Soil name: Pukerangi

Overview

Pukerangi soils occupy about 130 ha on fan and lower hill slopes in the upper Mataura River valley, near Garston. These soils also occur in northern Southland hill slopes outside the Topoclimate survey area. They are formed into moderately deep mixed fine alluvium and loess, overlying schist gravels. Soils are moderately well drained, with a slightly deep rooting depth, moderately high plant available moisture and silty textures. Present use is pastoral grazing with sheep and beef cattle. Climate is temperate with cold winters and warm summers, when soils are often seasonally dry.

Soil classification

NZ Soil Classification (NZSC): Typic Argillic Pallic; soils with stones; silty over skeletal.
Previous NZ Genetic Classification: Yellow-grey earth

Classification explanation

The NZSC of Pukerangi soils is consistent with the previous classification. Pukerangi soils have a moderately developed B horizon, P-retention of <30%, and evidence of clay accumulation in the lower subsoil. Pukerangi soils have silty textures, and angular shaped schist gravels between 45–90cm depth.

Soil phases and variants

Identified units in the Pukerangi soils are:

- Pukerangi rolling moderately deep (PkR2): has gravel between 45 and 90cm depth; occurs on slopes of 7–15°
- Pukerangi undulating moderately deep (PkU2): 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, Pukerangi rolling moderately deep (PkR2). 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., Pukerangi undulating moderately deep (PkU2).

Associated soils

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

- Arthurton: imperfectly drained moderately deep to deep soils that are formed in loess.
- Nokomai: deep well drained soil formed in loess
- Athol: deep poorly drained soil formed in loess

Similar soils

Some soils that have similar properties to Pukerangi soils are:

- Berwen: shallow equivalent of the Pukerangi soil, with gravels within 45cm depth

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.

Pukerangi profile	Horizon	Depth (cm)	Description
No profile photo available	Ap	0–23	Very dark greyish brown very slightly gravelly silt loam;slightly firm soil strength; moderately developed fine to medium polyhedral structure; gravels angular; many roots.
	Ap/Bw	23–34	Light yellowish brown very slightly gravelly silt loam; many wormcasts; firm soil strength; strongly developed fine to medium blocky structure; gravels angular; many roots.
	Bw	24–48	Light yellowish brown very slightly gravelly silt loam; firm soil strength; weakly developed coarse blocky structure; gravels angular; common roots.
	2BCt	48–70	Light yellowish brown very gravelly sandy loam; firm soil strength; weakly developed fine blocky structure; medium angular gravels; common roots.
	3BCt(g)	70–78+	Light yellowish brown silt loam; common light grey and yellowish brown mottles; slightly firm soil strength; massive structure; no roots.

Key profile features

Pukerangi topsoils are about 20–25cm deep and have a moderately developed structure. Subsoil structure is weak to moderately developed. Upper horizons have a slight gravel content that increases with depth. Clay has accumulated in the underlying gravels, indicating that significant soil development has occurred.

Typical physical properties

Note: values in Italics are estimates

Horizon	Depth (cm)	Bulk density	Permeability	Texture	Gravel content
Ap	0–23	Moderate – High	*Moderate*	Silt loam	Very slightly gravelly
Ap/Bw	23–34	Moderate – High	*Moderate*	Silt loam	Very slightly gravelly
Bw	34–48	Moderate – High	*Slow*	Silt loam	Very slightly gravelly
2BCt	48–70	—	*Moderate*	Sandy loam	Very gravelly
3BCt(g)	70–78+	—	*Moderate*	Silt loam	Gravel free

Profile drainage: Moderately well
Plant readily available water: *Moderately high*
Potential rooting depth: Slightly deep
Rooting restriction: Gravelly subsoil

Key physical properties

Pukerangi soils have a slightly deep (45–60cm) rooting depth and moderately high plant available water holding capacity. The soils are moderately well drained with slow subsoil permeability. Textures are silt loams, with topsoil clay content about 20%. Upper soil horizons have a slight gravel content, but gravelly horizons typically ocuur below 45cm depth.

Typical chemical properties

Horizon	Depth (cm)	pH	P retention	CEC	BS	Ca	Mg	K	Na
Ap	0–23	Moderate	Low	Low	Low	Low	Very low	Very low	Very low
AP/Bw	23–34	Moderate	Low	Low	Low	Low	Very low	Very low	Very low
Bw	34–48	Moderate	Low	Low	Low	Low	Very low	Very low	Very low
2BCt(g)	48–70	Moderate	Low	Low	Low	Low	Low	Very low	Very low
3BCt(g)	70–78+	Moderate	Low	Low	Low	Low	Low	Very low	Very low

Key chemical properties

Topsoil organic matter vaues are about 6%, P-retention 15–30% and pH moderate (high 5s). Cation exchange and base saturation values are low. Available calcium, magnesium and postassium levels are all low. 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
Structural compaction	severe	These soils have a severe vulnerability to structural degradation by long-term cultivation, or compaction by heavy stocking and vehicles. This rating reflects the low P-retention, organic matter and clay content.
Nutrient leaching	severe	These soils have a severe vulnerability to leaching to groundwater. This rating reflects the moderately good drainage and moderately high water-holding capacity.
Topsoil erodibility by water	moderate	Due to the low organic matter and clay content, topsoil erodibility in 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 moderately well drained nature of the soil and slow permeability.

General landuse versatility ratings for Pukerangi 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.

PkR2 (Pukerangi rolling moderately deep)

Versatility evaluation for soil PkR2		
Landuse	**Versatility rating**	**Main limitation**
Non-arable horticulture	Limited	Restricted rooting depth
Arable	Limited	Rolling slopes
Intensive pasture	Moderate	Vulnerability to topsoil structural degradation by cultivation and compaction by intensive stocking.
Forestry	Limited	Restricted rooting depth

PkU2 (Pukerangi undulating moderately deep)

Versatility evaluation for soil PkU2		
Landuse	**Versatility rating**	**Main limitation**
Non-arable horticulture	Limited	Restricted rooting depth
Arable	Limited	Vulnerability to topsoil structural degradation by cultivation and compaction; restricted rooting depth.
Intensive pasture	Moderate	Vulnerability to topsoil structural degradation by cultivation and compaction by intensive stocking; restricted rooting depth
Forestry	Limited	Restricted rooting depth

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 heavy vehicular traffic use should be minimal during these periods.
- Long-term cultivation should be carefully managed to minimise structural degradation
- Organic matter levels should be carefully maintained and enhanced
- Management of nutrient applications so as to minimise leaching losses

Soil profiles available for Pukerangi soils

Soil symbol	Profile ID	Topoclimate map sheet	Profile description available	Physical data available	Chemical data available	Profile photo available
PkU2	G520	4	✓	✓	✓	

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