IDENTIFYING AND CONSERVING ECOLOGICAL COMMUNITIES THREATENED BY SALINITY AND WATER-LOGGING IN THE AGRICULTURAL AREAS OF SOUTH-WEST WESTERN AUSTRALIA

Summary of activities carried out by the Project Officer TECs to identify, list and conserve TECs and priority communities in the Agricultural Areas of South Western Australia

13 March 2006

by

Rosemarie Rees

INTRODUCTION

The State Salinity Strategy (SSS) funded project *Identifying and Conserving Ecological Communities threatened by Salinity and Water-logging in the Agricultural Areas (Wheatbelt) of South-West Western Australia* has been running since February 2001. The project was originally funded for a two year period and a further 12 months funding has been provided for the 2005/06 financial year. Two project officers have been employed during the life of this project; Sheila Hamilton-Brown, carried out the initial activities describe in this report until she left the Department in October 2002. The position was then filled by Rosemarie Rees, in March 2003. Rosemarie has continued many of the recovery actions initiated by the previous Project Officer and during 2005/06 concentrated on identifying new Threatened Ecological Communities (TECs) and Priority Ecological Communities (PECs) resulting from the SSS funded *Biological Survey of the Agricultural Zone* (Keighery *et al.* 2004).

This report outlines progress for the above project to-date and highlights activities resulting in the nomination and listing of TECs from the agricultural zone.

BRIEF OF THE PROJECT

To develop and assist in implementing Interim Recovery Plans (IRPs) for Threatened Ecological Communities at risk from salinity (or whose conservation contributes to the control of salinity). To conduct further survey to characterise and assess possible TECs, especially those identified by the *State Salinity Strategy Biological Survey of the Agricultural Zone*.

SUMMARY OF ACTIVITIES

A. Evaluating available data and nominating communities for assessment by the TEC Scientific Committee

A number of possible TECs have been identified throughout the life of this project. In total 68 field trips to characterise possible TECs from the agricultural zone have been completed. All possible TECs identified, regardless of the type of community and/or threatening processes have continued to be recommended to the Threatened Ecological Communities Scientific Committee (TECSC). However, recovery actions are limited to TECs as set out in the brief.

Since the project began, ten TECSC meetings have taken place and 22 possible TECs from the south west agricultural zone have been nominated as TECs to the TECSC. Seven of the communities assessed are directly threatened by salinity and/or water-logging (Table 1). Nominations have also been prepared for an additional four TECs and seven PECs and these will be assessed by the TECSC at their next meeting (14 March 2006) (See Table 2).

To date three of the TECs listed in Table 1 have been endorsed by the Minister for the Environment with another ten yet to be endorsed (Table 1). In response to a request from the Minister, the details of those communities awaiting endorsement were re-presented using a new format recommended by the Director of Nature Conservation and forwarded for the Minister's consideration and endorsement in July 2005.

Table 1: Agricultural zone communities assessed by the TECSC since Feb 2001

TEC name	Recommended Conservation Category	Major Threats
Organic mound springs (Three Springs region)	EN Bi & ii	Changed hydrology, salinity, grazing, weed invasion, and clearing
Salt flats plant assemblages of the Mortlock River (East Branch)	EN Bi *	Salinity, water-logging, grazing, and weed invasion
Ferricrete floristic community (Rocky Springs type)	Vu to EN Bi & ii *	Salinity, water-logging, hydrological changes, fire, and weed invasion
Natural organic saline seeps fed by artesian waters of the Avon Botanical District	VU A*	Weed invasion, salinity, and hydrological changes
Wheatbelt *Allocasuarina huegeliana* over *Pteridium esculentum* communities	Priority 2	Salinity, rising water tables, weed invasion and clearing
Lesueur-Coomallo Floristic Community M2 (Melaleuca preissiana woodlands)	EN Bii *	Fire, *Phytophthora* sp. disease, salinity and weeds
Wet ironstone heath community (Albany District)	Priority 1	Salinity and changed hydrology, weed invasion and fire
Reedia spathacea – Empodisma gracillimum – Sporadanthus rivularis dominated floodplains and paluslopes of the Blackwood Plateau	CR Bi & ii *	Hydrological change, Feral animal grazing/trampling, fire and clearing
Reedia spathacea – Empodisma gracillimum – Schoenus multiglumis dominated peat paluslopes and sandy mud floodplains of the Warren Biogeographical Region	EN Biii *	Feral animal grazing/trampling, fire, hydrological changes, and clearing
Eucalyptus purpurata woodlands of Bandalup Hill	EN Bii *	Mining, changed hydrology, *Phytophthora* sp. disease and weeds
Montane mallee thicket of the Stirling Ranges	EN Bi & iii *	*Phytophthora* sp. Disease, fire and weeds
Eucalyptus acies mallee scrub heath on the mountains of the south-west	VU B	*Phytophthora* sp. disease and weed invasion
Coyanerup Wetland Suite: microscale paluslope associated with seepage and creeks	VU B*	*Phytophthora* sp. disease, fire rabbits and trampling
Green Range granite hill heath and woodland community	Priority 1	Weed invasion and fire
Stirling Range Upland *Eucalyptus cornuta* woodlands	Priority 4(b)	Weed invasion and grazing
Cryptogams associated with *Trymalium floribundum* and *Chorilaena quercifolia* in the karri forests of s-w WA	Priority 4(b)	Fire and logging
Eucalyptus acies, *E. lehmanii*, *E. goniantha* Tree Mallee over Tall Open Shrubland and Open Sedgeland	Priority 1	Weed invasion, possibly *Phytophthora* sp. disease
Eucalyptus acies, *E. doratoxylon* Open Tree Mallee	Priority 1	Weed invasion, possibly *Phytophthora* sp. disease
Plant assemblages of the Broomehill System	PTD A	-
Acacia rostellifera low forest with scattered *Eucalyptus camaldulensis* on Greenough Alluvial Flats	CR to PTD B *	-
Mature Banksia coccinea thicket Gull Rock, Moates Lake'	†‡	
Porongurup Range Karri forest'	†‡	

* Yet to be endorsed by the Minister for the Environment and Heritage
† Not enough information to define as an ecological community
‡ Not on database

Table 2. Nominations of agricultural zone communities for assessment by the TECSC

TEC name	Proposed Category	Main Threats
Woodlands and shrublands of the alluvial soils of the upper Blackwood River (R Smith, 2005)	EN #	Salinity, grazing, weed invasion,
Low shrublands on acidic grey-brown sands of the Gracetown soil-landscape system (R. Smith, 2005)	VU #	Trampling and recreational impacts, possibly disease and clearing,
Claypans on floodplains under *Eucalyptus wandoo* and *E. occidentalis* (Gibson *et al.* 2005)	EN	Salinity and changed hydrology, possibly weeds, inappropriate fire and disease
Claypans with mid dense shrublands of *Melaleuca lateritia* over herbs (Gibson *et al.* 2005; Keighery *et al.* 2002)	VU	Salinity and changed hydrology, grazing, weed invasion, disease
Very open mallee over *Melaleuca* sp. Kundip (GF Craig 6020) dense heath (G. Craig and S. Barrett, South Coast Region, pers. comm.)	P1 †	Mining, weeds, disease
Heath on Komatiite at Bandalup Hill (Cockerton *et al.* 2005)	P1 †	Mining, weeds, disease, changed hydrology
Wandoo woodland over dense low sedges of *Mesomelaena preissii* (Keighery *et al.* 2002)	P2	Salinity, weed invasion, disease
Banksia prionotes and *Xylomelum angustifolium* low woodlands on transported yellow sands (Keighery *et al.* 2001)	P1	Clearing, grazing, salinity, weeds, inappropriate fire
Tamma-Dryandra-Eremaea shrubland on cream sands of the Ulva Landform Unit (Keighery *et al.* 2001)	P1	Clearing, grazing, salinity, weeds
Wheatbelt Mottlecah dominated heathland on deep white sands.	P1	Clearing, grazing, salinity, weeds
Petrophile chrysantha low heath on Lesueur dissected uplands (Gp200-170) (Griffen 1994)	P2	Disease, weeds, inappropriate fire, and recreational impacts

nominated by South West Region
† nominated by South Coast Region

Current work focuses on examining the results of the *SSS Biological Survey of the Agricultural Zone* to identify and list additional wheatbelt TECs. Initial discussions with Science Division staff regarding the survey and analysis of wetland data from the SSS survey indicates that sampling intensity was not high enough to adequately define communities using quadrat group analysis to identify floristic community types, as was done for the Floristic Survey of the Swan Coastal Plain. Therefore, a higher level of species classification which defines broad species assemblages was employed. This analysis identified five assemblages at significant risk from salinity and water-logging (See Table 3). However, additional work is needed to adequately define community type from these five vegetation assemblages before they can be nominated as TECs. Nine wheatbelt wetlands containing representative quadrats of vegetation assemblages 2.1 and 3.1 were visited during the spring of 2005 but many of these wetlands contain several vegetation assemblages and therefore additional work is needed to adequately define community types and map boundaries between different communities within these wetlands.

Further discussion with Science Division and Wheatbelt Region Nature Conservation staff regarding the SSS Biological Survey data indicated that the wetland vegetation survey results are probably more representative and have better coverage than the survey of terrestrial sites. It was agreed that the vegetation associations identified as being significantly threatened by salinity give a good indication of the types of communities which are significantly threatened and worth consideration for listing as PECs and TECs.

It has been suggested that freshwater wetlands should be considered first (due to the degree of threat and number of sites sampled) and quadrat groups 17, 24 and 26 should be examined first. These quadrat groups give a good indication of the types of floristic groups which are associated with different freshwater basin wetlands. CALM Science staff have suggested looking at the characteristics of the wetlands which contain these quadrat groups (i.e. ephemeral, freshwater, perched) and then look at the species assemblages that define these wetlands (from the two way table) and the dominant vegetation to come up with broad wetland types (based on physical features of the wetlands and dominant vegetation rather than subsets of floristic community types within wetlands) which could then be considered for listing as TECs. This approach would provide a hierarchical or tiered system which characterizes wetlands at risk of salinity and water-logging. Some of the currently listed TECs would need to be reassessed to see where they would fit within these broader wetland types. A similar hierarchical approach could also be used to define naturally saline communities and woodland communities as PECs and TECs.

Table 3: Agricultural zone Vegetation Assemblages identified as being significantly threatened by salinity and water-logging (communities identified in Lyons et al. 2004 – SSS report)

Assemblage Name
Assemblage 2.1 Taxa of freshwater wetland basins and margins. This group contains almost exclusively native taxa that are largely distributed outside the higher rainfall areas of the South West. They mostly occupy wooded swamps and claypans but also occur within artificial water bodies such as reservoirs and dams. The assemblage includes *Persicaria prostrata, Elatine gratioloides, Marsilea costulifera, Centipeda crateriformis* subsp. *compacta, Persicaria prostrata* and the aquatics *Ottelia ovalifolia, Lemna disperma* and *Lepilaena australis*. Some species such as *Cyperus gymnocaulos, Eragrostis australasica* and *Eucalyptus camaldulensis* var. *obtusa* have a strongly northern distribution centered on the Geraldton sandplains and adjacent regions of the arid zone. Most of the component taxa (Ca. 74%) are known only from wetlands. A number of the remaining taxa, not restricted to wetlands, are introduced and include *Hordeum geniculatum*, *Echium plantagineum*, *Conyza albida* and *Solanum nigrum.*
Assemblage 3.1 A group dominated by ubiquitous wetland taxa distributed in various wetland habitats throughout the south-west. A few taxa extended into the Coolgardie bioregion (e.g. *Melaleuca strobophylla*, *Agrostis avenacea*). The component taxa occur in a wide variety of mostly non-saline wetland habitats. They include freshwater basin wetlands and margins, granite rock pools and herb swards, winter-wet terrestrial sites, disturbed freshwater and brackish wetlands and some small scale habitats (seasonally leached non-saline sands) on the margins of salt lakes and playas (See quadrat group 8.2). The assemblages contain several introduced taxa including *Pseudognaphalium luteoalbum*, *Cotula coronopifolia*, *Lythrum hyssopifolia, Juncus bufonius*, and *Polypogon monspeliensis*. *Centrolepis polygyna* and *Isolepis cernua* are common native members
Assemblage 2.4 Taxa of freshwater wetland basin and sedge swamps in the high rainfall and near coastal parts of the south-west. Most taxa have distributions centered on the Swan Coastal Plain, Warren and Jarrah Forest bioregions. Component taxa are almost exclusively aquatic or amphibious and include *Baumea articulata*, *B. vaginalis*, *B. rubiginosa* and *B. arthrophylla*. Aquatic members of the assemblages include *Triglochin huegelii*, *Utricularia volubilis* and *Potamogeton drummondii*
Assemblage 14 An assemblage dominated by freshwater wetland taxa. Wetland taxa represent 70% of the assemblage and 44% are aquatic or amphibious plants. The taxa occur in freshwater claypans and their margins (e.g. *Amphibromus nervosus*, *Rhodanthe pyrethrum*, *Chorizandra enodis*, *Eleocharis keigheryi*, *Microtis orbiculare* and the aquatics *Schoenus natans* and *Hydrocotyle lemnoides*) but also in seasonally damp terrestrial habitats with fine textured soils (e.g. *Wurmbea monantha*, *Hakea varia* and *Centrolepis alepyroides*). The assemblage is centered on the Swan Coastal Plain, Jarrah Forest, southern Geraldton Sandplains and the western margin of the Avon Wheatbelt bioregion.
Assemblage 15 A group of mostly herbaceous taxa that occupy similar freshwater habitats to assemblages 13 and 14, including sedge swamps, winter-wet flats and claypans. Approximately 43% of taxa only occur in wetlands while the remainder occupy damp/wet terrestrial habitats particularly in the high rainfall areas of the south-west. The assemblage is strongly centered within the Warren, Swan Coastal Plain and southern Jarrah Forest bioregions. Most component taxa are relatively widespread

within the high rainfall zone although a few, such as *Tribonanthes* sp. Lake Muir (GJ Keighery and N Gibson 2134), are only known form the Lake Muir group of wetlands. A few taxa within the assemblage occur in the western margin of the Avon Wheatbelt bioregion on granite rock outcrops (*Hydrocotyle callicarpa, Aphelia nutans*).

B. Database management

Since this project commenced in February 2001 the details of approximately 25 threatened and priority communities from the agricultural zone have been added to the TEC database. As a result of the investigations described in section A, new occurrences of three TECs previously included in the TEC database, have been located and added to the database. Occurrence maps for many of the wheatbelt TECs have also been updated over the past 12 months providing more accurate boundary data for these communities. Additional possible TECs are currently being assessed from the recently published *Biodiversity survey of the Western Australian agricultural zone* and the details of these communities will be added to the TEC database.

C. Developing Interim Recovery Plans

Interim Recovery Plans have been developed for eight TECs over the course of this project with an additional three IRPs in preparation. Seven of these IRPs are for communities which are directly threatened by, or contribute to the amelioration of, salinity and water-logging (Table 4).

Table 4: "Wheatbelt" IRPs written since Feb 2001

TEC Name	Status
Unwooded fresh water lakes of the southern Wheatbelt of Western Australia, dominated by *Muehlenbeckia horrida* subspecies *abdita,* and *Tecticornia verrucosa* across the lake floor, and *Muehlenbeckia horrida* subspecies *abdita*†	IRP Number 92 (completed July 2001)
Plant assemblages of the Moonagin System †	IRP Number 105 (completed May 2002)
Lesueur-Coomallo Floristic Community A1.2	IRP Number 106 (completed May 2002)
Plant assemblages of the Inering System †	IRP Number 107 (completed May 2002)
Herbaceous plant assemblages on bentonite lake beds of the Watheroo-Marchagee region †	IRP Number 108 (completed July 2002
Lesueur-Coomallo Floristic Community D1	IRP Number 109 (completed July 2002)
Ferricrete floristic community (Rocky Springs type)# †	IRP Number 154 (completed July 2004)
Assemblages of organic mound springs of the Three Springs area.* †	IRP Number 196 (completed August 2005)
Reedia spathacea - Empodisma gracillimum – Sporadanthus rivularis dominated floodplains and paluslopes of the Blackwood Plateau.*	Final Draft
Reedia spathacea - Empodisma gracillimum - Schoenus multiglumis dominated peat paluslopes and sandy mud floodplains of the Warren Biogeographical Region.*	Draft
Salt Flats Plant Assemblages of the Mortlock River (East Branch)* †	Draft

* Community listing yet to be endorsed by the Minister for the Environment and Heritage.
# Recommendation for reranking as Endangered yet to be endorsed by the Minister for the Environment and Heritage
† Threatened by or contribute to the amelioration of salinity and/or water-logging

D. Implementing recovery actions

In addition to the identification and listing of TECs and priority communities, the Project Officer TECs works closely with District Nature Conservation staff from the Midwest, Wheatbelt, South Coast and Warren CALM Regions to implement recovery actions for TECs. Some of these recovery actions include preparing reports on grant applications, writing newsletters and Landscope articles to raise awareness of wheatbelt TECs, liaising with land managers and mining companies to provide advice on the location and management options for occurrences of TECs, liaising with landowners regarding the possible acquisition of freehold land for inclusion in the conservation estate, arranging contracts for hydrological monitoring projects, monitoring the heath of wetland communities and participating in District recovery teams.

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