DECISION POINT

Connecting conservation policy makers, researchers and practitioners

Issue #82 / September 2014

Conservation off reserve

Making a difference outside of the national park

Mapping social networks across scales

Evaluating return on investment in projects

Measuring the impact of fragmentation at different scales

Decision Point

Decision Point is the monthly magazine of the Environmental Decisions Group (EDG). It presents news and views on environmental decision making, biodiversity, conservation planning and monitoring. See the back cover for more info on the EDG. ***Decision Point*** is available free from http://www.decision-point.com.au/

Plus

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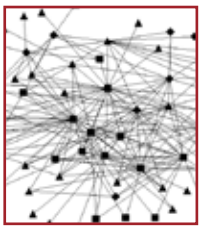

Billions of dollars are spent by governments each year paying farmers for environmental activities such as the preservation and enhancement of wildlife habitat. That money is often allocated using an environmental metric that reflects the environmental return the investment will generate. There are many metrics in use. Some are strong, many are weak. Our story on page 4 explores what we stand to lose through the use of a weak metric.

On the point

Off reserve

The focus of much conservation and environmental decision science is on nature reserves and national parks. And yet biodiversity (and activities to conserve it) occurs all across our land- and sea-scapes. Can good environmental decision making contribute to better conservation outcomes off reserve? You bet it can and every story in this issue of Decision Point bears that out.

Up front we discuss decision metrics for prioritising projects anywhere in the landscape (private land or conservation reserve). These metrics are used all over the world to determine how billions of dollars are handed out by government (most often to farmers) and yet few people have analysed the cost of using a poor metric as opposed to a strong one. David Pannell and Fiona Gibson did the sums and found a poor metric can result in environmental losses of up to 80% (see page 4)!

On page five Angela Guerrero discusses how cross-scale collaboration is crucial to large-scale conservation initiatives and examines the excellent work of many groups and people over in Western Australia in the Gondwana Link.

We also discuss how the impact of land use on forest fragmentation varies with spatial scale (page 8); examine impacts on biodiversity in the Brigalow Belt (page 10); consider the consequences of pine plantations on bird connectivity (page 11); reflect on the impacts of urban development on large trees (page 13); and explore whether it's possible to halt the spread of cane toads with a waterless barrier (page 14).

All of this research is about how we can achieve better conservation outcomes on land that is not part of the formal conservation estate – land on which we grow food and fibre, extract mineral wealth or build suburbs. Biodiversity is not the first consideration in this space but there is enormous scope for us to do better than we currently do.

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DECISION POINT

Decision Point is the monthly magazine of the Environmental Decision Group (EDG). The EDG is a network of conservation researchers working on the science of effective decision making to better conserve biodiversity. Our members are largely based at the University of Queensland, the Australian National University, the University of Melbourne, the University of Western Australia, RMIT and CSIRO.

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Does public funding crowd out private supply?

Public funds for ecological landscape restoration are sometimes spent subsidising the revegetation of cleared land, and the protection of remnant vegetation from livestock. The total area treated, however, is often unclear because such projects are not always recorded, and landholders may undertake similar activities without subsidisation. Consequently it's difficult to know what value the public funding is generating.

In the absence of empirical data, the Victorian state government assumes that privately funded work matches publicly subsidised sites on a hectare for hectare basis (a so-called 'x2' assumption). In other words, for every hectare that is restored using public money, there's a matching hectare being restored that isn't using public money.

Working against this assumption is the theory of 'crowding out' in which it is suggested that public investment may supplant private motivation. Landowners stop doing voluntary restoration because they come to believe it is only worth doing if the government pays them to do it.

David Duncan and colleagues attempted to throw a bit of light on this issue by checking out what was actually happening out in farming landscapes. They used aerial photography to map the extent of revegetation, native vegetation fencing and restoration on 71 representative landholdings in rural south-eastern Australia. They interviewed each landholder and recorded the age and funding model of each site.

Contrary to the local 'x2' reporting assumption (which should result in 50% of the total area being subsidised), they found that about 75% of the total area of the 412 sites was from subsidised sites, and that proportion was far higher for the period after 1997. However, rather than displacing unsubsidised activity, our modelling showed that landholders who had recently been subsidised for a project were more likely to have subsequently completed unsubsidised work. This indicates that, at least in terms of medium-term economic impact, the large increase in public subsidies did not diminish privately funded activity, as might be expected according to the theory of crowding out.

Reference

Duncan DH, G Kyle, WK Morris, FP Smith (2014). Public investment does not crowd out private supply of environmental goods on private land. *Journal of Environmental Management* 136: 94-102. http://dx.doi.org/10.1016/j.jenvman.2014.01.041.

Clarification

In the article 'Eradicating foxes: understanding that absence of proof isn't proof of absence' (Decision Point #81) we would like to clarify that the Tasmanian Government has not declared eradication success (as could have been inferred from the article).

Of practitioners, participants & conservation tenders

Extensive clearing of native vegetation on rural properties throughout Australia over the last century has contributed to significant declines in biodiversity. In an effort to counter this, Australian governments have offered a range of voluntary payments to land owners to undertake conservation actions on their land (eg, planting native trees or protecting remnant native vegetation). In recent years these payments have frequently been offered as conservation tenders. Within these, landholder participants submit a bid to the implementing agency specifying the monetary compensation they require to perform a given set of management activities.

Research on Australian conservation tenders has largely been limited to program evaluations and landholder surveys. Louise Blackmore and colleagues at the University of Western Australia have extended what we know by undertaking an analysis that compares and contrasts the views of landholders participating in these schemes with non-landholder participants (eg, academic researchers, consultants, state and local government representatives; who the researchers refer to as practitioners). The researchers surveyed each group to investigate the drivers of cost-effectiveness within tender programs and landholder participation.

Both practitioners and landholders indicate that programs supported by close agency–landholder relationships and offering flexibility to landholders are most likely to succeed. This is particularly the case where landholders perceive the tender instrument to be fair.

Whilst practitioners emphasise the role of transaction costs and program characteristics in achieving cost-effective biodiversity outcomes, landholders indicate that these factors are less important to participation rates. This research is important to guide future implementation of tender programs both in Australia and internationally.

Reference

Blackmore L, G Doole & S Schilizzi (2014). Practitioner versus participant perspectives on conservation tenders. *Biodiversity and Conservation* 23: 2033-2052.

Agri-environment schemes and reptiles

Agri-environment schemes involve payments to farmers to modify farming practices with the goal of providing environmental benefits such as the conservation of biodiversity. No studies have explicitly quantified the effectiveness of agri-environment schemes to increasing herpetofaunal (reptile and amphibian) diversity.

To examine whether agri-environment schemes protect and increase herpetofauna, Damian Michael and colleagues from the ANU established a landscape-wide biodiversity monitoring program in threatened semi-arid and temperate woodland communities in south-eastern Australia. With 31 species recorded, regional herpetofaunal diversity was relatively high, whereas local diversity was low. Herpetofaunal richness and reptile assemblage structure did not differ significantly between sites under agri-environment schemes and sites managed for livestock production. A gradient in species richness as a function of time-since-management intervention was not evident, although the abundance of one lizard species increased under vegetation management. Reptile richness and frog abundance differed significantly among vegetation types.

Herpetofaunal richness was positively related to native plant richness and bare ground cover, whereas Boulenger's skink *Morethia boulengeri* was negatively affected by bare ground cover. The ragged snake-eyed skink *Cryptoblepharus pannosus* was positively related to the amount of woody debris.

In this system, strong habitat specificity implies local-scale management interventions under agri-environment schemes may not significantly increase herpetofaunal diversity in the short term. Vegetation management is likely to increase the abundance of common lizard species rather than increase local species richness due to barrier effects. Future incentive schemes should focus on improving habitat connectivity, enhancing pasture condition and increasing woody debris in the agricultural matrix to dissolve dispersal barriers and mitigate the legacy of historical land-use practices. The researchers propose that agri-environment schemes which manage mosaics of intergrading vegetation types at multiple spatial scales will protect maximum herpetofaunal diversity.

Reference

Michael DR, JT Wood, M Crane, R Montague-Drake & DB Lindenmayer (2014). How effective are agri-environment schemes for protecting and improving herpetofaunal diversity in Australian endangered woodland ecosystems? *Journal of Applied Ecology* 51: 494–504.

Making environmental decisions using the wrong metric

Does a weak metric really matter?

By Fiona Gibson and David Pannell (University of Western Australia)

Good environmental decision making is information-intensive. Environmental managers invest a lot in monitoring and research to collect information, but often take a rough-and-ready approach to combining that information into a form that is useful for decision making. Does this matter? Does it make a difference to environmental outcomes to use a theoretically sound decision metric, compared with a weak decision metric? That was the question we set out to answer by comparing environmental outcomes generated by these two approaches.

What we found, in short, was that it does matter which decision metric you use. Indeed, it can make an enormous difference. As a consequence, many decision metrics used by environmental managers result in us missing out on very large environmental benefits.

What's in a metric?

What is a decision metric and why are they so important? Around the world, billions of dollars worth of public funds are allocated to environmental projects each year. These funds are scarce relative to the amount needed to support all possible environmental projects, so prioritisation is essential. This means some projects are determined to be more valuable than others and will receive funding whereas the less valuable projects miss out.

A common approach used by environmental managers to score the projects they have to choose between is to define a set of variables believed to correlate with projects' benefits and costs, and combine them into a formula or metric so that projects can be compared. Numerical values or scores are assigned to each potential project and these scores are used to rank the projects.

Of course, there are many different ways the various benefits and costs of a project could be combined and there are thousands of different decision metrics in practice around the world. Unfortunately, many (if not most) of these decision metrics have problems in the way they determine the value of the project. Indeed, the performance of many of these metrics is not much better than choosing projects at random.

Commonly used decision metrics have a range of weaknesses, including adding variables that should be multiplied, omitting important variables related to environmental benefits, omitting project costs, or subtracting costs rather than dividing by them (see the box 'nine questions to a robust ranking').

But what do these weaknesses add up to in terms of lost value? We estimated the environmental losses resulting from each of these weaknesses.

The attributes of a robust metric

Pannell (2013) described the requirements for a theoretically sound and practical decision metric for ranking environmental projects. He recommends:

$$BCR = \frac{V \times W \times A \times (1-R)/(1+r)^L}{C}$$

where BCR stands for Benefit: Cost Ratio, benefits depend on the value (V) of the environmental assets; the effectiveness of the new practices at increasing environmental values (W); the likely adoption of new practices or behaviours (A); the risk of project failure (R); the time lag until benefits occur (L); the discount rate (r); are divided by costs (C). All of the benefit-related variables are multiplied, not weighted and added, for reasons explained by Pannell (2013).

Distributions for each of these variables were obtained from a database of 129 projects that have been evaluated using INFFER (the Investment Framework for Environmental Resources – see the box on INFFER).

Essentially, our analysis involved evaluating and ranking projects using Pannell's metric and an alternate metric with one or more weaknesses included. By comparing the two results, we estimated the overall loss of environmental values from selecting relatively weak projects using the alternative metric.

We tested the metrics for different program budget levels: from 2.5% to 40% of the budget required to fund all the projects. Altogether, the analysis simulated 27 million projects being considered in 270,000 project-prioritisation decisions.

What's lost?

Using weak metrics makes an enormous difference. The wrong projects get funded, resulting in big losses of environmental values. Where funding is tight (as it almost always is) we found that poor metrics resulted in environmental losses of up to 80% – not much better than completely random uninformed project selection.

> "Environmental managers should be more concerned in the first instance about how they calculate a decision metric rather than funding the acquisition of higher quality information to feed into that metric."

Nine questions to a robust ranking

There are many ways that you can go wrong when putting together a formula to rank projects, and unfortunately the quality of the results is quite sensitive to some of the common errors. Common important mistakes include: weighting and adding variables that should be multiplied; messing up the comparison of outcomes with versus without the project; omitting key benefits variables; ignoring costs; and measuring activity (instead of environmental outcomes).

It's relatively easy to avoid these problems. Apply bit of theory, some simple logic and a dose of common sense and it's not hard to do a pretty good job of project ranking. Indeed, it's simply a matter of being able to answer the following set of essential questions. For more details on how you would answer these questions, see *Decision Point #75* or download a compendium of David Pannell's 20 blog posts on ranking environment projects at http://purl.umn.edu/156482

1. What is the core criterion?

2. What is it that you're ranking?

3. What is the benefit?

4. What factors should be taken into account in working out the benefits?

5. How should these benefit values be combined?

6. Should private costs and benefits be included?

7. What other costs should be included?

8. How do you deal with uncertainty?

9. Should every project go through a rigorous analysis?

Many environmental projects on private land involve planting native trees. It's easy to estimate how many trees will be planted but a lot harder to compare the expected outcome of one tree-planting project with another. Answering the nine questions posed here for each project is a good first step towards undertaking a robust ranking.

The most costly errors omitted information about environmental values, project costs or the effectiveness of management actions. Using a weighted-additive decision metric for variables that should be multiplied is another costly error commonly made in real-world decision metrics. We found that omitting information about project costs or the effectiveness of management actions, or using a weighted-additive decision metric (that should be multiplied) can reduce potential environmental benefits by 30 to 50 per cent. Think about how hard it would be to double your budget (achieve a bigger slice of the funding pie); yet an equivalent environmental benefit could be achieved in effect in many cases by simply strengthening the decision metric being used.

What about the quality of the info?

Of course, it's not just the structure of the metric calculation that could be a weakness in the prioritisation. The quality of the information going into the calculation is also a factor. We looked at the environmental losses resulting from use of poor-quality information in the decision metric. We compared results from prioritising projects based on perfect information and uncertain information.

Naturally, poorer quality information about projects results in some relatively weak projects being selected for funding. Surprisingly, however, we found that the quality of the decision metric makes a much bigger difference to environmental outcomes than the quality of the information used within it.

If a very poor metric is used, then the benefits of going from high uncertainty to perfect information are remarkably low: 3 to 6%. Improving information quality only produces benefits greater than 10% if a reasonably good decision metric is used, and even then only if the available budget is tight.

That's an amazing finding and suggests environmental managers (and policy makers) should be more concerned in the first instance about how they calculate a decision metric rather than funding the acquisition of higher quality (and inevitably much more expensive) information to feed into that metric.

Does it really matter?

Our results show that relatively easy improvements to metrics used for environmental decision making can make a big difference to the environmental benefits generated by funded projects. Environmental budgets are usually small relative to the problems faced, so good decision metrics are crucial.

So, your choice of metric matters. Simply choosing a logical metric can improve environmental outcomes more than even obtaining substantial increases in environmental budgets. Of course, getting a bigger slice of the budget will help, but it is critical to ensure that any money is spent wisely by using a good metric.

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Reference

Pannell DJ (2013). *Ranking environmental projects*. Working paper 1312, School of Agricultural and Resource Economics, UWA. Crawley, WA. http://ageconsearch.umn.edu//handle/156482

Pannell D, AM Roberts, G Park & J Alexander (2013). Designing a practical and rigorous framework for comprehensive evaluation and prioritisation of environmental projects. *Wildlife Research* 40: 126-133. http://dx.doi.org/10.1071/WR12072

Pannell DJ & FL Gibson (2014). *Testing metrics to prioritise environmental projects.* Working Paper 1401, School of Agricultural and Resource Economics, UWA. Crawley, WA. http://ageconsearch.umn.edu/handle/163211

INFFER puts this research into practice

David Pannell and collaborators have implemented the theoretically preferred project ranking metric in INFFER, the Investment Framework for Environmental Resources (Pannell et al., 2013). INFFER is being used by many environmental organisations around Australia (see the story on page 12), and there is growing international interest, with users in Canada, New Zealand and Italy.

As well as facilitating the use of a sound metric, INFFER assists users with logical project development, collation of required information, and selection of appropriate delivery mechanisms for each project.

(See our story on 'evaluating bang for buck' on page 12).

More info: www.inffer.org

Mapping the social network

Achieving cross-scale collaboration for large scale conservation initiatives

By Angela Guerrero (University of Queensland)

When it comes to addressing conservation and natural resource management problems it seems like 'collaboration' is a prerequisite for success. This is especially true for large-scale problems where multiple actors are involved, multiple objectives are on the table, multiple plans need to be negotiated and multiple solutions are required to be implemented at different scales.

But establishing relationships is not a straight forward task. It takes time. And time means money. Collaboration processes can be difficult. Disagreements between parties, dominant organisations or individuals, or a lack of willingness to collaborate makes the collaboration process anything but smooth. To minimise inefficient or ineffective efforts we need to be strategic about how we approach collaboration, focusing on developing relationships where it matters most. For example when pursuing large-scale conservation objectives it's crucial that the partnerships involved facilitate the coordination of actions across multiple scales. This was the focus of a recent research collaboration I led that has just been published in Conservation Letters (Guerrero et al. 2014).

Understanding the conservation social network

We collected data on one of the largest landscape-scale conservation initiatives in the world: the Gondwana Link conservation initiative. Their objective is to restore ecological connectivity by linking the remnants of bushland scattered across the region, with the idea that these connections will enable previously isolated animal populations to move across the landscape, making them less prone to local extinction.

We collected data on the individuals and groups that were involved in different conservation activities: from the property level (farmers and landowners), to those whose interests and operations are at the sub-regional level (eg, local government, community groups, local-scale NGOs), and over and above the region of interest (eg, natural resource management groups, state government, research institutions). We collected data on who these actors were collaborating with when performing key activities such as revegetation and invasive species control. The result is what we call a - conservation social network – for the region (Figure 1).

Stakeholders discuss revegetation on the Greening Australia property Peniup, one of the project sites in the Fitz-Stirling section of Gondwana Link.

Analysing network configurations

Our conceptual framework focuses on the different types of interactions that are favoured by individuals and organisations and how they contribute to collaboration within and across scales. We asked: what are the network configurations that we expect to see over or under-represented for stakeholders engaged in activities that require collaboration within and across scales? We linked different types of sub-network configurations or 'motifs' to different types of interactions that stakeholders related to the property, the sub-regional and the supra-regional (Figure 2). We focused our analysis on the configurations denoting within-scale, cross-scale interactions and scale-bridging interactions.

> "Some sub-regional stakeholders could play a scale-bridging role. Making these stakeholders aware of their strategic position in the network, and supporting them in this role, may improve coordination of revegetation activities across scales."

Figure 1: Conservation social networks for the region. Networks representing all-activities (A), revegetation activities (B), and the invasive animal control network (C). Nodes represent the different stakeholders and the links indicate collaborative interactions. The shapes of the nodes represent the scale of interest: property (diamond), sub-regional (triangle), and supra-regional (square).

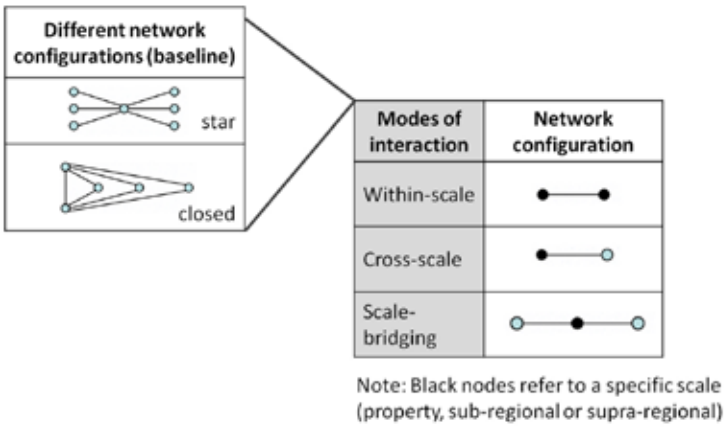


Figure 2: Conceptual Framework. Different network configurations can be found within collaboration networks. These general structures (eg, more centralised or more closed and cohesive), can be studied to assess different modes of interaction (eg, within the same scale or across operational scales). The black nodes imply stakeholders must be of a given scale (either property, sub-regional or supra-regional), and so in the first configuration two black nodes represents two stakeholders of the same scale interacting with one another, whereas the second and third represent cross-scale interaction.

We applied a novel network analytical tool to count the frequencies of those configurations in our network and performed statistical tests to see whether these observations were more or less represented than expected by chance. This method allowed us to assess whether the stakeholder interactions resulting from the current collaboration arrangements in this conservation initiative are conducive to cross-scale collaboration.

Collaboration across scales

We found that collaborative conservation initiatives predisposed cross-scale collaboration for the control of invasive animals, an action where coordination of activities is necessary. However, for activities relating to revegetation there was little evidence of collaboration across scales. We also found that some sub-regional stakeholders could play a scale-bridging role. Making these stakeholders aware of their strategic position in the network, and supporting them in this role, may improve coordination of revegetation activities across scales.

Our research is providing an approach for determining the potential for a conservation initiative to support multi-scale conservation and demonstrate its utility in a complex system that involves multiple stakeholders who undertake diverse land management activities across scales.

Targeted approaches for the development and support of collaborative relationships can reduce the complexity that characterises large-scale conservation initiatives. Specifically, it can avoid the inefficiencies that can result from comprehensive overarching approaches to specifying collaborative partnerships. A targeted approach to understanding and enhancing collaborative relationships, such as the one demonstrated by this research, can improve the effectiveness of conservation initiatives by identifying and nurturing key stakeholders and important relationships.

More info: Angela Guerrero a.guerrero@uq.edu.au

Reference

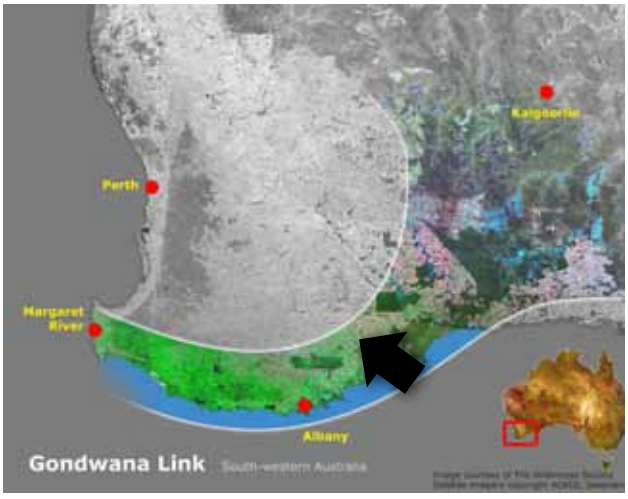
Guerrero AM, RRJ McAllister & KA Wilson (2014). Achieving cross-scale collaboration for large scale conservation initiatives. *Conservation Letters* http://dx.doi.org/10.1111/conl.12112

The Fitz-Stirling

Our case study region is referred to as the Fitz-Stirling. It's situated in Western Australia in one of the world's 34 global biodiversity hotspots. This region is part of the Gondwana Link large-scale conservation initiative, which aims to restore ecological connectivity across over 1,000 kilometers in south-western Australia. The Fitz-Stirling covers over 240,000 hectares. It is bounded by two of the largest areas of intact natural habitats that remain in the broader hotspot – the Fitzgerald River National Park and the Stirling Range National Parks (the Stirling Ranges are pictured above in the background). The area between these national parks (indicated below with an arrow) consist mostly of private farm land (cropping and sheep grazing) with scattered remnants of vegetation.

Conservation efforts over such a large area involves the efforts of different groups, land owned by different people and multiple levels of governance. Understanding the nature of the social networks that operate over multiple scales could prove crucial to the conservation outcomes that everyone is working towards.

The Environmental Decisions Group has collaborated in a number of projects with various stakeholders involved in Gondwana Link. For a summary of this research, see *Decision Point #73*.



One small crop or two large pastures?

How the impact of land use on forest fragmentation varies with spatial scale

By Lorenzo Cattarino, Clive McAlpine & Jonathan Rhodes (Uni of Qld)

The fragmentation of forest ecosystems is a major cause of species extinction. Fragmentation is the process by which forest cover is broken apart into smaller fragments (as opposed to the loss of the total amount of forest). It's caused by human activities such as agricultural expansion and intensification, logging and urban development. Different land uses can create different patterns of fragmentation at different scales (see the box 'Scales of fragmentation'). This is important because it has been shown that forest fragmentation at different scales can have different impacts on biodiversity (see the box 'Fragmentation and biodiversity').

A key step in developing appropriate conservation strategies to reduce fragmentation involves identifying the drivers of fragmentation at different scales. For instance, better farm management can be employed to reduce fine-scale fragmentation, while the elimination of subsidies for large-scale clearing could be more suited to target coarse-scale fragmentation.

Determining drivers of fragmentation

How do you know which land use is responsible for fragmentation at each scale? To answer this question, we need to determine how the impact of different land uses on fragmentation varies with spatial scale. That is exactly what we did using Queensland as a case study.

"If you are focusing on fragmentation across multiple agricultural fields or small properties, to protect wide-ranging species, our study suggests that your top priority should be to revegetate or keep standing trees in land modified by grazing rather than cropping."

Pasture land in the Brigalow Belt. (Photo by Leonie Seabrook)

We first decided to focus on cropping and grazing land uses as they are the major drivers of native vegetation clearing in Queensland. We expected the influence of cropping and grazing on forest fragmentation to be different at different scales.

Second, we measured fragmentation across a range of spatial scales in a sample of 5,309 landscapes (with a total of around 50

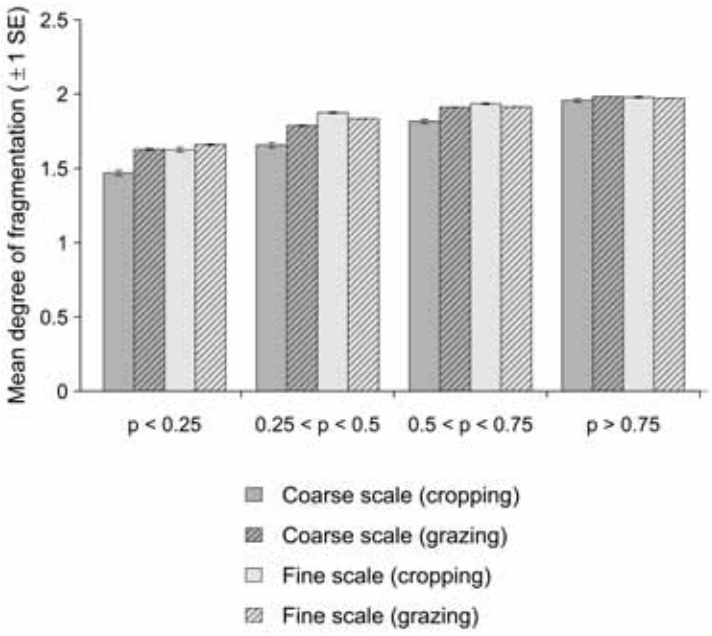
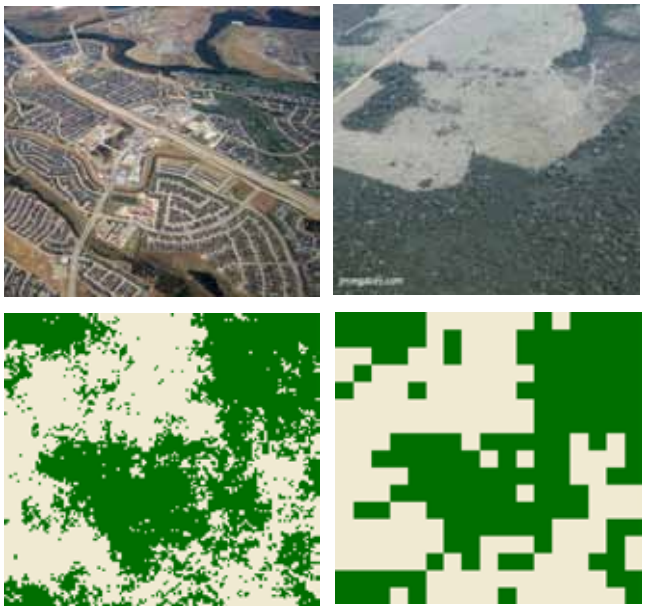


Figure 1. Bar chart showing the average degree of coarse-scale and fine-scale fragmentation (± 1 Standard Error), in landscapes with different dominant land uses, for different amounts of forest cover (p). The term 'cropping' indicates landscapes with a higher proportion of cropping land use than grazing land use, and vice versa for 'grazing'.

Scales of fragmentation

The scale at which forest fragmentation occurs can be roughly thought of as the size of the fragments in which the forest is subdivided. For example, urban development tends to break the forest into small patches (fine scale) while clearing of native vegetation for large-scale farming usually fragments the forest in to larger patches of vegetation (coarse scale).

fine-scale fragmentation **coarse-scale fragmentation**



km2). To do this, we borrowed a technique from fractal geometry. This allowed us to detect whether different spatial arrangements of forest patches occurred simultaneously at different scales in the same landscape. We discovered that the spatial arrangement of patches in the landscapes changed at approximately the 1 km^2 scale. This is comparable to the average size of an agricultural field in Queensland.

Next we quantified how fragmentation at fine scales (below 1 km^2) and coarse scales (above 1 km^2) varied as a function of the proportion of land in the landscapes occupied by crops and the proportion of land occupied by grazing pasture.

We found a scale-dependent effect of land use on forest fragmentation. At coarser scales, forest was more fragmented in landscapes with a higher proportion of grazed land than cropping land, while at finer scales the difference was much smaller (Figure 1). This suggests that grazing drives coarse-scale fragmentation more than cropping.

Our finding is consistent with the fact that, across multiple agricultural properties, vegetation tends to be more clumped as a result of clearing being clustered around areas of high soil fertility. On the other hand, vegetation is usually more fragmented across grazing proprieties, where soil fertility is a less important driver of clearing.

Targetting different drivers

Why would you be interested in this finding? Because it tells you which land use you should invest money in to develop conservation measures to reduce fragmentation at particular scales. If you are focusing on fragmentation across multiple agricultural fields or small properties, to protect wide-ranging species, our study suggests that your top priority should be to revegetate or keep standing trees

Cropping in the Brigalow Belt. (Photo by David Salt).

in land modified by grazing rather than cropping. This could be achieved, for example, by targeting Payment for Ecosystem Services (or PES) to grazed land rather than cropped land.

On the other hand, if you are focusing on fragmentation within an individual agricultural field to conserve species that move more locally, the choice of land use to target with conservation actions is less important.

Thanks to our finding, matching the scale at which fragmentation is managed with scales relevant to the ecology of species or land management is going to be considerably easier.

More info: Lorenzo Cattarino l.cattarino@griffith.edu.au

Reference

Cattarino L, CA McAlpine & JR Rhodes (2014). Land-use drivers of forest fragmentation vary with spatial scale. *Global Ecology and Biogeography* DOI: 10.1111/geb.12187

Fragmentation and biodiversity

In fragmented landscapes, animals have to spend a lot of energy moving between patches. This raises the chances of them starving or being eaten. But, do animals have to move more when fragmentation occurs at fine or coarser scales? This is critical to determine at which scale we should manage habitat fragmentation. To answer this question, Lorenzo Cattarino and colleagues from UQ conducted computer simulations on artificial landscapes (Cattarino et al 2013). They found that, as habitat declines, fragmentation at fine scales forces animals to move more than fragmentation at coarse scales, particularly in those species that naturally move short distances. Species moving larger distances are more affected by coarse-scale fragmentation, but to a smaller extent. So, at which scale should we manage fragmentation? The answer depends on the species you want to conserve.

Reference

Cattarino L, CA McAlpine & JR Rhodes. (2013) The consequences of interactions between dispersal distance and resolution of habitat clustering for dispersal success. *Landscape Ecology* 28:1321-1334.

Mapping biodiversity priorities in the Brigalow

Managing impacts on biodiversity in the Brigalow Belt

*By Rocio Ponce-Reyes, Tara Martin, Martine Maron, Stuart Whitten and Josie Carwardine**

*(*The authors are all from CSIRO, except Martine Maron who is based at the University of Queensland.)*

Biodiversity faces a range of threats in our farming regions. And now there's a new threat emerging in the form of an expanding Coal Seam Gas (CSG) industry (see the box on CSG). The threat posed by CSG operations isn't simply one additional challenge to factor in because it interacts with all the other pressures being experienced by biodiversity in agricultural landscapes. Which threats should decision makers be paying particular attention to? Which management strategies should be applied? There's considerable uncertainty around these questions which is why CSIRO is working with researchers from the University of Queensland to map the biodiversity management priorities in Queensland's Brigalow Belt, an agricultural region rich in CSG resources.

In Australia, the Bowen and Surat basins in the Queensland's Brigalow Belt bioregion (Figure 1) have been identified as large repositories of CSG. It's believed almost two thirds of Australia's CSG reserves lie here. The Brigalow Belt is also one of Australia's most ecologically transformed areas. It has been subjected to broad scale clearing of native vegetation since the mid 1800s, largely to support the pastoral industry and agriculture.

The Brigalow Belt bioregion is of great importance in terms of its biodiversity. Within its area 147 threatened species and 100 ecological communities listed as threatened at the state level can be found. As much of the Brigalow Belt region is private land, it has been already heavily cleared and fragmented. Limited vegetation remnants are found on its more fertile soils. Therefore we require additional approaches for improving the long-term persistence of biodiversity through managing threats across tenure boundaries.

Current conservation efforts in the region are limited and restoration has proved insufficient to maintain biodiversity values in the face of increasing threats like vegetation clearing. The emergence and expansion of CSG into many farming regions will compound existing threats and also bring new ones to the regional biodiversity. What should we be worried about and where should we prioritise our management?

What we need is a prioritised set of threat management strategies to assist decision makers in allocating scarce resources to conserving biodiversity. To assist with this decision analysis, some useful datasets exist. Unfortunately a complete set of empirical data for making informed decisions for the Brigalow is still unavailable. This creates challenges for decision-making in the region.

Identifying the status of biodiversity and its key threats in an area is the first step to developing a cost-effective management plan that could improve the persistence of species. The next step is for scientists

Figure 1: Map of the Bowen and Surat basins overlapped by the Brigalow Belt bioregion and the APLNG Tenements.

> "Actions will be parameterised with costs, likely benefits and feasibility estimates, allowing their ecological cost-effectiveness to be ranked."

Priority threat management

Similar exercises combining expert elicitation and cost-effectiveness analysis have been undertaken to map priority threat management in three of Australia's most significant regions in terms of biodiversity: the Kimberley, the Lake Eyre Basin and the Pilbara. Follow the links below to find out how valuable this process can be.

- **The Kimberley** see *Decision Point #47*
- **The Lake Eyre Basin** see *Decision Point #75*
- **The Pilbara** see the editorial in *The Conversation*

to investigate the major threats and potential management actions needed, in order to prioritise those actions based on their cost-effectiveness in mitigating threats. Prioritisation can be done using a species or an ecosystem approach or a combination of both, depending on the conservation objective, threats and available resources.

At CSIRO, in collaboration with the University of Queensland, we are currently working on a project that will analyse threat management priorities for improving the persistence of biodiversity in the Brigalow Belt region of Queensland. In this project we will bring together the best available scientific information and expert knowledge on the Brigalow Belt in order to identify the most important threats to biodiversity in the region and the actions to abate them.

Actions will be parameterised with costs, likely benefits and feasibility estimates, allowing their ecological cost-effectiveness to be ranked. Cost-effectiveness analyses enable comparisons of a range of management actions that will improve the persistence of biodiversity. With this project we will provide, for the first time, a region-wide analysis of alternative actions for managing threats to the biodiversity of the Brigalow Belt. And this analysis will include threats posed by CSG development.

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This research is funded by the Gas Industry Social and Environmental Research Alliance (GISERA). GISERA is a collaborative vehicle established to undertake publicly-reported research addressing the socio-economic and environmental impacts of Australia's natural gas industries. For more details about GISERA visit www.gisera.org.au

CSG

CSG is a form of natural gas extracted from coal seams at depths of 300-1000 metres. It is mostly made up of methane (95-97%) but contains a mixture of other gases as well. While the impacts of CSG extraction on terrestrial biodiversity have not yet been formally identified, the infrastructure required to support the extraction and transport of CSG is extensive. It consists of wells, pumping stations, storage stations, roads, railway networks and ports.

Pine fiction

Measuring connectivity in plantations

By Alessio Mortelliti (Australian National University)

Forest plantations are everywhere. You'll find them in almost every vegetated country in the world. They cover a surprisingly large portion of our planet – some 260 million hectares, corresponding to 7% of global forest cover. And their size is increasing at an impressive rate: according to the Food and Agriculture Organization every year an area roughly equivalent to the size of Switzerland (around 5 million hectares) is converted to planted forest. It is estimated that by 2020 planted forest will cover 300 million hectares, which is equivalent to half the size of the Amazonian rainforest.

Why are we converting such a large area of the planet to this 'artificial biome'? There are two main reasons: an increasing demand for wood used for timber and paper, and the need to sequester carbon to mitigate global warming.

Despite the considerable amount of research that has been conducted on the impact of plantations on biodiversity, there is little agreement on whether plantations are a 'biological desert', or a 'lesser evil' compared to agricultural land. As a consequence, landscape managers have a confusing body of empirical evidence to support their decision-making on whether or not to convert agricultural land to plantations. Considering the extremely large areas of the planet that are converted to planted forest each year and the parlous state of our biodiversity, this is far from an academic question. Our study sought to bring some clarity on the topic.

Our analyses were based on data from the 'Nanangroe experiment', one of the largest landscape transformation experiments ever established (managed by David Lindenmayer's research group since 1998). It involves monitoring changes to fauna inhabiting woodland remnants set in a grazing landscape as that landscape is converted to a massive pine plantation.

The setup of the Nanangroe experiment is very simple: bird populations inhabiting 50 treatment Eucalyptus patches (ie, patches that are surrounded by pine plantations) are compared to 50 control Eucalyptus forest patches (patches surrounded by grazed fields). A key feature of this experiment is that the habitat within the Eucalyptus patches has remained unchanged in control and treatment sites, while the 'matrix' surrounding the treatment patches was transformed. It is thus possible to focus on the impact of pine plantation with limited background noise from other confounding factors.

In our study we focused on the connectivity between populations (ie, on the flow of dispersers and immigrants between populations in the patches of woodland remnants). Population connectivity is a key ecological parameter; however, estimating it directly is an extremely difficult task which becomes prohibitive when working on many species. In this study we adopted a novel approach to estimate connectivity. We quantified it by measuring the synchrony in abundance between populations (ie, the coincidental changes of population density over time) over 15 years.

Our results are surprising; especially if, like many people, you believe that trees in the landscape make it easier for birds to get around. What we found is that pine plantations did not increase connectivity for any of the 52 bird species examined. The pine plantations acted as a barrier for four species, whereas for the remaining 48 species the effect of pine plantations was neutral (ie, it did not significantly affect the connectivity between populations).

> "Pine plantations did not increase connectivity for any of the 52 bird species examined."

A patch of remnant woodland in a sea of pines. New research is suggesting the pine trees do not facilitate the movement of birds from patch to patch.

The implications of our findings for landscape management are clear. The conversion of agricultural areas to plantation forestry is unlikely to promote substantial movement of individuals. Therefore, we strongly suggest that expansion of pine plantations should not be promoted in the belief that it may provide increased connectivity for birds compared with an agricultural matrix.

More info: Alessio Mortelliti alessio.mortelliti@anu.edu.au

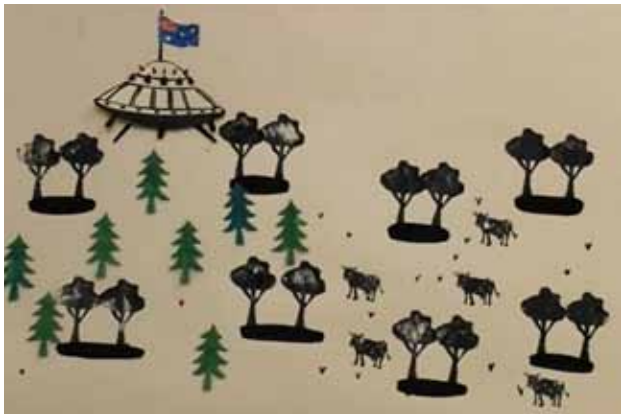
Reference

Mortelliti A, MJ Westgate & DB Lindenmayer (2014). Experimental evaluation shows limited influence of pine plantations on the connectivity of highly fragmented bird populations. *Journal of Applied Ecology*. doi: 10.1111/1365-2664.12313

See the movie

The science in Mortelliti et al, 2014, was the inspiration for an award-winning stop animation video produced by Alessio and Christina Thwaites. You can see their 3 minute, 52 second extravaganza at the Environmental Decisions Group YouTube Channel.

http://www.edg.org.au/edg-youtube.html



Evaluating bang for buck

What is the return on our investments in environmental projects?

By David Pannell (University of Western Australia)

I spy an outcome

To highlight the many contributions our research is making towards conservation outcomes, Decision Point is running a series of short stories on what we have achieved. In this instalment David Pannell talks about new tools and frameworks for evaluating environmental projects in terms of value for money.

In most countries, including Australia, funding for public environmental programs is very small relative to the number and scale of environmental problems. How do we generate the most valuable environmental outcomes from public investment in environmental programs? Decisions on how to achieve this are very challenging, requiring integration of ecological, physical, social and economic information. To assist with this, the NERP-Environmental Decisions Hub has clarified key principles and developed new models and frameworks that are being widely used by environmental managers.

Achievements include providing detailed advice on assessing value for money to the Australian Government's Caring for our Country program, the Murray Darling Basin Authority, and the Commonwealth Environmental Water Holder (CEWH).

How do you assess value for money? Key principles were outlined though a series of articles I wrote throughout 2013 as blogs (to download a compendium of these 20 blog posts on ranking environment projects, please visit http://purl.umn.edu/156482). Feedback on these guiding stories from the Department of the Environment was very positive. The insights and principles I set out in this series are embedded in tools that are currently being used to assist two regional NRM bodies from the Great Barrier Reef catchment to develop their new Water Quality Improvement Plans.

A key tool in this space is the Investment Framework for Environmental Resources (INFFER), which has been used to some degree by around half of Australia's regional NRM bodies (Pannell et al., 2013). INFFER has helped regions develop more robust projects with stronger business cases, including clear assessment of their value for money.

INFFER team members assess proposed environmental projects with stakeholders in North Central Victoria. There's never enough money to fund everything so decision makers need to rank or prioritise the projects before them. Ranking projects is a relatively straightforward and logical process. Unfortunately, not many organisations or governments do it well. (Photo by Geoff Park)

Officers from the Department of Environment have also been involved in the application of INFFER to important environmental assets such as the Gippsland Lakes and Corner Inlet in Victoria, and the use of prescribed burning to reduce bushfire risks in Victoria. Future work will include improvements in the assessment of environmental values and behaviour change in INFFER.

New decision-making tools and conceptual frameworks from our research are being used by managers and policy agencies around Australia and internationally. Frameworks such as INFFER are changing the thinking of environmental managers and influencing the culture of decision-making to focus more on environmental outcomes.

More info: David Pannell david.pannell@uwa.edu.au

Reference

Pannell D, AM Roberts, G Park & J Alexander (2013). Designing a practical and rigorous framework for comprehensive evaluation and prioritisation of environmental projects. *Wildlife Research* 40: 126-133. http://dx.doi.org/10.1071/WR12072

A robust ranking

There are many ways that you can go wrong when putting together a formula to rank environmental projects, and unfortunately the quality of the results is quite sensitive to some of the common errors. Common important mistakes include: weighting and adding variables that should be multiplied; messing up the comparison of outcomes with versus without the project; omitting key benefits variables; ignoring costs; and measuring activity instead of environmental outcomes.

With a bit of theory, logic and commonsence it's relatively easy to avoid these problems. Indeed, it's simply a matter of being able to answer a relatively straight forward set of nine essential questions (which are listed on page 5). To see a discussion on how to answer those questions have a look at 'When ranking environmental projects' in *Decision Point #75*.

For a full detailed background on how you would approach answering those questions see the compendium of 20 blog posts I wrote on ranking environment projects at http://purl.umn.edu/156482

> "INFFER has helped regions develop more robust projects with stronger business cases, including clear assessment of their value for money."

How green is my (suburban) valley?

Managing the impacts of urban development on large trees

By Darren Le Roux and Philip Gibbons (ANU)

How green is my backyard? Three quarters of Australia's population lives in urban areas so for most of us our 'backyard' is an urban space. And most of our urban spaces aren't that wildlife friendly. In a study we undertook in Canberra (Le Roux et al., 2014a), urban green space supported fewer mature trees, tree hollows, dead trees, logs, shrubs and litter than adjacent nature reserves (Fig 1). Each of these features represents important habitat for native species of birds, bats and invertebrates. As long as these habitat resources are absent from our urban green spaces, then so too will much of our native wildlife. What's more, this wildlife will be pushed out of our growing urban areas.

As an example, iconic old eucalypts that are scattered through Australia's suburbs (most of which pre-date European settlement) provide many habitat resources for native wildlife, including hollows where birds, bats and possums nest or roost; large volumes of nectar that support many of our invertebrates, birds and mammals; large dead branches that fall to the ground and large ribbons or slabs of peeling bark under which many unique invertebrates live (and which subsequently support many birds and lizards). In fact, we found that a third of all native bird species in Canberra ONLY use large, mature eucalypts over 150 years old.

In contrast to conventional thinking that connectivity is critical for wildlife, we found that isolated large trees in urban areas support more species and individuals of birds than equivalent large trees in intact areas such as nature reserves. That is, removing a large tree in an urban area is more detrimental to biodiversity than removing a large tree from a nature reserve!

However, large old eucalypts have a bad reputation in urban areas: they have dropped their limbs on cars, houses and even people; they can have an expansive root system that destroy footpaths and drains; they block solar access; and they can represent a hazard in areas with high bushfire risk.

Large eucalypts are therefore often removed to make way for new suburbs, such as the example in Figure 2 where two thirds of the mature eucalypts were removed for a section of one of Canberra's northern suburbs.

And where eucalypts are planted in suburbs, they are rarely permitted to get to an age when they provide suitable habitat (eg, tree hollows) for many native species. For example, in the suburbs of Canberra, planted eucalypts are generally permitted to reach 60-80 years of age before they are removed. However, our research indicates that about one third of the bird species in Canberra will not use trees that are under 150 years old, and many eucalypts live for 500 years.

The combination of trees that pre-date European settlement coming to the end of their safe life and the early removal of planted trees, means that large, old eucalypts might become a thing of the past in our urban areas. We carried out some simulation modelling to find out what the future might hold (Le Roux et al. 2014b). This suggests that large, mature eucalypts could be lost completely from Canberra's suburbs in 115 years (Figure 3).

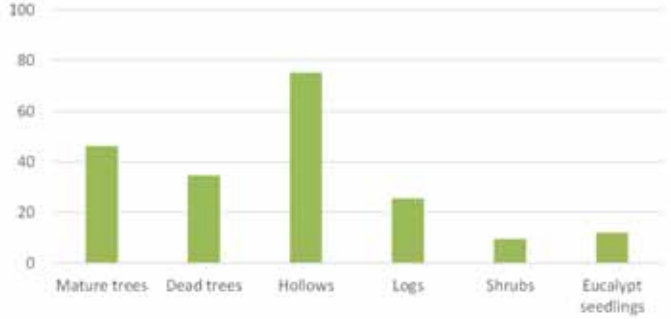


Figure 1. The frequency of habitat features in urban green space within the suburbs of Canberra, Australia, expressed as a percentage of their frequency in adjacent nature reserves.

Fig 2. Over two-thirds of the mature eucalypts at this site (left) were removed for this section of the new suburb of Gungahlin in Canberra (right) (Source: Google Earth).

Because eucalypts take a long time to form some critical habitat features (eg, hollows suitable for fauna typically occur only in trees greater than 120 years old), replacing large, old eucalypts is not simply a matter of planting a new tree.

A sensitivity analysis of our simulations indicated that the key variables that must be manipulated to reverse this decline of large eucalypts in urban areas is: (a) establish more young eucalypts in urban green space (b); extend the standing life of existing trees; and (c) increase the rate at which eucalypts develop habitat features such as hollows, logs on the ground, etc.

While these strategies—establishing more trees, extending the standing life of existing trees and increasing the rate at which eucalypts develop habitat features—will reduce the rate at which large, old eucalypts will decline in urban green space, no feasible combination of these will totally reverse a decline in large old eucalypts in Canberra's suburbs. Can we offset this loss in some other way? What about the use of nest boxes? We're currently examining these issues and hope to share with you what we've found in future issues of *Decision Point.*

More info: Darren Le Roux darren.leroux@anu.edu.au

Reference

Le Roux DS, K Ikin, DB Lindenmayer, W Blanchard, AD Manning & P Gibbons (2014). Reduced availability of habitat structures in urban landscapes: Implications for policy and practice. *Landscape and Urban Planning* 125: 57-64.

Le Roux DS, K Ikin, DB Lindenmayer, AD Manning & P Gibbons (2014). The Future of Large Old Trees in Urban Landscapes. *PLoS ONE* 9(6): e99403. doi:10.1371/journal.pone.0099403

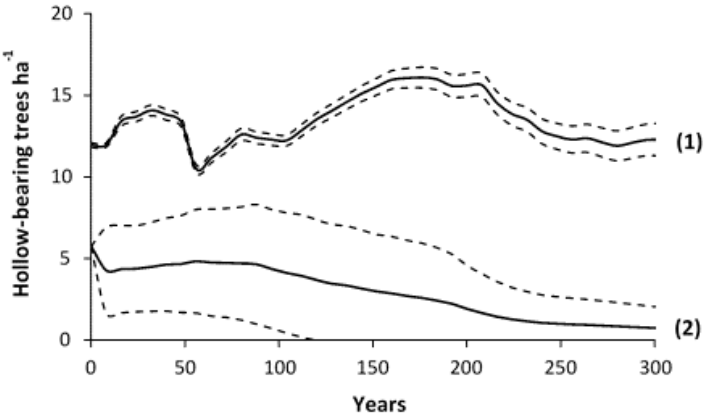


Figure 3. Using a simulation model populated with field data (Le Roux et al. 2014), we predicted that mature eucalypts (supporting tree hollows) are declining in the urban green spaces of Canberra (bottom solid line – 2) relative to the adjacent nature reserves (top solid line – 1). The dotted lines are 95% prediction intervals about the mean.

Halting cane toads in WA

A NERP workshop

(Broome, WA, May 2014)

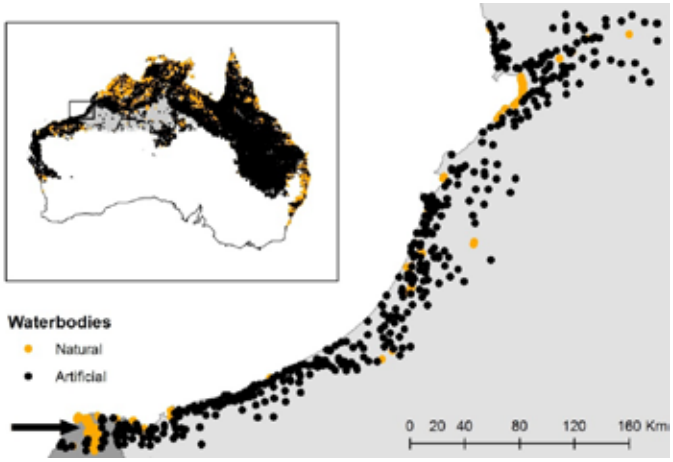
By Reid Tingley and Darren Southwell (University of Melbourne)

Cane toads have reached the Kimberley and there is no sign that their conquest is nearing completion. Their remorseless advance across the Top End makes it seem like they are invincible, but we believe that by exploiting the toads' inability to retain water, we might be able to control its spread. Few, if any toads can survive more than 10 days without water in the dry season. So, in very dry regions, we may be able to halt their spread by excluding them from permanent water sources. If we manage lots of water sources in the same area (eg, by fencing natural water bodies, or minimising leaks in tank and trough systems that provide water to cattle), we might be able to create a waterless barrier or 'firebreak' in the landscape that toads can't penetrate.

Now this sounds ambitious – where could we manage all permanent water bodies to create a waterless firebreak? Well it just so happens that toads will need to march south towards the Pilbara through an arid corridor where permanent natural water is in short supply. Artificial water points and natural springs dot the corridor, forming a thin strip of suitable toad habitat along the coast. The combination of landscape and climate makes this corridor a potential bottleneck (or choke point) in which to create a barrier.

But how effective might a barrier be at halting the spread of toads? We've modelled the way toads spread through this corridor by combining information on the biology of toads, their dispersal behaviour in response to rainfall, and the location of water points in the corridor (Tingley et al. 2013). We ran the model under a 'do nothing' scenario and then tested how many water points would have to be managed to halt toad spread. Given the distribution of water points, our preliminary modelling suggests that we would only need to manage around 100 water points to stop their spread. A barrier of this size in the right location would stop the invasion dead in its tracks, and prevent toads from occupying more than 260,000 km2 of their potential distribution in Western Australia.

So our modelling suggests that creating a waterless barrier might be a sensible strategy, but we wanted to ask pastoralists and people who know this region firsthand what they thought of the idea. After all, it's easy to 'pretend' to manage water points on a computer by simply deleting them! If this idea were ever to be implemented on the ground, we would want to be sure about the location of water points in the corridor, how easily we could exclude toads from those



Natural and artificial water bodies in the study area. The black arrow in the lower left-hand corner of the main figure shows the location of the De Grey River.

Cane toads can reach remarkable densities around dams, like this one at Auvergne Station, NT. (Photo courtesy of Ruchira Somaweera)

points, the willingness of stakeholders to participate, and of course, how much this all might cost. So, to get a handle on some of these questions, we travelled the entire length of the corridor and spoke to as many stakeholders as we could. Our trip was divided into two parts: a road trip and a workshop.

A road trip and a workshop

The first component of our trip involved talking to all of the pastoralists in the Kimberley-Pilbara corridor. We wanted to: 1) get feedback on the idea, 2) gain a better understanding of the landscape we're trying to model, and 3) improve the accuracy of our water point data. The configuration of water bodies will have a strong influence on how easily toads can disperse, so it's important to get this information right. As a result, we spent a considerable amount of time chatting with pastoralists about the locations of artificial water points (dams, tanks and wells), as well as natural water points such as perennial springs.

To help us work on the feasibility, practicalities and costs associated with stopping the spread of toads, we travelled to Broome to speak with people who know the country and the reality of getting things done. The goals of the workshop were to go back to square one and consider all possible actions we could employ to halt the spread of toads, to acquire further feedback on the feasibility of a waterless barrier in the Kimberley-Pilbara corridor, and to discuss trade-offs

Many Australian frogs, such as this desert spadefoot that we found on our road trip, are capable of burrowing when times get tough. But cane toads lack such adaptations for an arid existence.

Reid Tingley discusses the feasibility of stopping the spread of toads at a workshop in Broome.

> "Our preliminary modelling suggests that we would only need to manage around 100 water points to stop their spread. A barrier of this size in the right location would stop the invasion dead in its tracks."

between different goals for landscape management, and between alternative management actions for stopping toads. In the end, a wide range of stakeholder groups attended, including academics, NGOs, indigenous groups, and employees from several state and federal government departments.

Outcomes

Overall, the road trip and workshop were a great success. We received positive feedback about the idea of a waterless firebreak to halt the spread of toads and now have a better understanding of the landscape we're trying to model. However, perhaps the most promising aspect of the discussions was the realisation that a waterless barrier might create numerous opportunities for 'win-win' situations among environmentalists, pastoralists and indigenous communities. For example, this idea could present an opportunity to improve infrastructure and water usage on pastoral stations, while implementing and monitoring a barrier could provide potential employment opportunities for indigenous ranger groups in the area. We also managed to raise awareness of our work through several media interviews.

Now that the workshop is behind us, there is plenty of work to do. The first step is to refine our maps of water bodies and tighten up the modelling. Clearly, if we ever decided to spend large amounts of money implementing this project, we'd want to be confident in the models' ability to make reliable predictions. Then over the next 6 months, we'll use the model to estimate how much a project like this might cost, find the most cost-effective location for a barrier, and test how robust our decisions are to various sources of uncertainty.

So watch this space! There's plenty of exciting work to come!

More info: Reid Tingly reid.tingley@unimelb.edu.au

Reference

Tingley R, BL Phillips, M Letnic, GP Brown, R Shine &SJE Baird (2013). Identifying optimal barriers to halt the invasion of cane toads *Rhinella marina* in arid Australia. *Journal of Applied Ecology* 50: 129-137.

Dbytes

Dbytes is EDG's internal eNewsletter. It gets sent to members and associates of EDG each week, and consists of small snippets of information relating to environmental decision making. They might be government documents, research articles, blogs or reports from other research groups. Here are six bytes from recent issues. If you would like to receive the *Dbytes* eNewsletter, email David.Salt@anu.edu.au

1. National strategy for ecosystem science

Foundations for the future: a long-term plan for Australian ecosystem science aims to ensure that Australia's managed and natural ecosystems will be in as good a shape in 2035 to support the industries, native wildlife, landscapes and community wellbeing as they are today.

http://www.ecosystemscienceplan.org.au/

2. Land Account Estimates for the GBR

As part of its work in developing an integrated set of environmental accounts, the ABS has released Experimental Land Account Estimates for the Great Barrier Reef Region and its associated five NRM areas. This information is the first of its kind in Australia and attempts to quantify changes to land value, land use and land cover between 2009 and 2013 using existing data.

http://www.abs.gov.au/AUSSTATS/abs@.nsf/Lookup/4609.0.55.001Main+Features12014?OpenDocument

3. Biodiversity: Science & Solutions for Australia

A new eBook from CSIRO. It provides the latest scientific knowledge on Australia's biodiversity. The book describes the unique features of Australia's species and focuses on solutions for the future.

http://www.csiro.au/biodiversitybook

4. Land Management & Farming in Australia

The ABS issued 'Land Management and Farming in Australia, 2012-13'.

http://www.abs.gov.au/ausstats/abs@.nsf/latestProducts/4627.0Media%20Release12012-13

5. Australia's Best Ecology Blogs

Ian Lunt from Charles Sturt University has started a Facebook page which includes lots of blog posts from members of the Environmental Decision Group, including staff and students at Uni Melb, ANU and UQ, plus many others. The goal is to widen the audience for great popular science writing by ecologists and conservation scientists.

https://www.facebook.com/Best.Ecology.Blogs

6. Environment in national strategic thinking

This publication is the report of a forum - Considering the environment in national strategic thinking – sponsored by the Department of Agriculture, Australia21 and the Crawford School of Public Policy, Australian National University held in November 2013.

http://www.australia21.org.au/publication-archive/considering-the-environment-in-national-strategic-thinking/#.U-AsM02KBaT

Toad barrier

Earth dams (like the one in the photo on the left taken by Michael Letnic) have facilitated the spread of cane toads throughout arid regions of Australia. The water in this dam was pumped from underground by a mechanical bore, but toads were unable to access the water due to a fence along the dam perimeter.

Permanently excluding toads from such water sources would require more rigid fencing or converting dams to tanks, but new research suggests that this strategy may be our best hope for halting the cane toad's advance in naturally arid areas. Unlike our native Australian frogs, the toads don't have physiological adaptations that allow them to go without water for months at a time. Toads, particularly in dry country, need to rehydrate every 3-5 days. Without a source of water in the dry season, few, if any toads can survive more than 10 days. So, if we exclude toads from lots of water sources in the same area, we might be able to create a waterless barrier or 'firebreak' in the landscape that toads can't penetrate.

See our story on page 14 to find out how this idea is being developed in Western Australia.

What's the point?

How much native habitat is enough?

The question for farm and landscape planning is: 'How much intensive production can take place without excluding most native species from the landscape?' Roughly speaking, if any land use that largely excludes native biodiversity (eg, crops, plantations, fertilised pastures) covers less than one-third of the landscape, it is unlikely to lead to the disappearance of native plants and animals. Obviously the activities in the other two-thirds of the landscape are important in determining exactly which species thrive and which do not. Based on a review of the evidence, scientists have developed suggestions for the relative balance of different land uses across a landscape, known as the 10:20:40:30 guidelines. This proposes a suggested proportion of landscape use: 10 = over 10% under native vegetation and managed for conservation; 20 = over 20% under native vegetation but used for production purposes; 40= 40% used for modertate intensity production; and 30 = 30% or less given over to high-intensity production.

Reference

Page 115 in Biodiversity: Science and Solutions for Australia, the new ebook from CSIRO; available free at http://www.csiro.au/biodiversitybook

ENVIRONMENTAL DECISIONS GROUP

The Environmental Decision Group (EDG) is a network of conservation researchers working on the science of effective decision making to better conserve biodiversity. Our members are largely based at the University of Queensland, the Australian National University, the University of Melbourne, the University of Western Australia, RMIT and CSIRO.

The EDG is jointly funded by the Australian Government's National Environmental Research Program and the Australian Research Council's Centre of Excellence program.

Decision Point is the monthly magazine of the EDG.
The funding of the research presented in this issue of *Decision Point*, like most research, comes from multiple sources and is identified in the original papers on which the stories are based (references are provided in each story). In terms of CEED and NERP ED, the research on metrics (p4,5) was supported by NERP; the work on the mapping social networks (p6,7) was supported by CEED and NERP; the fragmentation and scale research (p8,9) was supported by NERP and CEED; and the work on connectivity in pine plantations (p11) was supported by NERP and CEED; and the work on urban development and large trees was supported by NERP.

To contact the EDG please visit our websites at:
http://ceed.edu.au/ or http://www.nerpdecisions.edu.au/

National Environmental Research Program

ARC ceed Centre of Excellence for Environmental Decisions

Australian Government
Department of the Environment
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The University of Melbourne

RMIT UNIVERSITY

The University of Western Australia