

Less Than 400mm

Saltland Scoring and Solutions

HOW TO IDENTIFY, RATE & SOLVE YOUR SALT LAND PROBLEMS

Areas with Rainfall Less Than 400mm

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Steps to use this pocketbook

1. Take a look at the site, ideally when things are still actively growing in spring.
2. Turn to the reference chart (page 10).
3. Identify indicator plants growing now.
4. Consider the salinity conditions across the site and sketch their boundaries on a mud map.
5. Score the salinity condition for the site (pages 8-9).
6. Consider the improved plants that will grow there (note on your map).
7. Read a story of what another farmer with similar conditions has done (pages 15-17).
8. Consider the potential payback period and whether you will need to divide the site or treat as one unit (page 18).
9. Contact a farmer near you or a technical assistant to discuss their experiences (pages 19-20).

Acknowledgements

This book is dedicated to the inspiring "Salt Man" Clive Malcolm and all his hard work.

You are an inspiration to us all.

Your work and legacy will always live on.

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*** Disclaimer

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:: Assessing Saltland



All salt affected land, except the beds of salt lakes and desert areas, is capable of growing plants. Which plants will grow depends on a variety of factors some of which vary with season, position and depth making them hard to measure. What will grow also depends on the salt and waterlogging tolerance of the plants. The plants grown can be used for a variety of purposes. For example, on highly saline and waterlogged land it may only be possible to grow samphire which is too salty to be a good grazing resource but provides environmental benefits. Some areas will grow valuable forage.

Saltland treatment and use must be guided by the capability of the land. It may be possible to modify the capability by installing surface drains to reduce waterlogging and inundation. Saltland is often of irregular shape and the boundaries of the mild, moderate and severe sections may also be irregular and treatments must take this into account.

Are all plants salt tolerant?

Plants such as wheat, barley, oats, ryegrass, subclover and medic are of low salt tolerance and are called *glycophytes*. Even salt tolerant selections of glycophytes are only about a fifth as salt tolerant as *halophytes*, or 'salt plants'. Nature has

developed halophytes for growing on saline soils, and in salt affected areas the difference in salinity between the grassed and bare patches, compares with the difference in salt tolerance between glycophytes and halophytes. Halophytes vary in their tolerance to waterlogging.

Salt affected land

The simplest way to judge an area's capability is to look at what is growing there.

The most obvious feature of 'saltland' on farms is that it will not grow crop and pasture plants which are glycophytes. The performance of agricultural plants gets worse as you move from the edge of an affected area to the centre and ranges from:

- **MILD** – reduced productivity; to
- **MODERATE** – patchy growth; to
- **SEVERE** – no growth of glycophytes

Factors which cause poor growth on saltland include:

- salt content of the soil
- degree of surface waterlogging
- inundation
- soil type - powdery, clayey, crusted
- acidity or alkalinity
- toxicity e.g. boron or aluminium
- high exchangeable magnesium (often in grey clay soils).



:: Saltbush is the halophyte & acacia the glycophyte



:: Assessing Saltland Capability



The severity of a site is related to the depth to groundwater and its salinity but the soil type determines the height to which water can rise by capillary action. Dense clay has the potential to allow the highest capillary rise but the rate of water movement is so slow the watertable can be closer to the surface without causing a problem.

Some saltland is not caused by a high watertable but is the result of management of soils with high natural salinity (e.g. morrel soils in WA). Fallow and overgrazing on these soils can cause the salt to accumulate in the surface, turning the soils to powder and wind erosion to occur.

Plants and saltland

Plants respond to the salt, waterlogging, soil and climatic conditions at a site and show what can be grown. As glycophytes fail on saltland they are replaced by more tolerant glycophytes (such as sea barley grass) or halophytes (such as bluebush, iceplant, samphire and salt spurry). The changes in plant cover provide the easiest way to judge the site conditions.

Salt tolerant forage species (halophytic forages and associated glycophytes) can be recommended

for a site on the basis of that plant 'test' and the climate. Additional factors which must be considered are dangers of drought, inundation and frost.

Failures

If an area fails to develop a cover of salt tolerant species it may be due to acidity, toxicity, soil instability or surface crusting. Soil tests can be conducted for acidity or toxicity.

What do you want from your saltland?

If saltland comprises a significant proportion of the farm it may be able to contribute to the production system by providing off-season grazing and supplementing the dry feed and/or stubble. If it is small and inconveniently shaped it may be best revegetated and left to provide environmental benefits. Severely salted and waterlogged land will usually only grow plants such as samphire, salt sheoak and *Melaleuca thyoides*. It may be best to fence off such land and leave it to revegetate naturally.



:: *Treating the moderate to high saline areas around the severe saltland will improve the sites sustainability*

What will your saltland grow?

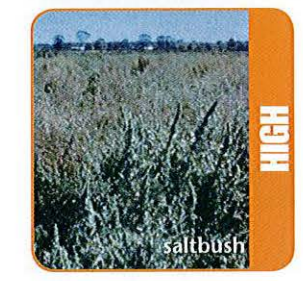
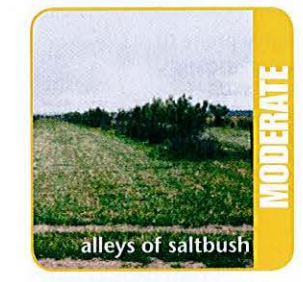
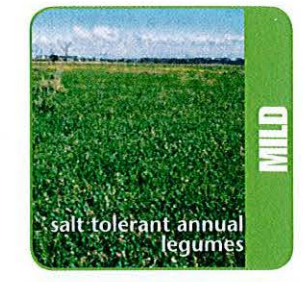
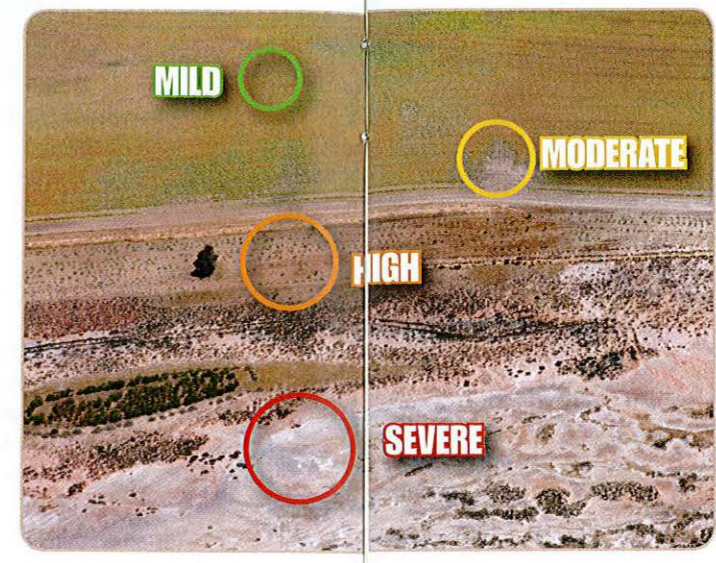
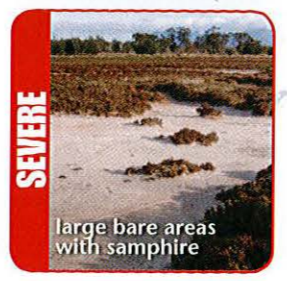
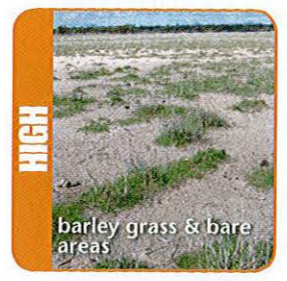
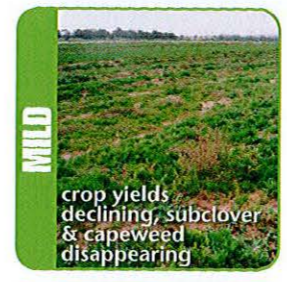
Use the reference chart on page 10 to lead you to your solution.



:: A Picture of Saltland

Before Treatment

After Treatment



Aerial photographs illustrate the severity and variability in saltland

Assessing the site conditions helps determine whether the site can be treated as one unit

To help identify indicator species refer to:
Saltdeck, available from Land, Water & Wool
Western Weeds, a guide to the weeds of WA

To help identify planted species refer to:
Forage shrubs & grasses for revegetating saltland. Bulletin 4153 Department of Agriculture and Food, WA.

:: Reference Chart

Low Rainfall Zone

What is growing now?

low yield crop	MILD	subclover & capeweed disappearing
low-moderate waterlogging	MODERATE	barley grass & some bare ground
highly prone to waterlogging	HIGH	patchy barley grass with larger bare areas
frequently waterlogged & inundated	SEVERE	samphire, curly ryegrass

What will it grow?

low yield crop	MILD	barley, annual legumes eg. frontier balansa, burr medic
low-moderate waterlogging	MODERATE	alleys saltbush with understorey, bluebush
highly prone to waterlogging	HIGH	dense saltbush or bluebush
frequently waterlogged & inundated	SEVERE	samphire, fence off

:: Mild



Strategies:

Establish annual legumes which are suited to the conditions. Can try occasional barley crop.

EM38 Category: 50-100mS/m

Options:

- Annual legumes can be introduced into the pasture i.e. medics, balansa or grasses (Rocket ryegrass)
- Engineering options, i.e. surface drains or grade banks.

Costs	Benefits
Annuals up to \$150/ha	Increases nitrogen fixing and biomass

Comment:

These areas are marginal for cropping. With standard pasture establishment techniques these areas can increase in production and sustainability.





:: Moderate



Strategies:

Establish saltbush in alleys and or bluebush as the perennial component. Encourage annual legumes between alleys in the 2nd or 3rd year.

EM38 Category: 100-200mS/m

Options:

- Saltbush shrubs in rows within an alley system i.e. old man, river
- Bluebush
- Plant annual legumes in the inter-row i.e. Frontier balansa, medics.

Costs	Benefits
Saltbush up to \$150/ha	Increases biomass providing autumn feed

Comment:

These areas may have been in crop in the past but now are unsuitable.

Most salt patches are managed with areas of good pasture. With some input these areas will increase in production and will help stabilise the paddock.

A good place to 'feedlot' sheep in autumn/early winter. Saltbush provides vitamin E and other minerals.

:: High



Strategies:

Establish dense stands of saltbush shrubs in areas that do not waterlog. Leave an alley-way for vehicle and stock movement every 8-10 rows.

EM38 Category: 150-250mS/m

Options:

- Saltbush shrubs in a block planting configuration i.e. old man and river
- Feed out hay/grain or graze with stubble.

Costs	Benefits
Annual legumes up to \$250/ha	Increases nitrogen and biomass
Saltbush up to \$200/ha	Provide autumn feed

Comment:

These are areas with increasing bare ground, barley grass and intruding halophyte.

They are best fenced off from the severe areas and managed with moderate areas once saltbush is established.

A great place to 'feedlot' animals in autumn/early winter to protect better soils. Saltbush provides vitamin E and other minerals.



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:: Severe



Strategies:

Fence off and leave the site to regenerate, especially if it is a creek or waterway.

EM38 Category: 200-300+ms/m

Options:

- Fencing to allow regeneration

Costs	Benefits
Fencing up to \$1,000/km	Area is left to regenerate

Comment:

These areas are usually the first to be identified as saline. Remember the area affected by salinity is larger than the observed bare patch. Fencing off these areas will help with regeneration. These areas are best left to revegetate on their own.



:: Case Study



Bernie Driscoll has always had sheep and in the past 20 years he has had salt affected land.

But it was a trip to Michael Lloyd's Lake Grace property that left him with a lasting impression of how sheep could benefit from saltland.

Bernie farms Tarana Farms - which is 2200ha in total - with wife Sheryl and son Richard.

Annual rainfall is about 325mm and the family crops 1200ha and runs 2500 breeding ewes, 750 of them mated to terminal sires.

At present the enterprise split is a fairly even balance between livestock and cropping but Bernie admits that the future emphasis between these enterprises is unknown.

Located 30km east of Ballidu, the family property sits on the Yilgarn Craton and is undulating.

Involved with a local Woolpro Group and a member of the Buntine-based, Liebe Group, Bernie was keen to host a Sustainable Grazing on Saline Lands research site on Tarana Farms to explore options on the 300ha of salt affected country on the farm. "We have some deep drains elsewhere on the farm, but I didn't think that drains would benefit this site," Bernie explains.



:: Case Study

"Saltbush is productive and regenerates and we wanted to set up saltland pasture sites across the farm that would allow us to defer grazing our annual pastures at the break of the season."

Three treatments, each 4ha in area and a control site were set up on the 20ha SGSL site which varied in its condition and ran down to a salty creek.

"We chose the sandy loam site because it ranged from good to bad to terrible," Bernie says.

"The idea was to test run a range of saltland pasture options for different areas and then apply this example elsewhere on the farm."

The SGSL site is low in the landscape and the soil depth is less than one metre because of a hard pan. Consequently, the site can fill up and inundate after a big rain.

Cleared in 1960, the original vegetation on the site was salmon gum, york gum and tea tree.

According to Bernie, the site has been salt affected since 1963, which was a particularly wet year.

While part of the site was bare or covered in bluebush, elsewhere the Driscolls are growing 3t/ha cereal crops adjacent to the salt affected area.

Bernie believes that fencing off areas of bluebush is an important first step and he is all for 'realistic' fencing subsidies.

The SGSL site was treated with a knock down herbicide.

One of the plots was planted to saltbush in July 2003 – a small proportion of it established from seedlings and the balance direct seeded using a niche seeder.

The following month, the remaining two plots were planted to Safeguard annual ryegrass and balansa clover and another to lucerne and

Evergreen's saltland mix – a blend of perennial grasses.

"We had good rains that August and the saltbush germinated well - particularly on the loam country as opposed to the heavier country," Bernie says.

"Where it was too saline, we had mixed success with the lucerne and grasses."

There is still evidence of some of the lucerne plants on the SGSL site and Bernie was encouraged by this result to sow a further 20ha of lucerne on better country on the farm in 2004.

"That lucerne was 30cm high with the summer rain earlier this year and it was good quality and productive, but summer rainfall is so unreliable," he says.

Given the success of the direct sown saltbush, Bernie has since sown a further 120km of saltbush and other seed on Tarana Farms.

The old man, creeping and river saltbush was sown with a mix of *Acacia saligna*, puccinellia and tall wheat grass.

Bernie says that of the mix, the old man saltbush is the surviving species.



Having had three seasons to assess his SGSL site, Bernie says that the 6ha of saltbush on the 15ha site is not enough.

"The saltbush has been really useful, particularly in autumn and summer, but we need more of it," he says.



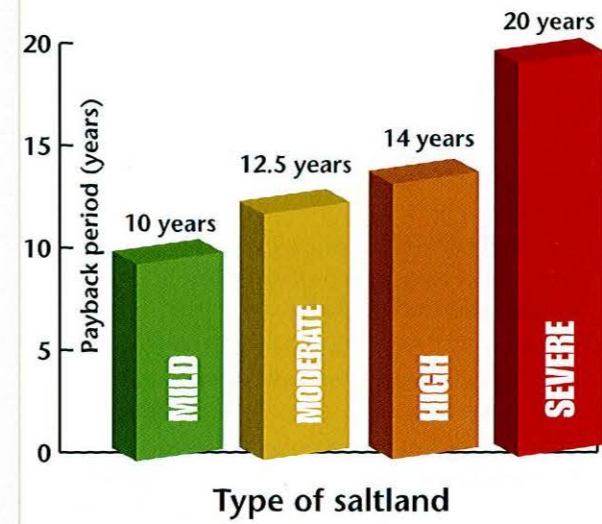
Bernie says the trial work to now has convinced him of the future potential of saltland pastures.





:: Economics

Average number of years to payback establishment costs



** Spending money on Mild to High saltland areas will payback within the medium term.

Based on economic analysis of SGSL producer sites in 2006 by Allan Herbert.

:: Farmers in Trial Areas

FARMER	LOCATION	PHONE	RAINFALL
Altham	Pingrup	9820 4014	355
Aynsley	Beverley	9646 6246	375
Bell	Corrigin	9065 7052	350
Bradshaw	Tambellup	9825 8228	390
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Brown	Wickepin	9888 1251	380
Carter	Wubin	9664 3051	300
Chapman	Bruce Rock	9065 1021	340
Cobley	Mingenew	9928 1011	380
Courboules	Corrigin	9063 2422	300
Driscoll	Ballidu	9674 4012	325
Fuchsichler	Koorda	9684 1281	300
Grima	Mullewa	9961 9013	320
Haggerty	Wyalcatchem	9681 5022	300
Hayes	Quairading	9646 6219	370
Hughes	Quairading	9645 5002	320
Hulls	Trayning	9683 1109	330
Jones	Mukinbudin	9047 1174	300
Kilminster	Bruce Rock	9061 1778	320
Lewis	Wickepin	9888 6040	350
Lloyd	Lake Grace	9871 2041	325
Matthews	Wickepin	9881 0214	350
Pearse	Meckering	9625 1202	350
Pepall	Katanning	9823 5031	380
Pickering	Dowerin	9631 1250	355
Pitman	Corrigin	9065 7074	340
Poultney	Corrigin	9062 9030	350
Robinson	Bruce Rock	9065 2027	310
Rogers	Corrigin	9063 7001	330
Smith	Mukinbudin	9047 0030	320
Smoker	Corrigin	9063 7015	340
Stokes	Cunderdin	9635 1265	350
Stone	Quairading	9645 1214	350
Sturges	Corrigin	9065 8040	380
Talbot	Corrigin	9063 2232	320
Tink	Ravensthorpe	9838 0064	370
Tubby	Morawa	9972 2102	340
Unkovich	Southern Cross	9049 1055	320
Walton	Yealering	9888 7048	380
White	Miling	9654 1122	360
Wigg	Dumbleyung	9864 2033	350
Witham	Tambellup	9825 8286	380
York	Tammin	9637 1142	380