TUN Tungkillo Land System

Rolling low hills in the Tungkillo area

Area: 134.1 km^2

Annual rainfall: 475 – 675 mm average

Geology: The land is underlain by metamorphosed sandstones and schists of the Backstairs Passage Formation of the Kanmantoo Group. These are moderately resistant to weathering and outcrop to varying degrees. Within these rock strata are minor occurrences of granitic rocks of the Palmer Granite and calcareous rocks of the Tungkillo Marble. On some isolated crests are Tertiary gravels or deeply weathered and kaolinized profiles, indicative of an ancient land surface, possibly of Tertiary age. Apparently all but a few scattered occurrences of this land surface have eroded away over time. Locally derived alluvial sediments fill valley flats. These are mostly coarse to medium grained and gravelly. Shallow water tables are common throughout the landscape. When these pick up salts stored in the weathering zone, and come to within a metre or two of the land surface, saline seepages occur.

Topography: The landscape is dominated by rolling low hills with slopes typically in the range 10 - 30%, although both steeper and gentler slopes occur. Rock outcrop is rare in some areas, and extensive in others. The flats between the low hills are well defined by clear breaks in slope, where saline seepages are most likely to occur. All flats have watercourses, which are eroded in places. Virtually all of the watercourses draining the System have a general eastwards flow to Reedy Creek.

Elevation: 230 m on the eastern side to 500 m in the south west.

Relief: 20 m to 100 m

Soils: The soils are almost all stony sands to sandy loams over weathering basement rock. Red or brown subsoil clays are common, but there are extensive areas of shallow stony soils. Deep texture contrast soils or uniform to gradational sands are typical of valley flats.

Main soils:

Soils formed on metasandstones and schists

K3a Loamy sand over red clay
K4 Sandy loam over brown clay
K5 Gradational sandy loam
L1a Shallow stony loamy sand on metasandstone
L1b Shallow stony sandy loam on schist

Soils formed on granitic rocks

L1c/d Shallow gritty loamy sand

Minor soils:

Soils formed on alluvium in valley flats

F2 Loamy sand over brown (**F2a**) to black (**F2b**) dispersive clay
G3 Thick sand over sandy clay
M1 Deep uniform coarse textured (**M1a**) to gradational textured (**M1b**) alluvial soil

Soils formed on granitic rocks

K3b Gritty loamy sand over red sandy clay

Soils formed on calcareous rocks

C2 Red loam over calcareous rock
D1 Sandy loam over red clay on calc-rock

Soils formed on ironstone crests

M3 Gravelly sandy loam over yellow sandy clay loam
J2 Brown ironstone soil

Main features: The Tungkillo Land System is characterized by rolling low hills with two major soil classes. On steeper rocky slopes, shallow stony soils over rock within 50 cm are most common. Elsewhere, loamy sands over brown clayey subsoils are more common. These soils have restricted to adequate waterholding capacity, moderately low fertility and are highly erodible. Shallow water tables cause seepage which is often saline. Valley flats have deep soils with sandy surfaces and variable subsoils. Low fertility and waterlogging are the biggest problems. Most of the salinity in the System is on these flats, or the break in slope to the adjacent higher ground. Watercourse erosion is common, but more extensive in salinized areas.

Soil Landscape Unit summary: 14 Soil Landscape Units (SLUs) mapped in the Tungkillo Land System

SLU	% of area	Main features #
ACB	1.0	Rises formed on calcareous rocks of the Tungkillo Marble Formation. Rises are up to 30 m high with slopes of 8-20%. There is sporadic rock outcrop. Main soils: red loam over calcareous rock - **C2** (E) and sandy loam over red clay on calc-rock - **D1** (E). These soils are shallow to moderately deep, well structured and with moderately high natural fertility. The soils themselves, except for shallower profiles, have no significant limitations to productivity, but steeper slopes and occurrences of surface rock and stone restrict options.
Agu Agv	0.3 0.4	Very rocky slopes formed on gneisses, granitic gneisses and granites. There is extensive rock outcrop and surface stone. Relief ranges from 50 m to 100 m, and slopes from 10% to 100% with occasional precipitous slopes. Watercourses are well defined in narrow depressions. **Agu** Very rocky slopes of 10-50%, and up to 50 m high. There is about 50% outcropping rock. **Agv** Very rocky steep slopes of 20-100%, up to 100 m high with about 50% outcropping rock. Main soils: shallow gritty loamy sand - **L1c** (E) and **L1d** (E). This land is too steep and / or rocky for any uses other than rough grazing.
AmC	14.1	Rolling low hills with relief of 30 to 60 m and slopes of 12-25%, formed on metasandstones and schists. There is up to 10% rocky outcrop. Main soils: sandy loam over brown clay - **K4** (E) and shallow stony sandy loam - **L1b** (C), with gradational sandy loam - **K5** (L), loamy sand over red clay - **K3a** (L), and shallow stony loamy sand - **L1a** (M). Soils as for **LUe** and **LVe** occur in unmapped creek flats. This land is moderately steep, and except for some minor gently sloping crests, is non arable. The soils are mainly shallow and stony with limited waterholding capacity, but deeper soils with clayey subsoils are common. Fertility is moderately low. Sporadic rocky outcrops restrict access. There is minor saline seepage on lower slopes.
AnC AnI AnY	35.4 6.7 7.0	Rocky low hills formed on metasandstones. These areas are similar to **AmC**, but with more extensive rocky outcrop. In places there is up to 50% outcrop, but usually about 20%. **AnC** Low hills to 60 m high with slopes of 10-30%. **AnI** Low hills to 80 m high with slopes of 10-30%. There is some watercourse erosion. **AnY** Rounded broad rocky crests associated with the slopes of **AnC**, with slopes of 2-10%. Main soils: shallow stony loamy sand to sandy loam - **L1a** (E) and **L1b** (C), with gradational sandy loam - **K5** (L), loamy sand over red clay - **K3a** (L) and sandy loam over brown clay - **K4** (L). This land is rocky and moderately steep, with mostly shallow stony soils. It is non arable. There are sporadic saline seepages on lower slopes.
CPD	0.6	Rises and low hills between 20 m and 50 m high with slopes of 10-20%, formed on granitic rocks. Rock outcrop is extensive. Main soils: shallow gritty loamy sand - **L1c** (E), **L1d** (E) and gritty loamy sand over red sandy clay - **K3b** (C). This land is rocky with generally shallow soils. Development opportunities are limited, due to the combination of rocky outcrop, restricted moisture holding capacity, low fertility and erosion potential.

CQD	25.3	Rises and low hills with relief of 20-70 m and slopes of 6-15% formed on metasandstones. There is minor rock outcrop. Main soils: sandy loam over brown clay - **K4** (E) and shallow stony sandy loam - **L1b** (C), with gradational sandy loam - **K5** (L), loamy sand over red clay - **K3a** (L) and shallow stony loamy sand - **L1a** (L). There are minor occurrences of soils as for **LUe** and **LVe** on unmapped creek flats, soils as for **FdZ** on ironstone crests, and soils as for **CPD** on granitic or gneissic intrusions. The soils are moderately deep to moderately shallow, with satisfactory moisture holding capacity. The main drawbacks are moderately low fertility and high erodibility. There are sporadic saline seepages, mainly on lower slopes.
FdZ	0.7	Slopes, sharp crests and summit surfaces formed on deeply weathered and kaolinized basement rocks, or on Tertiary sands and gravels. These are remnant ancient land surfaces. Slopes are up to 10%, but up to 30% on point crests. There is up to 20% (and sometimes more) surface ironstone. Main soils: brown ironstone soil - **J2** (E) and gravelly sandy loam over yellow sandy clay loam - **M3** (E). These isolated areas have deep but infertile soils. The high ironstone or quartz gravel content restricts waterholding capacity and ironstone locks up phosphates. The deep weathering profiles are potential stores of salt.
LUO LUe	0.7 5.5	Flats and drainage depressions with slopes to 4% formed on mixed alluvial sediments. Saline seepage affects 2-10% of the land. **LUO** Flats and drainage depressions with mainly stable watercourses. **LUe** Flats and drainage depressions with some watercourse erosion. Main soils: loamy sand over dark to brown dispersive clay - **F2a**/**F2b** (E), gradational loamy sand - **M1b** (E) and thick sand over sandy clay - **G3** (C). These soils are deep but imperfectly drained, due to dispersive clayey subsoils and low lying position in the landscape. Waterholding capacities are good, but natural fertility is moderate to moderately low. All of this land is at risk of salinization, and all watercourses are susceptible to erosion. Erosion is accelerated by salinization.
LVO LVe	0.7 1.6	Valley flats and lower slopes of up to 4% formed on coarse grained and gritty alluvium. There is some stream bank erosion and sporadic saline seepage, affecting 2-10% of the land. **LVO** Flats and drainage depressions with mainly stable watercourses. **LVe** Flats and drainage depressions with some watercourse erosion. Main soils: sandy alluvial soil - **M1a** (E) and loamy sand over brown to dark dispersive clay - **F2a**/**F2b** (E) with gradational loamy sand - **M1b** (C) and thick sand over sandy clay - **G3** (L). The soils are deep but infertile. The sandy soils are well drained, but the F2 soils are subject to waterlogging. All of this land is at risk of salinization, and all watercourses are susceptible to erosion. Erosion is accelerated by salinization.

PROPORTION codes assigned to soils within Soil Landscape Units (SLU):

(D) Dominant in extent (>90% of SLU)
(V) Very extensive in extent (60–90% of SLU)
(E) Extensive in extent (30–60% of SLU)
(C) Common in extent (20–30% of SLU)
(L) Limited in extent (10–20% of SLU)
(M) Minor in extent (<10% of SLU)

Detailed soil profile descriptions:

C2 Red loam over calcareous rock (Hypercalcic / Petrocalcic Red Dermosol)
Medium thickness dark reddish brown loam, over a reddish well structured loam to clay loam, grading to highly calcareous siltstone, soft carbonate with siltstone fragments throughout, or calcrete at about 50 cm.

D1 Sandy loam over red clay on calc-rock (Hypercalcic, Red Chromosol)
Medium thickness reddish brown sandy loam to loam, overlying a reddish brown well structured clay grading to soft carbonate capping weathered calcareous rock (limestone, marble, calcareous siltstone etc).

F2a Loamy sand over brown dispersive clay (Eutrophic, Brown Sodosol)
Thick grey massive loamy sand with a bleached A2 horizon, overlying a yellow brown and grey mottled weakly structured sandy clay loam to sandy clay, grading to alluvium.

F2b Loamy sand over dark clay (Calcic, Black / Brown Sodosol)
Thick grey massive loamy sand to sandy loam with a bleached A2 horizon, overlying a dark grey and yellow brown prismatic structured clay with soft calcareous segregations at depth, grading to alluvium.

G3 Thick sand over sandy clay (Eutrophic, Brown Sodosol)
Thick greyish sand with a bleached A2 layer, sharply overlying a brown mottled dispersive sandy clay to clay, grading to coarser grained material with depth.

J2 Brown ironstone soil (Ferric, Mesotrophic, Brown Kurosol)
Medium thickness grey brown loamy sand with an A2 horizon containing over 50% ironstone gravel, overlying a yellow brown clay with soft red inclusions of weathered ironstone, grading to a greyish silty clay forming in weathering schist or micaceous sandstone deeper than 200 cm.

K3a Loamy sand over red clay (Eutrophic, Red Chromosol)
Medium thickness grey loamy sand to sandy loam with a quartz and sandstone gravelly bleached A2 horizon, overlying a red, brown and yellow sandy clay grading to weathering micaceous sandstone by 100 cm. Occurs on coarse grained rock strata, in blue gum areas.

K3b Gritty loamy sand over red sandy clay (Mesotrophic, Red Chromosol)
Thick gritty and gravelly loamy sand to sandy loam overlying a brown or red gritty sandy clay loam to clay subsoil, grading to weathering granodiorite or granitic gneiss by 70 cm.

K4 Sandy loamy over brown clay (Eutrophic, Brown Chromosol / Sodosol)
Thick grey brown sandy loam to loamy sand with a bleached and gravelly A2 horizon, overlying a dark brown, yellow and red mottled clay with strong fine blocky structure, grading to weathered sandy schist or micaceous sandstone within 100 cm. Occurs in red gum areas.

K5 Gradational sandy loam (Bleached-Acidic, Mesotrophic, Brown Kandosol)
Medium thickness grey loamy sand to sandy loam with up to 50% rock fragments, overlying a massive brown silty clay loam with abundant rock fragments, grading to weathering schist by 100 cm.

L1a Shallow stony loamy sand (Lithic, Leptic Rudosol)
Thick grey brown loamy sand with up to 50% fragments of parent rock, grading to metamorphosed sandstone within 50 cm.

L1b Shallow stony sandy loam (Paralithic, Brown-Orthic Tenosol / Mesotrophic, Brown Kandosol)
Thick dark brown sandy loam to loamy sand with up to 50% rock fragments, grading to schist or micaceous sandstone within 50 cm.

L1c Shallow gritty loamy sand with subsurface bleaching (Acidic, Paralithic, Bleached-Leptic Tenosol)
Thick gritty and gravelly loamy coarse sand to coarse sandy loam with a bleached A2 layer, grading to weathering rock before 50 cm.

L1d Shallow gritty loamy sand (Lithic, Leptic Rudosol)
Thick gritty sand to loamy sand with quartz and gneiss stones throughout, grading to weathering rock by 50 cm.

M1a Sandy alluvial soil (Basic, Arenic, Red-Orthic / Brown-Orthic Tenosol)
Very deep gravelly loamy sand with a slight clay increase at depth, formed on gritty red or brown alluvial sand.

M1b Gradational loamy sand (Eutrophic, Brown Kandosol)
Very thick brown sand with bleached and rusty mottles, overlying a massive brown clayey sand to light sandy clay loam at about 100 cm, grading to sandy alluvium.

M3 Gravelly sandy loam over yellow sandy clay loam (Mesotrophic, Yellow Kandosol)
Thick grey gravelly loamy coarse sand to coarse sandy loam with a bleached A2 horizon containing more than 50% quartz gravel and cobbles, overlying a yellow gravelly sandy clay loam grading to gravel and stone beds in a clay matrix.

Further information: DEWNR Soil and Land Program