Tonganah soil – texture-contrast soil in Tertiary sediments derived from granite, under dry forest

Site description

Occurrence: In northeastern lowland Tasmania where mean annual rainfall is <1100 mm
Parent Material: Tertiary sediments derived from granite
Landform: Undulating land
Drainage Class: Imperfectly drained
Vegetation: Dry sclerophyll forest with *Eucalyptus amygdalina*, *E. obliqua* and *Pteridium esculentum*

Distinguishing Soil Properties

Profile features:

- Texture-contrast profile with sandy over silty clay loam and clay textures
- Yellowish red colours in subsoil layers
- Mottled B2 horizon with coarse blocky structure

Chemical and physical features

- Low total C, total N and total P in surface layer (0-30 cm)
- Very low ability to retain added P in surface horizons (low P retention)
- Permeability – slow – restricted by firm B2 horizon

Similar soils

- Jensen variant soil (Forest soil fact sheet no. 18) – similar morphology in in-situ granite; subsoil colours are brownish yellow, not red
- Mckay soil (Laffan et al. 1995; Grant et al. 1995; Laffan et al. 2002) – similar profile in in-situ granodiorite

Previous description

The Tonganah soil profile previously described by Grant et al. (1995) was more acid (pH in B2 horizon <5.5) so that the soil was classified as a Kurosol rather than Chromosol; it was also moderately well drained and had a weak rather than a firm B2 horizon

Soil Degradation Potential

FACTOR	RATING OF DEGRADATION POTENTIAL
Erodibility:	Moderate to high – High (depending on drainage class and the firmness of the B2 horizon)
Compaction and puddling:	Low
Mixing:	Moderate
Nutrient depletion:	High (N, P and probably S)
Landslides:	Negligible
Flooding:	Negligible

Site Productivity

Low productivity due to low levels of nutrients and restricted rooting depth

Soil Management

These soils are very low in nutrients and are easily degraded. Management must ensure minimal loss or disturbance of surface layers where organic matter and nutrients are concentrated. Burning should be minimised – use head burning only.

Native Forest Logging and Regeneration

LOGGING AND CLEARING:
Nutrient levels are low and concentrated in the thin surface horizon. The soils are prone to degradation by erosion especially after burning. Selective logging rather than clearfelling is appropriate. Unsuitable for wet weather logging.
PREPARATION FOR REGENERATION:
Minimal seedbed preparation is required. Disturbance during logging should be sufficient. Burning should be minimised. Avoid broadcast burning. Restrict burning to debris piles and head burns.
SILVICULTURAL CONSIDERATIONS:
Low nutrient status limits long-term productivity. Long-term management using partial logging techniques is likely to be a viable and sustainable option. Long rotations will be required.

Suitability for Plantations

Marginally suitable to **Unsuitable** for plantations due to low site productivity.

Profile

Authors: M.D. Laffan and P.D. McIntosh
Date: 25 June 1999
Location: Pit on Lauderdale Road, Scottsdale (off Bridport Road), immediately to the right of the forestry track when entering from Lauderdale Road
Map reference: Sheet 5244 (Nabowla) 538500 5447900
Landform: Flank of low ridge in undulating landscape
Vegetation: *Eucalyptus amygdalina* (dominant) and *E. obliqua* forest; understorey of *Pteridium esculentum*, *Banksia marginata* and saggs
Parent material: Tertiary sediments derived from granite; absence of gravels indicates that the parent material may be aeolian
Drainage: Moderately well drained
Slope: 2°
Aspect: Northeast
Altitude: 100 m
Photographs: PDM 4-02-4 (site); 6-99-13 (profile); 6-99-8 (profile detail)
Australian Soil Classification: **Bleached-Mottled Dystrophic Brown Chromosol**

A1	0-15 cm	Very dark grey (10YR3/1) (moist) loamy coarse sand; very weak strength; single grain; many roots; NaF 0/5.
A2	15-33 cm	Grey (10YR6/1) (moist) loamy coarse sand; loose strength; single grain; common roots; NaF 0/5.
B1	33-54 cm	Yellowish brown (10YR5/6) (moist) sandy loam; 40% brown (7.5YR4/4) mottles 5-10 mm diameter; firm strength; brittle; weak 50-100 mm blocky structure; brown mottles and earthworm casts penetrate between peds; few roots; NaF 0/5.
B21	54-66 cm	Yellowish red (5YR4/6) (moist) sandy clay loam; 40% yellowish brown veins 5-20 mm wide; firm strength; weak 20-50 mm blocky structure; few roots; NaF 1/5.
B22	66-90+ cm	Strong brown (7.5YR5/6) (moist) silty clay loam; 30% yellowish brown (10YR5/5) mottles 10-20 mm diameter and 10% yellowish brown (10YR5/5) vertical veins 80 cm apart; few horizontal veins; firm; weak coarse blocky structure, 50-100 mm; clay skins in 2 mm diameter pores; NaF 1/5.

Laboratory Analyses

Horizon	Depth (cm)	pH (H_2O)	Total C (%)	Total N (%)	C/N	Total P (mg/kg)	Colwell P (mg/kg)	Citrate-dithionite Fe (%)	P retn. (%)	Water stable aggreg. (%)
	0-30	*5.4*	*1.0*	*0.045*	*22*	*62*	*6.7*	*n.d.*	*n.d.*	*n.d.*
A1	0-15	4.4	3.9	0.14	28	123	n.d.	0.06	6	32
A2	15-33	5.0	0.9	0.01	-	26	n.d.	0.09	2	24
B1	33-54	5.4	0.9	0.03	-	78	n.d.	1.4	23	40
B21	54-66	5.7	0.9	0.02	-	135	n.d.	3.4	33	42
B22	66-90	5.7	0.5	0.01	-	120	n.d.	3.0	40	n.d.

Analytical methods were those of Blakemore et al. (1987), Laffan et al. (1996) and Rayment and Higginson (1992), except that total C was analysed by the Walkley/Black digestion method.

Subsoil of Tonganah soil, showing horizontal cut at 90 cm depth. The firm subsoils are split into blocks. The pale veins show where water migrates through the subsoil, reducing oxidised (ferric) iron compounds to the reduced (ferrous) form. The veins are also the only access routes of roots into the subsoil.

References

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Acknowledgements

To Forestry Tasmania and the Forest Practices Board for funding soil analyses.

Citation

Laffan, M.D. and McIntosh, P.D. 2002. Tonganah soil. *Tasmanian forest soil fact sheet no. 24.* Forest Practices Board, Hobart and Forestry Tasmania, Hobart. 4 p.

16 May 2002