Valuing Nature
Protected Areas and Ecosystem Services

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Introduction

Brendan Mackey, Penelope Figgis, James Fitzsimons, Jason Irving and Pepe Clarke

This publication brings together the key concepts, case studies and recommendations presented at a symposium entitled Valuing Nature: Protected Areas and Ecosystem Services held in Brisbane, Australia on 21-22 July 2014.

The symposium brought together over one hundred protected area, conservation, and ecological economic experts from government agencies, non-government organisations, the private sector, and universities. This included national and international experts in the areas of environmental accounting, the theory and practice of ecosystem service valuation, including approaches to payments for ecosystem services.

The symposium was held against the stark reality that while the living Earth – terrestrial, marine, coastal, and inland water ecosystems, and the wealth of life they support – fundamentally underpin human livelihoods, economies and well-being, these ecosystems and the many benefits or ‘services’ they provide are declining at an alarming and unprecedented rate (WWF, 2014).

Addressing this global challenge requires far-ranging responses from many fields including moral, ethical, science, governance and economic. The aim of the symposium was to generate a much higher interest in, and understanding of, the ecosystem services approach to accounting for and valuing the benefits of intact natural systems, and, in particular, the vital role of protected areas in securing these benefits.

The prevailing market economic paradigms of nations like Australia are currently undeveloped in their appreciation of these values and we are in the early days of developing accounting systems to incorporate what has come to be called ‘natural capital’. Without better understanding we will continue to have decisions based on superficial understanding of the value of our protected areas and other natural lands and seas with negative outcomes for both nature and human wellbeing.

At the heart of this symposium and publication lie some key questions: Are we really getting wealthier as a nation if Gross Domestic Product is increasing but we are eroding the natural capital on which our economy is based? Without better understanding we will continue to have decisions based on superficial understanding of the value of our protected areas and other natural lands and seas with negative outcomes for both nature and human wellbeing.

While terms noted above are related, there are fundamental differences between the accounting, valuation, commodification and monetisation of ecosystem services. The term ‘values’ is now so commonly used that we rarely pause to define or explain precisely what we mean by it. To paraphrase the American philosopher and educator, John Dewey (1929), values are those things with positive attributes we seek to make more secure, abundant, widely shared and available to future generations. Over the last 100 years, as the footprint of industrialisation has spread, it has become apparent that nature has become increasingly threatened, less secure and abundant for current and future generations.

Society has responded to these trends with conservation action and protected areas – initially a category of public land – which became the main policy instrument for helping conserve nature-based values, including scenic natural landscapes, important water catchments, areas of natural heritage significance, and threatened species and ecosystems. These multiple values attached to protected areas and biodiversity are long recognised and enshrined in international law along with national and state statutes. The Preamble to the Convention on Biological Diversity (CBD), for example, states that the 193 countries who are party to the Convention are: “Conscious of the intrinsic value of biological diversity and of the ecological, genetic, social, economic, scientific, educational, cultural, recreational and aesthetic values of biological diversity and its components”.

These broad and various values of nature are recognised differently across nations, sectors, interest groups and individuals. Society certainly values those ecosystems and species we find useful or of interest, but only some people acknowledge that other living beings have value aside from their utility (the intrinsic value noted above in the CBD). Many elements in human societies also value the relationships that develop between humans and nature. These bio-cultural values can be profound as in the traditional obligations to Country of Indigenous Australians. In many cultures there is assignment of sacred values to aspects of nature; species, holy mountains, rivers, forests and trees. ‘Mother Earth’ is a widespread concept among the world’s Indigenous peoples, with the juxtaposition of the two words making it clear that Indigenous people profoundly understand the interdependence that exists among human beings, other living species and the planet.
However, in an ever urbanised world which is resource hungry and deeply committed to immediate and materialistic goals, deeper understandings and connections to nature are being subsumed in many cultures. This often results in an almost anti-nature narrative – that only if nature produces a clear income or commodity such as tourism dollars, minerals, crops, pasture for animals or human settlement – does it have value. Australia is no exception. Protected areas – as one of the most significant categories of land use in Australia – are coming under increasing pressure from various sources. There is a substantial lack of recognition of ecosystem benefits among those who perceive such areas as ‘locked up’ lands, want open access for their recreational use or who see them as tourism opportunities first and foremost. Protected areas are also beleaguered by tightening budgets, ever-growing demand for natural resources and human-forced rapid climate change.

In these critical times, we need to explore new ways of communicating the multiple benefits to Australian society, and indeed the world community, of all healthy ecosystems and especially our National Reserve System of public, private and Indigenous protected areas. The science and policy communities should be generating robust and coherent information about nature-based values that can feed into policy deliberations, not just environmental policy but as a central part of our economic strategic thinking and planning. We should be exploring innovative ways of mobilising the financial and human resources we need to ensure our protected areas are properly managed and resilient in the face of multiple stressors and threats.

The publication commences with some big picture perspectives. Leading international authority on ecosystem services, Professor Robert Costanza opens with a chapter on the theory and practice of ecosystem valuation. He argues that in a world dominated by humans and with nature undervalued we need ‘a new vision of the economy and its relationship to the rest of the world that is better adapted to the new conditions we face’.

Dr. Mark Lonsdale from CSIRO provides an insight on a global initiative of great potential importance – the Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES), which developed with the growing awareness of the consequences of ecosystem change for human well-being and the scientific basis for action needed to enhance the conservation and sustainable use of those systems and their contribution to human well-being. The Section concludes with a perspective from New Zealand and how they have incorporated ecosystem valuation into their national policy.

Section 2 gives insight and examples of how intact nature holds diverse, but strong values, which societies seek to secure and pass on to future generations including cultural, aesthetic, inspirational, health and well-being and sustainable livelihoods.

Section 3 turns to the particular role of how protected areas hold and deliver ecosystem services and how these can be accounted for and valued, including a chapter on how IUCN’s relatively new ‘Red list for Ecosystems’ can be applied in Australia to improve environmental decisions by understanding which ecosystems are most at risk and the processes that threatened them.

Section 4 offers international perspectives and case studies from Australia and Canada, focusing on how ecosystems deliver particular benefits ranging from water and carbon sequestration to fisheries and tourism. They highlight challenges to valuing services and then incorporating that value into policy and traditional financial accounting systems.

Section 5 gives some perspectives on the critical issue of taking the ecosystems approach further. We have two perspectives on communicating the value of nature in a message-dense world, and national and state perspectives of how the particular role of national parks and other protected areas can be better embedded in policy making.

The publication concludes with key policy directions that emerged from the symposium’s presentations and discussions.

References


Ecosystem services in theory and practice

Robert Costanza

Introduction

The world has changed dramatically. We no longer live in a world relatively empty of humans and their artifacts. We now live in what some are even calling a new geologic era – the ‘Anthropocene’ (Crutzen, 2002) – a full world where humans are dramatically altering our ecological life support system (Daly, 2005).

Our traditional concepts and models of the economy were developed in the ‘empty’ world. The conventional view of the ‘economy’ is based on a number of assumptions about the way the world works, what the economy is, and what the economy is for (Table 1). In this ‘empty world’ context, built capital – the houses, cars, roads, and factories of the market economy – was the limiting factor. Natural capital (our ecological life support system) and social capital (our myriad relationships with each other) were both abundant. It made sense in that context, not to worry too much about environmental and social ‘externalities’ – effects that occurred outside the market – since they could be assumed to be relatively small and ultimately solvable. It made sense to focus on the growth of the market economy, as measured by Gross Domestic Product (GDP), as a primary means to improve human welfare. It made sense, in that context, to think of the economy as only marketed goods and services, and to think of the goal as increasing the amount of these goods and services produced and consumed.

But in the new ‘full’ world context, we have to think differently about what the economy is and what it is for if we are to create sustainable prosperity. If we seek “improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities” as the UN has recently proclaimed as the primary global goal (UNEP, 2011), we are going to need a new vision of the economy and its relationship to the rest of the world that is better adapted to the new conditions we face.

We have to first remember that the goal of the economy is to sustainably improve human well-being and quality of life. We have to remember that material consumption and GDP are merely means to that end, not ends in themselves. We have to recognise, as both ancient wisdom and new psychological research tell us, that material consumption beyond real need can actually reduce our well-being. We have to better understand what really does contribute to sustainable human well-being (SHW), and recognise the substantial contributions of natural and social capital, which are now the limiting factors to improving SHW in many countries. We have to be able to distinguish between real poverty, in terms of low SHW, and merely low monetary income. Ultimately we have to create a new vision of what the economy is and what it is for, and a new model of development that acknowledges this new full world context and vision (Table 1).

Planetary boundaries

Our planet’s ability to provide an accommodating environment for humanity is clearly being challenged by our own activities towards an unknown future state of significantly different conditions.

One way to address this challenge is to determine ‘safe planetary boundaries’ based on fundamental characteristics of our planet and to operate within them. ‘Boundaries’ here mean specific points related to a global-scale environmental process beyond which humanity should not go. Identifying our planet’s intrinsic, non-negotiable limits is not easy, but recently a team of scientists have specified nine areas that are most in need of well-defined planetary boundaries (Rockström et al., 2009; see Figure 1). The nine areas they identified are climate change, biodiversity loss, excess nitrogen and phosphorus production, stratospheric ozone depletion, ocean acidification, global consumption of freshwater, change in land use for agriculture, air pollution, and chemical pollution. They estimate that humanity has already transgressed three of these boundaries: climate change, biodiversity loss, and nitrogen production, with several others rapidly approaching the safe boundary.

Remedial policy responses to date have been local, partial, and inadequate. Early policy discussions and the resulting responses tended to focus on symptoms of environmental damage rather than basic causes. As a result policy instruments tended to be ad hoc rather than carefully designed for efficiency, fairness, and sustainability. For example, in the 1970s, emphasis centered on end-of-pipe pollution control which, while a serious problem, was actually a symptom of expanding populations and inefficient technologies that fueled exponential growth of material and energy throughput while threatening the recuperative powers of the planet’s life-support systems.
These problems are all evidence that the material scale of human activity is rapidly approaching, or already exceeds, the safe operating space for humanity on the earth. We are degrading our life-support systems – the ecosystem services provided by our natural capital assets.

**Ecosystem services**

Ecosystem services are defined as “the benefits people obtain from ecosystems” (Costanza et al., 1997; Millennium Ecosystem Assessment, 2005). These include provisioning services such as food and water; regulating services such as regulation of floods, drought, and disease; supporting services such as soil formation and nutrient cycling; and cultural services such as recreational, scientific, spiritual and other nonmaterial benefits (Costanza et al., 1997; Daily, 1997; de Groot et al., 2002). This is an appropriately broad and an appropriately vague definition. It includes both the benefits people perceive, and those they do not. The conventional economic approach to ‘benefits’ is far too narrow in this regard, and tends to limit benefits only to those that people both perceive and are ‘willing to pay’ for, in some real or contingent sense.

But the general population’s information about the world, especially when it comes to ecosystem services, is extremely limited. We can expect many ecosystem services to go almost unnoticed by the vast majority of people, especially when they are public, non-excludable services that never enter the private, excludable market. Think of the storm regulation value of wetlands (Costanza et al., 2008). How can we expect the average citizen to understand the complex linkages between

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<table>
<thead>
<tr>
<th>Current Economic Model: the “Washington Consensus”</th>
<th>Ecological Economics Model</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Primary policy goal</strong></td>
<td>More: economic growth in the conventional sense, as measured by GDP. The assumption is that growth will ultimately allow the solution of all other problems. More is always better.</td>
</tr>
<tr>
<td><strong>Primary measure of progress</strong></td>
<td>GDP</td>
</tr>
<tr>
<td><strong>Scale/carrying capacity</strong></td>
<td>Not an issue since markets are assumed to be able to overcome any resource limits via new technology and substitutes for resources are always available</td>
</tr>
<tr>
<td><strong>Distribution/poverty</strong></td>
<td>Lip service, but relegated to “politics” and a “trickle down” policy: a rising tide lifts all boats</td>
</tr>
<tr>
<td><strong>Economic efficiency/allocation</strong></td>
<td>The primary concern, but generally including only marketed goods and services (GDP) and institutions</td>
</tr>
<tr>
<td><strong>Property rights</strong></td>
<td>Emphasis on private property and conventional markets</td>
</tr>
<tr>
<td><strong>Role of Government</strong></td>
<td>To be minimized and replaced with private and market institutions</td>
</tr>
<tr>
<td><strong>Principles of Governance</strong></td>
<td>Laissez faire market capitalism</td>
</tr>
</tbody>
</table>

Table 1. Basic characteristics of the current economic model and the “ecological economics” model
landscape patterns, precipitation patterns, wetlands and flood attenuation, when even the best landscape scientists find this an extremely challenging task? We need to remember the definition of ecosystem services (the benefits provided by ecosystems), and acknowledge that the degree to which the public perceives and understands them is a separate (and very important) question.

Conventional economic valuation presumes that people have well-formed preferences and enough information about trade-offs that they can adequately judge their ‘willingness-to-pay’. Since these assumptions do not hold for many ecosystem services we must: (1) inform people’s preferences by showing the underlying dynamics of the ecosystems in question using models; (2) allow communities to discuss the issues and ‘construct’ their preferences within a framework to inform the discussions; or (3) use other techniques that do not rely directly on preferences to estimate the contribution to human well-being of ecosystem services (i.e. to directly infer marginal contributions to well-being) for example through the use of computer models.

In addition, the benefits one receives from functioning ecosystems do not necessarily depend on one’s ability to pay for them in monetary units. For example, indigenous populations with no money economy at all derive most of the essentials for life from ecosystem services but have zero ability to pay for them in monetary terms. To understand the value of these ecosystem services we need to understand the trade-offs involved, and these may be best expressed in units of time, energy, land or other units, not necessarily money, remembering that the local population may or may not understand or be able to quantify these trade-offs. Finally, if one can express the trade-offs (value) in one set of units (numerator) and can express the trade-offs between that numerator and another, then one can convert the trade-offs into the other numerator. For example, if we can express trade-offs in units of time and can estimate the time/money trade-off, we can express the time units in monetary terms.

A second issue is that ecosystem services are, by definition, not ends or goals, but means to the end or goal of sustainable human well-being. This does not imply that ecosystems are not also valuable for other reasons, but that ecosystem services are defined as the instrumental values of ecosystems as means to the end of human well-being. An important, but different, distinction some authors have made is one between intermediate services and final services (Boyd and Banzhaf, 2007). It is certainly true that for the purposes of certain aggregation exercises adding intermediate and final services would be double counting. But that does not imply that

Figure 1. Planetary boundaries. The globe represents the proposed safe operating space for the nine planetary systems. The wedges represent an estimate of the current position for each variable. The boundaries in three systems (rate of biodiversity loss, climate change, and human interference with the nitrogen cycle) have already been exceeded (Rockström et al., 2009; Steffen et al., 2011).
intermediate services are not services. Think of the production of car tyres in an economy. Some tyres are sold directly to consumers and are part of final demand, while others are sold to car companies and are intermediate products, sold to consumers as parts of cars. The tyres themselves are indistinguishable from each other, the only difference being who buys them. When calculating GDP (which is the aggregate of sales to final demand) it would not be appropriate to count both the tyres sold to final demand and the tyres sold to car companies, since those tyres are already counted as parts of the cars sold to final demand. But tyres in both cases, whether intermediate or final products, are means to the end of human well-being and are not ends in themselves. Likewise, ecosystem goods and services, whether intermediate (or ‘supporting’) in the Millennium Assessment typology services or final services are all contributors to the end of human well-being. Also, ecosystem processes (or functions) and services are not mutually exclusive categories. Some processes or functions are also services, others are not. Some services are intermediate, some are final, and some are partly both.

Ecosystems with embedded humans are complex, dynamic, adaptive systems with non-linear feedbacks, thresholds, and hysteresis effects (Costanza et al., 1993). Ecosystem services are therefore not the product of a linear chain from production (means) to direct benefits by people (ends) with no feedbacks or any of the other complexities of the real world. The real world is complex and messy and our systems of classification and definition of ecosystem services should recognise that and work with it, not ignore it in a misguided attempt to impose unrealistic order and consistency.

**Natural capital and ecosystem services**

The ecosystems that provide the services are referred to as natural capital, using the general definition of capital as a stock that yields a flow of services over time (Costanza and Daly, 1992). In order for these benefits to be realised, natural capital (which does not require human activity to build or maintain) must be combined with other forms of capital that do require human agency to build and maintain. These include: (1) built or manufactured capital; (2) human capital; and (3) social or cultural capital (Costanza et al., 1997, 2014; see Figure 2).

These four general types of capital are all required in complex combinations to produce any and all human benefits. Ecosystem services thus refer to the relative contribution of natural capital to the production of various human benefits, in combination with the three other forms of capital. These benefits can involve the use, non-use, option to use, or mere appreciation of the existence of natural capital.

The following categorization of ecosystem services has been used by the Millennium Ecosystem Assessment (2005):

1. **Provisioning services** - ecosystem services that combine with built, human, and social capital to produce food, timber, fiber, or other ‘provisioning’ benefits. For example, fish delivered to people as food require fishing boats (built capital), fisher-folk (human capital), and fishing communities (social capital) to produce.

2. **Regulating services** - services that regulate different aspects of the integrated system. These are services that combine with the other three capitals to produce flood control, storm protection, water regulation, human disease regulation, water purification, air quality maintenance, pollination, pest control, and climate control. For example, storm protection by coastal wetlands requires infrastructure, people and communities to ‘benefit’ from the storm protection function of wetlands. These services are generally not marketed but have clear value to society.

3. **Cultural services** - ecosystem services that combine with built, human, and social capital to produce recreation, aesthetic, scientific, cultural identity, sense of place, or other ‘cultural’ benefits. For example, to produce a recreational benefit requires a beautiful natural asset (e.g. a lake), in combination with built infrastructure (a road, trail, dock, etc.), human capital (people able to appreciate the lake experience), and social capital (family, friends and institutions that make the lake accessible and safe). Even ‘existence’ and other ‘non-use values’ require people (human capital) and their cultures (social and built capital) to appreciate.

4. **Supporting ‘services’** - services that maintain basic ecosystem processes and functions such as soil formation, primary productivity, biogeochemistry, and provisioning of habitat. These services affect human well-being indirectly by maintaining processes necessary for provisioning, regulating, and cultural services. They also refer to the ecosystem services that have not yet, or may never be intentionally combined with built, human, and social capital to produce human benefits but that support or underlie these benefits and may sometimes be used as proxies for benefits when the benefits cannot be easily measured directly. For example, net primary production (NPP) is an ecosystem function that supports carbon sequestration and removal from the atmosphere, which combines with built, human, and social capital to provide the benefit of climate regulation. Some would argue that these supporting services should rightly be defined as ecosystem ‘functions’, since they may not yet have interacted with the other three forms of capital to create benefits. We agree with this in principle, but recognise that supporting services/functions may sometimes be used as proxies for services in the other categories.

This categorisation suggests a very broad definition of services, limited only by the requirement of a contribution to human well-being. Even without any subsequent valuation, explicitly listing the services derived from an ecosystem can help ensure appropriate recognition of the full range of potential impacts of a given policy option. This can help make the analysis of
ecological systems more transparent and can help inform decision makers of the relative merits of different options before them.

To achieve sustainability, we must incorporate natural capital, and the ecosystem goods and services that it provides, into our economic and social accounting and our systems of social choice. In estimating these values we must consider how much of our ecological life support systems we can afford to lose. To what extent can we substitute manufactured for natural capital, and how much of our natural capital is irreplaceable? For example, could we replace the radiation screening services of the ozone layer if it were destroyed? Because natural capital is not captured in existing markets, special methods must be used to estimate its value. These range from attempts to mimic market behavior using surveys and questionnaires to elicit the preferences of current resource users (i.e. willingness-to-pay to methods based on energy analysis of flows in natural ecosystems (which do not depend on current human preferences at all) (Farber and Costanza, 1987; Costanza, et al., 1989; Costanza, 2004). Because of the inherent difficulties and uncertainties in determining these values we are better off with an intelligently pluralistic approach that acknowledges and utilises these different, independent approaches.

Valuation of ecological systems and services

The issue of valuation is inseparable from the choices and decisions we have to make about ecological systems. Some argue that valuation of ecosystems is either impossible or unwise. For example, some argue that we cannot place a value on such ‘intangibles’ as human life, environmental aesthetics, or long-term ecological benefits. But, in fact, we do so every day. When we set construction standards for highways, bridges and the like, we value human life –

Figure 2. Interaction (X) between built, social, human and natural capital required to produce human well-being. Built and human capital (the economy) are embedded in society which is embedded in the rest of nature. Ecosystem services are the relative contribution of natural capital to human well-being, they do not flow directly. It is therefore essential to adopt a broad, transdisciplinary perspective in order to address ecosystem services (adapted from Costanza et al., 2014).
acknowledged or not – because spending more money on construction would save lives. These are statistical lives, however, not particular lives and one should not confuse the two.

People also often talk about ‘economic value’, ‘ecological value’, and ‘social value’ as if they were separate things. Nothing could be further from the truth. As the discussion above makes clear, the ‘value’ or ‘benefit’ we are talking about here is the contribution to sustainable human well-being. None of these elements – ecological, cultural, economic – can make a contribution to that goal without interacting with the others. What we can ask is: what is the relative contribution of, for example, natural capital to sustainable human well-being, in combination with other forms of capital (built, human, social), in a particular context? We have to look at these things in context and as part of an integrated, whole system of humans embedded in cultures embedded in the rest of nature.

Another often-made argument is that we should protect ecosystems for purely moral or aesthetic reasons, and we do not need valuations of ecosystems for this purpose. But there are equally compelling moral arguments that may be in direct conflict with the moral argument to protect ecosystems. For example the moral argument that no one should go hungry. All we have done is to translate the valuation and decision problem into a new set of dimensions and a new language of discourse.

So, while ecosystem valuation is certainly difficult, one choice we do not have is whether or not to do it. Rather, the decisions we make, as a society, about ecosystems imply tradeoffs and therefore valuations. We can choose to make these valuations explicit or not; we can undertake them using the best available ecological science and understanding or not; we can do them with an explicit acknowledgment of the huge uncertainties involved or not; but as long as we are forced to make choices we are doing valuation. The valuations are simply the relative weights we give to the various aspects of the decision problem. Society can make better choices about ecosystems if the valuation issue is made as explicit as possible. This means taking advantage of the best information and models we can muster and making uncertainties about valuations explicit too. It also means developing new and better ways to make good decisions in the face of these uncertainties. Ultimately, it means being explicit about our goals as a society, both in the short-term and in the long-term.

The point that must be stressed is that the economic value of ecosystems is connected to their physical, chemical, and biological role in the long-term, global system – whether the present generation of individuals fully recognises that role or not. If it is accepted that each species, no matter how seemingly uninteresting or lacking in immediate utility, has a role in natural ecosystems (which do provide many direct benefits to humans), it is possible to shift the focus away from our imperfect short-term perceptions and toward the goal of developing more accurate values for long-term ecosystem services. Ultimately, this will involve the collaborative construction of dynamic, evolutionary models of linked ecological economic systems that adequately address long-term responses and uncertainties, like those mentioned above.

Institutions to manage ecosystems and their services

One hears a lot of talk these days about ‘ecosystem service markets’. The problem is, conventional markets are not the right institution for managing many ecosystem services. These services (other than provisioning services) are often ‘non-rival’ and not easily excludable and are therefore best thought of as ‘public goods’ or, more generally, a part of ‘the commons’ (Farley and Costanza, 2010). While we can and should use economic incentives (fees and payments) when appropriate to manage the commons, we need a different institutional form than ‘markets’ within which to do this – something more akin to an ‘ecosystem trust’.

Ruhl et al. (2007) document the ‘anti-ecosystem services bias’ prevalent in American property law, regulation, and social norms. One particularly interesting counter-trend to this bias emerges in the ‘public trust doctrine’, an idea that law professor Joseph Sax (Sax,1970) identified as the only legal doctrine with the breadth and substance to be useful as a comprehensive approach to natural resource (and ecosystem service) management. However, so far the U.S. Supreme Court has declined to implement this doctrine.

Recent proposals to expand the ‘commons sector’ of the U.S. and global economy by creating ‘common asset trusts’ to manage the atmosphere, water, and other natural capital assets (structured like the Alaska Permanent Fund or the many existing land trusts) may be one way of implementing this doctrine (Barnes, 2006; Barnes et al., 2008). For example, a bill has been introduced in the Vermont Senate to create a ‘Vermont Common Asset Trust’, based on the public trust doctrine, to ‘propertise’ (but not privatise) the state’s natural and social capital assets in order to better manage them on behalf of their common stakeholders (both living and future). Trusts are widely-used and well-developed legal mechanisms designed to protect and manage assets on behalf of specific beneficiaries (Souder and Farifax, 1996). Extending this idea to the management and protection of whole ecosystems and the services they provide, is a new but straightforward extension of this idea. Trusts would define whole ecosystems as common property assets, managed by trustees on behalf of all current and future beneficiaries. Once these common assets are assigned property rights, we can use all the existing property law to manage them more effectively. For example, we can charge fees for damages and make payments for enhancement. This gives Payment for Ecosystem Services schemes a broader institutional framework within which to operate and can help to drastically reduce transaction costs.
While trusts may not be the only or the best institution for managing ecosystem services, they seem to be a move in the right direction. We need to think much more creatively about the design of institutions that are better suited to the common asset nature of ecosystem services.

**The promise of ecosystem Services: toward a sustainable and desirable future**

A new model of the economy and prosperity consistent with our new full world context (Table 1) would be based clearly on the goal of sustainable human well-being. It would use measures of progress that clearly acknowledge this goal, such as Genuine Progress Indicator (GPI) instead of GDP. It would acknowledge the importance of ecological sustainability, social fairness, and real economic efficiency.

Ecological sustainability implies recognising that natural and social capital are not infinitely substitutable for built and human capital, and that real biophysical limits – planetary boundaries – exist to the expansion of the market economy. Climate change is perhaps the most obvious and compelling of these limits.

Social fairness implies recognising that the distribution of wealth is an important determinant of social capital and quality of life. The conventional development model, while explicitly aimed at reducing poverty, has bought into the assumption that the best way to do this is through growth in GDP. This has not proved to be the case and explicit attention to distribution issues is sorely needed. As Robert Frank has argued (Frank, 2007), economic growth beyond a certain point sets up a ‘positional arms race’ that changes the consumption context and forces everyone to consume too much of positional goods (like houses and cars) at the expense of non-marketed, non-positional goods and services from natural and social capital. Increasing inequality of income actually reduces overall societal well-being, not just for the poor, but across the income spectrum (Wilkinson and Pickett, 2009).

Real economic efficiency implies including all resources that affect sustainable human well-being in the allocation system, not just marketed goods and services. Our current market allocation system excludes most non-marketed natural and social capital assets and services that are huge contributors to human well-being. The current development model ignores this and therefore does not achieve real economic efficiency. A new, sustainable ecological economic model would measure and include the contributions of natural and social capital and could better approximate real economic efficiency.

The new economic model would also acknowledge that a complex range of property rights regimes are necessary to adequately manage the full range of resources that contribute to human well-being. For example, most natural and social capital assets are public goods. Making them private property does not work well. On the other hand, leaving them as open access resources (with no property rights) does not work well either. What is needed is a third way to propertise these resources, without privatising them. As noted above, several new (and old) common property rights systems have been proposed to achieve this goal, including various forms of common property trusts.

The role of government also needs to be reinvented. In addition to government’s role in regulating and policing the private market economy, it has a significant role to play in expanding the ‘commons sector’ that can propertise and manage non-marketed natural and social capital assets. It also has a major role to play as facilitator of societal development of a shared vision of what a sustainable and desirable future would look like. As Prugh et al. (2002) have argued, strong democracy based on developing a shared vision is an essential prerequisite to building a sustainable and desirable future.

The conventional economic model is not working, for either the developed or the developing world. It is not sustainable and it is also not desirable. It is based on a now obsolete ‘empty world’ vision and it is leading us to disaster.

We need to accept that we now live in a ‘full world’ context where natural and social capital are the limiting factors. We could achieve a much higher quality of life, and one that would be ecologically sustainable, socially fair, and economically efficient, if we shift to a new sustainable development paradigm that incorporates these principles. The problem is that our entire modern global civilization is, as even former US President George W. Bush has acknowledged, “addicted to oil" and addicted to consumption and the conventional development model in general. An addictive substance is something one has developed a dependence on which is either not necessary or harmful to one’s longer-term well-being. Fossil fuels (and excessive material consumption in general) fit the bill. We can power our economies with renewable energy, and we can be happier with lower levels of consumption, but we must first break our addiction to fossil fuels, consumption, and the conventional development model. But in order to break an addiction, one must first clearly see the benefits of breaking it, and the costs of remaining addicted, facts that accumulating studies like the IPCC reports, the Stern Review (2007), the Millennium Ecosystem Assessment (2005) and many others are making more apparent every day.

What else can we do to help break this addiction? Here are just a few suggestions.

- Create and share a vision of a future with zero fossil fuel use and a quality of life higher than today. That will involve understanding that GDP is a means to an end, not the end itself, and that in some countries today more GDP actually results in less human well-being (while in others the reverse is still true). It will require a focus on sustainable scale and just distribution. It will require an entirely new and broader vision of what the economy is, what it is for, and how it functions.
• Convene a ‘new Bretton Woods’ conference to establish the new measures and institutions needed to replace GDP, the World Bank, the IMF, and the WTO. These new institutions would promote:
  • Shifting primary national policy goals from increasing marketed economic activity (GDP) to maximizing national well-being (GPI or something similar). This would allow us to see the interconnections between built, human, social, and natural capital, and build real well-being in a balanced and sustainable way;
  • Reforming tax systems to send the right incentives by taxing negatives (pollution, depletion of natural capital, overconsumption) rather than positives (labour, savings, investment);
  • Expanding the commons sector by developing new institutions that can ‘property’ the commons without privatizing them. Examples include various forms of common asset trusts, like the atmospheric (or sky) trust (Barnes et al., 2008) payments for depletion of natural and social capital and rewards for protection of these assets; and
  • Reforming international trade to promote well-being over mere GDP growth. This implies protecting natural capital, labor rights, and democratic self-determination first and then allowing trade, rather than promoting the current trade rules that ride roughshod over all other societal values and ignore non-market contributions to well-being.

We can break our addiction to fossil fuels, overconsumption, and the current development model and create a more sustainable and desirable future. It will not be easy and it will require a new vision, new measures, and new institutions. It will require a directed evolution of our entire society (Beddoe et al., 2009). But it is not a sacrifice of quality of life to break this addiction. Quite the contrary, it is a sacrifice not to.

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Valuing nature’s green infrastructure in Australia

Paul Sinclair

Undervaluing nature

Australia desperately needs a powerful public constituency who value the protection, repair and re-creation of ecosystem services from protected areas and other natural lands. This constituency will be able to champion the simple truth that healthy natural ecosystems are not nice to have, optional extras, but fundamental major assets of any nation.

Undervaluing the many benefits and values flowing from protected areas is ‘business as usual’ in Australia. Despite at least two decades of thought and research, the intrinsic and extrinsic valuation of nature and its services has struggled to move beyond the margins of public debate, or profoundly influence government and business decision-making. We are not alone in facing the challenge. A recent survey found concern amongst Australians and residents of 11 other nations about the loss of biodiversity was at its lowest for 20 years (Globe Scan, 2013).

A consequence of this declining concern is growing confidence amongst regressive businesses and political parties that hard won protections for the nation’s natural life-support systems can be wound back without public backlash. For example, the federal regulatory frameworks and investment critical for establishing protection for the environment, and the foundation for market-based innovation in conservation and pollution reduction, have been under sustained attack from state and federal governments and the business lobby. Nature conservation programs were cut by $483.8 million in the 2014-15 Federal budget, while public subsidies promoting the use of fossil fuels were maintained.

A business as usual approach will result in the ecosystem services produced by protected areas remaining irrelevant to national reform and investment agendas and result in their degradation. The current very narrow interpretation of what constitutes infrastructure is a major obstacle. Take the current Australian Government’s approach to nation building infrastructure as an example. Tony Abbott said while electioneering in 2013: “…I hope to be an infrastructure prime minister who puts bulldozers on the ground and cranes into our skies” (Sydney Morning Herald, 2013).

It is arguable that the most critical piece of national infrastructure is natural – the Great Dividing Range which supplies about 13 million Australians with freshwater. Protected areas play a vital role in the harvesting and purification of these water supplies. Without the services provided by the Great Dividing Range, life in Australia’s biggest cities would be poorer, sicker and more vulnerable to disaster. Bulldozers and cranes will not secure protection of this natural infrastructure.

Changing our understandings

Our next Prime Minister will need to understand environments like the Great Dividing Range are critical natural infrastructure and a national priority for law making and investment. This will only happen if a powerful community based constituency which understands, sees and feels its dependency on protected areas along the Range demands the value of these environments be put at the heart of government, business and community decision-making.

Politics is about people. Today most Australians live in capital cities and towns wedged between the Great Dividing Range, its eastern escarpment and the ocean. This fertile crescent is where the majority of Australians’ daily dependence on ecosystems is most stark and vulnerable to climate change and habitat loss. Starting thousands of conversations with communities about our shared spiritual, physical and economic dependency on the range will be critical to creating the political momentum required to change the way it is valued.

The Australian Conservation Foundation wants to see a rapid expansion in size and quality of a network of protected areas across public and private lands from Cape York in Queensland to the Central Highlands in Victoria. This great network of mountains with its intricate, diverse habitats and microclimates contains much of Australia’s richest diversity of plants and animals. The high rainfall of the ranges delivers the fresh water on which most Australians are dependent.

These values are not currently secure despite considerable progress through the large scale, inclusive Great Eastern Ranges Initiative (GER) (Pulsford et al., 2013). Multiple threats from a warming climate, weak environmental laws and escalating pressure from land-clearing, logging, mining and urban development threatens to rapidly shrink the valuable environments found along the range to the detriment of people and wildlife.
The rugged gorges of the Great Dividing Range like Ettrema in Morton National Park NSW provide many benefits, including opportunities for adventure in magnificent surroundings. Photo: © Katherine Zischka
Such an initiative links some of Australia's most iconic protected areas including the Wet Tropics World Heritage Area, Gondwana Rainforests World Heritage Area, Greater Blue Mountains World Heritage Area, Australian Alps National Parks and the protected catchments of Melbourne's water supply catchments. These are not only globally significant for their importance to biodiversity, safeguarding many of our threatened species, but they also hold some our most scenic and most visited tourism and recreational assets. This provides a major economic and health asset for both visitors and the many residents of the heavily populated coast.

Australians depend on the Great Dividing Range and its escarpment for that most essential of human needs after air, fresh water. The range and its great escarpment is a barrier to rain clouds so the eastern slopes receive, by the standards of the driest inhabited continent, secure and regular rainfall. This means a large number of Australians, perhaps the majority, depend on freshwater harvested by the mountains and forests of the range.

However, the warming of the atmosphere as a result of greenhouse gas pollution is creating more extreme weather, directly threatening the environment people depend on for healthy freshwater with deep, long droughts, devastating wildfires and polluted water supplies.

The lands and forests of the range have a role to play in both mitigating pollution and supporting people and wildlife to adapt to a changed climate.

The great forests along the range draw down and store massive amounts of carbon pollution from the atmosphere (Mackey et al., 2010). If the GER vision of connecting the islands of conservation along the ranges into a mosaic of conservation efforts on many lands by many different people is achieved, it will involve a great deal of land repair involving restoration of degraded forests and the planting of substantial new corridors and ‘stepping stones’. All these lands will be critical components of a future comprehensive national climate mitigation and adaptation strategy to dramatically reduce greenhouse gas pollution and ‘clean’ the atmosphere of old emissions.

Climate change has particularly serious implications for Australia's limited freshwater resources. Early in 2014, the *Sydney Morning Herald* reported that researchers on either side of the Pacific Ocean had surveyed 41 United States and Australian water utilities, including Sydney Water and Melbourne Water. They found climate change will degrade the quality and availability of drinking water through a combination of unusual weather-related events, such as a drought followed by bushfires and then a flood.

The dependency of east coast cities on the freshwater harvested in the ranges is not only based on the quantity and quality of drinking water. As parts of Melbourne, Sydney and Brisbane are transformed into extreme ‘heat islands’ during longer and more intense heat waves, it will be urban parks and trees kept alive by water that provide cool sanctuaries for city residents. Heatwaves have already caused more deaths, over 4,000 in Australia in the past 200 years, more than any other natural hazard, with the exception of disease (Loughnan et al., 2013).

Southern and eastern Australia are consistently identified as areas that will be of greatest importance to biodiversity conservation into the future (Reside et al., 2013). National Parks and World Heritage Areas along the range are amongst the most biodiverse areas on the continent. Around 10,620,643 hectares of the range and its escarpment is already protected (Taylor, pers. comm.). However, climate change will challenge many species and greater connectivity and better ecosystem health will be vital for their resilience.

Unfortunately, many areas critical for providing pathways for species to migrate to the cooler climate of the range and its escarpment, are outside of the protected area network.

At the same time many of these places are at risk from coal mining and coal seam gas extraction, logging, agricultural land clearing and sprawling urban expansion. The network of national parks and World Heritage Areas within the range are being systematically undermined by state and federal governments’ regressive climate and environmental policies. Without stronger environmental laws and active conservation management these development pressures will further fragment and isolate the climate refuges in national parks and World Heritage Areas.

The biodiversity conservation, carbon storage, climate change adaptation and water supply benefits that will flow to the Australian community and economy from this network have not yet been comprehensively quantified across the whole range. But we already know the benefits are immense for people and wildlife (Maggini et al., 2013).

**The challenge**

Australia can and must expand, repair, renew and connect a network of protected areas and other conservation measures across public and private lands from the Cape York in Queensland to the Central Highlands in Victoria.

The dependency of Australia’s biggest cities on the ecosystem services of the Great Dividing Range means the potential to build a powerful constituency supporting these efforts to better manage and protect its ecosystem services is great, and unrealised. The challenge is clear.
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Introduction
Throughout the world, terrestrial, marine, coastal, and inland water ecosystems deliver many benefits or ‘services’ that underpin human livelihoods, economies and well-being. However, these ecosystems, and the wealth of life they support, are declining at an alarming and unprecedented rate. To address this challenge requires sound policy at local, national and international levels.

This in turn demands the adequate recognition of values and proper valuation of ecosystems as a global priority. This is reflected at the international level by the establishment by the United Nations of the Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES; see IPBES, 2014).

This new platform was established in April 2012, as an independent intergovernmental body open to all member countries of the United Nations. It grew out of various processes and reports such as the Millennium Ecosystem Assessment (2005), which highlighted the consequences of ecosystem change for human well-being and the scientific basis for action needed to enhance the conservation and sustainable use of those systems and their contribution to human well-being. Other major reports such as the UNEP Global Environmental Outlook series (UNEP, 2012) and the CBD Global Biodiversity Outlook series (CBD, 2010) also identified the negative trends in both biodiversity and ecosystems and boosted the impetus for a new institution.

Purpose of IPBES
The goal of IPBES is “To strengthen the science-policy interface for biodiversity and ecosystem services for the conservation and sustainable use of biodiversity, long-term human well-being and sustainable development” (IPBES, 2014).

It is hoped that IPBES will work for biodiversity and ecosystems in a similar way that the Intergovernmental Panel on Climate Change (IPCC) does for climate change – gathering the best available science to support governments and other decision-makers. Assessments will be conducted by large globally distributed teams of experts, under the broad direction of a Multidisciplinary Expert Panel (MEP).

At mid 2014, 119 governments have joined IPBES, and are typically represented at the Platform by their environment departments. The members are committed to building IPBES to become a major science and policy interface and to create a credible body which will synthesise, review, assess and critically evaluate relevant information and knowledge generated from a broad spectrum of sources.

Much emphasis is being put on the need for these assessments to be scientifically credible, independent and peer-reviewed, and include uncertainties. The scientifically independent experts will assess such inputs in a transparent way. They will not undertake new research but collaborate with existing initiatives at regional and sub-regional level. This is particularly important as biodiversity and ecosystem knowledge intrinsically needs local knowledge, and local solutions. Science will not be the only source of information – in many parts of the world traditional knowledge is a very important source.

The overall goal is to feed this vital information into policy processes at appropriate scales and subsequently improve decision making. IPBES envisages producing policy-relevant tools and methodologies. It also includes goals to build capacity to improve the science-policy interface and to catalyse financing for such capacity-building activities. The initial work programme (2014-18) was agreed at IPBES-2 (IPBES, 2014). A key task in this initial program will be to conduct regional and sub-regional assessments of biodiversity and ecosystem services that can aggregate to a global level, together with thematic assessments in areas such as pollination. These will be supported by methodological developments in socio-economic scenarios, valuation methods, and interaction with indigenous and local knowledge holders.
Piccaninnie Ponds, South Australia, are an exceptional example of karst and coastal fen wetlands, with groundwater springs reaching more than 110 metres in depth. Photo: © DEWNR
How does IPBES differ from previous approaches?

IPBES will be different from much that has gone before. Firstly, the scenarios for exploring the future will be built in consultation with policymakers and stakeholders so that the scenarios represent possible policy options that make sense in the real world. The Platform will use models to help assess status and trends in nature, and its benefits to people, into the future, under plausible socio-economic scenarios. Scenario analysis in turn, will provide the basis for decision-makers to explore the effect that alternative policy interventions could have on future outcomes. Secondly, it aspires to co-creation of knowledge with the users of the assessment, again with the intention of developing assessments of value to stakeholders. The platform will draw upon the best expertise in a broad array of disciplines. Importantly it will seek to integrate indigenous and local knowledge – so vital in understanding biodiversity – with scientific knowledge. Lastly, it will seek to build capacity, not only to conduct insightful assessments around the globe, but also to use those assessments to formulate new policies.

Ecosystems or Mother Earth?

The human relationship with the environment has always been profoundly affected by the values, religious beliefs and cultures of populations. As the recent CSIRO book put it “biodiversity is in the eye of the beholder: for some it is our life-support system; for others it is a resource to be used; for yet others it is a precious cultural symbol” (Chapter 1 of Morton et al., 2014). IPBES is certainly based on the principle of attempting to reconcile very different world views and integrating indigenous and local knowledge with western scientific knowledge but, this may have its challenges.

As a result of these different ways of seeing the evolution of IPBES has seen tensions between governments who see protection of nature as a pragmatic need to protect usable resources and those who see nature as indivisible from humanity and the fundamental source of their being and culture. The ecosystem services approach and language are thus seen by some to negate spirituality and to hold the potential to see the commoditisation and monetisation of all living things and natural systems.

The IPBES process will therefore take a broad and inclusive view of biodiversity and its relationship to people. For example, in the IPBES Conceptual Framework (IPBES, 2014), ‘ecosystem services’ is also represented as ‘Nature’s benefits to people’, and ‘Nature’s Gifts’ – terminologies more acceptable to some governments than the perceived utilitarian one of ecosystem services. Similarly, biodiversity and ecosystems are also termed ‘Mother Earth’ in the Framework.

IPBES assessments will also have a strong emphasis on social impacts of biodiversity, demanding social science inputs of a high order. At present there are few social scientists in the interim MEP, but the Platform is seeking to remedy this as it prepares to select new members in moving from the interim to the substantive MEP in January 2015. Certainly, the large teams of authors already assembled to prepare for the various assessments represent a diverse array of disciplines and perspectives.

Relevance to Australia

The building of IPBES internationally has been a highly political process of painstaking and arduous negotiation between governments. Consequently it will be likely to operate under significant constraints. However, this same deep engagement with governments also holds great potential to put clear, well supported science into policy processes and thus to have a positive environmental impact. This is true in all countries, but Australia is a country with great biodiversity resources, a rich variety of ecosystems and very formidable threats. If we could achieve a much higher level of understanding through IPBES of how critical it is to maintain ecosystem functioning and healthy biodiversity, we might see more far-sighted decisions and public investments.

Certainly Australia has a wealth of information to feed into assessments. We are fortunate to have a strong scientific community and national institutions like CSIRO. We are also building our understandings of traditional ecological knowledge (e.g. Prober et al., 2011; Hill et al., 2013). This effort needs to be supported to continue to build the data which is essential for long term identification of trends in biodiversity and environmental change (Lindenmayer et al., 2014).

Over time, I believe that the IPBES process will build the capacity of governments, industries and all decisions makers to formulate wise approaches to the management of biodiversity and ecosystem services – approaches founded on the understanding that actions to safeguard ecosystem health are fundamental to a sustainable future.
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New Zealand perspectives on Natural Capital and ecosystems

Georgina Langdale

The impetus for ecosystems thinking

When I moved back to New Zealand from Europe three years ago having worked on The Economics of Ecosystems and Biodiversity (TEEB, 2014) study, the philosophy, recommendations and tools of the study appeared to be very relevant and useful for New Zealand. TEEB highlights the economic benefits of biodiversity and healthy ecosystems and the profound economic and social cost of biodiversity loss and ecosystem degradation.

As a nation, so much of our identity is linked to the landscape. While this is true of all New Zealanders, it is deeply imbued in Māori culture which sees humanity as deeply connected to the natural world. We are all kaitiaki: guardians of nature, bound and entrusted to protect and conserve because our environment not only takes care of our physical needs – it offers mental, emotional and spiritual wellbeing – connecting people, families, and communities.

Like many other nations New Zealand is doing all it can to improve the economic well-being of its citizens. In the New Zealand context, this has meant a big focus on increased production and productivity, particularly in the primary industries sector. However, there is a tension between this goal and New Zealand’s success as an exporter of resource-based goods and services based on environmental integrity and its ‘Clean Green, 100% Pure’ brand.

The influence of this brand is three fold. Firstly, it adds profile to primary produce such as New Zealand’s dairy sector, worth 17% of New Zealand’s GDP. It helps attract NZ$20 billion of international visitor expenditure annually, and it has become synonymous with a host of other New Zealand products. Therefore it quite literally underpins the country’s international trade development strategy.

The pressure for increased productivity, when focused on production increase, has not been without environmental consequences, however there are signals that thinking is shifting to understanding more about our reliance on ecosystems and the steps we can take to maintain or improve them.

One of the most significant indicators of this shift in thinking has come from the Department of Conservation (DOC). DOC is responsible for managing one third of New Zealand’s land mass. This area includes New Zealand’s iconic protected areas, our National Parks which are home to the often thrilling and always extraordinarily beautiful ‘Great Walks’ such as the Milford Track, Routeburn and Abel Tasman. Incidentally, 70 percent of international visitors to New Zealand have some sort of experience of conservation land each year. Most visitors cite the landscape and pristine environment as a reason for coming to New Zealand.

By the mid-2000s, DOC had to face up to the fact that the impacts to New Zealand’s natural environment meant it could not keep up with the work required to conserve it all.

At first that led DOC to the question, how can we achieve more? But that begged the more important question, why? Why do we need to save our native species? Does the conservation of nature have value beyond the ‘feel good’ factor? DOC could also see how, internationally, ecosystems were working their way into business and policy decision-making. These questions, and this awareness led DOC to reframe the meaning of conservation success and to look at operating in a radically different way to the tradition conservation mould.

Faced with budget reductions and a flat line budget in the future – and an ever-increasing portfolio of conservation work to do, DOC set about a phased restructure which was completed in 2013. The whole department reorganised itself around the concept of ‘Conservation for Prosperity’.

Rather than the traditional way of thinking, which has largely been about ‘let’s do some conservation when we are prosperous’, DOC is encouraging New Zealanders across government, business and the community to look first at prosperity for this country, and then back along the line to see how conservation and effective management of protected areas can help the nation attain long term benefits. In doing so DOC is moving from a species-led decision-making process, to an ecosystem-led process. Partnerships are at the heart of this new strategy (DOC, 2014).
Developing the ecosystems approach in New Zealand

The process of taking up this ecosystems approach has seen conversations start to shift from us and them, to us and us. For example, there hasn’t always been an easy relationship with the farming sector and conservation, but taking an ecosystem-led approach has helped to open up discussions. It enables both parties to see their inter-dependencies on healthy ecosystems and each other more clearly and shifts the conversation to looking for solutions.

For example, in 2013, DOC announced a $2 million partnership project with Fonterra, a New Zealand based global dairy company, to restore five major water catchments in areas where dairying takes place. The aim is to create healthy waterways and biodiversity, by connecting communities, farmers, Iwi (the Maori community), agency, and business. It is anticipated that this approach drives a better business model that is less costly for farmers due to reduced inputs, while also creating ecosystem and conservation gains.

In another business partnership, the conservation of an iconic New Zealand bird, the blue duck, or whio, has become an indicator of the ecologically sustainable water management of energy generation company Genesis in New Zealand’s South Island. Genesis have partnered with DOC to support whio conservation, but they also see the ability of the local waterways to provide healthy habitat for the bird as an indicator of the sound management of the Genesis hydro power activities in the area.

Air New Zealand understands better than many, the relationship between protected areas, healthy, functioning ecosystems and a prosperous economy. So the airline partnered with DOC to support biodiversity conservation projects including a project that aims to bring back some of New Zealand’s rarest birds to the Great Walks. They transport some of New Zealand’s most treasured species (birds, reptiles and invertebrates) between regional centres as part of an active recovery programme to help endangered species (birds, reptiles and invertebrates) between protected areas, healthy, functioning ecosystems and each other more clearly and shifts the conversation to looking for solutions.

In New Zealand, the business case for incorporating an ecosystems-led approach into decision-making is a compelling one. The Sustainable Business Council (SBC) is a CEO led group of companies that catalyses the New Zealand business community to take a leading role in creating a sustainable future for business, society and the environment. SBC has been a driving force to help bring this onto company agendas. In 2013, the organisation initiated a Biodiversity and Business project, with the aim of raising awareness and understanding among business of biodiversity and ecosystem services; and supporting the integration of an ‘ecosystem approach’ into business management by providing locally relevant training, tools and case studies. The project launched in 2013 with the Valuing Nature conference in Wellington, organised jointly by SBC, DOC, Victoria University and other agencies from the natural resources sector of government (Valuing Nature Conference, 2013). Speakers included Pavan Sukhdev, Prof Bob Watson, James Griffiths from WBCSD and Marlene Laros from ICLEI and the conference was seen as a significant contribution to awareness-raising in New Zealand.

As with DOC, partnership is key, and the Sustainable Business Council project aims to nurture collaboration between New Zealand business and government on biodiversity and ecosystem issues. This is done through activities such as major company CEO’s briefings with representatives from government in order to give an overview of, and create senior level discussion around, planned government activity in the Natural Capital arena. Business is pushing the business case for this thinking back into government.

Also, as part of this project, five companies are trialling the World Business Council for Sustainable Development (WBCSD) and World Resources Institute (WRI) developed Ecosystem Services Review tool (Hanson et al., 2012). They cover a range of sectors and include Fonterra; New Zealand’s largest Maori-owned fisheries company, Aotearoa Fisheries Limited; Contact Energy, which is the country’s largest wholesaler and retailer of natural gas, and also generates electricity using hydro, geothermal and thermal energy; then there is engineering, construction and technical services provider URS, who among other things, are involved in developing Auckland city’s water infrastructure; and at the other end of the scale there is my own natural products company Archeus – very much a David amongst the Goliaths! Coming from TEEB, it was important to show that this process can be scaled down as well as up. Archeus has put conservation and an ecosystems approach at the heart of the business development and management with the attitude that you ‘start as you mean to go on’.

The great thing about this project is that the five companies involved interact with each other regularly, sharing information and offering insights and encouragement to each other. There is a tangible sense that each company is shifting internal mind sets and raising the bar for the business case for better management of ecosystems, due to a better understanding of the value of nature. Case studies from this project are available on the SBC website.

At the local government level, a number of councils in New Zealand have already started to explore ecosystem services as a potential framework for planning and decision-making. For example, the proposed Waikato Regional Policy Statement has an objective ‘to maintain and enhance a broad level of ecosystem services’.

The Auckland Plan also acknowledges the need to consider environmental values and resilience in decisions and a case study is underway to assess how an ecosystem services approach could improve selection of special housing areas under the plan to deliver 40,000 new dwellings over the next two years in Auckland.
An analysis of the management of natural resources in the lower North Island led to the creation of ‘Nature Central’ a collaboration between Hawke’s Bay, Horizons and Greater Wellington Regional Councils and DOC. At its launch, Hawke’s Bay Regional Council Chief Executive Andrew Newman said the project will focus on combining efforts in the areas of biodiversity, regional park management, biosecurity issues and the sharing of technical advice and expertise.

Māori increasingly play a central role in the management of New Zealand lands and their thinking embodies concepts around ecosystem services. For example, on the east coast of the north island the Ngāti Porou people have developed a whole of catchment scale project approach to conservation, covering approximately 100,000 ha. Through the lens of ‘Natural Capital’, Ngati Porou believe that healthy, resilient, restored and protected ecosystems will bring the East Coast transformational value – socially, culturally, economically and environmentally.

Natural Capital

The New Zealand Government has formed a Natural Resources Sector group, comprised of key agencies and ministries for Environment, for Primary Industries, Business Innovation and Employment, Māori Affairs and the Department of Conservation.

This group is currently developing the framework for trialling New Zealand’s first Natural Capital Assessment. While modelled on the UK’s National Ecosystem Assessment, it is planned that the valuation aspects of the New Zealand programme will draw on economics, other social sciences and indigenous knowledge systems, including Mātauranga Māori to ensure that it reflects the New Zealand context.

Among other sources of data, the Natural Capital Assessment will build on the environmental reporting framework being developed by the Ministry for the Environment and Statistics New Zealand to report on the state, pressures and impacts on the environment. It may assist the development of a roadmap for the New Zealand adoption of the UN generated environmental and economic accounts (SEEA). And it is envisaged that it could feed into the Treasury’s Living Standards Framework which seeks to integrate the four capitals – natural, economic, human and social capital – by understanding the interrelationships and dependences between them.

In terms of an emerging New Zealand perspective – it does seem that people are starting to ask the $50 million natural capital question – ‘what does true prosperity look like?’.

References


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Georgina worked for UNEP on the TEEB study into The Economics of Ecosystems and Biodiversity. Prior to that she worked for Kew Gardens and ran a communications consultancy in London, specialising in cultural communications. She returned to New Zealand in 2011 and has undertaken environmental consultancy contracts and established her natural products company, Archeus.
Introduction

NAILSMA is an Indigenous led not-for-profit company founded as the North Australian Indigenous Land and Sea Management Alliance in 2002 and then incorporated as a not for profit company in 2012. NAILSMA is unique in operating across northern Australian jurisdictions; assisting Indigenous people build effective land management and prosperous cultural futures.

Governments and Indigenous groups alike have utilised the unique scope of this organisation to facilitate cross-jurisdiction initiatives, such as water policy and northern development forums, carbon enterprises, land and sea manager networking and knowledge sharing opportunities, and land and sea management monitoring tools and support services.

To date, NAILSMA has successfully delivery over $30 million worth of projects across northern Australia partnering with Indigenous Australians, private and corporate sectors, science organisations and the public.

NAILSMA's approach to long-term outcomes is through a culture-based economy model (Figure 1). A culture based economy approach considers an economy that builds on Indigenous culture, knowledge and connection to country and that supports their ongoing health and maintenance whilst creating genuine opportunities for employment, income and business development. NAILSMA's vision is that Northern Australia will be a vibrant region where Indigenous Knowledge, cultural values and responsibilities to the land and waters are embedded in all environmental, economic and resource management policies and practices. NAILSMA believes that any future for land and sea management, what others may call ecosystem management, has to be built on a comprehensive approach that starts with Indigenous communities and involves governments, private, corporate and philanthropic sectors.

There are clearly synergies with land and sea management enterprise opportunities and Indigenous notions of well-being. Indeed, such opportunities on country may enable active pursuit and achievement of well-being targets where life circumstances in historically disengaged settlements and diasporas have largely failed.

Significant inequity persists between Indigenous and non-Indigenous groups in Australian society covering many aspects of life including employment, political representation, education, community safety and health. Despite Australia's status as a developed nation, a large portion of our demographic, particularly in remote areas, is living in conditions of disadvantage and poverty. It is the stated goal of the Australian Government's Closing the Gap policy (DPMC, 2014a) to redress such disparity.

The Australian Government's Biodiversity Conservation Strategy 2010-30 (NRMMC, 2010) notes the role of Indigenous people in its three priority areas, given their recognised land interests over a large portion of the continent. It states “Increasing Indigenous engagement means not only acknowledging Indigenous ecological knowledge but actively supporting its maintenance and use. It also means partnering with Indigenous peoples and supporting Indigenous employment and participation opportunities in biodiversity conservation wherever possible”. The Strategy specifically links conservation with Indigenous employment by aiming to achieve a 25% increase in employment and participation of Indigenous peoples in the conservation sector within 20 years.

Though the strategic aim of the Biodiversity Conservation Strategy to increase employment is important, the practical recognition of land interests, including Native Title, is by no means complete. The Strategy does not effectively recognise synergies amongst environmental values, the application of holistic Indigenous knowledge systems and the co-dependent well-being and enhancement of Indigenous cultural futures.

The Strategy aligns with messages on the international stage expressed in the IUCN Durban World Parks Congress 2003 Message Statement (IUCN, 2003), which provided international recognition of potential impacts on Indigenous people’s livelihoods and culture if not engaged in the establishment and management of sustainable protected areas. It provided a set of targets for 2010 (Message of the 5th IUCN World Parks Congress to the Convention on Biological Diversity, Durban, South Africa, September, 2003).
Continued support for Indigenous rangers will be fundamental to wider landscape conservation and the protection of important ecosystems like the large and diverse wetlands of the Araluen Swamp, NT. Photo: © D. Hancock
Similarly, other major national and international instruments like National Biodiversity Strategies and Action Plans under the International Convention on Biological Diversity, particularly around the Aichi Biodiversity Target 17; and the Millennium Development Goals have stressed Indigenous engagement and governance and access to information, and made calls on governments to address issues of poverty and engagement.

One of the more significant initiatives in the Australian context has been the creation of Indigenous Protected Areas (IPAs). Over 50 IPAs now cover some 365,000 sq. km. of Australia and constitute a third of the National Reserve System (Bruce Rose, pers.com.). IPAs have been celebrated by most land managers whose ability to care for their ancestral lands has been enhanced. It is cautionary to note however that IPAs are at the behest of government policy making, which can be an unreliable source for long term support. More significant, reliable and longer term forms of income and investment are required. Complementary opportunities must be made and taken to address the socio-economic of Indigenous land management through innovative enterprise opportunities.

Recognising and supporting indigenous stewardship of the land and sea.

The health of the land and sea and of their wildlife is co-dependent with that of our people. Long term social, ecological and economic resilience and prosperity are related. The culture-based economy model provides a way of understanding the interrelationships between the specific country we belong to, our culture which stems from that and our economic independent futures. This model guides NAILSMA in the services it provides to Indigenous people and the projects we work on collaboratively, such as:

- **Collaborative science and traditional knowledge projects supporting indigenous community employment and environmental stewardship priorities**
  
The expanding area of land and sea country under active Indigenous management presents an unprecedented opportunity to better manage and monitor biodiversity across north Australia. NAILSMA’s I-Tracker program works to develop tools that support scientifically robust, community-based biodiversity monitoring programs for Indigenous land and sea managers, and foster partnerships that contribute to sustainable Indigenous livelihoods based on caring for country.

- **Development by Design (DbD)**
  
  A preliminary DbD model is being developed by NAILSMA and The Nature Conservancy (TNC) to inform decision making and look at offsetting environmental and other degradation caused through development with payment for environmental services by Indigenous land managers.

- **Project development for prospective greenhouse gas abatement and carbon sequestration through traditional style fire management – NT Gulf, Arnhem Land, Daly Wadeye areas.**
  
  NAILSMA and the Northern Land Council propose to access resources to bring these projects through the development phase to engage with the Carbon Farming Initiative/Emissions Reduction Fund market and other payments for ecosystem services and offset investment to create employment and livelihoods opportunities for several hundred Indigenous land managers in the communities in these regions.
• **Support for the Learning on Country Program (LoCP)**
  The LoCP aims to improve school attendance and completion, improve the opportunities for students to create a satisfying and rewarding career in their community or elsewhere in Australia, and help prepare the next generation of Yolngu and Bininj landowners to care for their estates.

• **“Tracking changes” a monitoring and evaluation local management tool for Indigenous land managers.**
  Monitoring and evaluation frameworks are generally designed and employed by donors and external partners to track project performance. Traditional owner project managers have expressed concern for the carriage and enhancement of local values into their commercial activity and are seeking local management tools to help empower them in these (often) complex arrangements.

**Payment for Ecosystem Services (PES)**

Governments are operating in the PES space to a limited degree. The nomination of Indigenous Protected Areas provides support for traditional owners of lands of conservation value to deliver a range of prescribed services, set out in an agreed management plan, for a defined site recognised in Australia’s National Reserve System. In addition, some commercial, state and territory governments, conservation NGOs and research agencies value add with additional support (such as TNC’s ‘Healthy Country Planning’) for Indigenous rangers to undertake specific tasks. Under the Queensland Wild Rivers Act, for example, Indigenous rangers are supported outside of declared national parks.

Traditional style fire management and Western science has been used to reduce and monitor greenhouse gas emissions and sequestered carbon. This ‘carbon farming’ work has the potential to provide valuable income for land managers and is a good example of innovation in PES markets. PES markets can offer (semi) commercial income to local Indigenous communities and may be well matched to land based enterprise in remote areas, but their design and support for effective engagement with them remains an issue for Indigenous project developers and for government expectations.

Significant challenges exist with Indigenous groups around governance capacity and resources needed to set-up and operate sustainable land and sea management projects. Such projects are likely to exist in a complex government and private sector market environment and at a scale in the customary environment not previously experienced. Existing support does not adequately meet this challenge.

**Customary approaches to conservation matters**

Areas of conservation and of customary resource interest often overlap. Looking after biodiversity sits within a ‘whole of country’ approach including: vulnerable areas (like monsoon vine thickets, grave sites, weed infestations and bush medicine areas); asset protection (outstations, bores etc.); specific land use areas (camp grounds, hunting areas, ceremony grounds and places for tourists). Importantly conservation management objectives are seen through the lens of customary obligation to country and connected to kin. Networks of land (traditional estate) based ownership and cultural authority provide the framework for these activities to happen. Indigenous land managers seek to strengthen this social and cultural capital. It is a distinguishing feature of Indigenous land management and a component of achieving environmental outcomes that demands attention and resources in its own right.

Conservation through an Indigenous land and sea management lens is significant because it addresses the health and rich diversity of both cultural and natural resources and supports resilience in communities through reliable prosperity whether related to formal protected areas or other customary areas.

**Risks and issues**

Governments have invested substantial public resources into conservation and protected areas, including the prominent system of IPAs. Overdependence on government policy, particularly in respect to IPA funding, poses a significant risk to the effectiveness and longevity of the conservation effort. It is understood and to an extent expected that a mixed economy model including customary, government, philanthropic and business interests is needed by Indigenous land managers to sustain their management activities with greater independence and resilience, but there is very little support for the social capital building and business-like development that is needed. The risk to these shoestring conservation projects increases while the majority of their support is policy cycle driven.

Another area of risk for the Indigenous community resilience and conservation management nexus is the potential denigration of Indigenous rights in the push for accelerated mainstream development. Northern Australia is again attracting a lot of attention as a potential food bowl and locus for rapid primary industry development. Both major political parties went to the 2013 federal election with large scale plans to development in Northern Australia, and the recent Green Paper on Northern Development (DPMC, 2014b) has been the result.

Such plans, should they eventuate, will bring major changes in the ecological health of land and seascapes through more intensified agricultural systems, changes to river systems (water flows and quality), changes in fire regimes, increase in invasive species and pests, natural resources depletion, with consequent potential to impact on livelihoods, cultural sites, and possibly further marginalisation of traditional knowledge and language, and impact on social cohesion associated with increasing populations and growth centres.
Further risks lie in the lack of recognition of the rights and interests of Indigenous people as major landowners, making up most of the population outside larger centres, having time immemorial customary connection, a burgeoning land management sector and a suite of innovative enterprise initiatives that marry sustainable livelihoods with conservation of the national estate. NAILSMA supports the needs of Indigenous groups to be respected, properly informed, deferred to for decisions in respect of their land and interests and properly engaged in development planning and debate.

**Looking forward**

Indigenous held lands and jointly managed conservation reserves are over 40% of northern Australia’s total land. Inclusion of all Native Title interests (determined and scheduled) put Indigenous interests at well over 80% of the north. Further, Indigenous people are rapidly approaching 50% of the northern population outside major centres and proportionally growing faster than the non-Indigenous population. In the Northern Territory Indigenous people have freehold rights to over 80% of the coastline (NAILSMA, 2014).

Indigenous people must sit at the centre of decision-making processes if opportunities for meaningful prosperity are to be realised, long-term disadvantage to be addressed, environmental values looked after for generations to come and if tenable development decisions are to be made in respect of northern Australia. Protected areas offer potential for Indigenous practices and western science to come together to tackle environmental issues on an international scale. Despite significant issues such as relative authority and control of resources, joint management can also offer the opportunity for furthering Indigenous engagement in land and sea management for respective traditional owners and has the potential to enhance community well-being.

PES also offers a possibility of furthering Indigenous economic development and a serious opportunity to engage in market economies, such as carbon trading, while supporting other interests like providing a means to get back onto country and aligning environmental services with customary goals. There is a strong argument for traditional owner land management enterprise, such as traditional style fire management and carbon farming in national parks (exemplified in the case of Kakadu National Park) as well as other protected areas, pastoral properties and Aboriginal Land Trusts and leaseholds.

Sustainability is assumed to be a shared world goal with the survival of our species at stake, but the pressures of development and consumer society often contradict this rhetoric and dominate decisions around land use, resource allocation and rights. As a nation, as elsewhere, we have much to learn from Indigenous Australians. The challenges for Aboriginal peoples to maintain and enhance culture, language, knowledge systems and connection to the land go hand in hand.
hand with the goal of prosperity. These are challenges for the whole nation not simply for those disadvantaged by its history. Rights to control and access land and water are essential to Indigenous economies yet compromised by fickle policy environments and systemic development pressures. The topic of the symposium is Valuing Nature. Indigenous people undoubtedly value nature but for Indigenous Australians the following are important requirements if we are to have prosperous cultural futures and effectively care for our land and sea country:

- A shift in government policy relevant to international conventions such as the United Nations Declaration on the Rights of Indigenous People and critically the provision of free, prior and informed decision making in all matter relevant to our interests, including land and seas.
- Engagement in equitable partnerships in order to foster and support Indigenous innovation and best practice.
- Indigenous knowledge systems are respected accepted alongside contemporary science in land management activities.
- Indigenous-led research, advocacy and governance is supported and respected in informing climate science, influencing national public policy and for engaging with public corporate sectors.
- Indigenous land managers are engaged in independent and joint management of their vast estates.
- The full potential of PES is realised through research and policy and secures social, cultural and economic benefits alongside conservation interests.
- Indigenous land holders have access to sufficient expertise and information to support co-investment and business ventures.
- Land use planning processes are better matched to Indigenous interests.
- A northern Australia where Aboriginal and Torres Strait Islanders are fully recognized and benefit from their long-standing connection, dedication, obligations and management of their traditional estates on behalf of all Australians.

Indigenous people often say ‘We are dirt rich but cash poor – we seek a future where we care and prosper from our lands and seas. The way I personally see it is that connection to country is a vital and important value and should be accepted as such and not interpreted to mean something different. Connections to country is spiritual, it is our identity, our livelihood, our family and our future. We’ve been here forever and we’re not going anywhere anytime soon.’

References


Links

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Introduction

Despite advancing technology, human health remains inherently dependent on ecosystems. One needs only to consider recent ‘natural’ disasters, such as floods and bushfires, including the associated loss of life and injury, to recognise this truth.

Nevertheless, the predominant approach to human health continues to be the so-called ‘medical model’ – dependent largely on medical professionals and pharmacological interventions – with limited consideration of the ecosystem context, especially in developed nations. Yet a much broader definition of health was adopted in 1946 by the World Health Organisation (WHO):

“A state of complete physical, mental and social well-being and not merely the absence of disease or infirmity.”

Similarly the term ‘wellbeing’ was defined by the U.S. Centres for Disease Control (2013):

“A valid population outcome measure beyond morbidity, mortality, and economic status that tells us how people perceive their life is going from their own perspective.”

Taken together, these two definitions put paid to the idea that health is a purely clinical matter.

The relationship between nature and health

There are two key ways in which the environment affects human health: through its quality and its accessibility. But in an age when practitioners and policy makers expect claims to be substantiated by evidence before they will adopt changes, can we quantify the health benefits of ‘nature’?

When the WHO states that more than 25% of the world’s disease is attributable to environmental factors, it is referring only to the quality of the environment in which people live, or more particularly to environmental degradation. For example, air pollution is responsible for approximately 3.3 million deaths per year globally, and 1.1 billion people worldwide live without access to clean water, resulting in millions dying from diarrhoeal diseases. Australian research has shown that environmental degradation is also associated with poor mental health. And climate change, through such events as heatwaves, severe storms, droughts, flooding and landslides, even at this stage is contributing to hundreds of thousands of deaths per year worldwide.

The importance of the accessibility of the natural environment is less widely recognised. Yet increasingly, it is being understood that human health is undermined when we experience environmental deprivation: when we have no green spaces to enjoy, no pets or gardens to nurture, no nearby or accessible conservation areas. Since the 1980s, Wilson (1984) and others have argued that humans are dependent both physiologically and psychologically on nature and that the separation of humans from nature, associated with urban living, undermines human health and wellbeing. It causes a breakdown in the bond between people and the natural environment and results in diminished physical activity, increased obesity, Vitamin D deficiency and mental health problems. Among children, this separation from nature has been referred to by US journalist Richard Louv (2005) as “nature deficit disorder”. According to Louv, our children’s awareness of the natural environment is skewed so that they have few opportunities to build an intimate relationship with nature but at the same time are acutely aware of the global threats to the environment. Thus, their fears concerning the future are exacerbated by their lack of access to the calming influence of nature contact.

The Australian context

The Australian context in which this environmental deprivation is being played out is one where:

- Cardiovascular disease contributes 18% of the total burden of disease;
- 3 in 5 adults and 1 in 4 children are overweight or obese;
- In 2007-8, 62% of adults failed to meet the national physical activity guidelines;
- Medibank Private estimated that, in 2008, physical inactivity in Australia was costing $13.8 billion annually;
- Diabetes is on the rise, with an estimated 3.3 million Australians predicted to suffer Type 2 diabetes by 2031;
- 45% of Australians aged 16-85 have experienced a mental disorder; and
- Annual mental illness costs in Australia have been estimated at $20 billion.
There is substantial evidence that contact with the natural world may be directly beneficial to both mental and physical health. Photo: © Penelope Figgis
Evidence quantifying the health and wellbeing benefits of nature

Against this worrying trajectory of health indicators the evidence is clear that access to quality public open space (which is a key way in which people gain access to nature) is associated with increased physical activity, reduced obesity and improved mental health. For example, a study in Western Australia found that recreational walking increased by 17.6 minutes each week for each type of additional recreational destination (Giles-Corti et al., 2013). Similarly, Australian research has shown that the likelihood of obesity is 22% lower in areas classified as having high greenness (Pereira et al., 2013). Dutch research has shown that even an increase in streetscape greenery is associated with better perceived health, fewer acute health-related complaints and better mental health status (De Vries et al., 2013). In New Zealand, research has shown an association between access to green space and the need for treatment for anxiety and mood disorders, with a 4% reduction in treatment for every 1% increase in useable or total green space (Nutsford et al., 2013). And many studies, including of at-risk adolescents and those experiencing post-traumatic stress disorder, such as military veterans, have shown beneficial mental health outcomes of extended engagement in ‘wilderness’ activities.

Quantifying the health and wellbeing benefits of nature

It is clear from existing evidence that nature contact, whether via urban parks, gardens or more remote and pristine areas, is beneficial for human health – physically, mentally, socially, spiritually. However, at a time when governments are increasingly driven by $ values and empirical data, there is a need for more research to provide clear, quantitative data on the ‘value’ of parks and protected areas.

While it is not simple to ascribe values to the health benefits of protected areas and ecosystems, there are a number of potential measures which can be used to quantify the benefits. These include: avoided health care costs, Disability Adjusted Life years (DALYs), Willingness-to-Pay (WTP), cost-benefit analysis and Health Impact Assessment (HIA). Both DALYs and WTP have been used to demonstrate clear links between environmental degradation and health, so it is plausible that they could also be used to assess the impacts of environmental deprivation. But whatever methodology we use, we need to be cautious, both about the claims we make and about how they may be used by others. We need to ensure that both the intrinsic and the instrumental value of nature is acknowledged and protected.
References


Links


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Dr Mardie Townsend is an Honorary Associate Professor in the School of Health and Social Development at Deakin University, Melbourne, where her research interests focus on the health impacts of human contact with the ‘natural’ environment, and of ecological and social sustainability. With Parks Victoria and other organisations, Mardie leads research on such topics as: the motivations for and benefits of environmental volunteering; the use of nature-based therapies; the role of parks and green spaces in promoting wellbeing; and the mental health benefits of contact with nature.
Applying an ecosystems approach to large landscapes

Barry Traill

The Australian Outback

The Australian Outback is one of the few great natural places remaining on Earth. In the Outback – the arid centre, western deserts and the tropical north, – over 70 percent of the continent, the bush is still standing, the rivers flow naturally and wildlife still moves as it always has across huge landscapes.

In a planet with 7.2 billion people, most natural landscapes on Earth have now been transformed to cropping lands, plantations, urban and industrial zones and intensive grazing areas. Remote Australia therefore now ranks alongside the Amazon, the Sahara and the Canadian Boreal forests as one of a tiny number of big natural landscapes left on Earth.

This is of global significance for some ecosystems with the Outback having the world’s largest remaining areas in natural condition for three global biomes. The Outback has the largest remaining intact tropical savanna on Earth, covering nearly two million square kilometres across northern Australia. The Outback’s three million square kilometres of deserts are amongst the least modified in the world, and, at 160,000 square kilometres, the Great Western Woodlands in the south-west of the Outback, around Kalgoorlie, is the largest remaining woodland habitat in the world’s temperate Mediterranean climate zones.
The vastness of outback Australia is globally outstanding, but to hold its many values it needs active management of fire, weeds and feral animals. Martu country, Western Desert. Photo: © James Fitzsimons
Importantly, while the landscapes within the Outback vary from spinifex covered sand deserts to tropical savannas and wetlands, there are similar geo-political conditions across the whole of the Outback. Outback landscapes have simple resource based economies, land tenures dominated by pastoral leases, Aboriginal lands and uncommitted crown land, and relatively high Indigenous populations. They have similar ecological processes and face a similar suite of threats. Consequently, conservation solutions in one region will tend to be of value across the whole.

**A future in the balance**

The Outback is facing two main types of threats – extensive degrading threats and more localised, but destructive threats due to intensive industrial and agricultural projects. Most of the extensive degrading threats relate to changed fire regimes and introduced species (Woinarski et al., 2007). Across extensive areas of the Outback, the intricate pattern and process of fire management by traditional owners has been largely lost or withdrawn. Much of the land now burns extensively and without purpose or finesse. Feral animals occur in almost all the Outback and noxious introduced weeds affect conservation and production values in many regions.

A key overall point – perhaps a deceptively simple point – is that a principal problem for the protected areas or nature as a whole in remote Australia is not that there are too many people, but rather, there are too few. Much of the Outback lands, including many or most of its protected areas actually have fewer people, non-Indigenous or Indigenous, on it and managing it than at any time in the last 50,000 years.

This matters for the health of the ecosystems. Overall, the land is not being managed adequately for fire and invasive species. The science, as well as the traditional ecological knowledge, is very clear – that active management is required to provide fire regimes which best maintain biodiversity and ecological processes in a landscape. Active management of fires creates a fine mosaic of burnt and unburnt areas. However in many areas, in the absence of such management, fires have become more intense and much larger in extent, simplifying habitats and reducing populations of many species.

In addition to fire, active control is needed on all parts of the mainland to manage a mix of invasive and introduced plants and animals. For example, a persistent pest in all large national parks in Northern Australia is feral cattle, and in some areas, a mixture of feral pigs, horses, donkeys and water buffalo.

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<table>
<thead>
<tr>
<th>Feature</th>
<th>The Outback</th>
<th>Non-Outback</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area</td>
<td>5.6 million km² (73% of Australia’s land area)</td>
<td>2.1 million km² (27% of landmass)</td>
</tr>
<tr>
<td>Geography</td>
<td>Continental core, and remote coast</td>
<td>Mostly near-coastal periphery</td>
</tr>
<tr>
<td>Topography</td>
<td>Mostly flat, with isolated low weathered ranges</td>
<td>Includes the long spine of Australia’s tallest mountains</td>
</tr>
<tr>
<td>Climate</td>
<td>High to extreme variability; long dry periods interspersed with shorter periods of high rainfall</td>
<td>Less variability and less extreme</td>
</tr>
<tr>
<td>Soils</td>
<td>Most highly infertile</td>
<td>More fertile</td>
</tr>
<tr>
<td>Natural productivity</td>
<td>Very low or highly seasonal in Wet season, boom and bust cycles, annually or irregularly</td>
<td>More productive, rainfall and growth less seasonal</td>
</tr>
<tr>
<td>Cover of native vegetation</td>
<td>Mostly woodlands, hummock grasslands and shrublands; &gt;95% intact</td>
<td>Originally mostly extensive areas of diverse forests, now &gt;30% cleared</td>
</tr>
<tr>
<td>Rivers</td>
<td>Mostly free-flowing, &lt;5% of water taken for exploitative use</td>
<td>Most rivers are dammed; typically &gt;20% of water diverted for exploitative use</td>
</tr>
<tr>
<td>Population</td>
<td>0.8 million (4% of Australian population)</td>
<td>21.9 million (96% of total Australian population)</td>
</tr>
<tr>
<td>Population density</td>
<td>0.14 people per km²</td>
<td>10.4 people per km²</td>
</tr>
<tr>
<td>Indigenous population</td>
<td>25% of Outback population</td>
<td>&lt;5% of total non-Outback population</td>
</tr>
<tr>
<td>Indigenous land tenure</td>
<td>&gt;20% of land area owned by Indigenous people, with native title rights over extensive additional areas</td>
<td>&lt;2% of land area owned by Indigenous people, and limited additional areas for which native title rights apply</td>
</tr>
<tr>
<td>Economy</td>
<td>Relatively limited: intensive mineral production, extensive pastoralism, government services, tourism</td>
<td>More diverse: manufacturing, mining, horticulture, forestry, tourism, government services</td>
</tr>
</tbody>
</table>

Table 1. Summary of contrasts between the Outback and other parts of Australia
To deal with these issues alone, the wilderness needs more people not less. In this situation, the intertwined dependencies of people and country are key to note for conservation. Many protected areas in the Outback are highly valued for their cultural values, their extraordinary wildlife and the great beauty of many of their areas. They also provide the foundation for a range of economic enterprises such as tourism and carbon farming. Importantly, protected areas require an approach which ensures active human intervention. A healthy Outback environment needs and ‘values’ active and effective human management.

The importance of this synergy can be seen in current major trends in conservation and protected areas in the Outback. They reflect how people are valuing conservation and protected areas in particular ways. Two of the trends are positive, one is less so.

**Indigenous Protected Areas**

The most striking development is the rise of Indigenous Protected Areas (IPAs) and associated Indigenous ranger programs. These are almost entirely parks on private land – Aboriginal lands. There are now 63 IPAs covering 51 million hectares in Australia, the great majority in the Outback landscapes. They make up 30 percent of the area of Australia’s National Reserve System. These have moved incredibly quickly from the first IPAs just 15 years ago. And the pace is continuing, in the next 2-3 years there is likely to be another 15 million hectares declared.

Importantly, this has not been developed as a top down program. Aboriginal communities are putting their lands into these protected areas because it works for them – it is a non-legislated model that allows them to stay on their country, retain control of their land and fulfil important cultural obligations to look after land. Their pride that this role is recognised by the wider society is very evident. Managing country, looking after cultural sites, keeping country healthy provides a foundation for the provision of environmental services, such as carbon storage from vegetation recovery, improved species numbers and diversity, and water quality improvements from feral animal control. Such management also delivers ranger jobs and dollars that work for people in remote areas where alternatives are scarce. Thus there is a clear value and return to local people, culturally, economically, and environmentally, in establishing these new protected areas. There is also considerable evidence that communities enjoy better health, social cohesion and higher school attendance (Department of the Environment, 2014).
Changes to pastoral leases

The second trend is changes in the holding of pastoral leases. Pastoral leases cover 40% of the Outback, around 200 million hectares. Higher quality areas are tightly held by commercially viable pastoral operators, but a fact often overlooked is that poorer quality pastoral lands are increasingly going into other, non-grazing, enterprises.

In Western Australia, which has the largest pastoral zone, conservative assessments have stated that between 30-60% of pastoral leases are not, and probably can never be, commercially viable. Some of these leases are being purchased by non-pastoral interests: mining companies, Aboriginal communities, conservation organisations and other non-pastoral enterprises.

These changes on individual leases are being facilitated and driven by individuals, Aboriginal communities and conservation groups, but they are underpinned by the fundamental change that some pastoral leases are no longer managed primarily for meat or wool production. The alternative enterprises include carbon farming, tourism, life-style properties and on some properties specific conservation approaches. This is directly facilitating the creation of new public protected areas through more Indigenous Protected Areas and also properties run specifically for conservation by individuals and conservation organisations.

However, a current weakness is that all these new enterprises are still obliged to have a pastoral lease which states they must run stock. This leasehold condition is often not implemented raising issues over the legal foundations of new enterprises on pastoral leases. Given that this diversification is strong and likely to continue, reform of leasehold tenures in the Outback is required to allow an acceleration of sustainable diversification of enterprises on the current leasehold estate.

Government parks

The positive trends in IPAs and changes in pastoral leases, are not however mirrored in the fortunes of government-run protected areas – national parks and other conservation reserves. There have been modest increases in parks in parts of the Outback in recent years, especially in the Kimberley and on Cape York Peninsula. However, very large areas of crown lands with high conservation values remain unprotected by any conservation tenure. These areas are usually un-managed. While difficult to quantify, there is an apparent trend where protected areas on public lands are increasingly valued by strongly pro-development state and federal governments.

There is no indication that general public support for national parks has reduced, but there is a need for specific campaigns to turn latent support into active support that more strongly influences government policy. Better valuation of the many benefits which flow to the community from all well protected and managed lands and waters may also be a way of turning back to a more positive policy trajectory.

In summary, in the Outback – one of the great natural landscapes on Earth – there are major positive changes happening in protected areas. Huge areas of global significance are coming into the National Reserve System, especially through the declaration of new Indigenous Protected Areas. This take up of protected areas of different types reflects that they are delivering social, economic, environmental and importantly cultural value for people and communities.

However, work is needed to ensure that government-run parks, the core of the protected area system, are well managed and have strong and powerfully expressed public support. This will help build support for further gains needed in the reserve system into the future and help secure the outstanding qualities of the unique Australian Outback.

References


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Dr. Barry Traill is an Australian zoologist and conservationist with over 30 years’ experience as one of Australia’s leading environmental campaigners. Barry is currently Director of The Pew Charitable Trusts’ ‘Australian Outback to Oceans’ program and joined Pew in 2007. Barry has a particular interest and expertise in the ecology of terrestrial birds and mammals, and landscape-scale conservation of temperate and tropical woodlands and forests.
Introduction
This chapter illustrates the potential role of PES in the tropical savannas in northern Australia. In many situations however, the protected area estate is insufficiently large and/or representative to safeguard biodiversity. Here, a more pluralistic approach is required which involves partnerships with other landholders, in particular farmers. While some farmers may be intrinsically motivated to conserve biodiversity on their land, systematic participation can be encouraged by providing farmers with financial incentives in the form of ‘payments for environmental services’ (PES).

This chapter illustrates the situation for the tropical savannas in north Australia. It presents insights from empirical research which explores farmers’ willingness to sign up to voluntary conservation agreements. The research employs a choice experiment as a way of gauging likely business decisions in the absence of observable market behaviour. Such research is vital for the design of conservation programs and tailoring of conservation contracts to a given context – after all, voluntary conservation programs only make a real contribution to the conservation effort if there is sufficient up-take by farmers, resulting in consolidated and systematic conservation effort.

Pastoralists have a critical role to play in biodiversity conservation in northern Australia
Australia’s tropical savannas are a vast landscape of grasslands, open eucalypt woodlands (Figure 1), and extensive floodplains and wetlands covering almost 2 million square kilometres of land between approximately Townsville and Broome, and to the north (TS-CRC, 2014). The rich diversity of ecosystems supports high species richness. Land use options are limited by soil fertility, water availability and climate. Apart from areas reserved for National Parks and Indigenous Protected Areas tropical savannas are predominant used as rangelands for low-intensity grazing using Brahman-style cattle.

Tropical savannas may appear relatively intact; however, there has been extensive biodiversity decline since European settlement through a combination of factors including over-grazing, changed fire regimes and spread of exotic plant and animal species (Woinarski et al., 2007). While there are some large conservation reserves (including public, private and Indigenous managed areas) particularly in the wet tropical savannas, these are not large enough, on their own, to maintain viable populations of many endangered species and the ecological processes necessary to sustain them in the long term (Parr et al., 2009; Woinarski et al., 2010). The opportunity may exist to engage graziers and pastoralists to assist in halting the decline of at least some species and recovery of others. Pastoral enterprises tend to be large, typically between 100 and 10,000 square kilometres, and there are fewer than 700 across the tropical savannas. This means that, potentially, each pastoralist’s actions can have notable implications for biodiversity – native plants and animals and the ecosystems that support them. Therefore a consolidated effort of the pastoral industry is critical to the conservation endeavour. Pastoralists could achieve a great deal by undertaking preventative and restorative measures and adopting species-friendly grazing land management practices.

As business owners and managers, pastoralists pursue financial objectives, but many northern pastoralists are also intrinsically guided in their decision making by stewardship and lifestyle motivation (Greiner and Gregg, 2011). This is turn has been shown to be positively correlated with the level of adoption of conservation practices. Elsewhere empirical links have been shown between farmer attitudes and motivations and farmland biodiversity (Åhström et al., 2013). However, good intentions are often hampered by financial and human resource constraints. Some jurisdictions have introduced legislation to ensure land management meets minimum environmental standards. In Queensland, farmers have an environmental duty of care towards the environment, but this statutory provision is too generic to secure targeted biodiversity outcomes (Greiner, 2014).
Diversity of tropical savanna landscapes: Einasleigh Uplands (top), Mitchell Grass Downs (middle) and Kimberley (bottom). Photo: © Romy Greiner
Among conservation policy options, pastoralists prefer financial incentives as a mechanism for helping them achieve more biodiversity conservation on their properties. Payments for Ecosystem Services (PES) style policies and programs may therefore provide a mechanism to secure a discernible level of industry contribution to landscape-scale biodiversity conservation (Greiner et al., 2009). Examples of this would be ongoing stewardship payments for vegetation restoration or changed burning regimes where there is a clear biodiversity outcome contiguous with the carbon benefit. While PES-style policies and programs are used to pursue biodiversity conservation objectives in many countries and in southern states in Australia, none to date exist in the tropical savannas.

To be effective and efficient, the design of PES-style programs cannot solely be based on ecological, production and economic information but needs to consider a wider suite of factors which influence program participation, including attitudes, preferences and motivations of the land managers (Figure 1).

Pastoralists’ willingness to participate in voluntary biodiversity conservation

Research was undertaken to gauge the likely response of the northern Australian pastoral industry to the availability of PES-style programs. During 2013, a face-to-face survey was undertaken of pastoralists across the tropical savanna rangelands. Survey respondents included 104 pastoralists whose properties ranged in size from 20 to >15,000 square kilometres and included enterprises owned by families and corporations, including Indigenous-owned corporations. Respondents were spread across Queensland, the Northern Territory and Western Australia and across all northern natural resource management regions and bioregions.

The survey included a choice experiment to determine pastoralists’ willingness to sign up to hypothetical voluntary biodiversity conservation contracts and their preferences for contract attributes (Greiner et al., 2014). As part of the choice experiment, each survey respondent was asked to complete six choice tasks. Each task contained a discrete and a continuous question. The discrete question asked the respondent to choose his/her preferred alternative from among three hypothetical conservation contract alternatives and a ‘none’ option, which represented the voluntary nature of PES-style programs. If a contract alternative was chosen, the continuous question asked how much land the respondent would offer to subscribe to the chosen contract. The minimum area was set at 400 hectares. To put respondents in the best possible position to make informed choices, the survey questions preceding the choice experiment explored the property’s grazing system and production economics.

Each contract alternative defined the conservation action that the pastoralist would have to provide and stipulated an annual per-hectare stewardship payment. Other attributes included contract length, monitoring arrangement and ‘flexibility’. There were two types of conservation actions, removal of cattle from the contract area for the entire contract duration or rotational grazing based on biodiversity needs. Cattle would be excluded from the contract area during times each year when the target species/ecosystems were most sensitive to cattle impact, for example during the breeding season of ground-nesting birds. Land subscribed to a contract had to be actively managed, fences maintained, stray cattle mustered, and weed and feral animal control undertaken as required by environmental duty of care. Removal of cattle possibly required the introduction of a burning regime. Contract length varied from five to 40 years. Monitoring was conducted either by the funding organisation or the pastoralist, in which case random spot-checks applied. Some contracts offered ‘flexibility’, others did not. Flexibility meant that the pastoralist had the right to negotiate with the funding organisation a one-year contract suspension in ‘exceptional circumstances’. A request for contract suspension could be granted if,
despite best grazing and herd management practices, an unavoidable situation had arisen which threatened the economic sustainability of the property, but could be resolved if the pastoralist was able to move cattle onto the contract area during a time when the contract required cattle to be excluded. If granted, the pastoralist would not be penalised for breach of contract conditions but would forego that year’s stewardship payment. This provision could be enacted no more frequently than once in any five-year period and only applied to contracts with a minimum length of ten years.

The discrete choice data were analysed using mixed logit modelling and the key findings were (Greiner, 2015): Across the pastoral industry, higher stewardship payments significantly increased the likelihood of participation as did flexibility provisions. If contracts stipulated total exclusion of cattle, participation was significantly reduced. Rotational grazing that caused loss of cattle production also reduced likelihood of participation, but to a lesser extent. Longer contract periods also reduced likelihood of participation. External monitoring was slightly favoured over self-monitoring. Among property and respondent factors, higher land productivity was found to influence participation negatively, while property size, ownership, age, gender and previous participation in conservation contracts were not significant. In line with the literature, pastoralists with a positive intrinsic attitude towards biodiversity and those who regarded PES as an effective policy instrument were significantly more likely to participate.

The research indicated significant heterogeneity of preferences around each of the contract attributes, meaning that pastoralists had diverse preferences for contract attributes. Preference heterogeneity is illustrated in Table 1, which shows the average marginal willingness to accept (WTA) for each contract attribute and the 95% confidence interval.

These values represent the average additional stewardship payment required to secure contract sign-up. To be able to put these estimates into perspective, average per-hectare cash earnings of pastoral properties from cattle were calculated using national farm survey data (ABARES, 2014; average is for years 1990-2013; values in 2013/14 dollars). Over the past two decades, pastoral properties in the Kimberley had a cash income of $4.22/ha/year, approximately $7.50 in the Barkley, Victoria River District and Katherine region, Cape York and the Queensland Gulf, and $15.14 in central north Queensland. The results thus show that stewardship payments need to exceed average opportunity costs in most instances for contracts to be attractive to pastoralists. One reason is the large variability in cash income, with coefficients of variation ranging from 35% (Queensland Gulf) to 55% (Barkly Tablelands). This gives a measure of the income risk of pastoral enterprises and means that in good years pastoralists make a lot more money from the land than average returns suggest, and possibly reference stewardship payments against those higher returns.

The continuous choice component (land area offered for a chosen contract alternative) was analysed using ordinary least squares modelling. As expected, the land area that respondents suggested they would offer into a contract was significantly and positively influenced by the enterprise size and by the stewardship payment. Other contract features were not significant.
Conclusions

The chapter offers empirical insights into key factors and considerations influencing pastoralists’ decisions to participate in contractual biodiversity conservation. The research is based on the premise that conservation of many species of animals and plants in the tropical savannas is compatible with grazing, provided grazing land management respects the needs of these species (Woinarski and Ash, 2002). The research findings give potential investors in biodiversity conservation a foundation for the design of PES-style programs and a reference point from which to commence conversations with interested landholders.

When implementing PES-style programs in the tropical savannas, competitive approaches such as tenders and auctions are unlikely to work very well because farms are so large and the number of pastoralists who can effectively contribute to the conservation of specified biodiversity assets or target ecosystems may be small or even limited to one property. Thus negotiated approaches are important and contract attributes need to respond to pastoralists’ opportunity costs, risk perceptions, preferences and attitudes. Conservation actions need to be tailored to biodiversity conservation requirements and consider in particular whether and to what extent the species and ecosystems to be protected may be able to co-exist with grazing activity. The likelihood of participation will increase if grazing can be accommodated and the required stewardship payment will be less. When considering the level of stewardship payment it is important to consider that opportunity cost associated with conservation action is only one consideration that pastoralists apply. They inherently apply a risk premium and trade off other contract attributes against the payment. For example, most pastoralists will require higher stewardship payments if they are to sign up for longer contracts. They also implicitly account for transaction costs such as those associated with being required to undertake monitoring. One aspect of the risk premium can be gleaned from the large reduction in annual payment sought if the contract offers ‘flexibility’, such as the type of provision considered in this choice experiment.

The chapter provides empirical evidence that vast sections of the northern Australian pastoral industry are ready, in principle, to participate in PES-style programs and commit to undertaking biodiversity conservation action on their properties in return for stewardship payments.

<table>
<thead>
<tr>
<th>Contract attribute</th>
<th>Summary description</th>
<th>Mean WTA ($ per hectare per year)</th>
<th>95% confidence interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total exclusion</td>
<td>Contract requires cattle to be excluded from the area for the duration of the contract (compared to a rotational grazing system that does not cause any loss of cattle production)</td>
<td>$11.08</td>
<td>(7.45—14.47)</td>
</tr>
<tr>
<td>Long spelling</td>
<td>Contract area needs to be spelled every year for an extended period of time, resulting in up to 50% loss of cattle production from the area (compared to a rotational grazing system that does not cause any loss of cattle production)</td>
<td>$3.45</td>
<td>(0.71—5.95)</td>
</tr>
<tr>
<td>Years</td>
<td>Adding one year to the contract duration</td>
<td>$0.41</td>
<td>(0.31—0.53)</td>
</tr>
<tr>
<td>Flexibility</td>
<td>Introducing into contracts the possibility that a grazier can negotiate to suspend the contract in ‘exceptional circumstances’, but no more than 1-in-5 years</td>
<td>-$5.90</td>
<td>(-8.54—-3.47)</td>
</tr>
<tr>
<td>Monitoring</td>
<td>Moving from an external monitoring system to monitoring being undertaken by the grazier (with occasional spot-checks)</td>
<td>$1.17</td>
<td>(-0.52—3.02)</td>
</tr>
</tbody>
</table>

Table 1. Estimates of average willingness to accept (WTA) (n=598 observations, from Greiner, 2015)
Acknowledgements

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References


Nature as inspiration: valuing aesthetic and cultural landscapes

Marian Drew

When people think of ‘ecosystem values or services’ they most often think in terms of tourism, or perhaps water and habitat protection. However, wild environments have many other benefits including stimulating aesthetic appreciation and imagination. These inspiring experiences show us what we value, and these valued experiences, while as old as humanity, are increasingly recognised in literature as an integral part of ecosystem services (TEEB, 2014). The entire spectrum of profound cultural dimensions of natural environments has also been recognised by UNESCO with the listing on the World Heritage list of cultural landscapes (Mitchell et al., 2009).

For many people the immersion in natural and cultural landscapes generate exhilarating feelings of awe, beauty, wonderment and connection, which contribute profoundly to a sense of happiness and the building of rich, pleasurable and meaningful lives. These deeply felt experiences are significant to artists in their attempts to frame philosophical and aesthetic questions about who we are and what it means to be alive today. Physical engagement with wild environments is a complex aesthetic experience, which strengthens our understanding, knowledge and value of those places. Valuing something bigger than ourselves sharpens our ethical perspective and shapes the way we ethically behave in regards to other living beings (Crompton, 2010).

The cultural life of a society, for example poetry, visual and performing arts, music, as well as popular culture, form a framework that shape peoples’ perception and experience of the world, including natural landscapes. The unique platforms of the arts engage audiences in unthreatening ways about ideas of profound implication and importance. The arts also help us become more historically aware and more perceptive of the present, drawing us into thinking about the reality we are building and whether it needs changing.

I am interested to think how contemporary culture may play a role in developing our sense of coherence and connection between what we believe to be valuable and what we see and understand to be happening in the world around us. How might the arts continue to heighten our awareness and create connections to a world of beings outside ourselves?

Australian Photographer Peter Dombrovskis (1945-1996), answered some of these questions through his extraordinary photographs of the Tasmanian wilderness.

Figure 1. Morning Mist, Rock Island Bend, Franklin River, Tasmania (1979), © Peter Dombrovskis, courtesy of Mrs Liz Dombrovskis

The photograph titled Morning mist, Rock Island Bend, Franklin River, Tasmania (1979) portrays a section of the Franklin River that at the time was threatened by the proposed Franklin Dam and which led to Australia’s largest and most important conservation battle (Figure 1). It was the most iconic and significant image in the protest to protect the Franklin River which is now gratefully a part of the Franklin-Gordon Wild Rivers National Park, the heart of the Tasmanian Wilderness World Heritage Area. It should be noted that photography, in particular, has had an immense role in virtually all nature conservation campaigns in Australia as in other parts of the world as a clear way of communicating what is at stake, what will be lost and therefore it constitutes an implied call to action to save the beauty conveyed.
Thought graph - (Blue Lake Moreton Island) 2008, Marian Drew

Square on water (Lake McKenzie Fraser Island) 2008, Marian Drew
It is important to consider why Peter Dombrovskis’ famous image of the Franklin River so engages audiences and how this affect may support political movement. Timing and context are crucial, but reading of the image may reveal further the feelings and ideas that emerge from that exchange.

Studying the image, I immediately get a sense of strong forces at play and a deep sense of time. Human time frames are not evident here. Water has eroded a lot of rock and the island in the centre of the river will eventually be washed completely away. There is at once great fragility and great power. The cool morning colour and the rising fog create a deep and mysterious space where things are clouded. The water, relatively calm, shows powerful movement under the surface. The lines of water draw the eye behind the central rock, deep into a single viewpoint pictorial space. The image triggers memories of paintings, where mist, rock, trees and water represent a kind of natural but dangerous harmonic. The fog envelopes rock like a veil. We have to imagine what is hidden. We need to be careful. We are not relaxed viewing this image. Standing where we are just outside the frame, we could be washed away. We know this place exists because it is a photograph but it shows more than a place in time, it whispers in our ear a story of our own transience, our fragility and our place of the natural world. It is an incredibly beautiful image of an extraordinary place and I feel grateful knowing it still exists. We learn a lot about ourselves looking at it and know more about what we value.

These feelings, sensual experiences and psychological states that natural landscapes evoke in us are crucial to our maintaining healthy relationships with those environments and crucial to the health of our culture. Cultural diversity reflects and promotes ecological diversity and visa versa. Cultural diversity is an amplification of the creative response that maintains a diversity of knowledge not only necessary for rich and rewarding lives, but to our possible survival (Davis, 2009).

Culture mediates experience and acts to shape our appreciation and perception of natural environments. The business of art is culture and it follows that the arts play a significant role in shaping our appreciation and connection through culture to those environments. The arts need to develop the knowledge necessary to respond culturally to our continued adaptation and mitigation of change. Through partnerships with science, the arts are better informed of these critical issues. The arts may then more actively highlight those values, develop motivation and emotionally engage individuals and communities. This could be very important in communicating, for example, the inseparability of ecosystem health with human health and happiness, and the inevitability of connection no matter what the distance on the map.

Cultural change requires a broad base of recurrent dialogue. Cultural change doesn’t come from one person; it is a field of work by many citizens that include creative artists, designers, musicians, architects and artisans. It is a grass roots movement that comes in waves rather than lines. It is a momentum that includes all the failures and successes of amateurs and professionals. Cultural momentum needs to be understood as everybody trying; opening up dialogue through aesthetic means about things that are of value. By enhancing what we value we are able to act more ethically (Brady, 2006). A focused experience of art may help audiences highlight their own values and develop personal standpoints on cultural, social and environmental issues of importance.

By founding my art practice on a physical engagement with natural environments, I developed a specific series of photographic works about the “road kill” of native fauna in my local area of Brisbane, which grew over time to include some other regions in Australia. I was interested to explore our relationship with wild animals within an art historical framework to draw out the inherited contexts that have shaped our attitudes and behaviours. Between 2003 and 2011, I worked on a series of exhibitions with various titles, Australiana (2003), Still Life (2005), Every Living Thing (2007) and Birds (2009). These exhibitions explored ideas conveyed through still life paintings that animals and the natural world were a kind of resource that existed for human consumption in the broadest sense.

Figure 2. Pelican with Turnips 2005, Marian Drew

To test how these ideas felt in the present, I carefully arranged and photographed these dead animals in intimate domestic situations, tables of the dining, kitchen and sewing rooms (Figure 2). The familiarity of the still life as a seductive historic art form and the documentary nature of photography assisted in confronting my audiences with these recognisable but contradictory ideas.

Through this work I aimed to bring real deaths to our attention, acknowledge those animals and establish their close link to the sustainment of our lives. Native animals are killed on our roads, by power lines, by our pets and through a loss of habitat. Our progress is their profound loss. Through these art works, I hope to revive a sense of respect, responsibility, connection, and gratitude for the life and death of animals that cohabit our environments. I am trying to make the point that our life and death is strongly connected to theirs.
Rainbow Lorikeet on Queensland Needlepoint (Figure 3) shows one of the many Rainbow Lorikeets I have found on roads in Brisbane. My mother embroidered this 1970’s tablecloth of Australia which map the values of the time.

In summary, I argue that natural environments have a special importance to play in our cultural lives. Experience of wild places and animals stimulates aesthetic appreciation and imagination. These aesthetic appreciations help clarify the things that we value and in turn enhance our ethical behaviour towards other humans and other living things (Compton, 2010). The arts special contribution lies in working across language and across disciplines in the marriage of cognition and emotion, which takes place in aesthetic experience. With the right support, the creative arts may continue to discover relevant cultural ways of connecting to place, local and global, and through those cultural activities highlight the values of families, friends and communities building the cultural paradigms necessary for our planet to thrive.

References


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A global perspective on the role of protected areas in protecting natural capital

James Watson

Introduction

The collective decisions of governments, publicly-funded bodies and local communities have resulted in a rapid growth of national parks, nature reserves and protected wilderness areas throughout the world. It is possible that apart from agricultural expansion, land and sea management has never changed so quickly over such a large area. As of April 2014, the official global portfolio of nationally-designated protected areas numbered over 163,000 and covered 18.4 million square kilometers, or 12.5%, of the terrestrial realm and about 10.1 million square kilometers (or 3%) of the world's marine environments (IUCN and UNEP-WCMC, 2014).

As natural ecosystems shrink and fragment in many parts of the world, protected areas are now expected to fulfil the different needs of a growing range of stakeholders, primarily around protecting natural capital. Natural capital is defined here as the stock of natural ecosystems that yields a flow of valuable ecosystem goods or services into the future. It is the extension of the economic notion of capital (manufactured means of production) to goods and services relating to the natural environment.

The following is a summary of the findings of a review on the role of protected areas in protecting natural capital (Watson et al., 2014). It focuses on three components of natural capital that have been well studied: 1) species and ecosystems; 2) carbon; and 3) water.

Species and ecosystems

In the last third of the 20th century, recognition that protected areas were efficient and cost-effective ways of conserving threatened species and then ‘biodiversity’ (Chape et al., 2005), led both to a significant increase in the establishment of new protected areas in many countries (Butchart et al., 2012) and the agreement of formal targets for protection in international conventions (e.g. CBD 2004, 2010).

The adoption of protected areas as a core strategy to help avert the current extinction crisis by protecting “biological diversity and ecological and evolutionary processes” (Mulongoy and Gidda, 2008) appears to be well justified. A recent systematic global review concluding that well-managed protected areas are critically important for the conservation of biodiversity (Geldmann et al., 2013). Of the studies reviewed, 82% showed reduced rates of habitat loss, the chief threat to biodiversity (Butchart et al., 2012), inside protected areas compared to equivalent areas outside. In turn 74% of species population studies also showed more positive results within protected areas than outside. These findings are supported by a myriad of localised analyses (e.g. Taylor et al., 2011; Lynch et al., 2013; Woinarski et al., 2013) and hold true even for species with high financial value and under intense pressure from well-organised criminal organisations (e.g., tigers: Walston et al., 2010) or from intense pressure for resource exploitation in both terrestrial (Barber et al., 2012) and marine environments (Micheli and Niccolini, 2013).

However, despite the mounting evidence that well managed protected areas play an important role in conserving endangered species and ecosystems (Juffe-Bignoli et al., 2014) and national level efforts at improving bioregional representation (Gilligan, 2006), a recent global review showed that the rapid expansion of protected areas has not proportionately increased the number of species and ecosystems covered by protected areas (Watson et al., 2014). This is despite the fact that clear representation targets have been generated within the CBD strategic guidelines for well over a decade (Watson et al., 2009; Venter et al., 2014). At broad ecological scales, coverage varies markedly between major terrestrial biomes and ecoregions: using the latest available data (WCMC, 2014). Watson et al., (2014) found only 300 (36%) terrestrial ecoregions have >17% coverage (the current CBD terrestrial target), with over a quarter (n=237, 29%) having <5% coverage and 68 (8%) having <1% coverage. In the marine realm, only 46 (20%) of the 232 marine ecoregions have >10% coverage (the current CBD marine target) with nearly half (n=107, 46%) having <1% coverage. Despite a substantial increase in the size of the global protected area estate over the last decade, these coverage numbers reported by Watson et al. (2014) reflect the fact that most nations are placing new protected areas in locations that hit their CBD ecosystem percentage target obligations, and may be valuable in various ways, but are not often the most critical habitats for threatened species.
Fish River Station, a private protected area in the Northern Territory is an important refuge site for a range of threatened species. Photo: © James Fitzsimons
When finer scale analyses are conducted to assess if protected areas are being placed in areas important for conserving species (which is arguably the key piece of text within the CBD Aichi Target 11), the same patterns of variability occur. Among Key Biodiversity Areas (KBAs), only 28% of Important Bird Areas (sites identified as critical for bird biodiversity across the world) and 22% of Alliance for Zero Extinction sites (sites that hold >95% of the global population of an endangered species) are adequately covered by existing protected areas (Butchart et al., 2012). A recent global analysis of all threatened birds, amphibians and mammals (n=4,118) found that 17% are not found in a single protected area and 85% do not have sufficiently large populations in protected areas to give a reasonable chance of long-term survival (Venter et al., 2014).

In comparison, a decade ago, 20% of globally threatened terrestrial birds, mammals and amphibians were not found in a single protected area and 89% were inadequately represented (Rodrigues et al., 2004). While this is only a subset of terrestrial biodiversity, it is the only data that is available to assess these patterns in a temporal fashion. To my knowledge, there has been no fine-scale global analysis of marine protected area coverage of species or important marine biodiversity areas, which is a significant shortfall in understanding protected area gaps in the marine realm.

Before the CBD strategic plans came into effect, the patchy representation of species and ecosystems in protected areas has often been attributed to weaknesses in national planning methods (Pressey et al. 1993; Watson et al. 2009). Yet, these new global analyses show that significant additions to the terrestrial protected area estate over the past decade have not significantly lessened biases towards higher elevations, steeper slopes, and lands of lower productivity, lower economic worth, and low human density in many parts of the world (Watson et al., 2014). The lack of apparent progress in achieving ecological representation in the global protected area estate is a serious one, considering a) the still massive shortfalls in species and ecosystem representation and b) that achieving ecological representation is an essential strategy when considering the onset of rapid climate change (Watson et al., 2013).

Carbon

The role of protected areas as a climate change mitigation mechanism for securing carbon was hardly mentioned a decade ago. However, it is now an increasingly important argument for the continued establishment and management of protected areas (MacKinnon et al., 2011). It has been estimated that the recent expansion of the Brazilian protected area network resulted in a 37% decline in regional deforestation rates and, if properly managed, the network could avoid approximately 10 gigatonnes of carbon being released to the atmosphere over the next forty years (Soares-Filho et al., 2010). Further, a global analysis shows that reduced carbon emissions from the 17.2 million ha (19.6%) of humid tropical forests inside protected areas between 2000-2005 valued at USD 6,200 – 7,400 million (Scharlemann et al., 2010). It is still undecided if protected areas may be able to play a significant role in the REDD+ schemes that are being negotiated within the UNFCCC. It is incredibly important the storage or vegetation restoration schemes that occur within protected areas be eligible for accounting and compensation purposes to ensure that the full value of the protected area is accounted for.

Water

Protected areas are increasingly being relied upon to provide critical ecological services, including contributions to food and water security. For example, Dudley and Stolton (2003) argued that 33 out of 105 of the world’s largest cities obtain a significant (>50%) proportion of their drinking water directly from protected areas, including Mumbai, Jakarta, Sofia, Bogotá, Dar es Salaam, and Sydney. Another well recognized example is that Quito in Ecuador, home to 1.5 million people, relies on two protected areas for provision of 80% of the cities’ drinking water. Despite the fact that some protected areas play an important role in supplying very large cities their drinking water, few nations formally account for this when considering the positive impacts a protected area has for their nation’s prosperity. Hence it will be vital in the future that national accounts are established in a way that accurately quantify how individual protected areas contribute to human well-being along with their other intrinsic values.

References


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Valuing protected areas: the case for international payments for ecosystem services

Joshua Bishop

Introduction

Until recently in human history, we could take biodiversity and ecosystem services for granted. This is no longer true today, due to the accelerating scale and impact of human activity. Almost everywhere, living natural resources are in retreat from over-exploitation of wild species, pollution and climate change, habitat loss and degradation, and the spread of invasive alien species (SCBD, 2010).

Current global funding for biodiversity conservation has been estimated at around US$50 billion per year (Parker et al., 2012). Most of this expenditure represents allocations of public moneys, raised through taxes and spent domestically. It includes public spending on protected areas, as well as government subsidies to land users (mainly farmers) in an effort to encourage the adoption of environmentally friendly production practices. The private sector also devotes resources to conservation and/or the mitigation of environmental impacts, but this spending is not well documented.

Current funding may be adequate to secure the most highly valued natural sites and to mitigate the worst environmental damages. Unfortunately, indicators showing a continued widespread decline of biodiversity condition suggests that existing resources are not sufficient to halt biodiversity loss. Moreover, existing investments in conservation are insufficient to ensure continued supply of many valuable ‘ecosystem services’, upon which our economies, livelihoods and long-term welfare ultimately depend (Millennium Ecosystem Assessment, 2005).

The economic invisibility of nature

There are many reasons why conservation efforts are not able to secure the resources needed. One explanation is that the real economic values of natural assets and ecosystem services are not well reflected, or not visible, in conventional economic transactions and accounting systems. Although some of the benefits derived from nature – such as food, water, fuel and fibre – are at least partially priced and their production is rewarded in markets, many other ecological values are hidden and ignored by economic policy and business decision-making (TEEB, 2010).

The economic invisibility of nature is partly due to a lack of information about the role of biodiversity in supplying ecosystem services, and the value of those services to business and people. More fundamentally, economic invisibility stems from the weakness or absence of property rights over many ecosystems and their services. This means that people who are adversely affected by ecosystem decline (e.g. freshwater users) often cannot claim compensation for damages resulting from the activities of other parties (e.g. water polluters), while at the same time those who conserve or enhance ecosystem services (either deliberately or incidentally) may be unable to exact payments from the people who benefit. As a result, markets fail to conserve biodiversity and ecosystems or to supply efficient quantities of ecosystem services. For the same reasons, governments may neglect the values of ecosystem services in their decision-making.
Arkaroola Protection Area, South Australia. Photo: © Department of Environment, Water and Natural Resources, South Australia
Payments for ecosystem services

In response, many governments have begun to use payments for ecosystem services (PES) and related market-based instruments to encourage the private sector to do more to protect the environment. The most widely accepted definition of PES is “a voluntary payment from at least one buyer to at least one supplier of a well-defined ecosystem service or a resource use thought to deliver that service, on condition that the service or use is actually delivered” (Wunder, 2005).

PES applies the logic of the market economy: those who benefit from ecosystem services (i.e. consumers) pay to receive them. Funds collected from these beneficiaries are used to pay farmers, foresters and other managers of the land and oceans (i.e. suppliers) to produce not just food, fibre and other tangible commodities, but also less tangible ecosystem services. The result is that environmental protection remains seriously underfunded, both by domestic and international beneficiaries. Ecosystems are polluted, fragmented or converted to other uses, and biodiversity is lost, due to the failure to mobilize sufficient support for conservation action. The funding shortfall – estimated at over US$70 billion per year for the conservation of terrestrial sites alone (McCarthy et al., 2012) – is especially wide in developing countries, where biodiversity is most valued, while ecosystem services of global value may be undersupplied. The international community is thus free-riding on the efforts of a few buyers and suppliers in existing PES schemes, not to mention other people who look after ecosystems of value to the entire world but who receive little reward for their trouble.

The exception of carbon markets, which span the globe, most PES initiatives operate at a national or subnational level. Their geographic focus means that funding is limited to what local buyers – typically governments – are willing and able to pay, while ecosystem services of global value may be undersupplied. The international community is thus free-riding on the efforts of a few buyers and suppliers in existing PES schemes, not to mention other people who look after ecosystems of value to the entire world but who receive little reward for their trouble.

Experience with PES at national and sub-national levels provides many useful lessons on what is required for market-based schemes to be environmentally effective, economically efficient and socially acceptable. Many of these lessons are equally relevant to the development of international PES, including the need to:

• Implement PES in a socially sensitive manner, especially where there are large social and cultural disparities between buyers and sellers. While PES is not the most direct way to reduce poverty, with appropriate safeguards it can be a useful complement to other development policies and initiatives;

• Adapt to a range of institutional and regulatory settings and be able to operate in areas characterised by weak government capacity and/or poorly defined property rights. International PES schemes that are rooted in local contexts and responsive to local needs are more likely to be accepted by resource managers and, therefore, more likely to offer reliable supplies to international buyers (Bracer et al., 2007);

• Target payments to improve effectiveness and reduce costs, using transparent indicators of environmental priority to focus payments, as well as competitive tenders or reverse auctions to allocate funds, where technically feasible and culturally appropriate; and

• Find practical, cost-effective ways to enforce contracts, ensure accurate financial reporting and collect taxes across international boundaries, while also managing sovereign (political) risk and currency risk. These kinds of transaction costs are often a major hindrance to PES and are likely to impose an even greater burden on international payment schemes.

The future directions

What is needed is to scale up PES to the international level, to generate new and additional funding for conserving biodiversity and securing ecosystem services, especially in developing countries and emerging economies (Bishop and Hill, 2014).

Applying PES at an international level implies a focus on those ecosystem services that are enjoyed at a global scale or which straddle national boundaries. Climate regulation and certain biodiversity benefits stand out as prominent environmental values enjoyed by the entire global community. However, PES may also apply at regional or bilateral scales, for example as a tool for maintaining trans-boundary watersheds or conserving the habitat of migratory species that regularly cross international boundaries.
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The Paroo River in NSW, the last free flowing river within the Murray-Darling Basin, supports wetlands of international importance. Photo: © Penelope Figgis
Protected areas and an ecosystem-based approach to climate change mitigation and adaptation

Brendan Mackey

The climate change problem

Earth’s climate is rapidly warming as the consequence of anthropogenic greenhouse gas emissions, mainly carbon dioxide (CO2), from burning fossil fuel for energy and deforestation and land degradation. The average planetary temperature is set to increase by 3-5°C by the end of this century under a business-as-usual scenario (IPCC, 2013a). The climate change problem is the result of the atmospheric stock of CO2 growing faster due to human pollution than the rate at which natural processes absorb carbon from the atmosphere. To date, about 64% of the additional CO2 emissions in the atmosphere are from fossil fuel and 36% from depletion of land carbon stocks (Mackey et al., 2013). Anthropogenic greenhouse gas emissions are currently around 13 Gt C per year, of which 69% are fossil fuel emissions and 24% from land use change (IPCC, 2013b; IPCC, 2014a). The potential for further emissions is staggering from both sources as there are some 1,000 Gt C (i.e. one billion tonnes of carbon) in the remaining fossil fuel reserves (oil, coals and gas) and ~2,000 Gt land carbon in the world’s forests and other ecosystems (one tonne of fossil fuel or ecosystem carbon is the equivalent of 3.67 tonnes of CO2 in the atmosphere) (IPCC, 2013b, Figure 6.1).

While predicting the future is tricky, two things seem certain. First, the problem will only be solved when the world community (every nation) reduces CO2 emissions so that atmospheric concentrations stabilise at a level that limits global warming. If we are to limit warming to 2°C above pre-industrial temperatures – the agreed safeguard that will avoid much of the harm – then society can only emit a further ~300 Gt C in total; about 1/3 of estimated fossil fuel stocks and about 30 years of business as usual (IPCC, 2013a). Consequently we need deep cuts in emissions and we need them now. Second, even if we succeed in our mitigation efforts to limit the harm, we are still locked into a rapidly changing climate and all manner of climatic disruptions for a very long time; thousands of years in fact (IPCC 2013b, 2014b). Adapting to the adverse impacts of a changing climate will have to become a permanent component of conservation, natural resource management and land use planning.

The ecosystem-based approach

In considering how protected areas may be impacted by climate change, the kind of adaptation responses we should take, and their potential to help with mitigation, the key is to recognise what is called the ecosystem-based approach. In 2000, the Convention on Biological Diversity (CBD) adopted the ecosystem approach as the primary framework for actions to help achieve the Convention’s objectives. The approach is based on the application of appropriate scientific methodologies focused on levels of biological organisation which encompass the essential processes, functions and interactions among organisms and their environment. It recognises that humans, with their cultural diversity, are an integral component of ecosystems (CBD, 2010). The benefits of the ecosystem approach have been extensively reviewed and documented (CBD, 2009) and are discussed further below.

Mitigation

Through the process of plant photosynthesis, terrestrial ecosystems store carbon in living biomass (mainly the woody trunks, branches and roots of large old trees), dead biomass, and the soil. The amount of carbon they store is primarily a function of climate (photosynthesis needs a lot of water, and sufficient light and heat) as modified by local landscape conditions of topography and substrate. Of course, the full ecosystem carbon story is complex: fire regimes also play a role; plant species vary in their carbon densities; and respiring plants and decaying biomass release carbon dioxide back into the atmosphere.
Climate change is expected to pose serious challenges to fresh water supplies in many countries. Protected areas like Kosciuszko National Park play a major role in protecting freshwater. Photo: © Graeme Worboys
Human land use activities – logging, cropping, open-cut mining, any land use that removes biomass, kills trees and disturbs the soil – deplete ecosystem carbon stocks and emits CO₂ into the atmosphere. It follows that protecting ecosystems from these kinds of carbon-depleting land use activities is a mitigation action because it helps avoid emissions. Establishing and maintaining protected areas therefore is a mitigation strategy because, in most cases, it results in avoided emissions by preventing land use impacts, along with increased sequestration. Because many protected areas have a land use history that involved logging or clearing, their current carbon stocks are below the landscape’s natural carbon carrying capacity (Keith et al., 2014). By allowing natural ecosystem processes to unfold, and preventing further damaging land uses, protected areas can therefore also enable ecological restoration of the depleted carbon stocks.

It has been estimated that if all the carbon so far released by land-use changes (mainly deforestation) could be restored through reforestation this would reduce atmospheric concentrations of CO₂ at the end of the century by 40-70 ppm. Conversely, complete global deforestation over the same time frame would increase atmospheric concentrations by about 130-290 ppm (House et al., 2002). In comparison, the projected range of atmospheric concentrations of CO₂ in 2100, under a range of fossil fuel emissions scenarios developed for the IPCC, is 170-600 ppm above 2000 levels (Mackey et al., 2013) (the atmospheric concentration of CO₂ is currently around 400 ppm). While neither of these two extreme scenarios (total reforestation or total deforestation) is likely (and for total reforestation, even possible) they bookend the potential benefits and harm. Unfortunately, we are currently heading down the path of further deforestation, degradation and land clearing (Mackey et al., 2014). Avoiding emissions by protecting existing forest carbon stocks is a far superior mitigation action compared with planting new trees and reforestation (Mackey et al., 2013). Establishing and maintaining protected areas is an ecosystem-based mitigation strategy because this helps avoid CO₂ emissions and sequester carbon from the atmosphere.

Adaptation
Climate change adaptation refers to actions undertaken with the aim of reducing the adverse consequences of climate change, as well as to harness any beneficial opportunities. Adaptation actions aim to reduce the impacts of climate stresses on human and natural systems. There is now a substantial body of evidence that anthropogenic rapid climate change will cause great harm to human and other species (IPCC, 2014b). Adaptation is no longer an option but must become mainstreamed into policy and planning at all levels of governance and in all sectors.

Adaption responses can take many forms including engineered and technology-based approaches. Increasing recognition, however, is being given to ecosystem-based adaptation approaches. These can deliver significant value for societal adaptation and an ability to provide additional benefits, such as the use of mangroves to reduce the risk of coastal flooding from storm surges. Ecosystem-based adaptation can generate multiple social, economic and cultural co-benefits for local communities and contribute to the conservation and sustainable use of biodiversity (AHTEG, 2009). They are typically ‘no-regret’ options without perverse outcomes that can build upon traditional knowledge and local experiences, and are proving to be cost effective relative to engineered solutions (UNFCCC, 2013; 2014).

Ecosystem-based adaptation can assist biodiversity as well as people. Removing other stressors from a species’ habitat such as feral animals, weeds and land use pressures are a key ecosystem-based adaptation response for native species. Such actions, however, should be embedded within a broader connectivity conservation plan that identifies and protects important climate refugia, conserves the large-scale migration and connectivity corridors that operate at continent scales (including regional networks of habitat patches and habitat ‘stepping stones’), and maintains viable populations of extant species to maximize intra-species genetic diversity (Mackey et al., 2008). Protected areas are the core zones – the anchors in the landscape – around which such a connectivity conservation approach can be implemented as an ecosystem-based adaptation response to help biodiversity persist in the face of a rapidly changing climate.

Policy implications
To those not familiar with the machinations of international climate change negotiations and land carbon policy, rewarding protected areas for the mitigation and adaptation benefits they provide should be straightforward, given the facts and potential outlined above. Protected areas store lots of carbon so logically this should mean they are worth a lot of carbon money. The reality, however, is somewhat more complicated. Just because carbon has a monetary value in a market somewhere, does not mean that all carbon has a monetary value everywhere, let alone in a protected area. Carbon markets are regulated, operate under rules negotiated through the UNFCCC, enabled by national statutes such as the Carbon Farming Initiative and Emissions Reduction Fund in Australia, and jurisdictions have strict rules governing what constitutes ‘allowable’ abatement projects. There is also an international voluntary carbon market which is likewise subject to specific, agreed rules. So, the fact you (or your government) own or are responsible for managing an area of land does not automatically mean that the carbon stored in the living biomass, dead biomass and soil, has a monetary value and that someone will pay you to either avoid emissions by protecting the ecosystem carbon stocks or by sequestering more carbon through ecological restoration.

Under the United Nations Framework Convention on Climate Change, land carbon rules for developed countries like Australia have been negotiated under the Land Use, Land Use Change and Forestry (LULUCF) provisions of the Kyoto Protocol. We are in the second commitment period of the Kyoto Protocol, but as of writing it is unclear whether there
will be a third period post-2020. Under LULUCF, emissions from grazing, cropland management and forestry are now part of Australia’s national greenhouse gas accounts. The Carbon Farming Initiative (and subsequent Emissions Reduction Fund) is Australia’s national legislation under which emission reduction credits can be generated by land managers through changing their land management practices to avoid/reduce emissions or sequester carbon. Abatement projects, however, have to use an approved methodology and meet strict conditions of ‘additionality’. The latter means that the mitigation benefits are additional to what would have occurred without the abatement project.

What do the LULUCF rules mean for protected areas in Australia? If a currently unprotected area is protected that otherwise would have been degraded, then the mitigation benefits will accrue to the national accounts. As a matter of principle, the landowner should also be able to earn credits; though whether they can or not will depend on the availability of a methodology and the rules set out in it. Existing protected areas are not included in the national accounts until and unless carbon enhancement works are undertaken in them. Again, in principle, a protected area owner should be able to get credits for ecological restoration if it enhances carbon stocks (assuming there is an approved methodology). The other qualification to note is that they would only get the increment attributable to the restoration works, not all subsequent carbon stock growth. Australia’s greenhouse gas accounts, however, would receive the total increment from the time the land unit enters the national accounts.

Can protected areas gain benefits from voluntary carbon markets? The general answer is no because, as noted above, under the Kyoto Protocol rules it is now mandatory for Australia to report on emissions from land management (i.e., emissions from grazing, cropland management and forestry) in its national greenhouse gas accounts. Credible voluntary schemes such as the Verified Carbon Standard do not allow ‘double dipping’: if an emission is accounted for at a national level then it cannot also be sold as an offset credit in the voluntary market.

International and national carbon mitigation rules are under ongoing negotiation and different approaches are being trialled in various jurisdictions. Logically, it would make sense to develop an ‘ecological restoration’ methodology that could be applicable to protected areas. The fact is that many protected areas have been subject in the past to land uses such as logging which have depleted their ecosystem carbon stocks. If the level of degradation is severe, then some level of conservation management such as weed control or fire suppression might be needed to assist natural regenerative processes. In these circumstances, ‘additionality’ could be argued above and beyond that given by protected area status per se.

It is also being argued in international dialogues that developing countries need greater incentives to maintain existing forested protected areas. Providing them with financial benefits for preventing illegal logging, clearing, and mining in existing protected areas should be recognised as a mitigation action in REDD-plus policies. In all jurisdictions, given that protected areas deliver climate mitigation and adaptation benefits, increasing management funding is a cost effective form of climate action.

Similar problems to mitigation arise when considering adaptation policy regimes. The concept of ecosystem-based adaptation is being discussed within the UNFCCC negotiations (UNFCCC, 2013). However, it has also been highlighted by the IPCC that engineered and technological adaptation options are currently still the most common adaptive responses (IPCC, 2014b). The policy challenge is to have ecosystem-based adaptation formally recognised so that projects which use this approach can access climate funds. Funders typically prefer engineered adaptation response such as building sea walls as these are, among other things, more readily amenable to conventional project-based monitoring and evaluation. This is a particularly important issue in developing countries where local communities are often directly dependent upon local ecosystems for their food, fresh water and livelihoods.

Conclusion

It is true that human-forced rapid climate change will likely hurry the demise of many species and interrupt and change ecosystem composition, structure and dynamics. Our most effective conservation responses, however, are based around networks of well managed protected areas. In many bioregions, protected areas will be the best refuges for species from climate change, land clearing and the impacts of extractive industries, among other stressors. A fundamental argument in support of the ecosystem-based approach is that the biodiversity of natural ecosystems gives them greater adaptive capacity, and makes them more resilient to external stressors such as climate change, compared to engineered approaches and industrial agro-forestry systems (Thompson et al., 2009). The ecosystem-based mitigation and adaptation benefits provided by protected areas should be recognised, accounted for and valued in the ongoing international and national climate change policy deliberations.
Australia’s native forests, especially our temperate tall wet forests, are among the world’s most carbon dense and their conservation allows ongoing natural sequestration— a vital ecosystem service. Photo: © Wayne Lawler, courtesy Bush Heritage Australia.
A framework for monitoring the status of Australia’s ecosystems based on IUCN’s new global standard

David A. Keith, Jon Paul Rodriguez and Edmund G. Barrow

Introduction
For the past 50 years the Global Species Programme working of the International Union for Conservation of Nature (IUCN) with the thousands of scientists who support the IUCN Species Survival Commission (SSC) has been assessing the conservation status of species on a global scale in order to highlight taxa threatened with extinction, and thereby promote their conservation. The IUCN Red List of Threatened Species is the global standard of how any species is faring. In recent years, ecologists and other scientists have developed a vital parallel process for ecosystems.

IUCN Red List for Ecosystems (RLE) is a global standard for assessing risks to ecosystem levels of biodiversity developed through a series of international scientific workshops and stakeholder meetings (Rodriguez et al., 2012). The RLE is based on criteria and categories for assessing risks to ecosystems (Keith et al., 2013), which were formally endorsed as the global standard by IUCN Council in May 2014. By improving understanding about which ecosystems are most at risk and the processes that threatened them, IUCN’s Red List of Ecosystems initiative aims to support better environmental decisions.

This summary provides a synopsis of the RLE criteria and categories, and briefly discusses the diversity of potential applications of a Red List of Ecosystems in environmental decision-making.

Synopsis of Red List for Ecosystems criteria and categories
The Red List of Ecosystems protocol comprises five criteria for assigning ecosystem types to ordinal categories of risk (Figure 1). Risk’ is a central concept underpinning the Red List (Keith et al., 2013). It refers to the probability of a bad outcome over a specified time frame. In this case, the bad outcome is ‘ecosystem collapse’, a change resulting in loss of features (characteristic native biota, ecological processes) that define the ecosystem. Any RLE assessment must therefore be closely coupled to a description that explicitly identifies the defining features of an ecosystem type. Ecosystem collapse by definition involves loss of biodiversity, underpinning the utility of the RLE as a tool for conservation decisions. A collapsed ecosystem may be replaced by one or more novel ecosystems that operate with different governing processes. These novel systems lack key characteristics of the original system, but may nonetheless share some elements in common. Importantly, many of these novel systems support unique biodiversity, contribute to ecosystem services and other values, and therefore warrant assessment and management, irrespective of the prior systems from which they were derived.

The five assessment criteria act as an ensemble to detect different symptoms of future collapse that may arise from a diverse range of threatening processes (Keith et al., 2013). Four of the criteria (A-D) are shaped around proxy variables representing ecosystem distribution and processes, while the fifth criterion (E) provides a direct means for estimating the risk of collapse (Figure 1).

- Criterion A assesses the rate of decline in ecosystem distribution on the premise that ecosystem types with rapidly declining distributions are at greater risk of collapse than those with stable or expanding distributions.
- Criterion B uses standard metrics to assess the size of the current distribution on the premise that ecosystem types with restricted distributions are at greater risk of collapse than those with more extensive distributions.
- Criterion C assesses the rate, severity and extent of abiotic environmental degradation, based on the premise that this reduces the ability of an ecosystem to sustain its characteristic native biota.
Fire regimes are crucial to the function and renewal of mallee ecosystems. Danggali Conservation Park, South Australia. Photo: © David A. Keith
• Criterion D assesses the rate, severity and extent of disruption to biotic processes and interactions, based on the premise that these sustain coexistence and maintain full diversity of biota within the ecosystem.

• Criterion E assesses an explicit estimate of extinction risk based on a simulation model incorporating the salient processes and components that influence ecosystem change.

Both criteria C and D use ecosystem-specific variables to define a threshold of collapse and assess any trends towards it. Examples include hydrological variables to assess degradation of wetland and riparian ecosystems (criterion C) and variables representing trophic processes in predator-dominated systems (criterion D). For criteria A, C and D, rates of decline are assessed over three time frames: the past 50 years; the next 50 years; and historic (post-industrial, notionally since 1750). The latter accommodates ecological legacies, for example lagged losses of diversity that may occur in response to landscape fragmentation. Criterion E provides the capacity to incorporate interactions between multiple mechanisms of ecosystem decline, which may be assessed individually under the other criteria.

Risk assessment outputs

A primary output of an RLE assessment is the assignment of ecosystem types to categories of risk. However, important collateral outputs include:

• Explicit descriptions of the defining biotic components, abiotic environments and ecological processes that define the ecosystem type;

• A diagnosis of threats and salient mechanisms that drive loss of biodiversity from the system;

• Identification of ecological variables thought to provide the most sensitive and direct measures of ecosystem status;

• Collation and synthesis of spatial data and time series data relevant to tracking the status of the ecosystem type;

• Identification of the major factors that management strategies must address to conserve the ecosystem type; and

• Contextual information, such as contributions to ecosystem services.

The outputs above can be obtained by the assessment of ecosystem types individually, but a comprehensive typology of ecosystem types enables a systematic assessment within a region of interest and additional outputs such as comparative analyses of risks and prioritisation of conservation actions.

Applications of RLE data

IUCN will lead the development of a global Red List of Ecosystems. This will be based on a broad, global ecosystem typology, with a number of major ecosystem types represented within each marine and terrestrial ecoregion (e.g. Olsen et al., 2001). It will also support governments and NGOs to carry out regional and national assessments though training, capacity building and scientific advice. The potential applications of RLE data are diverse. They include contributions to:

• the design of protected area networks by identifying locations of poorly reserved ecosystems that would benefit most (in terms of risk reduction) from inclusion in protected tenures;

• monitoring the status of biodiversity, particularly at national and international levels through reporting on the Convention on Biodiversity Aichi Target 5 (CBD, 2010) which aims to reduce the rate of loss, degradation and fragmentation of all natural habitats;

• prioritisation of investment decisions (for both conservation and development), for example by helping to quantify outcomes of protected area management in reducing risks and by contributing data to applications of the Equator Principles (http://www.equator-principles.com/) by financial institutions;

• design of natural resource management strategies, for example by informing the allocation of water resources to sustainable river flows and agricultural production;

• environmental education through extension programs and resource materials to schools and community groups;

• frameworks for national legislation to promote biodiversity conservation (e.g., Nicholson et al., in press); and

• informing the sustainable delivery of ecosystem services.

The potential role of RLE assessments in sustaining ecosystem services and human wellbeing

Complex relationships exist between biodiversity, ecosystem services and human wellbeing. While ecosystem services are sourced from the natural environment, their delivery and contribution to human wellbeing also depends on social environments and the human and built resources within them (Costanza et al., 2007). There are many cases in which declines in the diversity of ecosystems reduce or eliminate the services that they deliver.

One of the most salutary examples is provided by the Aral Sea, once the world’s fourth largest freshwater ecosystem, which collapsed in the 1980s-1990s and was replaced by ephemeral steppe and hypersaline lakes due to overexploitation of irrigation water from its tributary rivers. The human costs of ecosystem collapse include loss of major shipping and fishing industries, associated loss of regional employment and trade, loss of food and potable water resources, and major impacts on human health including respiratory diseases and elevated infant mortality due to dust storms emanating from the dry sea floor (Micklin, 2006). Despite this and many other examples, the goals of biodiversity conservation and human wellbeing may not always align. For example, replacement of certain native ecosystems by certain novel ones may improve some ecosystem services to humans. In such cases, the RLE could contribute to a broader multi-criteria framework that seeks to optimise conservation and wellbeing outcomes.
### IUCN Red List Criteria for Ecosystems

<table>
<thead>
<tr>
<th>Listing Criteria (decision rules)</th>
<th>Each ecosystem type assigned to an ordinal category or risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Distribution reduction</td>
<td><strong>Collapsed</strong></td>
</tr>
<tr>
<td>B Restricted distribution and decline</td>
<td><strong>Critically endangered</strong></td>
</tr>
<tr>
<td>C Degradation of abiotic environment</td>
<td><strong>Endangered</strong></td>
</tr>
<tr>
<td>D Disruption to biotic processes</td>
<td><strong>Vulnerable</strong></td>
</tr>
<tr>
<td>E Quantitative estimate of risk of collapse</td>
<td><strong>Near-threatened</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Least concern</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Data deficient</strong></td>
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</table>

Quantitative thresholds

Figure 1. Summary of criteria and categories of the IUCN Red List of Ecosystems.

*Emphemeral floodplain lakes, Naree Station Reserve owned by Bush Heritage Australia. Photo: © Penelope Figgis*
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Links

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Introduction

Ecosystem goods and services are connected directly and indirectly to human welfare (Troy and Bagstad, 2009). Ecosystem goods, such as fish and timber and services, such as air production, water regulation and soil formation are fundamental to life and the prosperity of our societies (Statistics Canada, 2013). Parks Canada’s national parks provide ecosystem goods such as water and wetlands, which provide critical services including, water filtration, flood protection and recreational opportunities.

In 2011, Statistics Canada, the statistical agency of the Canadian federal government, received funding to develop experimental ecosystem accounts with the primary objective of supporting policy needs related to the valuation of ecosystem goods and services. The project, named Measuring Ecosystem Goods and Services (MEGS), was co-led by Statistics Canada and Environment Canada in cooperation with Agriculture and Agri-Food Canada, Fisheries and Oceans Canada, Natural Resources Canada, Policy Horizons Canada and Parks Canada.

The accounting concepts used in the MEGS project are consistent with the System of Environmental-Economic Accounts (SEEA): Experimental Ecosystem Accounting and other international efforts such as The Economics of Ecosystems and Biodiversity (TEEB) and Wealth Accounting and the Valuation of Ecosystem Services (WAVES).

The Thousand Islands National Park was selected as a case study due to the availability of geospatial data and previous valuation studies. The complete findings of the MEGS project were published by Statistics Canada in the Human Activity and the Environment (HAE) Report 2013.

Setting: Thousand Islands National Park

The Thousand Islands National Park (TINP) is part of the 3,000 km² Thousand Islands ecosystem of Eastern Ontario, Canada. The national park was established in 1904 and is one of the smallest national parks in Canada. The total area of the park is 22.3 km² and is primarily a collection of islands in the St. Lawrence River as well as some shoreline land parcels. The park is adjacent to the Canada-United States border (Mulrooney & Keenlyside, 2014).

The area lies within the Canadian Shield, an extensive area of exposed rock, forming in large part the geological base of the North American continent and includes a unique geological feature known as the Frontenac Arch. The Arch joins the south eastern U.S. Appalachian forest with the northern boreal forest in Canada. The park provides habitat for a great diversity of life, some of which are designated as species at risk (Mulrooney and Keenlyside, 2014).

The land form and water resources of the Thousand Islands area support an abundance of ecosystem services, including food, water and recreation. The Thousand Islands ecosystem has a rich settlement history that includes First Nations and early settlers both being drawn to and supported by the rich natural capital of the area. Modern day residents and visitors are also attracted to the area’s beauty, temperate climate and rural setting. For over one hundred years, picnicking, camping and boating have been very popular recreational activities in the park. The park continues to offer these recreational opportunities, while protecting a portion of this special Canada-U.S. transboundary ecosystem (Mulrooney & Keenlyside, 2014).

The Eastern Ontario region has experienced a significant change in population. In the period 1981-2011, the population living within 100 km of the Thousand Islands ecosystem increased from 1.3 million to approximately 2 million. This represents a 47 percent increase for this period. This population increase and the land use activities associated with human settlement have resulted in pressures on the ecosystem such as habitat fragmentation and pollution (Statistics Canada, 2013).
Case study methods and findings

The development of a geodatabase proved to be a key product for the MEGS project. The geodatabase supported the use of satellite land cover analysis at the national and case study levels to report on the quantity, quality and value of ecosystem services in Canada.

Three primary land covers were identified as part of the land cover analysis for the greater Thousand Islands ecosystem: forest composed 31 percent, cropland/field composed 24 percent and water composed 22 percent. Smaller land cover types included wetlands at 7 percent and urban/built-up areas at 6 percent of the greater area. As expected, TINP had higher forest cover at 82 percent and wetland at 10 percent of the protected area. The park also had a lower amount of land cover in cropland/field at 2 percent and urban/built-up areas at 2 percent than the Thousand Islands ecosystem (Statistics Canada, 2013).

Statistics Canada used two methods to estimate the monetary values for ecosystem services at Thousand Islands National Park. The first method builds on a previous body of ecosystem service research entitled Estimating Ecosystem Services in Southern Ontario by Troy and Bagstad (2009). This work was part of a larger federal/provincial/municipal project to provide land cover and ecosystem base data to support better land use decision making by communities within the Frontenac Arch Biosphere Reserve. Troy and Bagstad used the following six step work method: 1) study area definition; 2) typology development; 3) literature search and updating of Natural Assets database; 4) mapping; 5) total value calculation; and 6) geographic summaries.

The second method involved a literature review of published valuation studies for similar land cover types found in the Thousand Islands ecosystem. Monetary estimates of selected ecosystem services by land cover type were generated and transferred to similar areas within the national park.

By combining the above noted methods, the Statistics Canada assessment included the following ecosystem services: atmospheric regulation; water quality; nutrient and waste regulation; water supply regulation; soil retention and erosion control; habitat and biodiversity; pollination and dispersal services; disturbance avoidance; recreation; aesthetic and amenity and other cultural services (Statistics Canada, 2013).

Using the previous work by Troy and Bagstad (2009), estimates of the annual value of ecosystem services for the Park in 2012 Canadian dollars ranged from $12.5 million to $14.7 million (2012 dollars). The second method focused on the value of the park’s recreation services as well as option, bequest and the existence values associated with the park’s wetlands. The annual recreational services for all land cover types in the park were valued at $3.9 million (2012 dollars) and the annual option, bequest and existence values of the park’s wetlands ranged from $434,000 to $531,000 (2012 dollars) (Statistics Canada, 2013).

Summary

The case study benefited from the previous valuation work and the creation of the geodatabase. As part of an experimental approach several methods were used to help value the ecosystem services associated with the different land cover types.

The goods and services provided by Parks Canada’s protected areas can be thought of as gifts from nature. The Thousand Islands National Park case study is the first time an estimate of these gifts (annual flow of ecosystem goods and services) has been undertaken. However, it is important to note the estimated monetary values are conservative and do not fully represent the value of the park.

Despite constraints, this effort to identify and attempt to give monetary value to ecosystem service values supports park management, policy development and helps to document the benefit legacy of the Park. For example, park staff have shared the case study findings with key regional landscape management partners including the Frontenac Arch Biosphere Reserve and the Algonquin to Adirondacks Collaborative. In addition, the information is used regularly to support various park proposals and internal audits. Finally, the case study findings are expected to support several upcoming major Parks Canada planning cycles and county level planning processes.

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Payment for ecosystem services in practice – savanna burning and carbon abatement at Fish River, northern Australia

Nerissa Walton and James Fitzsimons

Introduction

Tropical savannas occur in Africa, Australia, South America and southeast and southern Asia. These ecosystems support about 10% of the world’s population, occupy one-sixth of the land surface and contain the most fire prone vegetation on earth (Russell-Smith et al., 2013). In Australia, savannas occur in the wet-dry tropics and feature both trees, dominated by eucalypts, and herbaceous plants, principally grasses. A defining feature of savannas is the existence of a dry season lasting up to nine months of the year. Grasses in the savanna have short, intense growing periods during the wet season, then cure rapidly during the dry. Rainfall is seasonal, ranging from 300 to 2000 mm with high inter-annual variation.

Indigenous people possess a long history of fire management prior to European settlement, living on their lands and maintaining skilled fire management over large parts of the landscape (Russell-Smith et al., 2009). This regime was disrupted with European arrival, which resulted in the movement of many Indigenous people away from their lands and the consequent breakdown of skilled fire management over large areas. Currently, over 20% of Australia’s northern savanna is owned or managed by Indigenous people and Indigenous land interests span a much greater area, through joint management arrangements and non-exclusive native title.

A feature of contemporary savanna fire regimes is the predominance of fires occurring in the late dry season, typically under severe fire weather conditions. Savanna wildfires can occur at any time in the dry season (March to November), however, 85% of fires occur in the late dry season, from August to November (Garnaut, 2011). Late dry season fires are characterised by low levels of patchiness, high intensity, high total fuel consumption and propensity to spread.

Contemporary northern Australian fire regimes are having significant impacts on regional biodiversity values (e.g. Woinarski et al., 2011) and contribute to national greenhouse gas emissions. Reinstating the traditional fire regimes for biodiversity, cultural and carbon benefits is now a rapidly increasing activity in northern Australia (e.g. Fitzsimons et al., 2012). Management of this significant ecosystem process presents great opportunity for ecosystem services. Here, we outline the Fish River Fire Project, the first early dry season savanna burning project to be declared under the Australian Government’s Carbon Farming Initiative and the first to have sold those credits, as a practical example of payment for ecosystem services.

The Fish River protected area

Fish River is a spectacular property with high conservation and cultural values in the Daly River region of the Northern Territory in Australia. It covers 182,500 hectares and encompasses sandstone ranges, large tracts of intact savanna, an extensive mosaic of monsoon forest wetlands, as well as the pristine waters of the Daly River and its tributaries. Fish River is home to unique assemblages of terrestrial and aquatic species and is an important refuge site for nationally-listed and Northern Territory-listed threatened species. It was purchased in 2010 by the Indigenous Land Corporation with support from the Australian Government’s National Reserve System Program, The Nature Conservancy, Pew Environment Group and Greening Australia (for more information, see Fitzsimons and Looker, 2012). As part of the National Reserve System it is managed primarily for biodiversity conservation and cultural values with other congruent objectives such as the management of visitor use, the needs of Indigenous people and local communities (including subsistence resource use) and to contribute to local industries such as tourism and the emerging carbon market. The tenure is a perpetual Crown lease for the purposes of ‘grazing and ancillary’ activities. The property is planned to be divested to Traditional Owners, upon the Northern Land Council’s resolution of the current native title claim.
Savanna burning on Fish River Station. Photo: © Ted Wood
The Carbon Farming Initiative

The Carbon Farming Initiative is a legislated offsets scheme of the Australian Government that allows farmers and land managers to earn carbon credits by storing carbon or reducing greenhouse gas emissions on the land. These credits can then be sold to people, business and government wishing to offset their emissions. Carbon credits are a financial commodity representing one tonne of CO₂ or carbon dioxide-equivalent (CO₂-e) that is sequestered and stored, or prevented from being released into the atmosphere, which can be sold as offsets. In Australia, the Carbon Credits (Carbon Farming Initiative) Act 2011 (Cth) and Regulations are the regulatory instruments that enable the production and trading of carbon credits and establish a set of integrity principles for Carbon Farming Initiative projects. These integrity principles require that abatement must be measurable and verifiable, additional to what would occur in the absence of a project, supported by peer-reviewed science and consistent with Australia’s international greenhouse gas accounts.

Within this framework, ‘methodology determinations’, the legal instruments that set out the rules for undertaking activities and measurement methods, are developed for each type of project activity, including for early dry season savanna burning.

Application of the savanna burning Carbon Farming Initiative methodology on Fish River

The Fish River Fire Project applies the Carbon Farming (Reduction of GHG Emissions through Early Dry Season Savanna Burning 1.1) Methodology Determination 2013. The methodology is based on traditional Indigenous knowledge coupled with western science which together demonstrate that controlled mosaic burning in the early dry season reduces fires in the late dry season and results in the avoidance of emissions of nitrous oxide and methane, both powerful greenhouse gases. Eligibility criteria for the methodology require the project to be on land receiving above 1000 mm average annual rainfall, containing the specified vegetation types, in this case eucalypt woodland and sandstone woodland, and having a history of regular late dry season fire.

Once eligibility is established, the legal right to carry out the project needs to be established and feasibility of the project assessed. The Northern Territory Government was approached to provide confirmation that the operation of an early dry season savanna burning project on the property was not inconsistent with the purpose of the Fish River lease. The Indigenous Land Corporation applied to the Clean Energy Regulator to become a recognised offsets entity and have the project declared an eligible offsets project. Once the project is approved, the activity, in this case early dry season burning, is undertaken. In some situations projects have been ‘backdated’ to include activity undertaken in the past and in the case of the Fish River Fire Project, project approval was backdated to 1 January 2011.

Under the savanna burning methodology, abatement is determined by calculating the annual emissions in the reporting period, and comparing this with the average annual emissions during the baseline period, the ten years prior to the project commencement. The abatement is the difference between the baseline and total emissions in the project year. Various tools are used to undertake the calculations, including a pre-validated vegetation map, seasonal fire maps from the North Australian Fire Information (NAFI) Service and the Savanna Burning Abatement Tool (SavBAT). Applications for Australian Carbon Credit Units are then submitted to the Clean Energy Regulator with an independently audited project offset report.

Impact of early dry season burning on greenhouse emissions

Prior to commencement of the project, 75% of Fish River burnt every year. Since the introduction of planned early dry season burning, the total area of the property burnt has reduced to 40%. Importantly, the proportion of the property burnt in the late dry season has reduced from 36% to 1% (Figure 1). This has resulted in significant avoidance of emissions of nitrous oxide and methane, which is converted to a carbon dioxide equivalent for carbon credit calculation purposes (Figure 2). A total of 49,041 credits have been issued to date, an average of 12,260 credits annually.

Selling credits on the market and media interest

The ILC has been issued with three tranches of credits to date, those for 2011 and 2012 combined and those for the 2013 and 2014 activity years. On each occasion, the ILC undertook a well publicised expression of interest process promoting the valuable cultural, social and biodiversity co-benefits associated with the project. Successful bids were identified based on three key criteria: the price; the organisation’s compatibility with Indigenous values; and how the company proposed to market the sale. Expressions of interest were received from liable entities (those corporations having an emissions liability under the Carbon Pricing Mechanism), carbon brokers and banks. Prices were high, recognising a genuine market value of the co-benefits produced by the project. The first two tranches of credits were sold to Caltex Australia for more than $22/t, a liable entity with a corporate social responsibility focus on Indigenous people and the environment. The media provided coverage to the expression of interest process and the sale of the credits. In particular, the ABC’s 7.30 NT program reported the first Indigenous owned Carbon Farming Initiative project and the first savanna burning project to sell credits on the market (Middleton, 2013).
Figure 1. Impact of early dry season burning on seasonality and area burnt at Fish River.

Figure 2. Impact of early dry season burning on greenhouse gas emissions – the red dashed line represents the baseline emissions for the 10 years prior to the purchase of Fish River and the green bars the emissions avoided from the baseline and therefore carbon credits produced. 2011 and 2012 abatement shown in this figure is calculated using the Carbon Farming (Reduction of GHG Emissions through Early Dry Season Savanna Burning 1.1) Methodology Determination 2013. Actual abatement claimed for these years under v1.0 was slightly less, as the baseline is lower when calculated under the first Determination. 2010, the year the ILC commenced management, is a transition year in the project, neither part of the baseline nor the project crediting period.
Land management costs

A deed with the Australian Government for Fish River requires that the reserve is managed in accordance with IUCN protected area category II (National Park). The types of costs incurred in managing the property include labour, infrastructure repairs and maintenance, weed management, fire management, visitor management, feral animal management, track maintenance and divestment consultations. Annual income under the Carbon Pricing Mechanism has represented approximately 1/3 of the annual cost of managing the reserve. Other complementary sources of income are the mustering of buffalo for pet meat, fire management on a neighbouring property, the ILC’s Real Jobs Program and contributions from The Nature Conservancy towards fire management and feral animal management.

Co-benefits of the Fish River Fire Project

The Fish River Fire Project is delivering social, cultural, biodiversity and economic benefits. All revenue from the sale of credits is reinvested in managing the property and supporting jobs and training for Traditional Owners. The employment of local Indigenous people, most of whom have familial connections to Fish River, is facilitating access for Traditional Owners to the property, reconnection with cultural values and protection of important cultural sites. The reduction in late dry season wildfire helps protect significant fire sensitive ecosystems and the many threatened species on the property, such as the Northern Quoll, Gouldian Finch and northern Masked Owl. The Fish River Fire Project is being used as a demonstration project to assist the development of other savanna burning projects by Indigenous groups in northern Australia.

Challenges and opportunities

Fish River was the first project to be accredited for the production of carbon credits from savanna burning and the first to sell its credits under the Carbon Farming Initiative. However, since registration of the Fish River Fire Project, a further 33 projects covering 13 million hectares have been approved by the Clean Energy Regulator and issued with over one million carbon credits as at January 2015 (Figure 3). This includes the registration of savanna burning programs that have been operating for a number of years (for example, EcoFire in the Kimberley, see Legge et al. 2011, and the West Arnhem Land Fire Abatement project in the Northern Territory).

The planned burning is undertaken about a year before credits are issued, so funds to undertake feasibility assessment, project development and burning are required prior to any income being received. This up-front cost could potentially inhibit more groups from entering the market without philanthropic or government support. Another challenge is land tenure, particularly the level of government involvement and consultation required to make land use decisions relating to Indigenous held land tenures.
The Clean Energy Act 2011 (Cth) was repealed in 17 July 2014 and the Carbon Farming Initiative Amendment Act 2014 (Cth), which gives legislative effect to the new Emissions Reduction Fund (ERF), commenced in November 2014. The Australian Government’s ERF will buy the lowest cost emissions reductions offered through a reverse auction process, where bidders will be required to submit bids that offer up a specified quantity of emissions reductions from identified projects at a specified price. Although savanna burning is recognised under the ERF, a number of uncertainties are presented under this new system for new and current projects. Government auctions commence in April this year and it is hoped that a process valuing the important co-benefits achieved by these projects will be incorporated into the ERF in the future.

Conclusion

We consider the following key steps would contribute to furthering the policy direction for savanna burning in Australia:

- Recognition of Indigenous land managers as key custodians of land and providers of ecosystem services, including carbon projects, and consider support for capacity building and project startup on Indigenous-held land.

- A stable domestic carbon policy and compliance market, and/or a vibrant voluntary market to create demand.

- Society (community, private and public sectors) valuing the ecosystem services provided by nature. For example, valuing externalities, recognising the costs of unsustainable systems and product design in pricing. Appropriately valuing these services can create viable, sustainable opportunities for landholders to diversify their income, enabling ‘protection’ and ‘production’ to co-exist.

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Links


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Coral reefs are a foundation for sustainable development

Marine ecosystems provide the foundations for wellbeing and livelihoods of hundreds of millions of people. The majority live in developing countries with few alternative sources of sustenance or economic revenue. However, the sustained and global decline of coral reef ecosystems, driven by a combination of climate change and accumulating local pressures, is compromising their ability to provide the goods and services upon which individuals, communities and entire cultures depend (TEEB Synthesis, 2010).

While the challenges of reversing this decline are enormous, actions to reduce additional impacts and support ecosystem recovery are feasible, and urgent. However, decisions continue to be made at all levels of society that further erode the natural capital provided by healthy marine ecosystems in the pursuit of short-term social and economic development opportunities. There is an urgent need to help decision-makers value the services provided by coral reefs so that the trade-offs between short term (and often short-duration) gains and longer term (and often enduring) costs of losses in marine natural capital can be better understood and objectively evaluated (Costanza et al., 1997).

We won’t protect what we don’t value

Global analyses have estimated the full economic value of coral reefs at between $36,794 and $2,129,122 (USD in 2007) per hectare per year (Figure 1; de Groot et al., 2012). The wide range is due to geographic variation in valuations and in methods used in individual studies.

Importantly, much of the value of coral reefs is not readily calculated through market flows. Reflecting the broad range of values from ecosystems, the Millennium Ecosystem Assessment recognises four categories of ecosystem services (Figure 2). While provisioning services include the benefits most readily captured by market valuations, they account for only around 16% of the value obtained from coral reefs. Often under-appreciated, regulating services account for 49% of total value, with cultural (31%) and habitat/supporting services (5%) making up the remainder (calculated from data in de Groot et al., 2012).

These estimates have proven important for raising awareness of the economic significance of coral reef ecosystems generally, and have demonstrated the value to managers of understanding and communicating the breadth and magnitude of ecosystem services values. This has been especially powerful for marine ecosystems, where values are perhaps least evident (certainly less visible) to the broader community. The lack of visibility is in striking contrast to the extremely high value of coastal and coral reef ecosystems: coral reefs and coastal wetlands have the highest monetary value of any biomes (Figure 1). However, for the full potential of valuation approaches to be realised, the concept of ecosystem services must be operationalised for use at a scale appropriate to marine resource management decision-making, and must capture non-monetary values.
Coral reefs provide a wealth of ecosystem services, including dive tourism destinations and habitat for species such as this young Hawksbill turtle. Photo: © Paul Marshall
Valuation must include non-monetary benefits

Tools and approaches for valuing both monetised and non-monetary benefits derived from ecosystems are becoming available for use by decision makers. However, most of the work on ecosystem services valuation to date has concentrated on the monetary value of stocks (natural capital) and flows (services). In practice, most management decisions require trade-offs between scenarios that have different cost-benefit ratios for a range of important non-monetary values, such as the importance, preferences, needs or demands expressed by people toward coral reefs. Tools that can integrate monetary and non-monetary valuations are necessary to allow decision-makers to evaluate alternative management scenarios, identify non-overlapping benefits, spatially model the production, flow, use and value of benefits, and incorporate the likely costs as well as benefits of different policy interventions (Balmford et al., 2011). Such tools will also need to be tailored to the specific context of marine ecosystem services.

We need to operationalise ecosystem services for coral reefs

The path to operationalising the concept of ecosystem services for use in coral reef management requires four steps: 1) adaptation of ecosystem services concepts for use in marine systems; 2) development of specific theory, tools and standards for applying the concepts in decision contexts; 3) building decision-support systems for integrating ecosystem service valuation into management planning and policy development; and 4) creating systems for stakeholder participation in obtaining and using ecosystem service valuations. Each of these steps is explored briefly below.

Adapting ecosystem services concepts

Many of the theoretical developments, approaches and tools developed for valuation of terrestrial ecosystem services are applicable to marine ecosystems, but there are important differences that need to be taken into account. Most marine ecosystems are not under private tenure, and open access can make it difficult to spatially delineate ecosystem services. Where there is tenure, it often has a basis in custom and a long history of traditional rights that create complex relationships between ecosystem services and beneficiaries. While not unique to the marine context, there can be very high social, cultural and economic dependency on marine ecosystem services by local communities.

However, some of the unique features of marine ecosystems are actually favourable for the application of ecosystem services valuation. Lack of private tenure also has an up side: decisions about access and use of ecosystem services can be implemented through public institutions. The long history of shared access to marine ecosystems also means that trade-offs between user groups and the sharing of benefits is often an established part of the human-environment relationship. There is also strong awareness of the urgent need for reforms to governance and management arrangements in some marine management settings that can increase receptiveness among stakeholders for an ecosystem-services approach to decision-making. Add to this the extensive data sets and comprehensive governance in place for some marine areas and it is apparent that there are good opportunities for developing and applying ecosystems service valuation approaches to management of at least some marine ecosystems, despite the technical challenges.
Tools, theory and standards

Since initial calls to action for the research community to develop resources to support decision makers (Daily et al., 2009), there have been some important developments in theory and tools for applying ecosystem services valuation concepts. Demonstration projects, including in the Belize Barrier Reef and on the coast of Oregon, USA have made important progress in adapting theory, building tools and establishing standards for marine ecosystems. These projects have seen the adaptation and application of sophisticated tools such as InVest (www.naturalcapitalproject.org), which help incorporate natural capital into marine protected area management decisions for the first time.

Tools like InVest are a critical step in the major challenge of moving from concept to practical application of ecosystem services valuation (Reyers et al., 2013). Important to effectiveness is the ability to account for linkages between ecosystem services and human wellbeing, and between different services. Operationally, a key virtue is their ability to model the implications for ecosystem services of different management scenarios in space and time, and at scales that are relevant to most marine spatial planning processes. While there has been important progress in developing sophisticated systems-based approaches to valuing ecosystem services, there is an operational trade-off in application: many marine resource managers and management programs are unlikely to have the technical expertise or time to learn and apply the models. Further, most of the tools developed to date focus on monetary valuation approaches.

Decision support

A remaining challenge is to develop less technically demanding decision support tools that enable managers to incorporate ecosystem service valuation concepts into engagement and planning processes, and which can readily lead to the use of more sophisticated tools for detailed spatial analysis. It is early days in our collective efforts to apply ecosystem services concepts to marine decision-making, with only a handful of case studies to date, but these early efforts are quickly building technical capacity and momentum. Fertile areas for future efforts include: tools for assessing or comparing total value (monetary and non-monetary) of ecosystem services; development of frameworks for integrating ecosystem services into the policies and guidelines that inform strategic management decisions; and building tools to enable ecosystem services to be integrated into tactical management decisions such as impact assessments, design of biodiversity offset projects and payment for ecosystem services projects.
**Stakeholder engagement**

Efforts to develop simpler operational approaches and tools for evaluating ecosystem services, and identifying trade-offs and options, will also greatly assist decision-makers to engage stakeholders. Invariably, natural resource management decisions involve changes to the way people access, consume or impact on ecosystems and the services they provide. Ecosystem services provide a fundamental and much-needed framework for describing the relationship between humans and the environment in a way that can help both resource users (beneficiaries of ecosystem services) and policymakers make more informed decisions. Tools that facilitate stakeholder participation have the potential to decrease resistance to management decisions, increase stewardship of ecosystems by stakeholders, and, ultimately, build resilience among marine resource users and local communities to cope with major change events (Marshall and Marshall, 2007).

**Toward a more informed discourse about costs of damaging nature**

Ecosystem service valuation is rapidly emerging as an approach for addressing urgent and critically important deficiencies in our governance of natural ecosystems. It is not without its drawbacks, including the increased risk of a commodification bias in natural resource decisions and the related challenge of capturing non-monetary values (Reyers et al., 2013). However, the trajectory of recent research and the early signs of success in application strongly suggest that we can effectively operationalise ecosystem services concepts for use in coral reef ecosystems and other marine settings. By explicitly linking the character and quality of ecosystems to human welfare, the valuation of ecosystem services offers the promise of decision-support systems that properly capture the trade-offs between short-term gains and long-term losses, and between different sectors or interest groups, thus enabling a more informed discourse about the benefits to humanity of conserving nature.

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Protected areas and water catchments: The Australian Alps

Graeme L. Worboys

The Australian Alps

The very highest of mainland Australia’s magnificent mountains are protected by eleven national parks and nature reserves. These iconic, winter-snow covered Australian Alps national parks include the headwater catchments of three of Australia’s famous rivers, the Murray, Murrumbidgee and Snowy Rivers (Figures 1 and 2). The fresh waters flowing from the Alps to the Murray-Darling Basin and to the coast generate economic benefits derived from agriculture, potable water consumption, hydro-electric power generation and river based adventure tourism. The downstream benefits associated with water from the Australian Alps have previously been indicatively estimated to be worth about $9.6 billion annually, highlighting that the Australian Alps are of national economic significance (Worboys et al., 2011).

These mountain protected areas are also nationally significant for their special natural values and their rich cultural heritage. Like other famous Australian protected areas such as the Great Barrier Reef, Uluru–Kata Tjuta and Kakadu, they are a National Heritage Listed Property. These iconic values are of intergenerational significance and part of the inheritance of future generations of Australians. There is nothing else like the Australian Alps nationally and globally. Its distinctive Australian alpine and subalpine animals include endangered species such as the Broad-toothed Rat (Mastacomys fuscus) and the Northern (Pseudophryne pengilleyi) and Southern Corroboree Frogs (Pseudophryne corroboreae). A total of 293 vertebrate species are recorded from the Alps.

The Alps are also famous for their mountain scenery and summer wildflower displays across alpine landscapes. The diverse plant life of the region includes 850 vascular plant species (Worboys et al., 2011). Many of these flora and fauna species survived the last glaciation of 10,000 years ago and some are found nowhere else on Earth. The Alps have a rich living cultural heritage that dates back 22,000 years and they have been an iconic visitor destination for Australians and others for nearly 200 years.

Protected area management

The Alps protected areas span 1.64 million hectares and include the Namadgi National Park (Australian Capital Territory); Kosciuszko National Park (New South Wales) and the Alpine National Park (Victoria) (Figure 1). They are managed by State and Territory protected area organisations and the entire headwater river catchments are co-operatively managed for conservation under the guidance of the Australian Alps National Parks Memorandum of Understanding and the Australian Alps Liaison Committee. Conservation and protection of the catchments and their ecosystem services is one of the principal objectives for the reserves.

Water, precious water

Water provided by the Alps represents 29% of the annual average inflow of the Murray-Darling Basin and consequently contributes to generating $15 billion worth of Australia’s agricultural produce in the Murray-Darling Basin annually (MDBA, 2010). The Murray-Darling Basin produces 45% of Australia’s irrigated production ($5.5 billion); 56% of its grape crop; 42% of fruit and nuts and 32% of its total dairy production. Some 2.1 million Australians live there and 40% of Australia’s farms are found in the Basin (MDBA, 2010). Water from the Alps is important for water supplies of many towns along the Murray River including the residents of the City of Adelaide. At the worst of times for farmers and water users, such as during extreme droughts in eastern Australia, the reliable inland flowing water from the Alps becomes, by both volume and quality, even more important. Further research is required to quantify and value the attribution of specific watershed services from the Alps such as drinking water, hydroelectricity and water filtration.

Section 4. Case studies of protected areas and ecosystem services
Healthy, natural catchments

In addition to the economic benefits, the Alps catchments and their waters provide many environmental benefits. They help maintain the natural ecosystems of the high mountain catchments; provide sustainable environmental flows of high quality water for downstream rivers and they help to dilute the effects of salt and silt laden waters sourced from the greater Murray-Darling Basin catchments. The integrity of this high quality Alps water however is vulnerable. It is highly reliant on the high mountain catchments found in the Australian Alps national parks being in good natural condition. Degradation of these catchments may seriously impact water quality water yield and natural water flow regimes.

Climate change: A current and future threat

The current and predicted effects of climate change are of concern given their potential to adversely impact the Alps catchments. Modelling has identified that the Murray-Darling Basin, including the Alps, is “likely to be 10% drier than past experience” based on mean records, since records commenced and median 2030 projections (MDBA, 2010). The CSIRO estimates of future changes in runoff in Victoria’s catchments indicate that by 2030, catchments located in the north-east and south-east may experience up to 30% reductions in runoff (State Government of Victoria, 2008).

Higher temperatures are also likely to reduce the length of the snow season in the Australian Alps with a higher proportion of precipitation falling as rain rather than snow and earlier melting of snow on the ground.

The projected climate change impacts for the Alps for the year 2050 includes: increases in mean temperatures of 0.6 to 2.9 degrees C; less overall precipitation (and up to an estimated 24% reduction from 2005 levels); lower humidity, less snow cover, changed river flow regimes with the absence of the annual spring snow-thaw run-off; more frequent and hotter fires; more droughts; more severe storms and higher total ultraviolet radiation due to less cloud; and more sunlight in the mountains (Worboys et al., 2011).

The mountains need to be resilient to respond to such climate change effects in order to protect iconic values as well as ecosystem services and this needs them to be in a healthy natural condition. Changes in climate and resulting water and fire regimes across the Alps are likely to result in declines in catchment stability and reduce the level of cost effective ecosystem services and benefits provided or alternatively increase the costs to the community of providing these services.
Condition of the Australian Alps catchments

In 1957, the Australian Academy of Science completed the first ever Report on the Condition of the High Mountain Catchments of New South Wales and Victoria (AAS, 1957). The Report’s findings identified serious soil erosion in Australia’s high mountain catchments and its findings contributed significantly to the removal of stock from the highest parts of Kosciuszko National Park, despite vehement opposition from some graziers at that time.

In 2010, a second assessment of the natural condition of the Australian Alps catchments was completed (Worboys et al., 2011). At this time, protected areas had been established for 66 years at Kosciuszko National Park (oldest) and for 30 years for what later became the Victorian Alpine National Park with stock grazing having been removed only 5 years previously in parts of the Alpine National Park.

A total of 235 sub-catchments were qualitatively assessed based on available expert and park manager knowledge, using three categories of condition (good, moderate or poor) applied to each sub-catchment (Figure 3). The trend in condition was also determined using three criteria: declining, no-trend-change or improving (Figure 4). Alarmingly, the assessment found 60% of the 235 sub-catchments were in a poor or moderate natural condition. Furthermore, the assessment found that only one-third were in a good and stable or improving condition.

Restoration work

The Australian Alps protected area agencies have undertaken considerable conservation management and restoration work for up to 66 years in places where stock grazing impacts ceased, but it will take many decades of active management to restore areas disturbed from this damaging practice. The cold climate of the high country means restoration of disturbed catchments is both seasonal, due to snow cover, and very slow, while new threats and pressures impact the natural condition of the mountains (see below).

In addition, those parts of the Alps occurring in the rain shadow on the lee side of the mountains are very dry. This combination of cold and dry conditions results in very slow recovery times. Responding to all of these threats and restoration requires significant financial and staff resources, a long term restoration plan and a clear understanding by all of the time that it will take for such restoration to be effective. The benefits are a resilient and effective catchment. However, the potential reduction of cost effective ecosystem services such as clean water, retained water yield and manageable flow regimes may result in increased costs to consumers.
Key threats to the Alps catchments

The 2010 assessment found serious threats to the Alps catchments including active soil erosion and increasing numbers of wild horses and deer that were contributing to soil erosion. Wild horse numbers had grown by 300%, from an estimated 2500 in 2003 to 7600 in 2009 despite some control actions (Dawson, 2009) and a further growth in numbers was predicted. The wild horses contribute to serious erosion and pollution in the very highest catchments by trampling, pugging, grazing, dirt bath development, the collapsing of stream banks and the causing of incision to mountain wetlands and streams (Worboys and Pulsford, 2013). Through such action, they directly impact endangered Sphagnum bog ecological communities, valley heath and wetlands and natural tussock grasslands and herbfields. Increased sedimentation of wetlands and waterways through trampling is likely to reduce the substantial value of clean water as an ecosystem service. The associated rich diversity of vertebrate and invertebrate Australian animal species that are found in such habitats are impacted including the Platypus (*Ornithorhyncus anatinus*), native fish (*Galaxia* spp.), the corroboree frogs and the Broad-toothed Rat.

Additional serious threats were identified by the survey that included frequent severe fires and the presence of four weed species with great potential to spread (blackberry, broom, hawkweed and willow). In their 2010 condition, the Alps catchments were assessed as being very vulnerable to predicted climate change effects. The management responses needed to fix the catchments was also considered.

Towards a climate change resilient catchment

In response to the catchment condition assessment, a *Caring for the Australian Alps Catchments Report* was prepared that recommended six priority actions to guide the Australian Alps Liaison Committee in preparing an adaptive management response for the Alps catchments (Worboys et al., 2011). The actions focused on halting catchment degradation; improving water quality; improving catchment resilience and optimising water flow regime and water yield. Improvements in the capacity to manage in a climate change environment were also identified and included introducing adaptive management techniques using new and improved management tools; monitoring the change in condition of the catchments; identifying threats and undertaking research into complex catchment management issues. The actions also identified targets that directly involved the people of the Alps with the implementation of adaptive management in the catchments.
Conclusion

The 2011 Catchments Report identified that the downstream benefits associated with ecosystem services (water) originating from the Alps catchments were of national economic importance with an approximate value of $9.6 billion per annum. This natural condition helped to deliver the high quality and reliable water supply, but climate change was considered a threat and was projected to reduce water yields and to produce altered precipitation events. The assessment also found that the natural catchment condition was being impacted significantly by wild horses, by soil erosion and by other animal and weed threats and in the early part of the 21st Century, it was not sufficiently resilient to deal with predicted climate change effects. The assessment underscored the immense importance of additional and adequately resourced active management to respond to stream and soil erosion, pest animal control, weed removal and other threats. This will be essential to restore the natural condition of the Alps catchments and to retain their optimum ecosystem services, particularly for water.

References


Undisturbed Sphagnum wetland, Ginini Swamp, Namadgi National Park showing raised hummocky vegetation and Sphagnum with an associated small, clear, and undisturbed ponded water body. This is the ideal habitat of the iconic and endangered Northern Corroboree Frog (*Pseudophryne pengilleyi*) and it is also one of the very few remaining undisturbed sites where it is still possible for the ACT Parks and Conservation to release Corroboree Frogs bred from their endangered species recovery programme.

Wetland impacted by horses, Pilot Wilderness, Upper Ingeegoodbee River, Kosciuszko National Park. The wetland is highly disturbed, the Sphagnum habitat has been lost, the soil pedestal identifies soil loss, the water is disturbed and dirty and the surrounding vegetation disturbed.
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Biography

Dr Graeme L. Worboys is a protected area management specialist with 41 years of national and international experience at practitioner and policy levels of management. He is the lead editor of IUCN’s 2015 compendium text book titled Protected Area Governance and Management and IUCN’s 2010 Connectivity Conservation Management: A Global Guide book.
Section 4. Case studies of protected areas and ecosystem services

Ecosystem accounts for the Great Barrier Reef: use of System of Environmental – Economic Accounting (SEEA)

Mark Lound

Introduction

The Australian Bureau of Statistics (ABS) in collaboration with a range of institutions is developing a set of experimental ecosystem accounts for the Great Barrier Reef. The accounts will cover both the marine and terrestrial environments of the region and include information on things such as biodiversity, land cover, water pollution and a selection of ecosystem services and natural capital. The project will test the ability of already available data on the environment and the economy to populate the System of Environmental-Economic Accounting (SEEA) – Experimental Ecosystem Accounting framework.

The SEEA is part of the international statistical system that governs the collection and dissemination of data by national statistical offices like the Australian Bureau of Statistics (ABS). The SEEA Central Framework (European Commission et al., 2012) was adopted as an international statistical standard by the United Nations Statistical Commission in 2012.

The SEEA records, as completely as possible, the stocks and flows relevant to the analysis of environmental and economic issues. An accounting approach distinguishes the SEEA from independent sets of statistics on environmental and economic issues because it demands coherence and consistency with a core set of definitions and treatments. As such the SEEA provides a framework to combine a wide range of data to create aggregates, indicators and trends across the broad spectrum of environmental and economic issues.

An ecosystem account of the Great Barrier Reef will help to highlight the relationship of environmental condition to the economic and other benefits that are provided by the region. Threats to the condition or health of the Great Barrier Reef include climate change, declining water quality from catchment run off, and the loss of coastal habitats from coastal development and fishing impacts. Many of the threats are the result of regional or global actions, beyond the boundaries of the Great Barrier Reef Marine Park (GBRMP).

The account could become an important tool to help make informed decisions to “allow ecologically sustainable use of the Great Barrier Reef region for purposes including... recreational, economic and cultural activities”, as specified in the Great Barrier Reef Marine Park Act 1975 (Cth.)

This work builds on earlier work undertaken by the ABS and is being done in collaboration with the Great Barrier Reef Marine Park Authority, the Australian Institute of Marine Science and the University of Queensland. The experimental accounts should be completed by April 2015.

Project outputs

The Great Barrier Reef accounts will cover both marine and terrestrial areas. The Great Barrier Reef marine region, which includes the area prescribed in the Great Barrier Reef Marine Park Act, will define the marine area. The terrestrial region will be defined from six mainland Natural Resource Management (NRM) regions that wholly or partially drain into the Great Barrier Reef Marine Park (Burnett Mary, Fitzroy, Mackay Whitsunday, Burdekin, Wet Tropics and the eastern watershed of Cape York).

The proposed accounts will be characterised by their physical location (terrestrial or marine) and by their units of measurement (physical or monetary). For some accounts, only physical measures will be possible, but the aim will be to value and therefore monetise as many assets and flows as possible. In this, expert input will be required on the available data, existing valuations and valuation techniques.
The Great Barrier Reef is the world's largest coral reef ecosystem and extremely rich and diverse. Photo: © Commonwealth of Australia (GBRMPA)
The SEEA Experimental Ecosystem Accounting framework provides guidance on prioritising accounts in the form of nine criteria to be applied. The following criteria will be used to assess which accounts will be attempted in the first instance:

**Environmental concerns**
- sensitivity of the service to changes in the environment, including from anthropogenic stressors
- likelihood of irreversible loss of ecosystem services including by the supplying ecosystem being pushed past a significant threshold and out of its “safe operating range”

**Policy context**
- possibility to influence environmental and/or economic policy and decision making (decision making context)
- economic importance of the ecosystem service

**Data and methods**
- availability of broadly accepted methods for analysing ecosystem services supply in physical terms at a high aggregation level
- availability of broadly accepted methods for analysing ecosystem services supply at a high aggregation level in monetary terms
- availability of data for measuring ecosystem services in physical terms
- availability of data for measuring ecosystem services in monetary terms
- plans to generate new data on ecosystem services supply

By presenting a selection of the accounts in a single publication, it is hoped that users will follow the flow of data to gain insight into possible interventions. For example, the amount of sediment and other loads that rivers discharge into the Great Barrier Reef lagoon will change over time with changes in land use, land management and land cover. While these changes are occurring, the marine park environment (e.g. coral reef condition) may also experience changes. A strong factual base can inform good decision making.

Alongside the physical measures included in the accounts, users may also consider the economic outcomes associated the changes. For example, the changes in economic activity associated with differing land use and the changes in activity associated with different zoning, cover and condition of the marine park. Figure 1 shows the connections between the terrestrial and marine environments and how changes may impact on the condition of assets and/or the services derived from the assets. Note terminology here for marine areas is not set in stone, and ‘cover’ was used to describe marine habitats like reef, or seagrass cover/abundance in an attempt at an account for the marine area analogous to the land cover account.

Figure 1. Example of flow accounts
Concepts, sources and methods

The nature of ecosystem accounting dictates that many datasets from many different data sources are required to populate the various accounts. The level of detail in the meta-data behind the datasets is integral to describing the quality of the accounts. The assessment of the suitability of data sources for accounts will involve consultation with custodians of the datasets.

To ensure comparability, the use of standards and classifications is a key feature of ecosystem account compilation. The key concepts are drawn from the SEEA Central Framework and SEEA Experimental Ecosystem Accounting (European Commission et al., 2013).

The choice of spatial boundaries is also a key consideration in ecosystem accounting. For the terrestrial areas of the study region, natural resource management regions and ABS standard geographical areas will be used for building the accounts. For the marine areas the choice is unclear and the experience with accounting for marine systems is more limited than for terrestrial systems. For the marine areas of the Great Barrier Reef data will be collected and presented according to a number of different spatial boundaries.

The valuation techniques to be employed have yet to be finalised but techniques that may be used include:

- Market value (e.g. of land, tradeable fishing licences)
- Replacement Cost
- Net Present Value

Standard statistical methods will be used to generate the estimates included in the accounts. The explanatory notes accompanying the accounts will provide details of the methods used.

Next steps

The project was launched in October 2013 with a teleconference which included key stakeholders, namely Australian Bureau of Statistics, Great Barrier Reef Marine Authority, Bureau of Meteorology, Department of the Environment, Geoscience Australia and the Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES).

In the coming months, data will be compiled into the accounts and various information papers presented. A draft paper documenting concept, sources, methods and outcomes in detail will be circulated in early 2015 with a final information paper on Experimental Ecosystem Accounts for the Great Barrier Reef scheduled to be released in April 2015.

In areas of high environmental interest, such as the Great Barrier Reef region, it is to be expected that the social, environmental and economic information landscapes be particularly well developed. Indeed, this was found to be the case in the accounting area, and it is expected that the accounts will meaningfully add to this base.

Information pertaining to smaller areas, shorter timespans and data more qualitative in nature will rightfully continue to influence policy as the resulting depth of insight into specific policy-relevant issues is critical. Complementary to this, accounts such as that described in this chapter, characterised by the use of consistent approaches to valuation, standard classifications and definitions, and long-term datasets will give the policy maker a consistent, comparable and broad-based tool that will grow in utility with time.

References


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Mark Lound is Director of the Centre of Environment Statistics at the Australian Bureau of Statistics, where he is managing the development of the first set of integrated environmental-economic accounts for Australia. He is a member of a number United Nations Statistical Working Groups developing the System of Environmental-Economic Accounting framework, including water and ecosystems. As well as working in a number of areas across economic and social statistics at the ABS, Mark has previously managed the statistical operations of Tourism Australia and the Bureau of Population and Immigration Research.
Understanding how healthy ecosystems in protected areas benefit tourism

Paul A. Whitelaw and Phil Partalis

Introduction

‘Ecosystems’ are fundamental to nature-based tourism, even though this word is seldom specifically used. The icons of Australian tourism from Sydney’s famous beaches to the Great Barrier Reef, the world’s largest coral reef, to the crocodile and bird rich wetlands of Kakadu, to the desert dunes and arid woodlands of Red Centre all are major attractions based on healthy ecosystems, often imbued with profound traditional and modern cultural meaning. Most of the great assets of Australian nature tourism are within national parks or other protected areas.

The Tourism & Transport Forum (TTF) is a national, member-funded CEO forum, advocating the public policy interests of the major corporations and institutions in the Australian tourism, aviation and passenger transport sectors. TTF has consistently acknowledged and positioned nature-based tourism development as a significant driver of economic activity for state and federal governments. In 2004, TTF launched the Natural Tourism Partnerships (NTP) Initiative, commencing with a landmark study aimed at positioning national parks as a tourism priority. This culminated in the launch of the NTP Action Plan by then federal tourism Minister, the Hon. Fran Bailey MP, addressing barriers to collaboration between the conservation and tourism sectors.

In 2009, TTF convened a policy panel for nature-based tourism, bringing together national parks agencies, tourism marketing organisations, private investors in nature-based tourism infrastructure and product, and other stakeholders with an interest in the conservation, management and sustainable development of the natural estate.

TTF’s advocacy agenda has focused in particular on the prioritisation of destinations, funding for branding and master planning, infrastructure investment and product development, and regulatory and tax reform. TTF has successfully supported initiatives including the National Landscapes program (DoE, 2014) and the Three Capes Track in Tasmania, which aim to create iconic experiences.

Nature-based tourism in Australia

Australia’s natural assets – its beaches, outback, wetlands, mountains, forests and reefs amongst others – are an integral part of our tourism product. Our World Heritage areas and national parks act as major drawcards for both domestic and international tourists. The legitimacy, integrity and authenticity of these sites are fundamental to their appeal. Indeed, a recent study by Tourism Australia found consumers from some of Australia’s key inbound markets viewed Australia’s world-class beauty and natural environment a key attractor, along with safety and value for money, in selecting a holiday destination.

Our natural areas are major venues for tourists to enjoy because they are aesthetically appealing, rich with flora and fauna and host to significant sites of current, recent and ancient human inhabitation. In 2012-13, Australia hosted 34.1 million visitors (comprising one in five domestic overnight travellers, one in ten day trippers, and two-thirds of international visitors) who participated in nature-based activities including visiting national parks, botanical gardens and wildlife parks. This makes nature-based tourism particularly important for Australia’s tourism income. Nature based visitors tend to generate higher yield and stay longer than the average international visitor – international nature-based visitors, for example, spend 17 percent more and stay 22 percent longer (TTF, 2014).

Beyond this, tourism also contributes to broader environmental and social outcomes, providing funding sources and points of engagement for indigenous heritage, especially in terms of economic development and cultural preservation.
As such, these natural settings are an essential component of the ‘infrastructure’ of the tourism industry. They must be protected and effectively managed in order to maintain their natural ecological integrity and their inherent tourism appeal and thus their capacity to reinforce Australia’s claim as a destination rich in natural tourism experiences. For example, Ningaloo Reef in Western Australia – teeming with fish and visited by iconic creatures like whale sharks – could lose its appeal should the quality and biodiversity of the marine environment diminish. With losses in environmental quality could come a decline in tourism activity and associated benefits of business activity and employment.

Realising the potential of nature-based tourism requires a supportive legislative framework and strategic investment in protected areas. Appropriate and consistent resourcing for park management and visitor infrastructure such as bushwalking trails, regional roads and visitor amenities is crucial. To achieve this, the tourism industry advocates prioritised resourcing for areas most frequented by visitors to maximise return on investment. There is even greater opportunity to leverage private sector investment in appropriate new product and experiences within parks, including attractions and iconic eco-accommodation. To deliver quality tourism projects that drive high-yield visitation, the industry requires coordination of planning and regulatory reform including improved certainty of land use, inter-agency cooperation and long-term lease arrangements to facilitate private investment.

Industry encourages government funding, planning and regulatory reform in support of such investment to also take into consideration benefits for local Indigenous communities, which are well positioned to play a key role in the cultural interpretation and stewardship of protected areas.

Measuring the tourism value of protected areas

Following TTF’s 2009 discussion paper on sustainable revenue and pricing for national parks, the 2013 report Conceptualising the Value of Protected Areas (TTF, 2013) synthesised literature on the value, financing and tourism potential of Australia’s natural estate.

A key concept identified and explicated in that work was the provision of “environmental services” – those benefits derived from a healthy environment. These services operate at many levels: declaring water catchments as protected areas ensure high quality water for downstream communities; undertaking recreation in protected areas can enhance health, the quality of life, and longevity of local residents; and, as noted, attractive natural areas can underpin a vibrant nature-based tourism economy that can drive business investment and employment in local communities.

TTF recognised the necessity of an economic-based valuation of ecological services to demonstrate the commercial value of protected areas to key stakeholders and decision-makers, and thus embarked on a study into the economic significance of protected areas.

Given the complexities of assessing protected areas in their entirety, the study has focused on Australia’s National Landscapes – sixteen iconic destinations identified as part of a project led by Tourism Australia and Parks Australia that incorporate both protected areas (especially iconic national parks) as well as townships and communities in their hinterland. In assessing the performance of these areas the study used a suite of key visitor metrics including visitors, visitor nights and expenditure associated with tourism activities.

The valuation project is being conducted in partnership with Tourism Australia and Parks Australia, with the support of state and territory parks agencies and Tourism Research Australia. Victoria University has been engaged to deliver the project, with the output intended for use by parks agencies, state tourism organisations and TTF to promote nature-based tourism as a means for conservation and economic development.
In particular, the project will play a key role in establishing the relationship between protected areas and their contribution to the economic welfare of regional communities. The study triangulates data from Tourism Research Australia, the Australian Bureau of Statistics and national parks agencies to produce visitor expenditure estimates. These estimates will then underpin detailed analysis of tourism’s contribution to regional economic output and employment, producing comparable figures for the tourism performance and socio-economic welfare in National Landscape regions. TTF is in the process of finalising the study and will release the results on completion.

References


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Philip Partalis participated in the symposium as the Manager of Research and Policy at the Tourism and Transport Forum (TTF), the peak body for the Australian tourism industry. Philip has a background in economics and marketing, with a keen interest in economic development, environmental management and social equality. He is currently based in Melbourne as a subject matter expert in government, tourism and events issues with Repucom, a global leader in strategic research solutions for leading brands in sports, culture and entertainment.
Public perceptions and challenges of communicating the value of ecosystems and protected areas

Paul Sheridan

Introduction

Deep down, everyone values nature. After all, it is the reason we are still breathing. Without being able to readily identify the inter-dependent systems that operate to create oxygen, purify water and enrich soils and sustain an abundance of life, we fundamentally understand ecosystems because we rely on them for our existence.

What is far less certain, however, is why we make the decisions we do about it, how that value is acknowledged, prioritised in our daily lives, and what it takes to inspire action to maintain, and even improve it.

At the heart of efforts to improve protection or management of our special natural places and systems exists a paradox: most people will readily agree that nature should be protected but few will actually take the steps necessary to secure it.

Much of the explanation for this involves power: who has it and the priority, or lack of, they place on the protection of nature. However, far from seeing power as being held and exercised exclusively by the few, the democratic process that operates in Australia and many other nations offers ways to also gain and exercise power to protect and improve management of nature.

The key to success, to compel action politically or increase awareness of the value of nature through education, is to frame messages and harness the power of story to tap into and reflect the inherent, shared values that exist among the vast majority.

Shared values

Inside all of us operate value systems that interpret the world the around us. It is these value systems that influence our decisions, irrespective of the evidence in front of us.

Research conducted for the Pew Charitable Trusts (Essential Research, 2009, 2010, 2012) has identified that protecting nature is of high importance for a significant majority of Australians, irrespective of whether they hold conservative or progressive values, or vote that way.

The importance placed on ‘nature’ is higher in peoples’ minds than the more general question of where ‘the environment’ is positioned in their priority list. The importance placed on protecting nature is heightened further when respondents reflect on the characteristics of nature in Australia. A further findings was that voters that identify as conservative consider nature a high priority when separated out from considerations about the vexed issue of climate change.

The nature of Australia – its native wildlife, the rugged and vast landscapes of a sunburnt country – resonates strongly for most people outside the framework of what most view as ‘environmental issues’. Essential Research also identified that Australia’s native species and charismatic landscapes reflect what people feel makes them unique in the world and they identify with it as being part of their Australian heritage.

To achieve a deeper, transformative valuation of both native species and the ecosystems that sustain all life, we are therefore more likely to be successful if we frame communications to appeal to, and trigger, shared values.

Focusing on values shared by both conservatives and progressives, such as heritage, responsibility, nationalism (pride), and legacy, will enable common ground to be recognised among key stakeholder groups and decision-makers.
The beauty of the cool temperate rainforests of Tasmania matches their ecological importance and has inspired the will to champion nature against strong development pressures. Photo: © Wayne Lawler courtesy of Bush Heritage Australia.
Current barriers to support

Research has identified the following current barriers to support for action to protect nature:

- Fluctuating importance of ‘the environment’ in people’s priority lists, reflecting greater concern about hip pocket issues and uncertainty about the future. The environment is still largely regarded as not being an immediate issue impacting on personal welfare and prosperity.

  A long-term challenge exists to shift the environment from being considered a ‘tier 2’ issue of concern to being a ‘tier 1’ issue that people regard as being interlinked with their health and prosperity.

- Beyond a core audience of the environmentally engaged, a broader, more conservative audience often switches off from engaging with environment issues because the messages they hear are delivered by people or groups they consider to be ‘extreme’ or ‘not credible’.

  Environment groups such as Greenpeace and The Wilderness Society in Australia have been successful since the 1980s in securing policy change and higher levels of protection for species and nature. However, as a result of their often combative approach to advocacy, their organisational brands have also become associated with ‘radical’ behaviours by a broader, less engaged, middle ground of society and therefore seen as too ‘extreme’ for them as a vehicle for their own concerns.

  Environment groups, however, continue to be broadly viewed by audiences across the political spectrum as credible advocates of environment issues. The important distinction for these same audiences is that environment groups are not viewed as credible voices on issues related to economics, social issues, and other specialised areas.

  For the middle ground of Australian society, it is the people who are ‘at the coal face’ or who have spent the better part of their lives dealing with the forces of nature who are regarded as most credible. This includes people such as third generation graziers, Traditional Owners, experienced marine biologists, national park rangers, and veteran ‘Outback’ tour operators.

  A further reason they switch off is that the messages they receive are laden with problems but perceived as offering few solutions or information about how they may benefit from proposed solutions.

Opportunities

Despite a general malaise about ‘the environment’ as an issue in day-to-day lives, there are few barriers to agreement among both conservative and progressive audiences about the value and importance of nature, or that protecting nature should be a priority for government.

Any communication messaging on the deeper and broader values of our protected areas and other intact natural ecosystems needs to be built around these widely shared values. We need to continue to raise awareness about ‘what’s out there’, why nature is of importance and the benefits people receive from nature remaining healthy. The more we focus on aligning with these mainstream value systems the more likely efforts to secure protected areas and improve awareness of the value of nature will succeed.

Qualitative and quantitative research has identified that progressive and conservative audiences share the following values towards nature:

- A shared ‘life on Earth’ value that places the protection of biodiversity and maintenance of natural systems at the heart of decision-making. This is a value normally associated with a ‘deep green’ audience – the left leaning, environmentally aware and active. However, research found that when focused on nature, conservative audiences echoed this value.

- A shared responsibility to act personally to protect the natural environment. Conservative values strongly reflect the individual and this includes a sense of personal responsibility to ‘do our bit’ to protect nature. Progressive values more reflect the collective or common good, also activating a sense of responsibility to act.

- A shared heritage and ‘uniqueness’. What is unique about the natural environment is something many of us strongly connect with what makes us unique in the world. It can be a source of national pride that we are different, special, and that we have something that no one else has.

  This value remains a latent motivation to act or demonstrate concern and support for the conservation of our natural heritage. People need to not just be reminded of how special our natural heritage is, but they must also be alerted to the threats to it, the solutions on offer and how they will benefit from them.

The power of story and symbols

The language we adopt and access as part of our everyday lives reveals and influences our perceptions of the natural environment, reflects our objectives and interests, and affects our actions. We are also part of cultural groups that transform the physical environment into land and seascapes through the use of symbols – words, images and stories.

The role of story, of images and other symbols led to our collective imagining of our natural heritage. It is important to realise that most people have not been to the vast array of protected areas in Australia and across the world, nor are likely to, particularly those located in remote areas. However, ask most people about these places and they can imagine them and reflect back the stories they have absorbed.

It was the transformative power of story that revealed and deepened an appreciation of Australian nature, beyond a view of ‘a wide brown land’ and simplistic economic interactions with nature to a movement of people and interest in establishing protected areas in Australia. What was unique, challenging, unexpected, revitalising, wonderous, natural and healthy connected with us on a deeper level.

In the history of environmentalism in Australia many vigorous narratives have been told of the aesthetic, cultural and
ecological value of places remote from many people. The names the Franklin, Kakadu, the Daintree, Fraser Island, Terania Creek, Ningaloo Reef, the Tarkine were made precious by stories and images.

We have sometimes succeeded with ecosystems. Most people now understand that a ‘wetland’ is a system of value, but a few decades ago it was just a swamp or bog to be filled in. Rainforests would be seen as precious by most Australians not ‘brush’ to be cleared, and far more people appreciate the value of mangroves than in the past. We can continue this trajectory with creativity, great images and stories.

Ecosystem valuation

In recent years, researchers have sought to place an economic value on nature. The ‘ecosystem services’ that nature provides benefit us all and many organisations are now focused on developing a methodology to articulate what that economic value is.

Such a methodology may well prove influential with policy makers over time in accounting for the return on investment of creating and managing protected areas. However, it also holds the danger, as vigorously put by UK environmental writer George Monbiot in several articles of commodifying and monetarising nature (Monbiot, 2012, 2014).

He asserts “We don’t call it nature any more: now the proper term is ‘natural capital’. Natural processes have become ‘ecosystem services’, as they exist only to serve us. Hills, forests and river catchments are now ‘green infrastructure’, while biodiversity and habitats are ‘asset classes’ within an ‘ecosystem market’.” Monbiot sees an inevitable outcome: “All of them will be assigned a price, all of them will become exchangeable.”

Monbiot’s reaction is a reminder that as we seek new ways to communicate the value of nature it is important to remember the inherent value we all place on it which already exists for us through our value systems.

There is a saying that achieving environmental change is akin to an elephant’s gestation period: it takes about three years and involves a lot of noise. The lesson here is to persist, and to outlast.

There is also certainly a place for more consistent messages that reinforce the importance and value of nature being delivered by more than just one or a small handful of influential organisations.

The aid and development sector’s Make Poverty History initiative provides a great example of this. Numerous organisations were able to advocate for change under a common, easily understood banner that reinforced a call to action just about everyone could understand.

Conclusion

We cannot afford to assume that the support for protection of nature that has existed for many years will continue unless we work steadily away at reinforcing the reason why protected areas are important.

We need to educate the broad society and its decision makers on both the tangible and intangible values of protected areas, as key ‘holders’ of ecological function and health, and the multiple benefits they produce.

We also need to educate people on what they are and are not. Promoting the positives is essential, however an important communications effort is also required to counter misinformation about protected areas.

Media channels and platforms for distributing information may change over time, but what won’t is the influence of symbols and the challenge for us to use stories creatively to convey how we, the people, imagine our protected areas and value nature.

References


Environment as life support

Portraying the natural environment as our life support system has been a key theme in the Australian Conservation Foundation’s (ACF) conservation campaigns. During the fight to secure adequate environmental water flows in the Murray-Darling Basin for example, ACF depicted the Murray as the ‘lifeblood’ of Australia. The metaphor was successful in cutting through an unhelpful public narrative in which biodiversity conservation was pitted against the interests of regional farming communities. Rendering the Murray as our lifeblood was effective in demonstrating that the long-term interests of people and the environment are ultimately the same. It underpinned the formation of Voices of the Murray-Darling, a powerful alliance of more than 20 farming, fishing, environment and health groups across the basin. It was also crucial in securing cross-partisan pledges of support for river health from all federal South Australian parliamentarians.

Since that time, variations on the theme of ‘environment as life support’ have become commonly used in ACF communications. Whether it be oceans, forests or inland rivers, ACF has argued these environments provide Australians with clean air, fresh water, healthy food and a safe climate. The idea that ecosystems benefit people through the provision of ‘ecosystem services’ is implied in these declarations, but not explicit. However, through an emerging area of work in connectivity conservation, ACF intends to make Australia’s reliance on the natural environment a much more pronounced feature of our public communications. Indeed our challenge as advocates is to communicate the value and importance of ecosystem services to existing and new supporters, in much more compelling and convincing ways.

A case in point is ACF’s developing work with the Great Eastern Ranges (GER) initiative. The GER is a 3,600 km connectivity conservation ‘lifeline’ (Pulsford et al., 2013) stretching along Australia’s Great Dividing Range from Cape York in far north Queensland to the Grampians in western Victoria. The GER’s landscapes encompass Australia’s tallest mountains, most reliable rainfall and greatest biological diversity.

The GER is also critically important for the provision of ecosystem services (Mackey et al., 2010) including:

- Drinking water to nearly 11 million Australians
- Up to one third of flows in the Murray-Darling Basin food bowl
- Flood mitigation and filtration services in waterways draining to the Great Barrier Reef
- Carbon storage and climate regulation in some of the world’s most carbon dense forests
- Cultural landscapes for Indigenous and non-Indigenous Australians, and
- Recreation and tourism opportunities for both visitors and residents of nearby towns and cities.

Communicating the value of these services

As part of this emerging area of work, ACF has sought new means to communicate the value of these ecosystem services. In doing so, ACF have begun using an analogy which the general public and our political leaders already recognise and value – infrastructure. While ‘grey infrastructure’ can be understood as the built structures which provide the services needed for society to function (i.e. roads, sewers and communication systems); ‘green infrastructure’ can be understood as the natural environments that provide society with the ecosystem services it needs to function (such as clean air, fresh water, fertile soils). Used in this manner, the term green infrastructure helps to convey the necessity of healthy environments for our social and economic well-being.

Green infrastructure is more than just an interesting communications idea: it is a large and rapidly growing international design, planning and conservation approach, utilising natural systems to solve some of humanity’s most pressing problems. Examples include the United States Environmental Protection Agency’s Green Infrastructure program, the European Commission’s continental scale Green Infrastructure strategy and The Nature Conservancy’s business case for green infrastructure.
While the term ‘green infrastructure’ was originally understood to describe urban features such as green roofs, storm-water gardens and pollution treatment systems, it is increasingly employed to describe protected area networks and continental-scale connectivity initiatives. Examples of green infrastructure at the ecosystem or landscape scale include the ‘Linking Lands and Communities’ regional green infrastructure network across five counties in North Carolina, and WWF’s ‘Green Heart of Europe’ green infrastructure initiative across 12 countries in Central and Eastern Europe (see links). In light of this new approach, ACF views the ambitious GER connectivity conservation initiative as a national green infrastructure investment priority stretching 3,600 km across Australia.

**Message testing nature**

While ACF and GER partners and stakeholders see the potential of advocating investment in the GER as a national green infrastructure priority, ACF sought to examine what our supporters and target audiences in both metropolitan and rural areas thought of the idea. To find out, ACF commissioned Lonergan Research to undertake a series of ‘message testing’ focus groups. The key findings of this research (Bennett, 2014) are summarised below.

First, Lonergan found that participants had a much more positive response to the term ‘nature’ than they did to the term ‘environment’. For many, nature was a special place largely untouched by humanity and a term they felt had not been overly politicised. The environment, on the other hand, was a more encompassing notion than nature which included urban and built spaces, farms and mines. Moreover, it was a place that can be polluted or degraded. Participants also reported that the term was often used by politicians and that it was therefore politicised and polarising. Accordingly, Lonergan recommended ACF use the term ‘nature’ rather than ‘the environment’ in future communications; this is because it appeals to a wider audience in more positive terms. The catch however is that the term tends to perpetuate a problematic perception that humanity is somehow separate to the rest of nature, an issue which this chapter will address below.

Second, the phrase ‘nature is our life support system’ was also tested on participants. It was largely accepted as a true statement that conveys the sense of importance and urgency of protecting ecosystems, although some participants thought the statement an exaggeration or overblown. Interestingly, regional participants suggested the phrase would not resonate with city people, because they are ‘disconnected from nature’. Participants also reported that the term was often used by politicians and that it was therefore politicised and polarising. Accordingly, Lonergan recommended ACF use the term ‘nature’ rather than ‘the environment’ in future communications; this is because it appeals to a wider audience in more positive terms. The catch however is that the term tends to perpetuate a problematic perception that humanity is somehow separate to the rest of nature, an issue which this chapter will address below.

Finally participants were asked what they understood of the term ‘green infrastructure’. Overwhelmingly, infrastructure was associated with the built environment rather than ecosystems and landscapes. However, when shown images of urban green infrastructure such as green roofs and walls and storm-water gardens they immediately understood and became supportive of the notion of utilising ecosystem services to make cities more sustainable. However, making the link between distant protected areas and connectivity conservation initiatives and the ecosystem service benefits that flow to the economy and society, was much harder. Indeed, participants needed explicit examples to make these links comprehensible: for example, water collected from mountain catchments is needed to keep city parks green during hot summers; carbon stored safely in native forests and woodlands helps keep our climate stable and resilient.

**Conclusion**

Environmental scientists, policy makers and advocates should not underestimate the challenge of communicating the value and benefit of ecosystem services to a public audience. However, the focus group testing undertaken by Lonergan Research on behalf of ACF does offer some useful recommendations. Communicating about ‘nature’ rather than just ‘the environment’ will appeal to a wider audience. Emphasising how humans rely and depend on nature, especially for their health and well-being, will resonate. Giving tangible examples of ecosystem services is essential – illustrative images help. Finally, rather than using term ‘green infrastructure’ to describe landscape scale ecosystem services, the term ‘nature’s infrastructure’ may help people understand the concept more readily.

Nature’s infrastructure should be defined as ‘the network of protected land and water that we rely on for the clean air, fresh water and fertile soil we need to survive’. While this conception of ecosystem services avoids the anthropocentric pitfall of nature ‘gives’; the term may still perpetuate the dualistic error that humans are somehow separate from nature. This dualism however is deeply-seated and is not easily shifted. In recognition, this chapter argues that
environmental advocates frame communications and engagement around existing attitudes, especially the high valuation of nature, in order to build active public support for nature conservation and ecologically sustainable societies. Emphasising the Australian public’s profound dependence on ecosystem services or ‘nature’s infrastructure’ is one way ACF is doing just that.

References


Links

European Commission’s Green Infrastructure strategy
http://ec.europa.eu/environment/nature/ecosystems/

The Nature Conservancy’s ‘Case for Green Infrastructure’
http://www.nature.org/about-us/the-case-for-green-infrastructure.pdf

North Carolina’s ‘Linking Lands and Communities’ initiative
http://linkinglands.org/

WWF ‘Green Heart of Europe’ initiative
http://www.panda.org/?211253/WWF-launches-Green-Heart-of-Europe-to-protect-nature-across-12-countries

Australia’s Great Eastern Ranges Initiative
http://www.greateasternranges.org.au

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Natural solutions: embedding ecosystem understanding in protected area policy in Australia

Peter Cochrane

Introduction
Nature, at any scale or perspective, is a system of interdependent and interconnected elements, including the dominant species on the planet. Protected area policy, the primary objective of which is to conserve nature, needs to be framed in a systems approach that extends well beyond ecological systems inside and outside park boundaries. To an extent this has been reflected in the evolution of protected area concepts and policy over the last twenty years. The challenge now is, not to embed ecosystem understanding in protected area policy, but to embed protected area policy more centrally in the cultural and socio-economic systems in which protected area policy and management are framed and where they compete with other public policy objectives.

Evolution of the National Reserve System
The modern launch pad for protected area policies around the world is the 1992 Convention on Biological Diversity (CBD). In that year, the Australian Government produced a major Environment Statement that included the goal of a comprehensive, adequate and representative National Reserve System (NRS), in cooperation with the States and Territories, based on a collaborative and scientific bioregional framework (Keating, 1992).

The NRS Cooperative Program 1992-96 funded the bioregional framework and early property acquisitions. After a change of government, the NRS Program 1996-2007 funded out of the Natural Heritage Trust, focused more strongly on property acquisitions, extending support to non-government organisations, and to conservation on indigenous-owned lands – the latter established as a separate Indigenous Protected Areas (IPA) Program. The first, especially the $2 for every $1 raised by purchasers, gave a major boost to the private land sector in Australian conservation. The second created an equitable non legislated model of strong appeal to Indigenous people and in turn of great interest internationally.

The policy underpinning the NRS program was rearticulated in cooperation with the States and Territories, and released as the Directions for the National Reserve System – A Partnership Approach (NRMMC 2005).

In 2004, the Programme of Work on Protected Areas (POWPA) was adopted under the CBD, setting a comprehensive international framework for national protected area policies. Australian Government policy then and subsequently is broadly consistent with this framework.

In 2006, Brian Gilligan conducted an external evaluation of both the NRS and IPA Programs (Gilligan 2006a,b) and set the scene for a significant increase in investment in both streams following a change in government in 2007. In 2008 the NRS (including IPAs) became one of six national priorities under the new Caring for our Country program – with a substantial increase in funding to $180 million for the NRS purchasing and covenant stream over 5 years; and a trebling of support for IPA establishment and management to $50 million over 5 years.

In 2009, the the Natural Resource Management Ministerial Council agreed to a revised and much broader NRS policy framework, Australia’s Strategy for the National Reserve System 2009-2030 (Natural Resource Management Ministerial Council, 2009) – which included more specific elements of connectivity, health and resilience, intrinsic value, social and economic wellbeing, cultural identity, science, ecosystem services, recreation, and tourism. Collaboration with the States/Territories was central, bioregionalisation continued to underpin priorities for property purchases, the contribution of $2 for $1 raised for property purchases remained, whether by government or non-government proponents, and national reporting of progress and a strong emphasis on science continued.
The Tasman Peninsula's spectacular coastal scenery has important biodiversity values and internationally significant geological features which generate major long term economic benefits for tourism and recreation. Photo: © Joe Shemesh courtesy Parks Tasmania.
Key science inputs were two major reports by CSIRO on the impacts of climate change on the NRS (Dunlop and Brown 2008; Dunlop et al., 2012). These addressed continental and regional scale impacts of climate change on protected area policy and management, and the social and political context for goal setting and decision-making for nature conservation. They recommended re-thinking protected area policy, its objectives and what might be realistically achieved in the face of the predicted changes in ecosystem composition, structure and function in the future.


By 2013, this policy and program framework had helped to build a conservation estate across Australia of remarkable diversity, embracing land owned and managed by national, state/territory and local government agencies, private land trusts and foundations, private properties under perpetual conservation covenants, and indigenous lands managed by their traditional owners to protect natural and cultural values. The conservation estate doubled in area between 1996 and 2013, to over 16% and 127 million ha of the Australian continent. The proportion of this estate under indigenous management went from near zero to nearly 50%. There was a progressively greater integration of protected area planning and management into wider landscape planning and management. The research and knowledge base underpinning the development and management of our conservation estate and the various toolkits for planners and managers were held by some to represent world’s best practice.

**Shifting priorities**

However, by 2013 the National Reserve System was no longer a core policy priority of the Australian Government with a dedicated funding program. This has major implications, not least for the important private lands sector which had used the NRS’s 2:1 funding model to lever substantial funds for nature conservation from the private sector.

New initiatives were needed to refresh the environment policy space. The most relevant of these initiatives was the National Wildlife Corridors Plan (DSEWPC, 2013), reflecting core elements of earlier policy and sustained advocacy for connectivity conservation from the conservation community, especially the IUCN World Commission on Protected Areas. It set out a broader vision for diverse, connected and healthy landscapes that support and sustain biodiversity, communities and wellbeing. It established a framework to retain, restore and manage ecological connections in the Australian landscape, connecting protected areas across multiple tenures. While somewhat narrowly interpreted around the concept of wildlife corridors, its central focus on connectivity was an important and strong acknowledgement and reflection of this fundamental attribute of natural systems.

Finalising the Plan in a relatively short timeframe meant bypassing the normal and usually lengthy collaborative Commonwealth-State consultative processes. The combined effect of limited state/territory engagement, no specific funding program for implementation, and a subsequent change of government, has left the National Wildlife Corridors Plan in a policy cul-de-sac.

The disbanding in 2011 of the formal Commonwealth-State ministerial forum dealing, inter alia, with environmental issues (the Natural Resources Management Ministerial Council) removed a key structural element for cooperation and policy consistency. Collaborative policy development and endorsement is now much less evident. Policy coherence and consistency is diminishing as different governments open up new state-based policy fronts on grazing, logging, hunting, tourism infrastructure and developments in protected areas. Some of these directions, championed by specific interest groups such as hunters and shooters, recreational fishers, and other lobby groups were picked up in election policies and are being implemented by incoming governments. These new directions may be a reaction to perceived conservation gains from a significantly larger conservation estate, but as protected area professionals well know, a larger estate will struggle to deliver conservation outcomes without additional resources to manage it effectively.

**Positive directions**

Against this fragmenting policy consistency and coherence, some positive factors could help rearticulate a national protected area policy.

Internationally, IUCN’s Red List of Ecosystems, and the proposed Green List of protected areas, involve a strong focus on ecological systems, their condition and outlook (IUCN, 2014). The condition and Outlook reports for the Great Barrier Reef (Ward, 2014) are an approach that could be more broadly applied.

Continuing investment in ecological sciences is improving our understanding of ecosystem function, complexity, connectivity and resilience, and enhancing our capacity to adaptively manage complex systems.

There is a growing focus on socio-economic values, through collaboration with the tourism sector, better support for and integration with Indigenous and local community interests, and innovative engagement with the health sector.

The non-government private land trust sector continues to be active in property purchase and management and through growing collaboration and partnerships with Indigenous interests through IPA establishment and management. Philanthropic support however has slowed since the global financial crisis and the loss of the important leverage of NRS program support.
A complex future

The case for the social and economic value of land in its natural state is still not well articulated or appreciated in Australia. The hackneyed notion that protected areas ‘lock up’ land continues to have traction in some quarters, despite concerted efforts by protected area agencies to collaborate and partner with tourism operators and other commercial interests to unlock the economic potential of protected areas, consistent with the protection of their natural and cultural values. Funding to manage protected areas is declining, creating an increasing risk of delivering less than optimal conservation outcomes, which in turn makes continued deterioration more likely and reinforcing perceptions of poor management. A focus on threatened species also carries a risk of reduced attention on ecosystem health and wider landscapes.

Adding to this complexity, the extent of naturalised species across our continent creates novel systems, comprising a more or less stable mix of native and introduced species. Returning to some idealised past state and condition for native ecosystems is not viable. Specifying ecosystem function, resilience, and adaptation as management objectives with measurable indicators and targets is very challenging for scientists, let alone policy makers and managers.

Species and ecosystems will continue to disappear despite our best efforts. The extent of past global change and its legacy, continued loss of habitat, invasive species pressures, and the priorities of food security for a growing human population mean this is inevitable. Associated with this loss will be the diminution and loss of the ecosystem services they provide.

Despite the very positive outcomes for the investment in the NRS over the last twenty years, 40% of Australia’s terrestrial bioregions are under-represented in the conservation estate at the threshold of 10% by area. It is well accepted by most scientists that conserving 10% of the area of an ecosystem is unlikely to result in its long-term viability. Over half of the bioregions are under-represented at the CBD Aichi target of 17%. Around half of the properties in the NRS are less than 100 hectares in area, and are unlikely to be viable in the long-term unless they are well connected with surrounding ecosystems with some degree of intactness.

A national multisectoral approach

So what does this mean for protected area policy, and embedding an ecosystem approach within that policy?

Protected areas serve many functions apart from conserving natural systems and as destinations for visitor experiences and associated economic activity. We need reminding that we are still dependent on nature and the services that it provides. The natural and socio-economic systems within protected areas are part of larger systems, and our policy and management frameworks need to explicitly reflect this.

A substantial policy review and refresh that is truly national is timely – i.e. collaborative and multi-sectoral, including health, indigenous, community, and economic interests – based on a shared responsibility to encourage individual and collective action. This will need significant corporate engagement because it is not just a matter for government or civil society – loss of natural capital and ecosystem services is a material issue for business and the economy. It must fully engage the states and territories, given the Constitutional role they play in land management.

Essential ingredients, without which a good policy is doomed to fail, include:

- Commitment – both intention and action
- Capacity – people with skills, knowledge and tools to deliver
- Collaboration – to build and maintain partnerships across sectors
- Cash and resources
- Champions to communicate, promote and challenge

We must use the concepts and language from more dominant sectors of society. A current national and international priority is infrastructure recognising its vital role in economies, economic growth and well-being. Nature is essential infrastructure – providing vital services that we depend on, but its health and resilience are diminishing. Our wellbeing depends even more on natural infrastructure that on built infrastructure, exemplified by our supplies of clean water from well-managed un-polluted catchments; the supply of oxygen to the atmosphere from intact and resilient vegetation; and our vast bank of genetic diversity producing dividends such as new drugs for treating and preventing disease.

What is missing for conservation purposes are an adequate set of tools that measure the benefits of these assets and the services they provide, the investment needed to ensure these services continue, and the consequences and costs of failing to do so. These are of course under active development, and application in some quarters (e.g. for timber and water users, and more recently a biodiversity materiality reporting tool is being trialled). In their absence however, we have most commonly appreciated the value of nature after its loss, or substantial degradation, and when its restoration becomes a cost.

Our natural environment is a very significant attractor for international visitors to Australia – unique wildlife, vast land and sea-scapes, clear skies and waters. The economic value of this is still not well-quantified or appreciated. However the recent Outlook report for the Great Barrier Reef, an asset of global ecological significance and enormous national economic importance, has sent some important signals about the value of nature, how this value has diminished and is diminishing, the rationale for additional investment and the
Australian Fur Seal, Montague Island Nature Reserve, NSW – one of the first sites listed on the IUCN Green List of protected areas. Photo: © OEH/Stuart Cohen
potential consequences of failing to invest. The tourism industry has, as a result, been very vocal in arguing for better protection and further investment in managing the threats to the reef.

The scale and depth of the Great Barrier Reef condition assessment and forecasts are hard to replicate elsewhere, but the issues are the same for many other, if not all, protected areas. Our green infrastructure, our vital natural capital, is eroding and disappearing. As a park agency head I would have highly valued tools that efficiently measured the condition and trends in ecosystem status in the parks I managed and explicitly linked these trends to broader socio-economic consequences. A purely economic focus however is too narrow. A deteriorating natural environment has implications for human health and wellbeing, for example. It will be increasingly important to make these linkages across sectors and disciplines.

Compartmentalising and managing our complex world in silos, whether its nature conservation, human health, financial policy, or indigenous affairs will not result in enduring or effective solutions to current and future challenges. Nor does anything in our world work on a ‘set and forget’ approach. Nature should have taught us this a long time ago. It is dynamic, ever changing, with interdependent elements that innovate to be able to adapt to change. Our protected area policy must reflect these attributes.

References


Links

IUCN Green List Available at: http://www.iucn.org/about/work/programmes/gpap_home/gpap_quality/gpap_greenlist/ [Accessed December 2014].

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The value of Victoria’s parks: a new framework for valuation and accounting of park ecosystem services

Tony Varcoe, Helen Betts O’Shea, Mark Eigenraam and Bill Jackson

The Victorian parks network

Parks Victoria (PV) recently released a long term strategy, Shaping Our Future, which includes three core goals: Conserving Our Special Places; Connecting People and Parks and Providing Benefits beyond Boundaries (Parks Victoria, 2014). An important step in demonstrating the relevance of parks to all Victorians and contributing to these goals is being able to quantify the contribution of the parks network to Victorians, and specifically the environmental, economic and community wellbeing of the State.

In 2014, Parks Victoria and the (then) Victorian Department of Environment and Primary Industries (DEPI) established the Valuing Victoria’s Parks project to develop a new framework for estimating and accounting for the quantity, value and benefit of ecosystem services provided by Victoria’s parks.

In developing the framework we have made the first steps to holistically quantify and value a range of ecosystem services provided by the parks network.

While recognising the importance of conserving Victoria’s natural and cultural landscapes and marine environments for their intrinsic and scientific importance, Victoria’s parks also contribute significantly to the wellbeing of the Victorian community and productivity of its economy. While the benefits of Victoria’s parks have been broadly described in the past, and some of the economic benefits of particular parks have been quantified in case studies (e.g. PricewaterhouseCoopers, 2003) the contribution of the diverse range of services provided by parks to Victoria’s economy and community wellbeing has not been adequately captured in current valuation paradigms. This is because many of the goods and services provided by parks are ‘public goods’ which are not traded in markets. Many of these goods and services often have multiple beneficiaries and benefits that are often excluded from the economy and economic decisions.

Importantly, while there is ongoing debate about the degree to which different approaches can determine value (acknowledging differences in the interpretation of value in the first place), there is increasing agreement that the absence of a price for ecosystem services does not indicate absence of value.

The Victorian parks network

Victoria’s land area supports a wider range of ecosystems than any area of a similar size in Australia: alpine, mallee, grasslands and grassy woodlands, forests, heathlands and heathy woodlands, inland waters and estuaries, and coasts. Many of these ecosystems are primarily protected in parks.

Victoria has a diverse parks and waterway network that spans more than 4 million hectares or 18% of the State and includes a protected area system of more than 80 national, State and wilderness parks, 24 marine national parks and sanctuaries and 2,500 conservation reserves. Additionally the parks network includes over 90 metropolitan, reservoir and regional parks. The parks network receives around 55 million visits to land and marine parks and 45 million visits to bay and waterway assets annually.

Applying international frameworks

In order to quantify the contribution of the land, water and ecosystem assets of Victoria’s parks to the wellbeing of the community and productivity of the Victorian economy we need a common framework of measurement. A new valuation and accounting framework currently in development is adopting and applying the best available international standards and guidelines from the System of Environmental-Economic Accounting (SEEA) and The Economics of Biodiversity and Ecosystems (TEEB) to recognise parks as significant capital assets that provide a range of services and benefits to Victoria.
The Great Ocean Walk, Victoria is an example of how parks can provide outstanding health and recreational assets. Photo: © Parks Victoria
The natural capital of parks can be considered as the basic units of capital that generate ecosystem services and benefits for the community (Figure 1). While conservation of natural capital is the core purpose of most parks, importantly our system of parks also plays an important role in providing built, social and cultural capital.

The Millennium Ecosystem Assessment (www.maweb.org) defined Ecosystem Services as ‘the benefits people derive from ecosystems’. From an economic perspective, they are those contributions of natural capital which generate goods and services which people value. If well-managed, the capital of ecosystems within parks yield a flow of services to communities such as water supply, water and air filtration, climate regulation and protection from storms and flooding. Parks also offer many social ecosystem services such as opportunities for cultural and spiritual connection, recreational and tourism opportunities, health improvement and the preservation of genetic diversity.

As manager of the Victorian parks network, the primary objective of Parks Victoria is to ensure that this natural and other capital does not depreciate in quality or value.

The valuation and accounting framework requires that the purpose of both the valuation and accounting structures are clearly defined and explained. Consistent definitions that link ecosystem services to beneficiaries are required. While there has been increasing recognition of the need to develop more consistent metrics to quantify ecosystem quality (e.g. Wentworth Group of Concerned Scientists, 2008) a key challenge has been to apply valuation and accounting frameworks through available accounting paradigms (e.g. the current System of National Accounts versus SEEA experimental ecosystem accounts) and different valuation approaches (e.g. total value versus marginal value).

**Ecosystems services provided by Victoria’s parks network**

The major ecosystem services provided by Victoria’s parks are shown in Table 1. The Victorian parks network contains both protected areas with primary conservation objectives as well as other parks with other objectives such as outdoor recreational use. Importantly, in describing ecosystem services provided by the parks network, we need to recognise that the relative importance of different ecosystem services will vary across different park types (see Table 2).

**Developing experimental ecosystem accounts for Victorian parks**

As part of the Valuing Victoria’s Parks project DEPI and PV are adapting and applying the TEEB and SEEA frameworks to the Victorian parks network. Over the past decade, DEPI has been contributing to the development of SEEA Experimental Ecosystem Accounting on private land (Eigenraam et al., 2013) which includes establishing the information systems required for government to implement a market-based approach to manage ecosystem assets and make effective investment in increasing the supply of ecosystem services at least cost.

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<th>Provisioning services</th>
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Table 1. Ecosystem services from Victorian parks
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*** = high importance, * = lower importance

Table 2. Relative importance of ecosystems system services across park types in the Victorian parks network
Consistent with international accounting standards and building on the extensive ecomarkets work undertaken in Victoria, a system of experimental ecosystem accounts is now being developed for the parks system. The five steps in the development of these accounts are:

1. Define the ecosystem assets
2. Assess the condition of ecosystem assets
3. Identify and quantify ecosystem services
4. Value benefits of ecosystem services
5. Develop ecosystem accounts tables

This work will in turn generate five sets of accounts:

1. Ecosystem Assets Accounts – The extent, condition, significance and changes in stocks
2. Ecosystem Service Flow Accounts – The quantity and changes in the flow of ecosystem services
3. Ecosystem Service Benefit Accounts – Changes in the benefit to people from changes in ecosystems services flows
4. Ecosystem Expenditure and Protection Accounts – Economic transactions that affect ecosystem assets and services
5. Consolidated Ecosystem Accounts – Summary of benefits, expenditure and return on investment

In relation to the Ecosystem Service Benefit Account, accounts tables will provide both information that can be included in the current System of National Accounts for contribution to the economy, such tourism benefits. However, it will also provide additional experimental accounts, based on SEEA guidelines, which recognise other welfare benefits of ecosystem services, such as water filtration services.

While an initial set of pilot accounts has been developed at a parks network scale, these accounts will over time be developed at three scales – parks network, landscape and park. Over the next few years, the accounts will be further developed and integrated into park management business systems to enable reporting of both costs and benefits of park management.

Valuing the benefits from ecosystem services

An important step in valuation of ecosystem services is to determine the purpose for which the valuation intended. Environmental valuation in the context of ecosystem accounting focuses on appraising the total economic value derived from the ecosystem assets. The total economic value encompasses a range of use and non-use values held by the community reflecting the range of ecosystem services that may be provided by a single asset. Ecosystem service valuation for the purpose of decision making is likely to focus more on the marginal returns from alternative options (e.g. consumer surplus), thereby informing potential costs and benefits.

The key steps for undertaking ecosystem service valuation are summarised below:

1. Identify the ecosystem service and beneficiary
2. Estimate current flow of ecosystem services
3. Determine the purpose for the valuation
4. Choose the valuation concept
5. Choose appropriate valuation method/s
6. Derive estimate of value of benefit
7. Recognise limitations/uncertainties and consider the need for future research

Based on these steps, a range of ecosystems services are being valued for the Victorian parks network. Over time the range and scale of these assessments will be improved and refined. The approach has been to pursue valuation of the benefits of ecosystem services in monetary terms where possible and appropriate to demonstrate the links to the economy and value provided to the community. Where monetary valuation of the benefits of ecosystem services is not feasible or desirable, proxy indicators have been developed using available information to reflect the importance of the services. Figure 2 provides an example of the linkages between the ecosystem service and valuation for water purification services.
Application to management and policy

The valuation and accounting framework for Victorian parks has a number of potential applications for different purposes and audiences. These include:

1. Communications – to increase awareness and appreciation of the connection between healthy resilient parks and the State’s economic and community wellbeing.

2. Park planning and investment – to support park and public land planning, investment, management and evaluation decisions through more objective assessment.

3. Inform policy – to inform policy about appropriate funding models for the parks network to maintain its natural capital and provide a flow of ecosystem services to the community.

4. Audit and reporting – to bring park assets and ecosystem services on to the balance sheet for full cost accounting.

One of the important goals of developing pilot accounts is to enable more consistent and holistic reporting of the costs, benefits and effectiveness of park management through annual reports and State of the Parks reporting. A preliminary analysis of the value of ecosystems services provided by the network, together with case studies, has been completed as a first step which will provide the basis for more refined valuation.

Implementation of a more thorough and robust valuation and accounting framework will require improved and coordinated monitoring systems to provide quantitative data to account for change in the extent and condition of park assets and quantity of ecosystem services flow and value of benefits. A greatly improved picture of the contribution of land, water and ecosystem assets to the productivity of the Victorian economy and wellbeing of the community will then be available to improve policy, planning and investment decisions.

![Ecosystem service valuation for water purification in Victorian parks](image)

**Figure 1. Ecosystem service valuation for water purification in Victorian parks**
References


Links


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Around 50 percent of Melbourne's water supply is obtained from the catchment areas of Yarra Ranges National Park. Photo: © Parks Victoria
Key directions for valuing ecosystem services and protected areas in Australia

Brendan Mackey, Penelope Figgis, James Fitzsimons, Jason Irving and Pepe Clarke

Background

These key directions summarise significant insights and recommendations from the presentations and discussions at the Symposium Valuing Nature: Protected Areas and Ecosystems organised by the Australian Committee for the International Union for Conservation of Nature (ACIUCN) in partnership with Griffith University, The Nature Conservancy, Parks Victoria, Pew Charitable Trusts and the Australian Conservation Foundation held in Brisbane, Queensland on 21-22 July 2014.

The editors also drew upon the written chapters provided by speakers for this publication, however the recommendations presented here cannot be ascribed to any single delegate or organisation and responsibility for them resides with the editors.

Introduction

For most of human history the services provided to society from functioning natural ecosystems, while culturally appreciated by some, have largely been ‘taken-for-granted’. However, the accelerating scale and impact of human activity demands a profound re-evaluation of this mindset. While the concept of ecosystem services is gaining traction in policy arenas, the role of protected areas (including Indigenous and private protected areas) in delivering functioning ecosystem services, has not received the same attention. Appreciation of the many benefits and values flowing from protected areas has struggled to move beyond the margins of public debate or profoundly influence government and business decision-making.

There are promising signs of change. Internationally the ‘ecosystem services’ approach to decision making has been developed through such major works as the Millennium Ecosystem Assessment (2005), the various TEEB analyses (TEEB, 2009) and the UK National Ecosystem Assessment (2011). In Australia, approaches to both accounting and valuation are under active development, and are being tested at national, state and local levels. This will assist in developing a much stronger basis for accounting for and valuing the full range of the benefits and services provided by natural ecosystems and protected areas, assessing trends in health and the outcomes of investing in conservation management and the consequences and costs of failing to do so.

Looking at nature conservation through an economic lens brings both risks and opportunities. The challenge is to acknowledge and guard against the risks, not oversell the advantages, and make the most of the opportunities this perspective opens for influencing policy and mobilising resources for the benefit of nature conservation in the 21st century.

The following steps are vital in seeking a more comprehensive and science-based approach to recognising the values and benefits of natural systems and, in particular, the important role of protected areas, which should be understood and highly valued as the core of the ‘green infrastructure’ of our country.

1. Work from the position that nature is the fundamental life support system

A major shift cannot occur until we accept that the diversity of species, ecosystems and associated natural processes across local to global scales, are not an ‘optional extra’ for human society, but together constitute our fundamental life support system. The degradation of ecosystems is a major loss to any nation, their continued cumulative loss across the world an ultimate threat to human survival.

Protected areas are one of the world’s key mechanisms for maintaining thriving ecosystems. They need to be recognised as centrally important green infrastructure, requiring ongoing investment and political commitment. They should not be derided as ‘locked up’ resources but seen as assets generating benefits above and beyond those derived from tourism and recreation alone.
The iconic Overland Track in Cradle Mountain - Lake St. Clair National Park Tasmania. Photo: © Fiona Rice courtesy of Parks Tasmania.
2. Mainstream Natural Capital into national economics

Commit to mainstreaming the concept of the value of natural capital by embedding it in our economic thinking, economic planning, national economic measures and the development of a green economy. It should be fundamental to the way we evaluate and measure our national economic progress. Such recognition would be a catalyst for complementary reforms and put us on the path to a more sustainable economy, with multiple benefits for all Australians. The following key steps would enhance this essential mainstreaming process:

a. Undertake an Australian National Ecosystem Assessment

Ensure Australian decision-makers have access to the best available environmental data by undertaking a rigorous National Economics of Ecosystems and Biodiversity (NEEB) study, similar to the UK National Ecosystem Assessment released in 2011 and based on the full range of provisioning, regulating, habitat and cultural services (TEEB, 2009). This can build on and incorporate existing work on environmental information and accounting by the Bureau of Meteorology and the Australian Bureau of Statistics.

b. Specifically evaluate the ecosystem services provided by protected areas

Make the evaluation of the full range of benefits from our protected areas a key part of any national TEEB study so that the true (multiple) values of national parks and other protected areas can be better incorporated into policy and funding decision making.

c. Place National Ecosystem Assessment information at the heart of policy and planning

The National Ecosystem Assessment data should be used to underpin all policy development in resource and land use planning including developing clear targets for ecosystem conservation and restoration and modelling alternate scenarios which fully take into account the ecosystem services relied upon by the broader economy and population. It will also assist in the complex area of offsets to ensure best outcomes.

d. Develop high level advice with direct access to economic planners

Recognise the centrality of ecosystem health by incorporating high level advice on ecosystem or natural capital into national decision making. For example, the UK Government recently established a high level Natural Capital Committee to help it ensure the value of England's natural capital and its potential to support growth is fully taken into account in decision-making. The Committee provides advice on the state of English Natural Capital to the Economic Affairs Cabinet Committee, chaired by the Chancellor of the Exchequer.

3. Utilise new approaches in ecological economics

From a national policy perspective, accounting for ecosystem services is important because for a nation to be confident it is getting wealthier, it has to know that both Gross Domestic Product is increasing and natural capital is not being degraded. Ecological economics provides new concepts that can help better account for and value a more comprehensive range of the benefits and ecosystem services from natural ecosystems and protected areas – far better than the more limited tools available from conventional economics.

a. Ecosystem services

These are the benefits people obtain from ecosystems. They include provisioning services such as food and water; regulating services such as regulation of floods, drought, and disease; supporting services such as soil formation and nutrient cycling; and cultural services such as recreational, scientific, spiritual and other nonmaterial benefits. Many of the goods and services provided by natural ecosystems and protected areas are ‘public goods’ which are not traded in markets and which often have multiple beneficiaries and benefits that are excluded from the economy and economic decisions. While there is ongoing debate about the degree to which different approaches can determine value, the absence of a price for particular ecosystem services does not indicate absence of value.

b. Accounting and valuation

There is a difference between accounting for stocks of a ‘product’, and the valuation of those stocks. Accounting and finding ways to monitor trends in the health of environmental assets can be an important tool (Wentworth Group, 2014). However, as long as we are forced to make choices, we are undertaking a valuation; the valuations are simply the relative weights we give to the various aspects of a decision problem. Society can make better choices about ecosystems if the valuation issue is made as explicit as possible. Even without any subsequent valuation, explicitly accounting for the services derived from an ecosystem can help ensure appropriate recognition of the full range of potential impacts of a given policy option. This can help make the analysis of ecological systems more transparent and can help inform decision makers of the relative merits of different options before them.

c. Green infrastructure
Green infrastructure can be understood as the natural environments that provide society with critical ecosystem services including clean air, fresh water and fertile soils. Green infrastructure is more than just an interesting and novel communications idea; it is a large and rapidly growing international design, planning and conservation approach, utilising natural systems to solve some of humanity’s most pressing problems. While the term green infrastructure was originally understood to describe urban features such as green roofs, storm-water gardens and pollution treatment systems, it is increasingly employed to describe protected area networks and continental-scale connectivity initiatives.

d. Payments for Ecosystem Services

There is momentum building internationally and nationally for payments for ecosystem services (PES) to landowners, custodians and managers. Many governments internationally have begun to use PES and related market-based instruments to encourage the private sector to do more to protect the environment and to provide incentives to private, leasehold and public land managers. In some cases funds collected from the beneficiaries can be used to pay farmers and other land and sea owners and custodians to undertake conservation management in ways that helps ensure the continued flow of a range of ecosystem services.

Most PES initiatives operate at a national or subnational level. Applying PES at an international level implies a focus on those ecosystem services that are enjoyed at a global scale or which straddle national boundaries. Climate regulation and certain biodiversity values benefit the entire global community. PES may also apply at regional or bilateral scales, for example as a tool for maintaining trans-boundary watersheds or conserving the habitat of migratory species that regularly cross international boundaries.
4. Adopt standardised ecological economic accounting frameworks

The economic invisibility of nature is partly due to a lack of information about the role of biodiversity in supplying ecosystem services, the distribution and condition of terrestrial and marine ecosystems, and the value of those services to society. We need much better understanding of the full range of benefits we receive from natural systems especially from healthy and well-managed ecosystems. Various initiatives are underway to provide the kind of information needed to implement an ecosystem services approach. These initiatives should be supported and their frameworks promoted and adapted by governments and organisations. Key examples include:

a. Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES)

Through the United Nations, the international community established in 2012 the Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES) as an independent intergovernmental body open to all member countries of the United Nations. Currently 119 governments have joined IPBES and are committed to building this Intergovernmental Platform as the leading body for assessing the state of the planet’s biodiversity, its ecosystems and the essential services they provide to society. The overall goal is to feed this vital information into policy processes at appropriate scales and subsequently improve decision making. IPBES is attempting to reconcile very different world-views and integrate indigenous and local knowledge in planet’s western scientific knowledge.

b. System of Environmental-Economic Accounting (SEEA)

The United Nations Statistics Division has developed a System of Environmental-Economic Accounting (SEEA). The SEEA is a system for organising statistical data for the derivation of coherent indicators and descriptive statistics to monitor the interactions between the economy and the environment and the state of the environment to better inform decision-making. SEEA is being applied by the Australian Bureau of Statistics along with the associated Experimental Ecosystem Accounting.

c. Victorian Government’s framework

Parks Victoria and the Department of Environment and Primary Industries are developing a new valuation and accounting framework consistent with SEEA, recognising that while conservation of natural capital is the core purpose of most parks they also play an important role in providing built, social and cultural capital. If well-managed, the capital of ecosystems within parks yield a flow of services to communities which include: water supply; air filtration; climate regulation; protection from storms and flooding; opportunities for cultural and spiritual connection; recreation and tourism opportunities; health improvement; and the preservation of genetic diversity. The valuation and
accounting framework for Victorian parks has a number of potential applications for different purposes and audiences including communications, park planning and investment, informing policy, and audit and reporting.

5. The significant role of Indigenous people in managing land and sea country requires both ongoing recognition and resources

Throughout the world, Indigenous people are carriers of immense ecological knowledge which is increasingly recognised as vital to the tasks of ecosystem protection, management and restoration. For tens of thousands of years Aboriginal people survived in the Australian landscape due to their intimate knowledge of the land, seas and their plants and animals. Indigenous culture and spirituality is based on this deep knowledge and Indigenous people have a vital role to play in achieving ecosystem protection as a national priority.

a. Recognise and promote a culture-based economy in partnership with Indigenous communities

A culture-based economy should be recognised and promoted in government policy and by organisations working in partnership with Indigenous communities. In addition to an ecological economic perspective, important and practical insights into ecosystem services comes from Indigenous understandings.

A ‘culture-based economy’ approach considers an economy that builds on Indigenous culture, knowledge and connection to country. It supports their ongoing health and maintenance whilst creating genuine opportunities for employment, income and business development. The culture-based economy model provides a way of understanding the interrelationships between the specific country that Indigenous people belong to, their culture which stems from that and their economic independent futures.

b. Recognise traditional governance and knowledge

Areas of conservation and of customary resource interest often overlap. Looking after biodiversity sits within a ‘whole of country’ approach to land management which is seen through the lens of customary obligation to country and connected to kin. Networks of land-based ownership and cultural authority provide the framework for these activities to happen.

One of the more significant initiatives in the Australian context has been the creation of Indigenous Protected Areas (IPAs). Over 50 IPAs now cover some 36.5 million ha of Australia and constitute a third of the National Reserve System. Various kinds of land management – such as ‘carbon farming’ based on traditional fire management – have the potential to provide valuable income for land managers. The West Arnhem Land Fire Abatement (WALFA) project is a successful Australian example of innovative payments for fire management as a carbon offset (NAILSMA, 2014), while the Fish River example outlined in the Walton and Fitzsimons chapter highlights how PES was done for savanna burning in a market context as part of the Carbon Farming Initiative.

6. Continue to build national protected areas networks and invest in ecosystem health through effective management at a landscape scale

A critical part of an increased understanding of ecosystem services is an appreciation that a nation needs continued and ongoing investment in the building of systems to protect the core lands and seas and in the science, the policy and the delivery of effective management both on protected areas and other lands and sea areas.

Australia has a substantial National Reserve System (NRS) comprised of National Parks and other public reserves, Indigenous Protected Areas and private protected areas covering more than 137 million hectares or over 17 percent of Australia (DoE, 2014). The NRS has been called “the single most important asset for the conservation of Australia’s unique and globally significant biodiversity” (Taylor et al., 2014). NRS areas are often the core lands of larger landscape-scale initiatives of mixed tenure lands (see Fitzsimons et al., 2013).

A 2014 report of WWF found that despite this significant progress over the past two decades, Australia has still not achieved sufficient representativeness with nearly 40% of bioregions having less than 10% representation and over 10% of subregions having no representation at all in the National Reserves System (Taylor et al., 2014).

Clearly, continuing to build the NRS is system should be a major priority in sustaining the natural capital of our nation. Unfortunately there is no current budget to assist stakeholders purchase additional conservation properties. This is a serious policy gap as, previously, Australian Government funds served to leverage significant co-investment from the states and private organisations.

A related need is effective long term management of protected areas to ensure the integrity and health of their associated values and benefits, including those ecosystems services recognised by environmental accounting systems. The capacity of any ecosystem to deliver its full range of benefits is clearly affected by its health. Effective park management requires addressing threatening processes such as invasive species and inappropriate fire regimes. Conservation science tell us that we cannot maintain ecosystem health and manage threatening processes within
protected areas in isolation from the surrounding landscapes. Threats need to be managed at the appropriate scale and often across multiple tenures and substantial areas of land and sea. This concept has been widely adopted internationally as ‘connectivity conservation’ (Worboys et al., 2008).

In Australia, a number of initiatives based on connectivity conservation principles have emerged (Fitzsimons, et al., 2013) which promote the green infrastructure concept. Better cooperative management across tenures in these landscapes will deliver multiple ongoing benefits to the Australian people. While they attract support from multiple sections of Australian society they warrant strong policy and resourcing support from all levels of government. The following areas are particularly rich in ecosystem services and should be national priorities for strong conservation investment

a. The Australian ‘Outback’

The tropical north of Australia has the largest remaining intact tropical savanna on Earth, covering nearly two million square kilometres. The Outback’s three million square kilometres of deserts are amongst the least modified in the world, and at 160,000 square kilometres, the Great Western Woodlands in the south-west of the Outback, around Kalgoorlie, is the largest remaining woodland habitat in the world’s temperate Mediterranean climate zones.

This region delivers many diverse benefits, including rich biodiversity, major cultural livelihood and economic opportunity services to Indigenous people and substantial services to the tourism industry.

b. The Great Dividing Range

The vast range which stretches 3600 kilometres from western Victoria to far north Queensland supplies about 13 million Australians with freshwater and a myriad of other services. Protected areas within this region play a vital role in the harvesting and purification of these water supplies. The great forests along the range draw down and store massive amounts of carbon pollution from the atmosphere. The Great Eastern Ranges Initiative links some of Australia’s most iconic protected areas and most important watersheds.

c. Australian Alps

The protected areas of the Australian Alps include the headwater catchments of three of Australia’s most economically important rivers, the Murray, Murrumbidgee and Snowy. Estimated to be worth about $9.6 billion annually, the Australian Alps provide ecosystem services in the form of water that are of national economic importance. The clean waters flowing from the Alps to the Murray-Darling Basin and to the coast generate economic benefits derived from agriculture, hydro-electric power generation, nature-based tourism, and potable water consumption.

7. Allow pastoral leases the option of conservation management and payment for ecosystems services

Pastoral leases cover 44% of Australia, around 338 million hectares. Those leases of high attractiveness to graziers are tightly held by commercially viable pastoral operators, often across generations. However pastoral lands are increasingly going into other, non-grazing enterprises, particularly driven by the new industry in conservation land management. These changes on individual leases are being facilitated and driven by individuals, Indigenous communities, conservation groups, and governments, with pastoral leases with important ecological values being secured for addition to the National Reserve System.

In the pastoral zone, especially northern Australia, a current weakness is that enterprises are ordinarily obliged to have a pastoral lease which states they must run stock. Given that alternative land uses such as carbon farming, wildlife protection, and eco-tourism are expanding, reform of leasehold tenures in the Australia is required to allow an acceleration of sustainable diversification of enterprises on the current leasehold estate which will provide a major benefit to ecosystem health and consequent services.

8. Research priorities

Several areas of research emerged as important from the symposium.

a. Trial public trusts as an institutional reform to support payment for ecosystem services

Conventional markets are not well suited for managing many ecosystem services. A complex range of property rights regimes are necessary to adequately manage the full range of resources that contribute to human well-being. Most natural and social capital assets are public goods: making them private property does not work well in many circumstances, and leaving them as open access resources with no property rights is also problematic. A third way is to expand the commons by developing new institutions that can ‘propertise’ the commons without privatising them, such as through public trusts. For example, a bill has been introduced in the Senate in Vermont, USA, to create a ‘Vermont Common Asset Trust’, based on the public trust doctrine. This suggests that in addition to their role in regulating and policing the private market economy, governments have a significant role to play in expanding the commons sector.
b. **Promote applied research into protected areas and ecosystem services to generate policy-relevant evidence and to raise understanding**

Further research is needed into protected areas and ecosystem services to demonstrate proofs-of-concept, generate the empirical evidence-base need to inform policy, and to help educate and raise awareness of the approach among policy and decision-makers and the general public. Examples include:

- Build an ecosystem services component into sustainability rating systems;
- Champion initiatives such as wetland-based sewerage treatment systems that explore how green infrastructure can complement or even replace grey infrastructure;
- Undertake accounting and valuation of the key ecosystem services of major regions such as the Great Dividing Range, including forecasts of changes under different scenarios; and
- Develop more accurate cost per hectare figures for managing parks so that the return on investment and opportunity costs can be better estimated.

c. **Research into what is constraining incorporation of ecosystem services into decision-making**

Research is needed into what is enabling and inhibiting the incorporation of ecosystem services into both policy and financial accounting systems. In many cases, the economic value of a particular ecosystem service is known (e.g. water supply in Melbourne’s catchments) but it is not given full consideration in land use decisions, nor is the value considered an assets in current accounting frameworks.

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**References**


