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## ***Risk and restoration potential for remnant vegetation in salinising landscapes***

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### **Workshop Paper**

While the physiological processes that confer salinity and/or waterlogging tolerance on native species are well understood, few studies in Australia had focused on how native plant communities respond to the development of secondary salinity. Given that remnant vegetation on Australian agricultural land is often small in extent, highly fragmented and likely to be degraded by grazing, weeds and other factors, rising water tables may deliver the final blow to maintaining their ecological activity.

This project aimed to identify effective management priorities and strategies for native vegetation in the lower portions of landscapes, in relation to the risk to vegetation health from rising groundwater and salinisation. We used a mixture of hydrological modelling, field assessment and existing data. Because of the availability of pre-existing data, the project was conducted in the upper and middle Blackwood Basin in Western Australia. One reason for choosing this location is that the south-west of WA has been designated one of 25 world 'hot spots' for biodiversity and the only one in Australia.

#### **Contribution to salinity management**

The problem was approached at several scales. At landscape scale, hydrological modelling of the future groundwater surface was linked with the distribution of plant community types in vegetation remnants, as mapped by the Spatial Resources Group from the Department of Agriculture. This helped to identify which remnants are most at risk from rising groundwater, and assess their conservation significance. More detailed hydrological modelling assessed the likely impact of different management responses on the persistence of individual remnants under threat. A prioritisation framework based on an assessment of the degree of threat, value of the asset, and likelihood of successful management intervention was developed.

Detailed field investigations were carried out in Capercup Nature Reserve and the Australian Bush Heritage Fund block near Kojonup. Both contain wandoo woodland in good condition with an ungrazed understorey, plus adjacent areas experiencing secondary salinisation.

Investigation of the interactions between groundwater characteristics and dynamics, soil characteristics, micro-topography and vegetation responses elucidated opportunities for managing vegetation at the micro-scale. For example, where micro-topographic differences influence vegetation health, then opportunity exists to maintain some elements of the current vegetation in areas of higher micro-topography, with the rest planted with salt-tolerant species, thus creating a new ecosystem mosaic.

All remaining native vegetation can be considered valuable in terms of conserving diversity and providing ecosystem services to surrounding farmland. In reality, the underlying hydrological processes driving development of dryland salinity cannot be simply or immediately reversed. While groundwater pumping and other engineering works could maintain the hydrological integrity of natural areas, high cost means only a few key reserves could be protected.

#### **Increased confidence resulting from project**

The project has resulted in the following:

1. The development of a theoretical approach to the question of how to manage vegetation at risk of salinity

2. The conclusion that it is difficult, if not impossible, to determine clear ecohydrological tolerances for plant communities due to the temporal and spatial variability of water levels and the variability in species compositions across small distances (at least in SW WA). The project findings also question the relevance of doing this. Plant communities seem to collapse, often due to unusual or infrequent events, and within this context tolerance of 'average' conditions may not be relevant. We need much better information on the responses to such events. We also need to manage veg so that the natural system is well within its buffering capacity for extreme events, and this may not be achieved if we aim to manage vegetation at the upper end of its tolerance limits.
3. The conclusion that there is little prospect for restoration of salinised communities or for the movement of salt-tolerant species into salinising areas as vegetation change due to salinisation generally includes complete collapse of the native community and replacement with an extremely simplified system. Restoration to a very simple community may be possible with significant management inputs, particularly earthworks, but without some sort of broader hydrological change it is unlikely that any sort of 'natural' community will develop.
4. Broadscale estimates of losses from salinisation may over-estimate the actual damage as fine scale variation in microtopography mediates the broad-scale risk from water table rise, such that some locations escape impacts, at least in the short term.
5. The development of a decision-tree approach which works down from a regional context to specific hydrological conditions and provides detailed predictions of likely ecosystem response and possibilities for management or restoration action.

The unanswered questions

How far are the results from this study generalizable to other vegetation types and situations?

Given that prioritization should take place on the basis of an assessment of risk, probability of success and value of the asset, how can regional risk assessments be translated into local ecological consequences? Also, how do we derive a relative value for different assets?

The relative importance of surface flows versus water table rises in causing vegetation decline

How significant do the management inputs to restore a community need to be (relative to asset value), and how do we critically evaluate restoration results?

Does managing local hydrology in certain areas make a difference?

Interactions between salinity and other factors leading remnant vegetation decline - eg fragmentation

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## ***Risk and restoration potential for remnant vegetation in salinising landscapes***

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### **Project Summary**

#### Project Goal

To minimise potential biodiversity loss resulting from secondary salinisation in agricultural landscapes.

#### Project Purpose

To determine conservation priorities in salinising landscapes from assessments of risk from water table rise, and to develop strategies for protection and restoration of vegetation cover.

#### Project Summary

The project aims to identify effective management priorities and strategies for native vegetation and revegetation in the lower portions of landscapes, in relation to risk from rising groundwater and salinisation. Identification of important areas for biodiversity conservation will be based on the relative risk to, and values of, the vegetation types present. Management options (eg revegetation, engineering) will then be developed based on the likelihood of different types of intervention being successful. In addition, the potential for restoration of salinised areas will be assessed by examining how well different plant groups tolerate different hydrological conditions. If groups of plant species can be recognised which can persist in the altered hydrological conditions predicted by current modeling, these can be used as the basis for restoration programs.

Commencement Date July 2000

Completion Date May 2003