KPP Koppio Land System

Range of hills on the eastern side of Lower Eyre Peninsula

Area: 842.2 km^2

Annual rainfall: 345 – 575 mm average

Geology: The Land System is underlain by gneisses, schists, amphibolites and quartzites of the Hutchinson and Flinders Groups of metasediments. These outcrop sporadically, because over most of the land surface the rocks are either deeply weathered or buried by relict laterites. The lateritic mantle is of Pliocene age, and apparently developed prior to the crustal movements which caused the uplift of the present day Koppio Hills. The process of lateritization occurred over a vast peneplain of early Tertiary sediments and basement rocks. A plateau capped by mixed lateritized Tertiary and basement rock formed during uplift. This has subsequently been extensively dissected. Laterites are preserved on higher ground, and even on dissected hillslopes there are extensive deposits of reworked lateritic gravels. Only on the eastern margins of the ranges, and on steeper dissection slopes elsewhere, where the lateritic materials have been largely eroded away, are basement rocks near the surface.

On the western side of the hills is an extensive outwash fan formed on mixed alluvial sediments. These are clayey with abundant lateritic gravels. Narrow drainage depressions within the ranges are infilled by local wash deposits. These are variable clays and sands, commonly free of lateritic gravels.

Topography: The Koppio Land System is a range of hills bounded by an abrupt fault scarp on the eastern side, but by gentler slopes grading to the Cummins - Wanilla Basin to the west. The System grades to undulating land to the north and is buried beneath coastal dunes to the south. The landscape is largely one of undulating to rolling low hills, characterized by a dendritic drainage pattern. However, along the eastern margin where the basement rocks comprise a sequence of parallel soft schists and resistant quartzites, the drainage pattern is trellised. Slopes are generally in the range 2-20%, with some minor steeper grades to 30%.

Elevation: 60 m on footslopes in the west and north to 320 m (Pillaworta Hill) on the eastern edge

Relief: Up to 150 m, but typically 50 - 100 m

Main soils: *Soils formed on relict laterites and clays associated with lateritic gravels on hillslopes and footslopes*

J2a Ironstone soil (Ferric, Petroferric, Brown Dermosol) (Local name - McAvaney)
Medium to thick sandy loam to loam with 25-75% ironstone gravel in the paler coloured A2 layer, over a yellowish brown sandy clay loam to sandy clay with more than 50% ironstone, becoming indurated with depth.

J2b Ironstone soil (Ferric, Eutrophic, Brown Kandosol / Chromosol) (Local name - Stevens)
Medium to thick sandy loam with a paler A2 layer containing abundant transported ironstone gravel, overlying an ironstone gravelly yellowish brown sandy clay loam to sandy clay grading to Quaternary or Tertiary sediments with variable ironstone fragments.

Soils formed on lateritized basement rocks

J2c Ironstone soil (Ferric, Red / Brown Chromosol) (Local name - Koppio)
Medium thickness sandy loam with abundant ironstone gravel over a red to olive medium clay grading to kaolinitic weathering rock.

Soils formed on basement rocks

K3 Acidic sandy loam over red to brown clay on rock (Eutrophic, Red Chromosol) (Local name - Jericho)
Medium thickness sandy loam to sandy clay loam over a red to brown blocky clay with increasing schist and gneiss fragments on weathering rock of the Hutchinson Group at about 100 cm.

L1 Shallow soil on rock (Lithic / Petroferric, Leptic Tenosol / Rudosol)
Variable gravelly loamy sand to sandy clay loam over basement rock or massive ironstone at depths usually less than 50 cm.

Minor soils:

Soils formed on relict laterites and clays associated with lateritic gravels on slopes

J1 Ironstone soil with alkaline subsoil (Calcic, Ferric, Brown Sodosol) (Local name - Stevens, sodic variant)
Medium to thick sandy loam with abundant ironstone gravel and a bleached A2 layer, over a coarsely structured yellow brown mottled clay, calcareous with depth grading to deeply weathered and kaolinized Quaternary or Tertiary sediments with variable ironstone fragments.

G3 Sand over poorly structured clay (Calcic, Brown Chromosol / Sodosol) (Local name – Hall)
Thick loose sand with a bleached A2 layer, sharply overlying a brown or yellow mottled clay with strong columnar to prismatic structure, calcareous with depth.

Soils formed on basement rocks

K2 Acidic loam over brown to red clay on rock (Eutrophic, Red Chromosol) (Local name - Calderwood)
Medium thickness sandy loam to loam over a well structured red clay, occasionally calcareous at depth, with increasing rock fragments over weathering basement rock within 100 cm.

D7 Acidic sandy loam over red to brown sodic clay (Eutrophic / Calcic, Red / Brown Sodosol) (Local name - Hammat)
Medium thickness sandy loam to loam over a red to yellowish brown blocky clay with increasing weathered rock fragments grading to weathering gneissic rock with sporadic fine carbonate segregations from about 100 cm.

D1 Shallow loam over red clay on rock (Hypercalcic, Red Chromosol) (Local name - Laube)
Thin to medium gravelly loamy sand to loam over a yellowish red blocky medium to heavy clay with increasing rock fragments and soft carbonate, over weathering schist at about 100 cm.

Soils formed on alluvium in drainage depressions

M2 Deep clay loam (Eutrophic, Grey Dermosol) (Local name - Clayey Elson)
Thick black fine sandy clay loam with granular structure grading to a dark grey well structured sandy clay, with increased mottling and gleying at depth.

F2 Sandy loam over poorly structured brown clay (Calcic, Brown Sodosol) (Local name - Sandy loam Elson)
Sandy loam over poorly structured brown mottled sandy clay.

N2 Wet saline soil (Salic Hydrosol)
Miscellaneous soils of wet saline land.

Soils formed on outwash sediments on fans

F1 Sandy loam over brown clay (Calcic, Brown Chromosol)
Medium thickness sandy loam with a paler coloured A2 layer containing variable ironstone and quartz gravel, over a brown mottled clay, generally calcareous at depth.

D2 Loam over red clay (Calcic / Hypercalcic, Red Chromosol)
Medium thickness sandy loam to clay loam with a paler coloured A2 layer containing variable ironstone and quartz gravel, over a red clay, calcareous at depth.

D6 Ironstone gravelly sandy loam over red clay (Ferric, Red Chromosol)
Medium thickness hard sandy loam with up to 50% ironstone gravel, over a coarsely structured red clay with variable ironstone gravel, calcareous at depth, over alluvium.

Main features: The Koppio Land System is predominantly hilly country, although only about 10% of the land is too steep for arable agriculture. The hills are characterized by deep ironstone gravelly texture contrast soils. These soils are moderately fertile, but prone to phosphate fixation (ironstone gravel effect) and acidification. Clayey subsoils prevent free drainage, so waterlogging is a problem in wet seasons. Most of the land is susceptible to water erosion. A broad outwash fan on the western side occupies about 15% of the land area. Soils are mainly sandy loam texture contrast types, with similar properties to the ironstone soils of the hills, except that they are less susceptible to erosion. Drainage depressions within the hills have a variety of soils, but most have impeded drainage. In these valleys, and on the fans, saline seepage is widespread. Between 2% and 5% of the total land area of the System is affected to some degree by salinity.

Soil Landscape Unit summary: 30 Soil Landscape Units (SLUs) mapped in the Koppio Land System:

SLU	% of area	Main features
AKC	<0.1	Moderately steep rocky slopes. Stony slopes too steep for cultivation, but suitable for pastures. Saline seepage and watercourse erosion are sporadic problems. (Refer to Laube Land System). Main soils: Skeletal soil - **L1**. Shallow stony sandy loam semi arable. Laube - **D1 -** Sandier surface soil with brown clayey subsoil.
AOC AOI	10.2 0.1	Moderately steep and rocky slopes formed on basement rocks. **AOC** Slopes with stable watercourses. **AOI** Slopes with eroded watercourses. Main soils: shallow soil on rock (**L1**), with variable texture contrast soils as listed above in "Soils formed on basement rocks". This land is generally too steep and stony for agricultural land uses.
DJB	0.2	Gently undulating rises. Rises formed on deeply weathered rock with mainly ironstone gravelly sandy loams with red clayey subsoils. These are moderately deep and fertile, but prone to slight waterlogging, poor structure and acidification. Associated calcareous sandy loams are moderately fertile, with reduced water holding capacity, but not prone to waterlogging or acidification. Butler soils are infertile and prone to waterlogging and poor root growth. Potential for water erosion is slight to moderate. Up to 2% of the land is affected by salinity. Main soils: Red brown earth (ironstone) - **D6**; Wiabuna (rubbly) - **A5**; Butler - **F2** (sodic) / **F1** (non-sodic)
FRQ	0.1	Slopes with variable saline seepage. **FRQ** Very gentle slopes with 2-10% saline seepage and minor water course erosion. Main soils: ironstone soil - **J2** (extensive) and loam over brown/red clay - **F1** (extensive), with sandy loam over poorly structured brown clay - **F2/J1** (minor) in drainage lines. These soils are deep, acidic and imperfectly drained, with moderately low fertility. Salinity control is a significant issue. There is moderately low to moderate water erosion potential.

FVB FVC FVD FVH FVI FVL FVM FVN FVZ FVh	2.7 20.1 17.1 5.6 8.3 0.4 10.3 0.1 0.1 4.5	Gently to moderately inclined slopes and low hills formed on lateritized basement rock, largely overlain by lateritized relict Tertiary sediments. There are sporadic saline seepages throughout (up to 2% of land surface affected - more where indicated). **FVB** Very gentle slopes. **FVC** Undulating slopes **FVD** Rolling slopes **FVH** Undulating slopes with eroded water courses **FVI** Rolling slopes with eroded water courses **FVL** Very gentle slopes with 2-10% saline seepage **FVM** Undulating slopes with 2-10% saline seepage **FVN** Rolling slopes with 2-10% saline seepage **FVZ** Summit surfaces (flat topped crests) with no salinity **FVh** Undulating slopes with eroded water courses and 2-10% saline seepage Main soils: ironstone soils - **J2a**, **J2b, J2c** and **J1** (very extensive, J1 minor), with acidic loam over brown to red clay on rock - **K2**, acidic sandy loam over red to brown clay on rock - **K3**, and acidic sandy loam over red to brown sodic clay - **D7/K3** (limited on steeper dissected slopes), shallow soil on rock - **L1** (minor on steeper rocky slopes), sand over poorly structured clay - **G3** (sand spreads), and deep clay loam - **M2** and sandy loam over poorly structured brown clay - **F2** (limited in drainage depressions). The soils are generally deep, with adequate waterholding capacities. Fertility is affected by strong leaching and acidification. High ironstone contents reduce phosphate availability. Waterlogging affects many soils - a result of tight clayey subsoils close to the surface. The soils are generally erodible, and on steeper slopes erosion potential is high. Widespread (although minor overall) salinity indicates a need for increased water use efficiency.
JdB JdE JdJ JdK JdL Jde Jdj	5.8 0.1 1.8 6.6 0.3 0.1 0.5	Outwash fans and drainage depressions flanking the western side of the Koppio Hills. They are variably salt affected and eroded. **JdB** Gentle slopes with up to 2% of land affected by saline seepage. **JdE** Drainage depressions with up to 2% of land affected by saline seepage. **JdJ** Drainage depressions with eroded watercourses and up to 2% of land affected by saline seepage. **JdK** Flats with more than 10% of land affected by saline seepage. **JdL** Gentle slopes with 2-10% of land affected by saline seepage. **Jde** Drainage depressions with eroded watercourses and 2-10% of land affected by saline seepage. **Jdj** Drainage depressions with eroded watercourses and more than 10% of land affected by saline seepage. Main soils: sandy loam over brown clay - **F1** (extensive) and loam over red clay - **D2** (extensive), with ironstone gravelly sandy loam over red clay - **D6**, sand over poorly structured clay - **G3**, and wet saline soils - **N2** (minor on salt affected land). The main soils are deep and moderately fertile, although poorly structured and imperfectly drained. Watercourses are particularly sensitive in these landscapes, erosion and salinity being severe in places.
KJB KJE KJJ KJj	0.1 0.1 1.6 2.0	Outwash fans and drainage depressions within the Koppio Hills. Saline seepages are widespread although minor in overall extent (ie affect between 2% and 10% of the land). **KJB** Gently sloping fans. **KJE** Drainage depressions **KJJ** Drainage depressions with eroded watercourses. **KJj** Drainage depressions with eroded watercourses and with more than 10% of the land affected by saline seepage. Main soils: deep clay loam - **M2** (extensive) and sandy loam over poorly structured brown clay - **F2** (extensive), with wet saline soil - **N2** (minor on salt affected land). This land is potentially productive, with deep, moderately fertile well watered soils. Salinity and waterlogging are the main limitations.

ZA- ZD- ZL-	0.7 0.2 0.1	Saline land in which halophytic vegetation occupies more than 50% of the land area. **ZA-** Flats where more than 50% of the area is moderately to highly saline (ie has mainly halophytic vegetation). **ZD-** Bare salt flats or salt lakes. **ZL-** Lunettes. This land has low productive potential unless salt tolerant pastures or fodder plants are established. Reclamation in this way is generally feasible on **ZA-**, but not **ZD-.** Reduction in watertable depth relies on whole catchment management changes.
-R-	0.1	Tod River Reservoir.

References:

- Wetherby, K.G., Moore, S.D. and Sinclair, J.A., 1982. The Tod River Soil Survey. Dept. of Agriculture SA, Tech. Paper No.2.
- Johns, R.K., 1961. Geology and Mineral Resources of Southern Eyre Peninsula. Geological Survey of SA, Bulletin No.37.

Further information: DEWNR Soil and Land Program