Soil name: Pebbly Hills

Overview

Pebbly Hills soils occupy about 1800 ha on rolling downs in the Pebbly Hills district. They are formed into quartz gravel deposits overlayen by a thin layer of loess. Soils are shallow and well drained, with a slightly deep rooting depth and moderate water-holding capacity. Present use is pastoral grazing with sheep and some deer and beef cattle. They have a cool temperate climate with regular rainfall.

Soil classification

NZ Soil Classification (NZSC):	Acidic-allophanic Firm Brown; rounded stony; quartzic; silty
Previous NZ Genetic Classification:	Moderately to strongly leached yellow-brown earth

Classification explanation

The NZSC of Pebbly Hills soils is consistant with the previous classification. Pebbly Hills soils are strongly leached, with a compact subsoil that is acidic (pH <5.5) and has P-retention of >85%. The soils typically have silty topsoils and quartz gravel within 45cm depth.

Soil phases and variants

Identified units in the Pebbly Hills soils are:

- Pebbly Hills hilly shallow (PbH3): has gravel within 45cm depth; occurs on slopes of 15–25°
- Pebbly Hills rolling shallow (PbR3): has gravel within 45cm depth; occurs on slopes of 7–15°
- Pebbly Hills undulating shallow (PbU3): has gravel within 45cm depth; occurs on slopes of 0–7°

The soil properties described in this Technical Data Sheet are based on the most common phase, Pebbly Hills hilly shallow (PbH3). 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., Pebbly Hills undulating shallow (PbU3).

Associated soils

Some soils that commonly occur in association with Pebbly Hills soils are:

- Woodlands: formed in deep loess, with gravel at greater than 45cm depth, and imperfect drainage.
- Pukemutu: formed in deep loess, with gravel at greater than 90cm depth, and poorly drained due to fragipan
- Waikiwi: formed in deep loess, with gravel at greater than 45cm depth, and well drained.

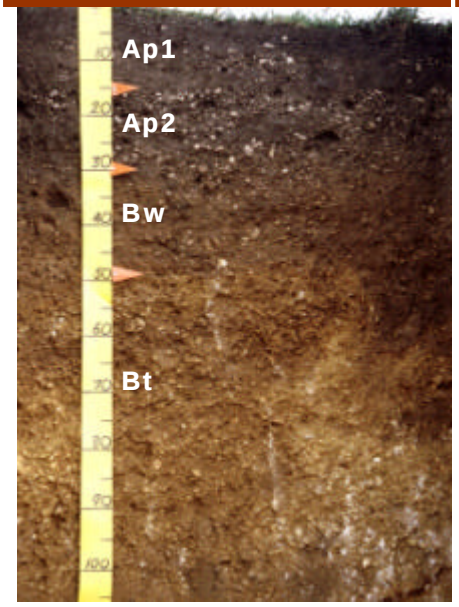
Similar soils

Some soils that have similar properties to Pebbly Hills soils are:

- Oteramika: occurs across the Southland plain. Typically formed into a matrix of mixed quartz and highly weathered greywacke and schist gravel; moderately well to imperfectly drained
- Benio: occurs in northern Southland. Typically formed into a matrix of mixed quartz and highly weathered greywacke and schist gravel.
- Wairaki: occurs on high terraces and fans from the Takitimu Mountains. Formed in tuffaceous greywacke alluvium.

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.

Pebbly Hills profile	Horizon	Depth (cm)	Description
	Ap1	0–15	Brownish black moderately gravelly silt loam; weak soil strength; weakly developed very fine to fine polyhedral structure; gravels slightly weathered and subrounded; abundant roots
	Ap2	15–30	Brownish black very gravelly silt loam; weak soil strength; moderately developed very fine to medium polyhedral structure; gravels slightly weathered and subrounded; abundant roots
	Bw	30–49	Brown very gravelly silt loam; common worm casts; dense particle packing; moderately developed extremely fine polyhedral structure; gravels slightly weathered and subrounded; many roots
	Bt	49–90+	Bright brown extremely gravelly sandy loam; common dark reddish brown sesquioxide and bright brown clay coats on faces of gravels; dense particle packing; massive structure; gravels moderately weathered and subrounded; few roots

Key profile features

Pebbly Hills soils have a topsoil 20–30cm deep with moderate to weakly developed structure. Subsoil structural development is moderate, becoming weak to structureless below 50cm depth. Clay and iron oxides have accumulated in the subsoil, resulting in the gravels becoming densely cemented. Gravel occurs throughout the profile, and is dominantly quartz.

Typical physical properties

Note: values in Italics are estimates

Horizon	Depth (cm)	Bulk density	Permeability	Texture	Gravel content
Ap1	0–15	—	*Moderate*	Silt loam	Moderately gravelly
Ap2	15–30	—	*Moderate*	Silt loam	Very gravelly
Bw	30–49	—	*Moderate*	Silt loam	Very gravelly
Bt	49–90+	—	*Slow*	Sandy loam	Extremely gravelly

Profile drainage: Well

Plant readily available water: *Moderate*

Potential rooting depth: Slightly deep

Rooting restriction: Extremely gravelly subsoil

Key physical properties

Pebbly Hills soils have a slightly deep rooting depth and moderate plant available water, and are limited by the subsoil gravel. The soils are well drained, with good aeration in upper horizons that decreases with depth, and the subsoil is slowly permeable. Textures are silt loams, grading to sandy loams in the gravelly horizons. Topsoil clay content is about 20–30%, and slightly to moderately gravelly. Subsoils are typically very to extremely gravelly.

Typical chemical properties

Horizon	Depth (cm)	pH	P retention	CEC	BS	Ca	Mg	K	Na
Ap1	0–15	Moderate	Moderate	Moderate	High	High	Moderate	High	Low
Ap2	15–30	Moderate	Moderate	Moderate	Low	Very low	Very low	High	Low
Bw	30–49	Moderate	High	Moderate	Very low	Very low	Very low	High	Low
Bt	49–90+	Moderate	High	Moderate	Very low	Very low	Very low	High	Low

Key chemical properties

Topsoil organic matter levels are about 13%; P-retention <30% in the topsoil, and 50–90% in the subsoil; and pH moderate (low–mid 5s). Cation exchange values are moderate and base saturation high. Available calcium, magnesium and potassium levels are moderate and soil reserve phosphorus levels 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	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 good drainage, offset by the low–moderate clay and P-retention.
Nutrient leaching	severe	These soils have a severe vulnerability to leaching to groundwater. This rating reflects the good drainage and moderate water-holding capacity.
Topsoil erodibility by water	slight	Due to the high organic matter content, topsoil erodibility in these soils is slight. Erodibility is highly dependent on management, particularly when there is no vegetation cover.
Organic matter loss	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).
Waterlogging	slight	These soils have a slight vulnerability to waterlogging during wet periods. This rating reflects the good drainage. The hilly phase will have nil vulnerability.

General landuse versatility ratings for Pebbly Hills 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.

PbH3 (Pebbly Hills hilly shallow)

Versatility evaluation for soil PbH3		
Landuse	**Versatility rating**	**Main limitation**
Non-arable horticulture	Unsuitable	Hilly slope
Arable	Unsuitable	Hilly slope
Intensive pasture	Limited	Hilly slope
Forestry	Limited	Restricted rooting depth

PbU3 (Pebbly Hills undulating shallow)

Versatility evaluation for soil PbU3		
Landuse	**Versatility rating**	**Main limitation**
Non-arable horticulture	Limited	Restricted rooting depth
Arable	Moderate	Restricted rooting depth; vulnerability to leaching to groundwater
Intensive pasture	Moderate	Restricted rooting depth; vulnerability to leaching to groundwater
Forestry	Limited	Restricted rooting depth

PbR3 (Pebbly Hills rolling shallow)

Versatility evaluation for soil PbR3		
Landuse	**Versatility rating**	**Main limitation**
Non-arable horticulture	Limited	Restricted rooting depth
Arable	Limited	Rolling slopes
Intensive pasture	Moderate	Restricted rooting depth; vulnerability to leaching to groundwater
Forestry	Limited	Restricted rooting depth

Management practices that may improve soil versatility

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

Soil profiles available for Pebbly Hills soils

Soil symbol	Profile ID	Topoclimate map sheet	Profile description available	Physical data available	Chemical data available	Profile photo available
PbU3	UT 6	14	✓	✓	✓	✓

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Crops for Southland
PO Box 1306, Invercargill. New Zealand

www.cropssouthland.co.nz