Soil name: Crookston

Overview

Crookston soils occupy about 6,100 ha on terraces in the Waimea plains, and in fans flanking the Blue Mountains between Heriot and Tapanui. They are formed in wind deposited loess derived from greywacke and schist rocks. Crookston soils are well drained and have a deep rooting depth, high water holding capacity, and have light silt loam textures with P-retention between 20 and 40%. They are high producing soils currently used for intensive sheep and dairy production and some cropping. Rainfall is evenly spread, although these soils can be seasonally dry over the summer.

Soil classification

NZ Soil Classification (NZSC): Pallic Firm Brown; stoneless; silty
Previous NZ Genetic Classification: Intergrade between yellow-grey and yellow-brown earth

Classification explanation

The NZSC of the Crookston soils is consistent with the previous classification. Crookston soils are well-drained Brown soils that have properties intergrading with Pallic soils, reflected in the pale yellow-brown colours (hue 2.5Y). The subsoil horizon is structureless, with slightly firm or greater soil strength that may limit root penetration.

Soil phases and variants

Identified units in the Crookston soils are:

- Crookston undulating deep (CkU1): has no stones within 90cm depth; occurs on slopes of 0–7°
- Crookston undulating moderately deep (CkU2): has gravel between 45 and 90cm; occurs on slopes of 0–7°
- Crookston rolling deep (CkR1): has no gravels within 90cm depth; occurs on slopes of 7–15°

The soil properties described in this Technical Data Sheet are based on the most common phase, Crookston undulating deep (CkU1). 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., Crookston rolling deep (CkR1).

Associated soils

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

- Kaweku: well drained, shallow soils on high terraces
- Arthurton: imperfectly drained equivalent of the Crookston soil
- Waikoikoi: moderately deep to deep; poorly drained due to fragipan
- Jacobstown: poorly drained floodplain soil due to a high groundwater table

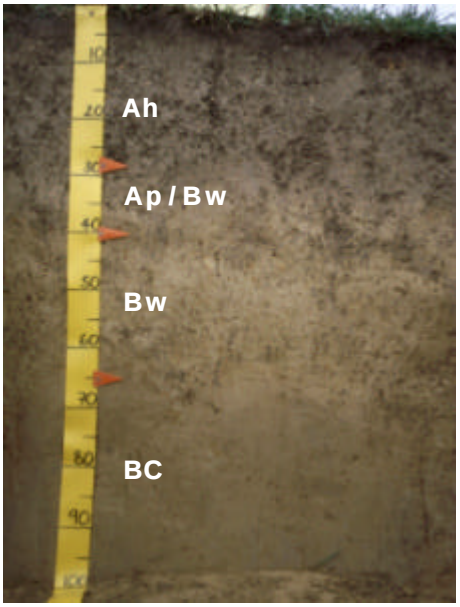
Similar soils

Some soils that have similar properties to Crookston soils are:

- Clinton: similar soil showing a greater degree of Brown soil properties with browner colours and P-retention of 30–40% throughout the profile; occurs on fans and terraces near Clinton
- Tuturau: similar soil but has loamy silt subsoil textures; formed in near-source loess adjacent to the Mataura River, between Mataura and Waimahaka
- Waikaka: also has Brown-Pallic intergrade properties, but has an upper subsoil with browner colours and P-retention of 40–60%; occurs in higher rainfall rolling and hilly land grading between the downlands and the hill country
- Nokomai: dominated by Pallic soil properties; occurs in the Garston and Waikaia plains areas
- Edendale: Brown soil on intermediate terraces of the Southland plain; has P-retention of 60–80%

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.

Crookston profile	Horizon	Depth (cm)	Description
	Ah	0–29	Greyish yellow brown silt loam; weak soil strength; strongly developed polyhedral structure; many roots
	Ap/Bw	29–40	Pale yellowish brown silt loam; many worm casts; weak soil strength; strongly developed fine polyhedral structure; many roots
	Bw	40–65	Pale yellowish brown silt loam; common worm casts; slightly firm soil strength; moderately developed fine polyhedral structure; few roots
	BC	65–90	Greyish olive silt loam; slightly firm soil strength; massive structure; few roots.

Key profile features

Crookston soils have topsoils 20–30cm deep with moderately to strongly developed structure. Subsoils have moderately developed structure that becomes more compact and structureless below 50cm depth. The weak weathering of the soils is reflected in the pale yellowish brown colour that becomes paler with depth.

Typical physical properties

Note: values in Italics are estimates

Horizon	Depth (cm)	Bulk density	Permeability	Texture	Gravel content
Ah	0–29	Moderate – High	*Moderate*	Silt loam	Gravel free
Ap/Bw	29–40	Moderate – High	*Moderate*	Silt loam	Gravel free
Bw	40–65	Moderate – High	*Moderate*	Silt loam	Gravel free
BC	65–90	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

Crookston soils have a deep rooting depth and high plant available water, meaning there is no significant 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 light silt loam in all horizons, with topsoil clay content of 20–25%. Crookston soils are typically stone free, although the moderately deep phases have gravels between 45 and 90cm depth that may restrict rooting depth and reduce available water status to moderately high.

Typical chemical properties

Horizon	Depth (cm)	pH	P retention	CEC	BS	Ca	Mg	K	Na
Ah	0–29	Moderate	Low	Moderate	Moderate	High	High	Moderate	Moderate
Ap/Bw	29–40	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Low	Moderate
Bw	40–65	Moderate	Moderate	Moderate	Low	Low	Low	Moderate	Moderate
BC	65–90	Moderate	Low	Low	Low	Very low	Low	Moderate	Moderate

Key chemical properties

Topsoil organic matter values range from 5 to 7%, P-retention values 20–40% and pH values moderate. Cation exchange and base saturation values are high in the topsoil and decrease down the profile. Available calcium, magnesium and potassium values are moderate to high in the upper soil horizons. Phosphorus reserves are low and sulphur levels low in the topsoil but high in the subsoil. Micro-nutrient levels are generally adequate although boron responses in brassicas and molybdenum responses in legumes can occur.

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	moderate	These soils have a moderate vulnerability to structural degradation by long-term cultivation, or compaction by heavy stocking and vehicles. This rating reflects the light silt loam texture and low P-retention.
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, but is offset by the good profile drainage.
Topsoil erodibility by water	moderate	Due to the light silt loam texture, the topsoil erodibility of these soils is moderate. 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	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 Crookston soils

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

CkU1 (Crookston undulating deep)

Versatility evaluation for soil CkU1		
Landuse	**Versatility rating**	**Main limitation**
Non-arable horticulture	Moderate	Risk of short-term waterlogging after heavy rain
Arable	Moderate	Risk of short term waterlogging after heavy rain
Intensive pasture	Moderate	Vulnerability to nutrient leaching to ground water; vulnerability to structural compaction.
Forestry	High	Few limitations

CkU2 (Crookston undulating moderately deep)

Versatility evaluation for soil CkU2		
Landuse	**Versatility rating**	**Main limitation**
Non-arable horticulture	Moderate	Risk of short term waterlogging after heavy rain; restricted rooting depth.
Arable	Moderate	Risk of short-term waterlogging after heavy rain
Intensive pasture	Moderate	Vulnerability to nutrient leaching to ground water; vulnerability to structural compaction.
Forestry	Moderate	Restricted rooting depth.

CkR1 (Crookston rolling deep)

Versatility evaluation for soil CkR1		
Landuse	**Versatility rating**	**Main limitation**
Non-arable horticulture	Moderate	Risk of short-term waterlogging after heavy rain; rolling slopes
Arable	Limited	Rolling slopes
Intensive pasture	Moderate	Rolling slopes; vulnerability to structural compaction
Forestry	High	Few limitations

Management practices that may improve soil versatility

- Careful management after heavy rainfall and wet periods will reduce the impact of short-term waterlogging. Intensive stocking, cultivation and vehicular traffic should be minimised during these periods.
- Installation and maintenance of subsurface mole and tile drainage will reduce the risk of short-term waterlogging
- Management of nutrient applications that minimise leaching losses

Soil profiles available for Crookston soils

Soil symbol	Profile ID	Topoclimate map sheet	Profile description available	Physical data available	Chemical data available	Profile photo available
CkU1	H2	3	✓	✓	✓	✓
CkU1	H3	3	✓	✓	✓	✓
CkU1	H11	3	✓	✓	✓	✓
CkU2	B9	12	✓	✓	✓	✓
CkU2	FT20	15	✓	✓	✓	✓
CkU1	RT1	11	✓	✓	✓	✓
CkU2	RT4	11	✓	✓	✓	✓
CkU1	WT1	24	✓	✓	✓	✓

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