Soil name: Invercargill

Overview

Invercargill soils occupy about 14,300 ha throughout the lowlands of Southland. They are peat soils formed in moderately to strongly decomposed organic material. Invercargill soils typically occur as basin peats (up to 6m deep) overlaying fine alluvium and gravel, and the peat bogs vary in size from a few metres across to hundreds of hectares. The soils are characterised as having very poor drainage, and extreme acidity that severely restricts the growth of most crops. Many peat swamps are only developed around the edges, with areas of deeper peat partially or not developed, and are subsequently used for casual pastoral grazing or are included in the conservation estate. Climate varies according to location.

Soil classification

NZ Soil Classification (NZSC):	Acid Humic Organic; deep, undifferentiated amorphous; peat
Previous NZ Genetic Classification:	Organic soils

Classification explanation

The NZSC of Invercargill soils is consistent with the previous classification. The soils are formed in very poorly drained deep peat with an organic matter content of at least 30%. The peat is moderately to strongly decomposed, such that the origin of the plant material cannot be distinguished.

Soil phases and variants

Identified units in the Invercargill soils are:

- Invercargill undulating deep (IvU1): has no stones within 90cm; occurs on slopes of 0–7°

The soil properties described in this Technical Data Sheet are based on the most common phase, Invercargill undulating deep (IvU1). Values for other phases and variants can be taken as being similar.

Associated soils

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

- Dacre: poorly drained floodplain soil
- Pukemutu: poorly drained soils with a fragipan formed in deep loess on the Southland plain
- Tisbury: poorly drained soil formed in deep loess on the Southland plain
- Mokotua: imperfectly drained soil formed in deep loess on the Southland plain.
- Tiwai and Kapuka: shallow to moderately deep podzolised soils forming on marine terraces in the lower Southland plain.

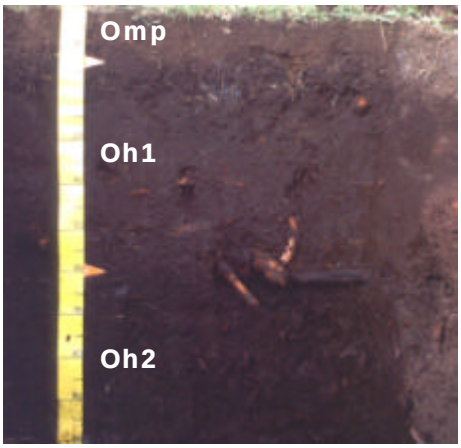
Similar soils

Some soils that have similar properties to Invercargill soils are:

- Colac: moderately decomposed basin peat formed on marine terraces adjacent to Colac Bay
- Otanomomo: weakly to moderately decomposed raised peat bog
- Titipua: has a peaty topsoil, but the organic content is between 18–30%, and is not high enough to meet the requirements of Organic soil
- Andrews: very similar weakly decomposed peat; formed from plant materials that have a minor moss component.

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.

Invercargill profile	Horizon	Depth (cm)	Description
	Omp	0–13	Dark reddish brown peaty loam; weak soil strength; moderately developed blocky structure; abundant roots
	Oh1	13–60	Very dark reddish brown peat; weak soil strength; structureless; strongly decomposed, with some weakly decomposed woody tree roots; common roots
	Oh2	60–90	Brownish black peat; weak soil strength; massive structure; moderately decomposed; few roots

Key profile features

Invercargill soils typically have no topsoil, although developed peats under pasture do show 10–30cm of peaty textured topsoil development. The profile as a whole is dominated by dark coloured moderately to strongly decomposed organic material. Tree roots and branches are also commonly buried throughout the soil.

Typical physical properties

Note: values in Italics are estimates

Horizon	Depth (cm)	Bulk density	Permeability	Texture	Gravel content
Omp	0–13	Very Low	—	Loamy peat	Gravel free
Oh1	13–60	Very Low	—	Peat	Gravel free
Oh2	60–90	Very Low	—	Peat	Gravel free

Profile drainage: Very poor
Plant readily available water: *Moderately high*
Potential rooting depth: Shallow
Rooting restriction: Very poor aeration and extreme acidity

Key physical properties

Invercargill soils in the natural state have shallow rooting depth that is limited by the very poor aeration and extremely acid subsoils. Soils that have been developed will have a deeper rooting depth, depending on the degree to which the aeration and acidity have been improved. Invercargill soils have moderately high plant available water and very low bulk densities. The texture is dominated by organic material, and the texture of the mineral fraction varies, with a clay content of 30–50%. Stones and gravel are absent except in moderately deep soil where they occur below 45cm.

Typical chemical properties

Horizon	Depth (cm)	pH	P retention	CEC	BS	Ca	Mg	K	Na
Omp	0–13	Very low	Very low	Very high	Low	Low	Very high	Low	High
Oh1	13–60	Very low	Very low	Very high	Very low	Low	Very high	Very low	High
Oh2	60–90	Very low	Very low	Very high	Very low	Very low	Very high	Very low	Very high

Key chemical properties

Organic matter levels are greater then 30%, and typically 50–90%; P-retention values very low and pH values very low (<4.9). Cation exchange is very high, reflecting the organic matter content, but the base saturation is low. Available cations vary, with low values in many soils. Reserves of phosphorus and sulphur are also very low as are micro-nutrient levels.

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	minimal	These soils have a minimal vulnerability to structural degradation by long-term cultivation, or compaction by heavy stocking and vehicles. This rating reflects the very high organic matter levels.
Nutrient leaching	slight	These soils have a slight vulnerability to leaching to groundwater. This rating reflects the very poor drainage and water-holding capacity.
Topsoil erodibility by water	minimal	Due to the high organic matter content, the topsoil erodibility is minimal. Erodibility is highly dependent on management, particularly when there is no vegetation cover.
Organic matter loss	minimal	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). Soils that have been drained will initially have a very severe vulnerability.
Waterlogging	severe	These soils have a severe vulnerability to waterlogging during wet periods. This rating reflects the very poor drainage.

General landuse versatility ratings for Invercargill soils

Note: The versatility ratings in the table below are indicative of the major limitations for semi-intensive to intensive land use. 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.

IvU1 (Invercargill undulating deep)

Versatility evaluation for soil IvU1		
Landuse	**Versatility rating**	**Main limitation**
Non-arable horticulture	Unsuitable	Inadequate aeration
Arable	Unsuitable	Inadequate aeration
Intensive pasture	Limited	Inadequate aeration; subsoil acidity
Forestry	Unsuitable	Inadequate aeration.

Management practices that may improve soil versatility

- Installation and maintenance of drainage ditches
- Liming to raise the soil pH, and adequate fertiliser

Soil profiles available for Invercargill soils

Soil symbol	Profile ID	Topoclimate map sheet	Profile description available	Physical data available	Chemical data available	Profile photo available
IvU1	JT6	21	✓	✓	✓	✓
IvU1	CT19	6	✓	✓	✓	✓
InU1	JT11	21	✓	✓	✓	✓
InU1	LT2	41	✓	✓	✓	✓
InU1	LT6	41	✓	✓	✓	✓
InU1	LT8	41	✓	✓	✓	✓
InU1	LT11	41	✓	✓	✓	✓
InU1	LT19	41	✓	✓	✓	✓
InU1	LT23	41	✓	✓	✓	✓
InU1	LT28	41	✓	✓	✓	✓
InU1	MWT10	28B	✓	✓	✓	✓

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