

# PASTURE SEEDING USING MULCH ON AN EXTREMELY SALINE SCALD AT DERRIWONG – CONDOBOLIN

SUSTAINABLE GRAZING ON SALINE LANDS

Case study – Condobolin

**PROJECT MANAGER: JOHN GREIG**  
**FARMER: ANDREW BURLEY, DERRIWONG, NEAR CONDOBOLIN, NSW**

## QUICK FACTS

**Area of site:** 20 ha

**Soil type:** red brown earth, texture light medium clay to light clay

**Soil salinity (EC<sub>e</sub>):** Extreme at 0–10 cm (36–73 dS/m). Highly saline at 50 cm (10–20 dS/cm). Highly saline at 100 cm (12–20 dS/cm). Also extreme sodicity (ESP 31–40 at surface)

**Groundwater system:** fractured rock

**Watertable:** can be close to the surface in wet years

**Geology:** sedimentary fractured rock at ≥ 1 m. Strata at 75°, almost vertical

**Pastures sown:** mostly saltbushes and bluebushes seeded by hand

## Problem/Situation

Evidence of salt at this site appeared after the mid-1950s floods, with the area remaining a bare scald ever since.

The local Derriwong–Ootha Landcare group has been attempting to reclaim land and manage and reduce the effects of the rising saline watertable. The salinity in the area is severe, with soil salinity measurements of up to 110 EC<sub>e</sub>. Since 1989 the group has experimented with a wide variety of plant species (over 110), investigated propagation techniques, and piloted engineering works. The group has refined establishment methods.

The aim of this trial was to establish productive ground cover on the scald, trialling various halophytes (salt-tolerant plants) for persistence.

## Actions taken at the site

Before sowing, the site was mostly bare ground, with some dead ice plant and barley grass in patches. Also present were several species of annual saltbush, scattered African boxthorn and short-leaved bluebush.

In early April 2004 the paddock was parallel-ripped, with 5-m spacings between the lines. A couple of weeks later most of the species used were sown. Sowing was by hand, not 'high-tech'. Four-wheel-drive utes took straw bales along the rip lines. A person stood on either side to put straw onto the rip lines and others followed with ice-

cream buckets of seed, throwing seed onto each patch of straw. Various old straw and grass hays were provided by local Landcare members. The straw (about a hatful every 5 m) was placed by hand into the rip lines, and a teaspoonful (approx 600 g/ha) of mixed seed was thrown on each patch of straw.

It was very dry at sowing. No fertiliser or other soil treatments were used. Early sowings were planned to be before rain made sowing difficult – or so it was hoped. The choice of species sown was based on John's extensive trial experience on his property over many years.

*Species sown (most sown on 17.4.04)*

<i>Atriplex cinerea</i>	Grey saltbush (prostrate form)
<i>Atriplex lindleyi</i>	Flat-topped saltbush
<i>Atriplex rhagodiodes</i>	Murray River saltbush
<i>Atriplex halocarpa</i>	Pop saltbush
<i>Atriplex codonocarpa</i>	Dwarf saltbush
<i>Atriplex semilunaris</i>	Annual saltbush
<i>Atriplex amnicola</i>	River saltbush
<i>Atriplex lentiformis</i>	Quailbush (sown later)
<i>Atriplex paladosa</i>	Marsh saltbush
<i>Atriplex undulata</i>	Wavy leaf saltbush
<i>Atriplex nummularia</i>	Old man saltbush
<i>Atriplex vesicaria</i>	Bladder saltbush
<i>Maireana tomentosa</i>	Felty bluebush
<i>Thinopyrum ponticum</i>	Tall wheat grass
<i>Puccinellia ciliata</i>	Puccinellia
<i>Swainsona cyclocarpa</i>	Salt lake pea
<i>Threlkeldia diffusa</i>	Coastal bonefruit
<i>Melilotus alba</i>	Melilotus (not sown over whole area)
<i>Sporobolus virginicus</i>	Marine couch (cuttings planted on 3/11/04)
<i>Paspalum vaginatum</i>	Saltwater couch (cuttings planted on 15/9/04)
<i>Distichlis sp.</i>	Salt-grass (sown 3/11/04 by cuttings)

## Results

### The first year

Better germination results were found with the finer hays than with the sorghum or millet ones.

Emergence was progressive, with some species coming up in May, others in October and others still later.

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The plant densities counted on mulch sites in October of the first year were:

Saltbush	3 plants / 20 m
Bluebush	< 1 plant / 20 m
Melilotus	1 plant / 20 m
Grasses	12 plants / 20 m

The germination results were varied. Of the mulched patches:

- 30% had nothing established that was planted
- 25% had saltbush and no grasses
- 25% had grasses and no saltbush.

Overall ground cover was still very low because of the very wide spacings between sowings. There were also weeds, with ice plant on over 95% of the mulch sites at least giving some cover. Boxthorn was also scattered over the site. There were many locusts for a month before Christmas.

## The second year (2005)

The site was grazed in autumn (March to May) by 700 ewes. Sheep had access to the site until they ate everything edible – and then some. However, the sheep were losing condition on this salt pasture. Samphire present on the site remained mostly ungrazed: although



*Before: The site in February 2003, showing the extreme scald that has existed since the 1950s.*



*After: Some success with saltbushes and bluebushes in May 2005.*

it is very salt tolerant, John does not recommend sowing it as he thinks it may crowd out other more useful species.

Observations were again taken in September. The site had a good scattering of most of the species sown. It was estimated that 200 grass plants and 200 saltbushes had become established per hectare. The site needed to be cross-ripped to encourage more pasture establishment, as the original rip lines were too far apart and conditions for pasture establishment (or even survival) were very poor until mid June. John would have liked to have sown some seed in these new lines, but there was seed set from what was planted the year before that would eventually thicken up the pasture.

In September 2005, plant dry matter was 1 to 2 kg/ha of grasses and 6 kg/ha of saltbushes and bluebushes. The low dry matter was due to the wide spacing between rows and plants. Ground cover was less than 2%.

There was a good germination of grasses in the rip lines after the winter/spring rains of 2005, either from seed planted the year before and washed there, or from seed from the plants that had produced a few seeds. Ice plant was still growing thickly in all rip lines and in some other places.

## Conclusions from Industry & Investment NSW

This saline site, like others in this district, is one of the most challenging in the state from a rehabilitation perspective. The wealth of experience that John has after more than a decade of revegetating such sites is invaluable to the district. Given the high risk of failure, he has come up with a practical and relatively cheap method of establishment by manual spreading of seeds on top of individual small piles of hay. The difficulties with establishment here – caused by drought following sowing – were evident.

It is extremely difficult for a germinating seed to survive, given the hypersaline environment at the soil surface. Use of the hay mulch is an excellent idea, as it greatly reduces the salinity of the soil surface just below it. Also, sowing patches 5 m apart is cheaper than conventional establishment, allowing for gradual recruitment of plants and/or re-sowing in patches. Using a large variety of seed species gives the greatest chance of having the right species that can fit the unique niche of each spot. It is also ideal having the Landcare group to help.

Revegetation of these scalds is often a slow, gradual process, so this patient, conservative method is well suited. It is crucial not to overgraze, especially in the first seasons.

Luke Beange

Luke Beange

## Final comments from the project manager

Andrew is quite pleased with the improvement at the site, as there are now some plants where before there was nothing.

The run of drought years has helped lower the watertable, but it has also necessitated heavier grazing by sheep than would be desired for a better ground cover to develop. Despite this, the area of bare ground continues to decline.

Andrew believes that the saline bare ground in this area can be rehabilitated economically by using this low-cost method. From his extensive experience on his property at nearby Ootha, John assesses the stock-carrying capability of this pasture on such land after 5 years to be about the same as that of unimproved pasture (i.e. half a sheep/acre or 1.25 sheep/ha). He says this may not be much, but that the stocking rate is usually much higher for a short time in autumn when other feed is in short supply.

John Greig

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## Acknowledgments

NSW Salt Teams.

## APPENDIX

### Soil characteristics at the test site

Good patch <sup>a</sup>	Bad patch <sup>b</sup>	Bulk <sup>a</sup>
<b>pH at surface (CaCl<sub>2</sub>)</b>		
6.3	8.3	6.9
<b>Salinity, late summer (est. EC<sub>e</sub>, dS/m)</b>		
52.1	77.9	98.6
<b>Organic carbon %</b>		
1.5	0.48	0.8
<b>Sulfate sulfur (KCl) mg/kg</b>		
2300	2700	5900
<b>Phosphorus (Colwell) mg/kg</b>		
18	16	15
<b>CEC meq/100 g</b>		
47.7	68.1	109.5
<b>Ca/Mg ratio</b>		
0.82	0.6	1.4
<b>Sodicity, ESP %</b>		
31	40	21

<sup>a</sup> 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).

<sup>b</sup> 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

Note that the sulfur readings are extremely high here!

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 = 456 mm at Condobolin)

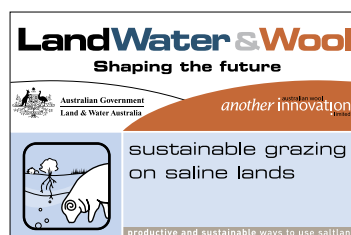
	Jan	Feb	Mar	Apr	May	Jun
2004	67	25	13	22	19	50
2005	12	20	3	3	1	60
2006	32	0	3	5	4	57

	Jul	Aug	Sep	Oct	Nov	Dec	Total
2004	15	31	24	51	25	59	401
2005	47	34	88	52	127	12	459
2006	52	7	22	0	7	47	236

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