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Developing a Model for Environmental Weed Management in Fragmented Landscapes: a case study

Melissa Herpich

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Postal address: GPO Box 2182, Canberra ACT 2601

Office Location: Level 1, The Phoenix
86-88 Northbourne Ave, Braddon ACT

Telephone: 02 6263 6000

Facsimile: 02 6263 6099

Email: enquiries@lwa.gov.au

Internet: lwa.gov.au

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Project Management

Principle Investigator : Melissa Herpich

Position held: Project Manager- Environmental Weeds, South East

Organisation: Department for Environment and Heritage

Postal Address: PO Box 1046 State: SA Postcode:5290

Email: Herpich.Melissa@saugov.sa.gov.au Telephone: (08) 87351205 Fax: (08) 87351135

Project Leader: Mark Bachmann

Position held: Manager Conservation Programs, South East

Organisation: Department for Environment and Heritage

Postal Address: PO Box 1046 State: SA Postcode:5290

Email: Bachmann.Mark@saugov.sa.gov.au Telephone: (08) 87351130 Fax: (08) 87351135

Project Officer: Andrea Lindsay

Current Contact Details

Postal Address: 31 Macrea St, Bairnsdale, State: VIC Postcode: 3875

Email: andrea.lindsay@mailpuppy.com Telephone: (03) 5152 7758

Introduction and Project Aims

The Environmental Weed Management Action Tool, EWeedMAT, was initially developed in the South East Natural Resources Management (SENRM) Region of South Australia (Herpich, 2006). Like much of temperate Australia, remnant native vegetation in this region has been reduced to a small proportion of its original area and is now found in isolated remnant patches separated by farms and plantations. Weed invasion is one of the major threats to the remaining biodiversity, and yet resources to control weeds are very limited.

Planning for environmental weed management, while undertaken at a variety of scales, frequently fails to influence what is happening on ground. In the SENRM region we recognised that while a lot of effort was going into environmental weed control, overall the problems were rapidly escalating. Acknowledging that the sub-regional scale is the logical scale for effective environmental weed management planning, we set out to develop a model to prioritise on-ground weed management actions, ultimately developing EWeedMAT and applying it in the SENRM region.

Subsequently, due to considerable interest from other regions, we decided to subject the EWeedMAT model to some more rigorous scrutiny, including trialling it as a case study in another region. The aim was to critically analyse the model and its variables, setting it out in a format which could be logically adapted and applied by environmental weed or NRM planners in other parts of the country.

Project Activities

Step One - Review of existing models and choice of variables.

A large number of 'decision support' type models are now used nationally to help provide certainty in natural resource management. A significant number of those relevant to native vegetation management make reference to weeds, either as evidence of degradation or as threatening processes.

In examining these models it became obvious that the ones which tended to produce the most useful support to management actions were aimed at the site scale. At the other end of the spectrum, those that claimed to encompass regional scale issues tended to be either focussed on single weed species or were so broad in their application that they considered environmental weeds as one of many possible threats to remnant vegetation.

What was needed was a model suited to setting environmental weed priorities at an intermediate scale that also captured information useful for subsequent management. While none of the models examined encapsulated fully what was needed, they did serve as useful starting point in developing EWeedMAT.

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A summary of the models examined in the development process can be found in Lindsay and Herpich (2008), *Analysis of Literature and criteria for validating a decision support tool for environmental weed management*.

Step Two – Trial EWeedMAT in an alternative region.

The aim of the case study was to trial EWeedMAT in another region to see if it worked outside of the SENRM region. It was also hoped that through the process relevant adaptations could be included in the model, broadening its scope. The Yorke Peninsula sub region of the Northern and Yorke NRM Region was chosen as being substantially different from the South East NRM region. The climate is drier, with rain falling almost entirely in the cooler months. Nowhere is far from the sea: salt and sand dunes are significant features of the landscape

The case study was conducted through a series of workshops, spread over a 9 month timeframe. A broad range of people with local weed knowledge, remnant vegetation management and regional NRM planning experience were included from the Yorke Peninsula.

Similarly to the application of EWeedMAT in the SENRM region, patch selection, mapping and desktop data analysis was undertaken by the Department for Environment and Heritage (SA) using GIS platforms.

Weed infestation data for the 41 selected patches was gathered at workshops and through direct communication. The EWeedMAT formula was run in several different ways, reflecting the original formula and two versions incorporating suggested changes that had resulted from the workshop process. Results of the calculations were reviewed by Yorke Peninsula locals and the group decision was that an altered version of the model best reflected the relative values of the patches in the Yorke Peninsula.

A more detailed discussion of the case study process and results can be found in Lindsay and Herpich (2008), *EWeedMAT: Environmental Weed Management Action Tool – The Yorke Peninsula Case Study*.

The boxes below show a comparison between the South East version of EWeedMAT and the changes developed over the course of the Yorke Peninsula Case Study.

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South East Variables and Scores	
Variables	Spread of scores
Physical Attributes Score (Maximum 10)	
Size (S)	0- 4 0 (smallest) 4 (largest patches)
Area to edge ratio (A:E)	0 – 3 0 (narrow/indented patches) 3 (blocky/circular patches)
Diversity of Tenure (DT)	0 - 1.5 0 (largest number of property managers) 1.5 (fewest property managers)
Security of tenure (ST)	0 – 1.5 0 (none of the patch under secure tenure) 1.5 (>80% of patch under secure tenure)
Biodiversity Attributes Score (Maximum 10)	
Vegetation Communities (VC)	0 – 3 0 (fewest communities) 3 (most communities)
Community Significance (CS)	0 – 2 0 (no significant communities present) 2 (most significant communities present)
Threatened Species score (TS)	0 – 5 0 (no threatened species) 5 (highest TS values)
Weed Threat Score	
Infestation score and Invasiveness score	Infestation score for each weed: (initial <5% score = 1), establishing 6-25% score = 5, widely distributed 26-50% score = 10 or distribution critical >50% score = 15) Patch weed threat score = \sum (infestation score X invasiveness score) for all weed species. Invasiveness score derived from weed risk assessment process
Adapted from Lindsay and Herpich (2008)	

Yorke Peninsula Variables and Scores	
Variables	Spread of scores
Physical Attributes Score (Maximum 10)	
Size (S)	0 – 4 0 (largest) 4 (smallest patches)
Area:Edge Ratio	3 – 0 3 (narrow/indented patches) 0 (blocky/circular patches)
Diversity of Tenure (DT)	1.5 – 0 1.5 (largest number of property managers) 0 (fewest property managers)
Security of tenure (ST)	1.5 – 0 1.5 (none of the patch under secure tenure) 0 (>80% of patch under secure tenure)
Biodiversity Attributes Score (Maximum 12)	
Vegetation Communities (VC)	0 – 5 0 (fewest communities) 5 (most communities),
Community Significance (CS)	0 – 2 0 (no significant communities present) 2 (most significant communities present)
Threatened Species score (TS)	0 – 5 0 (no threatened species) 5 (highest TS values)
Weed Threat Score	
Infestation score and Invasiveness score	Infestation score for each weed: initial <5% score = 1, establishing 6-25% score = 5, widely distributed 26-50% score = 10 or distribution critical >50% score = 15) Patch weed threat score = \sum (infestation score X invasiveness score) for all weed species. Invasiveness score derived from weed risk assessment process
Invadeability Factor (maximum 5)	
Proportion of patch that is not saline	5 – 1 5 (patch has a high proportion of highly invadeable communities) 1 (patch has a high proportion of communities that are not readily invadeable.

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Step three - Knowledge Adoption and information Dissemination.

Knowledge adoption was acknowledged as a core component of the project and there were several different target audiences for results. The different target audiences and the products developed are listed in Table One Below.

Table One, Knowledge Adoption Products developed by project.

Target audience	Product Type	Product title/info
Yorke Peninsula NRM and Weed planners/managers	Workshops	Three workshops were held with Yorke Peninsula locals over the course of the Case Study and collect data on patches. Workshops served as a valuable forum for generating interest, understanding and endorsement of the process and the product.
Yorke Peninsula land managers	Factsheets	Two different types of factsheets have been developed – the first is a general factsheet outlining the case study process and development of EWeedMAT – entitled <i>Yorke Peninsula – protecting Native vegetation from Weeds</i> . The second type of factsheet is for each patch owner and summarises the data for each patch, the weeds found and describes basic weed management info.
NRM/Weed Planners	How To Manual	The manual is A5 sized and is designed to allow people to understand the evolution and workings of EWeedMAT, how to adapt it and apply it in their region. 1000 copies have been printed for distribution.
General NRM	Fact Sheet	<i>The Environmental Weed Management Action Tool (EWeedMAT)</i> A new tool for regional environmental weed planning. Produced jointly with LWA.
Ecologist/NRM/Veg managers/planners	Conference Presentation	Presentation at SA Weeds Conference October 2 nd and 3 rd , Adelaide. Entitled ' <i>Prioritising regional environmental Weed actions</i> '.
Ecologist/NRM/Veg managers/planners	Conference Presentation	2 workshop presentations at Veg Futures Conference. Toowoomba QLD October 21-23 rd 2008. Entitled ' <i>A new approach to environmental planning which may actually work! Using EWeedMAT as a planning tool</i> ' and ' <i>Putting the heart back into regional landscape restoration planning: The Environmental Weed Management Action Tool (EWeedMAT)</i> '
General Community SENRM Region	NRM Article	Article in From the Ground Up – Local NRM Board Newsletter delivered to every household in region. Entitled ' <i>The Environmental Weed Management Action Tool (EWeed MAT): a Southeast regional initiative takes on the world.</i> '
General NRM	Journal Article	Article in Stock Journal published May 2008 entitled: ' <i>EWeedMAT: New directions in environmental weed planning</i> '

Project Achievements Against Objectives

Core Objective– To further develop a weed management prioritisation model to allow better planning for environmental weed management at the regional scale.

This objective is fully met. EWeedMAT has been trialled in an alternative region and found to be useful and suitable. Modifications have been made to EweedMAT through the process which have demonstrated the ease with which the model can be adapted and applied in different situations.

The objective has been met through the production of two core outputs:

1. A review of literature relevant to decision support models. Attached to this document and
2. A case study trial of the model outlining the approach used and results. Also attached here.

Supporting Documents

The following supporting documents have been provided to Land and Water Australia:

1. EWeedMAT : Environmental Weed Management Action Tool – Yorke Peninsula Case Study. A. Lindsay and M. Herpich (2008).
2. EWeedMAT : Analysis of Literature and criteria for validating a decision support tool for environmental weed management. A. Lindsay and M. Herpich (2008).
3. How to manual - EWeedMAT: A Guide to implementing a landscape scale environmental weed planning tool. M. Herpich and A. Lindsay.
4. Stock Journal Article: EWeedMAT – New Directions in regional Environmental weed planning.

References

- Herpich, M. (2006 a), **South East Environmental Weed Management Tool**, Department for Environment and Heritage, September 2006, Mount Gambier, SA, Australia.
- Lindsay, A. M. and Herpich, M. (2008), **Analysis of Literature on Modelling Relevant to Decision Making for Weed Management**, Department for Environment and Heritage, Mount Gambier.
- Lindsay, A. M. and Herpich, M. (2008), **EWeedMA Environmental Weed Management Action Tool: Yorke Peninsula Case Study**, Department for Environment and Heritage, Mount Gambier, Draft