

Pallic Soil



Otago Regional Council

New Zealand Soil Classification (NZSC) orders

Description

Pallic soils, as their name suggests, are pale due to low contents of iron oxides. They are mainly formed from fine wind-deposited silt (loess) and have weak soil structure and high density in subsurface horizons. They are typically dry in summer and wet in winter.

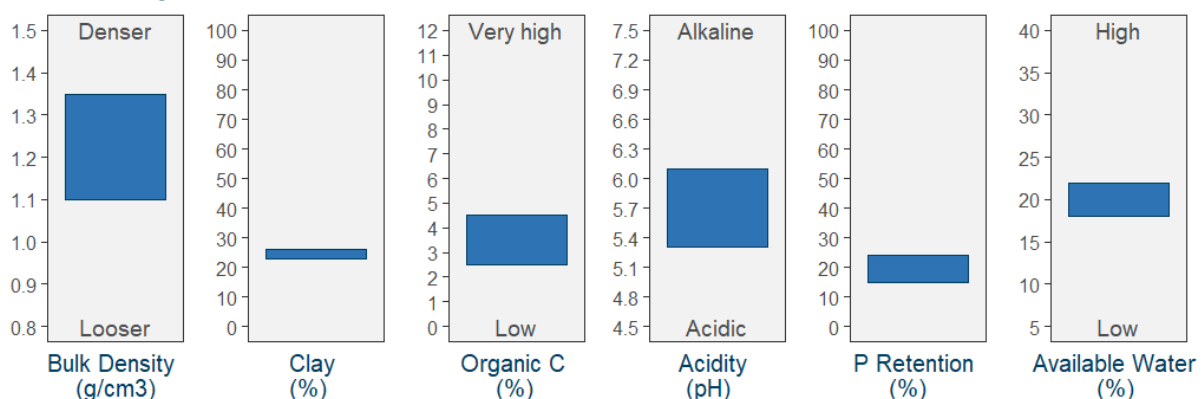
They make up 27% of soils in Otago.

Key characteristics

- ▶ **Parent material** Loess from schist or greywacke
- ▶ **Drainage** Poor to imperfect
- ▶ **Fertility** Medium to high (except for Sulphur)
- ▶ **Rooting depth** Moderate to limited

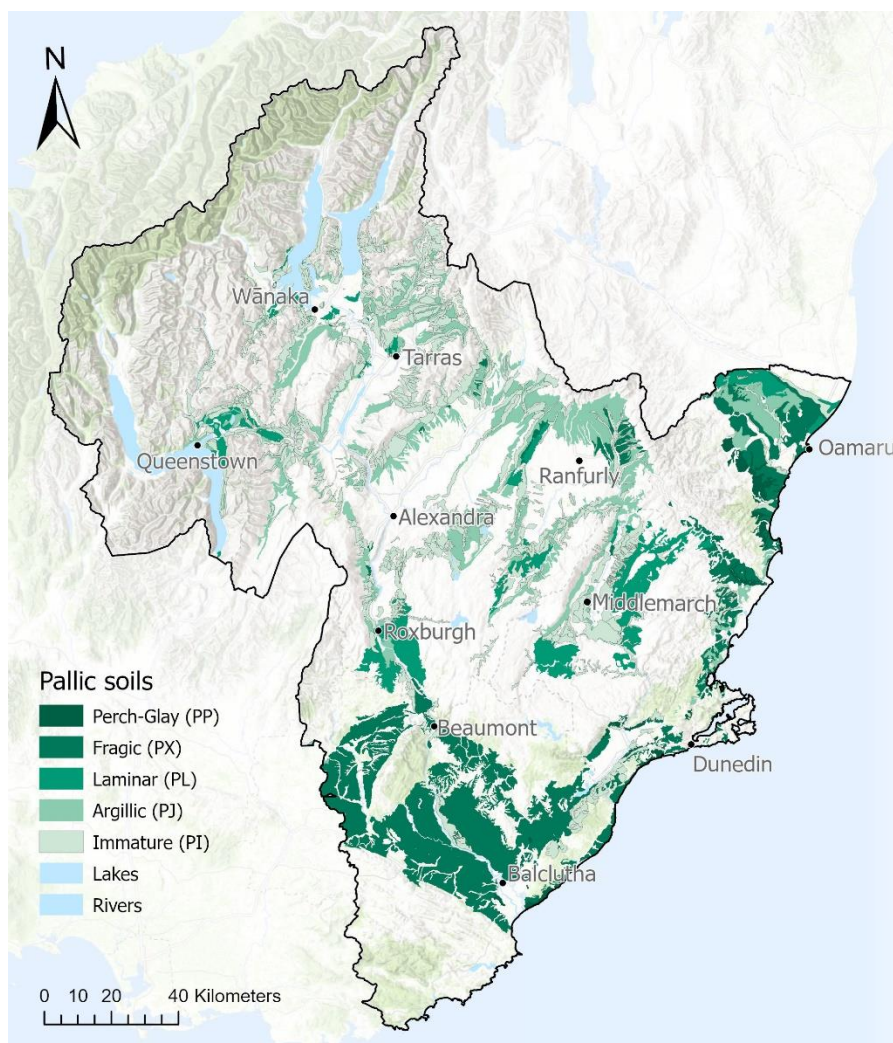


Expected ranges of Pallic topsoil (0-10 cm) key properties². *C is carbon, P is phosphorus.*



Vulnerabilities

▶ Structural damage	Medium	Impaired drainage or weak structure means they are susceptible to damage from pugging and heavy machinery use, especially when wet.
▶ Nutrient loss	N	Medium Greater risk for the better drained groups.
	P	Medium Low P retention means P easily lost from surface runoff. Bypass flow via soil cracks can occur after drought.
▶ Erosion	High	Weak structure means they are erodible. Tunnel gully erosion is common on slopes. Wind erosion is a risk when ploughed.
▶ Waterlogging	Medium	Fragic and Perch-Gley Pallic soils are susceptible to waterlogging due to poor drainage and almost impermeable pans. Other Pallic soils are better drained.



Occurrence

Pallic soil mainly occurs on the rolling downlands in Otago. Generally, they are found in areas of annual rainfall between 500 and 800 mm. They are in places where summer drought is common and are often waterlogged in winter.

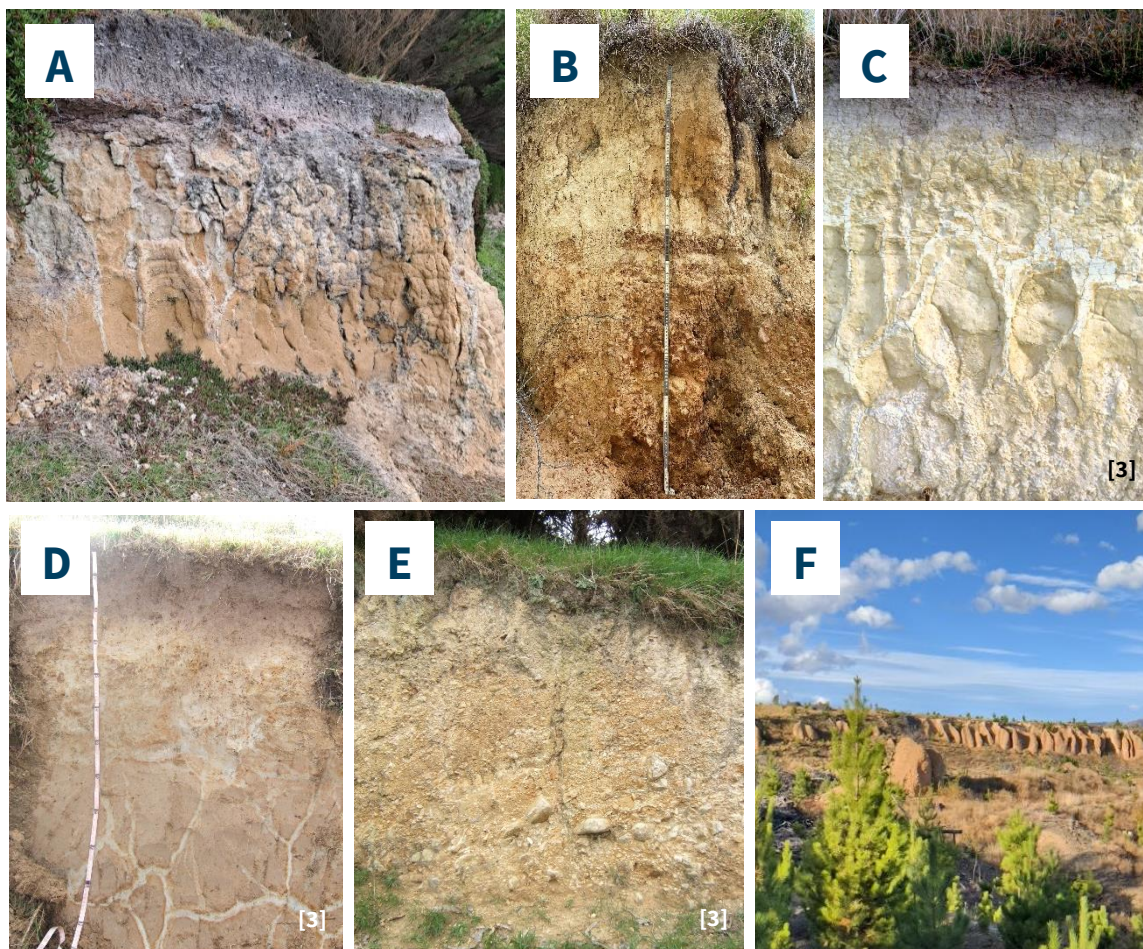
The map shows the regional extent of the different NZSC groups of Pallic soil. For more detailed mapping see page 4.

NZSC group	%*	Description ²	Management considerations ²
Perch-Gley	2	Prolonged periodic wetness caused by a perched water table.	Remain wet over winter and into spring. Heavy grazing can promote pugging and runoff of sediment and faecal matter. Drains are widely used to reduce waterlogging.
Fragic	32	Dense brittle pan in the subsoil that impedes drainage and rooting.	Restricted potential rooting depth. Caution is needed if cultivating as the soil has high propensity for wind and rill erosion. Minimal or no-till establishment of cultivation is best.
Laminar	12	Clay accumulation as thin subsoil bands.	Productive versatile soils due to deep rooting potential and satisfactory permeability. Suited to irrigation.
Argillic	19	Clay accumulation as thin coatings on peds or in pores.	Versatile with deep rooting potential. Suited to irrigation.
Immature	34	No pan, or argillic horizon, weakly expressed Pallic Soil features.	High versatility, because of their deep rooting potential, which enables exploitation of the high available water capacity in the subsoil. Can be highly productive. Suited to irrigation.

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

In the landscape

In Otago, Pallic soils are predominantly used for pastoral grazing. In Central Otago, mostly Immature Pallic soils dominate the rolling hills and merge into Semiarid soils where drier and Brown soils where wetter. Fragic Pallic soils are the next most extensive of the Pallic groups and are formed from loess on stable slopes in South Clutha and North Otago. Laminar Pallic soils are mainly present in the rolling hills around Ettrick, Ngapara, Moonlight and Queenstown. Perch-Gley Pallic are restricted to pockets of wet areas generally close to the coast and often at the foot slopes of hills, where they are associated with Gley soils.



A Cutting showing the pale-orange loess parent material below the pan of a Fragic Pallic soil. **B** Old Argillic Pallic soil with clay accumulated in the deeper horizons. **C & D** A pale poorly drained Perch-Gley Pallic soil, where pale gleyed lines show the blocky structure and frequency of wetting. **E** Cutting of a stony Immature Pallic soil. **F** The clay-containing loess of Argillic Pallic soil near Naseby.

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



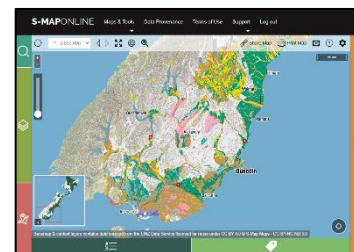
► growOTAGO

Owner	Otago Regional Council
Recommended use	Only use where S-map not available
Coverage	100% of 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/10.26060/9vzf_hw43. Photos reproduced with permission.
- [2] Hewitt, A.E., Balks, M. R. and Lowe, D.J., 2021. The Soils of Aotearoa New Zealand. Chapter 10 Pallic Soils. Springer International Publishing. Pages 145-162. Fragic Pallic soil profile.
- [3] New Zealand Society of Soil Science and Manaaki Whenua - Landcare Research photo library. Photos reproduced with permission.

