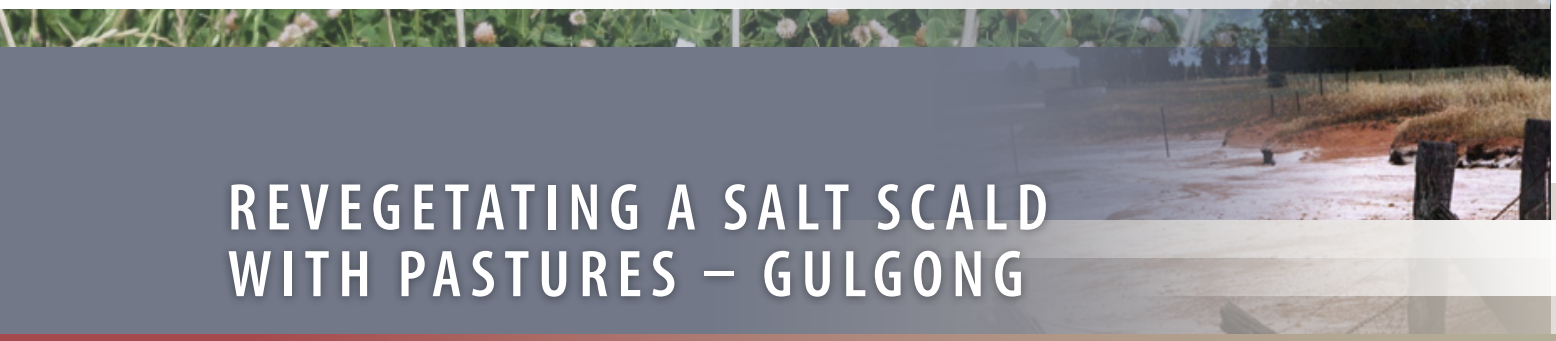


REVEGETATING A SALT SCALD WITH PASTURES – GULGONG

SUSTAINABLE GRAZING ON SALINE LANDS

Case study – Gulgong

FARMER: MICHAEL NOTT, TALLAWANG VIA GULGONG

QUICK FACTS

Site area : 3 ha scald in a 30 ha paddock

Situation: salt scalding and tree death at bottom of the flow line

Soil pH (water): 5.9 to 6.6

Salinity (EC_e): 1 to 23 dS/m at 0–10 cm ; 7 dS/m at 100 cm under hottest spots

Soil texture: light to heavy clay

The problem

In early 2003 a major salt scalding was identified at 'Tallara', in the Tallawang Valley near Gulgong. Soil salinity was recorded as above 16 dS/m (EC_e), and a nearby dam had a water salinity reading of 16 dS/m. Areas of this site were covered with paspalum grass and red grass, whereas the more severely saline areas around the flow lines were bare. The high level of ground cover on this saline site indicates that the landholder had nursed this site very well, never overgrazing it; it would have quite easily scalded if it had been overgrazed.

The scald area was towards the bottom outlet of a large valley, as is common for saline areas. The water in dams close to the scald is sometimes perfectly clear, like sea water; this clarity is a good indicator of the presence of salty water. The valley floor paddocks surrounding the scald are capable of growing lush pastures of clover and phalaris, indicating that the soil is good and that the saline groundwater is not getting to the surface everywhere.

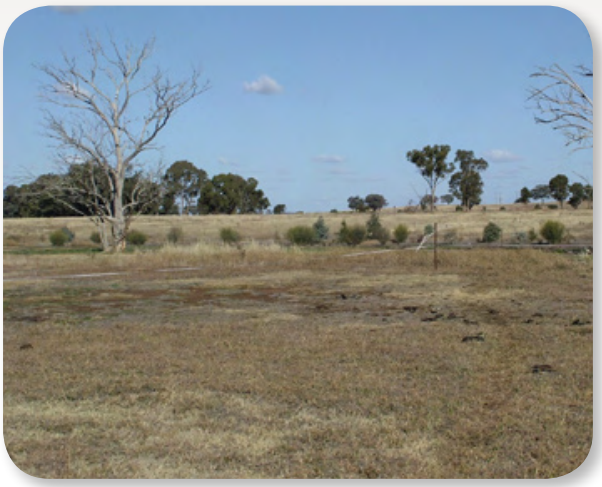
Luke Beange

Dam water near the scald. Note how clear salty water is: salt causes many sediments to drop out of solution.

Actions taken at the site

Soil measurements

Six holes were dug to about 1 m depth on the site to be measured for salinity, some in saltier-looking areas and some in fresher-looking areas. Salt was measured as electrical conductivity (EC_e).



Jenene Kidston

Before: *The main part of the scald in June 2005. Note the dead trees and bare areas in the flow line. Also note the good standing dry grass (mostly paspalum).*

Luke Beange

After: *The pasture established in September 2006.*

Case study — Gulgong

- The salty profiles were uniformly salty (ranging from 6–12 dS/m) in the top 0.5 m, and they became less salty (3–8 dS/m) from 0.5 to 1 m down.
- The fresher profiles were also uniform in the top 0.5 m (ranging from 1–4 dS/m), but in the next 0.5 m they differed. One did not change from the top (2 dS/m); one became half as salty (1.3 dS/m); and one doubled in salinity (5 dS/m).

What all this indicates is that the surface differences masked the fact that below the soil lay salty groundwater that was closer to the surface in some places than in others.

The total area of the site was 30 ha. The soil texture varied from light clay to heavy clay, with most being medium to heavy clay. There was also some sodicity.

Preparation

In November 2003, saffron thistle on the land surrounding the bare area was sprayed with a knockdown herbicide, with a good result.

In 2004, sowing was delayed by the threat of locusts. Plague locusts flew in on 3 February. All pasture on 'Tallara' that was not eaten by the locusts was defoliated by them. Another paddock of pasture sown this year was destroyed. The farm was devastated in 4 weeks, and there was a massive egg laying. The hoppers hatched in early October and were sprayed. A big swarm flew in later, and the farm was eaten out again.

The site was grazed with cattle to stop vegetation from becoming rank and allow direct drilling to take place when ready. It was also limed, and the whole area received an application of single superphosphate by topdressing. There was a good coverage of young paspalum and some salt-tolerant grasses in the spring.

In 2005, a good population of paspalum was still present. Weeds included annual ryegrass (light infestation) and vulpia (medium infestation).

On 20 June, a contact knockdown herbicide was applied for paspalum and vulpia. (It was successful, but a late germination of vulpia caused problems.) The idea was to reduce, and in some cases kill, unwanted weeds, but at the same time to check (not kill), the strong stand of paspalum, which is very beneficial in combating salinity in the summer months.

Sowing

On 15 July 2005 a pasture mix was sown into good soil moisture. Species sown were:

- Venus lucerne 3 kg/ha
- Holdfast phalaris 1 kg/ha
- Quantum fescue 0.5 kg/ha
- Currie cocksfoot 0.5 kg/ha
- Cefalu arrowleaf clover 75 g/ha

The lucerne and clover were sown together, in alternate rows to the grasses.

Note that no specifically salt-tolerant pastures were sown, partly because most of the sown area was not salt affected.

There was no cultivation. The time of sowing was determined by the date when the hired machine became available, but this was not a problem because the ground had been too wet previously.

An Agrowdrill® was used for direct drilling at a row spacing of 17.5 cm. Granulock 15® fertiliser at 58 kg/ha was applied.

Jenene Kidston

The seed box on the Agrowdrill® used for sowing.

An Agrowdrill® was hired to sow the site so that direct drilling could be used. This is very new technology in that this machine has four boxes. It has a crop-seed box and fertiliser box as usual, but it also has a divided small-seeds box that allows direct-drilling of clovers (i.e. blue and pink seed) and pasture grasses in alternate rows. This improves the establishment of clovers and grasses in that grasses that are often slow to germinate will not have to compete with the clovers. Later in the life of the pasture it should also improve the persistence of clover by allowing light and moisture into the clovers while the grasses are active.

Jenene Kidston

The important parts of the Agrowdrill®. The boot cuts a slot. The deep tube is for fertiliser and the shorter tube at the back sows the seed. This machine does not have presswheels but uses a finger roller to press the seed into the slot and maximise soil-seed contact. Loose rings on the roller allow the fingers on the roller to stay in the rows.

Results

(as reported by Michael Nott)

The establishment procedure seemed to work well. Just after sowing rain once again fell – at times it was too much at the one time. An outbreak of red-legged earth mite on the salt area after sowing was sprayed out.

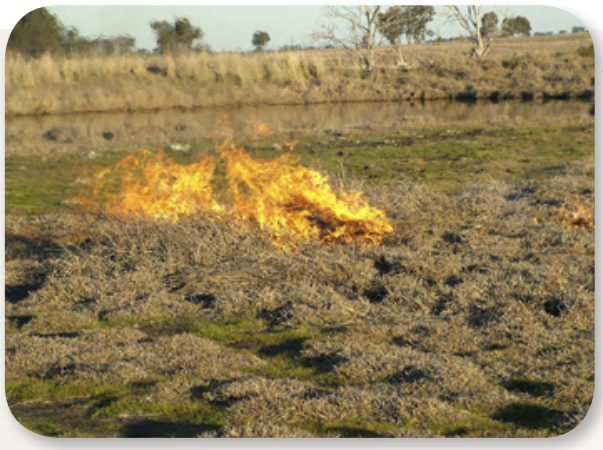
An unexpected germination of vulpia grass appeared; this created unwanted competition for the young pasture and also came as a disappointment. The only way to avoid this problem would have been to spray it out several years in a row, but because of the nature of the site this would have been the wrong thing to do.

The pasture establishment on the scalded areas had been a little disappointing. After spring Michael was hoping the young pasture would respond when the grasses had run their course. Once the pasture had established itself, a spray program was planned to eliminate as many unwanted weeds as possible.

In November, a botanical composition and groundcover assessment of the area was made by Industry & Investment NSW District Agronomist Jenene Kidston. This assessment was repeated the following year, and the table at top right summarises the results. Jenene's comments follow.

Jenene Kidston

Pasture on the day of measurement in September 2006.



Jenene Kidston

Old, rank paspalum growth was burned in August 2005 to help the new growth to come through.

Pasture composition (%)

Species	November 2005	September 2006
Paspalum	24	51
Suckling clover	18	0
Sub clover	9	0
Other clovers	4	2
Ryegrass	16	4
Soft brome	9	0
Vulpia	6	0
Danthonia	0	20
Tall wheatgrass	0	12
Lucerne	2	6
Others	12	5

Measurements pick up the plants dominant at the time; hence they reflect seasonal fluctuations. The very long, wet, cool and mild spring in 2005 produced abundant plant growth. Grasses like danthonia and tall wheat grass would have been swamped by this growth of winter species such as clovers, ryegrass and brome. The drought conditions of 2006 brought these perennial grasses back to the fore.

Jenene Kidston

By December 2005 good spring rain had brought a big flush of growth, most of which in this photo was pre-existing species such as paspalum.

Ground cover (%)

Type	2005	2006
Living plants	100	21
Litter	0	78
Bare ground	0	1

The large litter burden in 2006 was produced from the 2005 growth and inhibited plant growth.

Comment from Industry & Investment NSW

By Jenene Kidston, Agronomist, Industry & Investment NSW, Mudgee

When the pasture was sown in 2005 the conditions were too wet, leading to failure. The wettest part of the site was not sown because it was impossible to get onto the paddock. Machinery would have caused damage to the site.

There were already a lot of moderately salt-tolerant species e.g. paspalum and ryegrass on the site, so it was decided not to kill these existing grasses.

Case study — Gulgong

Final comments from the landholder

(July 2008)

It is a pretty good result overall. I am quite happy with it. The last few years have dried up the site, so there is no excess water on top of the ground. The tall wheat grass has gone berserk. Wherever we direct drilled there is a pretty good result. The trouble we had was where there were old grass butts the ground level is higher and the machine could not penetrate. We should have gone harder to get into the ground.

Another problem was it was wet when sowing. Dry sowing would have been better – we would have got better traction and would have done a better job.

The tall wheat grass did not take off for 2 years. In the last 12 months (up to July 2008) it has really taken off.

Michael Nott, Tallawang

Prepared by Luke Beange, Advisory Officer, Industry & Investment NSW, Dubbo

Acknowledgments

Jenene Kidston, Agronomist, Industry & Investment NSW, Mudgee

NSW Salt Teams.

APPENDIX

Surface (0–10 cm) soil data (late summer 2004)

	Good site[B]	Bad site[B]	Bulk[A]
pH at surface ($CaCl_2$)	6.4	7.1	6.1
Salinity, late summer (est. EC_e, dS/m)	1.3	14.4	2.7
Organic carbon %	2.4	1.5	1.7
Sulfate sulfur (KCl) mg/kg	14	290	24
Phosphorus (Colwell) mg/kg	11	11	7.4
CEC meq/100 g	19.5	32.6	12.4
Ca/Mg ratio	2.0	0.63	1.7
Sodicity, ESP %	3.1	17	6.3
Soil texture	MC	MC	MC

[A] *Samples used for measurements were taken from at least six holes (0–10 cm deep) made in locations with a range of salinity symptoms (visually assessed).*

[B] *Samples used for measurements were taken from one hole (0–10 cm deep) made in a location with no salinity symptoms and one in a location with extreme salinity symptoms (visually assessed).*

Notes:

CEC, cation exchange capacity

ESP, exchangeable sodium percentage

MC, medium clay

Non-saline < 1.5 dS/m; saline > 1.5 dS/m.

Non-sodic, ESP < 6%; sodic, 6%–14%; strongly sodic, > 14%.

For further information, see the *Glove Box Guide to Salinity* (NSW DPI) for your part of NSW, on the page headed 'Soil testing for salinity and sodicity'.

Rainfall during the trial (mm) (average annual rainfall = 633 mm at Mudgee)

	Jan	Feb	Mar	Apr	May	Jun
2005	66.5	13	33	0	0	131
2006	69	81	21	29	3	32

	Jul	Aug	Sep	Oct	Nov	Dec	Total
2005	34	0	123	107	145	9.5	**662**
2006	87	7	15	3	26	40	**414**