

# Physiographic zone: Bedrock/Hill Country

Southland's physiographic zones allow us to better understand why we have variations in water quality in different areas. We've divided Southland into nine different zones according to factors such as soil type, geology and topography. Through them we can target solutions to higher risk areas as opposed to a region-wide, generalised approach.

## Understanding your zone

Each zone is different in the way contaminants build up and move through the soil, areas of groundwater, and into our streams and rivers. Physiographic zones allow us to target advice and management strategies to keep farm nutrients on the farm and out of waterways.

## The Physiographics of Southland project was developed as part of *Water and Land 2020 & Beyond* so we can better understand:

- where our water comes from
- how water moves through the landscape
- why we have differences in water quality across the region

## Key features of the Bedrock/Hill Country zone

- Mostly rolling to steep land, up to 800 metres above sea level (below the tree line).
- Prominent landforms.
- Soil overlies bedrock or glacial till.
- Either previously or currently densely covered with native forest, tussock or plantation forestry.
- Found throughout Southland.

## What does 'Bedrock/Hill Country' mean?

Land with bedrock or glacial till\* found near the surface, located below 800m above sea level. There are no significant areas of groundwater.

\*Glacial till is a mixture of rock debris and sediment that has been deposited by a glacier. It is relatively impermeable, allowing little water to get through.

## Water source and movement

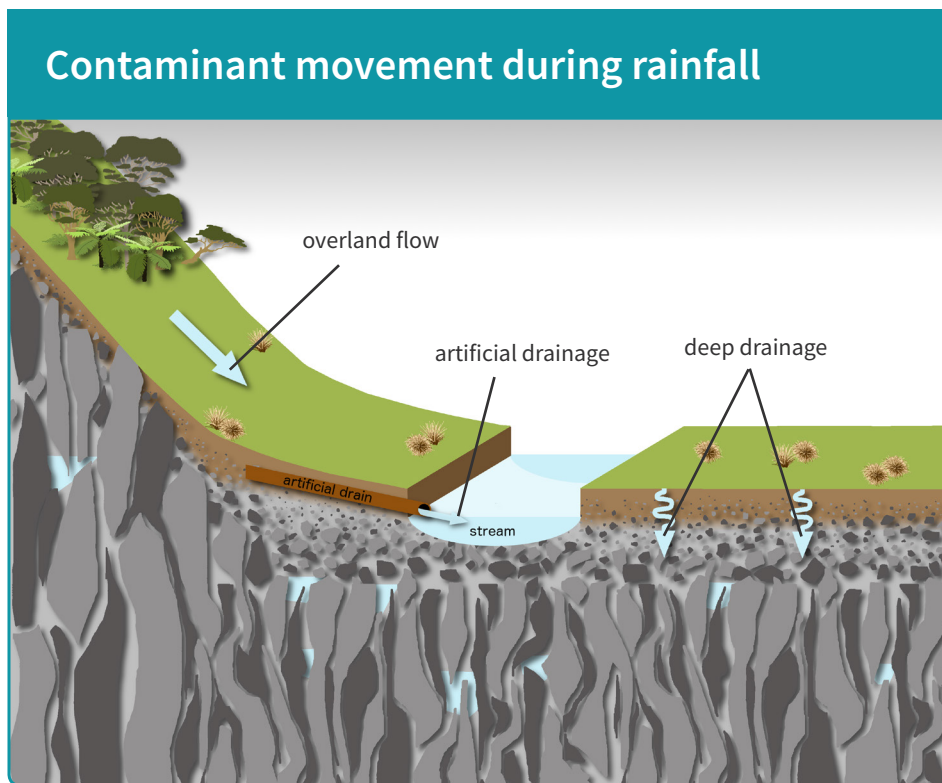
- High rainfall zone due to its elevation.
- Dense network of branching streams throughout the zone that flow to neighbouring lowland areas.
- No significant areas of groundwater.

## Contaminant movement

Contaminant loss to streams is the main concern in this zone. Water quickly flows down-slope through wet soils and as overland flow to nearby streams following high or prolonged rainfall. Nitrogen, phosphorus, sediment and microbes are all carried with water, particularly during late autumn and winter.

In undeveloped areas Bedrock/Hill country streams can be a major source of recharge (top-up) water and dilution for lowland waterways and aquifers. However, in developed areas contaminants lost from Bedrock/Hill country streams contribute to the contamination loads in lowland streams in neighbouring zones.

Groundwater within the Bedrock/Hill Country zone is minimal and mainly found within rock fractures. Groundwater contaminants are typically not a concern for this zone.



▶ Contaminant flow pathways for the Bedrock/Hill Country zone include overland flow (runoff) in the steeper areas, and artificial drainage where soils are poorly drained and deep drainage in flatter areas.

## What does this mean for water quality?

- ✓ Water from less developed areas of this zones provide a source of high quality water and dilution for downstream zones.
- ✓ Little nitrogen build-up in groundwater due to denitrification in the soil zone.
- ✗ Water flowing over highly developed hills carries potentially large amounts of contaminants (nitrogen, phosphorus, sediment and microbes) to nearby streams, particularly following heavy rainfall.
- ✗ Water flowing through artificial drainage carries potentially large amounts of contaminants (nitrogen, phosphorus, sediment and microbes) to nearby streams, particularly following heavy rainfall.

## Improving Southland's water quality

The following good management practices are applicable to all physiographic zones in Southland:

- Capture nutrients, sediment and microbes in wetlands and sediment traps
- Nutrient management
- Riparian management
- Effluent management

## Good management in the Bedrock/Hill Country zone

In addition to the above, good management in the Bedrock/Hill Country zone includes measures for reducing the effects of overland flow and artificial drainage.

### Reduce the effects of overflow by:

- Protecting soil structure, particularly in gullies and near stream areas
- Managing critical source areas (CSA)
- Reducing Phosphorus use and loss

### Reduce the effects of artificial drainage by:

- Protecting soil structure, particularly in gullies and near stream areas
- Reducing phosphorus use and loss
- Reducing the accumulation of surplus nitrogen in the soil, particularly during autumn and winter
- Avoiding preferential flow of effluent through drains
- Capturing contaminants at drainage outflows

## Physiographic zones and the Southland Water and Land Plan

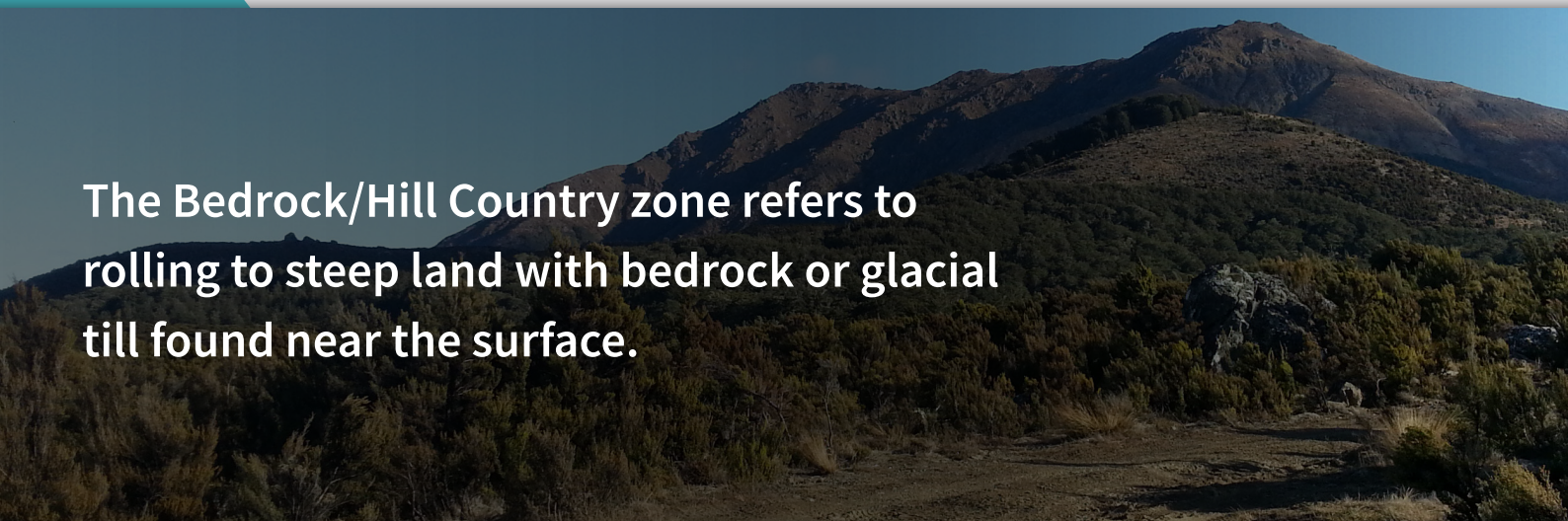
Environment Southland has developed a proposed Southland Water and Land Plan, using the science behind the physiographic zones to inform the plan and provide a tailored approach to particular issues that have been identified for each zone.

The main aim of the plan is to introduce new methods that help to halt any further decline in water quality by managing activities that we know adversely affect the quality of Southland's freshwater – such as land use intensification, wintering and stock in waterways. A key focus of the changes is to shift all land owners towards good management practices in ways that will give the best gains for maintaining water quality.

## Further information

For more information about physiographic zones and good management practices contact Environment Southland. Phone 0800 76 88 45 or email [service@es.govt.nz](mailto:service@es.govt.nz). You can also find out more about the Physiographics of Southland and your zone on our website, [www.es.govt.nz](http://www.es.govt.nz).

What zone is your property in? View our map online: <http://bit.ly/waterandlandmaps>



The Bedrock/Hill Country zone refers to rolling to steep land with bedrock or glacial till found near the surface.