

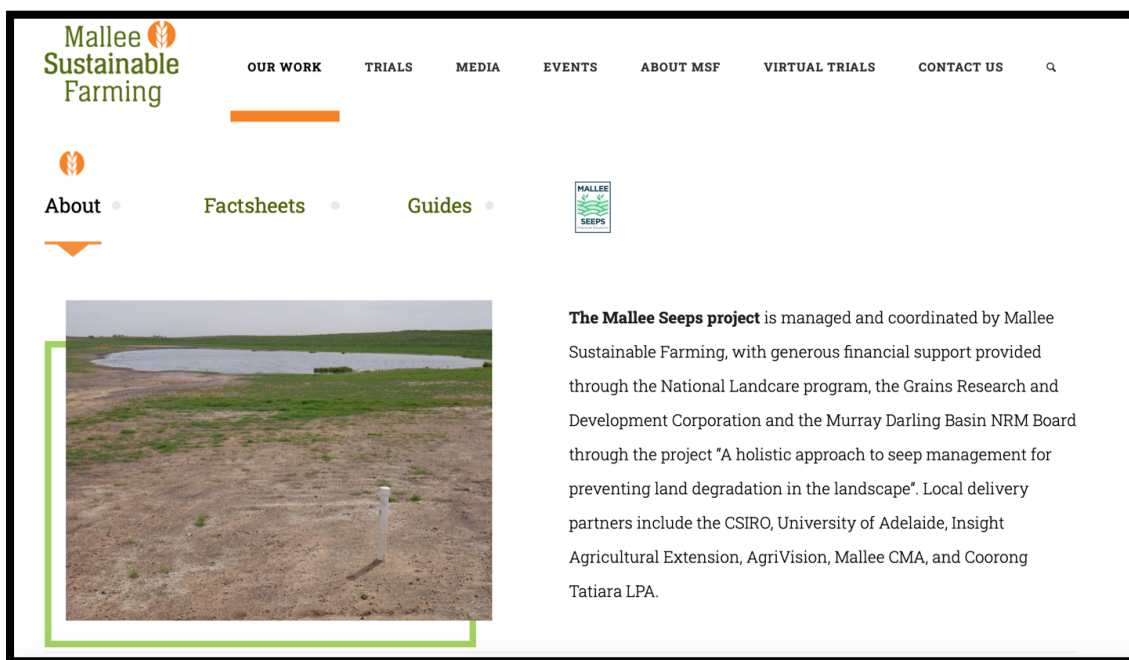


THE LEAK UPDATE # 3, FEBRUARY 2020

MALLEE SEEPS WEB PAGE NOW UP AND RUNNING

The Web page for the Mallee Seeps project is now up and running; it is located on the MSF web site. A direct link to the page is as follows; <http://malleeseeps.msfp.org.au/> The site aims to provide an access point for information relating to project activities, along with important technical and management information that can be accessed by farmers and advisers.

Information will be progressively added to the site in coming months, and will continue to be updated throughout the life of the project. Contributions and suggestions for content are always welcome, and can be directed to Jay. As always, everyone is encouraged to share the existence of the site with farmers and others having an interest in Mallee Seeps. Thanks to Kylie Martin Creative for all of her hard work to make it happen!





NEW MALLEE SEEPS PROJECT LOGO

The new Logo for the Mallee Seeps project has now been developed. The range of logos are now available on the Drop Box share folder. Feel free to utilise the logo on any specific publication or project-related activities that you may be involved in.

As a reminder, it is important to also acknowledge the support of our project funders through inclusion of their organisation's logos. The order in which these appear should be as follows; National Landcare Program, the GRDC, The Murray Darling Basin NRM Board, MSF and your own organisation's logo.

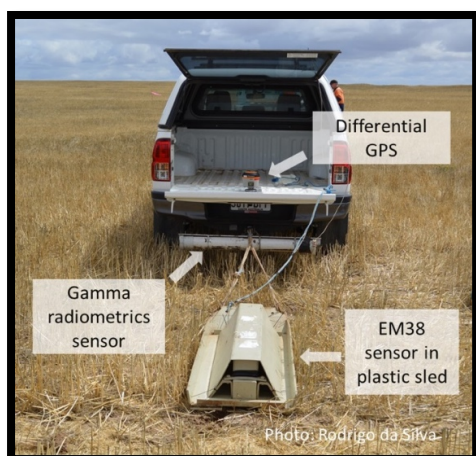
UPDATE FROM CSIRO's GEOPHYSICS "SHOOT-OUT" AT WYNARKA

Mark Thomas and David Gobbett, CSIRO.

CSIRO is looking at ways to understand how seeps are formed in Mallee landscapes by running a geophysics "shoot-out". Geophysics scans underground to give a picture of what is happening in and on the ground. The technologies in the shoot-out included gamma radiometrics, electromagnetics (EM), ground penetrating radar (GPR) and resistivity.

Gamma radiometrics measures natural radioactivity to show where certain elements accumulate, revealing how today's soil has been formed. EM, GPR and resistivity measure the ground's electrically conductive responses, and can be sensitive to water, salts, clays and different densities; different systems and settings vary the depth of measurement of these underground properties.

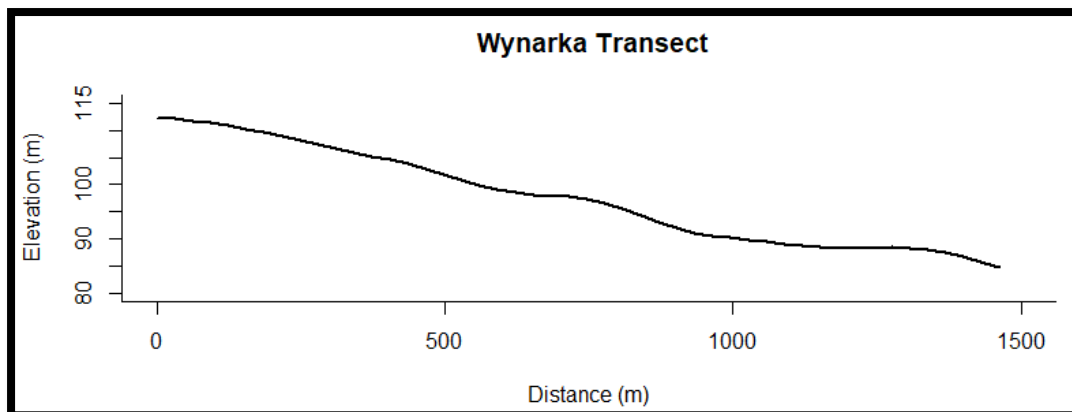
In addition to the familiar EM38 for shallow conductivity (less than 1.5 m deep), we used a CMD-Explorer which is able to simultaneously measure from the surface to a depth of about 7 m. Maps can be made by taking lots measurements linked to GPS on-the-move.



The geophysics survey was carried out with assistance from Mike Hatch from the University of Adelaide, and GPR and resistivity specialist consultant Phil Mill in the 'Rose-Thomas' paddock near Wynarka, SA. This test site was selected because it is a focus of current work by Chris McDonough (IEA), as well as previous soil and ground water studies (e.g. Hall 2015, Henschke and Young 2015), with the hope that the geophysics scans could be complemented by the findings of previous studies (*continued page 3*).

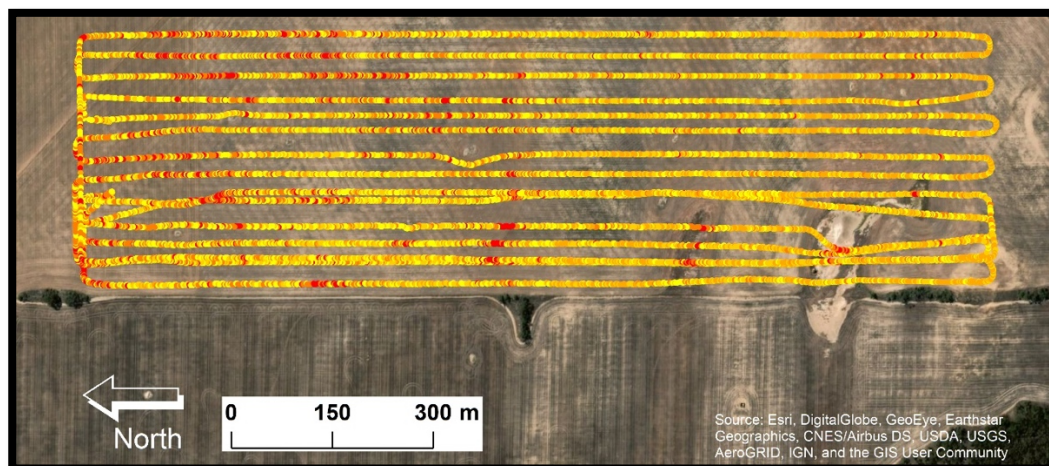


Working with Chris McDonough we set up a 1300 m by 300 m survey area that traced a full sandy and calcareous slope, including the crest and two growing seeps low down. The area was previously under wheat and canola, and areas around the seeps planted with lucerne and puccinellia grass. Survey lines were set up running down the slope 25 m apart. The survey was done on Monday Feb 3rd, 2020.

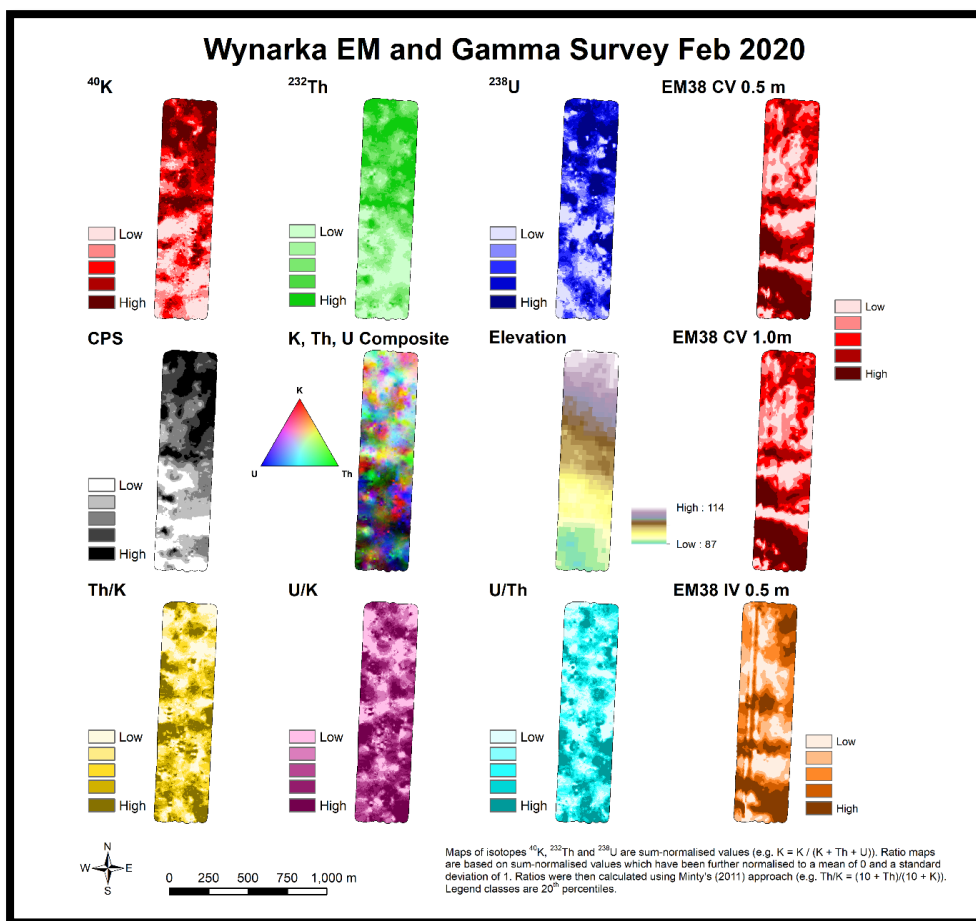


We expect the geophysics shoot-out to add to the broader Mallee Seeps project in three ways:

1. By helping us build a 3-D picture of the landscape as a whole so we can understand water flows and restrictions
 2. Assessing which of these tools provides the most useful information about Mallee Seeps
 3. Showcasing new geophysics that may help Mallee farmers, adding to the seeps detection 'tool kit'
- (continued page 4).



While it's still early days as the survey was only completed last week, first looks at some of the data are promising. Preliminary Gamma and EM38 maps from the survey are shown below. Once all the data have been processed we will overlay the maps on the slope and soil data to see how patterns of slope, soils, water and salts co-relate to learn about what is happening in the landscape, and what we can do about seeps in similar types of landscapes.



RHIANNON JOINS SARDI TEAM BUT STILL COMMITTED TO MALLEE SEEPS PROJECT!

Congratulations to Dr Rhiannon Schilling (valued Mallee Seeps team member) who was recently appointed to the position of Leader, SARDI Agronomy group. We look forward to your continued association with the Mallee Seeps project, and importantly continuation of the valuable contributions provided by University of Adelaide team.

NRM BOARDS IN SA CHANGE THEIR NAME AND TWEAK THEIR FOCUS

The Murray Darling Basin NRM Board is in the process of changing its name to the Murraylands and Riverland Landscapes Board. The new Landscape South Australia Act 2019 will replace the Natural Resources Management Act 2004 as the key framework for managing the State's land, water, pest plants and animals, and biodiversity across the State. The new Act is due to come into force on July 1, 2020. Applications to become a member of the new Board are now open, and close on March 6, 2020. If interested, you can access further details through the Board's web site;

<https://www.naturalresources.sa.gov.au/samurraydarlingbasin/home>

MALLEE SEEPS TEAMS IN ACTION – PICTORIAL



Mallee Seeps trials being harvested by the Frontier Farming team at Turriff.



Field day pics from last season Mallee Seeps field days (SA left, and Vic right).

UPDATE FROM TRACEY STRUGNELL, COORONG-TATIARA LAP

In relation to the seeps project, what was the most important 'discovery' that you made during 2019?

- Working with different landholder groups around Coomandook, Cooke Plains, and Meningie it has been interesting to listen to the different perceptions and experiences that farmers have had in relation to farming with dryland salinity. It has also been of concern (and frustration) by farmers concerning the reasons as to why there has been a recent expansion in dryland salinity.
- The need to revisit CSIRO studies looking at recharge under various annual and perennial systems (undertaken at Coomandook) and to reapply these findings to the current dryland salinity situation.

What is the most important aspect of the project that you plan to focus on for the 2020 season?

In the short term further work is required in the following areas;

1. SALINE SITE REMEDIATION

- Further work on ripping saline soils
- Further work on Fodder Beet salt tolerance and optimum seeding technique
- Continue to identify salt tolerant pasture options & demonstrate
- Improve understanding of evapo-concentration of salts and the role of groundcover (*continued page 6*)

2. SALINITY PREVENTION

- Revisit CSIRO studies looking at recharge under various annual and perennial systems (undertaken at Coomandook). Reapply these findings to the current dryland salinity situation
- Continue to improve understanding of regional groundwater systems & their response to rainfall events, land use change, and climate variability
- Explore high water use cropping options
- Explore the potential of soil amelioration to improve plant water use across the landscape

Reflecting upon your engagement and your activities in the Seeps project so far, if there was one message that you would like to convey to a 'salt affected Upper SE/Mallee farmer' what would it be?

- Carry out a soil salinity – ECe (dS/m) to ascertain how saline the site is. This will determine what salt tolerant pasture species are suitable to grown on the site
<http://www.coorong.sa.gov.au/webdata/resources/files/Soil%20Salinity%20Sampling%20Fact%20Sheet.pdf>
- Maintain groundcover on a salinity affected site at all costs; helps to reduce further evapo-concentration of salts at the soil surface.
- On a variable site consider a shot gun mix of salt tolerant pastures in the first instance, as soil salinity levels will vary markedly across the site.
- Anticipate areas at risk of salinisation; maintain groundcover, consider establishing salt tolerant species.
- Where possible seed after rainfall has flushed the top soil.
- On saline areas Messina germinates better on a mound of soil or stubble rather than in a furrow.
- Maximise plant water use and production right across the District.

INTERESTING SOIL TESTING RESULTS FOR CROP REHABILITATION

Chris McDonough, Insight Extension

Figure 1 shows the Crop Restoration demonstration trial at Mannum last year. Soil test were taken on both August 12th and December 11th at corresponding locations. These results have been matched against crop growth so that some threshold levels for crop growth can be established for this remediation. It is also important to assess whether this new soil and organic matter applied in to the soil surface in this trial will remain at lower salinity, or revert to the toxic levels of the bare scald over time. Understanding these factors will be critical to the potential success of this rehabilitation process (*continued page 7*).

Figure 1. Mid-season results with promising crop establishment achieved

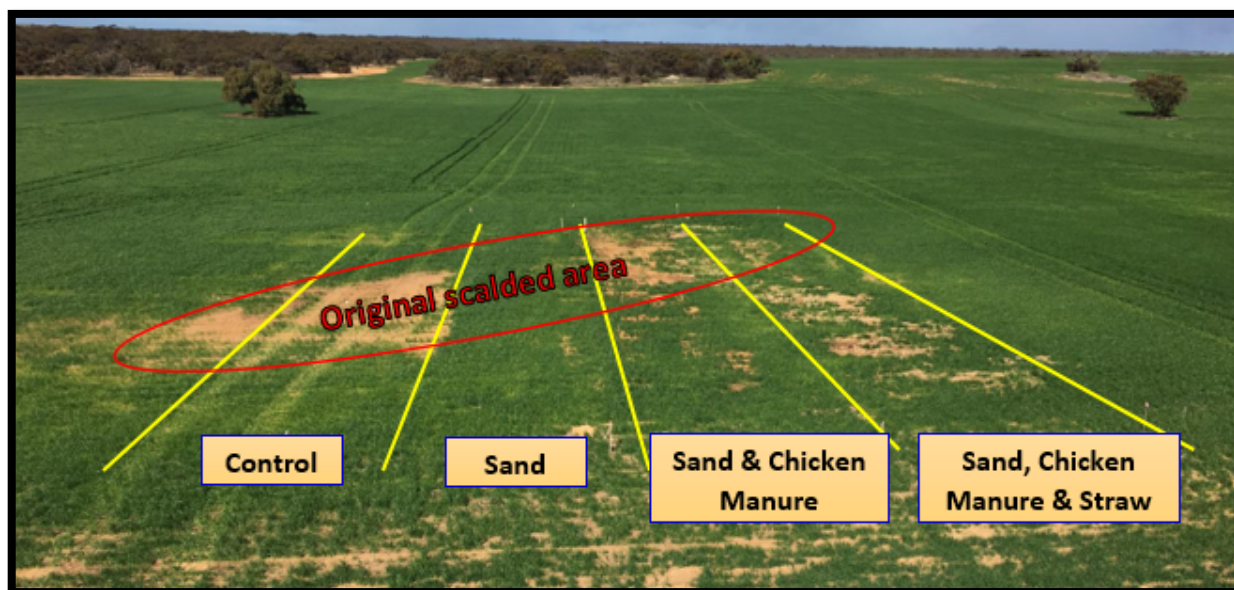


Table 1. First soil testing results (August 12, 2019) at different depths (cm)

	Control 1	Control 2	Sand 1	Sand 2	Sand & Manure 1	Sand & Manure 2	Sand Manure & Straw 1	Sand Manure & Straw 2	Ryegrass Dominant Area
Crop Growth	None	None	Good	Good	None	Good	None	Good	Poor
Soil Salinity (dS/m)									
crust	0.86	0.56	0.07	0.17	0.68	0.16	1.2	0.2	0.41
0-10cm	0.77	0.59	0.11	0.08	0.95	0.28	1.0	0.4	0.39
10-20cm	0.72	0.66	0.47	0.46	0.81	0.64	0.94	0.59	0.31
20-30cm	0.71	0.40	0.56	0.46	0.87	0.44	0.66	0.54	0.32
30-40cm		0.43	0.57	0.37	0.54		0.49		0.33
Soil pH									
crust	10.9	10.8	6.8	6.7	8.5	7.0	8.6	7.8	9.8
0-10cm	10.8	10.8	6.9	7	9.4	9.1	8.6	7.5	10
10-20cm	10.6	10.5	10.2	10.1	9.1	10.3	10.4	10.1	9.9
20-30cm	10.2	10.2	10.3	10.4	9.7	10.2	10.2	9.9	10
30-40cm		10.3	10.2	10	9.6		10.0		10.2

The brown columns represent areas that were bare within the control strip, as well as patches within the Manure and Straw strips, due to uneven site treatment preparation (or some scald crust being brought to the surface). The green columns represent areas where the crop was growing well (above the previous scald areas prior to treatment). The yellow column is a nearby edge area that is being dominated by ryegrass that is displacing the poor crop growth.

Table 2. Second soil testing results (December 11, 2019) at different depths (cm)

	Control 1	Control 2	Sand 1	Sand 2	Sand & Manure 1	Sand & Manure 2	Sand Manure & Straw 1	Sand Manure & Straw 2	Ryegrass Dominant Area
Crop Growth	None	None	Good	Good	None	Good	None	Good	Poor
Soil Salinity (dS/m)									
crust	2.54	0.61	0.23	0.11	0.79	0.2	1.21	0.42	0.50
0-10cm	1.49	0.61	0.25	0.04	0.77	0.19	0.27	0.54	0.66
Soil pH									
crust	10.9	10.7	6.8	5.9	8.0	6.2	7.6	8.0	9.8
0-10cm	10.8	10.7	7.3	5.4	8.3	6.5	6.9	8.6	10.5

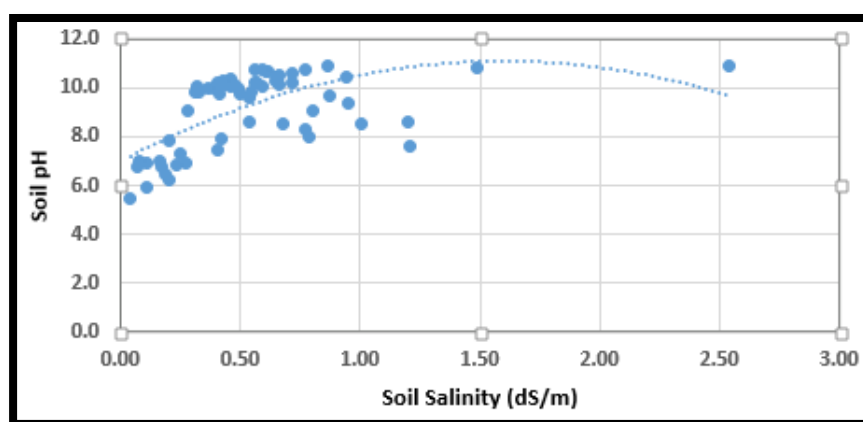
Key findings from these tables are as follows:

1. Surface crust salinity levels (top 2-3cm – but not crusty where crop growing well) ranged from 0.07-0.2 dS/m where the crop established well, but 5.6-1.2 dS/m where no crop grew. The intermediate zone of ryegrass and crop was 0.41 dS/m.
2. Topsoil salinity levels (0-10cm) ranged from 0.08-0.4 dS/m where the crop established well, but 5.9-1.0 dS/m where no crop grew. The intermediate ryegrass zone of was 0.39 dS/m (*continued page 8*).

3. High pH levels in both the crust and the topsoil control area samples at 10.7-10.9 pH may well have contributed to poor germination, particularly in the control 2 area, but did not appear problematic at the other treatment areas.
4. There appears to be some correlation between increasing salinity and pH levels, but this may need further investigation (see Figure 3).
5. High subsoil salinity levels where no crop was growing may be partly due to being central to the worst of the original scald areas, but may have also deteriorated due to remaining bare. This was not apparent even to 40cm depth where the 15cm of sand was placed on top and the crop grew well.
6. Crust and Topsoil salinity levels greatly increased in the bare control 1 treatment area, with only slight variations occurring at all other sample sites. Some crust samples had become quite black and hard.

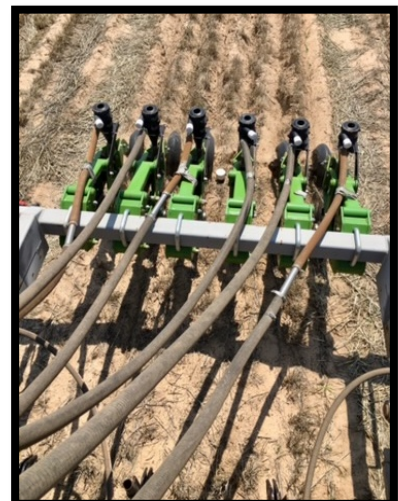
With further investigation into this site and other demonstration sites it is hoped that a clear picture as to what soil conditions are required to be able to rehabilitate early stage seep scalds back to cropping.

Figure 2. Relationship between soil pH and salinity levels at the Bond Seep rehabilitation trial site.



LAMEROO MALLEE SEEPS RESEARCH SITE UPDATE: SUMMER CROPPING

Featuring summer crops (sorghum) sown in November 2019 (photo taken February 4th 2020). There was some difficulty in establishing the summer crops on the sand, however better establishment occurred on the actual seep site (slightly heavier soils) where double cross sowing took place. In the first week of Feb 2020 (following summer thunderstorms) additional summer crop and winter wheat plots have been sown (photo illustrating the crops being sown) (photos credit Chris Davies).



FIVE MINUTE 2019 SEASON REFLECTION

Chris McDonough, Insight Extension

In relation to the seeps project, what was the most important 'discovery' that you made during 2019?

That we can get Puccinellia and tall wheat grass to establish on bare, well established salt scalds, and it appears initially that we can bring recently formed seeps back to crop production (refer to Figure 1).



Figure 1: Puccinellia established on previously bare salt scald at Wynarka

What is the most important/significant aspect of the project that you plan to focus on for the 2020 season?

- Can we successfully utilise seep water for farm use before it starts causing scald degradation?
- Getting more farmer to take action rather than sit back and watch their seeps grow.

Reflecting upon your engagement and your activities in the Seeps project so far, if there was one message that you would like to convey to a 'seep affected Mallee farmer' what would it be?

- The time for action is now. There are practical solutions to commence in each of the Recharge, Intercept and Discharge zones that can prevent or turn around significant land degradation.

MALLEE COWANGIE HISTORICAL CASE STUDY (BRIAN ETHERTON) DUNE SEEPAGE

Rob Sonogan, AgriVision Victoria

Background.

In 1981 two seriously affected bare dune seepage saltpans of about 5ha in area each were sown to Tall Wheat Grass (TWG) and protectively fenced. A comparison of different treatments were made between two different saltpans. Saltpan A (located near a road) was fenced with more traditional post and wire construction, whereas Saltpan B (located in the centre of the paddock) was fenced with a relatively new 3 wire electric fence. In 1981 a series of shallow and some deeper piezometers were installed to monitor water-table levels and salinities.



Photos (left) Brian Etherton, Cowangie, surveying one of his Dune Seeps, protectively fenced from livestock and planted to some Salt tolerant tree species and (right) looking from Brian Etherton's treated salt-pan into an adjoining neighbours untreated area; still expanding and bare.

Initial observations

Vegetation

The TWG established on wind-blown small rises within the saltpan and more so around the perimeter edges where the soils in both instances were less saline. Within the pans the TWG did not persist but some is still growing today around the edges.

Fencing

The electric fencing suffered severely from day one, with wind-blown wild turnip and roly pollies piling up against it regularly causing the fence to blow over and sheep with full wool showed little respect! This trial was abandoned in 1985 and the site not again fenced. The permanent fenced Saltpan A is still stock-proof to this day.

Catchment treatment

In the early 1980's a three-year rotation of wheat, pasture and bare fallow was a typical practise. Today the property is share farmed on a two-year rotation of wheat, pasture; but this is not typical of the region which is almost universally continuous crop. Brian still has sheep and some summer weeds are evident at times.

Saltpan management

Both saltpans have not been cultivated nor sprayed since 1981. Although grazing has occurred on the unfenced area regularly and not the fenced pan, both today are similar with almost complete ground-cover. This consists of native saltbushes, some samphires and many native and introduced grasses.

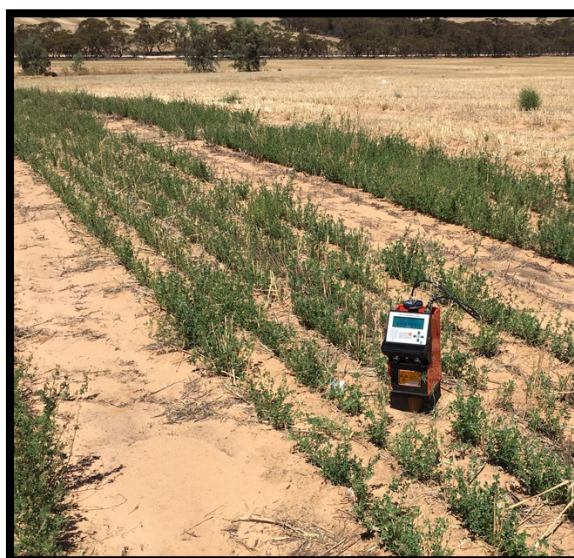
Water table salinity levels

Water table salinities of Saltpan B are presented in Table 1. These have always been relatively high ranging from 27,000 to 41,000 EC. The more detailed monitoring that happened in the 1980's indicated fluctuating water levels responding to wetter and drier months with an overall trend downwards as the years passed.

Recent recommencement of water table monitoring for this project has reinforced that downwards trend. This is in sharp contrast to all adjoining properties that are reporting the expansion of existing historic saltpans and the emergence of new seepage areas over the past 10 years.

BACK PAGE PICS

Photos from the Turriff trial site showing the sowing of the summer crop trials by the Frontier Farming team along with the measurement of soil moisture in an established lucerne trial.



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