# Mckay soil – texture-contrast soil in granodiorite, under dry forest

## Site description

*Occurrence*: In northeastern lowland Tasmania where mean annual rainfall is <1100 mm
*Parent Material*: In-situ granodiorite
*Landform*: Undulating and rolling hills
*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 coarse sands/coarse sandy loam over light clay
- Lower A2 horizon may be weakly cemented
- Mottled and coarsely structured B2 horizon

*Chemical and physical features*

- Low total C, N and total P in surface layer (0-30 cm)
- Exchangeable Mg and K, and $SO_4$-S increase sharply in subsoil horizons
- Low total P throughout profile and very low ability to retain added P (very low P retention) in upper horizons
- Permeability – slow


## Previous description

Mckay soils have been previously described by Laffan et al. (1995) and Grant et al. (1995)

## Similar soils

- Soil 11.2, Forest Soils of Tasmania (Jensen soil) – similar profile in granite

## Soil Degradation Potential

| FACTOR | RATING OF DEGRADATION POTENTIAL |
|---|---|
| Erodibility: | Moderate to high |
| Compaction and puddling: | High |
| Mixing: | Low |
| Nutrient depletion: | High (N, P and S) |
| Landslides: | Negligible |
| Flooding: | Negligible |

## Site Productivity

Low productivity due to severe limitations of restricted rooting conditions and low nutrient availability, especially N and P

## Soil Management

These soils are 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.

## Native Forest Logging and Regeneration

LOGGING AND CLEARING:
Minimise the area used for snig tracks. Routine matting and cording is not possible because of sparse understorey but where pale subsoils (A2 horizons) are exposed on snig tracks these areas should be matted before further passes by machines.
PREPARATION FOR REGENERATION:
Minimal burning is required for regeneration. Harvest disturbance and head burns will generally be sufficient. Widespread hot burns will deplete low nutrient levels further.
SILVICULTURAL CONSIDERATIONS:
Selective harvest methods such as seed tree retention are appropriate. Long rotations are required.

## Suitability for Plantations

**Marginally suitable** for plantations because of low productivity.
CLEARING: Dozer clearing should 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. Ripping and mounding should be along the contour to minimise the risk of erosion.
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 second rise 150 m north of first depression north of junction with Fraser Road.
*Map reference*: Sheet 5845 (Lanka) 593750 5452200
*Landform*: Shoulder of rise in undulating and rolling landscape
*Vegetation*: *Eucalyptus amygdalina, E. obliqua, Pteridium esculentum* and *Gahnia grandis*
*Parent material*: Strongly weathered granodiorite
*Drainage*: Imperfectly drained
*Slope*: 6°
*Aspect*: East
*Altitude*: 165 m
*Photographs*: PDM 8-01-22 (site); 8-01-10 (profile)
*Australian Soil Classification*: **Bleached-Mottled Mesotrophic Yellow Kurosol**

| | | |
|---|---|---|
| A1 | 0-12 cm | Dark greyish brown (10YR4/2) (moist) loamy coarse sand; loose strength; single grain; 20% quartz gravels 2-4 mm diameter; common medium roots. |
| A2e | 12-30 cm | Greyish brown (10YR5/2) (moist) coarse sandy loam, grading to light brownish grey (10YR6/2) in lower 5 cm; loose strength grading to very firm in lower 5 cm; single grain grading to massive in lower 5 cm; 20% quartz gravels 2-4 mm diameter; few fine and medium roots. |
| B2 | 30-46 cm | Brownish yellow (10YR6/8) (moist) coarse sandy clay loam; 60% pale yellow (2.5Y7/3 and 2.5Y7/4) mottles 20-30 mm diameter; very firm strength; weak 40 mm angular blocky structure; 10% quartz gravels 2-4 mm diameter; very few fine roots. |
| B2t1 | 46-92 cm | Pale yellow (2.5Y7/4) (moist) light clay; 30% brownish yellow mottles 10-20 mm diameter; very firm strength; strong 40-100 mm prismatic structure breaking to 10-20 mm blocky; brown (10YR4/3) and pale brown (10YR6/3) clay skins on block surfaces; very few fine roots. |
| B2t2 | 92-110+ cm | Olive yellow (2.5Y6/8) (moist) silty clay loam; 15% red (2.5YR4/8) mottles 10-20 mm diameter; firm strength; weak 80 mm angular blocky structure; light yellowish brown (2.5Y6/3) clay skins on block faces; very few fine roots; abundant mica flakes; |

# Laboratory Analyses

| Horizon | Depth (cm) | pH ($H_2O$) | Total C (%) | Total N (%) | C/N | Colwell P (mg/kg) | Total P (mg/kg) | P retn. (%) | $SO_4$-S (mg/kg) | Water-stable aggreg. (%) |
|---|---|---|---|---|---|---|---|---|---|---|
| | **0-30** | *4.6* | *1.08* | *0.04* | *25* | *1* | 29 | *2* | *2.3* | *n.d.* |
| A1 | 0-12 | 4.4 | 3.20 | 0.08 | 40 | 2 | 34 | 1 | 2.8 | 76 |
| A2e | 12-30 | 4.8 | 0.62 | 0.04 | 17 | 1 | 21 | 2 | 3.2 | 68 |
| B2* | 30-46 | 5.0 | 0.31 | 0.02 | 14 | n.d. | 17 | 35 | 5.1 | 21 |
| B2t1* | 46-92 | 4.9 | 0.48 | 0.03 | 16 | n.d. | 23 | 26 | 51 | 49 |
| B2t2 | 92-110 | 5.0 | 0.22 | 0.02 | 12 | n.d. | 26 | 23 | 71 | 34 |

| 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** | *0.71* | *0.34* | *0.09* | *0.06* | *3.4* | *36* |
| A1 | 0-12 | 1.25 | 0.52 | 0.11 | 0.10 | 5.2 | 38 |
| A2e | 12-30 | 0.46 | 0.23 | 0.04 | 0.05 | 1.8 | 43 |
| B2* | 30-46 | 0.59 | 0.56 | 0.11 | 0.10 | 3.3 | 42 |
| B2t1* | 46-92 | 0.68 | 1.32 | 0.29 | 0.25 | 9.5 | 27 |
| B2t2 | 92-110 | 0.44 | 1.28 | 0.30 | 0.28 | 10.2 | 23 |

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 $SO_4$-S (details available from P. D. McIntosh, Forest Practices Board).
* Citrate-dithionite Fe = 1% and 2.6% in B2 and B2t1 horizons respectively.

## 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.*

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