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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://ceed.edu.au/dpoint-news/

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On the Point

What goes into a Decision Point?

How do you judge the validity of stories appearing in Decision Point? Some stories are clearly tied to peer-reviewed journal articles (eg, p6 and p11) but others appear to be straight opinion pieces (eg, p4 and p13). In this issue there’s a story on the State of the Environment Report (p9). Is that merely government propaganda?

The answer is that you should judge every story on its own merits. Decision Point is the magazine of the Environmental Decision Group but one of its aims is to act as a forum for the EDG and its many partners and associates.

Our slogan, carried on every cover, says ‘connecting conservation policy makers, researchers and practitioners’. ‘Connecting’, of course, is a two-way street and that means, where possible, we’ll also run stories from interested stakeholders; stories that our stakeholders want to share across the EDG network. In the past we’ve carried stories from TNC, Greening Australia, WWF, CSIRO, Australia Bush Heritage and many more. Some of these stories have been commentaries on specific bits of science, some of them have been more promotional (“here we are, and this is what we do”). We devoted all of issue #49 to decision making surrounding the Coral Triangle Initiative, most of which was not EDG work. We welcome contributions from all quarters.

In the end we aim for an engaging and informative mix of research news and views that will ultimately contribute to better environmental decision making at all levels. Where possible we supply links to further information and contacts if you want to pursue an issue. And then we leave it to you to make up your own minds as to whether a story is worth it or not.

And the SoE story on p9? As an overview of what it is and what it says, it’s not half bad.

David Salt
Editor, Decision Point
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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.

Decision Point is available free from: http://ceed.edu.au/dpoint-news/
Simple rules for complex invasive weeds

Designing practical rules for controlling invasive species is a challenging task for managers, particularly when species are long-lived, have complex life cycles and high dispersal capacities. Previous findings derived from plant matrix population analyses suggest that effective control of long-lived invaders may be achieved by focusing on killing adult plants. However, the cost-effectiveness of managing different life stages has not been evaluated.

This investigation illustrates the benefits of integrating matrix population models with decision theory in evaluating the largest infestation of mesquite (a leguminous weed) in Australia. Included in the model is the mesquite life cycle, different dispersal rates and control actions that target individuals at different life stages with varying costs, depending on the intensity of control effort. It then used stochastic dynamic programming to derive cost effective control strategies that minimize the cost of controlling the core infestation locally below a density threshold and the future cost of control arising from infestation of adjacent areas via seed dispersal.

The researchers then applied a sensitivity analysis to show that four robust management rules guide the allocation of resources between mesquite life stages for this infestation:

(i) When there is no seed dispersal, no action is required until density of adults exceeds the control threshold and then only control of adults is needed;
(ii) when there is seed dispersal, control strategy is dependent on knowledge of the density of adults and large juveniles and broad categories of dispersal rates only;
(iii) if density of adults is higher than density of large juveniles, controlling adults is most cost-effective;
(iv) if density of large juveniles is equal or higher than density of adults, management efforts should be spread between adults, large and to a lesser extent small juveniles, but never saplings.

The study shows that simple rules can be found for managing invasive plants with complex life cycles and high dispersal rates when population models are combined with decision theory. In the case of our mesquite population, focussing effort on controlling adults is not always the most cost-effective way to meet our management objective.

More info: jean-baptiste.pichancourt@csiro.au

Reference

Different dispersal abilities enable reef fish to coexist

The researchers in this study describe a unique and robust mechanism for coexistence: Species that differ only in their dispersal abilities can coexist if habitat patches are distributed at irregular distances. This mechanism creates complex patterns of coexistence that are robust to substantial environmental variability.

The Great Barrier Reef (GBR) is noted for its diversity of reef fish and its complex arrangement of reef habitat. This analysis demonstrates that it is different pelagic larval durations that are enabling fish species to stably coexist. Further, coexisting species on the GBR often dominate different subregions, defined primarily by cross-shelf position.

Interspecific differences in dispersal ability generate similar coexistence patterns when dispersal is influenced by larval behavior and variable oceanographic conditions.

Many marine and terrestrial ecosystems are characterized by patchy habitat distributions and contain coexisting species that have different dispersal abilities. This coexistence mechanism is therefore likely to have ecological relevance beyond reef fish.

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Reference

80% decline in koalas in SW Qld

In south-west Queensland, anecdotal reports have indicated koala populations have been significantly impacted by drought from 2001–2009. This study aimed to compare koala distribution and numbers in south-west Queensland in 2009 with pre-drought estimates from 1995–1997. It also sought to understand impacts that more frequent drought and heatwaves might have on koalas.

Community surveys and faecal pellet surveys were used to assess koala distribution. Population densities were estimated using the Faecal Standing Crop Method. From these densities, koala abundance in 10 habitat units was interpolated across the study region. Climate data and land clearing were examined as possible explanations for changes in koala distribution and numbers between the two time periods.

Although there was only a minor change in distribution, there was an 80% decline in koala numbers across the study region, from a mean population of 59,000 in 1995 to 11,600 in 2009. Most summers between 2002 and 2007 were hotter and drier than average.

Vegetation clearance was greatest in the eastern third of the study region, with the majority of clearing being in mixed eucalypt/acacia ecosystems and vegetation on elevated residuals.

Changes in the area of occupancy and numbers of koalas led the researchers to conclude that drought significantly reduced koala populations and that they contracted to critical riparian habitats. Land clearing in the eastern part of the region may reduce the ability of koalas to move between habitats.

The increase in hotter and drier conditions expected with climate change will adversely affect koala populations in south-west Queensland and may be similar in other wildlife species in arid and semiarid regions. The effect of climate change on trailing edge populations may interact with habitat loss and fragmentation to increase extinction risks.

Monitoring wildlife population dynamics at the margins of their geographic ranges will help to manage the impacts of climate change.

Reference
An elephant out of the box
Consider all the options and all the costs
By Don Driscoll (EDG, ANU)

When Professor David Bowman from the University of Tasmania published an opinion piece in *Nature* suggesting that we introduce elephants to Australia to control an invasive grass he really set the cat amongst the pigeons. There was a loud and ferocious response ridiculing the idea as not worthy of serious debate. And yet there is much in what Professor Bowman suggested that warrants reflection.

He makes two critical points with which most conservationists would agree. First, Australian ecosystems are in a severe state of degradation due to invasive plants and animals. Invasive species have wiped out much of Australia’s natural heritage, and they continue to destroy what we have left.

Second, because of this ongoing environmental catastrophe, we need to put all of the management options on the table to try to find ways of reducing the rate at which our biodiversity succumbs to the impacts of invasive alien species and other land-management dilemmas.

He is right. We should consider introducing elephants and rhinoceros to Australia. However, this should be weighed up alongside alternative approaches for dealing with the problem.

Let’s first consider the elephants and the objective of Gamba grass control. The problem here is that Gamba grass, introduced by the cattle industry, forms dense monocultures in tropical woodlands. Gamba grass can carry fires up to 25 times hotter than native grasslands which cooks woody shrubs and trees, completely changing the ecosystem (for example, everything that lived in trees…kaput). So exterminating Gamba grass is a good idea (though many in the cattle industry disagree).

It is past time to reconsider the standard approaches to fire management, to dingo management, and to invasive species.

At least as surely as cane toads eat cane beetles, elephants eat Gamba grass. In assessing the value of elephant introduction, we need to establish how effectively elephants would control the target weed. But elephants also eat leaves from woody plants, and love to push over trees (everything that lived in trees…kaput). Further, elephants have a tendency to roam, requiring expensive fences to protect local communities from being trampled by this bizarre approach to biocontrol.

However, the real question is whether all of those problems are worse and more expensive than other control methods. Gamba grass control, as detailed in the NT Government’s Weed Management Plan 2010, is not without its limitations; the control methods are labour-intensive, machinery and chemicals are expensive and the herbicides will have impacts on non-target species. And, as with the elephants, we need some data on how effectively spraying and slashing controls Gamba grass.

So, while a knee-jerk reaction to this out-of-the-box suggestion is that it is completely mad (it may yet prove to be), to decide if we should reject this idea, we have to discard our prejudices and look very carefully at the costs, the effectiveness, and the impacts on other societal objectives, compared with the other options for management that are available.

The same discarding of preconceptions and reconsidering all of the options using evidence is now needed in many of the land-management decisions that we make. Professor Bowman raises one of these: dingo culling.

Through the dogged research of Professor Chris Johnson over the past few years, we now know that culling dingos in our rangelands is counter-productive. Culling dingos leads to an increase in foxes and an increase in kangaroos. More foxes mean fewer native Australian mammals (goodbye Easter Bilby), and more kangaroos mean less grass for cattle and sheep producers. Dingo culling is the elephant-in-the-room in Australian rangelands. If dingo packs are allowed to establish, they keep away foxes to the benefit of bilbies and they control kangaroo numbers, to the benefit of other native plant species (and commercial productivity). Ironically, there is some evidence that dingo culling even leads to an increase in livestock attacks. This can happen when rogue dogs move through areas that are not defended by a resident pack.

Unfortunately, recent economic analyses failed to properly consider this full range of benefits, with the result that the status quo was reinforced.

Another area where elephants and rhinoceros are called for (metaphorically speaking) is in bushfire management in southern Australia. Here, the standard practice has been to burn extensive areas of bush with the expectation that such burning will help to prevent house loss during bushfires. Recently the Victorian Government set the arbitrary goal of annually burning five per cent of the forest estate as a response to the fires of January 2009. However, when you start gathering the evidence on the effectiveness of different management approaches, it quickly becomes apparent that widespread forest burning is not the solution to the protection of houses and lives during bushfires.
“It is time to put all of the options on the table (even ideas that might seem crazy at first), along with their costs, and the evidence for their effectiveness and their side-effects.”

Using data from the Victorian 2009 fires, Dr Phillip Gibbons showed that burning forest at large distances from a house had only a relatively small protective effect. In contrast vegetation within 40 metres had a much larger protective effect (see Decision Point #56). And this didn’t even consider the full range of out-of-the-box ideas; sprinkler systems, fire-resistant building designs, letting houses burn, then rebuilding them. The five per cent target of the Baillieu Government won’t protect houses, it costs a lot of money to implement and it has adverse impacts on biodiversity. This is the approach of a dinosaur when what we really need is an elephant!

It is past time to reconsider the standard approaches to fire management, to dingo management, and to invasive species. It is time to put all of the options on the table (even ideas that might seem crazy at first), along with their costs, and the evidence for their effectiveness and their side-effects. Then we can make informed, intelligent decisions that get the best possible outcome for a range of objectives.

This is an edited version of an editorial by Don that appeared on ABC website last month.
http://www.abc.net.au/environment/articles/2012/02/02/3421179.htm
If you’d like to see info on David Bowman’s original story visit

Just as out of the box

- Given that traditional approaches to conservation are demonstrably failing to slow or reverse current catastrophic declines in biodiversity, surely the world needs to consider and experiment with bolder and more adventurous strategies. The Environmental Decision Group prides itself on thinking outside of the box and, over time, has proposed a number of seemingly outrageous ideas.
- Indeed, in Decision Point #36, Hugh Possingham asked if conservation wasn’t altogether too conservative when it came to considering alternatives and proposed we consider stimulating adaptive radiation, rethinking our definition of weeds and attempt more aggressive early experimentation.
- What’s interesting to note is that, given a bit of analysis, many of the ideas that EDG has proposed have been shown to be winners. Consider the following five stories that have featured in past issues of Decision Point:
  - Should we sell our poorest performing nature reserves and invest the proceeds in better performing protected areas? Decision Point #41
  - Should we set up marine protected areas that move around? Decision Point #31
  - Should we bury parts of nature reserves in sugar to deplete soil nutrients in order to favour native shrubs and grasses? Decision Point #48
  - Should we protect endangered species with a special lotto fund? Decision Point #31
  - Should we monitor the state of Australia’s biodiversity with a national network of listening posts? Decision Point #44

You can read about all of these ideas by following the links or visiting the Decision Point archive at http://www.edg.org.au/decision-point.html
Bang, bang, bang… Climate change, habitat loss, invasive species, disease, pollution, and overexploitation are all having growing impacts on many species and ecosystems. Typically each impact is studied and managed in isolation but it is becoming increasingly clear that a single-stressor perspective is inadequate when biodiversity is threatened by multiple, co-occurring stressors. In a world first, EDG researchers have measured the relationship between current climate, climate-change and habitat loss on plants and animals on a global scale.

A team from UQ and CSIRO reviewed over 1300 studies of habitat loss and fragmentation around the world over the past two decades (see figure 1), and mapped the impacts on species against changing temperature and rainfall patterns. Our results, published recently in *Global Change Biology*, indicate that species in areas with high temperatures and where average rainfall has decreased over time will suffer greater impacts from habitat loss and fragmentation. With the exception of arthropods, all taxonomic groups (birds, plants, arthropods, mammals, amphibians and reptiles), showed a consistent interaction between current temperature and habitat loss. This is the first study to conduct a global terrestrial analysis of existing data to quantify and test for interacting effects between current climate, climatic change and habitat loss on biological populations.

The growth of human population has caused significant habitat degradation across the globe, primarily through agriculture and urban development. This alone has negatively impacted on many species. However, when combined with rises in temperature and reduced rainfall as a result of a changing climate, there could be catastrophic results for some populations. Serious declines are already a reality for many species.

Understanding the synergistic effects between climate change and other threatening processes has critical implications for our ability to support and incorporate climate change adaptation into policy and management. Strategies that don’t take into account the combined effects of habitat loss and a changing climate may be inefficient or, even worse, ineffective.

The findings from this investigation suggest drastic measures may be needed to preserve the world’s wildlife for future generations. Management strategies should focus on areas with warmer climates, especially those that are more susceptible to changes in precipitation. Existing measures against drought should also be intensified in order to reduce the negative interaction with climate change. This is especially the case in fragmented landscapes.

Where climate change interactions are expected to be relatively small and knowledge and capacity high, the best feasible option might be to continue what we are already doing. That is, building resilience in a system to climate change through strategies such as habitat restoration, and fire and grazing management while continuing to manage other stressors like invasive species. However, in areas where the effects of climate change and interactions are expected to be severe, our current suite of management actions...
“Management strategies should focus on areas with warmer climates, especially those that are more susceptible to changes in precipitation.”

may be ineffective. It may be appropriate in these cases to use a mixture of more proactive management strategies such as species translocation, engineering habitat to reduce impact of interactions, and even abandoning effort on saving species in one area in favour of other areas. Monitoring that informs management is thus essential to pre-emptively identify populations that may suffer decline, and to assess cost-effective and feasible management actions.

This study can be used to identify which areas are vulnerable in the future to biodiversity loss caused by habitat loss and climate change. Australia is a major target because not only do we have high maximum temperatures (consider figure 2), but places like the Wet Tropics in northern Queensland, the Carpentaria, south Western Australia, and even Tasmania have all suffered from decreased rainfall (figure 3).

More info: Chrystal Mantyka-Pringle c.mantykapringle@uq.edu.au

Reference


Figure 1: Criteria for how studies were selected for inclusion in the meta-analysis.

Figure 3: Map of precipitation change (Source: Hijmans et al, 2005.)
The State of the Environment reporting process is not without challenges. As Hugh Possingham pointed out in Decision Point #48: “Every five years there is a state of the environment report that laments the lack of consistent nation-wide biodiversity data.”

Readers of previous SoE reports will be fully aware that a lack of baseline environmental data is an ongoing issue. However, the reporting process has evolved over time and SoE 2011 breaks new ground in a number of important ways to establish a foundation for future reporting.

So, what’s new in 2011?

Effective environmental management requires adequate information.

Australia’s fourth SoE

In December 2011 Minister Tony Burke tabled Australia’s fourth national State of the Environment (SoE) report in Federal Parliament. Preparation of a national SoE report at five-yearly intervals is mandated under the terms of the Environment Protection and Biodiversity Conservation Act 1999. Each report is the work of independent experts supported by staff of the Federal Environment Department (presently Department of Sustainability, Environment, Water, Population and Communities, DSEWPaC).

‘Environment’ is defined broadly under the Act. The SoE report includes assessments across a wide range of biophysical and ecological elements of the environment. In addition to this it also covers social and cultural aspects of environmental issues.

In SoE 2011, the Australian environment is assessed at a national scale across nine themes - atmosphere, inland water, land, marine environment, Antarctic environment, biodiversity, heritage, built environment and coasts – each representing key biogeographic or conceptual aspects of the Australian environment.


“The report

For the first time in national environmental reporting, this assessment goes beyond a descriptive summary of evidence to include graded ‘report-card’ style assessments of environment condition and trends, pressures acting on the environment and the effectiveness of our management decisions. While relevant and comprehensive long-term datasets are in short supply, there is plenty of knowledge and expertise on environmental issues in Australia.

The independent authors of SoE 2011 brought together experts to establish consensus views on condition and trend where possible, and to identify areas with inadequate data and/or lack of consensus. Also new are discussions of the drivers of environmental change, resilience, risks, and future projections or ‘outlooks’. We hope that this approach will make it easier to document changes in the environment come the time of the next national SoE report in 2016.
Key findings

The full SoE 2011 report runs to a hefty 932 printed pages, and even this depth of coverage represents a simplification of the key issues, so it is difficult to succinctly summarise its conclusions. However, the report deals with the major causal factors influencing Australia’s environment and heritage, looks at the effectiveness of management responses and highlights the key issues relevant to the sustainability of Australia’s environment and heritage. It also identifies important gaps in our knowledge with the aims of improving our understanding and management of the environment and the SoE reporting process itself. The main findings are brought together in a Summary section within the main report – see http://www.environment.gov.au/soe/2011/report/key-findings.html

The Summary lists seventeen key findings (“Headlines”) drawn from the theme chapters:

• Our environment is a national issue requiring national leadership and action at all levels.
• Effective environmental management requires adequate information.
• Earth is warming, and it is likely that we are already seeing the effects of climate change in Australia. As the driest inhabitable continent, Australia is particularly vulnerable to climate change.
• Early action by Australia to reduce emissions and to deploy targeted adaptation strategies will be less costly than delayed action.
• Ambient air quality and air pollution management in Australia’s urban centres is generally good, but the impact of urban air quality on health is still a matter of serious concern.
• Pressures of past human activities and recent droughts are affecting our inland water systems.
• Meeting our water needs will be a critical challenge.
• Australia’s land environment is threatened by widespread pressures.
• Threats to our soil, including acidification, erosion and the loss of soil carbon, will increasingly affect Australia’s agriculture unless carefully managed.
• The overall condition of the Australian marine environment is good, but integrated management will be key to the future conservation of our oceans.
• The ocean climate is changing and we will need to adapt.
• The Antarctic environment is showing clear signs of climate change, which is likely to have profound effects on Antarctic species and ecosystems.
• Our unique biodiversity is in decline, and new approaches will be needed to prevent accelerating decline in many species.
• Our extraordinary and diverse natural and cultural heritage is currently in good condition, but is threatened by natural and human processes, and a lack of public sector resourcing.
• Australia’s built environment faces many pressures and consumes significant natural resources, though consumption may be slowing.
• Coastal regions bring together many of the issues affecting other parts of the environment, and coordinated management will be needed to mitigate pressures.
• Australians cannot afford to see themselves as separate from the environment.

Aims and objectives

The objective of State of the Environment reporting is to: “make relevant and useful information on the state of the Australian environment available to the Minister, the department and more broadly to support decisions about environmental policies and management at national and regional scales” and to “give the public access to accurate, up-to-date information on the state of the Australian environment.”

The basic aim is to increase awareness of the condition of Australia’s environment and the pressures on it, and to inform and improve environmental decision making.


“New approaches will be needed to prevent accelerating decline in many species.”

Four trends

Four trends in environmental management stand out over the past decade. The first is that the Australian Government has exerted stronger leadership on a number of important environmental issues, such as biodiversity conservation and water governance.

The second is that the Australian, and state and territory governments have given much greater emphasis to regional-scale environmental management, complementing the roles of different levels of government and of community-based organisations such as Landcare.

The third is the use by governments of an array of market-based mechanisms to complement regulation as a means of realising environmental goals.

Finally, Indigenous Australians have become more formally involved in the management of their land and sea country.

The readership of Decision Point represents an informed audience that we hope will make use of this report, as well as providing the sort of constructive criticism that will drive improvement in future reporting.

The psychology of searching for hard-to-find species
Base-rate neglect, inverse-probability fallacy and poor environmental decisions

By Terry Walshe (EDG, University of Melbourne)

Our big brains struggle to coherently combine probabilities. It’s something that’s been noted time and again in studies on how doctors interpret a medical diagnosis but it’s a basic problem whenever we are presented with information with several points of uncertainty (consider the blue cab / green cab problem on the right). And this is a big problem commonly encountered in environmental management whenever we have imperfect detection.

When can we declare successful eradication of a weed? Or when do we accept a species has gone extinct? What’s the chance a contagious disease is still present in an animal population, despite negative tests on a subset of individuals? If we allow development at a site, what’s the chance an endangered species is present even though it hasn’t been found in biological survey records? When acquiring land for conservation reserves, how confident are we that species of interest are actually captured by the reserve network? In the first four problems allude to the costs of false absences (and all species of interest are actually captured by the reserve network? And this is a big problem commonly encountered in environmental management whenever we have imperfect detection.

To illustrate this, consider the challenge of surveying for an endangered cryptic (hard-to-find) species at a site slated for development. Let’s say the chance of detecting the species, if in fact it is present, is 50% in any one survey and that six visits to the site fail to detect it. Then a probability of (0.5)^6 = 0.016 that all six surveys reporting absence is 4/(4 + 750) = 0.005 (or 0.5%). Note that this probability is conditioned by the first branch of the logic tree, using frequencies instead of probabilities (see figure 1). If we imagine 1,000 sites of comparable habitat, the species is expected to be present at 250. Of those, six surveys will detect the species at (1 – 0.016) × 250 = 246 sites.

Alternatives to relying on our intuition are application of Bayes Theorem or, equivalently, graphical capture of the problem in a logic tree, using frequencies instead of probabilities (see figure 1). If we imagine 1,000 sites of comparable habitat, the species is expected to be present at 250. Of those, six surveys will detect the species at (1 – 0.016) × 250 = 246 sites.

If the species is not detected, it’s either a false absence (4/1000) or a true absence (750/1000). The chance the species is actually present despite six surveys reporting absence is 4/(4 + 750) = 0.005 (or 0.5%). Note that this probability is conditioned by the first branch of the logic tree, using frequencies instead of probabilities (see figure 1). If we imagine 1,000 sites of comparable habitat, the species is expected to be present at 250. Of those, six surveys will detect the species at (1 – 0.016) × 250 = 246 sites.

The intuitive answer for many people is 1.6% (or something very close). But our big brains have let us down. The chance the species is not detected if in fact it is present is not equivalent to the chance the species is present if it is not detected. We’ve been duped by the inverse probability fallacy and base rate neglect.

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“The chance the species is not detected if in fact it is present is not equivalent to the chance the species is present if it is not detected.”

Blue Cab, Green Cab?
Two cab businesses operate in a city: the Blue Cab Company and the Green Cab Company. Eighty-five percent of the cabs in the city are Blue, and the remaining 15% are Green. A cab was involved in a hit-and-run accident at night. A witness later identified the cab as a Green cab. The court tested the witness’ ability to distinguish between Blue and Green cabs under night-time visibility conditions. It found that the witness was able to identify each colour correctly about 80% of the time, but confused it with the other colour 20% of the time.

What do you think are the chances that the errant cab was Green, as the witness claimed?
In her 1980 study, Maya Bar-Hillel asked this exact question and reported that the most common response (from 52 participants) was an answer of 80%. The correct answer, by the way, can be found using Bayes Theorem. The correct answer is 41%!

Similar studies on judging probabilities in the context of diagnosis of life-threatening diseases have come up with depressingly similar results*. Our big brains struggle to coherently combine probabilities. In this context we have a particular tendency to place undue emphasis on diagnostic reliability and ignore the relevance of the background information describing prevalence. Psychologists call it ‘base-rate neglect.’

[*EDG researcher Dave Pannell outlines the history of the same problem in medical diagnosis. See http://www.anneldiscussions.net/2011/12/201-reasoning-with-probabilities/]

Reference

Continued on page 11
If the species is especially cryptic such that you’re unlikely to detect it in any one visit, but the habitat is ideal, you need to revisit the site many times. If the habitat is poor and the species is easy to detect, a lesser effort is required."
The Biodiversity Fund
Enduring legacy or missed opportunity
By Emma Burns and David Lindenmayer (ANU)

We welcome the expenditure of almost a billion dollars over the next six years on biodiversity conservation. And we commend the Australian Government for making a commitment of ongoing investment to this Fund—a long-term approach to conservation funding our nation has sorely needed for a long time. However, our reading of the public documents associated with the Biodiversity Fund raise several concerns.

1. Definition, design and testability

The purpose of the Biodiversity Fund remains far from clear and to date there is limited evidence of strategic thinking on ‘how’ it might be best implemented. The press release, fact sheet, and guidelines give an impression that the Biodiversity Fund will solve all environmental problems but focus on none in particular. Supporting documents mention everything from unique species, resilience, climate change, carbon farming, carbon storage, pollution, ecosystem function, biodiversity and ecosystem services.

The objectives of the Biodiversity Fund are to:
- help maintain ecosystem function and increase ecosystem resilience to climate change.
- increase and improve the management of biodiverse carbon stores across the country.

But what will success look like? How will we complete measurements to determine if a targeted ecosystem and its ecological functions have been maintained or if a targeted ecosystem has increased its resilience to climate change? And how do you measure an increase and improvement in management of biodiverse carbon stores?

Given the objectives above, it will be important to target ecosystems strategically. However, there is no evidence that particular ecosystems will be targeted or whether there will be efforts to prioritise among ecosystems to achieve stated objectives. Instead, the aim is to have a spread of projects across Australia, in a diversity of vegetation types. It is mentioned frequently that activities should be in areas of ‘high conservation value’ - although it is not stated what these are.

2. Integration with existing science?

Some of the proposed initiatives within the Biodiversity Fund are currently not well supported by the existing science in conservation biology, restoration science or environmental management.

Our great concern is that ill-informed actions may undermine ecosystem function and even lead to accelerated biodiversity loss. Indeed, mis-guided planting programs can actually have negative impacts on the environment, for example, through promoting habitat for hyper-aggressive animals like the noisy miner which can in turn have negative impacts on other native birds. In essence, well meaning planting programs can lead to “bio-perversity” (Lindenmayer et al. 2011) – that is perverse outcomes for the environment from well-intentioned environmental programs.

“Guidelines give an impression that the Biodiversity Fund will solve all environmental problems but focus on none in particular.”

3. A need for monitoring

The Biodiversity Fund is characterized by a lack of robust monitoring. A paucity of effective monitoring lay at the core of the caustic criticism of the Natural Heritage Trust (Hajkowicz, 2009) and the spectacular failings of other large-scale and very expensive environmental programs like European agri-environment schemes and large-scale restoration initiatives in the USA.

Lindenmayer and Gibbons (2012) argue that the budget for monitoring should be 8-10% of a program budget and we see no reason why the Biodiversity Fund should be any different. Indeed, it has only been through targeted, fit-for-purpose monitoring that it has been possible to determine what makes a good planting in temperate woodland environments and what does not make a good planting.

For monitoring to be effective, the objectives of a program need to be clearly articulated and the purpose and on-ground actions tightly linked to these objectives. Monitoring and evaluation needs to go beyond high level program evaluation and must include a rigorous assessment of on-ground effectiveness of management interventions (Field et al. 2007; Lindenmayer & Gibbons 2012).
4. We aren’t learning from successful programs

The Biodiversity Fund has failed to learn from successful programs that have been developed and implemented by the Australian Government. For example, to date, an exemplar program has been the Environmental Stewardship Program (see http://www.nrm.gov.au/funding/stewardship/index.html) under which land managers are being paid to undertake strategically designed and scientifically informed conservation actions in targeted threatened ecological communities.

The Environmental Stewardship Program has a well defined objective and desired outcomes and has an evidence-based implementation and investment strategy where the biodiversity benefit of funds spent is estimated relative to the program’s objective. The program’s design and implementation is strongly linked to conservation science, and to date it has been supported by well designed monitoring to quantify the effectiveness of the program. These are critical features of effective and informed program design.

What does success look like?

We believe that the Biodiversity Fund needs a re-think. The Australian Government should consult widely and develop an evidence-based strategic plan and implementation plan. Some early key questions might include:

• If one wanted to create a truly effective fund for biodiversity conservation what should we do?
• How should we best target funding so that, for example, actions can have positive additive effects by strategically linking to other initiatives?

The Biodiversity Fund needs to map implementation back to objectives and a well articulated purpose, and in concert with this process, design a robust monitoring scheme. That way we will know what success should look like, we will have the capability to test effectiveness, and at a minimum we will be in a position to learn and adapt from the experience. ⚫

This is an edited version of an editorial by Emma and David that appeared on The Conversation last month. http://theconversation.edu.au/the-biodiversity-fund-another-missed-opportunity-4889

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“The Biodiversity Fund needs to map implementation back to objectives and a well articulated purpose, and in concert with this process, design a robust monitoring scheme.”

An enduring legacy?

If the fund is truly to create an enduring legacy for our Nation’s imperiled biodiversity, it needs to go well beyond ‘grants for plantings’ and consider how we can:

1. Secure the Travelling Stock Route network – this could mesh neatly with the National Wildfire Corridors Program and potentially have enormous benefit for biodiversity, particularly given that these critical areas are currently under significant threat of being sold or heavily grazed.

2. Better protect paddock trees in agricultural areas (which are undervalued and in a declining condition).

3. Encourage and educate land managers to cease destructive set stock grazing and other high-impact activities like the removal of bush rock, and fallen timber.

4. Better manage, in a coordinated and strategic way, known threats to native vegetation cover.

5. Better manage and expand the existing reserve system.

Clearly there are many other important initiatives to consider, and thought and time is needed to identify them. The conservation-biology community in Australia is known to be one of the best in the world and it is critical that the Australian Government harnesses the collective knowledge of that community to ensure the best return on taxpayer investment.

A stock route in NSW forms refuge for a woodland community. These critical areas are currently under significant threat of being sold or heavily grazed. If the Biodiversity Fund could protect and integrate these areas with other conservation strategies it might create an important and enduring legacy. (Photo by Pia Lentini)
Target 7: managing impacts of invasive species

By Anabel Lusk

The opportunity to work at ANU and DSEWPaC was eye-opening. It provided real life, real time insights, within an institutional context, on the complex process of science informing policy.

My project focused on investigating approaches for measuring progress towards Target 7 of Australia’s Biodiversity Conservation Strategy (ABCs) 2010-2030.

Target 7 is to reduce by 2015 the impacts of invasive species on threatened species and ecological communities, in terrestrial, aquatic and marine environments by at least 10%. Reporting on progress towards this target is expected in three years. Therefore it is vital that steps are taken now to ensure that a robust scientific framework for monitoring is in place to enable appropriate feedback.

My research explored the appropriate course of action for the implementation and monitoring of Target 7 of the ABCs. It draws from observations, literature review and the analysis of case studies. Analysis of existing Australian policies and the ABCs gave me an insight into if or how key terms are defined. I also undertook an international comparative study focusing on the European Union and the United States, which produced a number of examples of monitoring techniques that could be translated into an Australian context.

What does ‘impact’ mean?

My research highlights that it is imperative that the key terms and scope of the strategy are clearly defined. And this must occur prior to the establishment of comprehensive measurement tools needed to address Target 7. This will enable all those responsible for reporting progress on the target to operate from a position of common understanding.

It’s been acknowledged around the world that the lack of transparent definitions relating to invasion biology has been a contributing factor to the slow progress made in invasion ecology over recent decades. Decision makers and those implementing the strategy should also have a common understanding of what key terms mean in order to produce cohesive and effective outcomes.

While most of the terms in Target 7 are outlined in the ABCs glossary, an explicit definition of ‘impact’ is not provided. In order for measuring and monitoring processes to be effectively implemented for the purposes of addressing Target 7, it is imperative that the contextual meaning of ‘impact’ is precisely defined and understood.

Anabel (centre) presents her findings to a group at DSEWPaC. Prudence is on her left with the Director of SRIS, Dave Johnson, on her right. Anabel made the point that there appears to be little incentive to share information between the science and policy sectors.
A clash of cultures

It was a fascinating experience spending time as a researcher in both academic and governmental institutions. I developed a healthy respect for the difficulties surrounding the integration of science into specific policy issues. However, what I witnessed is just the tip of the iceberg. Feedback from discussions with policy makers and scientists suggest that the greatest limitations to strengthening the science-policy interface are embedded within the foundations and structures of both spheres, especially in relation to knowledge sharing.

There appears to be little incentive to share information between the sectors. This seemed to be particularly the case in the science sector, where emphasis is more on research publication rather than science-policy integration and collaboration. On the policy side, constraints relating to time and politics, amongst other things, limit the ability of decision makers to comprehensively explore academic perspectives.

Change requires the determination and commitment of people; in this context the heat should be on both the scientists and policy makers. My experiences working with people from both sectors were entirely positive. The policy makers I worked with at DSEWPaC were all extremely open and encouraging of developing science-policy collaboration. Academics at the ANU are similarly open to enhancing such collaborations. So, hopefully, where there’s a will there’s a way.

A complex and constrained process

Officers cannot necessarily use science in the way scientists may envisage that they do. All assessments occur within the framework of the EPBC Act, which undertakes assessments on a case-by-case basis and assesses developments on its' own merits. This has been flagged under a recent review (Hawke Review) of the Act as an area for possible reform.

When decisions were being taken in and around Mission Beach, they were being made on a case-by-case basis. As a result there has been significant fragmentation of habitat and increases in road traffic – two of the main contributing factors towards cassowary fatalities. It was important for me to realise early on that this is a reality of the process and that components such as economic certainty for industry are also valid things to consider.

Decisions on cassowary habitat

By Prudence Roberts

The issue of how science informs policy consumed me for the most part of this summer. My research project with the ANU and the DSEWPaC broadly looked at the role science plays in the decision making process, and used as a case study three specific decisions surrounding referrals for property developments in the Mission Beach area, Queensland. The referrals were made under the Environmental Protection and Biodiversity Conservation Act (EPBC Act) because the developments might impact on the habitat of the southern cassowary. The cassowary is a listed species under the EPBC Act and the Mission Beach population is estimated at less than 35 birds.

For most of the two months I was based within DSEWPaC. This meant sitting at a desk with assessment officers and witnessing the daily functions of the Queensland Assessment Section. I gained an appreciation of how the assessment process happens, and began to understand some of the contextual detail constraining the process, especially the limitations of statutory timeframes. I conducted literature reviews, read Recovery Plans, Significant Impact Guidelines, and referrals while asking what where the elements that made these decisions good examples of science informing decision making, and could these be easily reproduced.

Another important finding was that science was not being used in the way that I had been taught to use it. Coming from a science background, I learnt that I had to quickly change my definition of science. There was not so much scientific research being done (for example relying on peer reviewed papers) to inform the decisions. Instead, documents such as the internally produced Recovery Plan or the commissioned Habitat Linkages Report were heavily used to justify certain conditions incorporated into decisions. It appeared that the medium in which science was most present and being used was in these reports.

In the limited time available to carry out this summer project I was able to appreciate the broader context of how environmental decisions are made, and what possible avenues there are for science to play a greater role in the decision making process. The importance of a few key documents accessible to assessment officers should not be underestimated. These documents are informed by a number of different scientific papers and research. The staff responsible for such documents had scientific backgrounds and one in particular had done extensive research on the cassowary.

My time in DSEWPaC has been critical to my understanding of the reality of government intervention in biodiversity conservation. It’s been a valuable experience in shaping my own decisions in regard to future studies and fuelled my motivation to be involved in both the world of academia and government.
Research shows that when human beings make decisions, they tend to focus on what they are getting and forget about what we are forgoing. For example, people are more likely to buy an item when they are asked to choose between buying and not buying it than when they are asked to choose between buying the item and keeping their money “for other purchases”. Although “not buying” and “keeping one’s money” are the same thing, the latter phrase reminds people of something they know but typically fail to consider: buying one thing means not buying another.

So should we do everything in our power to stop global warming? To make sure terrorists don’t board aeroplanes? To keep Escherichia coli out of the food supply? These seem like simple questions with easy answers only because they describe what we will do without also describing what we won’t. When both are made explicit — should we keep hamburgers safe or aeroplanes safe? — these simple questions become vexing. Harm prevention often seems like a moral imperative, but because every yes entails a no, it is actually a practical choice.

How are we to make that choice? In the seventeenth century, Blaise Pascal and Pierre de Fermat derived the optimal strategy for betting on games of chance (see below), and in the process demonstrated that wise choices about harm prevention are always the product of two estimates: an estimate of odds (how likely is the harmful event?) and an estimate of consequences (how much harm will it cause?). If we know which harm is most likely and which harm is most severe, then we know which harm to prevent. We should spend less to prevent a natural disaster that will probably leave 3,000 people homeless than a communicable disease that will certainly leave 3 million people dead, and this is perfectly obvious to everyone.

**What’s the point?**

Getting vs forgoing

In 1654, Pascal wrote to de Fermat outlining a solution to the ‘unfinished game’ problem: how do you divide the pot when players are forced to end a game of dice before someone has won? From this idea the two men developed the method known today as probability theory. You can read about it in Keith Devlin’s book ‘The unfinished game’.