Semiarid Soil

New Zealand Soil Classification (NZSC) orders

Otago Regional Council

Description

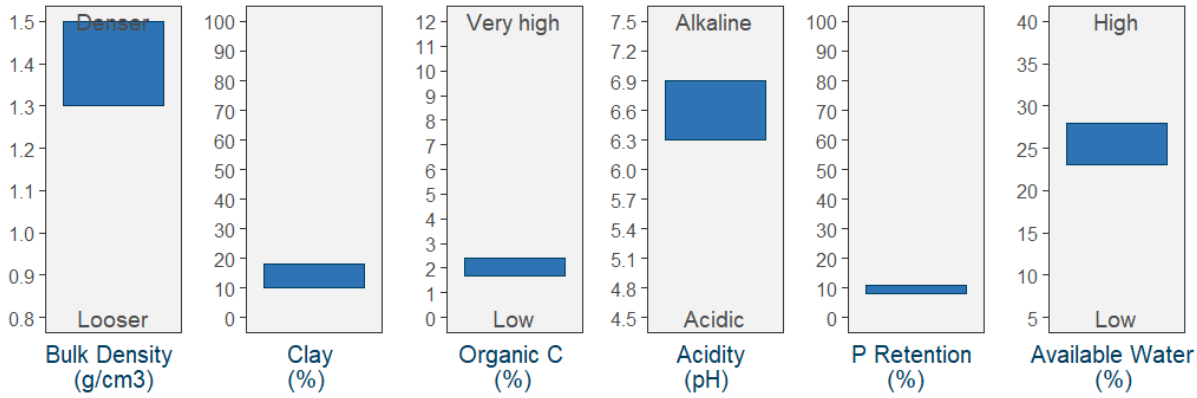
Formed in the driest areas of the country where most months experience a water deficit, Semiarid soils in the inland basins of Central Otago range from gravelly soil on low terraces to older clay rich soils on higher terraces and hills. They are productively used for merino drystock farming and lowland pasture and horticulture when irrigated.

They make up 7% of soils in Otago.

Key characteristics

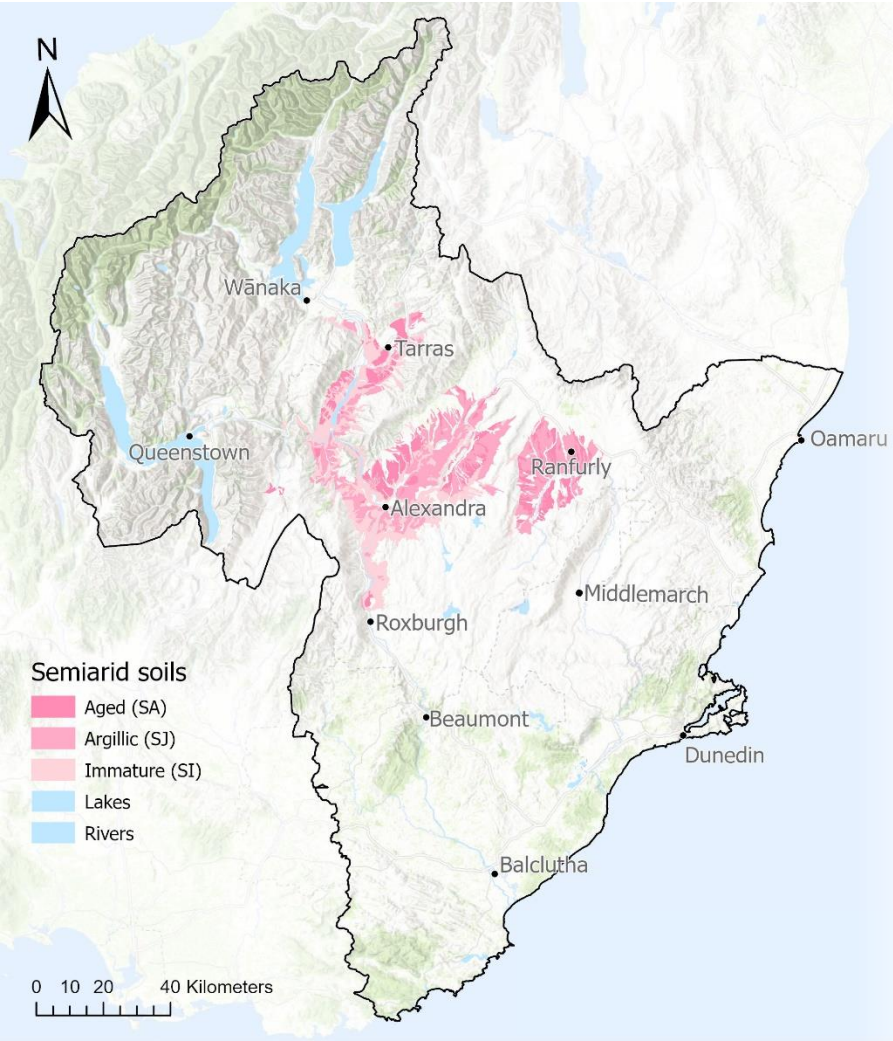
- **Parent material** — Schist or greywacke alluvium, colluvium, loess
- **Drainage** — Moderate to well
- **Fertility** — Medium (high Na, K, Ca, Mg)
- **Rooting depth** — Limited due to rock and dryness

Expected ranges of Semiarid topsoil (0-10 cm) key properties[2]. *C is carbon, P is phosphorus.*



Vulnerabilities

▶ **Structural damage**		**High**	Weakly developed soil structure due to low clay and organic matter contents means they are at high risk of breaking down from heavy use, especially when wet.
▶ **Nutrient loss**	**N**	**High**	N leaching high risk due to the drainage characteristics.
	P	**High**	Low P retention and high permeability means P easily lost from surface runoff and bypass flow down fissures.
▶ **Erosion**		**High**	Weak structure means they are highly erodible. Wind and water erosion are a severe risk when not protected by vegetation.
▶ **Waterlogging**		**Medium**	Permeability can vary depending on the clay content. Poor irrigation management can lead to ponding and/or perched water tables, especially in the Aged-Argillic group.



Occurrence

Semiarid soils are only found in the inland basins of Central Otago, where annual rainfall is generally between 300 and 500 mm and evapotranspiration is high (water deficits common throughout the year). They experience hot summers and cold winters.

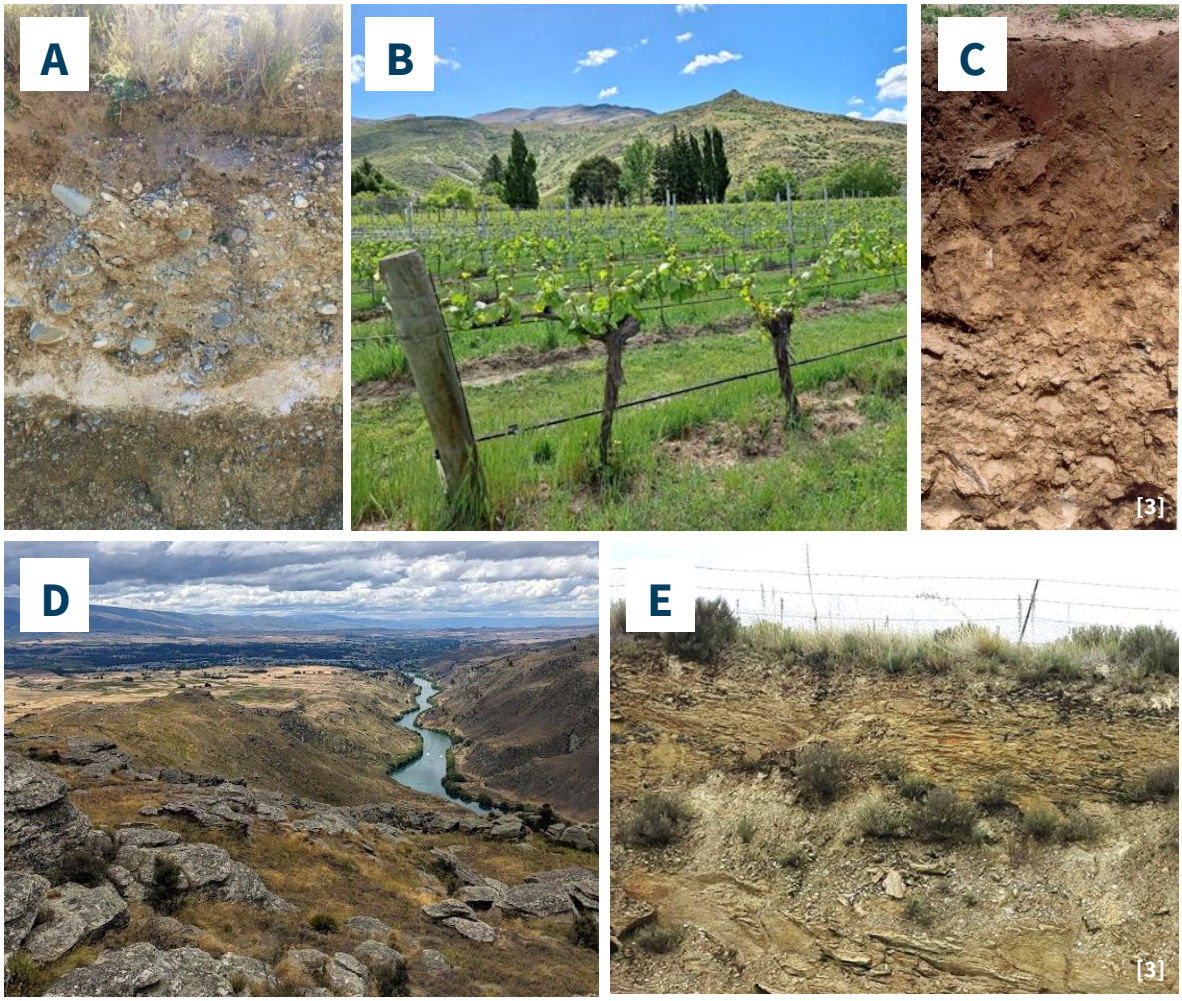
The map shows the regional extent of the different NZSC groups of Semiarid soil. For more detailed mapping see page 4.

NZSC group	%*	Description[2]	Management considerations[2]
Aged-Argillic	19	Have reddish clay accumulation in the subsoil.	With age the clay can clog the subsoil soil pores, which may limit the potential for roots to penetrate the subsoil for water and nutrients. Under irrigation, there may be a risk of waterlogging in the subsoil.
Argillic	45	Have clay accumulation as thin coatings on peds or in pores.	Unlike Aged-argillic soils, the clay may not affect the potential root depth and may boost the water holding capacity.
Immature	36	Weakly expressed Semiarid soil features.	Rapidly permeable gravelly soils, and some strongly structured soils. The stony profile is poor for most crops not only because of the low rainfall but also because the abundant gravels reduce the amount of fine soil available to trap any rain that does fall. There is little stored water for roots to tap into. Stone-fruit orchards are successful on Immature Semiarid soil, though are susceptible to frost damage.

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

In the region

Argillic Semiarid soils are the most extensive of the order and are found on low to intermediate terraces throughout Otago. Immature Semiarid soils are more common on the lower terraces between Roxborough and Luggate with less in the Manuherekia and the Maniototo is almost void of them. Aged-Argillic tend to form at the highest elevations of the Semiarid soils and are the oldest (ca. 350,000 years old). Semiarid soil starts to intergrade with Pallic and then Brown soils at higher elevations (>300 m) and greater annual rainfall (>500 mm).



A White calcium carbonate (salt) visible at the base of the B horizon which accumulate due to the low rainfall and high evapotranspiration. **B** With irrigation Semiarid soils can be very productive for a range of horticultural crops. **C** An Argillic Semiarid soil profile, where the red brown is clay. **D** Looking up the Roxburgh Gorge towards Alexandra – a typical arid and rocky landscape of Semiarid soils. **E** Cutting showing the weathered schist.

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: *right place, right time, right rate and right product*. Find out more information on fertiliser management here.
▶ **General**	For general guidelines on sustainable soil management you can find some useful links here.

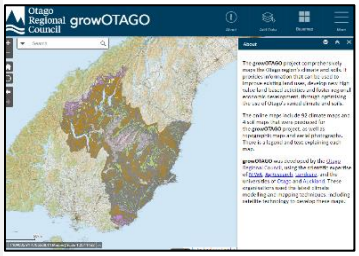
Soil maps

► 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

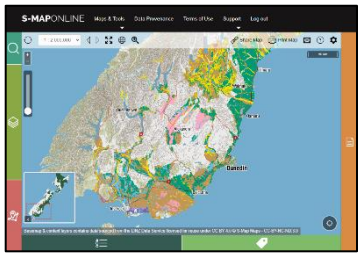
► growOTAGO

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. Aged-Argillic soil profile on a high terrace.

[2] Hewitt, A.E., Balks, M. R., and Lowe, D.J., 2021. The Soils of Aotearoa New Zealand. Chapter 15 Semiarid Soils. Springer International Publishing.

[3] New Zealand Society of Soil Science and Manaaki Whenua - Landcare Research photo library. Photos reproduced with permission.