Soil name: Tokanui

Overview

Tokanui soils occupy about 15,900ha on hilly and rolling land east of the Mataura River, south of Mataura. They are formed in loess derived from greywacke and schist which overlays tuffaceous greywacke rock. Tokanui soils are well drained and have a deep rooting depth, high water holding capacity, heavy silt loam textures and P-retention of 40–85%. They are primarly used for intensive sheep and beef production. Climate is cool temperate with reliable summer rainfall.

Soil classification

NZ Soil Classification (NZSC): Typic Firm Brown; stoneless; silty
Previous NZ Genetic Classification: Strongly leached southern yellow-brown earth.

Classification explanation

The NZSC of the Tokanui soils is consistent with the previous classification. Tokanui soils are well-drained soils with yellow-brown subsoils, and rarely suffer from drought. There is a subsoil horizon that is structureless, with slightly firm or greater soil strength that may limit root penetration, and has slow permeability that may cause waterlogging during wet periods. The soils have P-retention of 40–85%, are typically stone free and have silt loam textures to 90cm depth.

Soil phases and variants

Identified units in the Tokanui soils are:

- Tokanui undulating deep (TkU1): has no gravel within 90cm depth; occurs on slopes of 0–7°
- Tokanui rolling deep (TkR1): has no gravel within 90cm depth; occurs on slopes of 7–14°
- Tokanui hilly deep (TkH1): has no gravel within 90cm depth; occurs on slopes of 15–25°
- Tokanui steep deep (TkS1): has no gravel within 90cm depth; occurs on slopes >25°

The soil properties described in this Technical Data Sheet are based on the most common phase, Tokanui rolling deep (TkR1). 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., Tokanui hilly deep (TkH1).

Associated soils

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

- Chaslands: imperfectly drained equivalent of the Tokanui soils
- Scrubby Hill: occurs above 100m altitude in the hilly land southeast of Waimahaka, but is more leached and has podzolised and acidic properties, high P-retention and thin iron pans
- Fortification: moderately deep over the underlying bedrock; strongly leached, with P-retention of >85%.
- Tyneholm: shallow over the underlying bedrock; occurs below 300m altitude north of Waimahaka

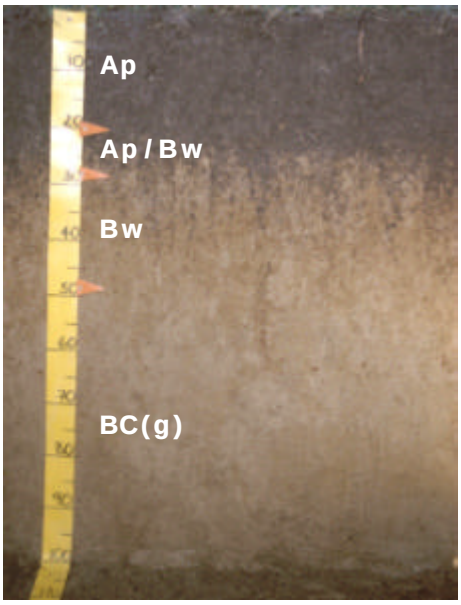
Similar soils

Some soils that have similar properties to Tokanui soils are:

- Otaraia: similar profile form, but has pH of less than 5.5 in the subsoil; occurs in the rolling and hilly land between Mataura and Clinton
- Waikiwi: similar profile form, occurs on high terraces of the Southland Plain
- Waimahaka: occurs in near-source loess adjacent to the Mataura river, south of Waimahaka; has loamy silt subsoil textures, P-retention of 60–85%, and occurs in complexes with soils that have podzolised properties
- Tuturau: occurs in near-source loess adjacent to the Mataura river, north of Waimahaka; is less weathered in subsoil, with P-retention of 25–60%, and is not associated with soils that have podzolised properties.

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.

Tokanui profile	Horizon	Depth (cm)	Description
	Ap	0–20	Greyish yellow-brown silt loam; weak soil strength; strongly developed fine to medium polyhedral structure; abundant roots
	Ap/Bw	20–28	Bright yellowish brown silt loam; many worm casts; weak soil strength; strongly developed fine to medium polyhedral structure; abundant roots
	Bw	28–49	Bright yellowish brown silt loam; very few dull yellow-orange mottles; few worm casts; weak soil strength; moderately developed coarse prismatic plus medium polyhedral structure; many roots
	BC(g)	49–90	Yellowish brown silt loam; few orange mottles; slightly firm soil strength; massive structure; few roots

Key profile features

Tokanui soils have topsoils 20–30cm deep with a moderate to strongly developed structure. Subsoils have moderate structure that becomes compact and structureless below 50cm depth. The moderate weathering of the soils is reflected in the bright yellowish brown colour.

Typical physical properties

Note: values in Italics are estimates

Horizon	Depth (cm)	Bulk density	Permeability	Texture	Gravel content
Ap	0–20	Moderate	*Moderate*	Silt loam	Gravel free
Ap/Bw	20–28	Moderate – High	*Moderate*	Silt loam	Gravel free
Bw	28–49	Moderate – High	*Slow*	Silt loam	Gravel free
BC(g)	49–90	Moderate – High	*Slow*	Silt loam	Gravel free

Profile drainage: Well

Plant readily available water: *High*

Potential rooting depth: Deep

Rooting restriction: No major restriction

Key physical properties

Tokanui soils have a deep rooting depth and high plant available water, meaning there is no major physical barrier to root growth. The soils are well drained but the compact subsoil is slowly permeable, and may cause short-term waterlogging after heavy rainfall. Texture is heavy silt loam in all horizons, with topsoil clay content of 25–35%, and the soils are typically stone free.

Typical chemical properties

Horizon	Depth (cm)	pH	P retention	CEC	BS	Ca	Mg	K	Na
Ap	0–20	Moderate	Moderate	Moderate	Low	Moderate	Low	Very low	Low
Ap/Bw	20–28	Moderate	High	Moderate	Low	Low	Very low	Very low	Low
Bw	28–49	Moderate	High	Moderate	Low	Low	Very low	Very low	Low
BC(g)	49–90	Moderate	Moderate	Low	Low	Very low	Very low	Very low	Low

Key chemical properties

Topsoil organic matter levels are 5–9%, P-retention values in the topsoil are 40–60%, with subsoil values up to 80%. Soil pH values are moderate (high 5s) in all horizons. Cation exchange values are moderate, and base saturation values and available cation values mostly low. Soil reserves of phosphorus are low and sulphate sulphur values are high in the subsoil. 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 good drainage, and the topsoil clay and P-retention values.
Nutrient leaching	moderate	These soils have a moderate vulnerability to leaching to groundwater. This rating reflects the high water-holding capacity and slow subsoil permeability.
Topsoil erodibility by water	slight	Due to the clay content, the topsoil erodibility of these soils is slight. 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). Hilly and steep phases of these soils will have nil vulnerability.
Waterlogging	slight	These soils have a slight vulnerability to waterlogging during wet periods. This rating reflects the good drainage, but slowly permeable subsoil.

General landuse versatility ratings for Tokanui 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.

TkR1 (Tokanui rolling deep)

Versatility evaluation for soil TkR1		
Landuse	**Versatility rating**	**Main limitation**
Non-arable horticulture	Moderate	Risk of short-term waterlogging after heavy rain; rolling slope
Arable	Limited	Rolling slope
Intensive pasture	Moderate	Vulnerability to leaching to ground water; rolling slope.
Forestry	High	No major limitations

TkU1 (Tokanui undulating deep)

Versatility evaluation for soil TkU1		
Landuse	**Versatility rating**	**Main limitation**
Non-arable horticulture	Moderate	Risk of short-term waterlogging after heavy rain.
Arable	Moderate	Risk of short-term water logging after heavy rain.
Intensive pasture	Moderate	Vulnerability to leaching to ground water.
Forestry	High	No major limitations

TkH1 (Tokanui hilly deep)

Versatility evaluation for soil TkH1.		
Landuse	**Versatility rating**	**Main limitation**
Non-arable horticulture	Unsuitable	Hilly slopes
Arable	Unsuitable	Hilly slopes
Intensive pasture	Limited	Hilly slopes
Forestry	Moderate	Hilly slopes

TkS1 (Tokanui steep deep)

Versatility evaluation for soil TkS1.		
Landuse	**Versatility rating**	**Main limitation**
Non-arable horticulture	Unsuitable	Steep slopes
Arable	Unsuitable	Steep slopes
Intensive pasture	Limited	Steep slopes
Forestry	Limited	Steep slopes

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 vehicular traffic should be minimised at these times.
- Installation and maintenance of subsurface mole and tile drains on flatter terrain will reduce the risk of short-term waterlogging.
- If compaction occurs, aeration at the correct depth and moisture content can be of benefit.

Soil profiles available for Tokanui soils

Soil symbol	Profile ID	Topoclimate map sheet	Profile description available	Physical data available	Chemical data available	Profile photo available
TkU1	MWT16	28B	✓	✓	✓	✓
TkR1	MWT13	28B	✓	✓	✓	✓
TkRI	MWT21	28B	✓	✓	✓	✓
TkU1	NT1	30	✓	✓	✓	✓
TkU1	ST6	29	✓	✓	✓	✓

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

Crops for Southland
PO Box 1306, Invercargill. New Zealand

www.cropssouthland.co.nz