Digging Deeper Into Rangeland Soils

Planning long-term paddock and pasture improvements by understanding key soil constraints

LANDSCAPE SOUTH AUSTRALIA
SA ARID LANDS

Digging Deeper Into Soil at Wilkatana Station

Property Size: 458km^2 | Stock: Merino Wool Sheep & Beef Cattle | Soil Type: Red Chromosol
Annual Rainfall: 210mm | Region: Gawler Ranges

First step: Identifying the problem

Wilkatana station is located on the western slopes and plains of the Flinders Ranges. **Paddocks on the lower slopes of the Ranges have been very difficult to regenerate** with good vegetative cover. Previous efforts to encourage regeneration have been unsuccessful, and the scalded areas can only support short lived forbs and weedy species. Andrew and the team at Wilkatana needed soil information to find new ways to improve the site. Samples were collected in affected areas of the 'Range' paddock' and sent to a laboratory for analysis, and a physical assessment was completed. The results highlighted the following two problems:

Problem 1: Sodic Soils

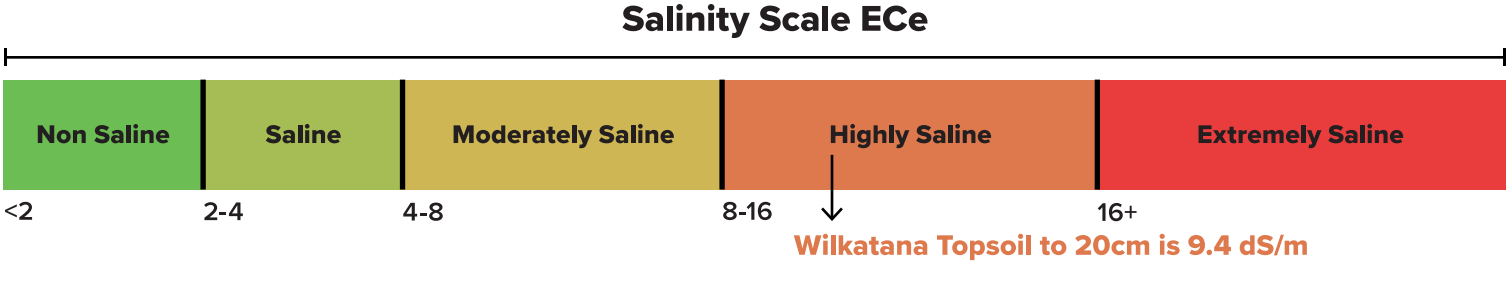
Sodicity in soil is the presence of a high proportion of sodium (Na+) compared to other cations - generally greater than 6% of the cation exchange. Sodic soils can be dispersive meaning the clay particles suspend in water. This results in a high shrink/swell risk, and susceptibility to erosion. Sodic soils can crust over on the surface, making it difficult for plants to establish.

Problem 2: Poor Water Infiltration

Infiltration is an indicator of the soil's ability to allow water into and through the soil profile. The longer it takes for water to infiltrate the soil, the greater likelihood of water run-off and growing difficulties. Experiments consistently reveal that sites with perennial cover have improved infiltration compared to sites with just bare ground.

Before we move on, a quick chemistry lesson

Soil salinity is measured by its electrical conductivity. There are different methods to measure salinity in the soil, the most common being expressed as EC 1.5 and ECe. In this Rangelands project dataset, the ECe is the measurement to consider, as the values have been adjusted for the soil texture class. **The average ECe value in 200 topsoil samples tested in the Rangelands area was 9.40 ECe dS/m** (considered extremely saline). Many productive Rangeland pasture species are adapted to growing in saline conditions and managing good pasture cover can prevent salinity from worsening. Use the visualiser below to see what salinity ranges can be problematic:



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How did we fix the issue? It's easier than you think

As a pastoralist, Andrew says **"increasing the water holding capacity of the affected site is key for us, and the ultimate goal is to improve this soil, increase pasture diversity and support its productivity for the future."** By implementing two simple methods, this soil could support long-lived grasses and a wide range of palatable saltbush as valuable sheep fodder. These methods are:

Ripping: Deep rip lines were created along with the contour to slow surface water run-off. Infiltration tests were then implemented after the rip to compare treatments to a wider area.
Seeding: The site was seeded with 18 species of native plants including Saltbush, Bluebush and salt-tolerant Forbs to fast track plant establishment and cover.

Improving infiltration is a positive step

Ripping can be an effective tool to increase infiltration of rainfall deeper into the ground. Ripping also helps flush salts down the soil profile reducing sodicity and salinity. On scalded sites at Wilkatana Station, a 20mm rainfall event was simulated. The unripped site took on average 360 seconds to infiltrate the soil, whereas the ripped site took just 22 seconds.

The price of amelioration

What does it take to rip one hectare of scalded paddock with a grader pulling three tynes?

30 minutes + 15L fuel = 16x quicker infiltration

Test your infiltration rates at home

Avoid mistakes: understand your soil

Soil texture is important as it has a direct correlation to water holding capacity. Soil type will also determine the pasture type(s) that grow on your property. Heavy cracking clays usually grow grasses and small shrubs. Free draining soils and sands grow taller shrubs and small trees. Tracks made on sandy soils are less likely to erode than those created on heavier soils but will leach nutrients more rapidly.

Pro tip:

Soil characteristics will also influence how well it will support the construction of roads/tracks. Understanding your soil properties is critical to prevent erosion or water flow issues, and helps preserve your road network for the long-term.

Want to test your own soil? See instructions on the next page...

Test your own land

www.landscape.sa.gov.au/saal

Home Sodic Soil Tests

Find out whether your sodic soils are dispersive with this simple at-home test:

1. Place a soil clump (aggregate) gently into a container with the water.
2. Watch the aggregates for the first 10 minutes, then check again after 30.
3. If the water around the aggregate turns cloudy, the soil is dispersive. The cloudier the water, the more dispersive the soil.

On the right, soil from two sites were added to a jar of distilled water to test soil dispersion. Can you guess which jars are dispersive?

Home Microbial Activity Test

Simply bury two pairs of cotton undies in your soil. After eight weeks, dig up your undies and see how much of the material has been consumed by soil organisms. This method is great for comparing the microbial activity at different sites. Take note of the vegetation, and soil condition and composition of pasture species where you bury them.

"Soils with a healthy mix of bacteria and fungi can break down organic matter like cotton, hence the use of cotton underwear. This project highlights the impact of really good grazing and land management in terms of maintaining vegetative cover to build soil health." – **Andrea Tschirner**

Want to dig deeper?

Did you know there's almost 500 species of native Australian Dung Beetle? In addition to our local heroes, there have been almost 50 species introduced specifically to breakdown and bury livestock manure, building organic matter and cycling nutrients. Dung beetles are a vital part of soil heatlh in cattle country.

Learn about soil properties
Head to the website www.soilquality.org.au to learn more about soil properties

Get your hands dirty!
Head to our website at www.landscape.sa.gov.au/saal to learn about soil texture

Need numbers?
Contact the APAL at www.apal.com.au and send your soil samples away for analysis

Australian Government
Department of Agriculture, Fisheries and Forestry

Future Drought Fund

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