

This Information 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. Advice 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: **Fleming**

Overview

Fleming soils occupy about 3000ha on low angle fans, low terraces and slowly accumulating floodplains of rivers and minor streams in eastern and northern Southland and west Otago. They are formed into alluvium derived from greywacke and schist rock. Fleming soils are imperfectly to poorly drained, with a dense fragipan at 45–90cm depth which restricts water drainage, and can occasionally be flooded. At present they are used for intensive sheep, dairy and deer production, with some cropping. Regular rainfall occurs and soils are seldom dry.

Physical properties

Fleming soils have a slightly deep potential rooting depth that is severely restricted by the fragipan. Plant available water is moderately high. The soils are imperfect to poorly drained, with slow permeability in the subsoil and limited aeration during sustained wet periods. The imperfectly drained variant often has better drainage, with only a thin fragipan. Textures are silt loams, but range between loamy silt and heavy silt loam. Topsoil clay content is 20–35%, and sandy lenses are common in the subsoil. The moderately deep phases have gravels between 45 and 90cm depth.



Fleming profile

Fertility properties

Topsoil organic matter levels are 4–8%; P-retention values 20–40% (mostly 20–30%) and pH moderate (high 5s). Cation exchange values are moderate and base saturation moderate to low. Available calcium and magnesium levels are moderate, with potassium levels high. Soil reserves of phosphorus and sulphur are low. Micronutrient levels are generally adequate.

Associated and similar soils

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

- Jacobstown: poorly drained Gley soil due to high groundwater; has no fragipan
- Ardlussa: well drained, deep or moderately deep Brown soils
- Gore: well drained, shallow stony Brown soils
- Mataura: well drained, deep or moderately deep recent soils found on the accumulating floodplain

Some soils that have similar properties to Fleming soils are:

- Waikoikoi: formed in wind deposited loess on downlands.
- Athol: formed in wind deposited loess on downlands; has perch-gley properties, but no fragipan
- Pukemutu: formed in wind deposited loess on downlands; have silty clay subsoil
- Hokonui: has clayey textures, and is formed in mixed loess and alluvium on fans from the Hokonui Hills

Sustainable management indicators

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	severe	These soils have a severe vulnerability to structural degradation by long-term cultivation, or compaction by heavy stocking and vehicles. This rating reflects the poor drainage and low P-retention.
Nutrient leaching	slight	These soils have a slight vulnerability to leaching to groundwater. This rating reflects the slow subsoil permeability and high water holding capacity. The imperfectly drained variant is likely to have a moderate vulnerability.
Topsoil erodibility by water	slight	Due to the moderate clay and organic matter levels, 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

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.

FmU1 (Fleming undulating deep)

FmU2 (Fleming undulating moderately deep)

FmU1vi (Fleming undulating deep, imperfectly drained variant)

FmU2vi (Fleming undulating moderately deep, imperfectly drained variant)

Versatility evaluation for soil FmU1, FmU2, FmU1vi, FmU2vi

Landuse	Versatility rating	Main limitation
Non-arable horticulture	Limited	Inadequate aeration during wet periods; restricted rooting depth
Arable	Limited	Inadequate aeration during wet periods; short-term waterlogging risk after heavy rainfall.
Intensive pasture	Limited	Short-term water logging risk after heavy rainfall
Forestry	Limited	Inadequate aeration during wet periods; restricted rooting depth

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 should be minimised during these periods.
- Installation of subsurface mole and tile drains will reduce the risk of short-term waterlogging.
- If compaction occurs, aeration at the correct moisture condition and depth can be of benefit.

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