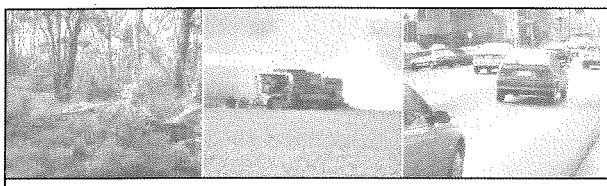

National DRYLAND SALINITY Program

NATIONAL DRYLAND SALINITY PROGRAM

Inspiration, Celebration, Aspiration – an R&D Workshop recognising the achievements of NDSP Phase 2

25th – 26th March 2003
Stamford Plaza Hotel
Adelaide, South Australia

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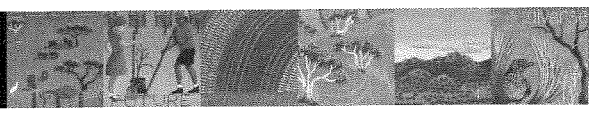

Understanding the recruitment biology of vegetation communities on saline soils

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**Scintex Environmental*

Workshop Paper

1. What is the context of your research ie what was the issue and how did you explore it?

Salinity levels in riparian wetlands and the ground water under adjacent plant communities are rising and destroying large areas of remnant vegetation. Remnants along drainage lines are particularly vulnerable to hydrological change. Many of southwest Australia's rivers are associated with low gradients and deeply weathered landscapes in which salt has accumulated over tens of thousands of years. Plant communities, such as those associated with yate (*Eucalyptus occidentalis*), persist along these naturally saline rivers in the upper tributaries of the Gairdner River, where this project is based.

Information on plant communities existing on naturally occuring saline soil, and their regeneration and restoration potential is limited. Vegetation response to salinity along saline drainage lines has also received little attention. An understanding of recruitment strategies and vegetation health, structure and diversity of plant communities in saline soils will help improve restoration plans for land affected by secondary salinity and waterlogging. The project hopes to develop a greater ecological understanding of vegetation affected by dryland salinity and waterlogging at plant community scale. Information on the impact of salinity and waterlogging on yate woodland will ensure that management strategies are developed that consider specific soil and water thresholds necessary to maintain functioning ecosystems. A conceptual model can be developed that is able to identify safe soil and water regimes for yate woodlands, with the potential for use in other similar woodland, shrubland and samphire communities.

How did your results contribute to the management of dryland salinity?

Our project confirms that a greater understanding of vegetation response to changes in soil/water regimes is necessary to identify the key processes driving changes to community health, structure and diversity in saline lower landscapes.

Soil and water regime thresholds need to be identified to maintain biodiversity in remnant riparian systems and restoring sites affected by hydrological change. Even plant communities adapted to naturally saline conditions were not immune to change when critical thresholds were exceeded.

Identify the dryland salinity questions that can now be answered more confidently.

Overall, vegetation survey results found that community structure, species abundance and species diversity all changed along the disturbance gradient. Succulent chenopods such as samphires are increasing their distribution into the mixed shrubland zone whilst the large sedges, shrubs and trees are disappearing. The samphire and mixed shrubland zones are now dominated by fewer species as naturally saline environments become effected by secondary salinity.

Further up the slope away from the drainage line, grasses (both weedy and native) and chenopods are beginning to colonise as tall shrubs, such as Melaleucas, slowly move out. Although no life form group has been lost to the system in the open woodland zone, there has

been an increase in grass and sub-shrub abundance and a decrease in upper and mid stratum species abundance.

Species diversity at samphire and mixed shrubland zones declined significantly as the disturbance worsened. The diversity in the open woodland zone further up slope was not affected along the disturbance gradient perhaps because species that declined in abundance were all replaced by other more tolerant species.

Multiple regression analysis helped to identify the most important variables affecting vegetation health. Soil chloride levels and waterlogging periods were found to predict up to 90 % of plant health variation. Elevation above drainage lines and soil texture were also able to increase predictions in some instances.

In conclusion, current structure, species abundance and diversity along primary saline rivers will not persist in secondary saline environments. Waterlogging and elevation is a useful initial predictor of a site's fate, particularly in the lower parts of the landscape. Waterlogging duration, soil chloride, and soil type increase the predictive power higher in the landscape and all have important implications for management.

4. What is the most important unanswered question that MUST be answered in order for us to manage dryland salinity?

Other communities are prevalent in lower landscapes in southwest Australia. The salmon gum and gimlet woodlands are prominent examples. Developing quantitative thresholds for their health and survival needs to be pursued (but see also Project UMU16).

From the present work, it can be predicted that the success of revegetation and vegetation restoration in lower landscapes will be improved by the development of key indicators.

An obvious strategy to ensure that watertable thresholds are not exceeded is to install drains in or around remnant vegetation. The efficacy of drains in protecting remnant vegetation must be assessed. Deep drainage is proposed to increase productivity of agricultural land. The impact of such drains on downstream remnant vegetation needs to be determined.

Understanding the recruitment biology of vegetation communities on saline soils

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Project Summary

Study Topic Objectives

- Assess the recruitment dynamics of communities in primary saline soils with varying degrees of secondary salinity / waterlogging.
- Analyse the recruitment biology of key functional groups existing in saline soils.
- Examine the water relation dynamics of vegetation communities in primary saline soils.
- Develop a conceptual model, based on recruitment biology, for restoration of land affected by secondary salinity / waterlogging.

Expected Outcomes

The project will have developed a greater ecological understanding of the recruitment biology for vegetation communities existing on primary saline soils, and the impact of secondary salinity on these communities. Understanding the recruitment biology of plants on primary saline soils will provide land restoration information for remnant riverine vegetation and surrounding agricultural land affected by secondary salinity and waterlogging. Restoration regimes could be based on a conceptual model using information on recruitment requirements and the condition of the natural system.

Commencement Date

January 1999

Completion Date

2003