Soil name: Kaweku

Overview

Kaweku soils occupy about 4,400 ha on high terraces and adjacent scarp slopes of the Waimea plain and Knapdale districts. They are formed in a thin layer of loess overlying gravelly alluvium derived from greywacke and schist rock. They are moderately well drained shallow soils with stony subsoils. They have clayey textures in the subsoil, which retains moisture well and makes them less prone to summer droughts. Kaweku soils are suitable for pasture and cropping, being presently mostly used for sheep and cereal crop production. Seasonally dry periods over summer can be expected in some years.

Soil classification

NZ Soil Classification (NZSC): Acidic Orthic Brown; rounded-stony; hard sandstone; silty

Previous NZ Genetic Classification: Yellow-grey earth.

Classification explanation

Kaweku soils have been reclassified from the previous classification based the soil properties being more similar to Brown soils than Pallic soils. This is reflected in the lack of firm subsoil, and P-retention of greater than 30% throughout the profile. Kaweku soils typically have a pH of less than 5.5 in the subsoil, and gravel occur within 45cm depth.

Soil phases and variants

Identified units in the Kaweku soils are:

- Kaweku undulating shallow (KkU3): has gravel within 45cm depth; occurs on slopes of 0–7°
- Kaweku hilly shallow (KkH3): has gravel within 45cm depth; occurs on slopes >25°
- Kaweku rolling shallow (KkR3): has gravel within 45cm depth; occurs on slopes of 7–14°

The soil properties described in this Technical Data Sheet are based on the most common phase, Kaweku undulating shallow (KkU3). 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., Kaweku hilly shallow (KkH3).

Associated soils

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

- Crookston: moderately deep to deep well drained soils
- Waikoikoi: moderately deep to deep; poorly drained due to fragipan
- Dipton: shallow, poorly drained equivalent of the Kaweku

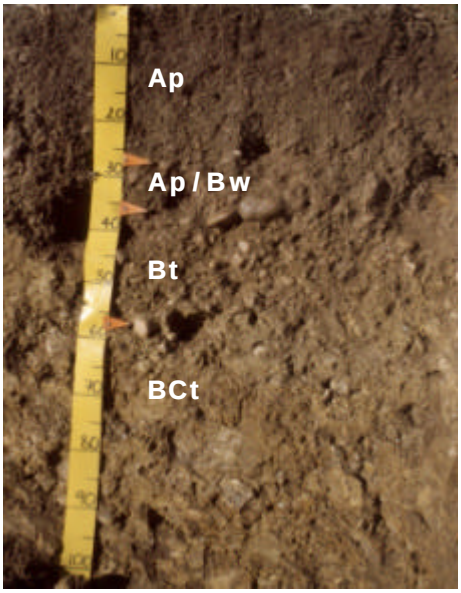
Similar soils

Some soils that have similar properties to Kaweku soils are:

- Benio: on older high terraces; generally more leached and gravels are strongly weathered
- Oreti: occur on intermediate terraces; gravels only slightly weathered with a cemented pan
- Wairaki: occur on high terraces and fans from the Takitimu mountains
- Oteramika: occur on shoulder and sideslopes in central and southern Southland, where loess has been eroded away.

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.

Kaweku profile	Horizon	Depth (cm)	Description
	Ap	0–21	Very dark greyish brown silt loam; slightly firm soil strength; strongly developed fine polyhedral structure; many roots.
	Ap/Bw	21–36	Yellowish brown moderately gravelly silty clay; many wormcasts; slightly firm soil strength; moderately developed fine polyhedral structure; gravel rounded and moderately weathered; common roots.
	Bt	36–53	Yellowish brown very gravelly silty clay; few strong brown mottles; slightly firm soil strength; moderately developed medium blocky structure; gravels rounded and moderately weathered; few roots.
	BCt	53–100	Brownish yellow extremely gravelly clay loam; slightly firm soil strength; massive structure; gravels rounded and moderately weathered; no roots.

Key profile features

Topsoil depth ranges from 15 to 30cm and has moderate to strong structure. The subsoil has moderate structure grading to structureless below 50cm depth. Gravel occurs throughout the soil, and are typically moderately weathered. Clay has accumulated in the subsoil, resulting in clayey textures. Roots generally become restricted in the lower subsoil.

Typical physical properties

Note: values in Italics are estimates

Horizon	Depth (cm)	Bulk density	Permeability	Texture	Gravel content
Ap	0–21	Moderate – High	*Moderate*	Silt loam	Very slightly gravelly
Ap/Bw	21–36	Moderate – High	*Moderate*	Silty clay	Moderately gravelly
Bt	36–53	Moderate – High	*Moderate*	Silty clay	Very gravelly
BCt	53–100	Moderate – High	*Moderate*	Clay loam	Extremely gravelly

Profile drainage: Moderately well drained

Plant readily available water: *Moderate*

Potential rooting depth: Moderately deep

Rooting restriction: Extremely gravelly subsoil

Key physical properties

Rooting depth is moderately deep but is limited by the subsoil gravels. Soils have moderate plant available water. Permeability is moderate and bulk density moderate to high through the profile. Textures grade from heavy silt loams in the topsoil to silty clay and clay loams in the subsoil, with the topsoil clay content of 30–40%. Topsoils are commonly slightly gravelly with very gravelly horizons occuring within 45cm depth.

Typical chemical properties

Horizon	Depth (cm)	pH	P retention	CEC	BS	Ca	Mg	K	Na
Ap	0–21	Moderate	Moderate	Moderate	High	High	Very low	Very low	Very low
Ap/Bw	21–36	Low	Moderate	Moderate	Low	Low	Very low	Very low	Low
Bt	36–53	Low	Moderate	Moderate	Very low	Very low	Very low	Very low	Low
BCt	53–100	Moderate	Moderate	Moderate	Very low	Very low	Low	Very low	Low

Additional chemical properties (as a profile average)

Sulphate sulphur levels are low in the topsoil and grade to very high levels in the subsoil.

Key chemical properties

Topsoil organic matter levels are 5–6%; P-retention values are in the range 40–60%; pH values decrease down the profile and are below 5.3 in the subsoil. Major nutrient levels are low, with responses to phosphste, potassium and lime. Minor elements are adequate although boron responses in brassicas and molybdenum responses in legumes 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	Slight	These soils have a slight vulnerability to structural degradation by long-term cultivation and compaction by intensive stocking and vehicles.
Nutrient leaching	Severe	These soils have a severe vulnerability to leaching to groundwater. This reflects the moderate water holding capacity.
Topsoil erodibility by water	Slight	Due to the low clay content of the silt loam texture, the topsoil erodibility of these soils is slight. Erodibility is highly dependent on management particulary when there is no vegetation cover.
Organic matter loss	Moderate	Vulnerability to long-term decline in soil organic matter levels is partly dependant on soil properties and highly dependent on management practices (e.g., cultivation practices and crop residue management)
Waterlogging	Minimal	These soils have a minimal vulnerability to water logging during wet periods. This rating reflects the good drainage and moderate permeability.

General landuse versatility ratings for Kaweku 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.

KkU3 (Kaweku undulating shallow)

Versatility evaluation for soil KkU3		
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	Rooting depth

KkR3 (Kaweku rolling shallow)

Versatility evaluation for soil KkR3		
Landuse	**Versatility rating**	**Main limitation**
Non-arable horticulture	Moderate	Rooting depth and rolling slopes
Arable	Limited	Rolling slopes
Intensive pasture	Moderate	Vulnerability to leaching to groundwater, and rolling slopes
Forestry	Moderate	Rooting depth

KkH3 (Kaweku hilly shallow)

Versatility evaluation for soil KkH3		
Landuse	**Versatility rating**	**Main limitation**
Non-arable horticulture	Unsuitable	Hilly slopes
Arable	Unsuitable	Hilly slopes
Intensive pasture	Limited	Hilly slopes
Forestry	Moderate	Rooting depth and hilly slopes

Management practices that may improve soil versatility

- Organic matter levels should be carefully maintained and enhanced
- Management of nutrient applications that minimise leaching losses

Soil profiles available for Kaweku soils

Soil symbol	Profile ID	Topoclimate map sheet	Profile description available	Physical data available	Chemical data available	Profile photo available
KkU3	M3164	12	✓	✓	✓	
KkU3	RT6	11	✓	✓	✓	✓
KkU3	BT14	12	✓	✓	✓	✓
KkU3	BT16	12	✓	✓	✓	✓
KkU3	MT139	26	✓	✓		
KkU3	M851	?	✓	✓		
KkU3	GG/GW 63	11	✓	✓		
KkH3	B4	12	✓	✓	✓	✓

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