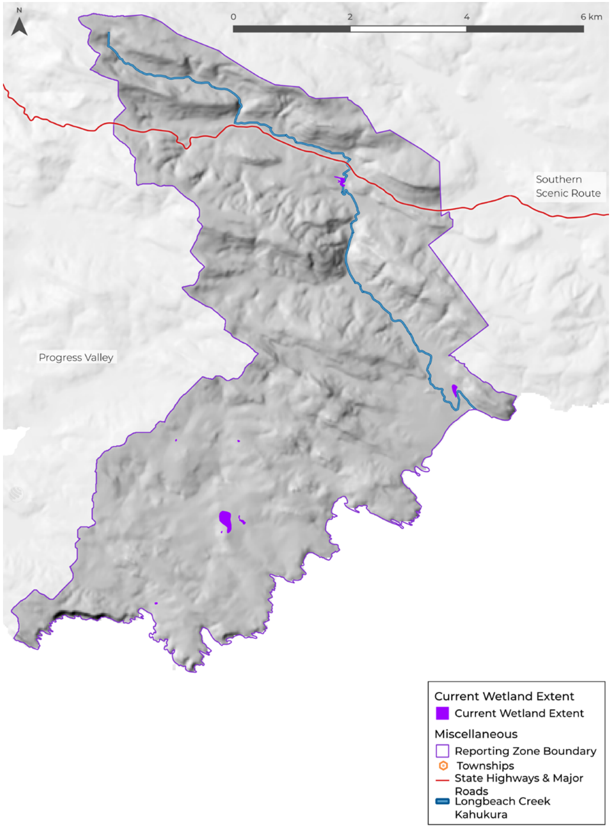
Wetlands purify water through sediment capture and storing nutrients in their soils and vegetation. This is particularly important for the agricultural nutrients nitrogen and phosphorus, which contribute to the eutrophication of receiving environments such as rivers, lakes and estuaries.

For the purposes of this document wetlands are generally defined as per the Southland Water and Land Plan definition.

The following areas were not included as wetlands in this classification:

- Wet pasture or where water ponds after rain
- Pasture containing patches of rushes less than 50% total cover
- Ponds of any kind unless associated with 0.5 or more hectares of terrestrial wetland.
- Areas of forest unless previoulsy identified as wetland.
- Areas associated with the main active flood channels of rivers.

Historic wetland extent



▲ *This map shows the current wetland extent over three time periods.*

Current state

The current wetland extent in the Catlins zone is eight hectares, with no change in extent between 1996 and 2022. This contrasts with many other areas of Murihiku Southland, where significant reductions in wetland extent have occurred during that period.

Remaining natural inland wetlands

Only eight wetlands have been identified in the Catlins zone, all of which are small. The largest is approximately five ha and consists of swamp scrubland. The next two largest are marshlands, around one ha each, while the remaining wetlands are small shallow-water areas, some of which may be unnatural.

Water quantity – how much do we have, and how much are we using?

There are currently no consented surface water or groundwater takes in the Catlins zone.

How much do we need to reduce contaminants to achieve a state of hauora?

Regional contaminant modelling

We have undertaken contaminant modelling to help us better understand water quality across Murihiku Southland. This modelling utilises monitoring data to estimate water quality in all waterbodies (excluding Fiordland and Islands). This expanded view of water quality allows us to estimate the reductions in contaminant load and concentrations required to achieve the identified target attribute states and to test the impact of different land use scenarios.

For this work, we focused on four main contaminants of concern: nitrogen, phosphorus, sediment, and *E. coli*. Actions taken to reduce the impact of these contaminants on our freshwater systems will have benefits for ecological and human health outcomes.

How much do contaminant loads need to be reduced?

Load is a measure of the total mass of a contaminant (in kg or tonnes) coming from a given area past a given point over time. For example, the total amount of nitrogen delivered to the sea by a river in one year.

We use loads to quantify contaminants here because they describe the amount of contaminants lost over a whole catchment area. It is the land that consequently needs to be managed to reduce those loads. It is important to remember that concentrations (e.g., the mass of the contaminant per litre of water in the waterbody in kg/L) must also be considered. Concentrations in waterbodies are affected by the size of the contaminant load lost from land and the amount of water available to dilute that load. Hence, water takes and climate can affect concentrations too.

Concentrations are the relative amount of contaminant present in a given volume of water at that time. Concentrations are important because they have direct relevance to toxicity attributes as well as ecological processes.

This modelling considers draft targets for the following attributes:

Rivers
Periphyton biomass, nitrate toxicity, dissolved reactive phosphorus, visual clarity, suspended sediment, *E. coli*.

Lakes
Total nitrogen, total phosphorus, phytoplankton.

Estuaries
Macroalgae.

This modelling accounts for the loads and concentrations required to achieve target states everywhere for all the above attributes.

Estimated load reductions for the Catlins zone are given in the table. Load estimates were calculated using sites with ten years of data and relates to 2017.

Contaminant	Total Load (2017 - Best estimate*)	Percentage load reduction required to achieve hauora (Best estimate*)
Total Nitrogen	22 Tonnes/Year	↓ 0% (0-0)
Total Phosphorus	1 Tonnes/Year	↓ 17% (2-46)
Sediment	1,500 Tonnes/Year	↓ 22%
E. coli	0.3 peta *E.coli*/Year	↓ 69% (46-86)

These values represent our best estimate. Levels of uncertainty are indicated by the 90% confidence interval shown in brackets where available.

What options do we have to reduce nutrient and sediment loads?

We have modelled different scenarios to indicate how far each may go toward achieving the required estimated nitrogen load reductions for all zones across Murihiku Southland. There are no results to present for the Catlins zone scenarios, as no reduction in nitrogen is required for this zone.

For phosphorus and sediment loads in the Catlins zone, reductions are required, but these are modest compared to the larger reductions required in some other zones. It seems likely that the modest reductions required in this zone could be achieved by adopting available mitigation measures without needing significant land use change.

Estimated reductions for *E. coli* are larger, as is the case for much of the region, and would require the adoption of mitigation measures to achieve.

Opportunities for action

We have put together opportunities for action in the Catlins zone to reduce contaminant loads and improve the state of freshwater.

Property scale actions

Property scale actions should be tailored to physiographic setting as well as catchment priorities and broader context. In the Catlins zone, load reductions are required for phosphorus, sediment and *E. coli* to meet hauora targets.

We can use farm scale observations, physiographic information and our understanding of water quality to help refine the most relevant actions for a given location or landscape.

Physiographic zones help us to understand better how contaminants move through the landscape. Each zone has common attributes that influence water quality, such as climate, topography, geology and soil type.

Physiographic zones differ in how contaminants build up and move through the soil, through areas of groundwater and into rivers and streams.

Contaminants can move from the land to waterways via:

- overland flow (or surface runoff)
- artificial drainage, e.g. tile drains and mole pipe drainage
- deep drainage (or leaching) of either nitrogen or phosphorus to groundwater
- lateral drainage (or horizontal movement through soil) of phosphorus and microbes

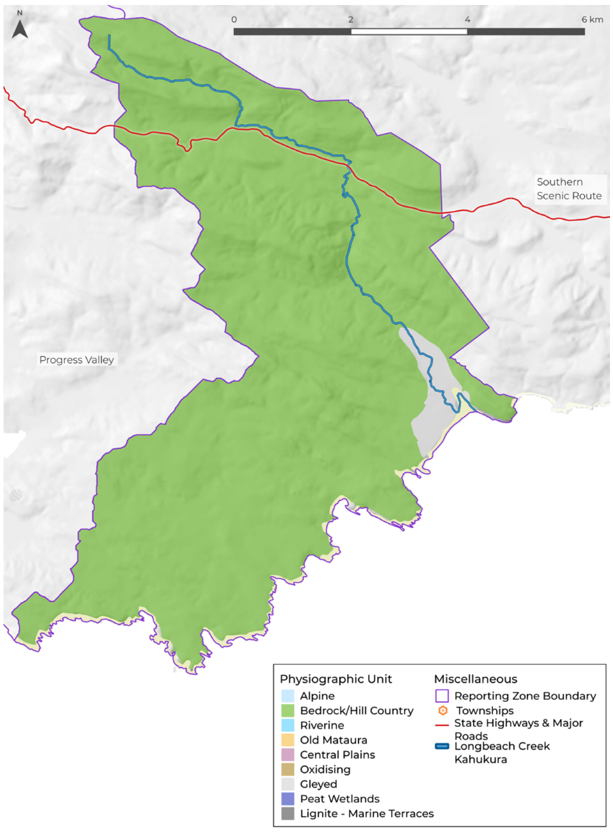
These key transport pathways for contaminants differ for each physiographic zone. Understanding differences between zones allows the development of targeted land use and management strategies to reduce impacts on water quality.

Widespread implementation of property actions to improve water quality can have significant co-benefits for catchment hydrology (flood risk and climate change resilience) and biodiversity outcomes.

The Catlins zone is made up of the bedrock/hill country zone with a small area of gleyed.

Property scale or more resolute physiographic information may be available in some locations. We promote using the best information available to identify farm-specific risks and solutions.

Physiographic zones



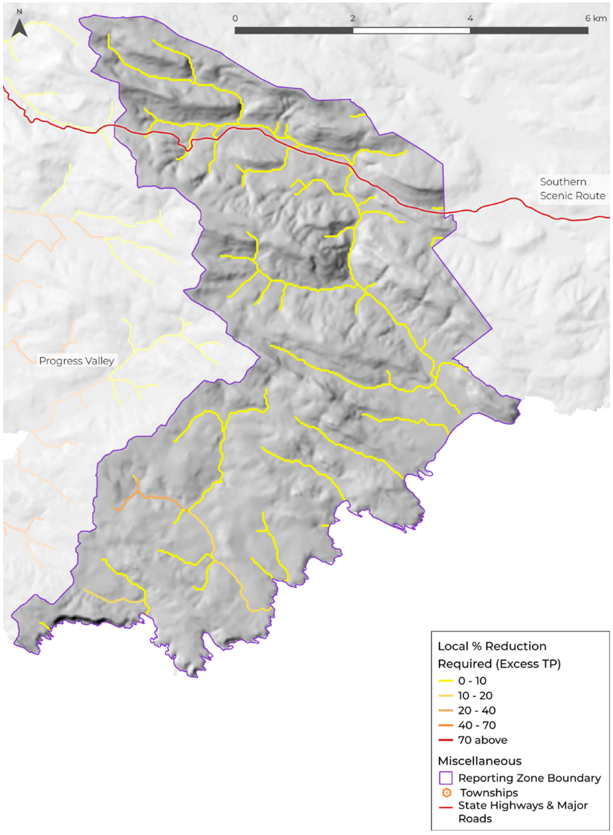
The following maps help to identify the most important actions to focus on in different parts of the catchment.

Phosphorus

Over time, reductions are required across the catchment area to achieve hauora targets.

Physiographic information can help inform what likely contaminant loss pathways need attention in different locations. The excess load map shown here indicates where phosphorus loss mitigation should be a particular focus in farm planning.

Critical Excess TP Load (%)



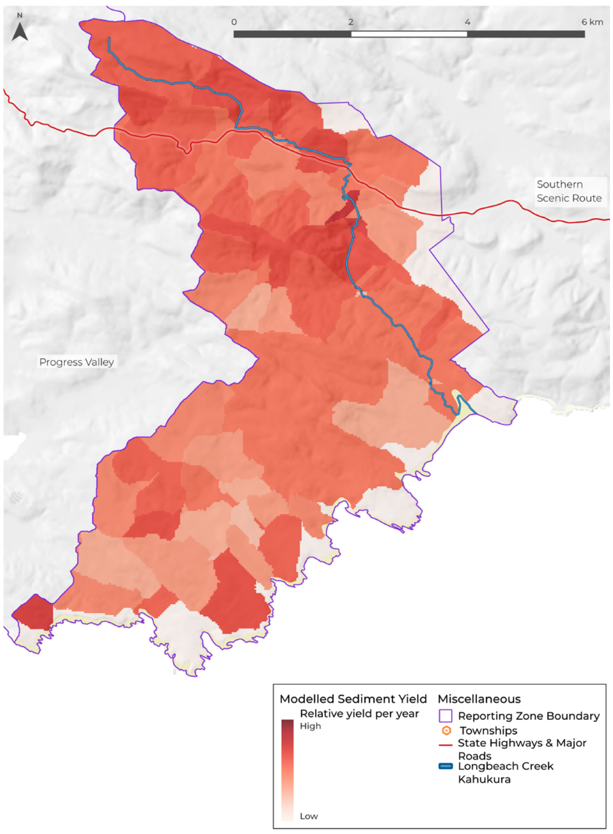
Sediment

The map (right) shows how we expect sediment loss to vary throughout the zone.

Certain areas within the agricultural landscape are estimated to have higher rates of sediment loss, particularly in regions with sloping land, erosion-prone soils and where stream bank erosion is likely a concern.

Sediment from agricultural land poses a greater threat to rivers and lakes because it is often fine-grained and carries higher concentrations of nutrients. Agricultural and forestry properties in the darker red-shaded areas should prioritise identifying opportunities and implementing mitigation measures to reduce sediment loss.

Modelled Sediment Yield



E. coli

The risk of *E. coli* loss to water depends on landscape type, slope, stock and vegetation. Property scale assessments should be used to mitigate the highest risk loss pathways on farms.

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