



Source: Soil and Land Resources of the Hawkesbury-Nepean Catchment *interactive DVD*

Landscape—hanging valleys on Hawkesbury Sandstone. Local relief <80 m, slopes <15%. Occasional broad benches and broken scarps, valley floors are relatively wide, gently inclined and often poorly drained. Low eucalypt woodland, scrub, heathland and sedgeland.

Soils—moderately deep to deep (50–>150 cm) Earthy Sands (Uc5.23), Yellow Earths (Gn2.84, Gn2.94), Siliceous Sands (Uc1.21) on slopes; deep (>200 cm) Leached Sands (Uc2.12), Podzols (Uc2.32, Uc2.36) and Grey Earths (Gn2.881) on valley floors.

Limitations—very high soil erosion hazard, perched watertables and swamps, highly permeable soil, very low to low soil fertility, localised rock outcrop.

LOCATION

Isolated occurrences throughout the Hawkesbury Sandstone, particularly in valley heads on the Hornsby Plateau. Brisbane Water and Ku-ring-gai Chase National Parks as well as Muogamarra Nature Reserve contain undisturbed examples of this soil landscape. It also occurs within the metropolitan area at Oxford Falls, Berowra Heights, St Ives, Ingleside, Fiddletown, Berrilee and Allambie Heights.

LANDSCAPE

Geology

Hawkesbury Sandstone consisting of medium to coarse-grained quartz sandstone with minor shale and laminite lenses.

Topography

Hanging valleys 100–1 000 m wide with gently to moderately inclined (5–15%) slopes. Local relief is up to 80 m. Occasional wide sandstone benches are found on side slopes with associated rock outcrops and low scarps. Seepage areas and hillside swamps are common. The gently inclined (0–5% slopes) concave valley floors and drainage lines are often swampy.

Vegetation

Considerable variation in vegetation occurs within this soil landscape depending on site drainage. Vegetation has been described in detail for hanging valleys in Ku-ring-gai Chase National Park by Buchanan (1980) and Buchanan and Humphreys (1980).

Low dry sclerophyll open-woodland occurs on better drained upper slopes. Tree and mallee species include red bloodwood *Eucalyptus gummifera*, narrow-leaved stringybark *E. oblonga* and narrow-leaved apple *Angophora bakeri*.

Closed-scrub and heathland occur on poorly drained areas and on swampy valley floors and include tall swamp sedge *Gahnia sieberiana*, swamp banksia *Banksia robur*, swamp teatree *Leptospermum juniperinum* and native dog rose *Baeckea linifolia*. Sedgeland/heathland communities occur in areas of shallow soils with impeded drainage. Typical species include sundews *Drosera* spp, and sedges such as *Lepidosperma flexuosum* and *Gymnoschoenus sphaerocephalus*.

Tall eucalypt open-woodland with dry sclerophyll understorey occurs on the better drained valley floors with slopes of <3%. Buchanan and Humphreys (1980) describe this podzol assemblage in detail. Typical tree species include smooth-barked apple *Angophora costata*, white stringybark *E. globoidea* and red bloodwood *E. gummifera*. The dry sclerophyll understorey typically contains shrubs such as Christmas bush *Ceratopetalum gummiferum*, woody pear *Xylomelum pyriforme* and wedding bush *Ricinocarpus pinifolius*.

Land use

Predominantly national parks and nature reserves. Examples include Ku-ring-gai Chase and Brisbane Water National Parks and Muogamarra Nature Reserve. Locations such as Ingleside, Berrilee and Fiddletown are used for grazing and market gardening. Berowra Heights and St. Ives are largely urban residential.

Existing Erosion

No appreciable erosion occurs where a protective vegetation cover is present. Severe sheet and rill erosion occurs on previously overstocked land at Elanora Heights. Minor gully erosion, often to bedrock, is associated with poorly planned and maintained trails.

Associated Soil Landscapes

Lambert (**la**) soil landscape also has small hanging valleys and seepage areas, but does not include swamps.

Deep Creek (**dc**) soil landscape occurs on valley floors with woodland within the Oxford Falls soil landscape (deep sandy Podzols (Uc2.36)).

SOILS

Dominant Soil Materials

of1—Dark brown, loose loamy sand. This is dark brown sand to sandy loam with loose apedal single-grained structure and porous sandy fabric. It generally occurs as topsoil (A1 horizon).

This material is often water repellent. Colour ranges from a commonly occurring dark brown (10YR 3/3) to yellowish-brown (10YR 4/3, 5/4). The pH is usually moderately acid (pH 5.0). Small subrounded sandstone and quartz gravel fragments are widespread. Roots and charcoal fragments are common.

of2—Black organic loam. This is black organic rich loamy sand to light sandy clay loam with loose, apedal single-grained or apedal massive structure and porous sandy fabric. This material occurs as topsoil in waterlogged areas (A horizon).

Colours are commonly dark and range from black (7.5YR 1.7/1, 10YR 1.7/1) to brownish-black (10YR 3/1). This material is often waterlogged. The pH is usually moderately acid (pH 5.0). Iron coated sandstone and quartz gravel fragments and roots are common.

of3—Bleached loose sandy loam. This is bleached loamy sand to sandy clay loam with either loose apedal single-grained or apedal massive structure and porous sandy or earthy fabric. This material occurs as an A2 horizon.

Surface condition is commonly loose but is occasionally hardsetting. Moist colours range from dull yellowish brown (10YR 5/3) to dull yellow orange (10 YR 6/4). Dry colours are frequently bleached light grey (10YR 7/1). Orange mottles often follow root channels. The pH ranges between strongly acid (pH 4.5) and slightly acid (pH 6.0). Subrounded, sandstone and quartz gravel fragments and roots are rare, but charcoal fragments are common.

of4—Earthy yellowish-brown clayey sand. This is a yellowish-brown, clayey sand to light sandy clay loam with apedal massive structure and porous earthy fabric. It usually occurs as subsoil (B horizon).

Colour is commonly bright yellowish-brown (2.5Y 7/6, 10YR 7/6). This material is often moist to saturated and in this condition is labile to plastic and corresponds with Buchanan's (1980) puggy clay. The pH ranges between moderately acid (pH 5.0) and slightly acid (pH 6.0). Subrounded sandstone fragments, quartz pebbles and roots are rare. Charcoal fragments are absent.

of5—Friable sandstone. This is deeply weathered soft friable sandstone that has the appearance of sugar crystals.

This material ranges from clayey sand to sandy clay with apedal massive structure and earthy fabric. Colour ranges from greyish yellow brown (10YR 6/2) to light grey (10YR 8/1). Pale grey or yellow mottles may be present at depth. This material has an appearance similar to sugar crystals and is often waterlogged. The pH ranges from moderately acid (pH 5.0) to slightly acid (pH 6.0). Small rounded quartz gravels are rare whilst roots and charcoal fragments are absent.

Associated Soil Materials

The following associated materials occur in podzol soils associated with woodland on wide, well-drained, gently undulating valley floors. They are essentially equivalent to podzol soil materials as described for Deep Creek (**dc**) soil landscape.

- dc2** Loose grey-black loamy sand
- dc3** Mottled loose greyish-yellow brown sand
- dc4** Soft sandy organic pan
- dc5** soft sandy iron pan

In upper valley locations adjacent to Lucas Heights soil landscape (**lh**) subsoils may consist of:

- lh2** Bleached stony hardsetting sandy clay loam
- lh4** Pedal yellowish-brown clay

Occurrence and Relationships

Slopes. Up to 30 cm of dark brown, loose loamy sand (**of1**) overlies 20–100 cm of earthy, yellowish-brown clayey sand (**of4**). **of4** often overlies 3–20 cm of friable sandstone (**of5**) (Earthy Sands (Uc 5.23), Siliceous Sands (Uc1.21)).

Occasionally, 10–20 cm of bleached, loose sandy loam (**of3**) occurs between **of1** and **of4**. This is common when **of4** textures are heavier (e.g., sandy clay loam) (Yellow Earths (Gn 2.94, 2.84)). Boundaries between soil materials are usually gradational. Total soil depth is generally <100 cm.

Poorly drained valley floors with heathland or sedgeland. Up to 40 cm of wet, organic, black loam (**of2**) overlies either bedrock (Humic Lithosols (Gn 2.01)) or 20–30 cm of **of3** (Leached Sands (Uc2.12)). **of2** and **of3** occasionally overlie 10–50 cm of **of4** (Grey Earths (Gn2.81)).

Usually 5–20 cm of friable sandstone (**of5**) underlies the above soil materials. Boundaries between soil materials are usually gradational. Total soil depth ranges from 20–150 cm.

Swamps. A surface mat of up to 50 cm of reddish-brown material containing iron oxides, algae and bacteria (Buchanan, 1980) overlies up to 200 cm of peaty black anaerobic root mat which abruptly overlies grey-brown, saturated mottled sand. The mottled sand may be up to several metres thick and often has rusty stains associated with root channels (Acid Peat Soils (O, Acid)).

Either a layer of relatively impermeable sandstone or **of4** often underlies swamps (Lamy and Junor, 1965). Where Oxford Falls soil landscape occurs below the friable sandstone plateau surfaces of the Somersby (**so**) soil landscape, greater soil depths are encountered.

LIMITATIONS TO DEVELOPMENT

Urban Capability

Low to moderate capability for urban development.

Rural Capability

Land generally not capable of regular cultivation, but capable of being grazed.

Landscape Limitations

Seasonal waterlogging
Rock outcrop (localised)
Erosion hazard
Flood hazard (localised)
Shallow soils (localised)

Soil Limitations.

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| of1 | Low available water capacity
Low fertility
Very strongly acid
High aluminium toxicity |
| of2 | High organic matter
Strongly acid
High aluminium toxicity |
| of3 | Low available water capacity
Very low fertility
Extremely acid |

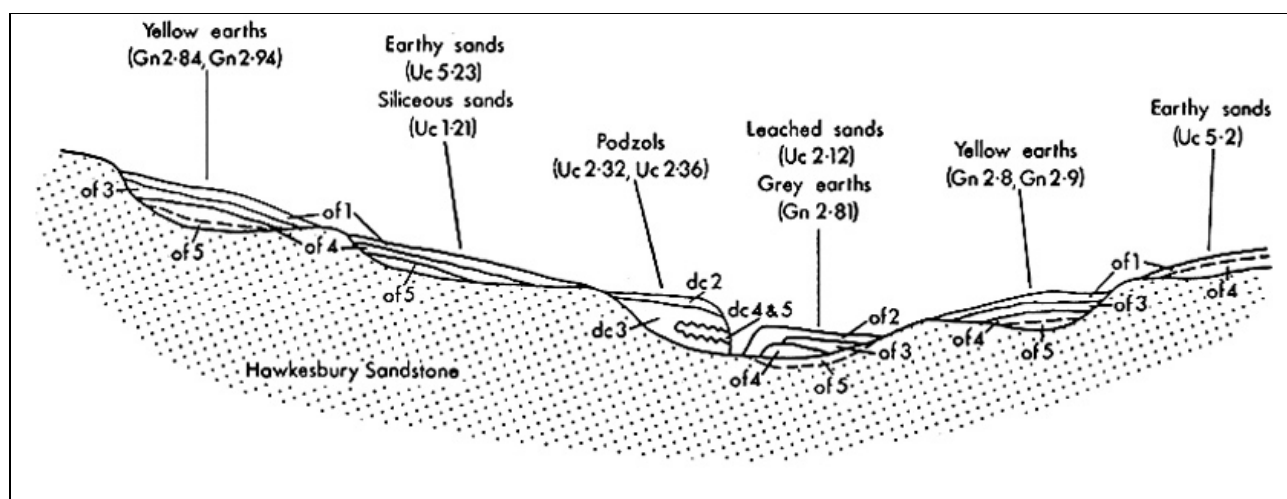
of4	Low wet strength Low available water capacity Very low fertility Strongly acid Low permeability (localised)
of5	Low available water capacity Very low fertility

The general fertility is low to very low. Most soil materials have low available water capacity, low to very low CEC, and low nutrient status. The exception is **of2**, which has a low to moderate fertility with very high organic matter, and moderate available water capacity.

of1 and **of3** have low erodibility as they consist of well-drained coarse sands. **of2** is moderately erodible as it contains appreciable quantities of fine sands weakly bound together by a high amount of organic matter. **of4** and **of5** have very low erodibility, consisting predominantly of coarse sand grains bound together by organic matter (**of4**) or clays and iron oxides (**of5**).

The erosion hazard for non-concentrated flows is generally high, but ranges from high to extreme. Calculated soil loss from non-concentrated flows for the first twelve months of development range up to 91 t/ha of topsoil and 131 t/ha of subsoil. The soil erosion hazard for concentrated flows is very high.

In most cases the soil materials are stable to slightly reactive. Where highly organic soils are thicker than 50 cm, soils may be moderately reactive.



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