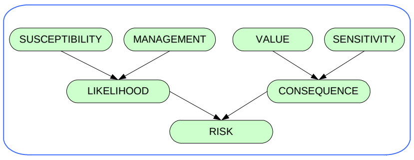
Lower Murray Landscape Futures: Land Use and Risks to Native Vegetation



The Lower Murray Landscape Futures project 2005 – 2006

The LUIM was used in the Lower Murray Landscape Futures (LMLF) project. This was a collaborative project led by the Land Technologies Alliance (LTA) and involving the University of Adelaide, SARDI, DPI and CSIRO. The aims of the dryland biodiversity component of this project were:

1. Assess the impact of existing NRM plans for the dryland areas of the Mallee bioregion on selected resource condition targets and socio-economic targets, and
2. Assess the impacts of these plans under alternative scenarios based on the outcomes of the analysis of the existing plans and input from stakeholders.

Key achievements

- First use of the integrated LUIM tool as an extension to ArcGIS 9.1.
- Incorporated a measure of landscape context into the sensitivity assessment.
- The biodiversity risk results were used as an input for the Systematic Regional Planning model.

Elements

Native vegetation remnants occur in the study area as patches within paddocks used for agriculture, as fenced parcels adjacent to paddock boundaries, as conserved areas (national parks and other reserves) and in riparian zones along rivers, streams, wetlands and lakes. The LUIM was used to assess the on site impacts of agricultural land uses on remnant patches of native vegetation for five threatening processes:

1. Weed invasion.
2. Wind erosion.
3. Nutrient deposition (wind transported).
4. Rising groundwater levels.
5. Total grazing pressure.

No changes were made to the risk assessment framework for this project. However, the definition of sensitivity was refined to incorporate the ecological concept of resilience. The refined definition of sensitivity is:

> **Sensitivity:** the predicted capacity of the system (remnant native vegetation patch) to absorb the impact of disturbance and avoid system changes leading to such things as loss of flora and fauna species and change in vegetation composition and structure.

Process

The risk assessment method comprised the following steps:

1. Identification of threatening processes.
2. Rating patches for susceptibility to threatening processes.
3. Rating patches for sensitivity to threatening processes.
4. Classification of patches for asset value.
5. Collection of land use and land management information.
6. Rating management practices for their impact on the patches of remnant vegetation.
7. Derived spatial layers for use in further modelling.

A workshop was held in Horsham, August 2005, with regional experts from CSIRO, Mallee CMA, DPI, University of Adelaide, DSE, and Melbourne University, to identify the key threatening processes to biodiversity in the region. The workshop participants classified the large number of unique EVCs in the region, into seven broad groups and rated each for their susceptibility and sensitivity to the threatening processes. The vegetation classes and the ratings for susceptibility are presented in Table 7.

Table 7 Vegetation groups classified for susceptibility to threatening processes in the Lower Murray region.

Threatening process	Vegetation group: Flood dependent	Pyrogenic low nutrient	Mallee meso-nutrients	Dryland woodland grassland	Upland	Raak	Chenapod shrubland
Weed invasion	High	Low	Moderate	Moderate	Low	Low	Moderate
Total grazing pressure	High	Low	Moderate	High	High	Low	High
Rising groundwater levels	Low	Moderate	Moderate	Moderate	Low	Moderate	Moderate
Wind erosion	High	Low	Low	Moderate	Moderate	Low	High
Nutrient migration	Low	High	Moderate	High	Moderate	Low	Low

The ratings for the vegetation groups were used in combination with additional assessment criteria shown in Table 8 to rate each remnant vegetation patch (very low, low, moderate, high, very high) for susceptibility to the threatening processes.

Table 8 Susceptibility criteria for remnant patches in the Lower Murray region.

Threatening process	Susceptibility criteria
Weed invasion	Vegetation type
	Patch size
	Perimeter to area ratio
	Distance from edge of remnant
Total grazing pressure	Vegetation type
	Patch size
	Perimeter to area ratio
	Distance from edge of remnant
Rising groundwater levels	Vegetation type
Wind erosion	Vegetation type
	Patch size
	Perimeter to area ratio
	Distance from edge of remnant
Nutrient migration/soil deposition	Vegetation type
	Patch size
	Perimeter to area ratio
	Distance from edge of remnant

Two criteria were used to assess sensitivity of the patches to the threatening processes: vegetation type and isolation of the patches. Each patch was classified (very low, low, moderate, high, very high) for sensitivity to each of the threatening processes.

Bioregional conservation status was used as a measure for asset value of remnant patches of native vegetation (Table 9).

Table 9 Conservation status criteria (from NRE 2002) used to classify asset value.

Conservation status	Criteria	Asset value
Least concern	>50% of pre 1770 and no current threats	Low
Rare	Rare by geographic occurrence with no current threats	Low
Depleted	30-50% pre 1770, or	Moderate
	Current threats and condition equivalent to 30-50% pre 1770	
Vulnerable	10-30% pre 1770, or	High
	Current threats and condition equivalent to 10-30% pre 1770	
Endangered	<10% pre 1770, or	Very high
	Current threats and condition equivalent to <10% pre 1770	

The land use practices applied in each patch of remnant vegetation and adjacent to the remnant vegetation need to be known for the 'management' component of the LUIM risk assessment. The region is dominated by cropping and grazing systems with most areas being grazed even in cropping years. Regional experts identified cropping and grazing management practices that could influence the occurrence of degradation (Table 10). They were also asked to rate each of the combinations of practices for their influence on the occurrence of each of the threatening processes.

Table 10 Management practices assessed for each threatening process for the Lower Murray region.

Cropping and grazing management practices	Weed invasion	Total grazing pressure	Rising ground water levels	Wind erosion	Nutrient migration
Crop species			✓	✓	✓
Fallow			✓	✓	✓
Tillage			✓	✓	✓
Stubble retention			✓	✓	✓
Control traffic			✓	✓	✓
Management of weeds in crops	✓				
Management of crop as weeds	✓				
Pasture species	✓		✓		
Management of pasture weeds	✓				
Grazing management	✓	✓	✓	✓	✓
Livestock camping					✓
Grazing system		✓			
Fencing of remnant	✓	✓			

An example of the types of practice information collected is given for the land use category 'Cropping' and wind erosion susceptibility combination.

Practices that have the potential to influence the occurrence of wind erosion were:

- Crop type: Cereals (deep rooted), pulse crops, or oilseeds
- Fallow: Long or short
- Stubble retention: Burnt or grazed, or retained
- Tillage: No till or tillage

The combinations of practices were ranked from best to worst and then given a rating (strongly negative, moderately negative, weakly negative, neutral, beneficial). An example of the best and worst combinations of practices for cropping and their ratings for wind erosion are:

- Best practice: Cereals, short fallow, stubble retained, and no till/min till = Weakly negative
- Worst practice: Oilseeds, long fallow, Stubble grazed/burnt and tillage = Strongly negative

The experts were also asked to estimate the distribution of each of the practices for the region, identifying the most common practices through to the least common. For example the estimated percentage of cropping area under cereal, pulse or oilseed crops according to regional experts was:

- Cereals: 60%
- Pulses: 20%
- Oilseeds: 20%

Results

Using the LUIM, risk maps were produced (Figure 26) that highlighted patches of remnant vegetation (of high conservation value and where the consequences of degradation would be most severe) that were most likely to experience degradation under the current land management.

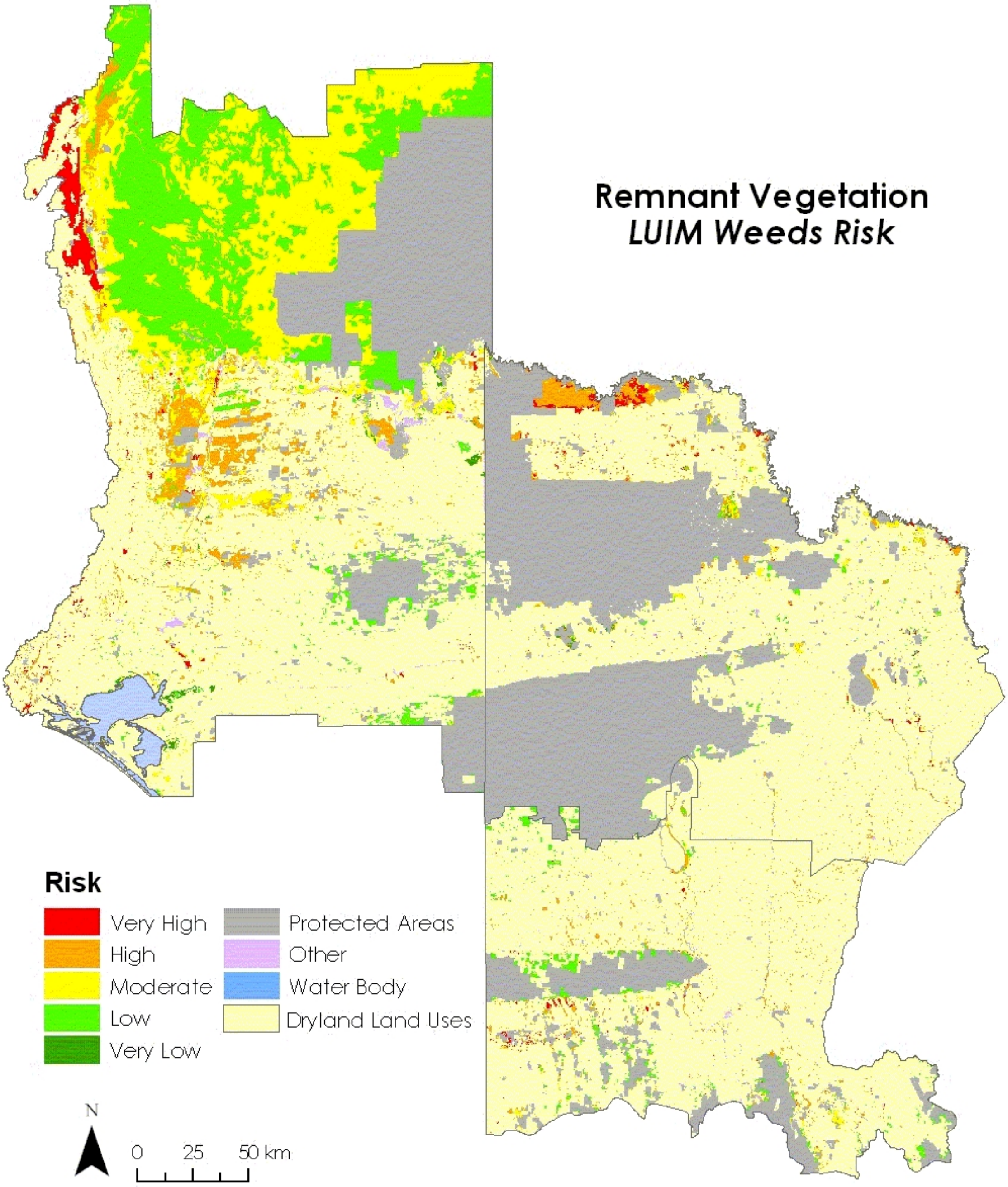


Figure 26 Example of LMLF project risk results produced for the threatening process Weed Invasion.

The biodiversity risk maps produced using the LUIM were used as inputs in CSIRO's Systematic Regional Planning model. The model was used in the LMLF project to examine spatial priorities for NRM based on selected targets in existing NRM plans. The biodiversity risk information was used to support the identification of spatial priorities for remnant vegetation management for the region, which will ultimately support investment decisions by regional natural resource management agencies.