

WOA Woakwine Land System

Area:	279 km ²
Landscape:	Old coastal dunes capped with calcarenite and wind blown sand
Rainfall:	550 – 775 mm average
Geology:	Calcreted calcarenite of the Pleistocene Bridgewater Formation on ridges, with Pleistocene lagoonal deposits of the Padthaway Formation on flats on the landward edge.
Main soils:	B3 (41%) Shallow sandy loam on calcrete (Petrocalcic Red Tenosol-Kandosol-Rudosol) RR (36%) Rock or exposed calcrete.
Minor soils:	B6 (9%) Shallow loam over red-brown clay on calcrete (Petrocalcic Red Chromosol-Kandosol) H3 (4%) Bleached siliceous sand (sandy Bleached Tenosol)
Summary:	Very shallow soils on calcreted calcarenite dominate this land system. The associated limitations for land use are low water holding capacity and rockiness. The calcrete is, however, mostly rippable and when ripped the root environment is generally well-drained. Rocks will interfere with tillage in a lot of soils and so these areas will also be unsuitable for root crops.

Soil Landscape Unit summary: Woakwine Land System (WOA)

SLU	% of area	Component	Main soils	Prop#	Notes
MAB	0.05	Rise	B3RR	D	Calcreted former beach ridges with stony, very shallow red and brown loam, occasionally over red clay, on calcrete. >50% bare calcrete. MAB Gently undulating ridges. MABA As above with low dune core ridges. MAC as above, undulating slopes. MAD as above, rolling rises and low hills, bare rock is dominant. Main soils: <u>Shallow sandy loam on calcrete</u> - B3 and <u>Rock or exposed calcrete</u> – RR .
MABA	1.3	Rise	B3RR	D	
MAC	10.2	Rise	B3RR	D	
MAD	44.9	Rise	RRB3	D	
M-B	9.3	Stony rise	B3RR	V	Calcreted former beach ridges with stony, very shallow red and brown loam, occasionally over red clay, on calcrete. Less than 50% bare calcrete. 10-20% swales with shallow sandy loam, mostly over poorly structured brown, or red clay on calcrete; 10-30% of swale areas have very shallow sandy loam on calcrete, soils or bare calcrete. M-B Gently undulating rises. M-C Steeper, undulating rises. Main soils: Rises: <u>Shallow sandy loam on calcrete</u> - B3 and <u>Rock or exposed calcrete</u> – RR . Swales: <u>Sand over friable brown clay on calcrete</u> - B7 and <u>Shallow sandy loam over red-brown clay on calcrete</u> - B6 .
		Swale	B7B6	L	
M-C	6.9	Rise	RRB3	D	
MBA	0.7	Plain	B3	D	Rises and plains with shallow sand, often over clay, on calcreted calcarenite.
MBB	2.6	Rise	B3B7	V	



MBC	0.4	Swale	B3	L	<p>MBA Plain with shallow sand over calcrete</p> <p>MBB Gently undulating rises with shallow sand, often over poorly structured brown clay, on calcreted calcarenite.</p> <p>MBC Undulating rises with shallow sand, often over red clay, on calcreted calcarenite. 10-30% of the rises have very shallow shelly sand or deep siliceous sand. <10% swales with mostly shallow sandy loam over red clay on calcrete and other very shallow soils.</p> <p>MBL Gently undulating rises, as for MBB above; 20-30% swales with mostly shallow sandy loam over red clay on calcrete and other very shallow soils.</p> <p>Main soils: Plains: <u>Shallow sandy loam on calcrete</u> - B3. Rises: <u>Shallow sandy loam on calcrete</u> - B3, <u>Shallow sandy loam over red-brown clay on calcrete</u> - B6 and <u>Sand over friable brown clay on calcrete</u> - B7. Swales: <u>Shallow sandy loam over red-brown clay on calcrete</u> - B6.</p>
		Rise	B3B6	D	
MBL	0.4	Swale	B6	M	
		Rise	B6B3 B7	V	
MCP	0.3	Swale/flat	B6	C	
		Rise	H2B3	D	
MCU	0.1	Swale	A4N3 B2	M	
		Rise	B3B2	V	
MEE	0.3	Swamp	B6	L	
		Depression	B6B3	D	
MEB	2.5	Stony rise	B3	V	
		Dune	I1H3	L	
MFB	0.4	Low rise	B6B3 B9	D	



MGE	0.1	Swale	B6B3	D	<p>Calcreted former beach ridges with less than 50% bare calcrete</p> <p>Mainly Hydrosols & shallow Tenosols in low parts of calcreted landscapes with Brown and grey Sodosols.</p> <p>MGE Swale area with shallow sandy loam over red clay on calcrete. 10-30% of the areas have bare rock.</p> <p>MGU Rises with shallow siliceous or calcareous sandy loam on calcrete, occasionally with red clay subsoils. 30-60% swampy swales with slightly deeper loam over red clay on calcrete, on better-drained parts, and wet peats and loam soils in lower parts.</p> <p>Main soils: <u>Shallow sandy loam over red-brown clay on calcrete</u> - B6, <u>Shallow sandy loam on calcrete</u> - B3 and <u>Shallow calcareous loam on calcrete</u> - B2.</p>
MGU	0.9	Rise	B3B2	E	
		Swamp	B6	E	
MHB	0.8	Dune	H3	E	<p>Calcreted calcarenite on old coastal dune ranges. Mainly moderately deep to deep siliceous sandy Podosols and Tenosols with shallow Petrocalcic Tenosol and sandy Petrocalcic Chromosols.</p> <p>MHB Gently sloping calcarenite ridges with deep bleached siliceous sands on dunes, often over brown sandy clay. Co-dominant are shallow stony rises with shallow siliceous sand on calcrete or bare rock, or occasionally, sandy loam on red clay on calcrete.</p> <p>MHC Undulating slopes on calcarenite range as for MHB but with 10-30% of rise areas have rock outcrop or shallow sand on calcrete or deep siliceous sand. <10% swales with sand over brown clay or shallow sand over poorly structured clay on calcrete. Minor deep siliceous sands.</p> <p>Main soils:</p> <p>Dunes: <u>Bleached siliceous sand</u> - H3.</p> <p>Stony ranges: <u>Shallow sandy loam on calcrete</u> - B3 and <u>Rock or exposed calcrete</u> - RR.</p> <p>Dune ranges: <u>Bleached siliceous sand</u> - H3, <u>Highly leached sand</u> - I1 and <u>Sand over friable brown clay on calcrete</u> - B7.</p> <p>Swales: <u>Bleached siliceous sand</u> - H3, <u>Thick sand over clay</u> - G3, <u>Sand over friable brown clay on calcrete</u> - B7 and <u>Shallow sand on calcrete</u> - B8.</p>
MHC	0.6	Dune range	H3I1 B7	D	
		Swale	G3B7 B8	M	
MJB	0.1	Rise	B3H3	D	<p>Old coastal dune ranges with less than 50% bare calcrete. Mainly shallow calcareous Rudosols, Calcarosols and Tenosols on calcreted, aeolianite with shallow siliceous sandy yellow Tenosols and shallow bleached sandy Tenosols.</p> <p>MJB Gently sloping rises with shallow sand over calcrete, and deep siliceous sand, soils.</p> <p>MJL Gently sloping rises with shallow sand over calcrete, and deep siliceous sand, soils; minor shallow sandy loam over red clay on calcrete soils. 10-20% swales with sand over brown clay or shallow sand over poorly structured clay on calcrete. Minor deep siliceous sands.</p> <p>Main soils:</p> <p>Rises: <u>Bleached siliceous sand</u> - H3 and <u>Shallow sandy loam on calcrete</u> - B3.</p> <p>Swales: <u>Thick sand over clay</u> - G3, <u>Sand over friable brown clay on calcrete</u> - B7 and <u>Shallow sand on calcrete</u> - B8.</p>
MJL	7.8	Rise	B3H3	V	
		Swale	G3B7 B8	L	
MKH	0.4	Rise	RRB3 B6	V	<p>Old coastal dune ranges with less than 50% bare calcrete. Soils are mostly red sandy Tenosols and/or Chromosols.</p> <p>Gently sloping rises with bare calcrete rock outcrop, shallow sand over calcrete, and deep siliceous sand, soils; minor shallow sandy loam over red clay on calcrete soils. 10-20% swales with shallow sand,</p>
		Swale	B7B3	L	



					<p>mostly over poorly structured clay, on calcrete.</p> <p>Main soils: Rises: <u>Rock or exposed calcrete – RR</u>, <u>Shallow sandy loam on calcrete – B3</u> and <u>Shallow sandy loam over red-brown clay on calcrete – B6</u>. Swales: <u>Sand over friable brown clay on calcrete – B7</u> and <u>Shallow sandy loam on calcrete – B3</u>.</p>
MSB	2.3	Dune range	B8H3 I2	D	Dune range with mainly moderately deep to deep siliceous sandy Podosols and Tenosols.
MSCD	0.4	Dune Swale	I1H2 B3B2	V L	<p>MSB Gently undulating dune range rises with shallow siliceous sand on calcrete or deep bleached, water repellent acid sands. 10-30% of the area has shallow sandy loam over red clay on calcrete soils.</p> <p>MSCD Undulating rises with overlying low dune core topography, with mostly deep, acid, water repellent, siliceous, bleached sand. 10-20% swales with shallow siliceous, often calcareous, sand over calcrete.</p> <p>Main soils: Dune ranges: <u>Shallow sand on calcrete – B8</u>, <u>Bleached siliceous sand – H3</u> and <u>Wet highly leached sand – I2</u>. Dunes: <u>Highly leached sand – I1</u> and <u>Deep brown sand – H2</u>. Swales: <u>Shallow sandy loam on calcrete – B3</u> and <u>Shallow calcareous loam on calcrete – B2</u>.</p>
MUB	1.0	Rise	B3B1	D	<p>Mainly shallow calcareous Rudosols, Calcarosols and Tenosols on calcreted, aeolianite with shallow calcareous Rudosols and dark brown Tenosols. Less than 50% bare calcrete. Typically shallow, dark brown sandy loam over calcrete, often with thin dark brown clay loam subsoil; and deep shelly calcareous sands.</p> <p>MUB Gently undulating rises; 10-30% bare calcrete rock. MUX Depressions with wet organic loamy and peat soils.</p> <p>Main soils: Rises: <u>Shallow sandy loam on calcrete – B3</u> and <u>Shallow highly calcareous sandy loam on calcrete – B1</u>. Depressions: <u>Wet clay loam – N3</u> and <u>Peaty soil – N1</u>.</p>
MUX	0.04	Depression	N3N1	D	
MwB	0.7	Stony rise Dune Swale	B3RR I1H3 B3B2 B6	V L L	<p>Gently sloping stony rises with very shallow red sands on calcrete, or bare rock. 10-20% dunes with deep, water repellent, bleached siliceous sand. 10-20% swales with shallow red siliceous or pale grey calcareous sand, often with red clay subsoils, on calcrete.</p> <p>Main soils: Stony rises: <u>Shallow sandy loam on calcrete – B3</u> and <u>Rock or exposed calcrete – RR</u>. Dunes: <u>Highly leached sand – I1</u> and <u>Bleached siliceous sand – H3</u>. Swales: <u>Shallow sandy loam on calcrete – B3</u>, <u>Shallow calcareous loam on calcrete – B2</u> and <u>Shallow sandy loam over red-brown clay on calcrete – B6</u>.</p>
MXT	0.3	Plain Swamp	RRB3 N3N1	V L	<p>Poorly drained plains with bare calcrete rock or very shallow sandy loam on calcrete. 10-20% swamps with shallow wet loams or peats.</p> <p>Main soils: Plains: <u>Rock or exposed calcrete – RR</u> and <u>Shallow sandy loam on calcrete – B3</u>. Swamps: <u>Wet clay loam – N3</u> and <u>Peaty soil – N1</u>.</p>
MzBA	2.2	Plain Stony rise	B2 B3RR	V L	<p>Plain with mainly very shallow calcareous clay loam on calcrete. 10-20% stony rises with shallow reddish loams over calcrete or bare rock.</p> <p>Main soils: Plains: <u>Shallow calcareous loam on calcrete – B2</u>. Stony rises: <u>Rock or exposed calcrete – RR</u> and <u>Shallow sandy loam on calcrete – B3</u>.</p>



NDG	0.03	Depression	G3B7	D	Depression with sand over yellow/grey poorly structured clay, often shallow over calcrete. Main soils: <u>Thick sand over clay</u> - G3 and <u>Sand over friable brown clay on calcrete</u> - B7 .
NjC	0.1	Plain	B7	D	Plains with shallow sand, mostly over poorly structured brown clay on calcrete. 10-30% clay loam over dark brown clay on calcrete. <10% stony rises with shallow loam on calcrete. Main soils: Plains: <u>Sand over friable brown clay on calcrete</u> - B7 . Stony rises: <u>Shallow sandy loam on calcrete</u> - B3 .
		Stony rise	B3	M	
NMT	0.1	Swampy plain	B7	V	Swampy plain with shallow sand over yellow/grey, poorly structured clay, on calcrete. 10-20% sandy rises with deep sand, often over yellow/grey clay. Main soils: Swampy plains: <u>Sand over friable brown clay on calcrete</u> - B7 . Sandy rises: <u>Thick sand over clay</u> - G3 , <u>Bleached siliceous sand</u> - H3 and <u>Wet highly leached sand</u> - I2 .
		Sandy rise	G3H3 I2	L	
NxN	0.8	Stony plain	B3	V	Stony plain with shallow sandy loam on calcrete soils; and dark clay loam on dark clay on calcrete. 20-30% stony rises with shallow dark sandy loam over calcrete; 10-30% of rises have red clay subsoils. Main soils: Stony plains: <u>Shallow sandy loam on calcrete</u> - B3 . Stony rises: <u>Shallow loam on calcrete</u> - B3 .
		Stony rise	B3	C	
XtC	0.2	Swamp	N1	D	Alkaline peaty swamps with Organosols (especially coastal)
Xtf	0.9	Swamp	B5N3	V	XtC Peat swamps. Xtf Swamps with shallow, often wet, clay loam grading to clay on calcrete. Minor peat soils. 20-30% rises with shallow calcareous loam or siliceous sand over calcrete. Main soils: Swamps: <u>Peaty soil</u> - N1 , <u>Wet clay loam</u> - N3 and <u>Shallow dark clay loam on limestone</u> - B5 . Rises: <u>Shallow calcareous loam on calcrete</u> - B2 and <u>Shallow loam on calcrete</u> - B3 .
		Rise	B2B3	C	
Xuf	0.03	Swamp	N3N1	D	Swamp with non-peaty and peaty wet soils; 20-30% stony rises with shallow often calcareous, grey clay loam, often over dark grey clay, on calcrete. Main soils: Swamps: <u>Wet clay loam</u> - N3 and <u>Peaty soil</u> - N1 . Stony rises: <u>Shallow loam on calcrete</u> - B3 .
		Stony rise	B3	M	
XxC	0.05	Swamp	N1N3 WW	D	Swamps with deep acid peats, organic loam over clay, or water filled. Main soils: <u>Peaty soil</u> - N1 , <u>Wet clay loam</u> - N3 .
Zr-	0.1	Saline flat	N2A7	D	Saline flat with wet saline clay loam and calcareous clay loam on marl; 10-30% of the area has dark clay loam over dark clay on calcrete; or wet non-saline clay loam soils on lagoonal sediments. Main soils: <u>Wet saline clay loam</u> - N2c and <u>Calcareous clay loam on marl</u> - A7 .

PROPORTION codes assigned to Soil Landscape Unit (SLU) components:

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



Detailed soil profile descriptions:

- A4** Deep (rubbly) calcareous loam (Hypercalcic-Lithocalcic Calcarosol)
Calcareous sandy-clay loamy topsoil grading into loamy-clay loamy subsoil with a significant CO₃ buildup in the subsoil. Often rubbly. Soil usually >120 cm in depth
- A7** Calcareous clay loam on marl (Marly Calcarosol)
Dark calcareous clay with a marly subsoil (often saline in Upper SE). Often with shells and a peaty surface.
- B1** Shallow highly calcareous sandy loam on calcrete (Supravescent-Shelly Petrocalcic Calcarosol-Rudosol)
Shallow, carbonate dominant sandy to loamy soil on calcrete. Carbonate dominates the soil profile as a whole, however, the surface soil may not be carbonate dominant, but needs to contain at least 30% carbonate.
- B2** Shallow calcareous sandy loam on calcrete (Petrocalcic Calcarosol)
Up to 40 cm calcareous loamy sand to sandy loam with variable calcrete rubble overlying calcreted calcarenite - rises.
- B3** Shallow sandy loam on calcrete (Petrocalcic Rudosol)
Medium thickness non calcareous sandy loam, often having a slight clay increase with depth, over calcreted calcarenite shallower than 50 cm - rises.
- B5** Shallow dark clay loam on limestone (Petrocalcic, Black Dermosol)
Black clay loam to light clay over calcreted limestone at shallow depth, grading to highly calcareous clay - flats.
- B6** Shallow sandy loam over red-brown clay on calcrete (Petrocalcic, Red Kandosol)
Medium thickness sandy loam with slight ironstone gravel overlying a weakly structured reddish brown sandy clay on calcarenite within 50 cm - rises.
- B7** Shallow sand over sandy clay on calcrete (Petrocalcic, Brown Chromosol)
Medium thickness sand overlying brown friable sandy clay to clay on limestone or calcreted sandy clay within 50 cm - flats.
- B8** Shallow sand on calcrete (Petrocalcic, Bleached-Leptic Tenosol)
Thick bleached sand over calcreted calcarenite within 50 cm - rises.
- B9** Shallow clay loam over brown or dark clay on calcrete (Clay loamy Petrocalcic Sodosol)
- G3** Thick sand over clay (Hypercalcic, Brown Sodosol/ Chromosol)
Thick bleached sand with an organically darkened surface abruptly overlying a massive to coarsely structured brown to reddish yellow sandy clay to clay, calcareous with depth - rises.
- H2** Siliceous sand (Sandy Calcarosol-Tenosol)
Deep to moderate depth calcareous siliceous sand. Often with non-calcareous topsoil; can be non calcareous throughout. Sometimes the subsoil is a light sandy loam.
- H3** Deep bleached sand (Basic, Arenic, Bleached-Orthic Tenosol)
Grey sand over a very thick bleached sand grading to yellow sand continuing below 100 cm.
- I1** Highly leached sand (Fragic, Pipey, Aeric Podosol)
Grey sand with a very thick bleached A2 layer, over dark brown and yellow massive soft to semi-hard clayey sand (coffee rock), grading to softer yellow and brown sand to sandy clay loam from about 80 cm.
- I2** Wet highly leached sand (Fragic, Humic, Aquic Podosol)
Grey sand with a thick bleached A2 horizon, overlying a thin to thick layer of coffee rock, grading to pale brown sand sharply overlying a grey, brown and yellow mottled sandy clay loam to light clay.
- N1** Peat (Organosol)
Peaty soil



- N2c** Wet saline clay loam (Dermosolic, Salic Hydrosol)
Medium thickness dark grey to black clay loam to clay grading to a well structured dark grey clay with minor carbonates and a water table within 100 cm.
- N3** Seasonally waterlogged, non to marginally saline equivalents of soils listed above, viz.:
- N3c** Wet **G3**
 - N3d** Wet **B5**
 - N3e** Wet **B7**
- RR** Bare rock
- WW** Water

Further information: [DEWNR Soil and Land Program](#)

