

# Managing grazing on riparian land - decision support tool and guidelines

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## Key Points

- Some landholders believe that fenced-off riparian areas can become weed-infested or a fire risk, and as a result are reluctant to participate in programs to protect and improve riparian sites.
- Controlled grazing of particular vegetation states, in suitable landscapes, can have environmental benefits.
- DELWP has developed a decision support tool and guidelines to help determine the potential impact, suitability and acceptability of controlled grazing on riparian land.
- The decision support tool and guidelines covers a five step process.

## Abstract

The Victorian Waterway Management Program, overseen by the Department of Environment, Land, Water and Planning allocates millions of dollars annually to riparian protection and improvement projects. These projects entail catchment management authorities working collaboratively with landholders to protect riparian areas by undertaking works such as fencing, revegetation, weed management and providing infrastructure to support off-stream stock watering.

The exclusion of grazing can result in excessive growth of pasture grass and weed species on fenced and revegetated riparian land. Some landholders believe that fenced-off sites are weed-infested or have increased fire risk, and as a result can be reluctant to participate in CMA programs to protect and improve riparian sites.

Whilst uncontrolled grazing is known to be a major degrading factor on riparian land, controlled grazing of particular vegetation states, in suitable landscapes, can have environmental benefits. For example, short periods of intense livestock grazing can open up a dense indigenous grass ground layer, facilitating the establishment of a range of indigenous herbs.

To assist in identifying when to consider controlled grazing as a riparian management tool, DELWP developed and released *Managing grazing on riparian land: a decision support tool and guidelines*. This publication is a user-friendly, objective, robust and defensible decision support tool to help determine the potential impact, suitability and acceptability of controlled grazing on riparian land.

## Keywords

Controlled grazing, riparian, decision support, guidelines, vegetation states

## Introduction

The Victorian Waterway Management Program, overseen by the Department of Environment, Land, Water and Planning (DELWP) allocates millions of dollars annually to riparian protection and improvement projects. These projects entail catchment management authorities working collaboratively with landholders to protect

riparian areas by undertaking works such as fencing, revegetation, weed management and providing infrastructure to support off-stream stock watering.

However, once riparian areas are fenced and revegetated, weeds may become a problem on some project sites i.e. the fenced-off area can be perceived as ‘weed-infested’ or ‘a fire hazard’. This can be a major factor contributing to a landholder’s reluctance to fence.

One solution often cited by landholders is to allow some form of ‘controlled grazing’ to manage excessive weed growth.

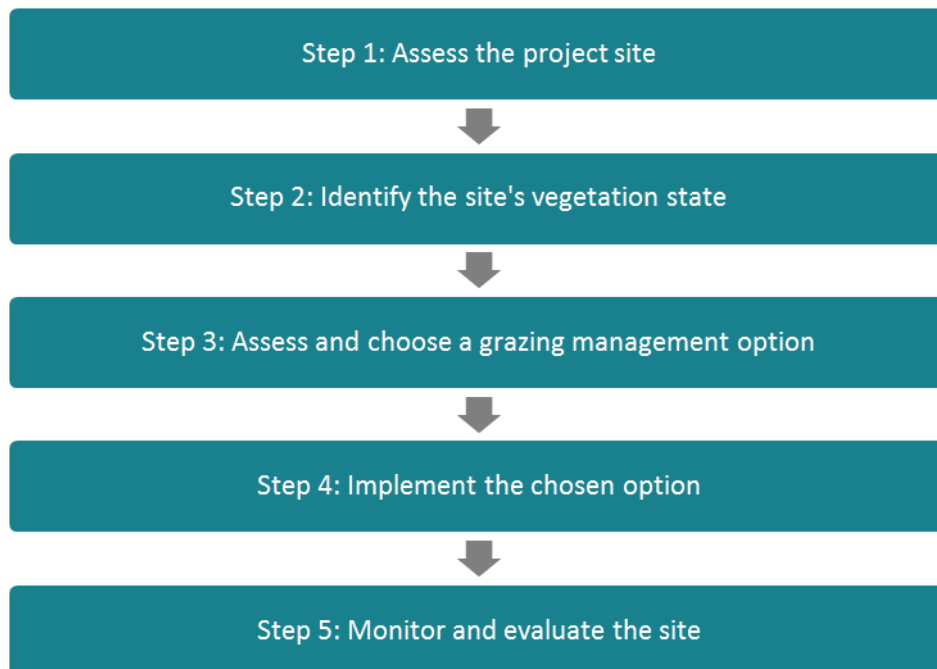
The then Department of Sustainability and Environment (DSE) commissioned an investigation (Water Technology 2009) into the use of controlled grazing as a riparian management tool. Based on this investigation, DSE developed the *Managing Grazing on Riparian Land: Decision Support Tool and Guidelines* (DEPI 2013) - an objective, robust, defensible process to decide about the suitability/acceptability of controlled grazing in riparian areas.

This paper presents the five-step process developed for the *Decision Support Tool and Guidelines* that aims to assist natural resource managers in:

- developing improvement projects for riparian lands;
- entering into landholder agreements aimed at enhancing or restoring riparian lands; and
- making decisions about Crown land water frontage licence applications, renewals and transfers.

### **Five-step process**

Figure 1 shows the five steps to determine the most suitable grazing management option for a riparian project site.



**Figure 1 . Five-step grazing management decision support tool**

### **Step 1 – assess the project site**

In step 1, the user gathers information about the project site to help decide if some form of livestock grazing is a viable management option, and if so, how site characteristics could shape implementation.

Firstly, the user determines:

- the goal (or ecological objective) for the site
- the problems you are seeking to address
- other riparian management options and methods (as well as, or in place of, grazing) to determine if they would:
  - be effective in treating the problems
  - be practical in treating the problems
  - create risks to either on-site or off-site values

Secondly, they assess the current effects of grazing on waterway values and conditions (including water quality, aquatic macrophytes, terrestrial flora and/or fauna species, streambank stability and riparian width).

At some sites, these values and conditions may be so important for site goals grazing must be excluded to protect the waterway from stock, regardless of whether maintaining or implementing a controlled grazing regime would otherwise be tolerable, acceptable or even beneficial. If some form of livestock grazing is an acceptable management option in light of these considerations, the user progresses to Step 2.

### **Step 2 - identify the site's vegetation state**

In step 2, the site is categorized into one of 11 vegetation states, based on the attributes of the vegetation. These states are:

- Pre-European
- Quality Remnant
- Modified Remnant
- Young Overstorey
- Native Grassy
- Mature Overstorey
- Single-Aged Young Overstorey
- Shrubby
- Exotic Pasture-Herbaceous
- Exotic Woody
- Revegetation.

These states reflect the typical structural and compositional attributes of riparian land (that is, tree canopy, sub-canopy shrub species and ground layer). Both a Key and Quick Reference Chart are provided to assist project managers in identifying the probable vegetation state of a project site. The Quick Reference Chart is shown in Figure 2. If the site is identified as having two or more vegetation states, for assessment purposes, the state most sensitive to livestock grazing is used as the default.

The *Decision Support Tool and Guidelines* provide typical vegetation characteristics (overstorey, shrub layer and ground cover), management and disturbance histories and representative photos for each of the 11 states to allow the user to confirm the vegetation state.

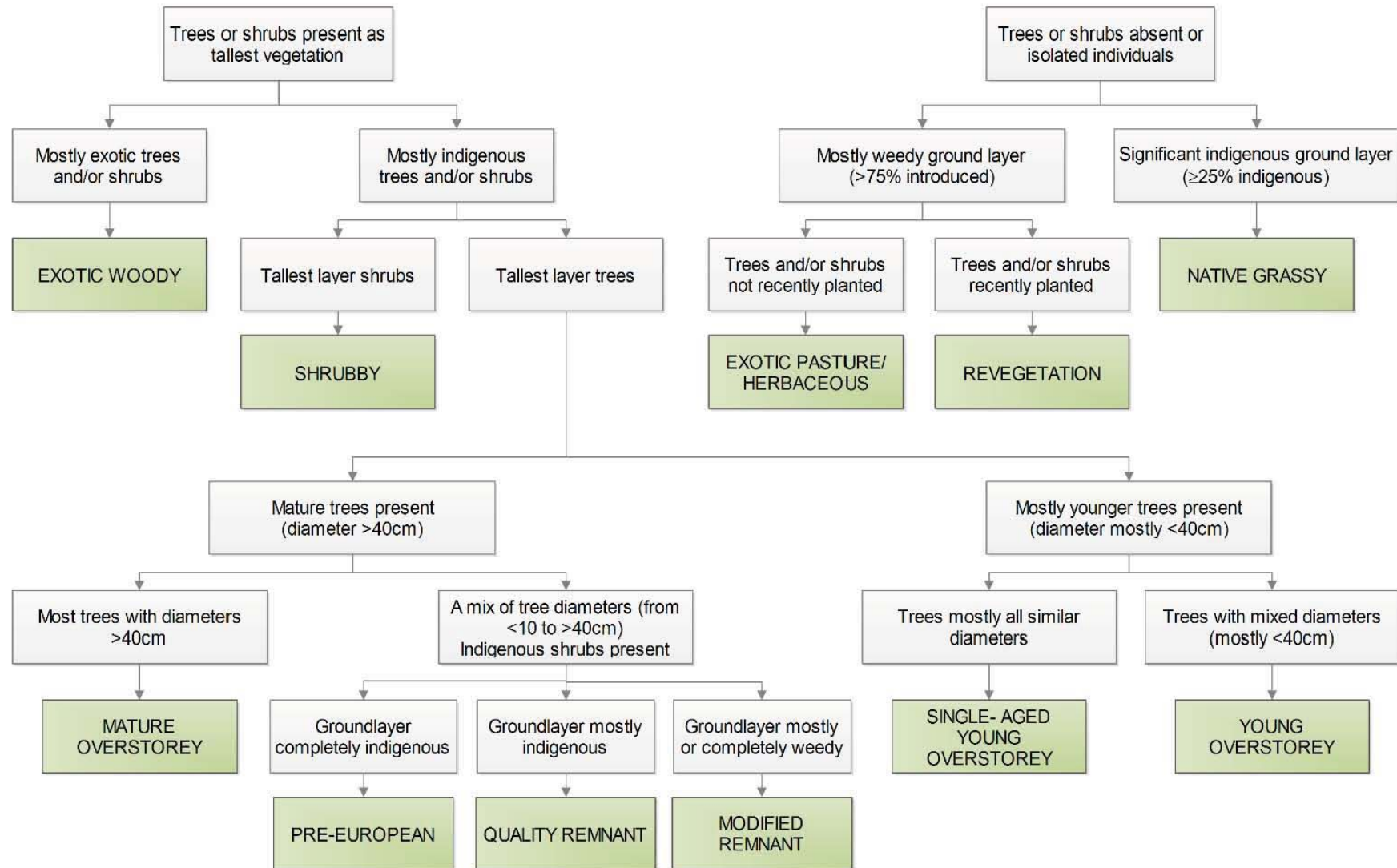


Figure 2. Vegetation state quick reference chart

### **Step 3 - Assessment of Livestock Management Options**

In step 3, the grazing management options available for the site's vegetation state are assessed, and the most suitable option is chosen.

The *Decision Support Tool and Guidelines* provides information and advice in applying four grazing management options for each vegetation state. The options are:

- maintain the existing livestock grazing regime
- control the livestock grazing regime (to specified times of the year, duration and grazing intensities)
- exclude livestock grazing from all or part of the project site
- exclude livestock grazing and implement other interventions (including weed management and revegetation).

For each grazing management option, the *Decision Support Tool and Guidelines*:

- presents predicted outcomes for each option (e.g. that the structure and state of the vegetation will degrade, stay as it is, or improve)
- assigns a level of acceptability for each option (i.e. not acceptable, tolerable, acceptable, beneficial)
- provides decision trees that consider site goals, vegetation condition (particularly ground cover), and the effects of grazing on threatened terrestrial species and streambank erosion.

### **Step 4 - implement the chosen option**

In step 4, the user is provided with information to assist them to implement the chosen grazing management option.

#### *Maintain the existing livestock grazing regime*

Grazing will usually be uncontrolled (that is, continuous) at most sites. However, some sites may have controlled livestock grazing, to maintain and improve the vegetation. This is often the case for high quality sites, where there is low-intensity grazing.

#### *Control the livestock grazing regime*

In this paper, 'control' means permitting a known population of livestock to graze in a defined area, at a specified time, for a specified duration. It does not include 'control' in an abstract or unquantified sense (such as some undefined type of oversight of the way livestock graze).

Aspects to consider in developing a livestock grazing regime include:

- **Type of grazing animal.** Controlled grazing may include using a particular type of grazing animal. Most grazing animals tend to graze selectively, preferring some species and avoiding others. This is often detrimental to the most palatable, accessible and actively growing plant species. There are substantial and well-known differences in how cattle and sheep graze, and the pressure this puts on riparian land.
- **Optimum grazing times.** The optimum time for controlled grazing is when:
  - the soil moisture is relatively low (to avoid or minimise soil impacts)
  - indigenous plants are likely to be dormant—usually from late summer to early winter - as grazing at this time won't affect their flowering and seed set.

- **Excluding grazing during the growth phase of native plants.** When native plants are entering their annual growth phase, heavy grazing can make them less able to set seed, send out new growth and develop healthy root systems. Healthy root systems not only bind the soil but also ensure plants get moisture in dry periods, and recycle nutrients. Controlled grazing should be avoided when native plants are in flower or setting seed. This is usually in spring and early summer, but the life-cycle characteristics of the particular riparian plant species at the project site must be understood (and especially the life cycles of important functional groups and endangered species).
- **Excluding grazing for weather or seasonal reasons.** Seasonal conditions will vary from year to year and affect the species composition and vegetation structure of a project site. Irrespective of the time of year, controlled grazing should not be used:
  - when the soil is very moist (typically in winter, although possibly at any time of year, including after heavy rain: bringing livestock onto a site when the soil is very moist will result in pugging and soil compaction)
  - when the soil is very dry (such as during a drought): when the soil is very dry, the ground layer may be too sparse, leading to overgrazing and soil erosion
  - after floods or wildfire: these events usually trigger native plants to germinate.
- **Excluding grazing where there are juvenile plants.** If there has been natural regeneration or replanting, controlled grazing should not be used until plants are beyond browsing height (normally after 3–5 years).
- **Grazing intensity.** Controlled grazing may include controlling grazing intensity, which is a function of the stocking rate and the duration of grazing. The optimum level of each depends on the particular characteristics of the project site. To determine the optimum grazing intensity, the site's species should be considered. For example:
  - many species within genera such as *Austrostipa* (spear grasses), *Austrodanthonia* (wallaby grasses), *Microleana* (weeping grass), *Chloris* (windmill grasses), *Juncus* (rushes) and *Carex* (sedges) can tolerate moderately intense grazing
  - species such as *Joycea* (wallaby grass) and many *Acacia* (wattles) can tolerate low-intensity grazing
  - orchids, lilies, saltbushes and grasses such as *Poa* and *Themeda* (kangaroo grass) can decline rapidly with even low-intensity grazing.

If implementing a controlled grazing regime, specific information (such as the livestock type and the duration and frequency of grazing) should be recorded to help managers to monitor and evaluate the project site.

#### *Exclude livestock grazing*

This option requires permanent exclusion of livestock from the site.

#### *Exclude livestock grazing and revegetate*

This option requires permanent exclusion of livestock from the site, as well as revegetation. Revegetation, in this context, includes any management action to re-establish indigenous vegetation, such as:

- site preparation (for example, controlling weeds and pest animals)
- establishing native vegetation by allowing for natural regeneration and/or direct seeding and/or seedling planting.

#### *Step 5 – monitor and evaluate the site*

Before implementing the chosen grazing management option, a monitoring program should be developed to assess the extent to which the option achieves the desired outcomes.

The type, elements and frequency of the monitoring program should be based on the vegetation quality and condition of the project site, with higher-quality sites (for example, Quality Remnant, Modified Remnant and Native Grassy) generally requiring a more rigorous program than lower-quality sites. This is because these sites are more likely to degrade if the grazing regime is wrong, and the consequences of degradation are higher (due to their higher quality).

Grazing livestock prefer younger plants to older plants, and annual and perennial grassy weeds to most indigenous species. Therefore, if implementing controlled grazing, the project site should be monitored and livestock removed before they start to graze key indigenous species.

The site should also be reassessed after some time, to ensure the grazing management option selected still suits the site’s vegetation state (which may have changed).

**Livestock management options by vegetation state – example for Modified Remnant**

Modified Remnant (Figure 3) is a weedier version of Quality Remnant. It typically has a low-to-moderate intensity livestock grazing history, with some soil disturbance. It has probably not been cultivated or fertilised.



**Figure 3. Examples of Modified Remnant vegetation state sites**

Table 1 shows typical Modified Remnant vegetation state characteristics.

**Table 1. Typical Characteristics for Modified Remnant Vegetation State**

Overstorey	Shrub Layer	Ground Cover
Overstorey is usually older in profile, but areas often still contain several overstorey age classes (different and smaller diameter classes)  There has often been no recent tree recruitment  There may be some individuals of exotic overstorey species (e.g. willows or poplars)	Introduced species dominate the shrub layer  Indigenous shrubs are still evident, even if sparsely distributed and old  Shrub recruitment may be evident	Introduced species dominate the ground cover, especially aggressive colonising weeds (such as annual grasses, blackberry, cocksfoot and phalaris)  There may be some indigenous ground layer: if so, it may maintain a reasonable diversity of indigenous species (however, the distribution will likely be patchy)

Grazing management options for Modified Remnant will differ depending on the percentage of indigenous species ground cover. This is best assessed in summer.

Table 2 presents a summary of the predicted outcomes and acceptability of the four grazing management option for Modified Remnant. The decision framework shown in Figure 4 can be used to determine the most appropriate option for the project site.

**Table 2. Grazing management options summary for Modified Remnant**

Grazing management option	Predicted outcome	Acceptability
Maintain the existing livestock grazing regime	<25% indigenous species ground cover: Site remains <i>Modified Remnant</i> , with reduced recruitment opportunities	Not acceptable
	≥25% indigenous species ground cover: Site degrades to either: a lesser-quality version of this state (with less indigenous ground cover) OR Mature Overstorey	Not acceptable*
Control the livestock grazing regime	<25% indigenous species ground cover: Site remains <i>Modified Remnant</i> : grazing controls ground layer biomass and enable recruitment of indigenous groundcover and/or woody species	Acceptable
	≥25% indigenous species ground cover: Site may degrade to a lesser-quality version of this state	Not acceptable**
Exclude livestock grazing	<25% indigenous species ground cover: Site remains <i>Modified Remnant</i> , with some risk of degradation in vegetation structure	Tolerable
	≥25% indigenous species ground cover: Site improves to <i>Quality Remnant</i> through unassisted patterns of recruitment	Beneficial
Exclude livestock grazing and revegetate	<25% indigenous species ground cover: Site remains <i>Modified Remnant</i> , with an increase in vegetation structure	Acceptable
	≥25% indigenous species ground cover: Site improves to <i>Quality Remnant</i> through assisted control of herbaceous weeds	Beneficial

\* Occasionally, the existing grazing regime is acceptable, most notably where a high level of indigenous ground cover is the result of current grazing practices.

\*\*Occasionally, short-duration, intense livestock grazing may be acceptable (for example, to open up a dense indigenous graminoid ground layer that is shading and outcompeting smaller indigenous herbs and forbs. Expert botanical advice should be obtained if considering this option).

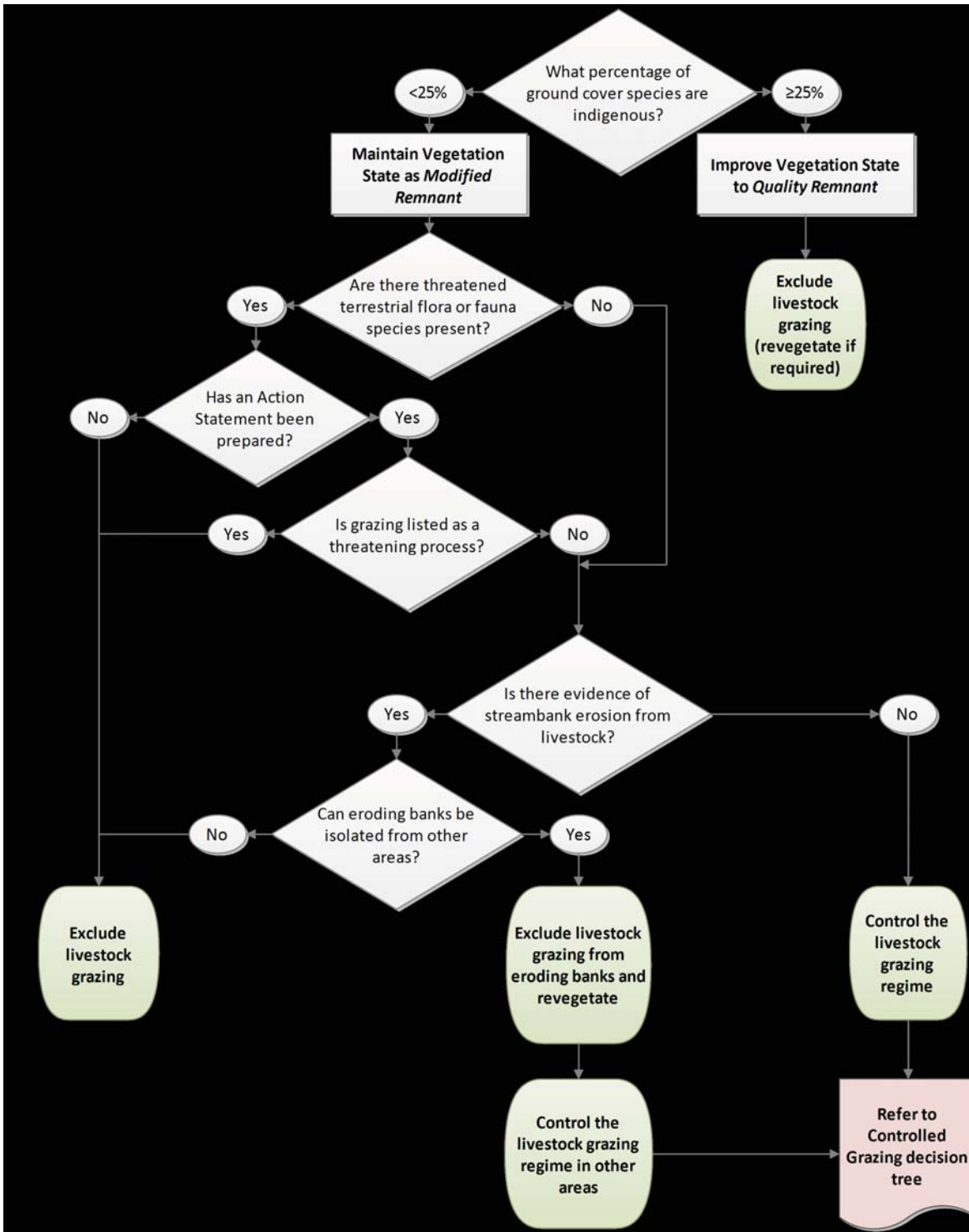


Figure 4. Grazing management options decision tree - Modified Remnant

If controlled grazing is identified as an acceptable management option for the project, the decision tree in Figure 5 assists the user to develop a controlled grazing plan.

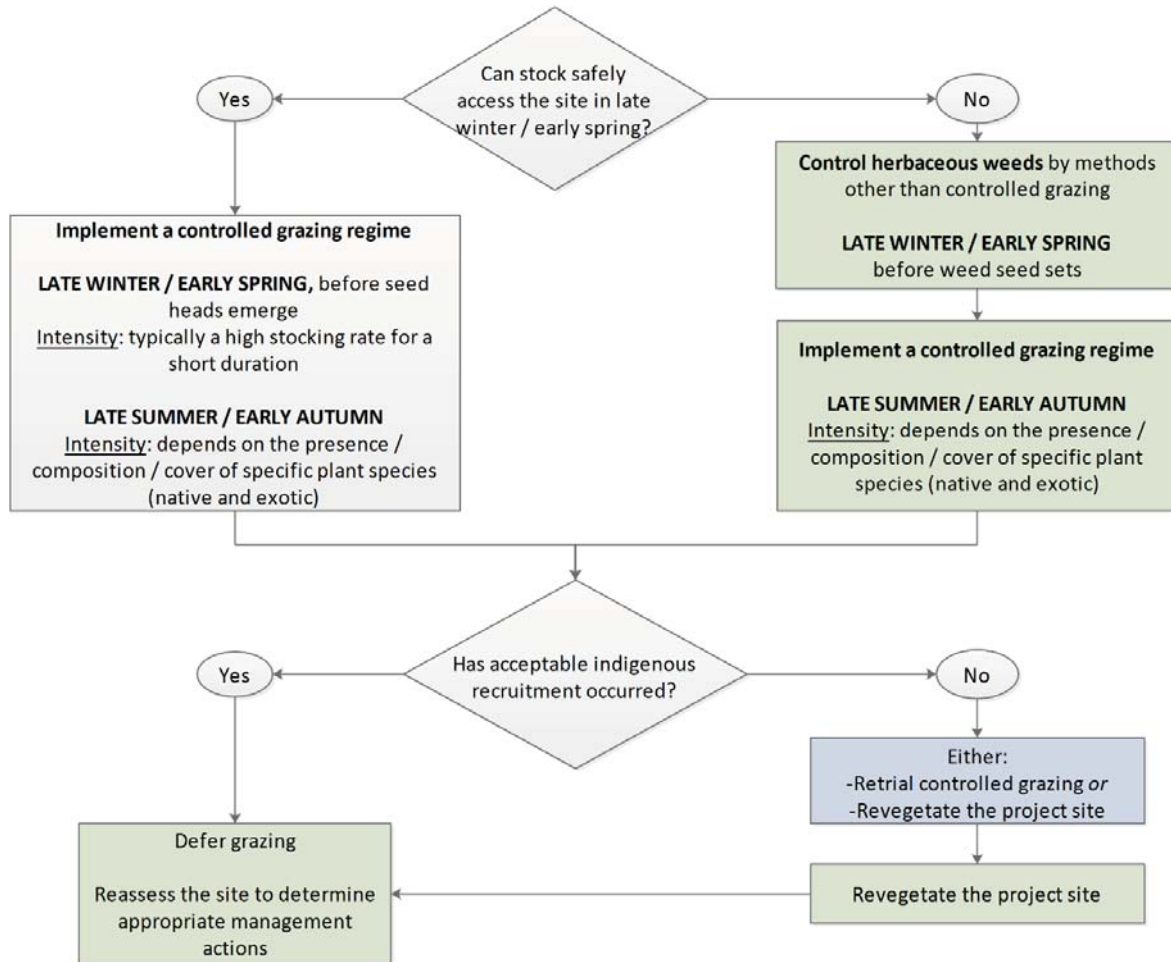


Figure 5. Controlled grazing decision tree - Modified Remnant

### Field testing

The *Managing grazing on riparian land: a decision support tool and guidelines* was released in 2013.

In late 2015, a post-project evaluation was undertaken to assess the usefulness and usability of the guidelines to end users. An online (SurveyMonkey) survey was sent to representatives from all Victorian CMAs as well as Parks Victoria.

Eighteen people took the survey. Of these, 61% were project officers, 17% field workers, 11% project planners, and 11% riparian managers. Forty-six percent had used the guidelines between 1 – 5 times; 36% between 6 – 10 times; 18% had never used the guidelines. No respondents indicated that they had used it more than 10 times.

When asked to compare the guidelines to other riparian grazing guidelines or methods, more than half considered these guidelines as above average in all categories (usability, practicality, defensibility and quality of outcomes). Sixty-four percent of respondents indicated that they are satisfied with the usability/practicality of the guidelines.

### Conclusions

Overall, survey data indicates that the riparian grazing guidelines have been a success, with the document’s target audience satisfied with the document and willing to recommend it to others. It compares favourably

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with other similar guidelines and/or methods available and all major steps are confirmed as useable and practical.

However, the guidelines are not being used frequently and consistently. This may be a positive sign though, as respondents indicated that they (and possibly landholders) are internalising and using the method and the steps, if not the document. The key role of the guidelines may be to act as a reference, teaching riparian land managers the assessment process and steps, rather than as a consistently used procedure.

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- the Project Steering Committee
- catchment management authorities and Melbourne Water for responding to surveys, assisting in field trials, commenting on draft reports and contributing valuable hands-on knowledge and experience applying controlled grazing techniques.

They were released in late 2013 and are available through the DEPI website

([http://www.depi.vic.gov.au/data/assets/pdf\\_file/0004/229279/Riparian-grazing-guidelines-November-2013.pdf](http://www.depi.vic.gov.au/data/assets/pdf_file/0004/229279/Riparian-grazing-guidelines-November-2013.pdf)).

## **Selected bibliography**

- Askey-Doran, M. (1999). Managing Stock in the Riparian Zone in Lovett, S. and Price, P. (eds). *Riparian Land Management Guidelines, Vol. II: On-ground Management Tools and Techniques*, Land and Water Australia, Canberra.
- Barlow, T. (1998). *Grassy Guidelines. How to Manage Native Grasslands and Grassy Woodlands on Your Property*.
- Department of Primary Industries (2011). *A Guide to Native Pasture Management*. Department of Primary Industries, Future Farming Systems Research, Hamilton. The State of Victoria. The guide is available at <http://www.dpi.vic.gov.au/agriculture/farming-management/native-vegetation/a-guide-to-native-pasture-management>.
- Department of Sustainability and Environment (2011). *Victorian Investment Framework Vegetation Work Standards*. Victorian Government, Department of Sustainability and Environment.
- Land and Water Australia (2006). Using Natural Regeneration to Establish Shelter on Wool Properties. Extension Note 3.
- Perry, D. (2004). Tree Planting and Aftercare. Landcare Notes LC0104. Department of Primary Industries, Victorian Government, East Melbourne.
- Price, P. and Lovett, S. (2002a). Managing Stock. Fact Sheet 6. Land & Water Australia, Canberra.
- Price, P. and Lovett, S. (2002b). Streambank Stability. Fact Sheet 2. Land & Water Australia, Canberra.
- Staton, J. and O'Sullivan, J. (2006). *Stock and Waterways: A Manager's Guide*. Land and Water Australia, Canberra.
- TreeProject (2003). *Preparing and Planting your Revegetation Site*.
- Water Technology (2009). *An Investigation of Controlled Grazing as a Riparian Management Tool: a Review*. Unpublished consultant's report for DSE.