

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: **Wairaki**

### Overview

Wairaki soils occupy about 1,800 ha on dissected, high, sloping terraces on the flanks of the northern and western slopes of the Takitimu Mountains in western Southland. They are formed into shallow loess overlying moderately to strongly weathered gravelly alluvium derived from tuffaceous greywacke and basic volcanic rocks. Soils are shallow to moderately deep, with moderate plant available water, moderately well to well drained, and have heavy silt loam to silty clay textures. Present use is pastoral farming with sheep, beef cattle and deer. Climate is temperate with cold winters. Regular rain occurs though some years can be seasonally dry.

### Soil classification

#### NZ Soil Classification (NZSC):

Typic Orthic Brown; rounded stony, tuffaceous sandstone; clayey.

#### Previous NZ Genetic Classification:

Moderately to strongly leached yellow-brown earth.

### Classification explanation

The NZSC of Wairaki soils is similar to the previous classification. Wairaki soils have no firm horizon in the subsoil, with roots being limited by the low water-holding capacity of the subsoil gravels. Wairaki soils typically have gravels within 45cm depth, with silty clay textures above the gravels.

### Soil phases and variants

Identified units in the Wairaki soils are:

- Wairaki undulating shallow (YkU3): has gravel within 45cm depth; occurs on slopes of 0–7°
- Wairaki rolling shallow (YkR3): has gravel within 45cm depth; occurs on slopes of 7–15°
- Wairaki hilly shallow (YkH3): has gravel within 45cm depth; occurs on slopes of 15–25°
- Wairaki steep shallow (YkS3): has gravel within 45cm depth; occurs on slopes of >25°
- Wairaki undulating moderately deep (YkU2): has gravel between 45 and 90cm depth; occurs on slopes of 0–7°

The soil properties described in this Technical Data Sheet are based on the most common phase, Wairaki undulating shallow (YkU3). 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., Wairaki hilly shallow (YkH3).

## Associated soils

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

- Sobig: moderately deep to shallow soil formed in loess overlying gravels
- Excelsior: deep well drained Brown soil, with a subsoil fragipan
- Mangapiri: poorly drained deep soil formed from mixed loess and mudstone
- Otanomomo: very poorly drained peat soils

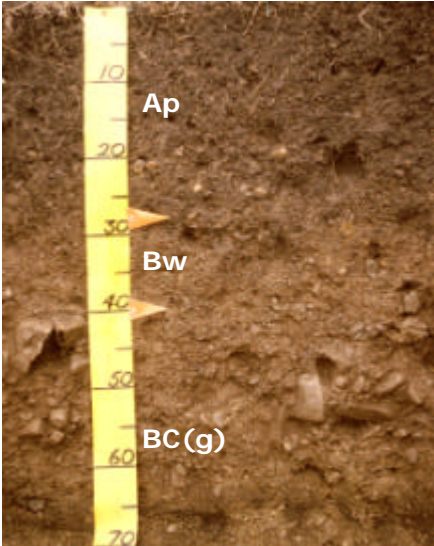
## Similar soils

Some soils that have similar properties to Wairaki soils are:

- Kaweku: occurs on high terraces of the Waimea plain; formed into moderately weathered mixed greywacke and schist gravels
- Benio: strongly weathered and leached soil, occurs on high terraces of the Waimea plain and in downlands northeast of Gore; formed into strongly weathered mixed greywacke, schist and quartz gravels
- Oteramika: occur on shoulder and sideslopes across the Southland plain; formed into moderately to strongly weathered mixed greywacke, schist, and quartz gravels.

## 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.

Wairaki profile	Horizon	Depth (cm)	Description
	Ap	0–28	Greyish yellow brown very slightly gravelly silty clay; weak soil strength; moderately developed fine to medium polyhedral structure; gravels moderately weathered and subangular; abundant roots
	Bw	28–40	Dull brown moderately gravelly silty clay; very few orange and greyish yellow mottles; weak soil strength; moderately developed fine to medium polyhedral structure; gravels moderately weathered and subangular; many roots
	BC(g)	40–70+	Dull brown very gravelly silty clay; few orange and few greyish yellow mottles; weak soil strength; moderately developed fine to medium polyhedral structure; gravels moderately weathered and subangular; many roots

## Key profile features

Wairaki topsoils are 20–30cm deep with moderate to strongly developed structure. Subsoils have moderate to weak structure depending on the amount of gravel. Mottles are sometimes present, and clay accumulation occurs in the more strongly weathered soils.

## Typical physical properties

Note: values in *Italics* are estimates

Horizon	Depth (cm)	Bulk density	Permeability	Texture	Gravel content
Ap	0–28	Low – Moderate	<i>Moderate</i>	Silty clay	Slightly gravelly
Bw(g)	28–40	Moderate – High	<i>Moderate</i>	Silty clay	Moderately gravelly
BC(g)	40–70+	—	<i>Moderate</i>	Silty clay	Very gravelly

<b>Profile drainage:</b>	Moderately well
<b>Plant readily available water:</b>	<i>Moderate</i>
<b>Potential rooting depth:</b>	Moderately deep
<b>Rooting restriction:</b>	Extremely gravelly lower subsoil

## Key physical properties

Wairaki soils have a moderately deep rooting depth, and moderate plant available water, that is limited by the gravelliness of the lower subsoil. Aeration and permeability are moderate, but the strongly weathered soils typically have clay bound gravels and are likely to be slowly permeable. Textures are heavy silt loams to silty clay, with the topsoil clay content of 35–50%. Topsoils are commonly slightly gravelly with very gravelly horizons occurring within 45cm depth.

## Typical chemical properties

Horizon	Depth (cm)	pH	P retention	CEC	BS	Ca	Mg	K	Na
Ap	0–28	Moderate	Moderate	Very high	High	High	High	High	Moderate
Bw(g)	28–40	Moderate	Moderate	High	High	High	High	Very low	Moderate
BC(g)	40–70	Moderate	Moderate	High	High	High	High	Very low	Moderate

## Key chemical properties

Topsoil organic matter levels are 7–10%; P-retention 40–55% and pH moderate (high 5s). Cation exchange and base saturation levels are high. Available calcium, magnesium and potassium values are all high. Soil reserve phosphorus and sulphur levels are 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
<b>Structural compaction</b>	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 good drainage, and moderate to high clay, P-retention, and organic matter content.
<b>Nutrient leaching</b>	severe	These soils have a severe vulnerability to leaching to groundwater. This rating reflects the good drainage and permeability.
<b>Topsoil erodibility by water</b>	slight	Due to the moderate to high clay and organic matter content, topsoil erodibility in these soils is slight. Erodibility is highly dependent on management, particularly when there is no vegetation cover.
<b>Organic matter loss</b>	moderate	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).
<b>Waterlogging</b>	slight	These soils have a slight vulnerability to waterlogging during wet periods. This rating reflects the good drainage and permeability.

## General landuse versatility ratings for Wairaki 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.

### YkU3 (Wairaki undulating shallow)

Versatility evaluation for soil YkU3		
Landuse	Versatility rating	Main limitation
Non-arable horticulture	Moderate	Vulnerability to leaching to groundwater; restricted rooting depth
Arable	Moderate	Vulnerability to leaching to groundwater
Intensive pasture	Moderate	Vulnerability to leaching to groundwater
Forestry	Moderate	Restricted rooting depth.

### YkR3 (Wairaki rolling shallow)

Versatility evaluation for soil YkR3		
Landuse	Versatility rating	Main limitation
Non-arable horticulture	Moderate	Vulnerability to leaching to groundwater; restricted rooting depth
Arable	Limited	Rolling slopes; restricted rooting depth.
Intensive pasture	Moderate	Vulnerability to leaching to groundwater; rolling slopes
Forestry	Moderate	Restricted rooting depth.

**YkH3 (Wairaki hilly shallow)**

Versatility evaluation for soil YkH3		
Landuse	Versatility rating	Main limitation
Non-arable horticulture	Unsuitable	Hilly slopes
Arable	Unsuitable	Hilly slopes
Intensive pasture	Limited	Hilly slopes
Forestry	Moderate	Hilly slopes; restricted rooting depth.

**YkS3 (Wairaki steep shallow)**

Versatility evaluation for soil YkS3		
Landuse	Versatility rating	Main limitation
Non-arable horticulture	Unsuitable	Steep slopes
Arable	Unsuitable	Steep slopes
Intensive pasture	Limited	Steep slopes
Forestry	Limited	Steep slopes; restricted rooting depth.

**YkU2 (Wairaki undulating moderately deep)**

Versatility evaluation for soil YkU2		
Landuse	Versatility rating	Main limitation
Non-arable horticulture	Moderate	Vulnerability to leaching to groundwater
Arable	Moderate	Vulnerability to leaching to groundwater
Intensive pasture	Moderate	Vulnerability to leaching to groundwater
Forestry	High	No major limitations

**Management practices that may improve soil versatility**

- Management of nutrient applications so as to minimise leaching losses

**Soil profiles available for Wairaki soils**

Soil symbol	Profile ID	Topoclimate map sheet	Profile description available	Physical data available	Chemical data available	Profile photo available
YkU3	ONT 7	25	✓	✓	✓	✓
YkU3	MT 4	7	✓	✓	✓	✓
yKU3	ZT5	43	✓	✓	✓	✓
YkU2	ZT 9	43	✓	✓	✓	✓
YkU2	150/72/12	43	✓			

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Crops for Southland  
PO Box 1306, Invercargill. New Zealand



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