

Conservation Management Notes

Managing bushland and wildlife habitat

Natural regeneration

This note outlines ways of restoring degraded native vegetation by harnessing and promoting the regeneration processes that are built into native ecosystems.

Natural regeneration means allowing or assisting the bush to grow back by itself. It is the most effective and most economical way to expand patches of native vegetation and improve their condition.

Each site is different, and techniques and methods are tailored to suit the ecosystem being restored (e.g. grassland, rainforest, woodland, wetland etc), and the type of threats being managed.

In healthy bushland **natural regeneration** occurs with little help from people, such as after a bushfire or an ecological burn designed to replicate traditional fire regimes. When natural regeneration is actively promoted in degraded areas, it is referred to as **assisted natural regeneration** (bush regeneration or rainforest regeneration are types of assisted natural regeneration). Active promotion may include removing threats such as weeds or grazing, plus using triggers such as fire or soil disturbance. When planting or direct seeding is required, it is generally referred to as revegetation.

The aim of assisted natural regeneration is to create conditions that favour the ecosystem's own recovery processes. It is important to understand what is preventing recovery and how to fix these problems, or how to manage them if they can't be fixed. The table on page 2 gives an overview.



Angophora costata seedlings, naturally regenerating from seed-fall. Photo V Bear

Principles for assisting regeneration

Work where the natives are stronger. Don't start removing weeds in the worst areas, such as the weedy edges, because resilience is generally low and regeneration will be slow. Look after the good areas and create the conditions that promote their expansion into adjoining more degraded areas. An exception to the rule might be target weeds that are a particular threat, or protecting a high value asset such as an old paddock tree or a threatened species.

Match the area initially taken on, to the capacity for ongoing maintenance. Work in small manageable areas. It is best not to start works, such as intensive weeding, until it is certain that resources are available to see the project through. A common mistake is to kick-start the regeneration process, only to lose the new seedlings to competition from unexpectedly strong weed regrowth.

Avoid excessive disturbance because it often favours weed regrowth. But do employ some disturbance where it is needed to trigger native plant regeneration or to treat compacted soil — take a balanced approach to the degree of soil disturbance employed.

Avoid mulching (mostly) because mulch suppresses germination of seedlings, although it can be useful in areas of low or no resilience to control weeds and erosion, and improve soil condition. Small, low-resilience patches within a natural regeneration area could be mulched where natural leaf litter is available from nearby sources. Mulching can be useful on the edges of bushland areas to define the limits of grazing or mowing zones, and to suppress the encroachment of exotic grasses. Mulch should be free of weed seeds or propagules. Above all, avoid burying resilient areas under a layer of mulch.

What might be preventing natural regeneration, and what to do	
Problem	Possible solutions
Grazing by livestock, macropods or feral animals.	Fence the area (see page 3) or use tree guards where practical. Reduce or strategically manage grazing. Control rabbits or goats.
Competition from weeds, including pasture species.	Remove weeds in a measured way and manage causes.
Soil compaction caused by trampling from stock or vehicles, or recreational use.	Manage the causes to prevent further damage. Provide habitat for soil fauna (e.g. allow leaf litter and fallen timber to accumulate), plant pioneer species such as wattles. Lightly rake or scarify — even rip in severe cases (but only if there are no weed sources nearby).
Lack of fire to trigger germination.	Use prescribed burning, smoke or smoke water treatment.
Frequent, low intensity fire.	Change management practices.
Lack of disturbance to trigger germination.	Lightly rake or scarify — rip in severe cases (but only if there are no weed sources nearby).
Loss of animals (e.g. bettongs and lyrebirds) that turn over soil and leaf litter, distribute soil fungi etc.	Improve habitat management on property and regional basis.
Loss of soil fauna (e.g. fungi, bacteria, worms and other invertebrates).	Provide habitat for soil fauna (e.g. allow leaf litter and fallen timber to accumulate). Reintroduce soil fauna by translocating small quantities of topsoil and leaf litter from nearby healthy areas.
Lack of seed dispersers such as birds and ants.	Improve habitat management on property and regional basis.
Lack of pollinators (e.g. insects, birds, mammals), leading to plants not setting seed.	Improve habitat management on property and regional basis.
Erosion — removing topsoil and seedbank, and damaging streambanks.	Reduce stocking rates. Place logs across soil surface to trap seeds and leaf litter, recontour the soil surface to trap seeds and leaf litter. Revegetate instead.
Elevated nutrient levels from fertiliser, animal faeces, or enriched runoff.	Prevent further nutrient enrichment, remove weeds and wait to see if natural regeneration occurs over time. Scalp off the contaminated topsoil, ensuring erosion will not occur, and revegetate. Revegetate.
Exposure to the elements (e.g. persistent strong winds, frosts, sunlight).	Plant a buffer on the windward side of a remnant bush patch, plant pioneer species. Focus regeneration efforts on areas which are more protected.
Excess shading from exotic species.	Remove or thin exotic trees and shrubs.
Drought .	Wait — sometimes natural regeneration does not occur for many years if intensive rainfall events are rare.
Lack of flooding.	Wait — it may be part of a long term natural cycle. On a regional basis, changes to water allocations may be required.
Mowing or slashing.	Change management practices.
Loss of resilience because of clearing, cultivation, frequent burning.	Reintroduce species after appropriate site preparation.
Salinity — conditions no longer suit local plants.	Revegetate instead using more salt tolerant species.
Erosion and siltation in watercourses.	Follow appropriate riparian conservation processes.

Fencing to assist regeneration

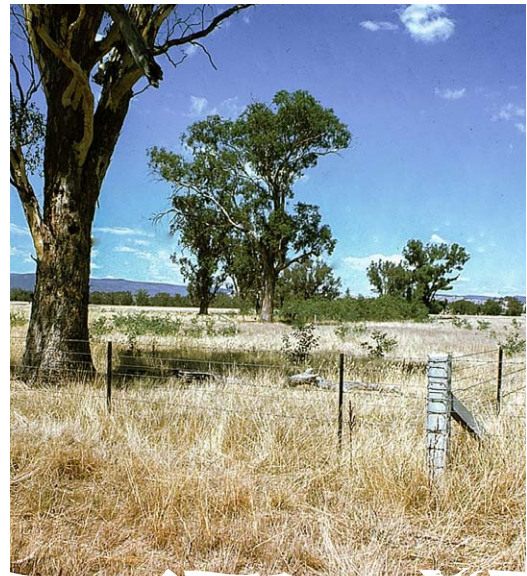
In rural areas, grazing is often the main factor inhibiting natural regeneration. Once remnant vegetation is fenced, grazing can be stopped or strategically managed, allowing natural regeneration to start again. The damaged areas can often recover with little or no further assistance.

The type of fencing will depend on:

- the length of time or season that grazing animals should be excluded
- the type of animals to be excluded
- the resources available.

Things to consider when fencing:

- fence an area bigger than the existing remnant to allow regeneration within and around the remnant
- make sure animals cannot reach over the fence to graze the vegetation (electric fencing is an economical way to exclude stock but allow the passage of native animals into the remnant — ensure the fence will not electrocute native animals such as echidnas)
- extend the fencing around and down-wind (i.e. in the opposite direction to the prevailing wind) of the remnant, if prevailing wind in the area is constant and strong.



Paddock trees protected from stock to allow for regeneration. Photo: OEH

A pattern of intense grazing for short periods followed by long rest periods is generally better for native vegetation than consistent grazing. Stock should be excluded when native species are flowering and seeding.

After an area is fenced, it is important to assess whether natural regeneration is occurring. The site should be monitored to see if new seedlings are coming up. It can take one to two years or longer because germination may need to be triggered by events such as drought breaking rains, flooding and fire. If no regeneration is taking place a regeneration trigger may need to be applied.

Controlling weeds in natural regeneration areas

Depending on its condition at the time of treatment, native vegetation often regenerates strongly once weeds are removed and more space and light is available. Weed control, however, is rarely a one-off event as weed seed is sure to be in the topsoil, and the factors that promote native plant regeneration tend to promote new weeds as well. After initial weed removal, follow-up work is required. Follow-up sessions may not take long but they need to be strategically timed (e.g. when weed regrowth is easiest to remove and has not seeded), and they may need to be continued for years, until the weed seedbank eventually diminishes. Care needs to be taken to minimise damage to regenerating native plants.

To choose the best weed control methods it helps to understand:

- the cause/s of the weed infestation — weeds are often a symptom of other problems
- which weeds are the greatest threat (e.g. vines that can potentially smother the canopy), and which weeds may not be much of a threat at all (e.g. small annuals)
- the nature of the weeds: their mature size, life-form (e.g. will they re-shoot from plant material left in the ground?), method of spread, life cycle (annual or perennial, when do they produce seed?)
- the approximate area affected by weeds, and the density of infestation
- whether there are native plants in, under or around the weeds
- whether the weed is playing a useful ecological role, such as providing habitat for native animals or protecting the creekbank from erosion (if so, removing them may cause more harm than good).

Some weeds — particularly spiky weeds with a dense form, such as lantana and African box-thorn — act as a refuge for native animals. Protecting habitat should be the top priority, so specialist advice may be needed before proceeding with weed removal. Replacement habitat may need to be established prior to removing these weeds.

Herbicides

Herbicide is a valuable weed management tool but needs to be used with great care in natural areas. Good plant identification skills are vital. It is important to choose a type of herbicide and application technique that will not harm surrounding native plants. This isn't always possible, and sometimes where there is a mix of native plants and weeds, hand weeding is actually a more efficient technique.

Herbicides are applied by foliar spraying, painting cut stumps, stem injection, basal bark spraying, and stem scraping.

A herbicide that becomes inert on contact with the soil, such as glyphosate, will minimise movement from one plant to another.

There are legal requirements for the use of herbicides. Information can be found at www.environment.nsw.gov.au/pesticides/. It is important to follow the instructions on the label, and stick to recommended doses for different weeds and techniques.

Revegetation — when regeneration is not enough

Where resilience is severely depleted or absent, plant material may need to be reintroduced. Some components of the native ecosystem may still have resilience (such as native grasses in pasture) but others (such as shrubs, or particular species) may have completely disappeared and require replanting or direct seeding.

Revegetation methods include:

- tree, shrub and ground cover planting
- direct seeding by machine or hand
- brushmatting — cutting and laying seed-bearing branches
- direct transfer of topsoil with leaf litter from a healthy site (only if this does not damage the healthy site)
- transplanting seedlings and rootstock.

Physical Control

For smaller weeds, pulling by hand or removing with hand tools is particularly efficient when there are light infestations and when weeds are growing among native plants. It is easiest after rain when the soil is softer.

Fire can be effective and is often also needed as a regeneration trigger (but can have heavy follow-up weeding requirements).

Seasonal crash grazing may be helpful in some circumstances. For instance if timed to reduce seeding of weeds but not affect natives.

Scalping and cultivation are not appropriate where natural regeneration is expected or there is a high risk of soil erosion, but can be highly effective for controlling nearby weed sources.

Biological Control

Some degree of biological control is available for a limited number of weed species, such as lantana, madeira vine and blackberry. Natural enemies, such as insects or diseases are used. Rather than eliminate a weed, they generally reduce it to a level where control can be achieved using other methods.

Useful references

Related Conservation Management Notes:

- Restoring native vegetation: regenerate or revegetate?
- Revegetation

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