

Machin soil – texture-contrast soil in mixed dolerite and sand colluvium under dry forest

Site description

Occurrence: In southeastern and southern Tasmania on low-altitude sites near the coast

Parent Material: Dolerite colluvium and aeolian quartzose sands

Landform: Hilly land

Drainage Class: Imperfectly drained

Vegetation: Dry to moist forest with *Eucalyptus obliqua*, *E. amygdalina*, or *E. globulus* and heathy shrubs, saggs and *Gahnia*



Distinguishing Soil Properties

Profile Features:

- Texture-contrast soil – sandy loam upper horizons over clay loam textures in subsoils
- A2 horizon not prominently bleached
- Mottled subsoil horizons – imperfect drainage

Chemical and physical features

- Low total carbon, nitrogen and phosphorus in upper soil horizons
- Slowly permeable subsoils
- Subsoils are sodic (exchangeable Na >6% of CEC) and highly erodible

Similar soils

Thumbs soil (Forest Soil Fact Sheet 4) – strongly bleached A2 horizon; poorly drained; high erodibility



Soil Degradation Potential

FACTOR	RATING OF DEGRADATION POTENTIAL
Erodibility:	Moderate to high; sodic subsoil horizons have high erodibility because of dispersible clays; subsoils are susceptible to tunnel-gully erosion
Compaction and puddling:	Moderate
Mixing:	High
Nutrient depletion:	High
Landslides:	Moderate
Flooding:	Negligible

Site Productivity

Limited by low nutrient levels

Soil Management

Spot cultivation is favoured, to prevent rilling of high erodibility subsoil layers. The upper soil layers contain much of the soil's organic matter and nutrients. Matting and cording of snig tracks is advisable, to preserve these layers intact. Gully erosion is a risk, especially after cultivation. Extensive soil disturbance or frequent burning is likely to decrease the soil's fertility. Culvert exits may require extra care. Drainage depressions must not be cultivated – disturbance may result in gully and tunnel-gully erosion.

Native Forest Logging and Regeneration

LOGGING AND CLEARING: Nutrient levels are low and mostly concentrated in the surface layer (except for cations such as Ca, Mg and K). Harvest methods should ensure that the surface layer is minimally disturbed. The surface layer helps to prevent erosion of sandy subsoil layers.

PREPARATION FOR REGENERATION: High intensity burns should be avoided as these will deplete soil nutrients.

SILVICULTURAL CONSIDERATIONS: On sandier soils long rotations will be needed because of slow growth rates.

Suitability for Plantations

Marginally suitable for plantations. Secondary fertilisation is likely to be required.

Profile

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Date: 14 June 2005

Location: Roadside cutting, Flinders Creek Road

Map reference (GDA): Sheet 5623 (Taranna) 0572134 5239978

Landform: Midslope of hillside 200 m long

Vegetation: Plantation; dry forest of *Eucalyptus obliqua*, *E. viminalis*, *E. amygdalina*, *Banksia marginata*, *Exocarpos cupressiformis*, with an understorey of *Lomandra longifolia*, *Goodenia ovata*, heathy shrubs and *Pteridium esculentum*

Parent material: Sandstone and dolerite.

Drainage: Imperfectly to poorly drained

Slope: 14°

Aspect: South

Altitude: 120 m

Photographs: PDM 6-05-20A (site); 6-05-23A (profile)

Australian Soil Classification: **Mottled-Sodic Eutrophic Brown Chromosol**

A1	0–12 cm	Brown (10YR5/3) (moist) loamy fine sand; very weak strength; single grain; 20% subrounded dolerite stones; few fine roots and common very fine roots.
A21	12–34 cm	Yellowish brown (10YR5/4) (moist) loamy fine sand; 5% yellowish brown (10YR5/6) mottles 10 mm diameter; 2% light yellowish brown (2.5Y6/3) 20 mm diameter; weak strength; very weak blocky peds 10–20 mm diameter; abundant pores 2–5 mm, resulting from worm mixing; common charcoal fragments; 30% subrounded dolerite stones 300 mm diameter; few fine roots and common very fine roots.
A22	30–60 cm	Light olive brown (2.5Y5/3) (moist) silty loam; 40% yellowish brown mottles 20–30 mm diameter; weak soil strength; massive; abundant pores 2–5 mm, resulting from worm mixing; 40% rounded stones 300 mm diameter; few fine roots; seepage of water at base of horizon..
B22g1	60–98 cm	Yellowish brown (10YR5/6) (moist) light medium clay; 25% light yellowish brown (2.5Y6/3) mottles 5–10 mm diameter; firm strength; moderate 20–30 cm blocky peds; large dolerite boulders in adjacent soil; few fine roots.
B22g2	98–110 cm	Yellowish brown (10YR5/6) (moist) medium clay; 40% pale olive mottles 20–30 mm diameter; firm strength; weak blocky peds 40 mm diameter; large dolerite boulders in adjacent soil; very few fine roots.

Horizon	Depth (cm)	pH (H ₂ O)	Total C (%)	Total N (%)	C/N	Total P (ppm)	Colwell P (mg/kg)	P retn. (%)	SO ₄ -S (mg/kg)	Water Stable Aggreg. (%)
	0–30	5.5	0.63	0.02	35	51	1	9	1	n.d.
A1	0–10	5.2	1.86	0.06	31	60	2	6	0	28
A2	10–30	5.7	0.64	0.02	40	43	1	11	1	18
B22g	30–60	5.6	0.64	0.02	38	34	n.d.	28	31	33
B3	60–90	5.4	0.64	0.02	40	29	n.d.	39	78	42

Horizon	Depth (cm)	Exch. Ca (cmol(+)/kg)	Exch. Mg (cmol(+)/kg)	Exch. K (cmol(+)/kg)	Exch. Na (cmol(+)/kg)	CEC (cmol(+)/kg)	BS (%)
	0–30	0.47	0.38	0.09	0.08	2.0	50
A1	0–10	1.41	0.67	0.12	0.17	4.8	49
A2	10–30	0.49	0.41	0.10	0.08	2.8	38
B22g	30–60	1.82	5.00	0.34	0.56	10.9	71
B3	60–90	2.70	7.78	0.23	1.16	18.3	65

The analyses presented are from samples taken from a similar profile to that described above, from the same site, but horizon thicknesses and designations differ slightly. Analyses were by Landcare Research New Zealand Ltd., 22 March 2001. Analytical methods were those of Blakemore et al. (1987), Laffan et al. (1996) and Rayment and Higginson (1992).

References

- Blakemore, L. C.; Searle, P. L. and Daly, B. K. 1987. Methods of chemical analysis of soils. *New Zealand Soil Bureau Scientific Report 80*.
- Laffan, M. D. Grant, J. and Hill, R. 1996. A method for assessing the erodibility of Tasmanian forest soils. *Australian Journal of Soil and Water Conservation* 9: 16 – 22.
- Rayment, G. E, and Higginson, F. R. 1992. Australian Laboratory Handbook of Soil and Water Chemical Methods. Incarta Press, Melbourne. 330p.

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