

Fraser soil – gradational soil in strongly weathered granodiorite, under dry forest

Site description

Occurrence: In northeastern lowland Tasmania where mean annual rainfall is <1100 mm

Parent Material: In-situ strongly weathered granodiorite

Landform: Undulating and rolling hills

Drainage Class: Moderately well drained

Vegetation: Dry sclerophyll forest with *Eucalyptus amygdalina*, *E. obliqua* and *Pteridium esculentum*



Distinguishing Soil Properties

Profile Features:

- Thin A1 horizon
- Gradational profile with sandy loam texture in upper horizons, silty clay loam in lower horizons and a weakly developed A2 horizon
- Firm weakly-structured B2 horizon
- Red-weathered granodiorite present below 50 cm depth

Chemical and physical features

- Low total C, total N and total P in surface layer (0-30 cm)
- Low SO₄-S in upper horizons, high in B2 horizon
- Low total P and low ability to retain added P (low to very low P retention)
- Highest concentration of nutrients is in the thin A1 horizon
- Permeability – moderate to slow, limited by firm B2 horizon



Similar soils

- Blumont soil (Tasmanian forest soil fact sheet no. 16) – uniform soil in granodiorite under wet forest; thicker A1 horizon

Soil Degradation Potential

FACTOR	RATING OF DEGRADATION POTENTIAL
Erodibility:	Moderate
Compaction and puddling:	Moderate
Mixing:	Moderate
Nutrient depletion:	Moderate
Landslides:	Slight
Flooding:	Negligible

Site Productivity

Low productivity, limited by low reserves of nutrients and probably by restricted rooting conditions in subsoils.

Soil Management

Topsoils are very thin and have probably been thinned by burning. In native forest management, surface horizons should be left intact as far as possible. Excessive disturbance and burning may further reduce productivity and promote erosion and should be avoided.

Native Forest Logging and Regeneration

LOGGING AND CLEARING:

Nutrient levels are low and concentrated in the surface horizon. The soils are prone to degradation by erosion especially after burning.

PREPARATION FOR REGENERATION:

Minimal seedbed preparation is required. Disturbance during logging should be sufficient. Burning should be minimised.

SILVICULTURAL CONSIDERATIONS:

Low nutrient status and droughtiness limit long-term productivity. Long-term management using partial logging techniques is likely to be a viable option.

Suitability for Plantations

Marginally suitable for plantations due to low site productivity.

CLEARING: Dozer clearing must be done using a rake blade.

CULTIVATION: Ripping to >50 cm depth is required so that roots can penetrate into the firm B2 horizon and utilise the full profile for nutrients and water.

FERTILISER TREATMENT: Fertilising planted seedlings is required. Secondary fertilisation will be necessary

Profile

Authors: M. D. Laffan, P.D. McIntosh and S. Rees

Date: 8 August 2001

Location: On North Fraser Road, Goulds Country; 20 m east of road on first rise 100 m north of first depression north of the junction with Fraser Road.

Map reference: Sheet 5845 (Lanka) 593700 5452020

Landform: Flat crest of rise in undulating landscape

Vegetation: *Eucalyptus amygdalina*, *E. obliqua*, *Pteridium esculentum* and *Gahnia grandis*

Parent material: Strongly weathered granodiorite

Drainage: Moderately well drained

Slope: Flat

Aspect: -

Altitude: 155 m

Photographs: PDM 10(1)-01-5 (site); 10(1)-01-3 (profile)

Australian Soil Classification: **Bleached-Acidic Mesotrophic Brown Dermosol**

A1	0-3 cm	Black (10YR2/1) (moist) coarse sandy loam; loose strength; single grain structure; abundant fine and medium roots; abrupt boundary.
A2	3-23 cm	Light yellowish brown (2.5Y6/3) (moist) coarse sandy loam; 35% light yellowish brown (2.5Y6/4) mottles 30-40 mm diameter; 10% light brownish grey (2.5Y6/2) mottles 30-40 mm diameter; very weak strength; massive; few fine and medium roots; gradual boundary.
B1	23-40 cm	Brownish yellow (10YR6/8) (moist) coarse sandy clay loam; 30% light yellowish brown mottles 10 mm diameter; weak strength; massive; few medium roots; gradual boundary.
B21	40-70 cm	Yellowish brown (10YR5/6) (moist) silty clay loam; 25% yellowish red (5YR5/8) mottles 10-40 mm diameter; firm strength; weak to moderate coarse blocky structure; 2% gravels 2-4 cm diameter; abundant mica flakes; few distinct light olive brown (2.5Y5/4) clay skins in pores and on block faces; few medium roots; diffuse boundary.
B22	70-100	Yellowish brown (10YR5/6) (moist) silty clay loam; 60% yellowish red (5YR5/8) mottles 40-100 mm diameter; firm strength; weak to moderate coarse blocky structure; 2% gravels 2-4 cm diameter; abundant mica flakes; few distinct light olive brown (2.5Y5/4) clay skins in pores and on block faces; no roots.

Laboratory Analyses

Horizon	Depth (cm)	pH (H ₂ O)	Total C (%)	Total N (%)	C/N	Colwell P (mg/kg)	Total P (mg/kg)	P retn. (%)	SO ₄ -S (mg/kg)	Water-stable aggregates (%)
	0-30	5.0	0.95	0.04	24	1	32	13	5	n.d.
A1	0-3	4.1	14.5	0.37	39	9	127	0	6	n.d.
A2	3-23	4.9	2.37	0.05	45	1	33	13	5	77
B1	23-40	5.1	0.84	0.05	17	n.d.	80	20	8	57
B2*	40-100	5.2	0.36	0.03	14	n.d.	32	35	177	48

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	0.41	0.26	0.09	0.08	4.1	20
A1	0-3	3.57	1.66	0.45	0.30	23.3	26
A2	3-23	0.36	0.20	0.09	0.12	4.4	18
B1	23-40	0.36	0.29	0.10	0.08	3.2	25
B2*	40-100	0.42	1.22	0.15	0.20	5.1	39

Analytical methods were those of Blakemore et al. (1987), Laffan et al. (1996) and Rayment and Higginson (1992), with variation of methods for C, N and SO₄-S (details available from P. D. McIntosh, Forest Practices Board).

* Citrate-dithionite Fe = 2.7% in B2 horizon.

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. 330 p.

Acknowledgements

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

Citation

Laffan, M.D.; McIntosh, P.D. and Rees, S. 2002. Fraser soil. *Tasmanian forest soil fact sheet no. 14*. Forest Practices Board, Hobart and Forestry Tasmania, Hobart. 4 p.

1 May 2002
