

This Technical Data Sheet describes the *typical average properties* of the specified soil.

It is essentially a summary of information obtained from one or more profiles of this soil that were examined and described during the Topoclimate survey or previous surveys. 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. Advise should be sought from soil and landuse experts before making landuse decisions on individual farms and paddocks.

The characteristics of the soil at a specific location may differ in some details from those described here.

No warranties are expressed or implied unless stated.

Soil name: Grasmere

Overview

Grasmere soils occupy about 760 ha on low lying coastal flood basins of the Oreti and Waihopai rivers. They are formed into fine alluvial silt overlying gravels derived from greywacke rock. Soils are deep, poorly drained and have acidic subsoils, with silty clay grading with depth to silt loam textures. Present use is pastoral grazing with sheep and beef cattle. Climate is cool temperate with coastal prevailing south to west winds. Regular rainfall occurs and soils are never dry.

Soil classification

NZ Soil Classification (NZSC):

Acidic Recent Gley; stoneless; clayey over silty

Previous NZ Genetic Classification:

Gley Recent

Classification explanation

The NZSC for Grasmere soils is consistent with the previous classification. The soils are poorly drained due to a high groundwater table, and young enough to show limited profile development. The soils are typically stone free, have clayey overlying silty textures, and acidic subsoils with pH of less than 5.5.

Soil phases and variants

Identified units in the Grasmere soils are:

- Grasmere undulating deep (GsU1): has no gravel within 90cm depth; occurs on slopes of 0–7°

The soil properties described in this Technical Data Sheet are based on the most common phase, Grasmere undulating deep (GsU1). Values for other phases and variants can be taken as being similar. Where they differ significantly they are recorded with a separate versatility rating.

Associated soils

Some soils that commonly occur in association with Grasmere soils are:

- Otakau: poorly drained accumulating soil of the coastal Oreti River flood basin; has silty overlying sandy textures
- Titipua: poorly drained floodplain soil with over-thickened slightly peaty topsoils
- Invercargill: poorly drained peat soil; formed on basin peat bogs
- Jacobs: very poorly drained soil of the saline estuary margin

Similar soils

Some soils that have similar properties to Grasmere soils are:

- Makarewa: poorly drained slowly accumulating soil of river and stream floodplains throughout Southland; has clayey textures, but subsoils are typically not acidic
- Dacre: poorly drained accumulating soil of river and minor stream floodplains throughout southern Southland; typically has silty textures and acidic subsoils
- Braxton: occurs on terraces; textures vary from silt loam to silty clay

Typical profile features

The following is a 'generic' or composite profile description representing the most common combination of characteristics for this soil type. The actual profiles for which descriptions and data are available are listed at the end of this Technical Data Sheet.

Grasmere profile	Horizon	Depth (cm)	Description
	Apg	0–20	Greyish yellow-brown silty clay; few brown mottles; slightly firm soil strength; moderately developed medium polyhedral structure; abundant roots.
	Bg	20–60	Grey silt loam; many bright brown mottles; few wormcasts; slightly firm soil strength; moderately developed medium polyhedral structure; abundant roots
	BCg	60–90+	Grey loamy silt; many bright brown mottles; weak soil strength; massive structure; many roots.

Key profile features

Grasmere soils have a topsoil 20–30cm deep that has a weakly developed structure. Subsoils have moderate structure, grading to structureless at depth. Subsoils are dominated by grey colours, reflecting the poor drainage caused by the high water table. Buried soils are common features of this soil.

Typical physical properties

Note: values in *Italics* are estimates

Horizon	Depth (cm)	Bulk density	Permeability	Texture	Gravel content
Apg	0–20	Moderate – High	<i>Moderate</i>	Silty clay	Gravel free
Bg	20–60	Moderate	<i>Slow</i>	Silt loam	Gravel free
BCg	60–90+	Moderate – High	<i>Slow</i>	Loamy silt	Gravel free

Profile drainage: Poor

Plant readily available water: *Moderately high*

Potential rooting depth: Deep

Rooting restriction: Subsoil aeration may be limiting in some soils

Key physical properties

Grasmere soils have a deep rooting depth and moderately high available soil water, although the rooting depth may be limited by poor aeration during wet periods due to the poor drainage and slow subsoil permeability. Texture is silty clay in the upper horizons, grading to silt loam to loamy silt in the subsoil. Topsoil clay content is about 35–40%. The soils are typically stone free.

Typical chemical properties

Horizon	Depth (cm)	pH	P retention	CEC	BS	Ca	Mg	K	Na
Apg	0–20	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Very low	Moderate
Bg	20–60	Low	Moderate	Moderate	Low	Low	Moderate	Low	Low
BCg	60–90+	Very low	Moderate	Low	Very low	Very low	Very low	Very low	Very low

Key chemical properties

Topsoil organic matter content is about 6%, P-retention 40% and topsoil pH moderate (mid 5s). Subsoil pH values are very low (mid 4s). Topsoil cation exchange and base saturation are moderate, becoming low in the subsoil. Available calcium and magnesium levels are moderate and potassium levels low. Soil reserve phosphorus is low. Micronutrient levels are generally adequate.

Vulnerability to environmental degradation

Note: the vulnerability ratings given in the table below are generalised and should not be taken as absolutes for this soil type in all situations. The actual risk depends on the environmental and management conditions prevailing at a particular place and time. Specialist advice should be sought before making management decisions that may have environmental impacts. Where vulnerability ratings of Moderate to Very severe are indicated, advice may be sought from Environment Southland or a farm management consultant.

Vulnerability factor	Rating	Vulnerability compared to other Southland soils
Structural compaction	moderate	These soils have a moderate vulnerability to structural degradation by long-term cultivation, or compaction by heavy stocking and vehicles. This rating reflects the poor drainage, offset by the moderate to high topsoil clay content.
Nutrient leaching	slight	These soils have a slight vulnerability to leaching to groundwater. This rating reflects the poor drainage, high water-holding capacity and slow subsoil permeability.
Topsoil erodibility by water	slight	Due to the moderate to high clay content, topsoil erodibility in these soils is slight. Erodibility is highly dependent on management, particularly when there is no vegetation cover.
Organic matter loss	slight	Vulnerability to long-term decline in soil organic matter levels is partly dependent on soil properties and highly dependent on management practices (e.g., crop residue management and cultivation practices).
Waterlogging	severe	These soils have a severe vulnerability to waterlogging during wet periods. This rating reflects the poor drainage and slow permeability.

General landuse versatility ratings for Grasmere soils

Note: The versatility ratings in the table below are indicative of the major limitations for semi-intensive to intensive landuse. These ratings differ from those used in the past in that sustainability factors are incorporated in the classification.

Refer to the Topoclimate district soil map or property soil map to determine which of the soil symbols listed below are applicable, then check the versatility ratings for that symbol in the appropriate table.

GsU1 (Grasmere undulating deep)

Versatility evaluation for soil GsU1		
Landuse	Versatility rating	Main limitation
Non-arable horticulture	Limited	Inadequate aeration during wet periods; potential flood risk.
Arable	Limited	Inadequate aeration during wet periods; potential flood risk.
Intensive pasture	Moderate	Inadequate aeration during wet periods; potential flood risk.
Forestry	Limited	Inadequate aeration during wet periods; potential flood risk.

Management practices that may improve soil versatility

- Careful management after heavy rain and wet periods will reduce the impact of short-term waterlogging. Intensive stocking, cultivation and heavy vehicular traffic use should be minimised during these periods.
- Installation and maintenance of subsurface mole and tile drains will reduce the risk of sustained aeration limitations and short-term waterlogging.
- If compaction occurs, aeration at the correct moisture condition and depth can be of benefit.

Soil profiles available for Grasmere soils

Soil symbol	Profile ID	Topoclimate map sheet	Profile description available	Physical data available	Chemical data available	Profile photo available
Gsu1	JT3	21	✓	✓	✓	✓

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Crops for Southland
PO Box 1306, Invercargill. New Zealand



www.cropssouthland.co.nz