caw	CAMPBELL	Colluvial (Erosional)

Landscape— Rounded, steep to rolling mountains and hills on Silurian volcanics in the Murrumbidgee Valley. Slopes >20%, local relief 100 - 350 m, elevation 430 - 1090 m. Common rock outcrop. Open-forest to low woodland cleared on lower slopes.

Soils— Shallow (<50 cm), well-drained Lithic Leptic Tenosols (Lithosols) and Brown Kandosols (Yellow Earths), moderately deep (50 - 100 cm), well-drained to imperfectly drained Red and Brown Chromosols and (Red and Yellow Podzolic Soils) and occasional Red Kandosols (Red Earths) and moderately deep (50 - 150 cm), imperfectly to poorly drained Brown Chromosols and Sodosols (Yellow Podzolic Soils, Solodic and Solonized Solonetz Soils).

Qualities and limitations— widespread shallow soils, localised complex soils, widespread poor moisture availability, localised non-cohesive soils, localised periodically frozen soils, widespread steep slopes, widespread rock outcrop hazard, localised rockfall hazard, widespread mass movement hazard, widespread foundation hazard, localised complex terrain, widespread recharge zone, localised discharge zone, localised salinity hazard, localised wind erosion hazard, localised gully erosion hazard, widespread sheet erosion hazard, localised high run-on, localised poor drainage, localised permanently high watertables, localised seasonal waterlogging.

LOCATION AND SIGNIFICANCE

Steep to rolling rounded hills and mountains on volcanics and sediments around Canberra. Examples include Tuggeranong Hill, Mount Taylor, Mount Stromlo, Mount McDonald, Mount Rob Roy and Red Hill. Steep slopes surrounding the Cotter Dam and adjacent to the Murrumbidgee River north of Tuggeranong and Molonglo River north of Western Creek are also included. Occurs extensively in NSW (Jenkins 2000 & 1993). Type location is around Mount Ainslie (MGA grid reference 696813E, 6094984N, grid zone 55).

Variants

Campbell variant a (cawa) has finer heavier soils, whilst Campbell variant b (cawb) is formed on sandstone and has shallow, stony duplex soils. Campbell variant c (cawc) has deep, bleached A2 horizons.

Included landscapes

The boundary between Campbell (caw) and Burra (bau) soil landscapes is often gradual and it is inevitable that some overlap will occur. Burra (bau) soil landscape occurs on fans and more gently inclined hillslopes.

LANDSCAPE

Landform

Steep to rolling rounded hills and mountains with slopes >20%, local relief of 100 - 350 m and elevation ranging between 600 - 1100 m. Rock outcrop occurs anywhere on slopes, often as rows of tombstone-sized and shaped outcrops of near-vertically-dipping tuff. Crests are rounded and narrow (<100 m), whilst hillslopes are long (>300 m), often with terracettes, grading into waning colluvial lower slopes. Drainage lines are often degraded. Springs are common on some mid and lower slopes.

Geology

Silurian volcanics and sediments of the Canberra Block. The complicated lithology includes various dacitic ignimbrites, tuffs and rhyolites with sporadic occurrences of siltstones, sandstones and limestones. Geologies include the Walker, Uriarra, Mount Painter, Paddys River, Laidlaw, Deakin and Colinton Volcanics. Small areas of the Canberra Formation are included.

Source: DMR 2002.

Vegetation

Open-forest (dry sclerophyll forest) to low woodland on exposed crests and bordering frost hollows. About 20% has been cleared for pasture, but more has been thinned. Eucalyptus bridgesiana (apple box) and E.melliodora (yellow box) grow on deeper, less stony soils. In exposed areas, frost hollow margins and areas of shallow rocky soils, E.pauciflora (snow gum), E.mannifera (brittle gum), E.rossii (scribbly gum), E.dives (broad-leaved peppermint) and E.rubida (candlebark) occur. E.macrorhyncha (red stringybark) is found on shallow rocky soils.

Common shrubs to small trees include Acacia dealbata (silver wattle), A.mearnsii (black wattle), Casuarina stricta (drooping sheoak) and Exocarpos cupressiformis (wild cherry). On disturbed sites, Cassinia aculeata (dogwood) is abundant, while Bursaria spinosa (native blackthorn) is evident on drier sites.

Grasses present include Danthonia spp. (wallaby grasses) on rocky sites, and Stipa spp. (spear grasses), Themeda australis (kangaroo grass) and Poa spp. (snow grasses) on less rocky soils.

Land use

No cultivation. Gentler slopes have been cleared for sheep grazing, whilst steeper slopes are generally unused. Nassella trichomata (serrated tussock) is a noxious weed that occurs in some small patches.

Land degradation

Minor and moderate sheet erosion is common and widespread. Mass movement, particularly terracetting, is evident on steep slopes. Gully erosion is common along drainage lines, occasionally severe and <1.5 m deep.

Soils are highly disturbed in areas of pine plantation such as the one at Mount Stromlo. The A1, A2, any B and/ or C horizons and the top of the weathered bedrock have often been mixed by deep-ripping and mounding. This practice is beneficial in the production of pines, but its long-term effect upon the soil productivity of this landscape has yet to be determined.

Erosion hazard

Land use	Non-concentrated flows	Concentrated flows	Wind
grazing	high	very high	slight
softwood plantation	high	high	moderate

SOILS

Soil variation and distribution

This landscape is a collection of erosional remnants of various volcanic blocks that form the generally isolated ridges, hills and mountains of the Canberra Lowlands. Soil materials vary from feature to feature, dependant on the underlying lithology. In part, this is reflected in the number of variants for this landscape.

Soils consist of shallow (<50 cm), well-drained Lithic Leptic Tenosols (Lithosols) and Brown Kandosols (Yellow Earths) associated with crest upper slopes and rock outcrop, moderately deep (50 - 100 cm), well-drained to imperfectly drained Red and Brown Chromosols (Red and Yellow Podzolic Soils) and occasional Red Kandosols (Red Earths) occur on sideslopes and moderately deep (50 - 150 cm) imperfectly to poorly drained Brown Chromosols and Sodosols (Yellow Podzolic Soils, Solodic and Solonized Solonetz Soils) are most common in footslopes and drainage lines.

QUALITIES AND LIMITATIONS

Land capability

Urban Capability	E	**Soil Regolith Class**	R3 (R1, R4)

Limitations to land use

Grazing	very high to extreme	**Cultivation**	high

Urban	very high to extreme		
Landscape			
Steep slopes	widespread	**Mass movement hazard**	widespread
Rock outcrop	widespread	**Rockfall hazard**	localised
Foundation hazard	widespread	**Complex terrain**	localised
Productive arable land	not observed		
Soils			
Shallow soils	widespread	**Complex soils**	localised
Poor moisture availability	widespread	**Non-cohesive soils**	localised
Hydrology			
High run-on	localised	**Poor drainage**	localised
Permanently high watertables	localised	**Permanent waterlogging**	not observed
Seasonal waterlogging	localised	**Flood hazard**	not observed
Erosion			
Wind erosion hazard	localised	**Wave erosion hazard**	not observed
Gully erosion hazard	localised	**Sheet erosion hazard**	widespread
Streambank erosion hazard	not observed		
Salinity			
Recharge zone	widespread	**Discharge zone**	localised
Salinity hazard	localised	**Seepage scalds**	not observed
Salt stores	low		

FACETS

caw(1)— Crests and upper slopes

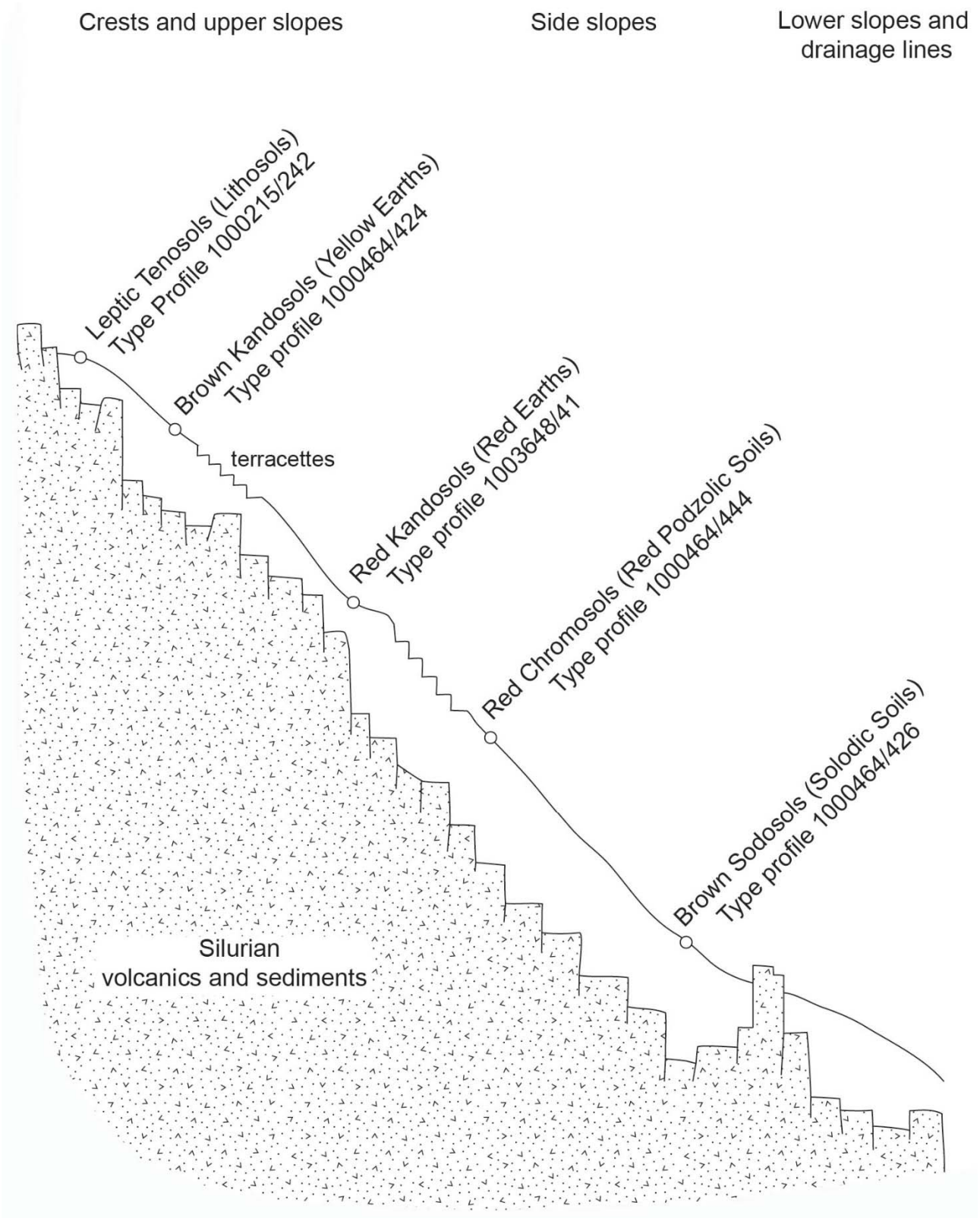
Soils	Shallow (<50 cm), well-drained Lithic Leptic Tenosols (Lithosols) and Brown Kandosols (Yellow Earths).
Type Profile(s)	Leptic Tenosol (Lithosol): Soil landscapes of the Michelago 1:100 000 Sheet (1000215) profile 242 (Master Type Profile)
	Brown Kandosol (Yellow Earth): Soil Landscapes of the Canberra 1:100 000 Sheet (1000464) profile 424 (Associated Type Profile)
HGL Reference	Typically corresponds with: HGL 14 (Majura Road) MA 1, HGL 23 (Sullivans Creek) MA 1, HGL 22 (South Canberra) MA 1, HGL 21 (Royalla) MA 1, HGL 25 (Uriarra Road) MA 1, HGL 11 (Kambah Pools) MA 1, HGL 13 (Lanyon) MA 1 and HGL 8 (Hall) MA 1.

caw(2)— Sideslopes

Soils	Moderately deep (50 - 100 cm), well-drained to imperfectly drained Red and Brown Chromosols (Red and Yellow Podzolic Soils) and occasional Red Kandosols (Red Earths).
Type Profile(s)	Red Chromosol (Red Podzolic Soil): Soil Landscapes of the Canberra 1:100 000 Sheet (1000464) profile 444 (Master Type Profile)
	Red Kandosol (Red Earth): OBSCRAS - BRINDABELLA (1003648) profile 41 (Associated Type Profile)
HGL Reference	Typically corresponds with: HGL 14 (Majura Road) MA 2, HGL 23 (Sullivans Creek) MA 2, HGL 22 (South Canberra) MA 2/3, HGL 21 (Royalla) MA 2 and MA 3, HGL 25 (Uriarra Road) MA 2/3 and HGL 13 (Lanyon) MA 2.

caw(3)— Lower slopes and drainage lines

Soils	Moderately deep (50 - 150 cm) imperfectly to poorly drained Brown Chromosols and Sodosols (Yellow Podzolic Soils, Solodic and Solonized Solonetz Soils).
Type Profile(s)	Brown Sodosol (Solodic Soil): Soil Landscapes of the Canberra 1:100 000 Sheet (1000464) profile 426 (Master Type Profile)
HGL Reference	Typically corresponds with: HGL 14 (Majura Road) MA 3/4, HGL 23 (Sullivans Creek) MA3/4, HGL 22 (South Canberra) MA 4, HGL 21 (Royalla) MA 4/5, HGL 25 (Uriarra Road) M 4/5, HGL 11 (Kambah Pools) MA 3/5 and HGL 13 (Lanyon) MA 3/4.



Schematic cross-section of the Campbell (caw) soil landscape, showing facets and soil types

REFERENCES

DMR 2002. New South Wales Statewide Geology coverage – 1:250 000 scale. Department of Mineral Resources, Sydney.

Jenkins B.R. 1993, Soil Landscapes of the Michelago 1:100 000 Sheet map and report, Department of Conservation and Land Management, Sydney

Jenkins B.R. 2000, Soil Landscapes of the Canberra 1:100 000 Sheet map and report, Department of Land and Water Conservation, Sydney

NOTES

(1) This report describes reconnaissance soil landscape information mapped at 1:100,000 scale and does not negate the need for site assessment at a scale suitable to the land use or development under consideration.

(2) 'Not observed' means unlikely to be found. 'Localised' means observed to a level considered significant for land management. 'Widespread' means prevalent and significant over most of the landscape. 'None recorded' means no occurrence has been recorded. 'Not assessed' means no result has been recorded for this attribute and it may or may not be present in the soil landscape.