DECISION POINT

Connecting conservation policy makers, researchers and practitioners

Issue #70 / June 2013

Putting people into the picture

Incorporating equity into conservation planning

Ecosystems services and land-use policy

The impacts of marine parks on villages in Raja Ampat

Local support helps achieve conservation outcomes

Decision Point

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

Plus

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A diver (Chris Brown) takes photos amidst mangrove roots in Hidden Bay, Gam Island in Raja Ampat, West Papua, Indonesia. Chris is a conservation scientist but in this image he is just another dive tourist taking in the natural wonder of this area. Eco-tourism in Raja Ampat is an important part of the local economy and several marine reserves have been planned for this region to protect marine ecosystems. However, the establishment of marine reserves isn't all good news for local communities as they can mean restricted access to traditional fishing grounds. How do you spread the pain (as well as the gain) in the fairest way in conservation planning? See Chris and Carissas' story on page 6. Photo by Megan Saunders.

On the point

Conservation is about people

The last issue of Decision Point was full of images of rhinos, lions and koalas. This issue is dominated by people sitting around tables and talking. Personally, I prefer looking at beautiful pics of wildlife and untamed landscapes but, truth be told, it's people talking that lies at the heart of conservation science. It's people's ideas, values, motivations and influences, and the sharing of these, that lie at the core of every bit of research coming out of the Environmental Decisions Group. And it's also understanding people's needs and appreciating the impacts of conservation on local communities that often determines whether policy and management ultimately succeeds. So, whereas the last issue focussed on some of the targets of our research – conserving iconic wildlife – this issue focusses on people and the social dimensions of conservation.

Chris Brown and Carissa Klein discuss how social equity can be factored into marine conservation planning (page 6). How do you achieve a triple-bottom-line success?

Gustavo Andrade and Jonathan Rhodes ask what factors determine environmental compliance in protected areas and discover it has everything to do with local community participation (page 8).

What about the people who manage our parks and reserves. We know that most conservation managers don't read science journals, so what evidence do these people need for their decision making and what do they actually use? Carly Cook went out and asked them (page 10).

Angela Guerrero explains why understanding social networks are important to conservation planning and the challenge of planning over multiple scales (page 12).

And Richard Hobbs reflects on the divisiveness that afflicts many conservation debates, and suggests it might arise because researchers are grieving for the things they are hoping for but failing to conserve (page 4).

So, conservation science is just as much about people as it is about endangered species and ecosystems. Having said that, I'll try to have more pics of animals next time.

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DECISION POINT

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

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Trade offs between condition, representation & cost

This paper presents a novel method for designing marine reserves that trades off three important attributes of a conservation plan: habitat condition, habitat representation and the economic costs to fishers. Prior to this paper, marine reserves were often designed without consideration of habitat condition, resulting in reserving habitat of marginal quality, especially when planners sought to avoid areas important for fishing. The objective here is to minimise the chance that protected habitats are in poor condition and avoid places valuable to commercial fisheries. Habitat condition was calculated in four ways, using different human impacts as a proxy for condition: all impacts; impacts that cannot be managed with a reserve; land-based impacts; and climate change impacts.

The researchers demonstrated how their approach might be used in planning reserves along the coast of California. Their analysis showed that three important trade offs emerge. First, reserve systems that have a high chance of protecting good condition habitats cost fishers less than 3.1% of their income. Second, the cost to fishers can be reduced by 1/2–2/3 by triaging less than 1/3 of habitats. And finally, increasing the probability of protecting good condition habitats from 50% to 99% costs fishers an additional 1.7% of their income, with roughly 0.3% added costs for each additional 10% confidence.

Knowing exactly what the cost of these trade offs are informs discussion and potential compromise among stakeholders involved in protected area planning worldwide.

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Reference

Klein CJ, VJ Tulloch, BS Halpern, KA Selkoe, ME Watts, C Steinback, A Scholz, & HP Possingham (2013). Tradeoffs in marine reserve design: habitat condition, representation, and socioeconomic costs. *Conservation Letters* DOI: 10.1111/conl.12005 http://onlinelibrary.wiley.com/doi/10.1111/conl.12005/abstract

Marine planning – indeed any environmental decision making – requires the trade-offs of decisions to be made clear. This research, led by Carissa Klein, examines the trade-offs between representation, habitat condition and costs in the planning of marine reserves. Carissa was also one of the lead researchers in a separate study that sought to explore the trade offs between environmental condition, economic costs and social equity in designing marine reserves. Incorporating equity into these conservation planning approaches has long been recommended by many people but has proved very challenging to implement. Read all about how it was achieved on pages 6 and 7.

A social-ecological approach to conservation planning

Many conservation plans never get implemented because they give insufficient consideration of the social processes that influence conservation decisions. Complementing social considerations with an integrated understanding of the ecology of a region can result in a more complete conservation approach.

Natalie Ban and colleagues suggest that linking conservation planning to a social-ecological systems framework can lead to a more thorough understanding of human-environment interactions and a more effective integration of social considerations. By characterizing a social-ecological system as a set of subsystems, and their interactions with each other and with external factors, the social-ecological system framework can improve our understanding of the linkages between social and ecological influences on the environment. Using this framework can help to identify socially and ecologically focused conservation actions that will benefit ecosystems and human communities, and assist in the development of more consistent evidence for evaluating conservation actions by comparing conservation case studies.

The authors note that a major shift in the planning community would be needed to integrate social-ecological thinking into conservation planning – one that places the same importance on social considerations as on ecological ones, and that seeks to integrate the two.

Reference

Ban NC, M Mills, J Tam, CC Hicks, S Klain, N Stoeckl, MC Bottrill, J Levine, RL Pressey, T Satterfield & KMA Chan (2013). A social–ecological approach to conservation planning: embedding social considerations. *Frontiers in Ecology and the Environment* 11: 194–202. http://dx.doi.org/10.1890/110205

"Many conservation plans never get implemented because they give insufficient consideration of the social processes that influence conservation decisions."

People and birds in the burbs

A large body of work over the past few decades has revealed the dramatic impacts of urbanisation on birds, for example the impact on species' distributions and ecologies. Many of these impacts result from gross changes in land use and configuration. Less well understood are the impacts relating to the interactions between people and biodiversity in the urban arena. For example, what is the impact of feeding birds or the provision of nesting resources for wildlife in the city?

Using data from the UK, Richard Fuller and colleagues show that the provision of supplementary resources aimed explicitly at enhancing bird populations can result in high levels of additional foraging and nesting opportunities, particularly in urban areas. However, their data also indicates that levels of such resource provision are strongly positively correlated with human population density at a regional scale, and within a large city. The proportion of households participating in bird feeding depends on social and economic features of the human population, suggesting that strong covariation between human and ecological communities will result.

They demonstrate that the abundances of some urban-adapted bird species are positively related to the density of feeding stations across the urban landscape, although such relationships were not apparent for other species that commonly use garden feeding stations. It has been suggested that interactions with nature, such as feeding birds, could have beneficial consequences for human health. A better understanding of this potential feedback is required.

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Fuller R A, KN Irvine, Z Davies, PRG Armsworth & KJ Gaston (2012). Interactions between people and birds in urban landscapes. In: Lepczyk, C.A. and Warren, P.S. (Eds) *Urban bird ecology and conservation, Studies in Avian Biology*, No. 45, pp. 249-266 https://www.dora.dmu.ac.uk/handle/2086/7959

Grieving for the past, hoping for the future

Reflections on the emotional dimension behind conservation science

By Richard Hobbs (EDG, UWA)

Richard Hobbs is stepping down as Editor-in-Chief of the journal Restoration Ecology. After 10 years at the helm, he's engaged with the whole spectrum of ideas that underpin the field of restoration ecology. It's been an exciting and fulfilling time but he has often been surprised by the intensity and discord in some of the arguments and the resistance in some quarters to the emergence of new ideas. Here's an edited excerpt from his parting editorial (Hobbs 2013).

Although lively debate on important issues is to be encouraged, I have been increasingly struck by how divisive some issues can be. For instance, in my own work, I have been involved recently in discussions on how best to confront the issue of non-native/invasive species and on the allied topic of novel ecosystems.

In the case of non-native species, it's been suggested that the management emphasis should be shifted from considering primarily a species' origin to a focus on the impacts species have on the ecosystems in which they establish. Sounds like a reasonable proposition (and very much in the frame of EDG thinking) but subsequent critiques of this view revealed a degree of alarm, almost outrage, at the arguments presented.

Although there has not been the same degree of criticism of the concept of novel ecosystems in the literature to date, there is considerable disquiet about this notion in some quarters. At conferences where the topic is presented, concerns are aired that the concept will adversely affect restoration policy and practice, particularly by opening the way for less stringent targets. Phrases such as 'slippery slope' and 'lowering the bar' have been used in this context.

Two sets

In both cases, there appear to be two very different sets of people with very different perspectives on the issues involved. One set holds firmly to established ideas and principles concerning invasive species and ecosystem management/restoration and thinks that any departure from the core set of ideas will be detrimental to efforts to maintain and restore species and ecosystems.

The other set argues that, looking at the evidence of current patterns and trends, there has to be a move away from the more traditional perspectives toward one that recognizes the changing situation facing those aiming to manage and restore systems.

Both sets of people have the same underlying backgrounds, training, and, probably, broad set of ethical underpinnings. Both are smart, dedicated groups of people who seek to inform and improve the ways in which the Earth's ecosystems and species are managed. And yet they now find themselves essentially 'talking past each other' and in apparent stark disagreement.

Why might this be the case? Why am I now apparently at odds with some of my colleagues and collaborators? Why are there such visceral responses to literature that suggests we need to start thinking differently about topics such as invasive species and restoration goals? One potential explanation occurred to me as I reflected on the nature of loss.

On change and loss

Over the past couple of years, both my wife and I have lost our mothers—both lived long, happy lives and died in their late 80s. Of course, both deaths were significant losses to our family and came with grief. Bereavement is an extreme form of loss, but losses of any kind can result in the need to grieve—the death of a friend or relative, the loss of a family pet, loss of personal possessions because of fire or theft, or losing one's job.

It struck me quite forcibly at the International Conference for Conservation Biology in Auckland in 2011 that people researching and managing the fate of species and ecosystems in today's world are constantly faced with loss. Whether it's a local and personal loss such as the destruction of a piece of local woodland or a species that was once abundant now being scarce or nonexistent, or whether it is loss on a grander and more general scale, such as the destruction of rainforest, the extinction of Australian marsupials, or the decline of the Arctic ice sheet, people with an interest in species, ecosystems, and the environment in general are constantly assailed with accounts of past or impending loss.

This is the subject matter of applied ecology, environmental science, and particularly conservation biology—investigating past, current, and future losses and how to understand, predict, and, ultimately, halt or reverse them. However, getting to this last phase is often difficult and time-consuming and requires observation and understanding of the processes involved.

It could be argued that most ecologists and conservation biologists live mostly in a world characterized by loss, and hence are either wittingly or unwittingly in a constant state of grief. This has been discussed only rarely in the literature, and scientists and practitioners rarely talk about the emotional aspects of what they do.

The process of grieving

The process of grieving has been explored in depth in psychology, perhaps most famously by Kubler-Ross (Kubler-Ross and Kessler, 2007), initially from the perspective of the dying patient and later in relation to grieving friends and relatives. Kubler-Ross proposed a five-stage process of grieving that is now well known: stages of denial, anger, bargaining, depression, and acceptance.

The initial phase, denial, is seen as a temporary defense mechanism as a buffer against unpleasant news or events. This may be replaced by

Table 1. Kubler-Ross's stages of grief in relation to death or bereavement, with suggested equivalent responses to conservation losses and possible links to management/policy approaches. (From Hobbs 2013)

Phase of Grief	Responses to Death, Bereavement	Responses to Conservation Losses	Example Managt/Policy Approaches
Denial	"I feel fine"; "This can't be happening, not to me"	"We can get things back the way they were"; "Our view will prevail in the end"	Traditional protected areas and hands-off approaches
Anger	"Why me? It's not fair!"; "How can this happen to me?"; "Who is to blame?"	"How can they let this happen?"; "Who is to blame?"; "Let's protest to the minister"	Advocacy and protest
Bargaining	"I'll do anything for a few more years"; "I will give my life savings if…"	"We'll trade off this species/area for that species/area over there"	Optimization tools
Depression	"I'm so sad, why bother with anything?"; "I'm going to die soon so what's the point?"; "I miss my loved one, why go on?"	"Species and ecosystems are being overwhelmed"; "We've lost the battle"; "Invasive species are everywhere"	Very good malt whisky
Acceptance	"It's going to be okay."; "I can't fight it, I may as well prepare for it"	"Sure things are changing, but there are still things to value"; "We can still make a big difference"; "Choose my battles"	Intervention, novel ecosystems, and reconciliation ecology

feelings of anger, envy, or resentment that may be directed at particular people, the medical profession, or the world in general. Bargaining takes the form of attempting to postpone the inevitable by negotiating or pleading with doctors, or with God. Depression results from the recognition of what has been, or is about to be, lost. Acceptance is the final recognition of, and preparation for, the inevitable finality of death, which need not, however, be viewed as resigned and hopeless giving-up.

Kubler-Ross presented five distinct stages, but made it clear that these were not necessarily sequential and, indeed, individuals could flip backward and forward from one to another or experience more than one simultaneously. Her approach has been often criticized as being too prescriptive and as misrepresenting how people actually grieve. Nevertheless, the five stages are recognized even by critics as 'handles or points of entry to comprehend what before was enigmatic even chaotic.'

Grief and the conservation scientist

When assailed constantly with accounts of loss of species, habitats, historical fidelity, and so on, could it be that many ecologists and conservation biologists may be suffering from chronic or acute grief? If this is true, can an understanding of the grieving process be useful?

When considering particular perspectives (including one's own) and the rationale behind various conservation/restoration decisions, it may be worthwhile examining the underlying basis for this rationale in terms of whether it stems from one particular stage of the grieving process versus another.

In relation to the polarized debates in ecology and conservation discussed earlier, one can ask whether they might at least partially be rooted in the different stages of grieving that people (and even whole organizations) find themselves at.

Table 1 lists Kubler-Ross's five stages and typical reactions of dying patients or those close to them. Applying the five stages to conservation losses, an equivalent set of reactions from concerned parties can be suggested, together with the associated tools and concepts relevant to each stage.

Responses to conservation loss

Denial in this context does not relate to the type of vested-interest denial that characterizes one side of the public and political discourse on climate change (and I discuss other examples in *Decision Point #61*). I would contend that there is a different type of denial to be found within the conservation community that relates more to an inability or unwillingness to recognize or accept ongoing changes in species distributions, abundances and interactions, and/or the increasing likelihood that some of these changes cannot be reversed.

Unlike climate change denial, this type of denial leads to demands for more, not less, action—and also leads people to reject suggestions that the time may have come to look at things differently and to find alternative solutions and ways of working.

Anger is another common response to conservation issues and challenges, particularly in the face of government or societal inaction or, worse, continued activity that leads to ongoing loss of things of value.

Bargaining, on the other hand, encapsulates the set of ideas and activities surrounding decision making, priority setting, and trade-offs—there is an implicit recognition that it will be impossible to do everything and hence some negotiated decisions have to be made.

Depression appears to be a constant possibility for people working in conservation as they face ongoing declines of species and habitats or as they contemplate the immensity of the tasks ahead.

Finally, acceptance perhaps represents a state of mind in which some degree of reconciliation has taken place regarding past losses and a recognition that, despite change, there is still much to value and to strive to protect or restore. At the same time, acceptance is often mistakenly taken for acquiescence, that one must accept the state of affairs resulting from change. Acceptance relates more to living with a particular loss, and adjusting one's own life from the lessons that came from the loss. Thus, one can continue to mourn the loss, and yet not fully accept the conditions that brought it about. Similarly, one can perhaps 'come to terms' with directional ecosystem or biodiversity change without 'accepting' the conditions that give rise to it.

Restoration and hope

Obviously, there are marked differences between a response to the loss of a loved one and individual and collective responses to conservation losses. In particular, death is a clear end point, whereas conservation losses are often diffuse, chronic, and uncertain—often characterized by incomplete evidence and contradictory claims and interpretations.

Another important feature is that conservation losses are sometimes reversible, and there have been many examples of spectacular conservation success, given the right set of circumstances and opportunities. This is where restoration comes to the fore, and provides the possibility of reversing past damage—in other words, turning loss into gain.

Kubler-Ross's treatment of the grieving process included the observation that throughout the process, hope generally remains, regardless of what else is happening. Restoration certainly provides hope for the future and has been embraced from local to global levels.

The provision of hope was one of the reasons I got into restoration ecology. When I started teaching a third-year undergraduate unit in restoration about 10 years ago, I had students coming to me after a few lectures saying how great it was to hear about something positive that could be done, after being browbeaten by 2 years of apparently intractable environmental problems.

Indeed, some recent commentators have called for a reinstalment of hope in the culture of conservation biology. Restoration certainly has an important place in this endeavor.

The hope provided by restoration does, however, have to be realistic, and to be based on the reality of the situation. Blind optimism can lead to false promises, wasted effort, and poor outcomes, particularly if expectations exceed capabilities.

To increasing numbers of observers, empirical evidence suggests that we are indeed heading toward, or are already in, an ecological 'new normal,' but others prefer to deny this and continue to believe that changes are reversible—or are angry that some others are pointing to the evidence to suggest that we need to find new ways of working. Those others have perhaps cycled faster through the grief process and have come to accept the inevitability of change and are trying to work on ways forward in the new circumstances in which we find ourselves (note again that acceptance does not mean that one has to actually like the situation).

Hence, clashes occur, not because different people have different ethical stances or values, but because they differ in the phase of the grieving process they are operating in. These people all seek to conserve the world's biodiversity and restore ecosystems: they may simply be operating from different perspectives arising from their particular intellectual and emotional journey.

Perhaps, therefore, ideas about grief can help explain, at least partially, some of the discordant debates and disagreements in conservation and restoration. As a final note, it is also important to say that loss can result in new opportunities. Loss in ecological terms may sometimes result in new but still worthwhile assemblages.

Effective intervention in the form of conservation or restoration can also help prevent further loss or in some cases reverse past losses. In lamenting what is lost, it is also important to remember to rejoice in what is still here—or what could be there in the future.

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Conservation and the triple bottom line

Incorporating equity into conservation planning

By Chris Brown and Carissa Klein (EDG, University of Queensland)

These days there's a lot of talk about achieving triple-bottom-line outcomes. By that it's meant that new developments have to produce good economic, environmental and social outcomes. Indeed, it's usually implied it's about maximising returns in all three areas – sort of aiming for win-win-win. But a recent analysis we undertook on incorporating social equity into conservation planning for marine reserves (Halpern et al. 2013) demonstrates you can't win in all three areas at the same time – the best results for the environment can be less fair, and the only way to make them fair is to sacrifice a tight budget.

We all have a sense of what is fair and unfair. If your neighbour pays less for their power bill than you do, you would probably feel ripped-off and look for a better deal. Likewise, it may seem unfair if they receive a benefit, such as a one-off discount, but you don't.

What's fair?

Decisions about the environment may also strike people as unfair. The costs of conserving threatened species and habitats may be borne by some people more than others. Environmental decisions can also benefit some groups more than others. For instance governments and international funds can hand out grants for conservation projects that benefit different groups in different ways. Or a new marine reserve might impose a greater cost on one fishing community than on another.

Equity or fairness can be defined as the distribution of cost or benefits among individuals or groups. It is a commonly sought outcome in conservation planning and yet it's often not formally factored in.

In the past, the best conservation plans focussed on the economic (cost-efficiency) and environmental (conservation effectiveness) aspects of the plan. The ideal plan would be low-cost and effectively protect biodiversity. But now there are growing calls that planning solutions should also be fair.

So, how do you account for equity? Economists have long used an index called the Gini coefficient to measure income equality. The Gini coefficient measures the difference between a perfectly equitable distribution and the actual distribution of a resource. The index has been adapted to work in a range of disciplines such as health and plant biology. More recently, EDG researchers have adapted the Gini coefficient to measure equality of conservation protection (See *Decision Point #58*, p8,9).

Impacts of plans on people

We used the Gini coefficient to measure the equality in impacts of different conservation plans on fishing groups in three very different situations. By comparing the Gini score with the conservation benefits for a number of proposed plans, we could quantify exactly how much equality must be sacrificed to improve conservation success. The overall budget was also considered by measuring the conservation benefit for different budgets to examine cost-effectiveness of each plan.

All three case studies involved planning marine protected areas but each case was very different in terms of the stakeholders affected and the scale of the planning process. The first study focussed on the central coast of California where a network of marine protected areas was recently created with consideration of the impacts on local fisheries. The second looked at a marine protected area in the southern Raja Ampat region of Indonesia where proposed no-take zones may differentially impact villages' access to fishing. And the third examined how international money is being distributed among six countries in the Coral Triangle region to mitigate threats to their marine resources.

In each of these cases, different fishing industries (in the Californian case), communities (in the Raja Ampat case) or even whole countries (in the Coral Island case) bear a short-term cost when a marine protected area is created, because they lose access to fishing grounds. We measured this equity cost in terms of both dollars and access.

What's ideal?

The aim of our analysis was to discover ideal solutions that balance equity, conservation and overall cost. What we discovered was that the best conservation outcomes compromise equity. For instance, in the Raja Ampat case, the best conservation outcome unevenly affected different fishing villages. Some critical coral reef habitats occur in just a few traditional fishing grounds. So, to protect these critical habitats by placing them in reserves, these communities lose a larger portion of their fishing grounds than other communities. The most equitable outcome in which impacts on access were equally divided did not effectively protect all types of coral reef.

We also found that if budgets for conservation are larger, solutions can be both more equitable and have better conservation outcomes. However, this means that triple-bottom line solutions are difficult to achieve, because cost-efficiency must be sacrificed.

"If budgets for conservation are larger, solutions can be both more equitable and have better conservation outcomes. However, this means that triple-bottom line solutions are difficult to achieve, because cost-efficiency must be sacrificed."

Diving around mangroves in Raja Ampat: bringing people into the picture is vital if conservation plans are to deliver effective outcomes. (Photo by Megan Saunders)

So are there any solutions that can guarantee equity, cost-efficiency and good outcomes for the environment? Possibly; it depends how equity is defined. People can feel more strongly about one kind of equity over another.

It is relatively common to have equity addressed by engaging community groups. If all affected groups are involved in the process of making decisions for environmental protection, they are more likely to be satisfied with the final decision.

You'd think that people would prefer equitable solutions over inequitable ones. But this is not always the case. Different people have more or less invested in managed systems and so don't necessarily expect to receive equal benefits. For example, if I have fished a place for 40 years, whereas my neighbour just moved to town and fishes once a month recreationally, why should we be treated equally when it comes to making decisions about managing fisheries?

The bottom line

The bottom line then on triple-bottom-line planning is there is no simple solution for environmental decisions that will be perfectly equitable, effective at protecting the environment and cost-effective. However, approaches like the ones we have employed helps to find the best set of solutions for a conservation problem. And, because it does so using a transparent framework, the various stakeholders involved (traditional owners, fisher groups, government representatives and so forth) can see what factors are being incorporated and how they lead to any particular solution.

Incorporating equity into our conservation plans is not a straightforward task. Not worrying about it, however, can lead to the ruin of the plan. Conservation plans that have the greatest benefits for conservation on paper are unlikely to deliver those benefits if they are offering highly inequitable solutions. Experience shows that people who feel unfairly treated can stop proposed conservation plans from ever happening.

The marine biodiversity at Raja Ampat is internationally significant. However, the costs of locking away this biodiversity in marine protected areas will be borne by local communities and some communities will be more impacted than others. (Photo by Megan Saunders)

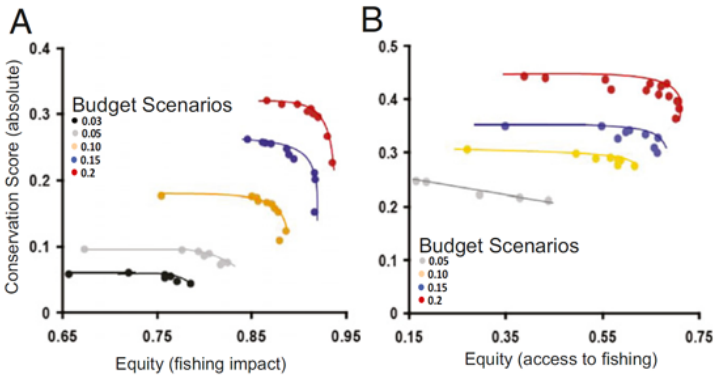

Figure 1. Trade-offs between achieving conservation goals and equity, measured under the following budget scenarios: (A) monetary impact to the fishing industry in central California with different budget constraints in place or (B) loss of fishing grounds in the Misool region of Raja Ampat, Indonesia. In both cases, the plots represent absolute measures of conservation objectives. The outer edge of the points is drawn to approximate the efficiency frontier; points interior to this frontier are suboptimal.
(From Halpern et al. 2013)

Governments and conservation groups need to keep this in mind and find solutions that leave people feeling that they were fairly treated and that their concerns were considered. Our approach is one that enables this to happen.

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A game of trade offs

The game of conservation planning has come a long way in recent decades. In the 1990s it was largely focused on where to establish protected areas to protect biodiversity. In more recent times the practice of conservation planning has acknowledged that the economic costs involved in establishing these areas is just as important to factor in. The idea that environmental benefits can be traded off against economic costs is a central concept here, something which has been widely demonstrated by the work of the EDG.

The game of conservation planning is now at a level of sophistication where the three pillars of sustainability – environment, economy and society – can all be incorporated. Halpern et al (2013) has demonstrated that it is possible to include equity (as a measure of social impact) in our considerations though, once again, trade-offs are the name of the game. You can't have solutions that give optimum environmental, economic and social outcomes simultaneously so it's important to understand how the trade offs work – what is lost or won with differing levels of these three factors.

The field of conservation is full of contested values and entrenched beliefs in which one group (be it farmers, fishers or conservationists) claim their vested interest (be it arable land, fishing grounds or endangered species) should hold sway over and above the interests of other groups. Good conservation planning attempts to make the trade offs between the environmental, economic and social impacts of any proposal plain and transparent. It's about bringing the various players together, and getting them to appreciate what particular trade offs are involved with any particular solution and then comparing this with other possible solutions on the table.

The people and the park

The importance of local communities to the effectiveness of protected areas

By Gustavo Andrade and Jonathan Rhodes (EDG, University of Queensland)

Protected areas have been part of the conservation landscape for over 150 years. Acknowledging the role of local communities in the management of these areas, however, is a much more recent thing. Just how important is that relationship? Our research is showing that in developing countries the level of local participation is the most important factor when it comes to the levels of compliance. So, maybe we should be paying more attention to it.

The world's first official national park was Yellowstone National Park in the United States. Since its establishment in 1872, governments have embraced the idea of protecting 'wilderness' against human impacts. The number of protected areas around the globe has grown enormously since then. Today, just under 13% of the planet's total land area lies within protected areas. There are some 144,000 protected sites covering over 19 million square kilometres.

The cost to local communities of claiming these areas has often been overlooked. Many protected areas established in the last century have followed the same conventional and exclusionary approach applied in Yellowstone. Many traditional communities that have strong cultural attachment to the land have been evicted without any consultation and frequently with inadequate compensation. Their traditional ways of living have been disrupted often triggering serious social impacts – all in the name of conservation that envisions an ideal of 'wilderness' without human interference.

Such wilderness has never in fact existed. Many traditional communities have been living in those areas for millennia. The result of such violent and authoritarian dispossession has often triggered hostile attitudes towards the protected areas. This has given rise to conflicts between park managers and local communities, reducing the effectiveness of protected areas for biodiversity conservation.

After Bwindi Impenetrable Forest in Uganda was gazetted as a national park, for example, several fires were deliberately set, burning 5% of the forest. In Tsitsikama National Park, South Africa, local communities practice illegal activities as a form of retaliation to command-and-control conservation policies. It's clear that if there are shortages of funds, equipment and well-trained staff – all of which are typical features of protected areas in developing countries – reserve protection can be jeopardised if the site does not have local community cooperation.

The importance of incorporating a more participatory approach in the decision making surrounding protected areas has been widely recognised in the literature and among some conservationists. However, it's still a contentious area. Some advocate that local communities are more likely to comply and to commit themselves to long-term conservation strategies when their knowledge and opinions are incorporated into protected area decision-making processes. Others believed that an exclusionary approach and enforcement is the cornerstone for the success of conservation in protected areas.

The panoramic grandeur of Serra do Tabuleiro Reserve in Brazil. The physical majesty of a region is still the main reason to establish national parks in many places, ignoring the cultural values of the locality. There are many cases where local communities have been evicted out of lands that have been part of their life for millennia.

Despite extensive knowledge about the management of protected areas, there is still little agreement about how compliance with protected area policies could be better achieved. A critically important question therefore is: What are the factors that influence and enhance compliance of communities with protected area policies?

Although many case studies have individually assessed this question for specific protected areas, few quantitative studies have attempted to make general statements about the factors that lead to better

The Bigodi Women Group use sustainably-harvested natural resources and weaving techniques to produce craft for tourists. The group is part of a larger community based organisation in Uganda called KAFRED. It was established to help conserve the Bigodi Wetland Sanctuary and ensure a healthy economy based on eco-tourism. Sustaining the natural values of the sanctuary is seen as been critical to sustaining the quality of life of local communities.
http://www.bigodi-tourism.org/6601.html

"In developing countries the level of local participation is the most important factor when it comes to the levels of compliance."

compliance with protected area conservation management plans. To address this issue, we undertook a comprehensive investigation using 55 published case studies on protected areas in developing countries (Andrade and Rhodes, 2012). We sought to identify whether the level of compliance with protected area policies was correlated with: local community participation in protected area management, age of protected area, area of protected area, the existence of buffer zones, protected area IUCN category, GDP PPP (Gross Domestic Product purchasing power parity) per capita, or human population density.

The result of this meta analysis has suggested that the inclusion of local communities in protected area management is likely to be a key determinant of the level of compliance with conservation strategies. It seems that local communities are more willing to comply with conservation policies and rules when they are included in the protected area decision-making process. Such inclusion creates a sense of ownership, where locals cooperatively protect reserves from outsiders and also regulate their own use of the area's natural resources. In general, we found that the higher the level of participation, the higher the level of compliance.

This has important implications for the management of protected areas and suggests that greater inclusion of local communities in management should be a key strategy for ensuring the integrity of protected areas. Other factors, such as protected-area age, the size of the protected area, the existence of a buffer zone, the level of protection as defined by IUCN categories, GDP per capita, and population density in the vicinity do not show a significant relationship with the level of compliance.

Simply restricting local access to the natural resources contained in a protected area – resources that can play a crucial role in the livelihood of local people – does not protect the natural values that the protected area was established for in the first place. Indeed, such an approach can actually accelerate the loss, such as an increase in illegal forest product on the black market from a forest locked up in a reserve.

On the other hand, including the local community in the management of the protected area promotes capacity building,

"In general, we found that the higher the level of participation, the higher the level of compliance."

the implementation of outreach programs and also encourages effective governance, guaranteeing that penalties will be applied and consistently enforced; all of which improves the chances of success in the long term.

Given that the majority of protected areas in developing countries face a huge funding deficit, a partnership with locals to help promote conservation strategies is a highly desirable outcome. Traditional knowledge can complement the effectiveness of modern science, and financial resources better invested in improving governance, capacity building, and outreach programs rather than draconian measures.

Of course, engaging local communities is not an easy task. There are no simple formulae or one-size-fits-all solutions for combining conservation objectives with local community needs. What works in one protected area may not work in another. Understanding the peculiarities of each protected area and the people who live in and around them is paramount for the success of each protected area's conservation program. How we effectively manage today's protected areas will determine whether those areas will remain under protection, or whether we will continue to see the loss of their natural values.

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The Kayapo tribe lives alongside the Xingu River in the eastern part of the Amazon Rainforest, near the Amazon basin, in an indigenous reserve (in green) which they help preserve. Around the edges of their territory (light brown) several fires in primary forest have been deliberately set by farmers to extend their territory. Source: (NASA 2004)

Sisters are doing it for themselves

The inclusion of local communities in the decision-making process relating to protected areas can promote a sense of ownership, where locals cooperatively protect reserves from the impacts of outsiders while also regulating their own use of natural resources. On Roviana in the Solomon Islands, for example, women involved in a conservation program were empowered by that involvement and actively played a role in achieving conservation outcomes. They are now managing and monitoring natural resources more comprehensively and setting their own rules to halt illegal activities inside strict resource-use zones (Aswani & Weiant 2004). It's believed the program's success may be attributed to five important factors: (1) a high level of participatory involvement and community leadership, (2) the enhancement of local perception that natural resources have been recovering gradually, (3) a combination of scientific and traditional knowledge, (4) economic incentives created by the alternative income generation, and (5) well-defined boundaries allowing enforcement to take place.

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Evidence and the conservation manager

What evidence does a manager need?

By Carly Cook (EDG, University of Melbourne)

It's often said that there's a gap between conservation science and conservation management, that the work of conservation researchers either isn't reaching managers or isn't addressing the issues most relevant to managers. In the hope of generating new perspectives on this problem, we decided to ask park managers about the information they need to make decisions and whether or not they have that information available to them (Cook et al. 2012). Understanding managers' views on evidence can provide important insights into how they can be best equipped to deal with complex conservation problems.

To collect this information we surveyed 100 conservation managers from Parks Victoria and the New South Wales Office of Environment and Heritage. First we asked them what were the most important pieces of information they needed in order to make informed decisions about managing biodiversity. We also asked which types of evidence they found useful for meeting their information needs. Then we asked managers (on a scale of 1 to 4) to rate: (i) how important each piece of information is for making decisions, (ii) how useful they consider each of the different types of evidence for their decisions, and (iii) which types of evidence they actually have for the areas they manage.

Managers told us that the decisions they make are complex, and that there are lots of different pieces of information they needed to inform those decisions (Table 1). The different types of information could be roughly grouped into two categories:

- information for the management of individual species or ecosystems, and

- information to make strategic decisions about how to prioritise management activities.

Table 1. The different components of management decisions that managers report to be important when making decisions about biodiversity.

Components	Description
Information about managing individual species or ecosystems	
Occurrence	Which species or ecosystems occur in the management area
Threats	The threatening process impacting on individual species or ecosystems
Management	The appropriate management actions to mitigate threats to individual taxa
Ecology	An understanding of the ecology of individual taxa relevant to management decisions
Effectiveness	An understanding of whether conservation targets are benefiting from management
Information about prioritizing management activities	
Distribution	Where species or ecosystems are found within the management area
Significance	The legislative or local significance of species or ecosystems in the management area
Condition	The condition of species or ecosystems (e.g., population status)
Resources	The funding and/or personnel available to conduct management activities

Parks Victoria managers with EDG scientists discuss strategies to control invasive willows in alpine bogs (See Decision Point #67 on how they used structured decision making to find a solution). Conservation managers have to make decisions on complex issues like this all the time. Managers surveyed by EDG say they find value in a broad spectrum of evidence in dealing with this complexity.

They told us that they place the highest priority on questions of what (occurrence), where (distribution), why (threats), and how (management action) to manage species and ecosystems, rather than the more strategic questions about how to prioritise management activities (Fig. 1). It was less important to managers to understand the financial resources available for management and the ecology of the taxa they are managing (Fig. 1). These results suggest that on-ground managers have a tendency to think locally, taking a more simplistic view of their information needs, rather than thinking strategically and taking a more holistic view.

Given the complexity of management decisions, it's not surprising that managers also told us they find a broad spectrum of evidence to be valuable when making management decisions, ranging from empirical data to the opinions of knowledgeable individuals (Table 2). The need for a diversity of evidence may arise from the fact that empirical evidence rarely considers the broader socio-political context in which management decisions are made. Therefore, managers must use other sources of knowledge to support crucial aspects of their management decisions.

While it has been suggested that managers tend not to value empirical data, the managers we sampled told us that they consider empirical evidence the most useful information they have for making decisions (Fig. 2). Unfortunately, managers also reported having poor access empirical evidence, but that the less useful types of evidence tend to be more readily available.

> "Managers do value science, but they have difficulty accessing the empirical evidence they want and need."

Table 2. The different types of evidence managers find useful for making decisions about the managing biodiversity.

Types of evidence	Description
Empirical evidence	
Research	Peer-reviewed papers, consultant reports, masters and doctoral theses, etc
Population monitoring	Regular population monitoring data
Condition assessments	Quantitative assessments of population status or vegetation condition
Experience-based evidence	
Anecdotal evidence	Information derived from the personal experience of protected area managers, experts and community members
Syntheses of multiple evidence sources	
Databases	Point location data (eg, species sighting recorded in the wildlife atlas) and vegetation mapping (e.g., geographic information system layers)
Management plans	General management plans for the protected area (eg, synthesizing multiple sources of evidence and setting out management priorities)
Specific management plans	Plans that address specific management issues (eg, recovery plans, fire management plans, invasive species management plans etc.)
Legislation	The State and Federal legislation and international agreements that management agencies have obligations to enact (eg, Environmental Protection and Biodiversity Conservation Act, Ramsar convention etc.)

Our results reveal that managers do value science, but that they have difficulty accessing the empirical evidence they want and need. What's not clear is whether managers are less likely to have science available because they cannot access existing management-relevant research, or whether important questions remain unanswered. Efforts to increase the use of science by conservation managers would benefit by improving the processes by which research findings are delivered to managers.

Research findings need to be presented in a form that is accessible, timely, and can be readily understood by managers. This could be achieved through active communication between scientists and managers, through greater incentives to publish in open-access journals, and through research magazines such as *Decision Point*. (Watch out for a future issue of *Decision Point* where we discuss effective strategies for increasing the usefulness, and use, of science for conservation management. http://onlinelibrary.wiley.com/doi/10.1111/cobi.12050/abstract)

While managers reported that they often lacked the empirical evidence they would like for the areas they manage, on average individual managers still reported having access to two-thirds (68%) of the evidence they find valuable. Efforts to increase the availability of science to managers could make a big difference in making up this shortfall. However, managers tell us that they benefit from multiple lines of evidence, which can help them to adapt to the continually changing management context.

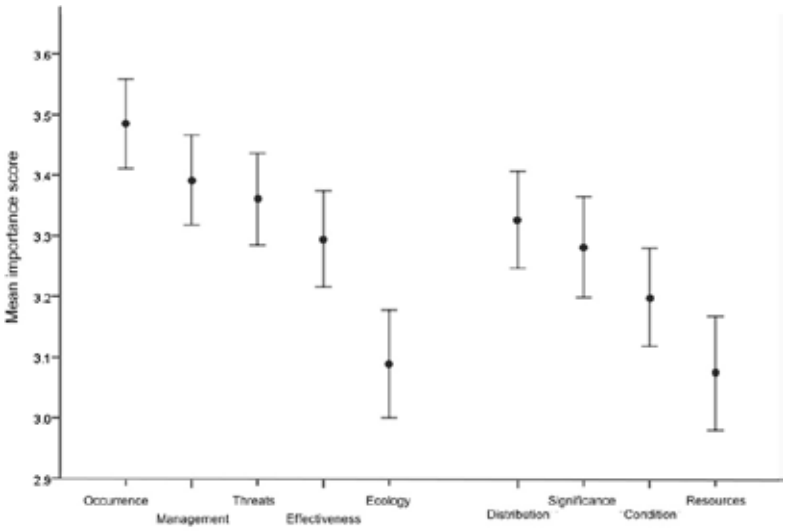

Figure 1: The value of information (mean importance score ± SE) for the different components of a management decision, as reported by protected area managers. Importance scores of ≥ 3 indicate managers consider this information important to make management decisions about biodiversity conservation.

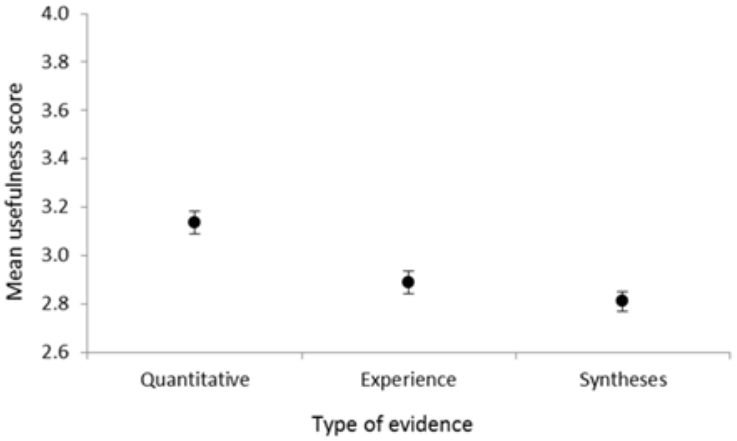

Figure 2: The utility of different types of evidence (mean usefulness score ± SE) to inform management decisions, as reported by protected area managers. Usefulness scores of ≥ 3 indicate managers consider this evidence valuable for making management decisions about biodiversity conservation.

Managers will never have all the information they desire to inform their management decisions, but this study demonstrates that they make pragmatic assumptions about how to make the most of limited resources. Understanding how managers use information to make robust management decisions is a field of research that requires more attention. Information use will likely differ according to the context for management and the background and training of managers, especially in developing countries. However, our data suggest conservation decisions are more complex than is often acknowledged in the literature.

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Understanding the network makes for a better plan

Learning about social networks for effective biodiversity conservation

By Angela Guerrero (EDG, University of Queensland)

Conservation has as much to do with people as it does with nature. So why is it that when we plan for conservation most of our attention goes towards understanding the biological and ecological aspects of the system we're trying to protect. We seldom ask: who are the key actors (individuals, groups or organisations) that enable or constrain the conservation outcomes we're after?

Answering this question could lead to conservation plans that are more strategic. Such information will provide guidance not only in terms of determining what actions can lead to achievement of conservation objectives, but also in terms of identifying who to engage with in the process of conservation so that there are increased opportunities for success.

But it's not just a question of who they are that's important; it's also a matter of how they are linked. Understanding the nature of these linkages helps us meet one of the big challenges of conservation planning, the problem of scale mismatch. This was the focus of a recent research collaboration I led that has just been published in *Conservation Biology* (Guerrero et al. 2013).

The value of networks

Solving conservation problems often requires multiple actions that are each associated with different ecological and management scales. This poses a difficulty for practitioners and decision makers whose influence is restricted to a particular spatial and temporal scale.

The challenge of developing strategies that can be applied at appropriate spatial and temporal scales can be aided by understanding who the key actors are, their spatial and temporal scales of operation or influence, and more importantly, an understanding of how they are connected to each other. These connections might be through links of collaboration, information sharing, or via transactions (such as the provision of service). In other words, an understanding of the network of people and groups involved helps in developing effective conservation strategies over multiple scales.

We define conservation social networks as the networks of relationships that link actors involved in conservation activities across space. They can be formal or informal. Formal networks are formed during the conservation-planning process through the establishment of formal agreements or partnerships, for example between non-governmental organizations or government agencies, around a particular conservation objective.

But networks don't have to be codified in agreements to exist or be important. Informal networks that grow up around specific issues of conservation interest or establish over years of association (such as social networks of farmers in which advice and information gets shared) can be just as important.

> "It's not just a question of who they are that's important; it's also a matter of how they are linked."

Network analysis

For conservation planning to operate effectively over multiple spatial, functional, and temporal scales, conservation practitioners need to apply tools that account for the multi-scalar nature of conservation problems. Social network analysis has been used across a diversity of disciplines to understand different social processes, some of which are often needed in conservation planning (eg, cooperation or knowledge generation). This is done by examining the network structure – how actors are connected to each other and the position they hold in the network relative to others. There's a range of measures that are used to characterise these structures and these include centrality, density, closeness and clustering measures.

We propose that social network analysis may provide guidance on how implementation might be approached when faced by multi-scale problems. It can help determine who are the key actors and how they are connected to each other. Such an analysis helps us:

- determine the links between key actors that could be used to promote cooperation and coordination of key activities across the network;
- identify bridging actors, or scale-crossing brokers, who could be important to engage with, because they link to others operating at different scales who would otherwise be disconnected;
- identify different subgroups of actors in the network that are related to particular, required, scales of action and thus could drive implementation at those particular scales;
- inform implementation strategies. For example, a network that is connected through a few key actors (Fig. 1a) may

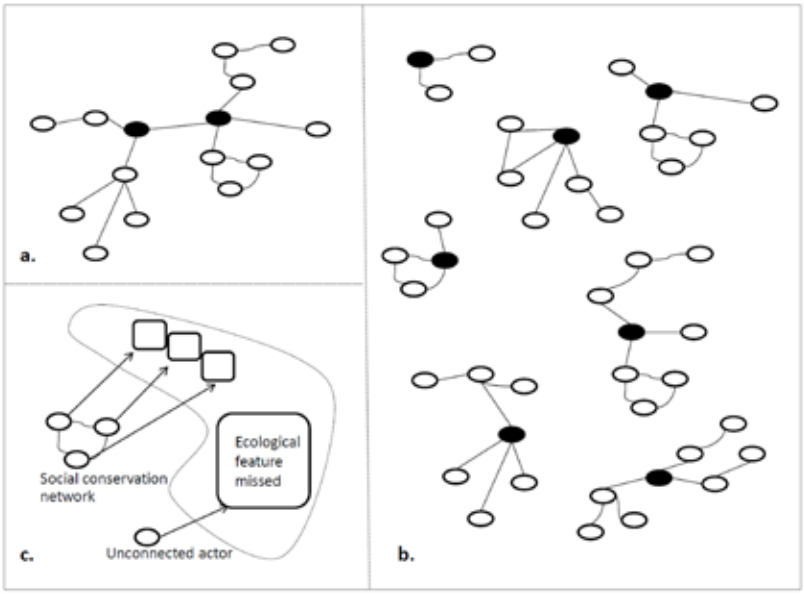

Figure 1. Examples of social-network structures. Circles represent actors (eg, individuals and organizations); solid circles represent actors connecting the network or subgroups). 1a. is a network connected through a few key actors, 1b. is a fragmented network with an actor connecting actors in each subgroup, and 1c. is a network with 2 different subgroups, each involved with different ecological features (squares) of the ecosystem of interest (outlined area). (From Guerrero et al. 2013)

"Social network analysis may provide guidance on how implementation might be approached when faced by multi-scale problems."

indicate the best strategy is to engage with these few key actors so that they can then coordinate action through their own networks. Alternatively, a network that is highly fragmented (Fig. 1b) may require engagement with many different actors and thus a greater financial investment at the implementation stage.

- minimise costs by identifying either well-connected actors or actors linked to others who could prove difficult or costly to engage with directly;
- identify actors who could help maximise understanding of the system's complexity because of their connections to actors who hold different types of knowledge;
- uncover particular collaboration gaps that if addressed might connect key groups or actors who could collectively enhance conservation success.

In sum, analysing network structures can help in understanding the degree to which multiple scales of action are linked or being coordinated. Social network analysis can allow for a targeted approach to the selection of stakeholders, and may be most useful when they are combined with other information about the social-ecological system to identify those actors connected to the most important ecological features (eg, Fig 1c). Such an analysis enables the targeting of actions to the most appropriate spatial scales.

Learning about the social system in which conservation actions are to be implemented can result in a more strategic conservation plan and one that has a greater chance of working.

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Mismatches in the Basin

A good example of the challenge of conservation and multiple scales can be found in Murray-Darling Basin. For over 100 years the Murray-Darling Basin, one of the most important river systems in Australia, has provided water for irrigation, livestock and industry, and domestic use across four Australian states. Increased water extraction driven by the expansion of irrigation in the basin resulted in a 40% reduction in water flow. As a result, ecosystems collapsed and native fishes, riparian vegetation, and wetlands of national significance have been hit hard. Diverse but unconnected institutions (eg, governments of different states) have attempted to repair water flow, and these efforts have led to a lack of effective governance of the basin as a whole. This is an example of a mismatch of spatial scale; the planning region did not reflect the boundaries of the ecological systems of the basin and instead encompassed areas of the basin occurring in each state. Linked to this spatial mismatch was a functional mismatch in which the full scope of features and ecological processes (eg, patterns of river flow, condition of wetlands) occurring across the basin were not accounted for. More recently, attempts to manage these scale mismatches include creation of institutions operating at a federal level and formation of the Murray-Darling Basin Authority. The Authority is responsible for the formulation of an integrated management plan to set water-diversion limits for the entire basin and for the development of specific conservation programs in conjunction with state governments. The challenge for the Authority is to formulate an integrated plan that sets water diversion limits in a manner that is consistent with the characteristics and needs of the entire social-ecological system not only at the whole-of-basin level but also across scales, without losing the local-scale perspective. In this way, from a network perspective, the Authority would effectively work as a bridging actor linking multiple scales of understanding, interest and action.

One basin, four states, many catchments and hundreds of conservation challenges.

Ecosystem services and land use policy

A NERP ED Workshop (Brisbane, March 2013)

By Fleur Maseyk and Yvonne Buckley (EDG, University of Queensland); and Marit Kragt (EDG, UWA)

Our managed landscapes provide us with many important ecosystem services such as the regulation of sediment transportation and the biological control of agricultural pests. These services, however, often go unquantified and even unacknowledged in policy. Can an ecosystem services approach help to increase the sustainability of land-use practices?

Despite considerable environmental legislation and ongoing efforts by resource management agencies, we still face a raft of environmental problems, many of which only seem to get worse. We're witnessing, for example, growing declines in water quality and native biodiversity; intensification of unsustainable farming practices; and increased scarcity of common resources. Are our policies not good enough, or is it their implementation that is failing?

It is on the back of this line of reflection that a cross-Tasman PhD research project being led by Fleur Maseyk has been established. To give the research a kick-start, a NERP-funded workshop was held at the University of Queensland in March.

The workshop at UQ brought together soil scientists, ecologists, economists, and policy makers from SEWPaC, DSITIA, SEQ Catchments, CSIRO, AgResearch in New Zealand, and other NERP ED nodes (UWA, University of Melbourne, and ANU) to workshop the 'Integration of ecosystem services into land management decision making'.

During the workshop, participants discussed some of the key challenges related to the incorporation of ecosystem services into decision making. These included: (i) how can ecosystem services be quantified and accounted for?; (ii) at what scale (temporal and spatial) should they be measured?; (iii) who wins and who loses in the provisioning ecosystem services? and (iv); how do we measure the value of ecosystem services and who should pay for these?

Similar questions have interested researchers since the findings of the Millennium Ecosystem Project in 2001. Concrete answers are elusive, data hungry, and fraught with issues of scale. Little wonder that the transition from concept to policy feels slow, or that the debate during the workshop was so wide ranging.

It was also not surprising that the answer to most of the questions explored during the workshop was 'it depends'. Workshop participants identified many barriers to incorporating an ecosystem services framework into environmental policy: from identifying the ecosystem services provided by different land uses; to quantifying those services from a biophysical perspective; to valuing the benefits of the services from a socio-economic perspective; and to setting up the institutional structures that allow incorporation of ecosystem services into policy.

In light of these discussions, it was concluded that clearly there is no such thing as an ecosystem-services shaped silver bullet. Further refining the 'it depends' provides an exciting and challenging platform for Fleur's PhD research.

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"Clearly there is no such thing as an ecosystem-services shaped silver bullet."

Laptops at 20 paces: Workshop participants robustly discuss the finer points of quantifying and valuing ecosystem services.

Workshop structure

Bridging the gap between science and policy requires us to find a common language and a common cause. Given the declines we are witnessing in biodiversity and water quality, there is an elevated urgency for science to deliver to the decision makers.

Thus there were two key focus areas for this workshop, and it was our aim that these areas be informed via cross-disciplinary conversations:

1. To determine a) the policy needs to integrate an ecosystem services approach to land management into public policy; and b) the current barriers preventing the uptake of ecosystem services into planning documents.

2. To explore how the integration of ecology and economic disciplines can respond to these needs.

To bring shape to these conversations, each of the three days of the workshop was assigned a theme:

Day 1: Policy needs for integrating ecosystem services and land management actions

Day 2: Methods for economic evaluation for ecosystem services

Day 3: Quantification of the provision of ecosystem services by woody vegetation and soils.

From conservation priority to opportunity

A CEED / NERP ED Workshop (Stradbroke Island, April 2013)

By Christopher Raymond (Enviroconnect, EDG (UQ) & LaP Hub (UTAS))

The conservation-opportunity concept was introduced to highlight the importance of translating conservation priorities into effective conservation actions. Whilst a number of studies have argued for the inclusion of conservation-opportunity assessments in conservation planning, few conceptual or empirical frameworks exist for making this inclusion. In April, twenty researchers and policy makers representing a diverse range of expertise, experience and conservation-planning interests attended a workshop on Stradbroke Island, Queensland, to further develop the concept of conservation opportunity. The workshop was sponsored by CEED and the NERP ED Hub, and led by Dr Christopher Raymond and Dr Andrew Knight.

The specific objectives of the workshop were:

1) To present and discuss current approaches related to the assessment of conservation opportunity;

2) To progress the theory supporting the concept of conservation opportunity;

3) To progress the concept of conservation opportunity as a process for implementing effective conservation action;

4) To identify future research directions;

5) To prepare peer-reviewed journal publications related to the assessment of conservation opportunity.

The workshop was a great success. New understandings of conservation opportunity emerged during the inter-disciplinary presentations and discussions; networks and professional relationships were established or strengthened; new linkages between NERP Landscape and Policy (LaP Hub) and Environmental Decisions Hubs were forged (including several collaborations on papers) and; social learning took place across the research-policy interface.

On days 3-4, the group identified five papers to be written on different aspects of conservation opportunity, including the presentation of philosophical insights, collaborative processes, spatial assessments, and policy frameworks. The key outputs of this workshop will be presented at a Conservation Opportunity symposium at ICCB 2013 in Baltimore.

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Talking up the opportunity: participants at one of the breakout groups at the conservation opportunity workshop on Stradbroke Island.

Dbytes turns 100!

Each week the Environmental Decisions Group sends out a little e-newsletter called *Dbytes* to all members of the EDG. It carries a news item on each node of the EDG network (Brisbane, Canberra, Melbourne and Perth) and six general news items on biodiversity policy, management research and/or communication. *Dbytes* aim is to keep EDG members up to date on biodiversity news and views.

So, why are we telling you this? Because we've just bought out our 100th issue of Dbytes and we were wondering (if you don't already get it) if you'd like to subscribe.

While it's primarily aimed at members of the EDG, over time *Dbytes* has picked up many subscribers from outside of the EDG, and we're happy to expand our network to anyone who wants to join. Indeed, the feedback we've received is that *Dbytes* has proved to be a vital source of intelligence ("very cool snippets", writes one subscriber; "a very informative, quick read", writes another).

To give you a flavour of the types of items included in *Dbytes*, below is a list of the general news items included in recent issues.

To subscribe, simply send me an email and I'll add you to the list. By the way, it's free! Of course, in that we're all info-overloaded and time-poor, nothing is completely free. Even though you don't have to pay money for it, simply allocating time to read *Dbytes* comes with a trade off of spending a little less time on something else. Because of this, we commit to the following:

- *Dbytes* only comes out once a week
- It will never carry attachments
- We will not use your email details for anything else
- We will do our best to ensure you can assess each issue of *Dbytes* in seconds so, if it carries nothing of interest to you, you can delete and forget. However, if an item is of interest, we provide info or links on how to get more information.

We've reached 100 so we must be doing something right.

More info or to subscribe: David Salt david.salt@anu.edu.au

General news appearing in recent *Dbytes*

Dbytes #100

1. The IUCN Red List of Ecosystems
2. Monitoring Evaluation Reporting and Improvement Strategy
3. NCCARF: Managing coextinction of insects in a changing climate
4. Payments for ecosystem services: lessons from around the world
5. Communicating Science for decision makers
6. Systematic review of Australian weed-related social surveys

Dbytes #99

1. Ranking environmental projects
2. NRM Research and Innovation Network Newsletter
3. Extinction: just how bad is it and why we should care?
4. NCCARF issued 'Adaptive management of Ramsar wetlands'
5. New journal on Resilience
6. Navigating the Rules of Scientific Engagement

Dbytes #98

1. 2013 L'Oréal Women in Science Fellowships
2. Planning for biodiversity conservation at a landscape scale
3. NRM Notes newsletter
4. Making complex issues accessible and readable?
5. Draft threat abatement for Phytophthora cinnamomi
6. A Stupidity-Based Theory of Organizations

From workshop to paper

The game of science can sometimes drag on. Discussions around workshops can lead to collaborations that lead to analysis that eventually lead to the creation of a science paper. All in all, with journal review processes sometimes taking forever, the time it takes for a good idea to be worked up into a formal scientific output can take several years. And for that output to produce an outcome (like arresting declines in biodiversity), it might take several more years (though many scientific outputs produce no outcomes). It took ten years for Marxan, the world's most popular conservation planning tool, to move from conception to application (see DPoint #16).

Pictured above is a EDG workshop run by Carissa Klein on Lady Elliot Island on integrating marine conservation planning. It was held in June last year (see DPoint #63, p15). One theme explored at the workshop was on integrating social equity into planning. The analysis was done, written up and submitted by October. It was accepted in January 2013 – a mere six months after the initial discussion – and we feature this research on the triple bottom line on page 6. Well done Halpern et al. Now to convert this output into an outcome...

What's the point?

Game of numbers

In the last issue of *Decision Point* (May, #69) we discussed threatened species and how we fund their protection. We cited a 2008 IUCN report, *The State of the World's Species*, that claimed there are around 16,900 threatened species around the world. One reader thought that sounded a bit high and, in the spirit of healthy scepticism, did his own fact checking. He found a much more up-to-date IUCN table (see http://www.iucnredlist.org/about/summary-statistics#Tables_1_2). The results in this table confirmed that there were some 16,900 species listed as threatened in 2008. However, it also presented 2012 numbers which showed the list had grown to 20,219; indeed it grows every year (and has almost doubled since 1996/98 when the total was 10,533, see table 1).

According to the summary statistics presented by the IUCN, of these 20,219 threatened species, 7,250 were vertebrates. That's 36% of the list and yet vertebrates only make up 3.7% of described species. (We discuss this over representation of vertebrates in *Decision Point #65*, p5).

(And we promise to find more up to date data next time.)

Table 1: An abridged version of the IUCN table of extinction numbers (just showing totals of threatened species each year).

Number of threatened species in 1996/98	Number of threatened species in 2008	Number of threatened species in 2009	Number of threatened species in 2010	Number of threatened species in 2011	Number of threatened species in 2012
10,533	16,928	17,291	18,351	19,570	20,219

ENVIRONMENTAL DECISIONS GROUP

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

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