

Boosting the conservation value of replanted woodlands for biodiversity

In brief

Temperate woodlands are among the most heavily cleared and disturbed biomes globally. Some types of temperate woodland have been cleared by up to 99%, with remaining (typically very small) patches often in poor condition. Major restoration programs have been established in an attempt to revegetate heavily cleared landscapes and recover biodiversity. These also address major land degradation problems such as secondary salinity and soil erosion, as well as providing shelter for livestock.

In this study, we quantified the effects of livestock grazing on birds and reptiles in 61 restoration plantings in the South West Slopes region of agricultural south-eastern New South Wales. We monitored the plantings in repeated field surveys over a 20-year period to establish relationships between the abundance of animal species and characteristics of the plantings, including whether they had been grazed by livestock.

Our findings clearly demonstrated that livestock grazing significantly lowers the diversity of bird and reptiles, through altering the leaf litter in plantings, direct trampling of nests or by changing the ground and shrub layers of vegetation that birds and reptiles use for nesting or foraging or both. We also found that the width and age of plantings had positive effects on biodiversity.

What we looked at

The effects of grazing on biodiversity inhabiting remnant vegetation have been relatively well-studied, but the effects on biodiversity in restored areas have only rarely been previously examined. Meanwhile worldwide, governments and environmental organisations are spending billions of dollars annually to restore millions of hectares of degraded land. Such restoration efforts are intended to address problems of biodiversity loss as well as secondary salinity and soil erosion. Our research is relevant to the management of restored native vegetation in Australia and globally.

We examined areas of restoration planting in the South West Slopes of New South Wales that vary in size, shape and condition. This region was formerly dominated by temperate eucalypt woodland, but is now one of the most heavily modified agricultural areas in Australia. An estimated 85% of its original cover has been cleared. The South West Slopes of New South Wales has been targeted for extensive

revegetation efforts over the past 20 years. Many revegetated areas are now being grazed, in some cases simply due to the disrepair of fences around plantings (which means they are increasingly accessible to livestock). This presents an opportunity to determine whether the value of restored (planted) woodlands for biodiversity, especially birds and reptiles, is altered by grazing by domestic livestock. (Tree-dwelling mammals rarely use these areas primarily because they have so few large old hollow-bearing trees.)

While previous studies have highlighted the impacts of grazing on the understorey and other layers of vegetation, as well as the effects of grazing on birds and reptiles in eucalypt remnants rather than plantings, we set out to quantify both the direct and indirect effects of grazing on the biodiversity inhabiting plantings. We also sought to identify the mechanisms underpinning such grazing impacts.



Ungrazed planting with phalaris. Photo: Damian Michael



Cattle in South Eastern New South Wales.
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What we did

We collected long-term empirical data from repeated biodiversity (bird and reptile) field surveys of 61 plantings across 25 farms over the past 15 years in the South West Slopes bioregion of New South Wales.

The width of plantings varied from 10 to 300 metres. Plantings ranged from 6 to 61 years old, with a median age of 18 years. Of the 61 plantings, 41 had never been grazed, 10 had been infrequently grazed ('controlled grazing'), and at a further 10 plantings, cattle and sheep had continuous access to the planting ('uncontrolled grazing').

We conducted surveys of:

- Vegetation structure and composition, looking primarily at six variables; the percentage of understorey, midstorey, overstorey, leaf litter, native grass tussocks and exotic grasses
- Bird species richness and the abundance of individual bird species
- Reptile species richness and the abundance of individual reptile species

The data were analysed to identify factors influencing the occurrence of birds and reptiles in revegetated woodland, including both the direct and indirect effects of grazing.

Further Information

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Key findings and their implications

Revegetated woodlands can have significant biodiversity benefits for a range of native animals, including an array of species of birds and reptiles. Across all sites we found a total of 15 reptile species and 89 bird species (only two of which were introduced). However, our analyses revealed that biodiversity benefits of replantings can be reduced by grazing. Indeed, livestock grazing had a significant negative effect on bird and reptile diversity.

Direct effects of grazing included trampling (e.g., of nests of ground-nesting birds). Indirect effects included changes in the structure of vegetation in the ground and shrub layers that influence nesting, foraging or both, and alteration of the leaf litter within plantings.

Earlier studies in temperate woodland remnants have shown that livestock grazing leads to a significant loss of leaf litter. Leaf litter is important for foraging for many woodland birds and also reptiles. The statistical analysis in this study showed that leaf litter was positively associated with bird and reptile species richness; reductions in leaf litter and resulted in reduced bird and reptile richness.

We found that bird species richness was positively affected by planting width and vegetation understorey cover.

Boulenger's skink exhibited a direct positive response to planting age and was more likely to be found in older plantings. No other species showed this direct relationship with planting age.

Recommendations

The key recommendations arising from this study are the following.

Intensive livestock grazing in restored areas (e.g., by set stocking) should be limited or excluded completely to support biodiversity values of plantings and to minimise the negative impacts on birds and reptiles. This is best done by maintaining fences that restrict stock access to plantings.

Many replanted woodlands are reaching an age (over 20 years) where the condition of fencing is

deteriorating. Fences need to be restored and maintained to help prevent access by livestock and uncontrolled grazing.

Managers can positively influence biodiversity values by increasing planting width. Many past restoration programs in our study region have resulted in the creation of narrow strips of planted woodland. While these areas are not without value, we suggest that there can be greater biodiversity gains if plantings are widened when fences need to be replaced.

Cited material

Lindenmayer, D.B., Blanchard, W., Crane, M., Michael, D. and Sato, C. (2018). Biodiversity benefits of vegetation restoration undermined by livestock grazing. *Restoration Ecology*, 26, 1157–1164