

# Physiographic zone: Oxidising

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 Oxidising zone

- Low elevation, flat to gently undulating land on elevated terraces along the outer margins of the major river systems.
- Also located in inland basins and some lowland areas.
- Soils and aquifers have low denitrification potential.

## What does 'Oxidising' mean?

Oxidising means well aerated, with plenty of oxygen.

The Oxidising zone is characterised by soil water and groundwater that contains high levels of oxygen, which allows nitrogen to accumulate.

## Water source and movement

- A high density of small streams runs through the zone, which can rise rapidly during heavy rainfall.
- Alluvial deposits contain an extensive groundwater resource.
- Drainage to waterways varies depending on slope, soil texture and permeability.
- Flat, free-draining soils - water seeps straight down to underlying aquifers (areas of groundwater). Groundwater in this zone is 'recharged' (topped up) by rainfall that drains down through the soil.
- Slowly permeable soils may experience seasonal waterlogging. On flatter areas, they will often have artificial drainage when elevated above nearby streams. On more sloping areas, they will often have overland flow.

## Contaminant movement

Groundwater in the Oxidising zone is susceptible to nitrate accumulation. Soils and underlying aquifers in the Oxidising zone have little ability to remove nitrogen (via a process called denitrification).

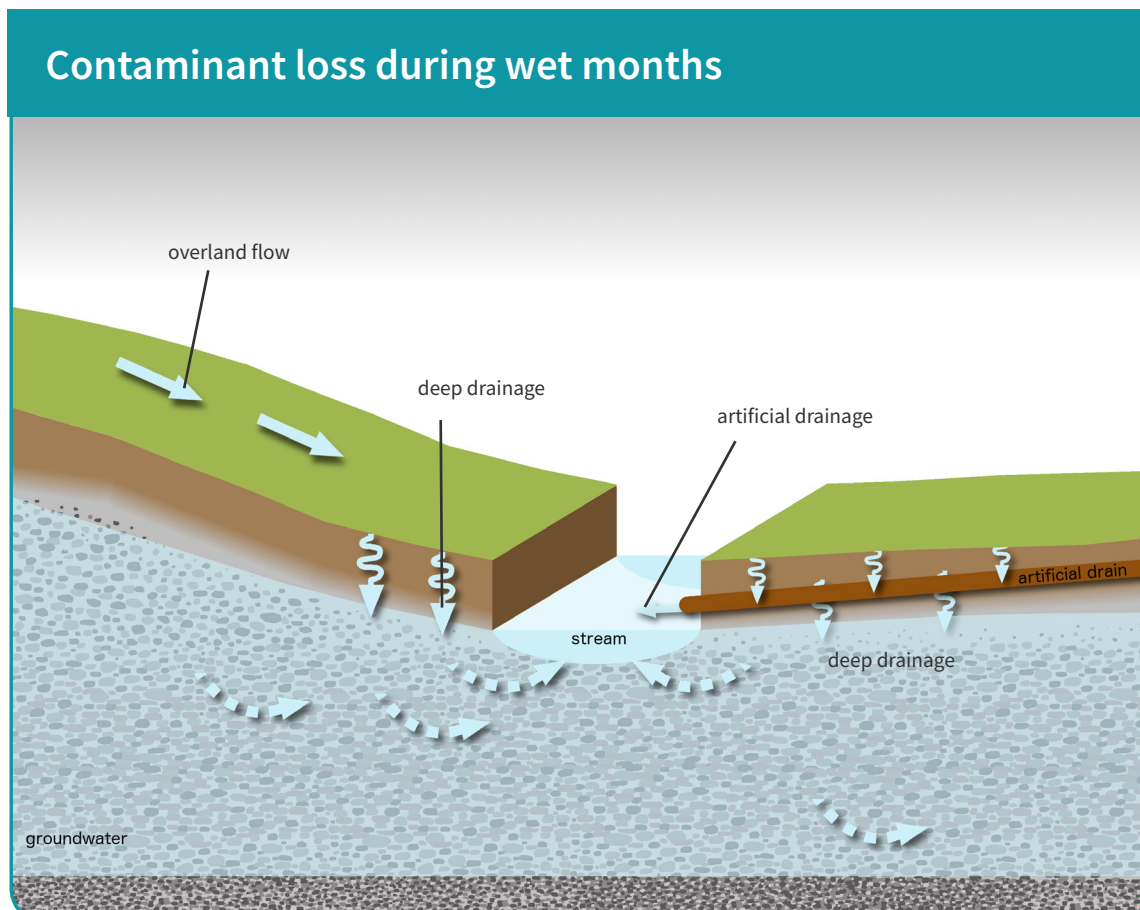
Streams in this zone rise rapidly during heavy rain when soils are wet. Soil water and groundwater carries with it contaminants, which continue to seep into streams after periods of heavy rain.

Oxidised soils can be very good at absorbing and storing water and any nitrogen it contains. During drier months, nitrogen is able to accumulate in soil to high levels. During winter when soils are wet, any nitrogen not used by plants leaches down into the underlying aquifer (deep drainage).

Artificial drainage (mole and tile drains) is used where soils have low subsoil permeability to help to reduce waterlogging. Contaminant loss through artificial drains to nearby streams can be high during wetter months. Overland flow may also occur during periods of heavy rain when soils are wet, especially where soils are sloping.

## What does this mean for water quality?

- ✓ Soils have good phosphorus retention.
- ✓ Limited potential for contaminant losses to rivers and streams as deep drainage is the main pathway.
- ✗ High risk of nitrogen build-up in groundwater.
- ✗ Following heavy or prolonged rainfall, contaminant losses to rivers and streams may occur via overflow or artificial drainage.



▶ Deep drainage (leaching) of nitrogen to groundwater is the main contaminant pathway in this zone. Artificial drainage and overland flow are also important contaminant pathways in some parts of the zone and can carry nitrogen, phosphorus, sediment and microbes.

## Improving 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 Oxidising zone

In addition to the above, good management in the Oxidising zone includes measures for reducing the effects of deep drainage, artificial drainage and overland flow.

Reduce the effects of deep drainage by reducing the accumulation of surplus nitrogen in the soil, particularly during autumn and winter.

### 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

### Reduce the effects of overland flow by:

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

## Physiographic zones and the Southland Water and Land Plan

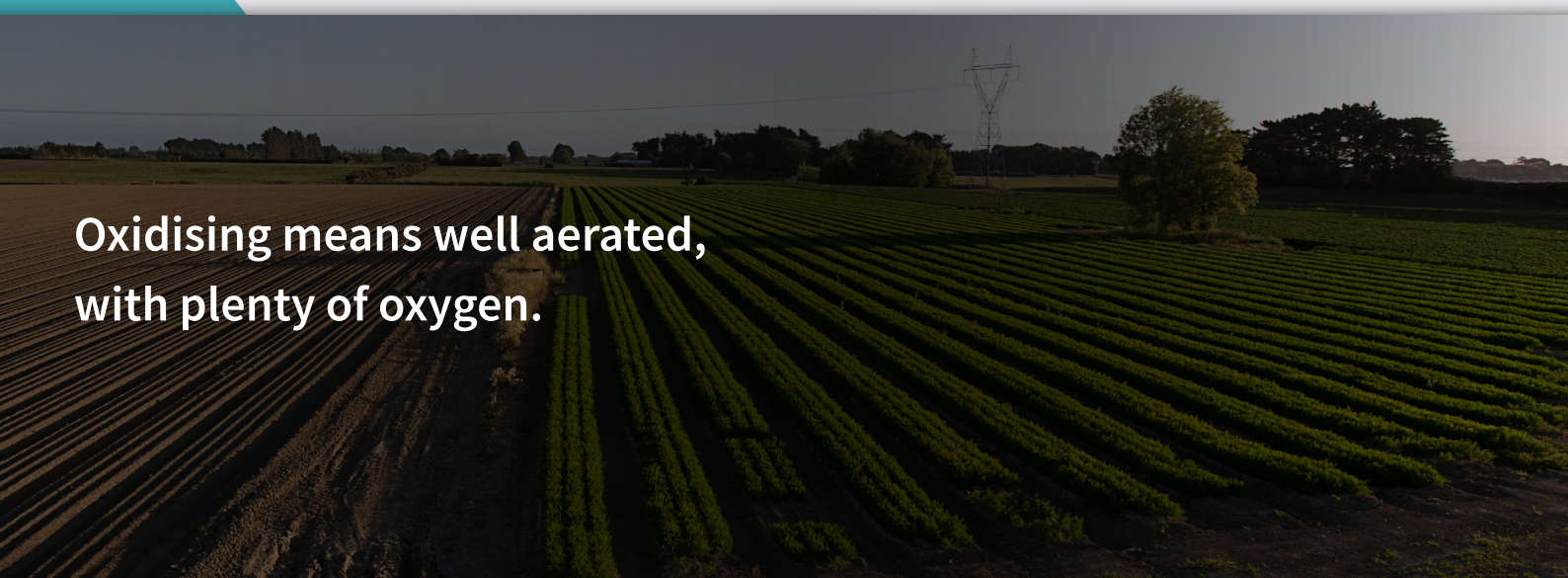
Environment Southland has developed a proposed Southland Water and Land Plan, using the science behind the physiographic zones to inform the plan and provide a tailored approach to particular issues that have been identified for each zone.

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>.



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