1-1-1978

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T C. Stoneman

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Recommended Citation
Stoneman, T C. (1978) 'Soil salinity in Western Australia: a summary,' *Journal of the Department of Agriculture, Western Australia, Series 4: Vol. 19 : No. 4, Article 2.*
Available at: https://researchlibrary.agric.wa.gov.au/journal_agriculture4/vol19/iss4/2

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Soil salinity in Western Australia — a summary

By T. C. Stoneman, Principal Soil Research Officer

Soil salinity problems have long been recognised in Western Australia. The earliest published explanation in 1924 suggested that removing native vegetation increased stream salinity, and this basic cause has been confirmed by many studies since.

Soil salinity as a result of agricultural development has been occurring for thousands of years. One of the earliest examples was in Iran where early civilisation developed successful irrigation schemes. These schemes eventually

Fig. 1.—Area of salt affected land previously used for crops and pasture

A typical area of severely salt-affected land in the wheatbelt
suffered from salt accumulation due to the development of shallow water tables.

Major salinity problems in the world continue to be associated with irrigation, but dryland farming has also caused soil salinity problems. Apart from Western Australia, significant areas are salt-affected in the Eastern States of Australia and in North America (page 115).

**Extent in Western Australia**

The extent of soil salinity has been estimated by farmers in surveys in 1955, 1962 and 1974. The area of once productive farmland now affected by salinity increased most in the Northern Agricultural areas. Results are summarised in Figure 1.

In addition to the areas of farmland that have turned salty, a further 378,000 ha was reported in the 1955 survey as being naturally occurring salt lakes, salt channels and samphire flats within farm boundaries.

Very little land in the South West Statistical Division is affected by salt. Consequently, articles in this Journal mainly concentrate on soil salinity in the wheatbelt—an area with from 275 to 600 mm average annual rainfall.

**Understanding the problem**

In the South-West of Western Australia, salinity problems have increased because of clearing of native vegetation to allow farming. Clearing affected the water table in a similar but less obvious way to irrigation where overwatering leads to the development of shallow watertables.

One of the earliest recorded contributions to an understanding of the cause of salinity was in 1924 by a Mr Wood, an engineer with the Western Australian Government Railways. He suggested that removing the native vegetation increased stream salinity and caused the subsequent deterioration in water quality in railway dams used for steam-train boilers.

A comprehensive report on soil salinity in Western Australia was published in 1929 by Dr Teakle of the Department of Agriculture. Three general categories of saltland were proposed and these still apply today:

- Seepage areas.
- Waterlogged valleys.
- Dryland salinity, in which waterlogging plays no part.

The next two decades marked a period of intense activity in surveying soils of the agricultural areas. Professor Patterson had predicted in 1917 that salt problems were likely in the Salmon Gums area and this proved to be substantially correct.

The problems of saltland in the Salmon Gums area led to extensive soil surveys in the Salmon Gums area, Lake Brown area, the Lakes district, the East Pingrup-Magenta area and the proposed 3,500 farm area south-east of Southern Cross. These surveys covered a total of about 3 million ha and gave a better understanding of the extent and nature of the salt problem.

**Post 1950 research**

Research by the Department of Agriculture and CSIRO since the mid 1950s has confirmed that highly saline water is close to the surface of salt-affected wheatbelt valleys (see page 104).

Studies have also indicated that most ground water is under pressure which is forcing it towards the surface (see page 106). The groundwater extends beneath the non-saline land on the valley sides but at a greater depth below the soil surface.

Soil surface treatments such as cultivation were shown to reduce the concentration of salts in the soil surface. However, attempts to reclaim saline areas by normal cultivation methods and normal plants such as cereals and annual ryegrass indicated that these methods were most suited to mildly affected areas, areas mainly growing sea barley grass, Hordeum marinum, and with few bare patches. On more severe areas special salt tolerant forage plants need to be sown.

Since the early 1960s a major effort by the Department of Agriculture has been the introduction and selection of productive salt tolerant perennial plants for areas considered too saline for any other use. The research is at the stage where seed of selected species is being multiplied and mechanised harvesting and sowing methods are being devised.

At the same time, studies on water and salinity balances of various areas in the wheatbelt have continued to gain an understanding of how much of the rainfall finds its way unused through the soil profile and into the groundwater.

Over the last six years, Department of Agriculture officers at Narrogin have investigated the effectiveness of a variety of cut-off drains and seepage interceptors. Many of these have reduced waterlogging over areas up to 40 metres below the channels, but as yet they have had little effect in reducing salinity downslope.

Also within the last two years, the Department of Agriculture has begun other investigations to monitor the effects of “interceptor banks”, which are recommended by some farmer groups for reclamation of salt-affected land.

Subsequent articles in this issue of the Journal provide more detailed explanations of the present state of knowledge about the causes of soil salinity in the wheatbelt.