Linking Incentives to Outcomes for Natural Resource Management

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What were this projects research objectives?

The aim of this research project was to investigate how quickly we could detect a change in ecological condition in grazed paddocks after grazing regimes had been changed to encourage biodiversity and conservation outcomes. As most ecological improvements tend to occur over decades rather than short time scales, we developed a number of new approaches and survey methods to trial to try to answer this question. This approach contrasts to much of the traditional long term survey work undertaken, such as the ANU surveys for the Box Gum Woodland Stewardship Scheme, and therefore differed in this critical aspect of detecting shorter vs. longer timescale ecological change.

How was the work undertaken and where?

In Spring 2009 we began trialling 25 newly developed or specially modified ecological indicators, as well as more traditional measures of ecological condition, and collected baseline data at 20 stewardship sites where a change from grazing to conservation management had been recently implemented. These were paired with 20 control sites, typically on an adjoining property or adjacent grazed paddocks. Properties were located between Blayney in the north, to Murrumbateman near Yass in the south. Sampling was repeated 2 years later (Spring 2011) at exactly the same locations so that we would have robust statistical data to show if ecological indicators demonstrated any significant improvement in stewardship sites compared with control sites, while accounting for a range of possible confounding factors.

Collecting groundcover data using point-intercept sampling method

Land managers filling out the final part of the survey questionnaire

Did the research find any significant indicators of short-term ecological change?

A number of the indicators revealed statistically significant improvement at stewardship sites compared to control (typically grazed) sites. Our indicators for litter decomposition, abundance of litter-dwelling invertebrates, litter depth and percent cover of bare ground exhibited clear change over a two-year interval at sites where livestock had been removed, compared to control sites. Five other indicators – interperennial distances, litter cover, regeneration of canopy species, foliage cover of native perennial plants, and number of native plant morphospecies – appeared to show hints of change (particularly for interperennial distances and litter cover) which may become significant over a somewhat longer time period. The other ten indicators analysed showed no signs of change over the two years of the study. Although it is possible above average annual rainfalls during the survey period maximised our chance of observing change we specifically undertook statistical analysis to detect changes at these sites relative to control sites. These results demonstrated a greater improvement at these sites which had changed their management and grazing practice relative to the control (typically grazed) sites.

How will this assist future monitoring programs?

These results are particularly important as many of these survey indicators are not currently in use by monitoring programs in Australia. Additionally a number of those indicators that are currently in use in traditional longer term surveys failed to show improvements within two years in this study. This suggests that monitoring of ecological condition and adaptive management could be significantly improved by placing greater focus on some of the fine details of the ground layer and their function. These types of groundlayer indicators, although seemingly simple, are critical drivers of ecosystem functioning. That is, the amount and rates of plant litter accumulation, its origin and degree of decomposition all influences a sites capacity to retain ecological resources, enhance soil stability and nutrient cycling, and provide habitat and food resources for invertebrates and other fauna.

Can land managers use these indicators?

We worked with land managers to assess which indicators could be assessed accurately and which they thought were both practical and simple to use. Overall, the majority of land managers found most of survey methods either ‘very simple’ or ‘simple’ and useful for detecting change in the ecological condition of a site. The top ranked indicators for simplicity were tree regeneration, number of flowers, apparent moth and butterfly species, pollinators on flowers, ant and invertebrate abundance.

The accuracy of these data collected by land managers was generally comparable to that collected by an ecological expert. Encouragingly, we found that some indicators we found useful for detecting short-term improvements in ecological condition were also those land managers found relatively simple to use (e.g., litter invertebrates). Although most land managers could not formally identify different plant species, most were very adept at identifying 'apparent plant species' (i.e., morphospecies). We found many planned to use a selection of these newly learned techniques to assist future monitoring and understanding of trends in ecological change.

Conclusions

This research found many of the groundlayer features, such as litter, invertebrates and groundcover, and attributes relating to function and structure (eg. depth and decomposition) rather than different species, are potentially more useful future short term monitoring tools for both monitoring programs and land managers.

Further information

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