

Gley Soil

New Zealand Soil Classification (NZSC) orders



Otago
Regional
Council

Description

Gley soils are formed in areas when there is prolonged wetness from high groundwater, perched water tables or slow drainage. They have pale to blue coloured subsoils resulting from low oxygen conditions. They represent the original extent of wetlands but can be productive if drained but remain prone to flooding.

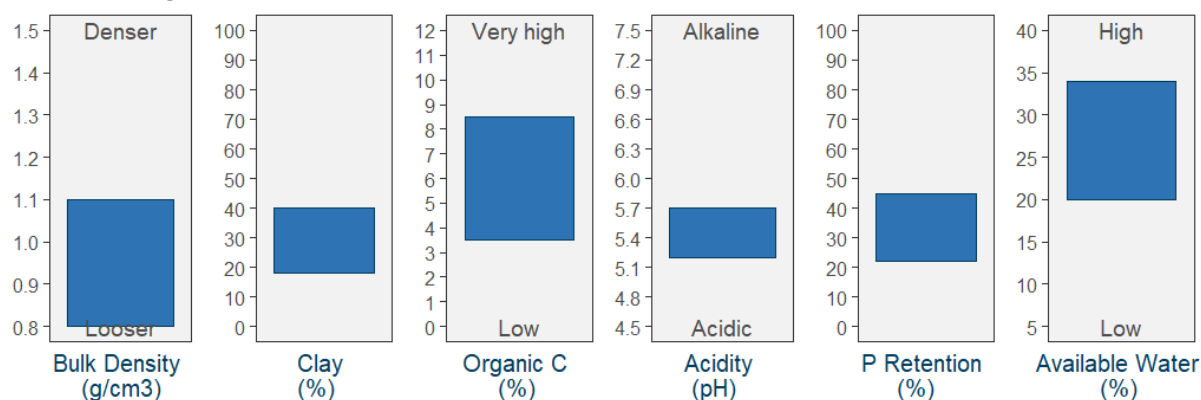
They make up around 2% of soils in Otago.

Key characteristics

- ▶ **Parent material** Colluvial or alluvial material of different rocks
- ▶ **Drainage** Poorly to very poorly
- ▶ **Fertility** Medium to high
- ▶ **Rooting depth** Unlimited but shallow due to low oxygen

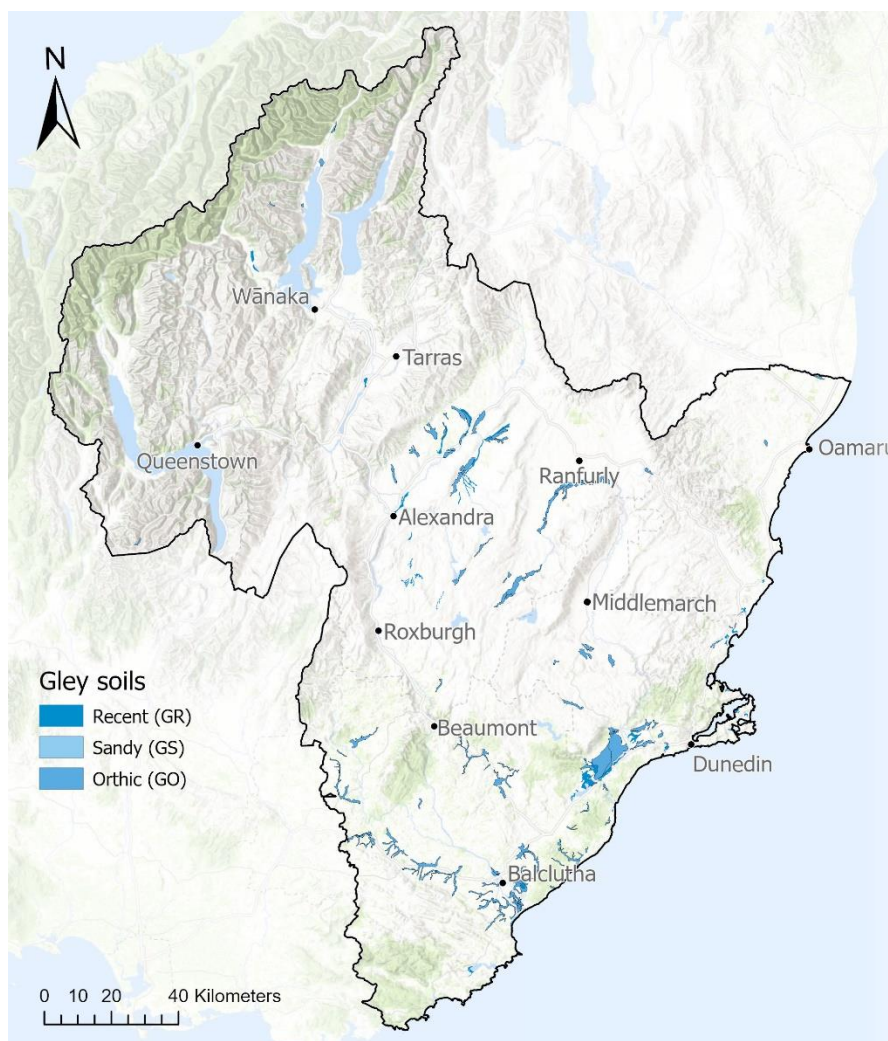


Expected ranges of Gley topsoil (0-10 cm) key properties². *C is carbon, P is phosphorus.*



Vulnerabilities

▶ Structural damage		High	Poor drainage and waterlogging even with installed drains means a high risk of structural damage from machinery use and pugging.
▶ Nutrient loss	N	Low	Poor drainage and conditions for denitrification of nitrate mean leaching is not a risk unless artificially drained.
	P	Medium	Surface ponding can increase the risk of surface P runoff.
▶ Erosion		Low	Due to being predominantly on flat land with poor drainage characteristics erosion risk is low. Flooding and ponding can increase topsoil erosion in drainage waters.
▶ Waterlogging		High	Poor drainage with high or perched water table and vicinity to waterbodies means waterlogging and flooding is a constant risk, even if drained.



Occurrence

They occur in low lying areas with high rainfall or with high water tables. They are predominantly found on the floodplains of major rivers. They can also form where water accumulates in gullies, seepages, and the base of slopes.

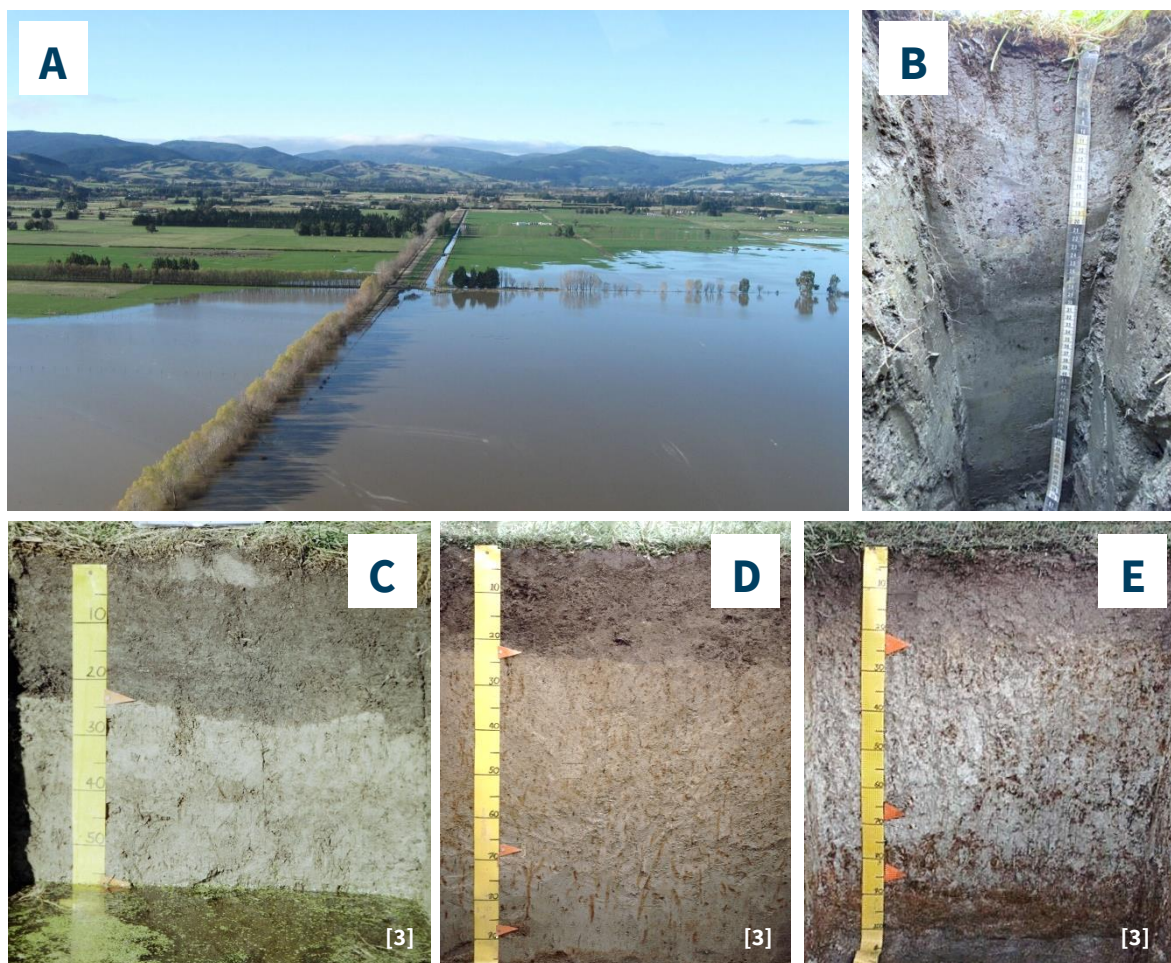
The map shows the regional extent of the different NZSC groups of Gley soil. For more detailed mapping see page 4.

NZSC group	%*	Description ²	Management considerations ²
Recent	18	Formed on young land surfaces, mainly alluvial or estuarine.	Can be highly productive for both pasture and cropping once drained. Use of heavy machinery should be limited when wet and pugging damage by stock is a common risk. Drains need to be well managed.
Sandy	0.2	Dominated by sand or loamy sand to depth.	Artificial drainage may be difficult because of lack of fall to a drainage outlet. Bearing capacity should be tested for weight bearing structures. Some areas are best left to water-tolerant native vegetation. However, in some areas these can be usefully managed in association with the adjacent dunes (where care is needed to prevent severe wind erosion and dune remobilisation).
Orthic	81	Other simple Gley soils that do not have any of the properties above.	Can be highly productive for both pasture and cropping once drained. Trafficability is limited when wet and pugging damage by stock is a common risk. Drains need to be well managed.

*Extent of each group as a percentage relative to all Gley soils in the Otago region.

In the region

In Otago, Gley soils are predominantly found on the floodplains of the major rivers (Taiari, Manuherekia, Pomahaka, Clutha/Mata au) and their tributaries (Ida Burn and Pool Burn, for example). The vast majority of these are Orthic Gley soils. Recent Gley soils are often formed in close proximity to the Orthic group but tend to have more frequent sediment input due to flooding of rivers or from estuaries. Most Recent Gley soils in Otago are by rivers with a few by estuaries on the Otago Peninsula and in small pockets across the East Coast. Sandy Gley soil in Otago is rare and is only found at the mouth of the Tokomairaro river. Much of the extent of Gley soils in Otago represent the former extent of wetlands prior to drainage and land clearing.



A Gley soils are prone to flooding due to their poor drainage characteristics - flood of the Taiari plains in 2010. **B** Recent Gley soil profile near Inchclutha on the floodplain of the Clutha Mata au. **C** Recent Gley with a water table at 60 cm. **D & E** Orthic Gley soil with the pale grey gleying visible at different depths.

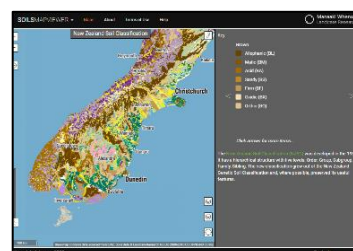
Sustainable management

▶ Erosion & Structure	Maintain vegetation cover, no-till crop establishment and wind breaks can reduce erosion. Avoid working and grazing (or only lightly) when the soil is wet and build organic matter.
▶ Nutrients	It is recommended to always work with the 4Rs for fertiliser management: <i>right place, right time, right rate and right product</i> . Find out more information on fertiliser management here .
▶ General	For general guidelines on sustainable soil management you can find some useful links here .

Soil maps

► Fundamental Soil Layer

Owner	Manaaki Whenua Landcare Research
Recommended use	Use at larger scales for general overview
Coverage	100%
Scale	1:50,000
Soil naming	NZSC
Development	Will be replaced by S-map
Link	soils-maps.landcareresearch.co.nz



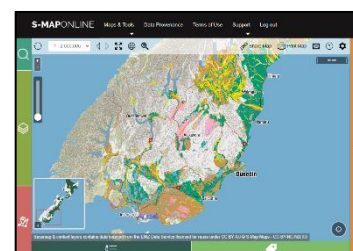
► growOTAGO

Owner	Otago Regional Council
Recommended use	Only use where S-map not available
Coverage	100% Otago (by lowland and upland)
Scale	1:50,000
Soil naming	Old regional soil series names
Development	Not planned
Link	maps.orc.govt.nz/OtagoMaps/



► S-map

Owner	Manaaki Whenua Landcare Research
Recommended use	Best available map. Use where present
Coverage	~30% of Otago
Scale	1:50,000
Soil naming	New S-map series names and NZSC
Development	Mapping ongoing
Link	smap.landcareresearch.co.nz/



For the te ao Māori of oneone (soil), including kaupapa Māori, history, and soil names, you can find more information [here](#).

Contact

For any questions you may have contact:

science.enquiries@orc.govt.nz

Note - This Infosheet generalises typical average properties of the specified soil order and groups. It has been prepared in good faith by trained staff within time and budgetary limits. However, no responsibility or liability can be taken for the accuracy of the information and interpretations. Expert advice should be sought before making decisions on individual farms. The characteristics of the soil at a specific location may differ from those described here. The vulnerability ratings given in the table on page 1 are generalised and should not be taken as absolutes for this soil in all situations. The actual risk depends on the environmental and management conditions prevailing at a particular place and time.

References

- [1] Manaaki Whenua - Landcare Research 2023. The New Zealand SoilsMapViewer. https://doi.org/10.26060/9vfz_hw43. Photos reproduced with permission.
- [2] Hewitt, A.E., Balks, M. R., and Lowe, D.J., 2021. The Soils of Aotearoa New Zealand. Chapter 5 Gley Soils. Springer International Publishing.
- [3] New Zealand Society of Soil Science and Manaaki Whenua - Landcare Research photo library. Photos reproduced with permission.

