

Tackling Saline Soils on the Lower Yorke Peninsula

Location: Warooka, SA.

Rainfall (mm)

Average annual: 400

Average growing season: 275



Background

David, Heather and Sean Newbold have a mixed farm at Warooka on the Lower Yorke Peninsula. The paddock, “Cane Grass”, has shown signs of salinity for over a decade.

Salinity in this paddock has increased over time due to a waterlogging event in 2016, and then dry conditions in 2024.

Over time the salt patch has progressed, and cropping is no longer viable in parts of the paddock.

In March 2025, as a part of a project staff from the Northern and Yorke Landscape Board and PIRSA-

SARDI assessed and collected samples from the paddock to develop a management plan.

About the area:

The property is in the Sturt Bay area of the Lower Yorke Peninsula, a low-lying landscape. Some important features of the landscape include a saline depression with a shallow saline groundwater table and highly calcareous soils.

What happened?

Site assessment and soil coring

The site is in a low point of the landscape, and slopes slightly to the south. Soil cores were collected to 50 cm in three separate zones, located roughly, in the northern end (Z1), in the middle (Z2) and the southern end (Z3) of the paddock (Figure 1). In Z1 there was cereal stubble cover, not present in the other zones.

All zones generally had a sandy loam topsoil (0-10 cm). The northern end of the paddock had a calcareous sandy loam subsoil, similarly the middle section of the paddock had a highly calcareous “rubbly” sandy loam subsoil layer, and in the southern end of the paddock the subsoil was a medium clay. The samples were sent to a laboratory and analysed for salinity. The results are shown in Table 1.

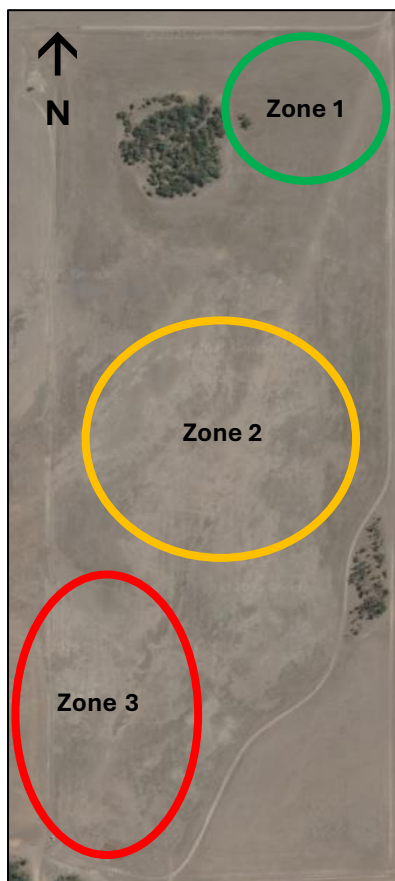


Figure 1. Soil sampling zones.

Soil test results

Salinity levels (ECe) ranged from very saline to extremely saline (Table 1). Note that the samples were collected during a dry period and topsoil salt concentrations may be diluted following rainfall. Soil in Z1 had the lowest overall salinity, however in this ECe range only tolerant crops such as barley will grow well, with yield penalties expected (see Further Resources). Topsoil in Z2 and Z3 were classed as too saline for plant growth.

Table 1. Soil sample results.

Zone	Depth	Salinity	
		ECe (dS/m)	Salinity class
1	0-10	11	Very
	10-30	10	Very
	30-60	8	Very
2	0-10	76	Extremely
	10-30	25	Highly
	30-60	21	Highly
3	0-10	133	Extremely
	10-30	28	Highly
	30-60	22	Highly

Boron was also at high to toxic levels for cereal crops throughout the profile across the paddock (results not shown). Boron is often associated with high salinity and carbonate.

The high levels of salt were evident by the presence of the salt and waterlogging-tolerant native plant Round-leaved Wilsonia (*Wilsonia rotundifolia*) (Figure 2), and Sea Barley-Grass at the site.

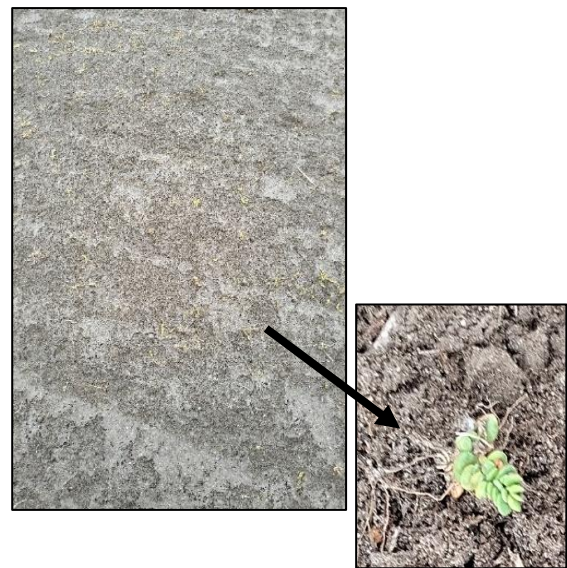


Figure 2. Round-leaved Wilsonia growing in the paddock. The plants were generally small and stunted, which is observed in highly saline conditions.

A large amount of the paddock had toxic levels of salt and boron and would only be suitable for highly salt tolerant plants. Further work was undertaken to assess the water table.

Digging deeper

Three soil pits were dug, one in each paddock zone, aiming for a depth of ~2 m. The water table depth varied across the site, becoming shallower moving from north to south. Water was not visible in Z1, though the bottom of the pit was damp. In Z2, water was found within 2 m and in Z3, within 1 m of the surface (Figure 2). The water was not tested however the farmer reported it tasted brackish.

Once the water table is within 1.5 metres of the soil surface, the water will rise by capillary action and evaporate from the surface. In areas with shallow saline water tables, this leads to salt accumulating in the soil. This is what leads to [Dryland](#) or [Water Table Induced Salinity](#). This is common across South Australia in cleared areas used for agriculture and especially in regions with shallow water tables.

On the southern Yorke Peninsula there is generally very little surface drainage and in wet seasons water can move slowly to accumulate in low-lying areas. The region is also prone to waterlogging, and many areas have become saline due to rising water tables following substantial waterlogging events. In dry conditions salt concentration in the topsoil increases with high evaporation rates.

Throughout this area there can also be dry saline land or ‘transient salinity’ often called ‘magnesia patches’ that are naturally saline areas but without a water table.

What next?

Prevent further salinisation

It is important to prevent salinisation of new land and reduce the extent and severity of the existing area. Growing deep-rooted perennial plants with salt tolerance on at-risk areas is a tried and tested option to use water from deeper in the soil profile. Saltbush, or other salt-tolerant native shrubs, are options for this site. Maintaining and/or improving ground cover is vital to prevent further evaporation and salinisation. Barley could be grown in the less saline areas. In areas where crops will not grow and stubble is not present, spreading sand or chaff has shown promising results (see [Further Resources](#)).

Management Options

Options in this paddock are limited by the extreme topsoil salinity, particularly in the southern area. Species planting distribution needs to be carefully considered.

In June 2025 PIRSA-SARDI staff used a Veris machine to map the paddock for Electrical Conductivity (EC) (salinity). The site was too dry, and in some areas too dry and salty, to produce a coherent map. To help with interpretation, normalised difference vegetation index (NDVI) imagery was assessed.

NDVI is, broadly, a way of measuring the abundance of living (green) plant material using satellite imagery. It is presented as a colour scale, with low biomass corresponding to warm colours (red, orange, yellow) and high biomass corresponding to cool colours (blue, purple).

The EC map was overlaid with NDVI imagery from previous seasons and compared to the soil testing results. This helped to generate a rudimentary planting guide which shows the boundaries for planting different species (Figure 3).

Using the planting guide, the northern and south-eastern parts of the paddock are viable for barley production, though there will likely be yield penalties.

The areas which are too saline for cropping should be fenced off and kept free of livestock. This will allow salt-tolerant native plants to establish on the site. If economical, chaff or sand could be spread prior to summer to provide immediate ground cover.

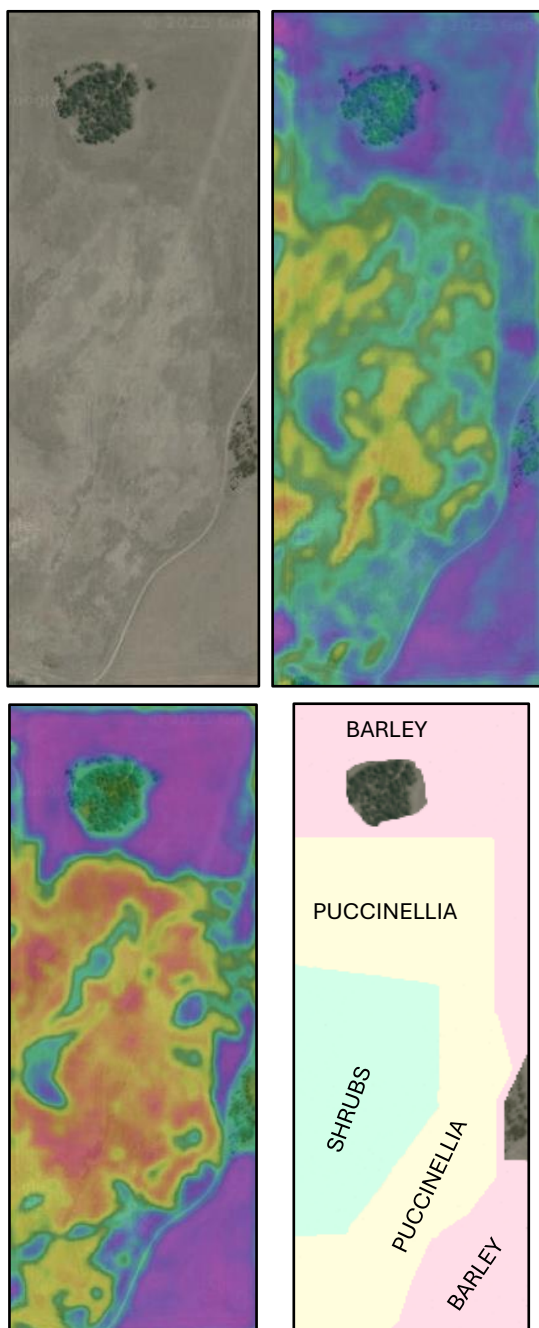


Figure 3. From L-R, top to bottom: Satellite imagery of the paddock in 2025, NDVI imagery from August 2023, NDVI imagery from August 2024, and the planting guide.

Near the middle of the paddock and surrounding the salt scald, salt and waterlogging tolerant grasses can be planted, starting on the outside edges.

Puccinellia is a promising option which can act as a pioneer species on saline areas and provides good feed value in winter and spring before flowering. Puccinellia should not be grazed in the first season of growth as the small plants are

susceptible to being ripped out by livestock. Other species options include Saltwater Couch, and Sea Barley-Grass. Gradually these species will spread inwards and take up more of the saline area.

Salt and waterlogging tolerant shrubs can be planted on the saline scald. Species, planting density and grazing frequency are a few important considerations prior to planting. It may be necessary to plant the shrubs into mounds of soil as some seedlings do not tolerate waterlogging and may struggle to tolerate the extreme levels of topsoil salinity. Planting options may include saltbush (Old Man and River), Samphire, and Orache. These species provide different levels of salt and waterlogging tolerance, and feed value for livestock.

Future steps

To establish a robust management plan, further surveys including intensive soil sampling, EC mapping in more moist conditions, and ground water assessments would be beneficial.

Ultimately the site will require an extensive and individualised management plan to enable it to practically and sustainably exist within the farming system.

A summary of relevant species is included in Further Resources. Information was sourced from Saltland Genie.

Acknowledgements

This project is funded by the South Australian Government's Landscape Priorities Fund (LPF). The LPF redistributes landscape levies collected by Green Adelaide in the metropolitan area to regional landscape boards.

Thanks to the Newbold family for their participation.

Further resources

Some helpful websites:

Evergraze – More Livestock from Perennials

<https://www.evergraze.com.au/regional-information/about-evergraze-0regional-packages/index.html>

Mallee Sustainable Farming – Dry Saline Land Decision Making Tree:

<https://msfp.org.au/dry-saline-land-2/>

Mallee Sustainable Farming – Sand, chaff and mulch spreading case studies:

<https://msfp.org.au/dry-saline-land-2/#Amelioration>

Pastures Australia – Pastures Fact Sheet Index

<https://keys.lucidcentral.org/keys/v3/pastures/Html/index.htm#A>

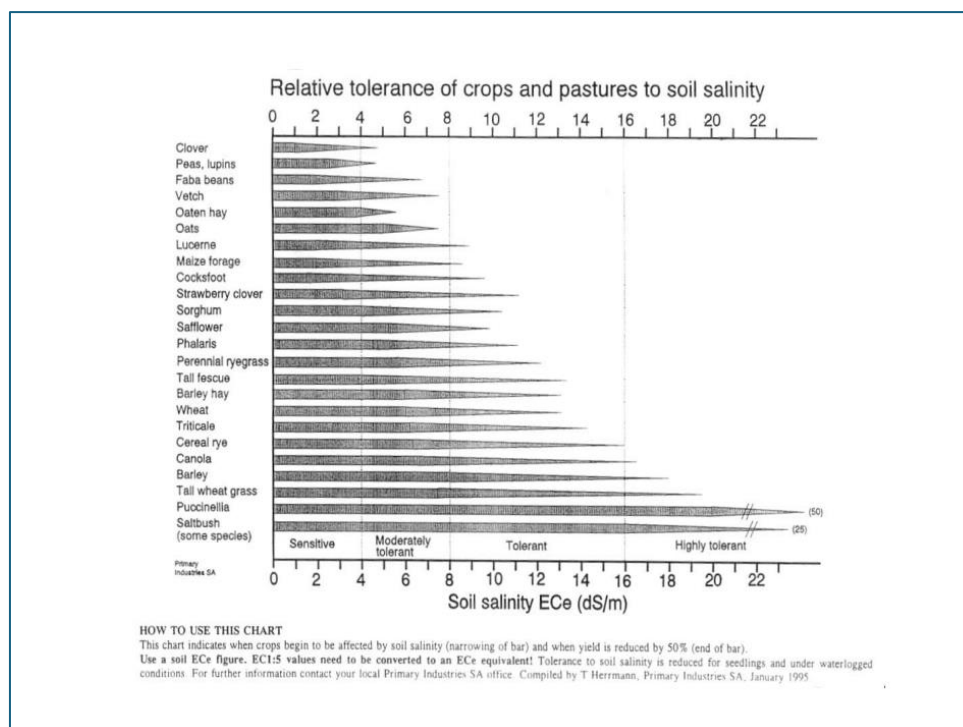
Perennial forage shrubs – from principles to practice for Australian farms:

<https://www.wool.com/globalassets/wool/land/pastures/grazing-management/accordion/perennial-forage-shrubs--from-principles-to-practice-for-australian-farms.pdf>

Saltland Genie – a web app providing profitable saltland solutions on your property:

<https://www.saltlandgenie.com/#/home>

Crop and pasture tolerance to soil salinity:



Source: Coorong District Council

Table 2. Characteristics of salt-tolerant shrubs and grasses which may be suitable. Information sourced from Saltland Genie.

Salt-tolerant shrub species				
Species	Salinity tolerance	Waterlogging tolerance	Feed value	Other
Old Man Saltbush (<i>Atriplex nummularia</i>)	✓✓	✓✓	Variable palatability but moderate protein and digestibility.	Drought tolerant. Deeper rooted than many other saltbushes.
Orache (<i>Atriplex prostrata</i>)	✓✓	✓✓	Palatable. Limited information on feed value.	
Rhagodia (<i>Rhagodia</i> spp.)	✓✓	✓	Variable depending on species.	Drought tolerant.
River Saltbush (<i>Atriplex Amnicola</i>)	✓✓	✓✓	Low to moderate energy value – at best provides maintenance for dry sheep.	Extremely tolerant of heavy grazing for short periods (once established)
Samphire (<i>Halosarcia</i>)	✓✓✓	✓✓✓	Poor grazing value. Must be supplemented with other feed.	Useful pioneer species in salt-affected land.
Salt-tolerant grass species				
Australian Saltgrass (<i>Distichlis distichophylla</i>)	✓✓✓	✓✓✓	No data available.	Provides groundcover and prevents erosion in salt scalds.
Common Couch (<i>Cynodon dactylon</i>)	✓✓	✓✓	Useful source of forage.	Recovers quickly from grazing.
Curly Ryegrass (<i>Parapholis incurva</i>)	✓✓✓	✓✓✓	Not preferred by livestock.	
Marine Couch (<i>Sporobolus virginicus</i>)	✓✓✓	✓✓✓	Variable.	
Puccinellia (<i>Puccinellia ciliata</i>)	✓✓✓	✓✓✓	Highest value in winter and spring, declines as plant flowers.	
Saltwater Couch (<i>Paspalum vaginatum</i>)	✓✓✓	✓✓✓	Limited information available.	
Sea Barley-Grass (<i>Hordeum marinum</i>)	✓✓✓	✓✓	Provides early pick of high nutritive value in winter – less than maintenance feed over summer.	Useful pioneer species in salt-affected land.

