

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: **Monowai**

Overview

Monowai soils occupy about 9,500 ha on low and intermediate terraces in the Te Anau basin and intermittently down the Waiau River. They are formed in outwash gravels derived from basic volcanic and Fiordland rocks. These soils are generally stony and have a high P-retention. They are well drained, with few pasture roots below 50cm because of gravel. They are suitable for pastoral grazing with sheep and deer. Winters are cold with summers occasionally seasonally dry in some years.

Soil classification

NZ Soil Classification (NZSC):

Cemented Allophanic Brown; rounded-stony; granitic; loamy

Previous NZ Genetic Classification:

Yellow brown loam

Classification explanation

The NZSC of Monowai soils is consistent with the previous classification. Monowai soils are variable, with stony and sandy variants, and are formed in fine earth. They have dark coloured soils.

Soil phases and variants

Identified units in the Monowai soils are:

- Monowai undulating shallow stony (MxU3s): has gravel above 45cm depth; are stony; occurs on slopes 0–7°
- Monowai undulating shallow (MxU3): has gravel above 45cm depth; occurs on slopes of 0–7°
- Monowai steep shallow (MxS3): has gravel above 45cm depth; occurs on slopes of >25°

The soil properties described in this Technical Data Sheet are based on the most common phase, Monowai undulating shallow stony (MxU3s). Values for other phases and variants can be taken as being similar. Where they differ significantly they are recorded with a separate versatility rating, e.g., Monowai steep shallow (MxS3).

Associated soils

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

- Mararoa: deeper soil, few stones
- Freestone: deeper soil, few stones
- Excelsior: moderately deep to deep soil with a fragipan
- Princhester: deeper soil, few stones
- Otanomomo: a peat soil occurring on low lying poorly drained depressions

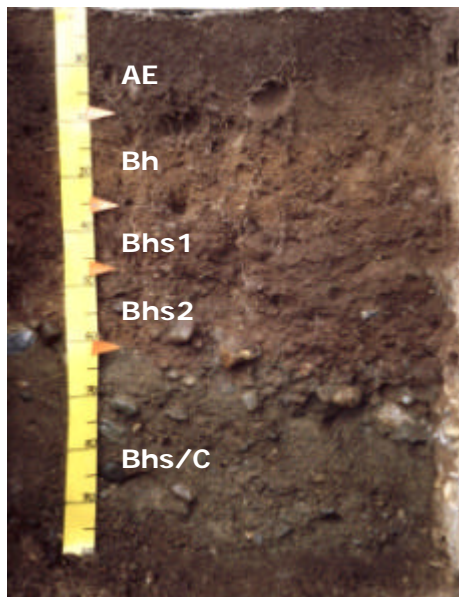
Similar soils

Some soils that have similar properties to Monowai soils are:

- Princhester: deeper and fewer stones
- Glenelg: formed on alluvial terraces; less leached and lower P-retention

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.

Monowai profile	Horizon	Depth (cm)	Description
	AE	0–16cm	Brown black slightly gravelly silt loam; weak soil strength; compact particle packing; weakly structured polyhedral; common roots
	Bh	16–25cm	Strong brown slightly gravelly silt loam; few worm casts; weak soil strength; compact particle packing; weakly structured polyhedral; rounded gravel; few roots
	Bhs1	25–36cm	Dark reddish brown very gravelly sandy; weak soil strength; moderately structured polyhedral; few roots
	Bhs2	36–53cm	Dusky red extremely gravelly sandy; firm soil strength; dense particle packing; moderately structured polyhedral; few roots
	Bhs/C	53–90cm	Dark reddish brown extremely gravelly sandy; compact particle packing; massive; no roots

Key profile features

Topsoil depth is 15–25cm with a weakly developed soil structure. Soils particles are tightly packed throughout the profile, often with a cemented layer in the subsoil. Soil colours are dark brown.

Typical physical properties

Note: values in *Italics* are estimates

Horizon	Depth (cm)	Bulk density	Permeability	Texture	Gravel content
AE	0–16cm	Low – Moderate	<i>Moderate</i>	Silt loam	Very slightly gravelly
Bh	16–25cm	Low – Moderate	<i>Moderate</i>	Silt loam	Moderately gravelly
Bhs1	25–36cm	Very Low	<i>Moderate</i>	Sand	Moderately gravelly
Bhs2	36–53cm	Very Low	<i>Slow</i>	Sand	Very gravelly
Bhs/C	53–90cm	Very Low	<i>Slow</i>	Sand	<i>Extremely gravelly</i>

Profile drainage:	Well
Plant readily available water:	<i>Low</i>
Potential rooting depth:	Shallow
Rooting restriction:	Gravel layers

Key physical properties

Pasture rooting depth depends on gravel content and there are few roots below 50–60cm. Upper horizons are well drained, but a partially cemented subsoil layer and compact gravel inhibits rapid drainage in the subsoil. Topsoils are well aerated with low bulk densities. Textures are silt loams in the upper horizons with sand textures in the subsoil. Topsoil clay content is 15–20%. Gravel content increases from slightly gravelly to extremely gravelly in the subsoil.

Typical chemical properties

Horizon	Depth (cm)	pH	P retention	CEC	BS	Ca	Mg	K	Na
AE	0–16	Low	High	Moderate	Low	Low	Moderate	Very low	Low
Bh	16–25	Moderate	High	Moderate	Very low	Very low	Very low	Very low	Low
Bhs1	25–36	Moderate	Very high	Moderate	Very low	Very low	Very low	Very low	Very low
Bhs2	36–53	Moderate	Very high	Very high	Very low	Very low	Very low	Very low	Very low
Bhs/C	53–90	Moderate	Very high	Low	Very low	Very low	Very low	Very low	Very low

Key chemical properties

Topsoil organic matter levels are 12–15%; P-retention values >75% in topsoil but below 60% in the subsoil. Profile pH values range between 5.5 and 6.0, with little change between horizons. Cation exchange values are high and base saturation values low. Available cations are low and soil reserve phosphorus, potassium and sulphur very low. Micro-nutrient 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	slight	These soils have a slight vulnerability to structural degradation by long-term cultivation, or compaction by heavy stocking and vehicles. This rating reflects the high topsoil organic matter levels.
Nutrient leaching	moderate	These soils have a moderate vulnerability to leaching to groundwater. This rating reflects the low clay content and well-drained nature of the topsoil.
Topsoil erodibility by water	minimal	Due to the high organ matter content, the topsoil erodibility of these soils is minimal. 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). Wind erosion of dry finely cultivated soil is possible.
Waterlogging	slight	These soils have a slight vulnerability to waterlogging during wet periods. This rating reflects the good drainage and shallow depth.

General landuse versatility ratings for Monowai 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.

MxU3 (Monowai undulating shallow)

MxU3s (Monowai undulating shallow stony)

Versatility evaluation for soil MxU3 and MxU3s		
Landuse	Versatility rating	Main limitation
Non-arable horticulture	Limited	Stony subsoil limiting root development; summer dry
Arable	Limited	Vulnerability to leaching to groundwater
Intensive pasture	Limited	Vulnerability to leaching to groundwater
Forestry	Limited	Stony soils limiting root development; summer dry

MxS3 (Monowai steep shallow)

Versatility evaluation for soil MxS3		
Landuse	Versatility rating	Main limitation
Non-arable horticulture	Unsuitable	steep slopes
Arable	Unsuitable	steep slopes
Intensive pasture	Limited	steep slopes; restricted rooting depth
Forestry	Limited	steep slopes; restricted rooting depth

Management practices that may improve soil versatility

- Avoidance of over cultivation of dry soils in summer will reduce risk of wind erosion.
- Irrigation for intensive pasture and crop production to overcome summer moisture deficiencies.

Soil profiles available for Monowai soils

Soil symbol	Profile ID	Topoclimate map sheet	Profile description available	Physical data available	Chemical data available	Profile photo available
MxU3s	SB9572	39	✓	✓	✓	
MxU3	MT14	7	✓	✓	✓	✓
MxU3	PT07	38	✓	✓	✓	✓
MxU3	AT04	39	✓	✓	✓	✓
MxU3	5158/72/1	38	✓			
MxU3	SB7736	39	✓	✓	✓	

Published by Crops for Southland with financial support from Environment Southland.

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