Soil Indicators of Queensland Wetlands

Lake Wyara

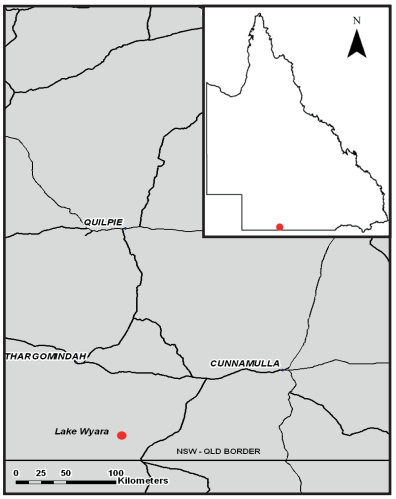
Queensland Wetlands Program

Study Area

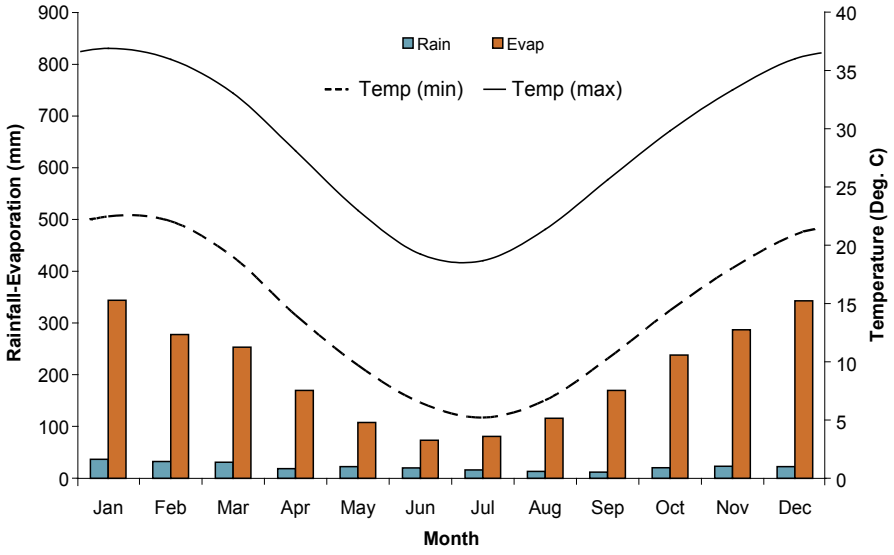
Lake Wyara is located in Currawinya National Park, approximately 120 km south west of Eulo, South-West Queensland.

The area is an aggregation of large and small ephemeral lakes, claypans and drainage depressions[1]. Lake Numalla is part of the Currawinya Lakes, which are on the Ramsar List of Wetlands of International Importance.

At the time of sampling the lake was dry. Lake Wyara is an example of a semi-arid saline lake in the Mulga Lands Bioregion



Climate[2]



The study area is situated within a semi-arid climatic region with no distinct wet and dry season. Evaporation exceeds rainfall in every month. The average annual rainfall for the area is 271 mm.

Landform and Inundation	Shallow salt lake on gently undulating sand plains Saline permanently inundated lake from overland flow
Soils[3]	Hydrosols and Kandosols
Vegetation[4]	*Halosarcia* spp. open succulent shrubland on alluvium (RE 6.3.10)
Geology[5]	Quaternary alluvium
Disturbance	No effective disturbance except grazing by hoofed animals

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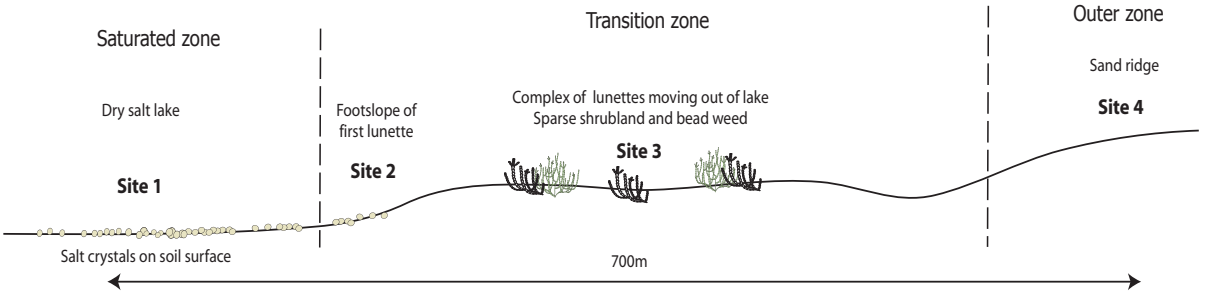
Location

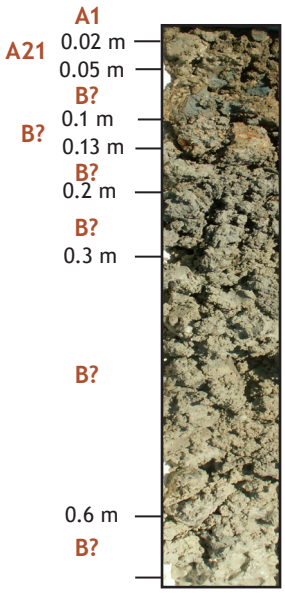
GDA94 • MGA Coordinates : 230071 E, 6817384 N, Zone 55 • Lat/Long : -28.74273 S, 144.23605 E

Landscape Diagram

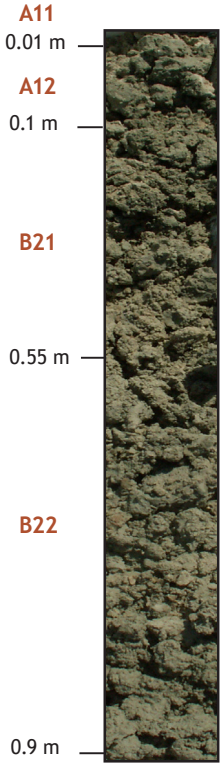


Soil Profiles

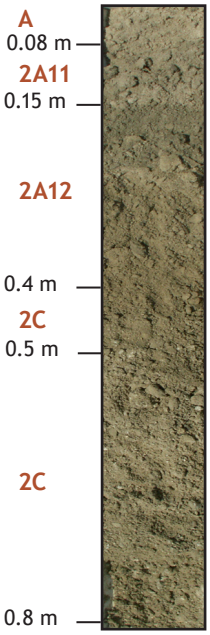
Site 155



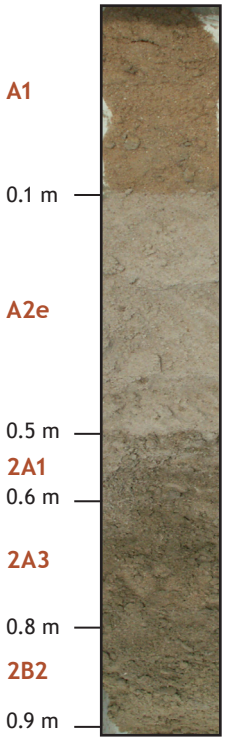
Site 156



Site 157



Site 158



Soil Indicators Present (within 0.3 m of surface)

Indicator[6]	Site 155	Site 156
Organic materials and organic carbon (OC)*	No organic materials OC: 1.98%	No organic materials OC: 0.23%
Matrix colour	Greenish grey	Pinkish grey to greenish grey
Chroma (thickness of layer)**	Present (0.25 m)	Present (0.3 m)
Mottles and Segregations	Common <5 mm distinct yellow mottles Many 5-15 mm prominent red mottles Few 5-15 mm prominent yellow mottles Few 5-15 mm distinct brown mottles	Not present
Depth to groundwater	0.6 m	Not present
Ferruginous root channel and pore linings	Not present	Present
pH*[7]	Strongly alkaline	Strongly alkaline
Texture	Light clay	Clay loam to light clay
Acid sulfate material	Present	Not present
Electrical Conductivity (EC)[7]	Brine (Seawater)	Highly saline
Indicator[6]	**Site 157**	**Site 158**
Organic materials and organic carbon (OC)*	No organic materials OC: 0.14%	No organic materials OC: 0.09%
Matrix colour	Greyish brown to grey	Light grey
Chroma (thickness of layer)**	Present (0.3 m)	Present (0.2 m)
Mottles and Segregations	Very few <5 mm faint brown mottles Very few <2 mm saline crystals	Not present
Depth to groundwater	Not present	Not present
Ferruginous root channel and pore linings	Not present	Not present
pH*[7]	Strongly alkaline	Strongly alkaline
Texture	Loamy sand to light clay	Sand
Acid sulfate material	Not present	Not present
Electrical Conductivity (EC)[7]	Moderately saline	Non saline

**Organic carbon % (Dumas method) and pH taken from surface (0-0.1 m)*
***Chroma value is less than or equal to 2*

Summary of Field Observations

- Organic carbon content increases moving into the saturated zone, whilst there is no visible accumulation of plant materials this can be attributed to the presence of microscopic algae
- Presence of faint, distinct and prominent mottling indicative of water fluctuation throughout the soil profile in the saturated and transition zone
- Gley colours (Figure 1) and sulfidic materials confirmed by laboratory testing indicate a permanently reduced environment in the saturated zone
- The average pH in the saturated zone is mildly alkaline however there is a layer (between 0.15 and 0.25 m) where the pH is strongly acidic, this could be from the oxidation of sulfidic materials

Figure 1. Gley soil colours

When a soil is exposed to an anaerobic environment ferric iron (Fe III) in the soil is quickly reduced to the colourless and mobile ferrous Iron (Fe II)

This gives the soil a characteristic grey/ green/blue colour called "gley"

Soil Morphology

Site 155		Classification		Australian Soil Classification			Sulfidic, Hypersalic Hydrosol		
				Landform Element			Playa		
				Morphological Type			Flat		
Horizon	Depth (m)	Boundary	Texture	Colour	Mottles	Coarse Fragments	Structure	Segregations	Consistence
A1	0 to .02	sharp to	light clay	yellowish brown (10YR54)	none	none	massive	none	-
A21	.02 to .05	-	light clay	brown (10YR53)	common (10-20%) fine (<5 mm) distinct yellow mottles	none	massive	none	-
B?	.05 to .1	-	light clay	dark greenish grey (10GY41)	none	none	massive	none	-
B?	.1 to .13	-	light clay	light greenish grey (10GY71)	many (20-50%) medium (5-15 mm) prominent red mottles, few (2-10%) medium (5-15 mm) prominent yellow mottles	few (2-10%) angular quartz small pebbles (2-6 mm)	massive	none	-
B?	.13 to .2	-	light clay	greenish grey (10GY61)	few (2-10%) medium (5-15 mm) distinct brown mottles	none	massive	none	-
B?	.2 to .3	-	light clay	greenish grey (10GY51)	none	few (2-10%) angular quartz small pebbles (2-6 mm)	massive	none	-
B?	.3 to .6	-	light clay	light greenish grey (10GY71)	very few (<2%) fine (<5 mm) faint brown mottles	very few (<2%) angular quartz small pebbles (2-6 mm)	massive	none	-
B?	.6 to .7	-	light clay	light greenish grey (10GY81)	none	none	massive	none	-

Site 156		Classification		Australian Soil Classification			Haplic, Hypersalic Hydrosol		
				Landform Element			Footslope		
				Morphological Type			Midslope		
Horizon	Depth (m)	Boundary	Texture	Colour	Mottles	Coarse Fragments	Structure	Segregations	Consistence
A1	0 to .01	sharp to	clay loam, sandy	pinkish grey (7.5YR62)	none	none	strong 10-20 mm platy	none	-
A12	.01 to .1	clear to	clay loam	grey (10YR61)	none	few (2-10%) subangular quartz small pebbles (2-6 mm)	moderate 5-10 mm platy	common (10-20%) fine (<2 mm) ferruginous root linings	-
B21	.1 to .55	gradual to	light clay	light greenish grey (10Y71)	none	none	massive	none	-
B22	.55 to .9		light clay	greenish grey (10Y61)	none	none	massive	none	-

Site 157		Classification		Australian Soil Classification			Haplic, Hypersalic Hydrosol		
				Landform Element			Lunette		
				Morphological Type			Simple slope		
Horizon	Depth (m)	Boundary	Texture	Colour	Mottles	Coarse Fragments	Structure	Segregations	Consistence
A1	0 to .08	abrupt to	loamy sand	greyish brown (2.5Y52)	none	none	massive	none	-
2A11	.08 to .15	clear to	light clay	greyish brown (2.5Y52)	very few (<2%) fine (<5 mm) faint brown mottles	none	moderate 5-10 mm subangular blocky	very few (<2%) fine (<2 mm) saline crystals	-
2A12	.15 to .4	clear to	light clay	light brownish grey (2.5Y62)	none	none	weak 5-10 mm subangular blocky	very few (<2%) fine (<2 mm) saline crystals	-
2C	.4 to .5	clear to	sandy light clay	light brownish grey (2.5Y63)	none	none	massive	none	-
2C	.5 to .8	-	clay loam	light brownish grey (2.5Y62)	none	none	massive	common (10-20%) fine (<2 mm) saline crystals	-

Site 158		Classification		Australian Soil Classification			Bleached, Mesotrophic, Yellow Kandosol		
				Landform Element			Playa		
				Morphological Type			Flat		
Horizon	Depth (m)	Boundary	Texture	Colour	Mottles	Coarse Fragments	Structure	Segregations	Consistence
A1	0 to .1	clear to	sand	light brownish grey (2.5Y63)	none	none	single grain	none	-
A2e	.1 to .5	clear to	sand	light grey (2.5Y72)	none	none	massive	none	-
2A1	.5 to .6	gradual to	loamy sand	dark greyish brown (2.5Y43)	none	none	massive	none	-
2A3	.6 to .8	gradual to	light sandy clay loam	greyish brown (10YR52)	none	none	massive	none	-
2B2	.8 to .9	-	clay loam, sandy	-	none	none	massive	none	-

Soil Chemistry

Site	Depth (m)	pH*	EC dS/m	Cl mg/kg	NO3-N mg/kg	TC** %	TN** %	Ca meq/100g	Mg meq/100g	Na meq/100g	K meq/100g	ESP %	CEC meq/100g
155	0.00-0.10	8.5	62.5	114000	8	1.98	0.19	5.71	5.41	15.6	2.65	62.4	25
	0.20-0.30	6.6	34.9	51000	11	0.52	0.06	3.45	2.62	17.3	2.85	57.7	30
	0.40-0.50	8.1	31.9	45300	14	0.27	<0.03	6.37	3.01	15.2	2.52	58.5	26
156	0.00-0.10	8.9	21	30300	9	0.23	<0.03	2.65	1.97	4.38	1.08	40	11
	0.20-0.30	8.5	17.9	25800	5	0.19	<0.03	2.62	2.36	12	2.11	63.2	19
	0.40-0.50	8.6	13.2	18300	3	0.25	<0.03	2.88	1.89	8.5	1.39	56.7	15
157	0.00-0.08	8.8	2.44	2720	2	0.14	<0.03	1.85	0.38	0.53	0.45	13.2	4
	0.08-0.15	8.7	3.55	4000	<1	0.21	<0.03	3.54	0.78	2.47	0.98	27.4	9
	0.20-0.30	8.6	6.54	8370	5	0.28	<0.03	6.12	1.6	7.23	1.87	42.5	17
	0.40-0.50	8.5	9.14	12200	2	0.54	<0.03	7.71	1.82	10.4	2.16	43.3	24
158	0.00-0.10	9	0.12	85	3	0.09	<0.03	0.718	<0.310	<0.091	0.11	3	<3
	0.20-0.30	8.6	0.02	<20	1	<0.05	<0.03	0.873	<0.310	<0.091	0.12	3	<3
	0.40-0.50	9.1	0.17	125	<1	<0.05	<0.03	0.547	<0.310	0.11	0.12	3.7	<3

*Aqueous 1:5
**Total carbon and total nitrogen

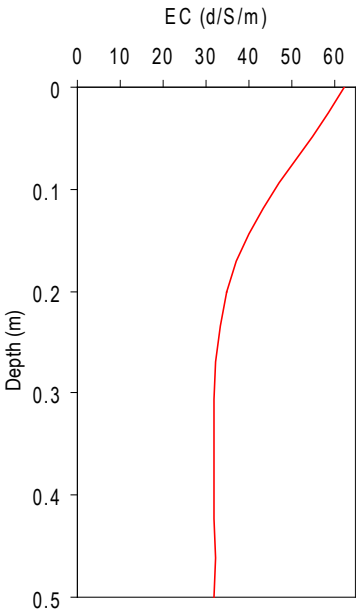
Electrical Condictivity

Electrical conductivity (EC) is a measure to describe the salinity, or the presence of soluble salts, of water, a soil water extract or suspension[8].
Moving along the transect from the saturated zone to the outer zone there is a distinct difference in profiles sampled.

Site 155

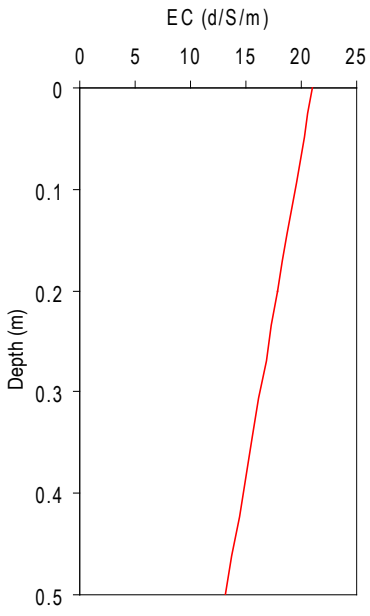
Salts are accumulating at the surface due to an evaporative concentration

This level of salt concentration is considered hypersaline



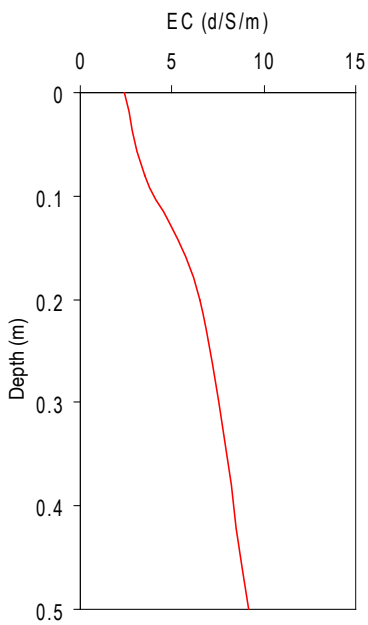
Site 156

Salts are accumulating at the surface due to an evaporative concentration but the effect is less pronounced



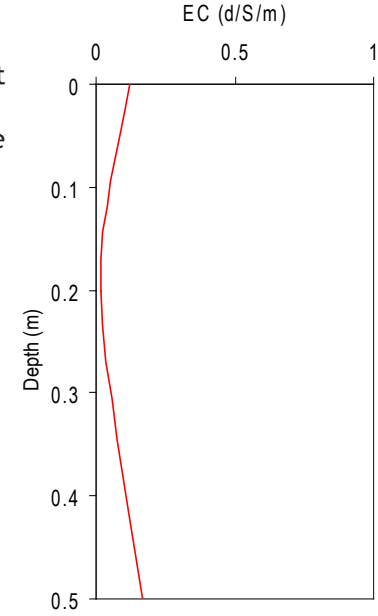
Site 157

Salt is being leached through the soil profile with accumulation at depth



Site 158

Very little salt is observed in the outer zone



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