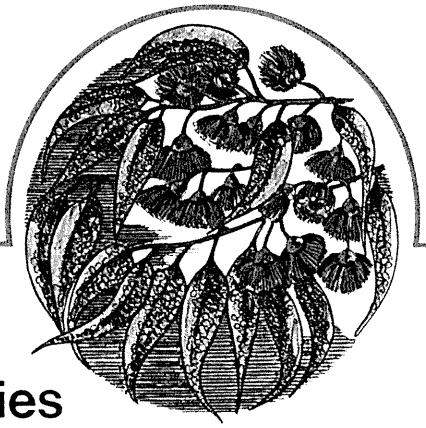


woods & forests

No. 10
in a series

Salinity and tree planting

Recent estimates of the loss of land in South Australia to saline seepage was 1% of sustainable agricultural land and 5.6% of non-arid grazing land. This represents a multi-million dollar loss in terms of capital value, decreased production and amelioration/reclamation work. Although tree planting on a modest scale cannot be expected to reverse this situation, planting in the right location can restrict the spread of salinity as well as provide other valuable benefits.

Background

Saline seepage soils are areas that have saline water close to or at the soil surface. They occur because drainage or run-off water comes to low lying areas and brings with it dissolved salts. This water comes as a result of clearing the deep-rooting, high water-using perennial vegetation. Seepage can also come from irrigation drainage or other acts of man (e.g.: interfering with natural drainage when building roads; dispelling town storm-water onto an area).

The salts in a seepage soil concentrate as water evaporates from the soil surface, and also as more salts are brought in. The salts cannot leach out of the topsoil because the water-table is kept high with the regular influx of water. Even when the water-table is at its lowest in the summer, it is still usually high enough to allow water to evaporate from the soil and therefore bring the salts to the surface.

The result is failure of cereals and pasture, tree death, the colonisation of salt-tolerant grasses and halophytes, bare ground and eventually salt encrustations appearing.

What To Do

Ideally, the best thing to do is to reduce the amount of water that moves to the low lying areas. Techniques to do this are currently under research by the Department of Agriculture. Tree planting on the catchment area is likely to be of benefit for this, but not significant with small plantings.

But once there is a seepage problem the techniques for amelioration include:-

- fencing to exclude stock and encourage the colonisation of the salt-tolerant grasses and halophytes;
- mulching to reduce surface evaporation;
- introducing other salt tolerant grasses (e.g. Puccinellia, tall wheat

- water diversion with contour banks (where there is a disposal site for the water);

- drainage or pumping of the seepage (again - where there is somewhere to take the water);

- the use of deep-rooted, high water-using vegetation to lower the water-table.

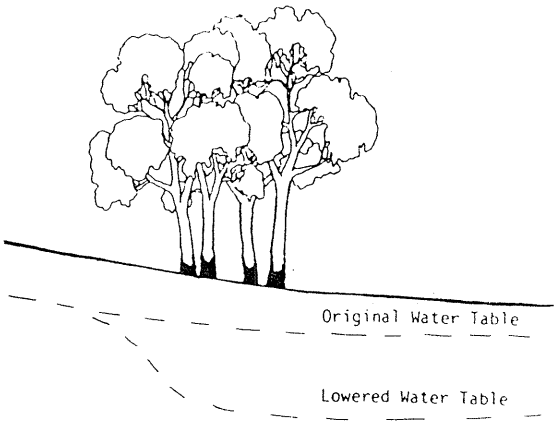
It is the role of trees in the last technique that is discussed further in this fact sheet.

For details of some of the other techniques, the reader is referred to the fact sheets of the Department of Agriculture.

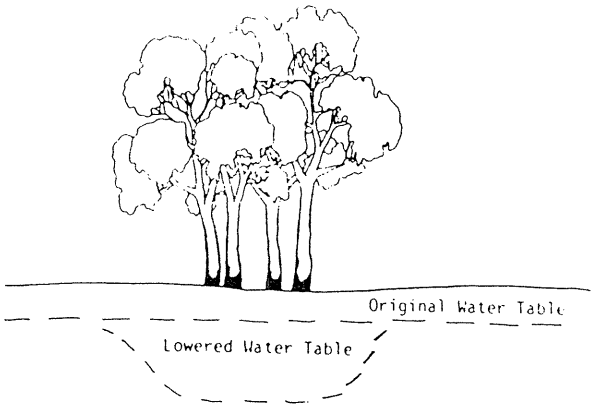
No. 1/81 'Saltland - how to handle it'
No. 30/80 'Grasses for Saltland'
No. 5/86 'Soil analysis for field crops and pastures'

The Role of Trees

There is significant evidence that trees will reduce the water-table of saline seepages. Reduction in the height of the water-table will mean that the salted area will not spread and that salts can be leached out of the topsoil and better pasture establishment can be achieved. On relatively flat ground the effect is generally only in the immediate root zone of the trees (the effect is likened to the drawdown zone around a bore), but on slopes the water-table can be dropped on the slope down from the trees. The permanency or magnitude of the effect in both cases will depend on the amount of water following into the seep, the 'water pumping capacity' of the species used and the extent of the planting.



It must be emphasised that trees are not a 'miracle cure'. They have an important role to play but in most cases they must be used in conjunction with the other techniques detailed above, especially drainage where possible.

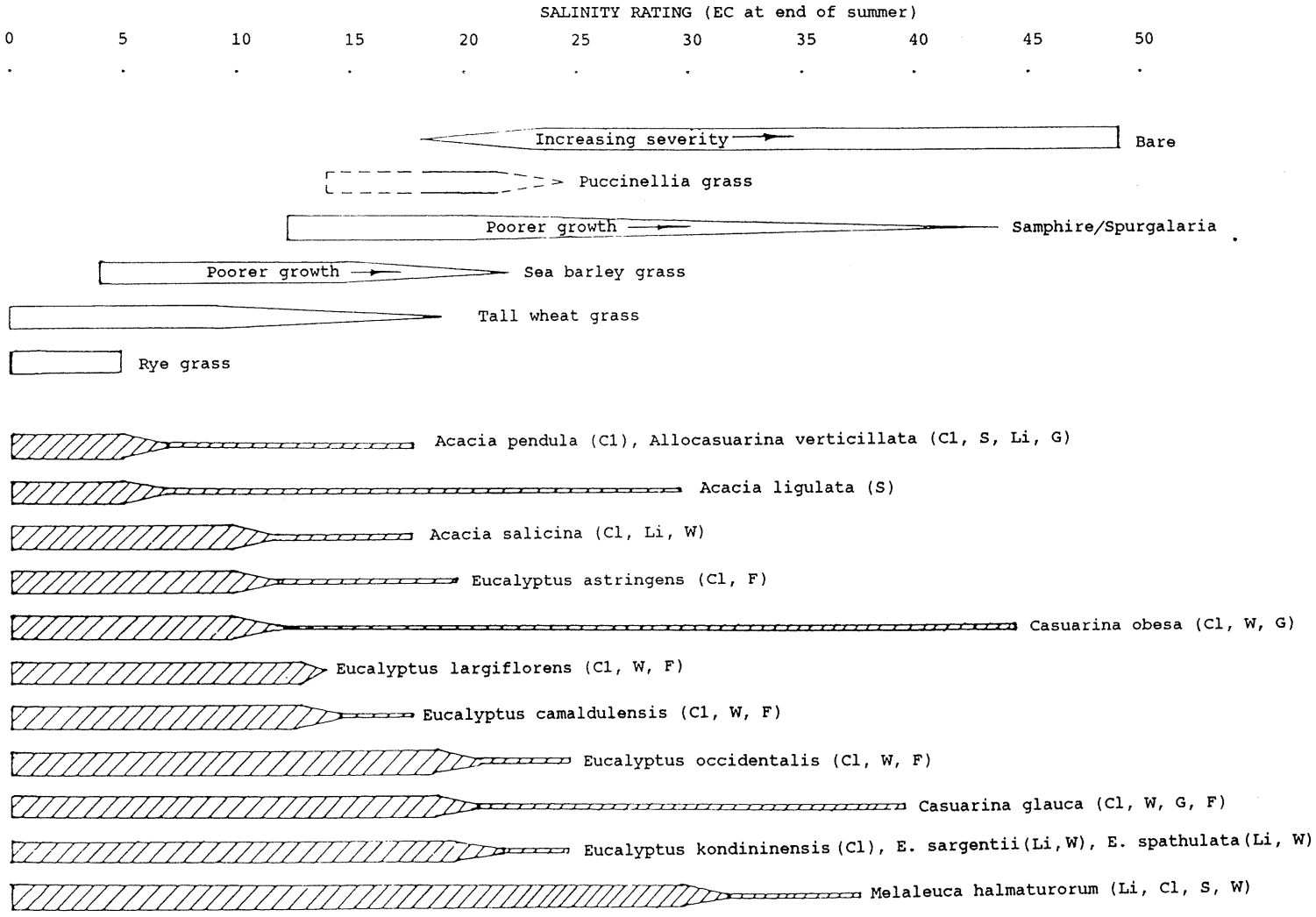


However, where trees are used, they provide benefits other than reducing the water-table They provide shade and shelter for stock. They provide a wildlife habitat, amenity and capital value, and can provide by-products such as firewood or fence posts.

The Salt Tolerance of Trees

Because the degree of salt tolerance of different trees and shrubs varies, it is essential to identify the salinity of the site before selecting the species. The most practical way of doing this is by the existing vegetation.

The chart below shows the soils salt levels at which various native plants, and the vegetation that occurs on saline seeps, have been recorded to be growing. No distinction has been made between provenances of individual species of native plants even though research has isolated superior performers (e.g. E. occidentalis Gibson).



Key

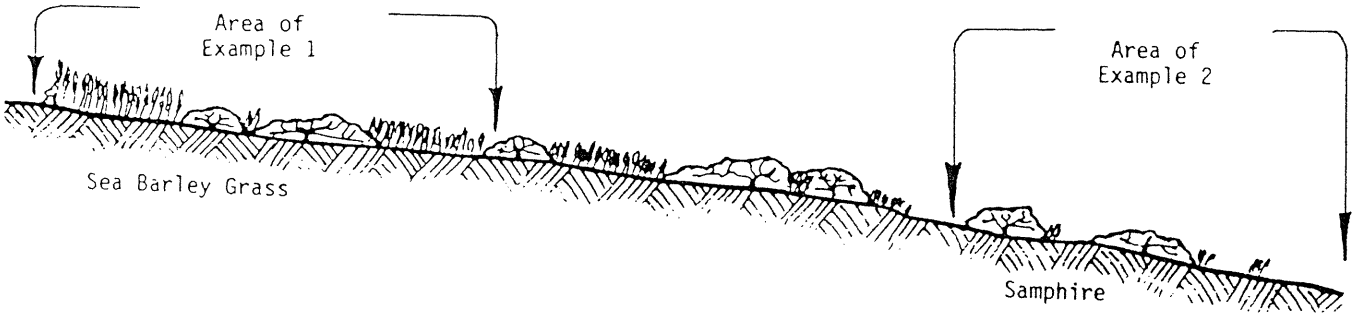
	Good health and vigour.	Li	Tolerates limestone.
		Cl	Prefers clay soil.
	Unsure of longevity or performance of mature species.	S	Prefers sandy soil.
		W	Tolerates water-logging.
		F	Useful firewood species.
	Transition zone.	G	Has grazing value.

To select suitable species:-

- identify existing vegetation;
- note the salinity range on the chart;
- select the tree species that have shown reliable performance at the same salinity level.

Example 1 - A site has healthy sea barley grass and just one or two samphire plants coming in. The soil probably has a salt rating of 13-15. From the chart it can be seen that Eucalyptus camaldulensis is very borderline at this rating and is best planted in slightly better ground. More reliability would be achieved with species in the last four bar graphs.

Example 2 - Sea barley grass is barely surviving, samphire is doing well, but 20%-30% of the area is bare. The chart shows that the soil salinity rating would be between 20-22. There should be success sowing puccinellia, but the only tree or shrub with reliable performance is Melaleuca halmaturorum. Some of the Eucalyptus species and two of the Casuarina species have shown some promise for the area.



Other species that are useful on salty sites, but have not had a salinity rating determined yet are:-

Trees

Acacia papyrocarpa (syn. sowdenii)
Acacia stenophylla
Allocasuarina verticillata
Callitris columellaris
Casuarina cristata
Eucalyptus brockwayi
Eucalyptus burracoppinensis
Eucalyptus calycogona
Eucalyptus campaspe
Eucalyptus concinna
Eucalyptus conglobata
Eucalyptus cornuta
Eucalyptus diptera
Eucalyptus incrassata
Eucalyptus lehmannii
Eucalyptus lesouefii
Eucalyptus longicornis
Eucalyptus loxophleba
Eucalyptus macrandra
Eucalyptus merrickiae
Eucalyptus microtheca
Eucalyptus oleosa
Eucalyptus ovularis
Eucalyptus platypus
Eucalyptus salmonophloia
Eucalyptus stricklandii

Eucalyptus diversifolia
Eucalyptus dumosa
Eucalyptus eremophila
Eucalyptus erythrocorys
Eucalyptus forrestiana
Eucalyptus flocktoniae
Eucalyptus gracilis
Eucalyptus griffithsii
Eucalyptus torquata
Eucalyptus woodwardii
Pinus halepensis
Pittosporum phylliraeoides
Salix matsudana x alba
Tamarix aphylla
Tamarix articulata
Tamarix odessana

Shrubs and Groundcovers

Acacia cyclops
Acacia ligulata
Acacia oswaldii
Acacia sophorae
Acacia victoriae
Alyogyne hakeifolia
Arthroineumum arbuscula
Acacia halocnemoides
Acacia leiostachyum
Atriplex cinerea
Atriplex nummularia
Atriplex paludosa
Atriplex semibaccata
Atriplex vesicaria
Cassia artemisioides
Disphyma clavellatum
Enchylaena tomentosa
Eremophila divaricata
Frankenia pauciflora
Galenia pubescens
Galenia secunda
Kochia brevifolia
Kochia pyramidata
Kunzea pomifera
Melaleuca armillaris
Melaleuca decussata
Melaleuca ericifolia
Melaleuca glomerata
Melaleuca hamulosa
Melaleuca huegelii
Melaleuca lanceolata
Melaleuca microphylla
Melaleuca nesophila
Melaleuca pentagona
Myoporum acuminatum
Myoporum insulare
Myoporum parvifolium
(broad leaved form)
Psiolcaulon caducum
Rhagodia spinescens
Scaevola crassifolia

Site Treatment

The following techniques should enable trees to be established beyond their range as indicated in the chart. How far beyond is not exactly known at present.

- Mounding - pushing up the earth to create mounds 0.5 metres high and 1.2-1.5 metres wide. Mounds made at least one season before tree planting will allow rain to leach out salts and the trees will get a better start. Mounds also keep young plants out of the waterlogging.

- Mulching - any mulch will reduce evaporation and therefore help prevent salt accumulation at the soil surface.

- Weed Control - On waterlogged sites grasses are useful for using soil moisture prior to spring, and when they cure they have a mulch effect. Where moisture is more limiting, weeds can be controlled with herbicides.

- Gypsum - if the soil sticks heavily to your boots or ponds water for a long time when there is a good chance it will benefit from an application of gypsum. Gypsum will improve the soil structure, creating a more suitable structure for root growth, and allowing better rainfall infiltration which will help leaching of the salts.

Further information on gypsum is found in the Department of Agriculture Fact Sheet No. 50/85 'Gypsum for Hardsetting Soils'.

Cultural Notes

Trees planted from 2.5-4.0 metres between centres should maximise the water pumping benefits. In cases where salinity is only marginal, cropping and grazing is possible between trees planted 2.0-3.0 metres apart in rows which are 10-15 metres apart.

Further help on establishing plants is found in Woods and Forests Department Fact Sheet No. 8 'Broadacre Establishment Techniques'.

The Native Plant Section provides the following services:

- Rural Tree Scheme - applications from April to October each year for seedling supply in the following autumn or spring. Attractive discounts apply.
- Farm tree plans. Landscaping plans and contracts.
- Contract tree planting or woodlots, windbreaks, shelter belts, shade, salinity amelioration and effluent disposal.
- Direct seeding contracts using native species mix or lucerne tree.

Native plants and information on species to suit individual needs are available from Woods and Forests Native Plant Sales Outlets at -

Murray Bridge	Native Plant Section, Bremmer Road, Murray Bridge Open 7.30 a.m. to 4.30 p.m. weekdays Telephone (085) 32 3344
Belair	Inside Belair Recreation Park, adjacent Old Government House. Open 7 days, 8.00 a.m to 4.00 p.m. weekdays and 10.00 a.m. to 4.00 p.m. weekends Telephone (08) 278 7777
Cavan	Corner of Diagonal and Goldsbrough Roads, Cavan Open 8.00 a.m. to 5.00 p.m. weekdays and 8.30 a.m. to noon Saturday. Telephone (08) 262 6509
Berri	Worman Street, Berri Open 10.00 a.m. to 4.00 p.m. weekdays Telephone (085) 82 1599
Bundaleer	Bundaleer Forest Reserve, 9 km south of Jamestown Open from April to October between 1.00 p.m. to 4.30 p.m. weekdays Telephone (086) 65 4044

Chip 'n' Bark mulch and other products are also available at some of the above outlets.