AUSTRALIAN SOIL

AUSTRALIA has a great diversity of soils. Most are ancient, strongly weathered and infertile. Others are younger and more fertile. This variety, combined with the natural limitations of many soils, has made it difficult to develop sustainable land management practices. The soils shown here are typical of the 14 Soil Orders in the Australian Soil Classification.

Anthroposols: Soils resulting from human activity

Spolic Anthroposol

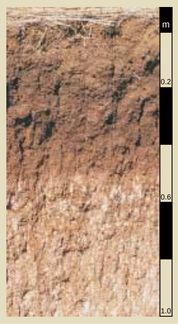
- Formed by the modification, mixing, truncation or burial of the original soil or creation of new soil parent materials as a result of human activities.
- Includes soils underlain by manufactured or organic landfill, soils formed by the application of human-made materials such as slurry, and soils formed by earthmoving in construction.
- Identified by the presence of artefacts in the profile or knowledge that the soils or parent materials have been made or altered by human action.
- Excludes soils altered by common agricultural operations and soils that are artificially drained or flooded.

Calcarosols: Soils with calcium carbonate

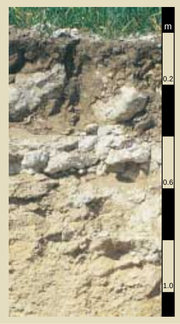
Hypocalcic Calcarosol

Supracalcic Calcarosol

Hypercalcic Calcarosol



Calcic Calcarosol



- Contain calcium carbonate as soft or hard white fragments or as a solid layer.
- Occur in the low rainfall, arid and semi-arid regions of Australia.
- Land use includes cereal growing and irrigated horticulture in the south and sparse grazing in the north.
- Limitations include shallow depth, low water retention due to hard carbonate content and wind erosion on the sandier types. High salinity, alkalinity and sodicity may also be a problem. Soil fertility deficiencies are widespread.

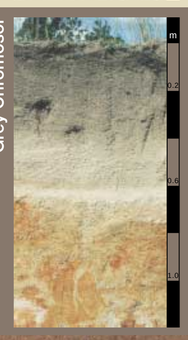
Chromosols: Soils with an abrupt increase in clay

Red Chromosol

Brown Chromosol

Yellow Chromosol

Grey Chromosol

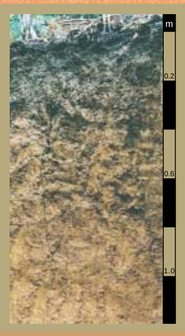


- Abrupt increase in clay content down the soil profile.
- Occur in most districts. Large areas in southern Australia have been cleared of vegetation.
- Common in the cereal belt of southern New South Wales and Victoria.
- Land use in the tropics is mainly cattle grazing of native pastures.
- Many have hardsetting surfaces with structural degradation caused by agriculture.
- May have impeded internal drainage.

Dermosols: Structured soils

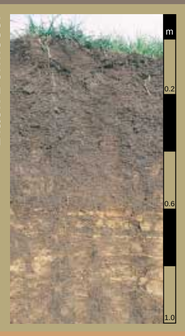
Red Dermosol

Brown Dermosol



Yellow Dermosol

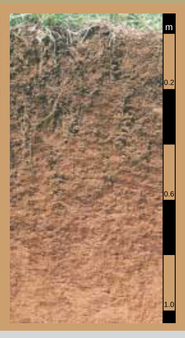
Black Dermosol



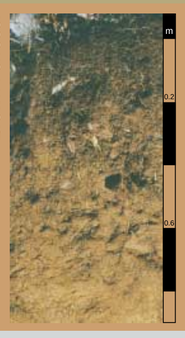
- Moderately deep and well-drained soils of wetter areas in eastern Australia.
- May be strongly acid in the high rainfall areas or highly alkaline if they contain calcium carbonate.
- Occur in the mountainous high rainfall zones of southeastern Australia.
- Support a wide range of land uses including cattle and sheep grazing of native pastures, forestry and sugar cane. Cereal crops, especially wheat, are commonly grown on the more fertile Dermosols.

Ferrosols: Iron rich soils

Red Ferrosol



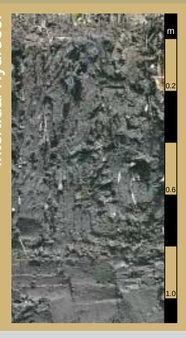
Brown Ferrosol



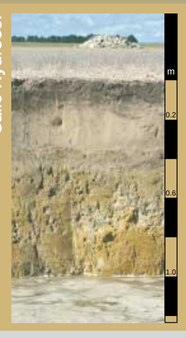
- High free iron and clay contents.
- Occur along the eastern coastline, in northern parts of Western Australia and the Top End.
- In high rainfall zones they may be very deep and well drained.
- Land use includes dairying on improved pastures, horticultural crops, some plantation forestry, and sugar cane in Queensland. In northern Australia the shallow and stony soil types support beef cattle grazing.
- May be degraded by erosion and compaction caused by cropping practices and may also suffer from acidification.

Hydrosols: Seasonally or permanently wet soils

Intertidal Hydrosol



Salic Hydrosol

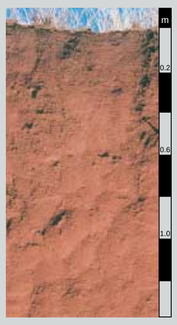


Redoxic Hydrosol

- Saturated for 2-3 months or more due to site or tidal influence.
- Distribution is often limited to wet drainage depressions, low lying narrow coastal plains and seepage areas on lower slopes.
- Saline Hydrosols of arid and semi-arid Western Australia differ from the non-saline Hydrosols of the temperate south and tropical north where rainfall is strongly seasonal.
- Most non-saline Hydrosols require drainage for land use other than grazing such as those under sugarcane in northern New South Wales and coastal Queensland.
- Small areas have been cleared and sown to improved pastures for dairying.
- Extent is increasing due to human-induced rising watertables leading to salinisation.
- Drainage of potentially acid sulfate Hydrosols can pose engineering and environmental problems and lead to acidification.

Kandosols: Structureless soils

Red Kandosol



Red Kandosol

Brown Kandosol

Yellow Kandosol

Yellow Kandosol

- Mostly well-drained, permeable soils although some Yellow and most Grey Kandosols have impeded subsoil drainage.
- Common in all States except Victoria and Tasmania. Most widespread in the arid and semi-arid interior.
- Used for extensive agriculture in the wheatbelt of southern New South Wales and southwest Western Australia. In the better-watered areas they are used for a range of horticultural crops.
- Most have low fertility and land use is restricted to grazing of native pastures.
- Grazing lands are susceptible to surface soil degradation such as hardsetting and crusting even though grazing intensity is low.

Kurosols: Acidic soils with an abrupt increase in clay

Red Kurosol

Yellow Kurosol

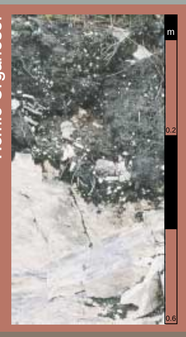
Brown Kurosol

Grey Kurosol

- Strongly acid soils with an abrupt increase in clay.
- Extend from southern Queensland, through coastal and subcoastal New South Wales, to Tasmania. Less common in southwest Western Australia.
- Vegetation is largely dependent on rainfall and ranges from eucalypt woodlands to open forests.
- Some areas have been cleared and used for dairying on improved pastures. In the higher rainfall areas of New South Wales and Tasmania, Kurosols are used for forestry. Small areas in Western Australia are used for cereal growing and lower rainfall woodlands support sparse cattle grazing.

Organosols: Organic soils

Hemic Organosol



Hemic Organosol

- Dominated by organic materials.
- Occur in wet landscapes in the more humid parts of the eastern Australian coastal zone.
- Less acidic forms in southern Australia have been drained and sown to pastures for dairying or used for intensive vegetable growing. Limited areas of sugarcane are grown on drained peats in north Queensland.
- Common in alpine regions but fragile and prone to erosion if disturbed.

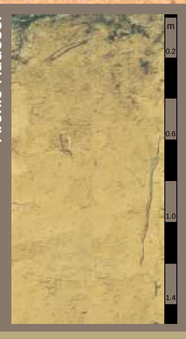
Podosols: Organic materials and aluminium, with or without iron

Aeric Podosol

Semiaquic Podosol

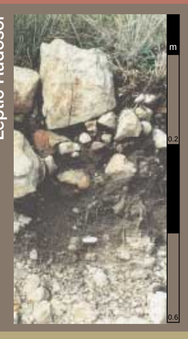
- Dominated by organic matter and aluminium with or without iron.
- Can be greater than 20 m deep ("giant podzols").
- Most are very permeable unless indurated pans are present.
- Largely confined to parts of the coastal zone and some offshore islands.
- Not all are derived from sand masses, they also occur in the wetter mountainous areas of Tasmania and New South Wales on other bedrock.
- Agricultural use is limited because of extremely low fertility, poor water retention and the seasonal waterlogging in some forms.
- Some wet soils have been drained and used for sugar cane (southeast Queensland) while others are used for irrigated vegetables and dairying and sheep grazing on improved pastures (Victoria and South Australia).

Arenic Rudosol



Stratic Rudosol

Leptic Rudosol

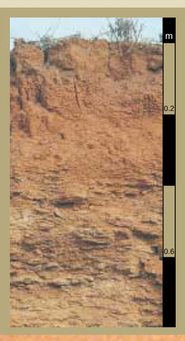


Rudosols: Minimal soil development

- Widespread but most have few commercial land uses because of their properties or occurrence in arid regions, or both.
- The largest areas occur in the desert regions of arid central and northwest Australia and support grazing of native pastures.
- In contrast, fertile variants formed in alluvium are used for cropping and improved pastures. Some dune soils of the Riverine Plain in the Murry-Darling Basin are irrigated for citrus and vines.
- Some Rudosol areas have spectacular scenery (e.g. Katherine Gorge and Bungle Bungle Mountains).

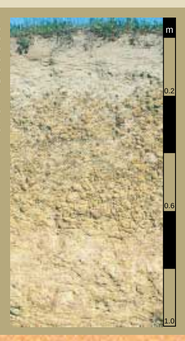
Sodosols: Soils high in sodium and an abrupt increase in clay

Red Sodosol



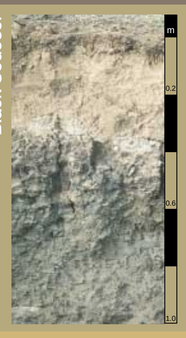
Brown Sodosol

Yellow Sodosol



Grey Sodosol

Black Sodosol

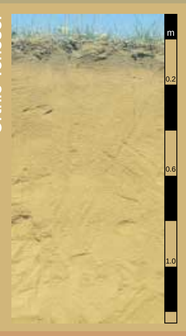


- Abrupt clay increase down the profile and high sodium content, which may lead to soil dispersion and instability.
- Seasonally perched water tables are common and subsoil horizons have a striking prismatic or columnar appearance.
- Usually associated with a dry climate and widely distributed in the eastern half of Australia and western portion of Western Australia.
- Common land uses include grazing of native or improved pastures for both dryland and irrigated agriculture, and forestry.
- Many will hardset when dry and are prone to crust formation.
- Dispersive subsoils makes them particularly prone to tunnel and gully erosion. Arid zone Sodosols may be strongly saline.

Tenosols: Weakly developed soils

Chernic Tenosol

Orthic Tenosol



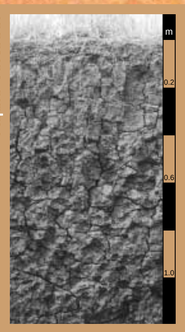
Orthic Tenosol

Bleached-Leptic Tenosol

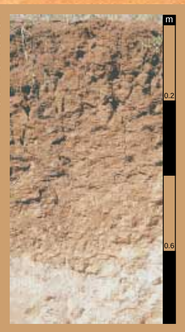
- Widespread in the eastern half of the continent where vast areas occur as red and yellow sand-plains.
- Large areas in Western Australia have red loamy soils with red-brown hardpan at shallow depths.
- Due to their poor water retention, almost universal low fertility and occurrence in regions of low and erratic rainfall, Tenosols are mainly used for the grazing of native pastures.
- In the better-watered areas landform prevents cultivation, but limited areas support forestry (east coast and southwest Western Australia).

Vertosols: Shrink and swell clay soils

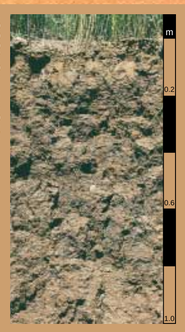
Aquic Vertosol



Red Vertosol

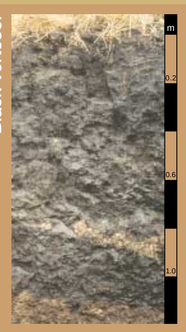


Brown Vertosol



Grey Vertosol

Black Vertosol



- Clay soils that shrink and swell, and crack as the soil dries.
- Australia has the largest area and greatest variety of Vertosols, including deep forms (up to 6 m or more).
- Largest single area occurs in the arid and semi-arid interior of the continent.
- Used for grazing of native and improved pastures, extensive dryland agriculture where rainfall is adequate, and irrigated agriculture.
- Problems of water entry are usually related to tillage practices and adverse soil physical conditions at least partly induced by high sodium in the upper part of many profiles.

Acknowledgements

General Production: Katharine Brown, Neil McKenzie, Ray Isbell and David Jacquier (CSIRO Land & Water).

Soil Images: State, Territory and Federal agencies participating in the Australian Collaborative Land Evaluation Program.

Landscape Images: Richard Woldendorp, Photographer.

Design: MA@D Communication, Braddon, ACT.

References

Isbell RF (1996) The Australian Soil Classification. (CSIRO Publishing: Melbourne).

Isbell RF, McDonald WS, Ashton LJ (1997) Concepts and Rationale of the Australian Soil Classification. (ACLEP, CSIRO Land and Water: Canberra).

MAED COMMUNICATION 2001/7

CSIRO

australian collaborative aclep land evaluation program

Natural Heritage Trust
Helping Communities Helping Australia