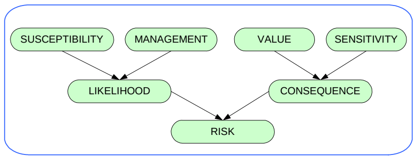
Biodiversity Impacts of Land Use Policy



Drivers of Land Use Change project 2003-2004

A method for mapping risk to native vegetation from adjacent land management practices

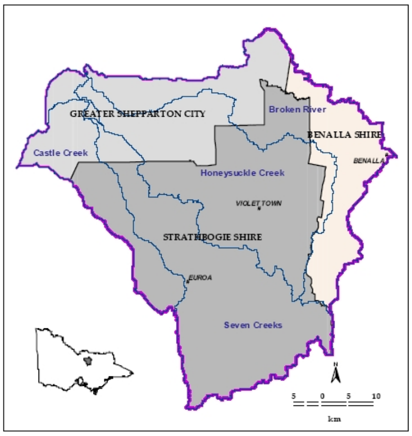


Figure 18 Project area location

In 2003, a spatially explicit methodology for the assessment of existing policies for their impact on native biodiversity was developed to identify gaps and potential policy conflicts (MacEwan *et al*. 2004). The work provided outputs for the Ecologically Sustainable Agriculture Initiative (ESAI) project 'Achieving biodiversity gains in conjunction with land use change'.

A risk assessment approach was adopted and the LUIM was used to develop and trial a method for mapping risks to remnant patches of native vegetation posed by current and future land use and land management change. The study area was a 2500 km^2 area encompassing the Broken River, Honeysuckle Creek, Castle Creek and Seven Creeks catchments (Figure 18).

Key achievements

- Augmentation of the LUIM to incorporate expert understanding of the impact of agricultural land use practices on adjacent native vegetation remnant patches.
- Inclusion of an assessment of the value and sensitivity of individual vegetation remnant patches.
- Development of a risk rating based on the likelihood of degradation and its consequence.
- Incorporation of Bayesian belief networks to quantify the risk output and its uncertainties.
- Development of an approach for the spatial representation of industry and government policies affecting land use change and those policies designed to protect native biodiversity.

Elements

For each of the previous LUIM applications, revision of the risk framework had occurred as needed. Terminology such as risk, susceptibility, sensitivity, vulnerability, value, and reversibility had been used to describe components of the various versions of the risk framework. In this project we reviewed the terminology to ensure consistent use across projects. We created the agreed risk framework for the LUIM for all future projects (Figure 1).

A BBN function was incorporated in the LUIM to store data on the most probable management combinations for the region. The BBN also enabled the local scale uncertainty or probability related to regional practices to be expressed in the final risk result. This was the first time that a BBN had been incorporated into a LUIM risk assessment.

A major innovation in this project was to model the risks of offsite impacts to native vegetation remnants from agricultural land use. Ecological Vegetation Classes (EVCs) were rated for their susceptibility and sensitivity to degradation based on the size and shape of patch and the type of remnant (EVC). EVC patches were used as the asset mapping unit (for example Figure 2). We considered three threatening processes; loss of regeneration capacity, vegetation loss, and changes to the hydrological regime but modelled only the first of these in this project.

The method comprised the following elements:

- Collation of spatial data on soil and land qualities, land use, land management, and planning zones. This included potential remnant vegetation scenarios and land capability information.
- Consultation with experts to create an inventory of threatening processes, land use practices and their interactions with different Ecological Vegetation Classes (EVCs).

- Interpretation of existing policies and industry plans with respect to their implications for land use and development of land use scenarios.
- Revision of the LUIM risk assessment framework and incorporation of a Bayesian belief network.
- Production of maps of risks to biodiversity assets from the threatening process –loss of regeneration capacity.

Process

We needed a method to relate regional scale land management distribution information to individual parcels of land and to identify the most likely combinations of management practices for each parcel. Information on the spatial distribution of management practices for the region was collected using both expert knowledge and agricultural census data (Table 3). ABS data were only available for Statistical Local Areas (SLAs) and were therefore much coarser spatial resolution than for the Victorian Catchment Indicators project.

Table 3 Percentage adoption of land use practices, used in the LUIM for the Drivers of Land Use Change project.

Statistical Local Area	Fertiliser application % area	Weed management % area	Grazing of the remnant % area	
			Grazed lands	Crop or forest
Greater Shepparton © -Pt A	70	20	80	20
Greater Shepparton © -Pt B East	70	20	80	20
Greater Shepparton © -Pt B West	70	10	80	20
Delatite (S) -Benalla	50	10	80	20
Delatite (S) - North	50	20	80	20
Delatite (S) - South	40	20	80	20
Strathbogie (S)	40	10	80	20
Murrindindi (S) - East	40	20	80	20
Murrindindi (S) - West	40	10	80	20

Notes: Fertiliser and weed management data for SLAs were derived from 2001 ABS agricultural census. Grazing of remnants was estimated by regional experts.

The BBN was used to relate the regional scale management practice data to specific parcels of land. The BBN (Figure 19) shows the results of applying the LUIM to a single EVC patch to determine the risk of loss of regeneration capacity occurring under a grazing management system.

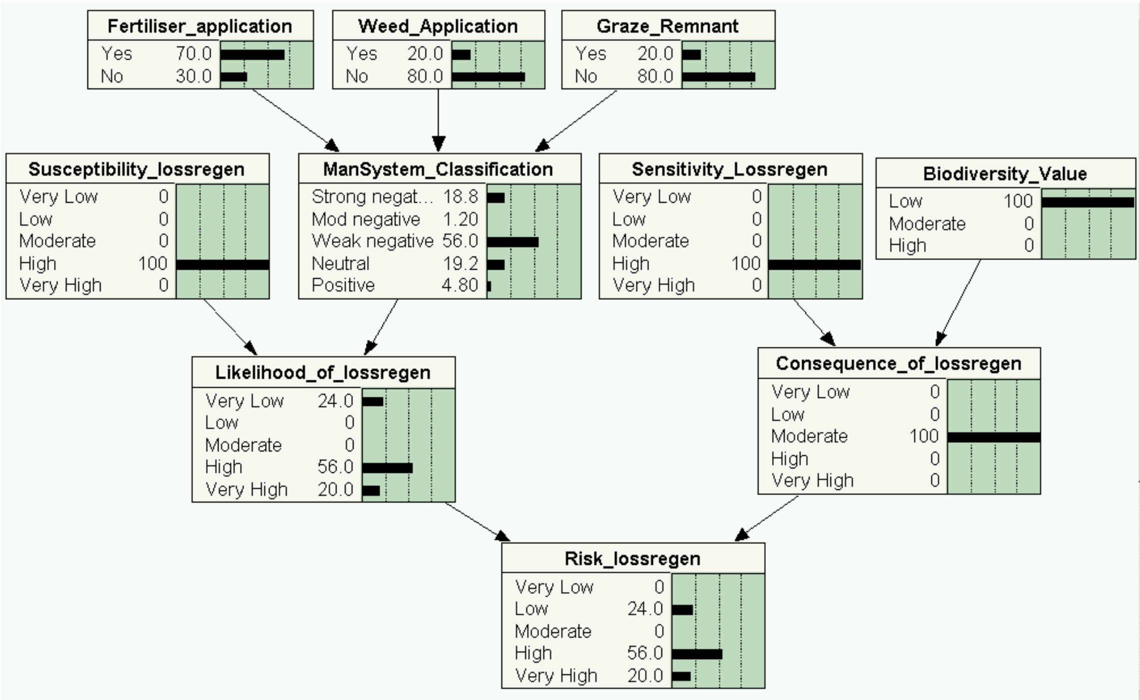


Figure 19 LUIM Bayesian belief network for loss of regeneration capacity showing an example of results for a single remnant EVC patch (MacEwan *et al.* 2004).

The dominant probability from the distribution was used to classify each EVC patch in the map output. For example (Figure 20) two EVCs could be classed as having a high risk of loss of regeneration capacity in spite of different probability distributions. This simplifies the map output (Figure 21 and Figure 22) but disguises the fact that there can be differences between remnant patches with respect to the confidence or certainty of the risk classification.

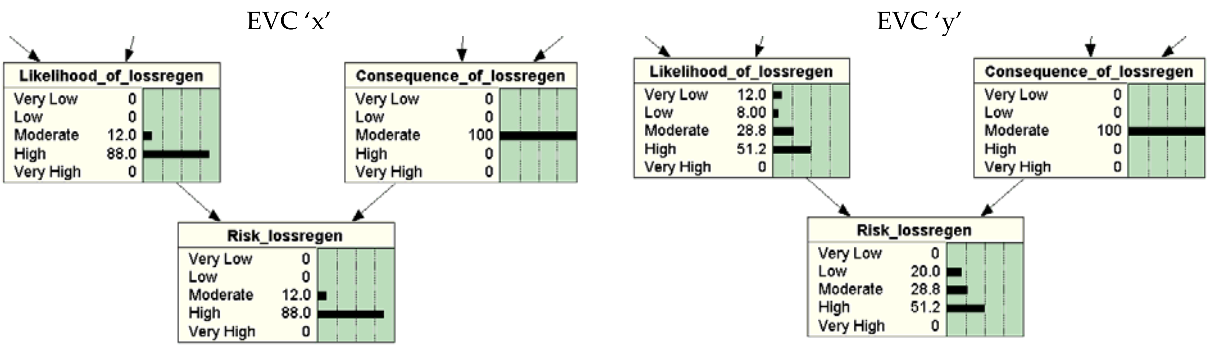


Figure 20 BBN risk probability distributions for two remnant patches falling into the high risk map class (MacEwan et al. 2004).

Results

The outputs for the LUIM risk assessment were:

1. Maps of risk of loss of regeneration capacity of EVCs posed by current and proposed future cropping (Figure 21) and grazing (Figure 22) areas; and,
2. A distribution of risk probability across five classes for each EVC patch.

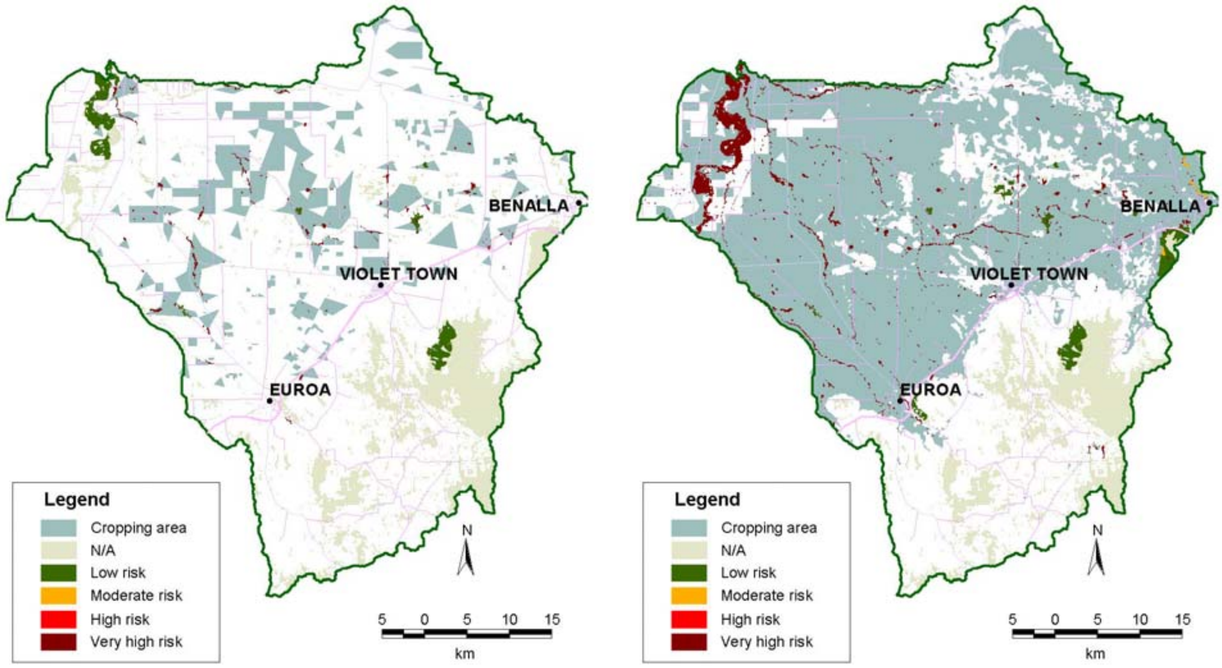


Figure 21 Risk of loss of regeneration capacity of EVCs posed by cropping, current (left) and future scenario (right) (MacEwan *et al.* 2004).

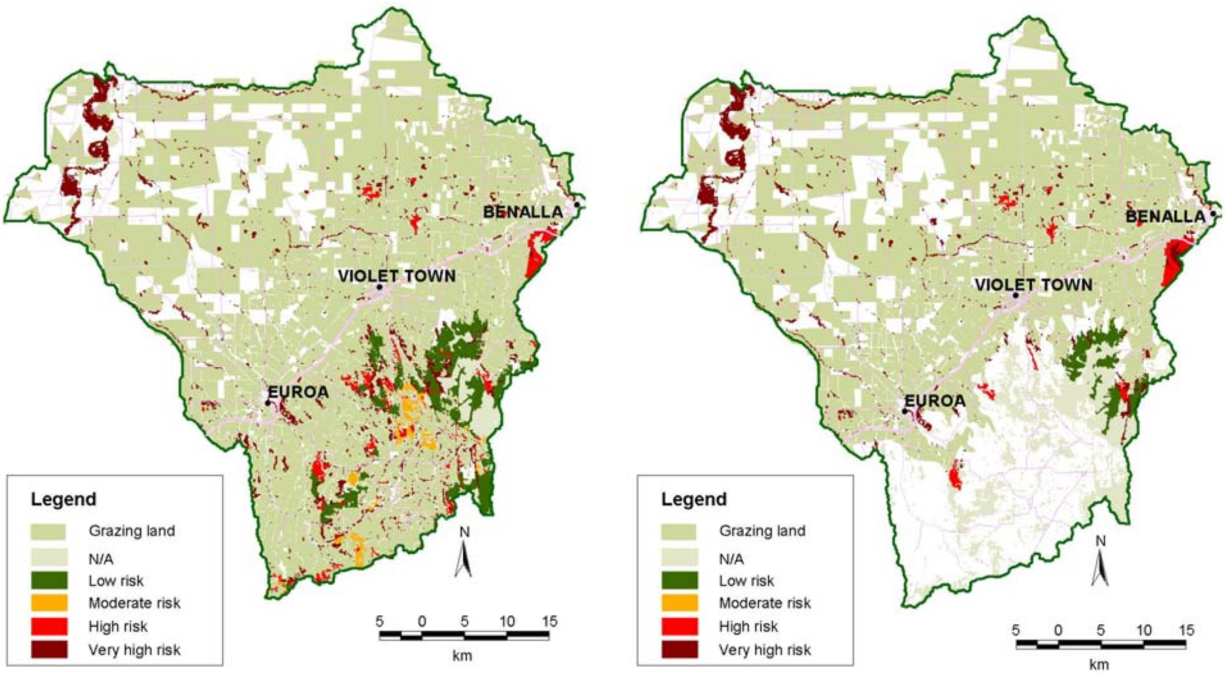


Figure 22 Risk of loss of regeneration capacity of EVCs posed by grazing, current (left) and future scenario (right) (MacEwan et al. 2004).