Connecting conservation policy makers, researchers and practitioners

Long-term monitoring
Is it informing our management of marine protected areas?

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Accounting for long-term costs in conservation planning

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
How do conservation NGOs influence policy?
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Lessons from CERF and NERP
Does better information save more koalas?
The long term

The long term is a strange place. We live in the here-and-now but the long term stretches out into the distant future. Most of it lies over our individual event horizons, and many of the choices we make today aren't taken with any consideration of what they mean for the long term.

Environmental decision science is all about bridging the gulf between the here-and-now and the long term. It attempts to factor in present day costs and benefits, while working out the consequences of today's choices on long term outcomes.

This issue of Decision Point examines a range of stories relating to long term conservation and the way we approach it. Up front we have Gwen Iacona reflecting on how the Tasmanian Land Conservancy plans for long-term management costs, something every conservation organisation should be doing (page 4).

On page 6 Melinda Moir and colleagues talk about the ingredients necessary to run a long term conservation collaboration, in this case one aimed at conserving invertebrates in WA's far south (which is a daunting prospect when you consider many of the inverts in this region haven't even been described).

On page 8 we have a special guest editorial from an overseas associate, Paul Armworth. Paul has reviewed the empirical evidence of the true costs of conservation management over time and finds some of the assumptions that have been made in the theory on this topic are somewhat off the mark.

Prue Addison and Carly Cook tell us we should be proud of some of the long-term monitoring we do in our marine protected areas, but that maybe we should be using this data a bit more in how we manage these areas (page 10).

And we continue our series on influencing policy (always a long-term challenge). In this instalment we hear a perspective from WWF campaigner Martin Taylor on the ingredients of big wins in conservation (page 12).

May your choices in the here-and-now prosper in the long term.

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Transdisciplinary research, involving close collaboration between researchers and the users of research, has been a feature of environmental problem solving for several decades, often spurred by the need to find negotiated outcomes to intractable problems. In 2005, the Australian Government allocated funding to its environment portfolio for public good research, which resulted in consecutive four-year programmes (Commonwealth Environmental Research Facilities, CERF, and National Environmental Research Program, NERP). In April 2014, representatives of the funders, researchers and research users associated with these programmes met to reflect on eight years of experience with these collaborative research models.

This structured reflection concluded that successful multi-institutional transdisciplinary research is necessarily a joint enterprise between funding agencies, researchers and the end users of research. The design and governance of research programmes need to explicitly recognise shared accountabilities among the participants, while respecting the different perspectives of each group.

Experience shows that traditional incentive systems for academic researchers, current trends in public sector management, and loose organisation of many end users, work against sustained transdisciplinary research on intractable problems, which require continuity and adaptive learning by all three parties. The likelihood of research influencing and improving environmental policy and management is maximised when researchers, funders and research users have shared goals; there is sufficient continuity of personnel to build trust and sustain dialogue throughout the research process from issue scoping to application of findings; and there is sufficient flexibility in the funding, structure and operation of transdisciplinary research initiatives to enable the enterprise to assimilate and respond to new knowledge and situations.

Reference

“Mutual trust, continuity of personnel and adaptive capacity are key success factors.”

Restoring jarrah forests in a time of climate change

Global climate change is projected to increase the frequency and intensity of drought in dry regions. Severe drought can trigger tree death and drive persistent vegetation change. To date, most empirical studies have focused on drought-induced mortality of adult trees, but this needs to be matched by similar efforts to understand drought impacts on seedling establishment if we are to understand the resilience of the world’s forests to projected climate change.

The Jarrah forest ecosystem of south-western Australia has experienced a 17% reduction in mean annual rainfall from 1975 to 2011. Drought-induced mortality of adult trees has been documented for Jarrah forest, but there is limited understanding of its capacity to recover, making it difficult to predict the likelihood of persistent effects. Long-term records of Jarrah-forest restoration following bauxite mining are available for the 19-year period between 1992 and 2010. Records include annual data on seedling establishment in restored mine sites for 587 species in 1938 plots during a period of climatic variability.

Rachel Standish and colleagues built a structural equation model to discriminate the relative effects of climate, restoration practice, and their interactive effects on three response variables including species richness of the restored plant assemblages. Climate variability had a significant negative effect on richness, but the effect size was relatively small, being less than half that of varying restoration practice. They suggest this is due, in part, to the reliability of rainfall (ie, no change in the coefficient of variation, seasonality or evenness, between recent and historical climates) despite a threefold difference in the absolute amount of wet-season rainfall. Importantly, there was no evidence that restoration practices were compromised by interacting effects of increased climate variability.

The researchers concluded that Jarrah-forest establishment in a restoration context appears resistant to recent changes in climate. Their research highlights the importance of deriving multiple metrics of climate change to understand community responses. In particular, rainfall reliability should be a focus of future research to determine its broader significance to seedling establishment in forests subject to a drying climate.

Reference

Does better information save more koalas?

Conservation decision-makers constantly face a trade-off between spending limited funds on direct management action (doing something), or gaining new information in an attempt to improve management performance in the future (improving our knowledge). Value-of-information analysis can help to resolve this trade-off by evaluating how much management performance could improve if new information was gained. Value-of-information analysis has been used extensively in other disciplines, but there are only a few examples where it has informed conservation planning, none of which have used it to evaluate the financial value of gaining new information.

We address this gap by applying value-of-information analysis to the management of a declining koala Phascolarctos cinereus population. Decision-makers responsible for managing this population face uncertainty about survival and fecundity rates, and how habitat cover affects mortality threats. The value of gaining new information about these uncertainties was calculated using a deterministic matrix model of the koala population to find the expected population growth rate if koala mortality threats were optimally managed under alternative model hypotheses, which represented the uncertainties faced by koala managers.

The researchers found that gaining new information about survival and fecundity rates and the effect of habitat cover on mortality threats will do little to improve koala management. Across a range of management budgets, no more than 1-7% of the budget should be spent on resolving these uncertainties. The value of information was low because optimal management decisions were not sensitive to the uncertainties they considered. Decisions were instead driven by a substantial difference in the cost efficiency of management actions. The value of information was up to forty times higher when the cost efficiencies of different koala management actions were similar.

The researchers demonstrated that the value of reducing uncertainty is highest when it is not clear which management action is the most cost efficient. This study will help expand the use of value-of-information analyses in conservation by providing a cost-efficiency metric by which to evaluate research or monitoring.

Reference

Editor’s note: For an engaging editorial by Sean Maxwell on the value-of-information analysis see Decision Point #67, p.9.
Planning for the long term costs of protected areas
The case of the Tasmanian Land Conservancy management endowment

By Gwen Iacona (UQld), Ian Hall (Tasmanian Land Conservancy) and Kerrie Wilson (UQld)

We often think of protected areas as pristine places that sustain rare and interesting species. It’s often true that an area is given protected status because it contains some natural value, like rare species, but what is frequently overlooked is the cost of sustaining those natural values over time.

The survival of those rare and interesting species, for example, often depends on ongoing human management. Activities such as prescribed burning, invasive species control, and patrolling for potential threats can be crucial for supporting the conservation benefit of protected areas. Yet, these activities all incur an expense, and the costs of managing protected areas over the long term can be substantial.

One organization that has a proactive approach to planning for long-term management costs is the Tasmanian Land Conservancy (TLC). The TLC has an objective to protect representative Tasmanian landscapes (such as the Five Rivers Reserve pictured on the right) in perpetuity. They have acknowledged that an ‘in perpetuity’ ideal requires an ability to abate threats and support species persistence in landscapes that have been fragmented by agriculture and forestry. Active management (including activities such as weed removal, see picture below) of these protected areas is therefore a necessity to ensure that desired conservation objectives are achieved. TLC has established a dedicated endowment that will cover operating expenses and enable the organization to focus its attention on conservation and management as opposed to fundraising. We sought to understand the approach TLC took to establish this fund and whether it was transferable to other protected area projects.

Costs over time

One of the challenges in planning for future management costs is determining what type of management is needed, both now and in the future, and how that cost will change through time. The TLC based their estimates on previous expenditures. All aspects of protected area management, including staff time and administrative overheads, were used to project the annual costs of management for each protected area.

However, past investment may not represent the ideal levels of expenditure. In response, TLC has implemented a detailed program to monitor the effectiveness of management. A long term conservation management and monitoring program is a critical component of their system and is overseen by a separate independent conservation council. This way, they can adapt management activities (and update cost estimates) if conservation objectives are not being achieved. Meanwhile, the cost of managing new protected areas is estimated by extrapolating from similar sites based on site level features such as size and community types as well as by using historic information provided by previous land owners and satellite imagery.

Once the likely annual expenditure for a site has been determined, enough money needs to be invested to provide this amount of income for the site every year. The TLC attains that goal by investing twenty times the annual cost of managing each site. This amount would pay for managing all the protected areas if there was a 5% return on the investment. However, they also want the amount of money available for managing the site to increase each year because the cost of a given management action is likely to be greater in
the future due to inflation. The TLC fund is held by a professional financial management service and currently provides a return of 7-8% per year. This is adequate to cover the management costs as well as price increases over time as estimated by the Consumer Price Index.

A conservation legacy

Once a target amount for the endowment has been identified, the next challenge is actually securing the money. In general it is easier to fund projects that are clearly valued by the general public. For instance, raising money for projects that protect charismatic species that people know and care about, such as protecting a forest of stunning, large trees, is easier than finding donors for a project protecting grasslands or spiders.

Funding management costs is a similar problem because it often is not obvious to the public that management of protected areas is necessary. The TLC contends that raising funds for a management endowment relies on educating potential donors about how protected area management is a legitimate cause that relates to the donor's values.

To this end, TLC has established endowments that allow donors to contribute to the fund and provide a conservation legacy in the name of a loved one. In the current fund, about 20% of the contributions are from named individual contributions, with the remainder coming from bequests, TLC raised funds, and several small and one large corporate endowment. The growth strategy for the capital fund is not from investment itself but from donations and bequests and other income not already budgeted.

The TLC fund for management, as of 2014, contains about AU$9 million with a target value of $12 million by 2017. This amount should be adequate to cover all the basic operating expenses (management plus overheads) for the 13 TLC protected areas covering a little over 13,000 hectares.

There is a strategy in place to allow for adaptive modification of the target amount as new protected areas are acquired. The current instructions for the financial management company is to withdraw one percent of the fund per quarter and deposit it into the TLC's general operations account. This simplifies the assessment of whether adequate return is being generated because they can just compare fund income with general operating expenses. TLC also has a private land conservation strategy that includes implementation of protective covenants as well as a land purchase, protection, and resale program, but the management of these temporary acquisitions is funded from different sources and not related to the endowment fund.

A strategy for the long term

Deciding how to fund protected areas management for the long term is the next big step in conservation planning. Based on TLC's experience, we suggest a strategy for establishing an endowment fund (Figure 1):

1. **Estimate costs:** Carefully estimate current annual management costs for each protected area, including staff time, materials, and overheads. Use existing knowledge, extrapolation from similar protected areas, and expert opinion to generate the best possible estimate of optimal management needs.

2. **Establish an endowment:** Establish an endowment that has sufficient principle and return to provide enough income to cover the annual expenses for each protected area while adjusting for inflation. This may involve new fundraising strategies to convince donors that such a fund is valuable.

3. **Establish a process that takes into account change:** Provide a mechanism for adjusting the fund for risk and for changes in management cost estimates over time. TLC identifies shortfalls in spending and monitors for effectiveness of current actions but other mechanisms are also possible.

4. **Make sure ongoing management is covered:** When a new protected area is added to the network, also add an amount to the fund that will generate adequate returns for its annual estimated management.

These recommendations are an example of how one conservation organization has approached the critical task of long term organizational sustainability and protected areas management into perpetuity. TLC has taken the proactive approach of establishing a capital fund to allow the protected areas to provide their conservation benefits into the future without having to find funds annually from other sources.

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Figure 1: The Tasmanian Land Conservancy strategy for establishing and maintaining a management endowment fund.

“Deciding how to fund protected areas management for the long term is the next big step in conservation planning.”
The benefits of multi-actor invertebrate management

A partnership to conserve invertebrates in WA’s far south

By Melinda Moir, Sarah Comer & Mark Harvey

Melinda is a researcher with the EDG and is based at the University of Western Australia; Sarah works for the WA Department of Parks & Wildlife; and Mark is with the Western Australian Museum. They represent part of the diversity of SCTIG, a multi-actor group dedicated to the conservation of invertebrates on Western Australia’s southern shores.

To be effective, species conservation should be collaborative. Ideally this would involve multiple parties across land management agencies, research institutions and the local community (see Decision Point #73 for stories on this theme). But how often are such groups formed, particularly for invertebrates? Can’t think of any? Well you wouldn’t be alone. Threatened invertebrates don’t get much press and even less active support.

The fact is that multi-actor groups are rare for invertebrate assemblages in Australia. Which is why we want to draw your attention to the South Coast Threatened Invertebrates Group (SCTIG). The ‘South Coast’ here belongs to Western Australia and this region is part of the internationally recognised southwest Australia biodiversity hotspot. SCTIG was set up back in 2001 and we’ve recently held our 17th meeting (the authors are all members of the group).

SCTIG was originally formed when the local land managers (now the Department of Parks & Wildlife, or DPaW) realised they needed the expertise from other groups if they were to have a hope of managing the hyperdiverse assemblages of terrestrial and freshwater invertebrates along the South Coast. Members of the group have consisted of DPaW, the Western Australian Museum, the University of Western Australia, the University of Melbourne, local NGO’s (such as Gondwana Link; South Coast NRM; and the Western Australian Speleological group), and the local community. What is noteworthy about SCTIG is that the group is actually making headway into some of the major hurdles involving invertebrate conservation; this in a region facing multiple threatening processes. Here we outline what SCTIG has achieved and reflect on what it takes for a multi-actor group to be successful.

The Linnaean Shortfall

A first and obvious step is to work out exactly what you have in the region. When it comes to invertebrates, unfortunately, this already poses a major problem. Invertebrates are experiencing a taxonomic bottleneck, with only a very small percentage of the fauna described for museums and other collections. Within the South Coast, invertebrate taxonomy for numerous groups has been kick-started by SCTIG.

Members are asked to collect especially hard-to-get invertebrates that may only be present at certain times of the year, or in unusual habitats. One recent example was a request earlier in 2014 by a SCTIG researcher for the incredibly rare males of tiny Moggridgea trapdoor spiders. One SCTIG ‘community/ member responded to the request and found two males on tree trunks during a rainy night near Walpole. SCTIG members may be asked to preserve the animals a certain way or, in the case of land snails for example, ensure that they are kept alive for molecular research. These samples are often invaluable to taxonomists, saving them from expensive and potentially unfruitful collecting trips. The taxonomy of some species has been driven by land managers, who believe that the species or habitats are at risk and require conserving.

By recognising what lives in the region and getting key species described by taxonomists, the management of these species can begin.

The Wallacean Shortfall

After the taxonomy is resolved, the next step is to work out where these critters occur, or perhaps to substantiate expectations that they really are restricted species. The Wallacean Shortfall is the general lack of knowledge on the biogeographic patterns for invertebrates which inhibits identification of restricted species (see Decision Point #61, p6-8).

The SCTIG has tackled this issue in two ways. First, groups suspected of being geographically restricted were targeted by members whenever the opportunity arose, and passed on to SCTIG specialists in the WA Museum.

Second, SCTIG found funds to model likely refugial habitat across the South Coast. Targeted surveys of these potential refugia were subsequently formulated, often through collaborations. For example, after consultation with members of SCTIG, the NGO South Coast Natural Resource Management group funded intensive surveys of the terrestrial short-range endemic invertebrates of the South Coast in 2006-2007. These intensive surveys resulted in detailed maps of 174 terrestrial species and an analysis of the endemcity and biogeography of millipedes in the region.

Gaining a solid understanding of the biogeography of species enables identification of potentially threatened invertebrates, and increases the likelihood of getting these successfully listed on the State’s threatened species list.

Policy and research

SCTIG has led the way in formulating invertebrate conservation listings and management plans. Prior to SCTIG, there were 3 invertebrates on the State Government threatened species list for the region (2 spiders and a snail). With impetus from the group, 26 additional species have been added as threatened (17 millipedes, 5 spiders and 4 insects). And SCTIG has been proactive in writing management plans, including the Stirling Range National Park Management Plan for invertebrates.

SCTIG has also fostered research collaborations and knowledge sharing which in turn benefits the invertebrates. Land managers such
Why inverts and why the South Coast?

Terrestrial invertebrates are believed to represent a whopping 78% of macro-biodiversity (vertebrates represent less than 3%) and the south-west Australian biodiversity hotspot is believed contain a large assemblage of largely undescribed invertebrate taxa. We know this region contains many very rare vertebrates such as Gilbert’s potoroo and the western ground parrot; and plants such as Banksia montana. And we know that the majority of threatening processes affecting vertebrates and plants (such as fragmentation, dieback disease and climate change) are also highly likely to be impacting the invertebrates. What’s more, the region possesses large numbers of short-range endemic invertebrate species (ie, 65% of 174 species accessed by Framenau et al. 2008 in the region). Given their restricted distribution and poor dispersal potential, such species are more susceptible to extinction.

Reference

Framenau VW, ML Moir & MS Harvey (2008). Terrestrial Invertebrates of the south coast region of Western Australia: Short-range endemics in Gondwanan relictual habitats. WA Museum, Perth.

as DPaw officers often have access to difficult-to-reach sites, including those affected by disturbances such as fire, weeds and plant diseases (eg, Phytophtora dieback, aerial canker, myrtle rust, etc). They can relay important observations to specialist researchers, such as mass invertebrate death, the presence of invasive invertebrates, or damage to habitat by disturbances.

The researchers may then visit the site, facilitated by the land managers (occasionally this involves exciting transport such as helicopters!). Alternatively, the annual SCTIG meeting may be held nearby to facilitate a field trip to the location. From these interactions, adaptive management of invertebrates is being driven. For example, the effects of fire on conservation-listed pill millipedes was initially thought to be a threatening process. However, subsequent observations after burns have allowed us to begin to understand that the millipedes can survive certain fires. The impact of multiple fires, different fire intensities, and the timing of fire (eg, larger impacts may be evident with fires occurring when millipedes emerge from hibernation), is currently unknown and may require structured research (any fire ecologists interested?).

This close, on-going collaboration between members of SCTIG has facilitated timely adaptive management for numerous native invertebrates, as well as the relatively quick identification of the arrival of invasive species.

The fruits of collaboration

Conserving this huge proportion of the world’s biodiversity is a monumental task. But rather than be overwhelmed, SCTIG has faced the problem head-on and, after 13 years, the group is making a difference. Our 2014 annual meeting was one of the largest meetings to date and featured land-managers from outside the South Coast region who are interested in invertebrate conservation within their own region.

SCTIG has demonstrated that the keys to successful collaboration are common goals, plus the tenacity and perseverance of a few key people within different organisations. Annual meetings help to focus members on agreed actions and outcomes, provide access to expertise, update everyone on the progress of research, and keep members informed of policy changes, management plans, changes in management regimes or other issues affecting invertebrate conservation.

Successful collaboration results in many and varied rewards: land managers benefit from an accessible knowledge pool and researchers benefit through the collaboration with publications and outreach activities. As an added incentive, members have been regularly recognised for their efforts in invertebrate conservation through researchers naming species in members’ honour (11 species to date).

Finally, meetings held in the South Coast region are always concluded with a field trip. Not only do these provide specimens for study and greater local knowledge, they also serve as enjoyable bonding exercises that allow members to get to know each other outside of the meeting room. Each of us have enjoyed the many meetings that we have attended over the years, and hope that other regions around Australia take the initiative to form similar successful collaborative networks to conserve their own invertebrates.

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Don't go unrecorded and help in raising awareness and generating public debate. (Photos by Melinda Moir except photo (b) which is by Mark Harvey.)
Children understand trade-offs. Ask them if they would like to have more chocolate cake and more candy, and it’s a no-brainer. However, ask them if they would like more chocolate cake or more candy and they could deliberate for some time. Conservation decision-making is the same. Asked if we would like to protect two beautiful habitats rich in biodiversity and ecosystem services and the answer is easy. But if we can protect only one and must choose between the two places, then it all gets much harder. We have to choose because we don’t always have enough resources to do both. The different costs of the two actions will obviously influence our decision. But just how good are we at evaluating those costs?

Over the last 15-20 years, conservation scientists have made great strides at adapting decision-support tools to account for the costs of different conservation options. For example, the spatial prioritization software Marxan allows users to assign different conservation costs to different bits of the landscape (see Decision Point #62, p12,13). However, somewhere in the rush to develop theoretical tools to handle cost data, empirical efforts to estimate conservation costs have lagged behind.

Recently, I undertook a review of the cost estimates that were being used in conservation planning studies (Armsworth 2014). I focused on costs of establishing and managing terrestrial protected areas. Studies ranged from global to local in extent and the spatial resolution of the cost data being used was extremely variable.

The lowest cost that authors often assumed is that conservation would cost nothing in some locations. The upper bound could be in the range of an eye-watering $10,000 to $60,000 per hectare (Australian dollars in 2014). However, the studies in question relied on very different ways of getting these cost estimates and the values they report are influenced by the estimation method used. For example, all of the studies focus on some components of the costs of establishing and managing protected areas only in the hopes that these will reflect spatial patterns in the overall costs that would come into play. Many of the seemingly ‘free’ conservation areas that authors were incorporating would bring with them significant cost burdens when more components of overall costs were included.

The conclusions that I drew from the review were just what you might expect from a dour Scotsman. To account for costs in conservation planning, we are going to need:

1. better estimates of conservation costs,
2. better reporting of cost estimates,
3. better analysis of those estimates and
4. greater criticality about how we incorporate those estimates into conservation planning tools.

In the rush to develop theoretical tools to handle cost data, empirical efforts to estimate conservation costs have lagged behind.”
For example, when relying on proxies for conservation costs, we need those proxies to preserve the variance in cost data and patterns of association between costs of conservation and data on biodiversity benefits. Yet, when I compared the most commonly used proxies (e.g., average agricultural land value nearby) to the actual costs of establishing protected areas, these basic standards were not met. Also, many authors estimate one cost component (e.g., acquisition costs) and assume that the patterns it contains adequately reflect what they would find if including other cost components (e.g., ongoing stewardship costs associated with managing a site). But, when testing the merits of this assumption, again I found it sometimes performed poorly.

Practitioners of course know all about the costs of doing conservation, routinely account for them in conservation decision-making and have done so for decades. However, this often seems to be done off-line of some larger scale conservation planning initiative, after broad priority regions have been identified and when scaling down to decide just which parcels of land within those regions to target. Moreover, when I have explored the methods that different conservation organizations use to project the future cost burden associated with protecting different parcels, I have observed a lot of variability in how different individuals and organizations do it. And, sometimes, practitioners' intuition does not resonate with what we see when we look at the data.

The principle that accounting for differences in costs of different conservation options would greatly increase the effectiveness of budget-limited conservation plans is well-established, and the conservation planning community now commonly casts their recommendations in terms of the “return-on-investment” offered by investing in different projects (for example, consider David Pannell’s approach to ranking environmental projects, see Decision Point #75, p4.5). However, somewhere along the way the conservation planning mantra that “some cost data are better than no cost data” seems to have slipped into “any old cost data will do.”

Just as conservation planning has learned the importance of being critical about the biodiversity data being used (e.g., how representative are indicator taxa of wider biodiversity trends we care about? or how were the data collected and are there inherent biases – e.g., sampling bias – we need to worry about?), we now need a similar maturity in how we think about data on conservation costs, where many similar considerations apply about data quality.

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Reference


Note: This guest editorial was written by Dr Paul Armsworth, an Associate Professor in Ecology and Evolutionary Biology at the University of Tennessee, Knoxville, USA. Paul has collaborated with many of EDG’s researchers over the years and Gwen Iacona (see page 4) was Paul’s student before joining the EDG last year. We hope to bring you more international perspectives on environmental decision science over time.

Variable management costs

The cost of managing protected areas can vary from little to very large so it’s important our assumptions on what real management costs into the future will be are based on solid evidence. For example, compare the two protected areas below, both managed by the same organization, The Nature Conservancy (TNC).

Below left: Managers of TNC’s Brush Mountain Preserve in Pennsylvania, have fenced sections of the preserve to exclude deer and allow for oak regeneration. Fencing like this can cost a small fortune. In addition, there has been extensive thinning of early successional trees, and a prescribed burn is planned to promote the historic forest type that was dominated by oaks and pines. The ploughed section in the foreground of the photograph is a firebreak for the upcoming burn.

Below right: In contrast, many remote mountain protected areas receive very little management effort. For example, TNC’s conservation objective for the Tally Preserve (below right), is to promote forest intactness within the northern Cumberlands region of Tennessee. The only management that occurs on this preserve was boundary marking and annual visits for ecological inventory.

(Photos by Eric Larson)
Long-term biological monitoring data are becoming increasingly available to inform conservation efforts around the world. These data are rich sources of scientific evidence that offer insights into the natural variability of ecosystems and species through time, as well as revealing information about the effectiveness of conservation efforts. However, there are many occasions where long-term monitoring data, like other forms of scientific evidence, have been of little use to conservation management. So, how are we going in Australia when it comes to using long-term monitoring data to inform management decisions? You often hear that conservation management agencies fail to use scientific evidence to inform management but our investigation suggests this is not the case – though there is room for improvement.

We recently explored how long-term biological monitoring data are used to inform the management of Australian marine protected areas (MPAs). We focussed on long-term monitoring programs from Australian MPAs, as these include some of the world’s longest running marine monitoring programs. Part of their value is the contribution they make to our understanding of the biological effects of MPAs. They also generate rich data sources that are available to inform the ongoing management of MPAs.

**MEE in MPAs**

- Management effectiveness evaluation (MEE) has gained global recognition as an important framework to promote the continual improvement of conservation efforts in protected areas. It involves an assessment of the complete management process: beginning with clearly defining the management context, through to measuring conservation outcomes to determine whether management objectives are being achieved (see Figure 1).

- In response to the growing societal demand for environmental accountability, there is a focus on publicly reporting MEE results to demonstrate the value for money of conservation efforts. But, ultimately, MEE is designed to facilitate evidence-based management to ensure the best conservation outcomes for protected areas.

- MEE should draw on the best available evidence, using both qualitative and quantitative data to support assessments. Whilst qualitative data are most appropriate for some aspects of management (eg, measuring stakeholder engagement), other aspects (eg, measuring ecological condition) should ideally be based on quantitative data sourced from monitoring or research. A lack of quantitative data often necessitates reliance on qualitative information, such as expert judgment, in MEE.

- Outcome assessment is the final stage of MEE, where the condition of important environmental attributes is assessed to determine whether management objectives have been achieved or if management should be adapted. This requires an assessment of the condition of indicators, such as the abundance of a threatened species.

- When monitoring data are available, these should be assessed against condition categories that have been defined numerically. Quantitative condition categories are commonly based on an acceptable range of natural variation of an indicator. For example, the United States National Parks Service uses historic long-term monitoring data to define quantitative condition categories for average forest patch size to reflect landscape fragmentation due to anthropogenic stressors, as: Good (>50 ha); Caution (10–50 ha); and Significant Concern (<10 ha). Quantitative condition assessments can enable more transparent and repeatable integration of monitoring data into MEE, and when condition categories represent thresholds that trigger management action promotes evidence-based management. In addition, condition rating scales can help simplify complex information about natural systems for public reporting.

**Figure 1: The management effectiveness evaluation cycle.** The cycle is designed to enable an assessment of the complete management process and facilitate evidence-based management. (Adapted from Hocking et al., 2006)
monitoring programs involved sampling both inside and outside of no-take zones, and occur in either a single MPA or are replicated in several MPAs across a network.

As with protected area management agencies around the globe, Australian agencies responsible for managing MPAs commonly use management effectiveness evaluation (MEE) to better understand, learn from, and improve conservation outcomes (see the box on MEE in MPAs). These evaluations are being used to judge the effectiveness of management in many Australian MPAs, however this process is in its infancy, with only one or two evaluation cycles having occurred in most cases.

Our research revealed that many long-term biological monitoring programs are used to inform qualitative condition assessments of biological indicators (under the ‘outcomes’ stage of a MEE cycle), where published monitoring results are interpreted using expert judgment in most cases. This means that available quantitative biological monitoring data are not yet used to provide maximum value in formal quantitative condition assessments for MEE.

While not yet fully utilized in MEE, we found substantial evidence that long-term monitoring data are informing the evidence-based management of MPAs (Figure 2) – contrary to the common criticism that conservation management agencies fail to use scientific evidence to inform management.

Many management agencies use monitoring results to justify the continued need for scientific research and monitoring in MPAs to resolve key uncertainties and identified knowledge gaps. Long-term monitoring results have also been valuable in supporting planning decisions, such as re-zoning MPAs based on an improved understanding of the distribution of marine habitats. Long-term monitoring results have also informed a variety of routine management decisions, such as the development of educational programs, compliance efforts, introduced species control and infrastructure development in MPAs.

Despite the goal of MEEs to enable evidence-based management of protected areas, we found that MEE is rarely the only mechanism that facilitates the knowledge transfer of science to management action. ‘Closing the loop’ of MEE to ensure evidence-based management remains a challenge for many management agencies around the globe.

How might we meet this challenge? In our paper, we provide several recommendations on how to improve the use of long-term monitoring data in MEE for evidence-based management. These include:

- **Ensuring internal MEE frameworks reflect MEE theory**, to determine where breaks in the information chain may be preventing the use of monitoring data in evidence-based management.
- **Implementing quantitative condition assessment of long-term monitoring data** to ensure more objective, repeatable and transparent use of monitoring data in MEE.
- **Invest in targeted long-term monitoring** to support outcome assessments.
- **Increase the frequency of evaluation** to ensure MEE enables evidence-based management.

On this last point, a shorter evaluation timeframe, more frequent than the common 5–10 year cycle, should improve the alignment of MEE with evidence-based management. More frequent in-house evaluation will ensure evidence-based management becomes the main driver of MEE, rather than public accountability through association with public reporting.

During our interviews, most informants indicated a willingness to move towards using monitoring results in quantitative condition assessment and to forge a stronger link between MEE and evidence-based management. All of which bodes well for the future of our unique network of marine protected areas.

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Note: This research was part of Prue Addison’s PhD at the University of Melbourne. She is now a postdoc at AIMS.

References


Australian MPAs

Australia’s marine protected areas (MPAs) are established for biodiversity conservation and many were gazetted more than ten years ago. These MPAs fall under either state or federal jurisdiction and all management agencies aspire to regularly monitor, evaluate and report on their management effectiveness. Like other parts of the world, long-term monitoring programs in Australian MPAs predominantly assess the effect of protection on subtidal coral and rocky reef communities.
Everyone wants to influence policy to protect those values they care most about. However, everyone goes about ‘influencing’ in different ways. So far in this series on ‘influencing policy’ we have heard from a psychology researcher who suggests scientists need to better engage with the conservative side of politics, and from a research policy officer who suggested influencing policy requires a sustained effort of figuring out the policy process (the who, what, where and how) and treating the process like a journey. In this instalment we hear a perspective from the world of non-government agencies (NGOs), and specifically NGOs seeking to create conservation policy outcomes. Martin Taylor from WWF-Australia is our speaker. In addition to talking about some of the tips and tricks of how conservation advocates achieve wins in conservation, Martin also shares his perspective on the role of science in this game.

There are many tactics and approaches to consider when seeking to create significant conservation outcomes but before I get into those I think it’s important to mention passion.

Big wins don’t come without a campaign by people passionate about the result. Full stop. Conservation has only ever progressed because NGOs and community groups put public pressure on decision makers. Consider the Franklin Dam campaign, saving the Reef from oil rigs, and protecting Fraser Island. Sure, each of those historic decisions involved development posturing has lost its appeal with voters. “But that didn’t come without a campaign by people passionate about those causes.

A news columnist observed that the recent dumping of the Queensland Premier and government shows “that muscular, pro-development posturing has lost its appeal with voters.” But that didn’t happen in a vacuum. The Fight for the Reef campaign made dumping of dredge spoil in Reef waters something every politician had to do something about, and voters judged them harshly if they thought they weren’t doing enough.

Recipe for success

A recipe for success in influencing policy includes a) a clear problem statement; b) a clear target; c) a clear ‘ask’, the solution we are asking the target to implement; and d) effective campaigning to give the target a good reason for adopting the ask. More about d) later.

Sometimes the ‘ask’ is a law, sometimes money, sometimes withdrawal of support. For example: a) land clearing is killing millions of native animals every year, and therefore b) the state government needs to c) legislate a ban on land clearing. A poorly identified, vaguely specified problem, target or solution is not a recipe for success.

The target is not necessarily a government. Recently, a tiny burst of adverse media over a violent video game was enough for the target (the department store Target, in that instance) to remove the game from their stores. Pressure exerted through the global 350 campaign has caused some universities to stop investing their endowments in fossil fuels.

“Without the underpinning of research, well focussed on answering critical questions, any campaign is at a loss.”

Campaigning

So, how do you get the target to want to adopt your proffered solution? It comes down to effective campaigning.

Campaigning is always about creating the space and setting the stage for a decision maker to act using a combination of media and constituent pressure.

A media campaign is usually indispensable to both demonstrate and also stimulate public pressure. You may be surprised to learn that a well-disposed government often wants the community to raise a stink in the media about the issue of the day, to set the stage for it to ride in on a white horse to widespread acclaim.

Good advocacy is never negative toward the target, only toward the problem. It is usually pitched as ‘you can be a hero, if you do this one thing’.

Media is either ‘earned’ or ‘paid’. Earned media is generated from stunts like giant melting polar bear shaped ice blocks, by issuing a new analysis or report, or reacting to a decision like an approval of a coal mine. Paid media requires the support of generous donors to pay for ads on billboards, in newspapers, on TV or the internet.

At other times though, a friendly champion within government might be able to deliver on the ask, but please… no media! A softly-softly approach might be preferred to avoid stirring up opposition that is currently asleep or looking elsewhere. Sometimes the opposition can come from within the same government.

May the public be with you

The good news is that we don’t have to convince the public to love nature and wildlife and support conservation. Poll after poll show consistently very high – 90% plus – support for national parks and conservation of nature and wildlife across party lines, age, ethnic, gender…doesn’t matter.

Not sure why we keep polling on this anyway. It’s not like we are trying to get the public to like eating worms. They are already on the side of conservation. The campaigner’s task is to activate and focus that already abundant goodwill and point it at the target.

But this doesn’t mean conservation issues will be top of mind when it comes to a vote. At the ballot box, competence in economic matters usually trumps all other considerations. Campaigners are on a constant quest to cut through this barrier and turn their issue into something that affects or at least appears to affect, decisions at the ballot box, and therefore something that contending parties take very seriously. A campaigner tries to mobilise the constituents with the electorate of key decision makers to write in and express their support for the campaign objectives or attend a forum in the electorate or turn out for a public rally or other visible expression of support within that electorate.

Campaigners place intense focus around election time because that’s when they can pressure the competing parties to dish up election commitments. For example, in the recent Queensland election, in response to relentless exposure in the media and by constituents through the Fight for the Reef campaign, both major parties committed significant amounts of cash to protect the Reef from harmful pollution. Both parties obviously became convinced by the campaign that it was a ‘must have’ to win over the swinging voter.

A common campaign tactic is an election policy scoreboard rating the different parties on how well their promises on various policy areas aligned with the campaign asks. Some delicacy is needed because a scoreboard looks a lot like a how-to-vote card. NGOs may risk losing tax
A report card on Australia’s NRS

Here’s an example of one of our efforts to influence conservation policy in Australia. WWF’s Building Nature’s Safety Net is a regular report card on Australia’s National Reserve System (NRS), the national mosaic of over 10,000 discrete protected areas on land on all tenures: government, Indigenous and private (including on-farm covenants), as well as marine parks and reserves. The NRS is the single most important asset for the conservation of Australia’s unique and globally significant biodiversity. In successive Safety Net reports we review progress toward agreed biodiversity targets, the state of financing for both expansion and maintenance of the reserve system and the gaps that need to be filled to ensure Australian biodiversity is relatively secure.

The reports form the basis of an ongoing campaign to increase funding for the National Reserve System program, a federal grants program, and matching budget allocations in states in territories.

The most significant success was the announcement by former Environment Minister Peter Garrett of $180m allocation for the program over the period 2008-2013. The announcement came a few weeks after he launched the 2008 Safety Net report in Parliament House. Unfortunately, the program was cut by his successor in late 2012 and has yet to be restored.

The report pictured here is the fourth in a series with the three previous reports published in 2006, 2008 and 2011.

Effective conservation campaigns rely on close coordination with scientists working in the area. Conservation science is at the heart of the ongoing story about the problem and the solution that’s needed to address it. Without the underpinning of research well focussed on answering critical questions, any campaign is at a loss.

Sometimes the critical questions have simple answers, often just one number. For example, how many species have no habitat inside a protected area? (see Decision Point #45, p4,5 for the answer!)

Beyond research papers, scientists can also write media and opinion articles in the popular press that can assist in a campaign. For example, in 2013 when a new Queensland Government decided to undo the land clearing laws, scientists throughout the state banded together to express their concern that this was not a good idea. And again, more recently, to express dismay with the resurgence of land clearing that has resulted. This second commentary appeared in the The Conversation.

No time for rest

A final and sobering reality to face is that securing conservation progress is an uphill and never-ending task. Even a favourable government usually cannot deliver everything that’s needed to address the enormous conservation problems we face, with expanding human impacts, declining wildlife and shrinking habitats. One has to be pragmatic and “not let the perfect be the enemy of the good”; giving credit to decision makers where credit is due.

Finally, you cannot take a win for granted, as we found with land clearing laws. A change of government can undo years of campaign work with the stroke of a pen. The only answer is to start all over again, keep building or refreshing the science, keep making the case, keep mobilising public opinion. The IPCC is a wonderful and inspiring example of that at the global level. Take comfort that the public is, most likely, already on your side.

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Martin Taylor is WWF-Australia’s Protected Areas Policy Manager and has published important analyses of the effectiveness of the Endangered Species Act in the United States, threats to international whale habitats, and the effectiveness of conservation actions in Australia including protected areas for threatened species. He has served on the Scientific Committee of the International Whaling Commission and as an NGO observer at CITES (Convention on International Trade in Endangered Species, Martin is pictured below at a CITES conference). He is a member of the IUCN World Commission on Protected Areas.

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Life at Large: taking the big picture
From the Australian Alps to the Tasmanian Midlands

By Ted Lefroy (Director, NERP Landscapes and Policy Hub)

Four years ago, the NERP Landscapes and Policy Hub (a sister hub to NERP Environmental Decisions) set out to answer the question “How do we take a regional-scale view of biodiversity?” The trigger for this question was the Hawke review of the Environment Protection and Biodiversity Conservation Act (1999). One of the questions facing the review was why, after 10 years of the Act being in operation, had the list of threatened and endangered species grown steadily to over 1,750 with precious few coming off that list. One of the review’s recommendations was to consider biodiversity at the scale of landscapes and whole regions as well as species and communities in order to understand and manage the underlying causes of decline.

In consultation with the Department of the Environment, the Landscapes and Policy Hub chose to apply a big picture view to two regions, the Australian Alps and the Tasmanian Midlands. The choice was partly because both regions were home to several listed plant communities plus a whole suite of threatened and endangered species, and partly because of their differences. One a privately owned valley, the other a publicly managed mountain range. One largely intact but under threat from invasive species and more frequent fires. The other a highly fragmented landscape, the second region to be farmed following European settlement.

The first step in the research process was to take the 36 researchers in a bus and visit the two regions. By talking to residents, land owners, managers and local experts the researchers had the opportunity to see the issues first hand. They then went to work in seven research teams specialising in social and institutional issues, climate change, biogeography, economics, wildlife, fire and freshwater ecology. An eighth team, communication and integration, took on the task of keeping the researchers in touch with each other and their wider audiences.

Every six months the researchers met to swap notes. In February 2015, they launched the website Life at Large to describe the six step process that emerged from their case studies:

1. Describe the social context
2. Consult the biodiversity checklist
3. Develop regional scenarios
4. Map processes and threats
5. Model species and communities
6. Set priorities

If you’d like to learn more about what we did or explore the tools, techniques and policy pathways that we have developed on our journey, please visit our new website Life at Large.

More info: www.lifeatlarge.edu.au

An example of the work that incorporates climate change scenarios into species distribution modelling. The area of Tasmania climatically suitable for the lowland Themeda triandra (kangaroo grass) community shown as the probability of occurrence (a) under current climate with known locations in black and (b) by 2050 based on agreement between 6 climate models.

Reference

“By talking to residents, land owners, managers and local experts the researchers had the opportunity to see the issues first hand.”

Four things we learned about regional scale assessment of biodiversity

1. Understand the social context. Building a social profile of a region from ABS and other survey data provides a picture of who lives there, what they do, what they value, their impact on natural values and their capacity to support conservation given that success will rely on local participation and commitment over the long term.

2. Embrace a broad definition of natural values. At the regional scale it’s necessary to include functional as well as compositional attributes of biodiversity and natural values of local and cultural significance (see the biodiversity checklist under step 2 on the website).

3. Incorporate climate change scenarios into species distribution modelling. To identify locations likely to be important for conservation in the future, it’s necessary to consider plausible shifts in the distributions of species, communities and ecosystem processes.

4. Represent results in ways that enable stakeholder participation in decision making. For example, dynamic visual methods can be used to represent scenarios for likely locations of high value for species, communities and other iconic features under different combinations of threatening processes.
Qualitative modelling

A NERP Workshop (Hobart, Oct 2014)

By Michael Bode & Justine Shaw

What is qualitative modelling and when would we do it?

Most conservation management problems involve decisions in systems that are both complex and uncertain. In recent years, difficult experience has taught us that unknown ecosystem interactions can undermine, or even reverse the gains expected from management interventions. High-profile examples include the explosion of rabbit numbers on Macquarie Island following the eradication of cats, and the decline of seabirds on the Little Barrier Island in New Zealand, after rat numbers surged following the eradication of cats. A set of techniques known as ‘qualitative modelling’ offers decision-makers a chance to forecast some of these negative outcomes before they happen, and to make decisions that avoid complex, negative management outcomes.

Late last year, researchers interested in qualitative modelling from the University of Queensland, the University of Melbourne, CSIRO, UC Santa Barbara, Australian Antarctic Division (AAD) and the Institute of Marine & Antarctic Science (University of Tasmania) met for three days at the AAD headquarters in Kingston, Tasmania. Workshop attendees shared their experience with applying qualitative modelling to ecosystem conservation, reporting work that spanned a broad range of research topics: Krill/sea ice interactions, fishery impacts on ocean ecosystems, invasive predator/prey interactions, freshwater lake dynamics, island invasive species management, and understanding threatened species interactions. Study ecosystems ranged from Christmas Island, the islands of the sub-Antarctic, Booderee National Park in Jervis Bay, the Southern Ocean, inshore Tasmanian marine ecosystems, and California’s Santa Cruz Island.

Participants discussed the definition, history and evolution of qualitative modelling, and its applications to modern ecological research. People discussed their newly developed models and code. Various limitations of qualitative models were also presented and ways to address this into the future were discussed.

Of course there was the inevitable white board filled with lots of code and network diagrams. There were five PhD students contributing, in addition to federal government senior research scientist and university academics. It was a great opportunity for colleagues to get together and further develop ongoing projects for new collaborations to form.

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Qualitative modelling workshopers at work. (Five people in the photo and not one looking at the camera or each other. Talk about introspective brain power.) (Photo by Justine Shaw)
Biodiversity conservation and the NRS

Below is an excerpt from the WWF report, Building Nature’s Safety Net 2014. It summarises the status of Australia’s National Reserve System (NRS) in terms of percentage cover and protection afforded to ecosystems and threatened species. Martin Taylor was the lead author of this report and he holds it up as important output from WWF in their effort to influence conservation policy. You can see his story on page 12. Building Nature’s Safety Net 2014 is free and available at http://www.wwf.org.au/news_resources/resource_library/711700/Building-Natures-Safety-Net-2014

Under the Convention on Biological Diversity (CBD), Australia has committed to bringing at least 17 percent of terrestrial and at least 10 percent of marine areas into ecologically representative, well-connected systems of protected areas by 2020 (Aichi Target 11).

Australia also has an agreed intergovernmental Strategy for developing a comprehensive, adequate and representative National Reserve System on land and sea that, if implemented, would deliver on this CBD target.

Due to dramatic recent growth, the National Reserve System covers 16.5 percent* of Australia’s land area, with highly protected areas, such as national parks, covering 8.3 per cent. The marine National Reserve System extends over one-third of Australian waters with highly protected areas such as marine national parks, no-take or green zones covering 13.5 per cent.

Growth has been uneven however, and the National Reserve System is still far from meeting Aichi Target 11, which requires that it also be ecologically representative and well-connected. On land, 1,655 of 5,815 ecosystems and habitats for 138 of 1,613 threatened species remain unprotected. Nonetheless, 436 terrestrial ecosystems and 176 threatened terrestrial species attained minimum standards of protection due to growth of the National Reserve System on land between 2002 and 2012.

The gap for ecosystem protection on land – the area needed to bring all ecosystems to the minimum standard of protection – closed by a very substantial 20 million hectares (from 77 down to 57 million hectares) between 2002 and 2012, not including threatened species protection gaps. Threatened species attaining a minimum standard for habitat protection increased from 27 percent to 38 percent over the decade 2002–2012. A low proportion of critically endangered species meeting the standard (29 percent) and the high proportion with no protection at all (20 percent) are cause for concern, but one which should be relatively easy to amend, as the distributions of these species tend to be small and localised.

Protected area connectivity has increased modestly for terrestrial protected areas in terms of the median distance between neighbouring protected areas, but this progress has been undermined by increasing land use intensity in landscapes between protected areas.

A comprehensive, adequate and representative marine reserve system, which meets a standard of 15 percent of each of 2,420 marine ecosystems and 30 percent of the habitats of each of 177 marine species of national environmental significance, would require expansion of marine national parks, no-take or green zones up to nearly 30 percent of state and Australian waters, not substantially different in overall extent from that of the current marine reserve system, but different in configuration.

Protection of climate change refugia, connectivity and special places for biodiversity is still low and requires high priority attention.

*Note the latest figures for the National Reserve System can be found at http://www.environment.gov.au/land/nrs