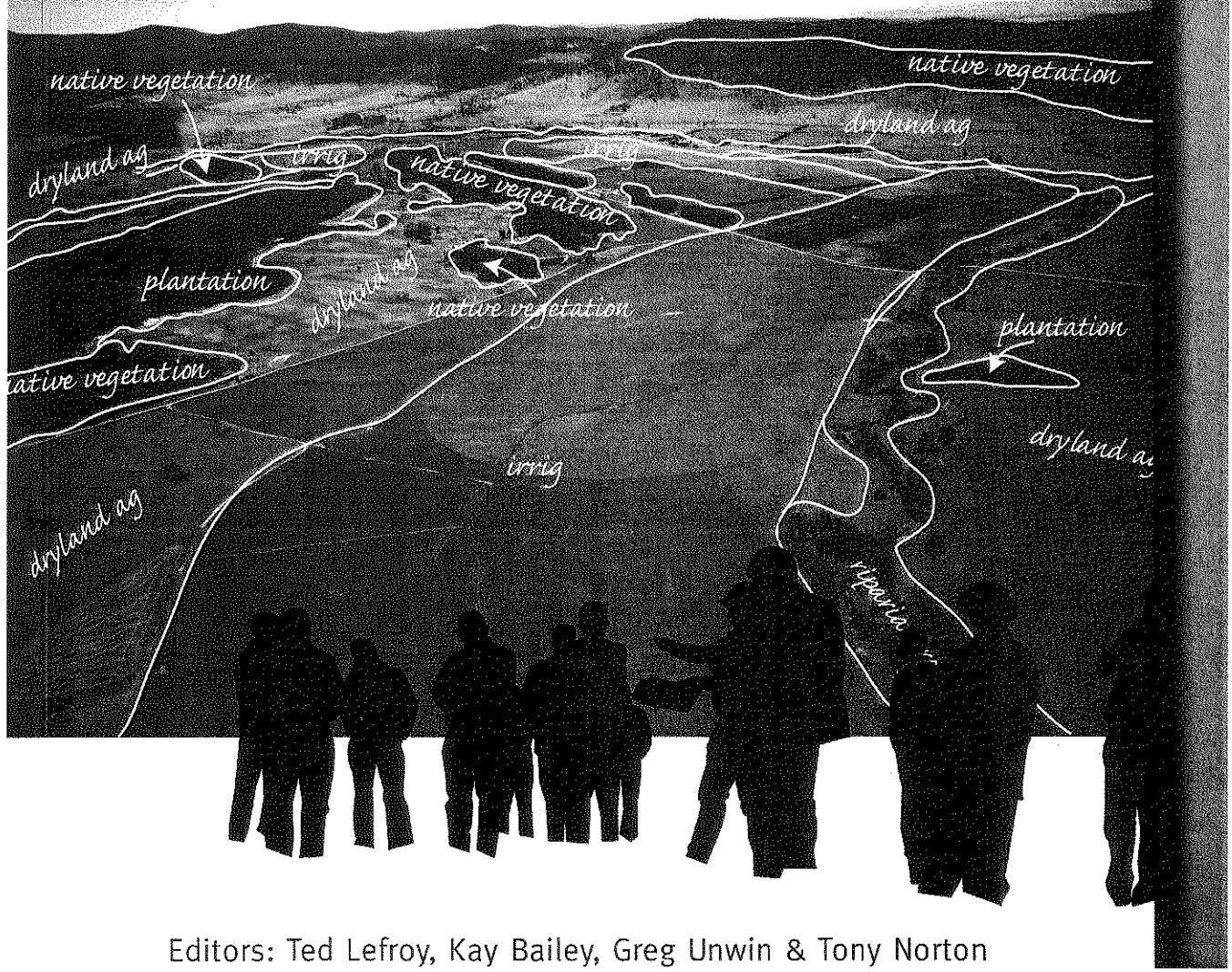
BIODIVERSITY: INTEGRATING CONSERVATION AND PRODUCTION

CASE STUDIES FROM AUSTRALIAN FARMS, FORESTS AND FISHERIES



Editors: Ted Lefroy, Kay Bailey, Greg Unwin & Tony Norton

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Preface

In June 2007, 250 people met in Launceston, northern Tasmania, at the conference *Biodiversity: balancing conservation and production*. The idea for the conference came from the community organisation Tamar NRM. Like other conservation groups that emerged from Australia's Landcare movement of the 1980s, this group was challenged by the expectation that farmers, foresters and fishers could take on the job of repairing and rehabilitating their environment while maintaining the viability of their businesses.

Like others in the Landcare movement, they realised that education and awareness, although essential, are not sufficient. People need practical guidance to learn how others have invested time and money in environmental projects and remained in business. There has been no shortage of advice and encouragement from governments, scientists and environmental advocates but there remains a thirst for real-life examples of what people have been doing, what has worked and what hasn't. Hence the subtitle of the conference – *Case studies from the real world* – and the subtitle of this book – *Case studies from Australian farms, forests and fisheries.*

The conference was held 20 years after then Prime Minister Bob Hawke announced the Decade of Landcare and ushered in an era of large public programs directed at environmental repair. The programs depended on community participation and have relied heavily on the assumption that we can have our cake and eat it – that we can make gains in the state of the environment that involve little or no cost to production yet improve our landscape and our livelihoods. We now know it is not that simple and we were keen to learn from first-hand experience.

Conference delegates fell roughly into three groups. Farmers, foresters and fishers presented first-hand accounts of what they had been doing in their own businesses and heard about the experience of others. There were also extension workers, advisers and community co-ordinators working for government agencies, regional catchment management organisations and farmer groups who offered case studies of community projects and large-scale conservation programs. Finally, there were scientists who had been trying to find ways to improve environmental management, in many cases working closely with farmers, foresters and fishers.

This book is structured around those three groups with 17 case studies from the 55 presented at the conference. Preceding those are keynote addresses from four prominent voices in the fields of ethics, advocacy, science and the future. The book concludes with the Tamar Principles, the collective wisdom of 100 delegates who spent a day synthesising what they had heard over the previous three days into seven steps for the future.

The editors wish to thank Amanda Bruce, Julia Dineen and Chris Davies for their help in editing and illustrating these case studies; Ian Sauer for the original concept; Christopher Strong for securing financial support for the conference; the conference sponsors (see Acknowledgements); the four keynote speakers who provided an inspiring introduction to the issues; and finally the delegates who so freely shared their experience, wisdom and enthusiasm.

Ted Lefroy, Kay Bailey, Greg Unwin and Tony Norton
June 2008

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Reflections on landscape integration: lessons from the past and principles for the future

David Lindenmayer

This chapter is a reflection on how far we've come in our attempt to integrate conservation and production in Australia. It is a personal reflection, not about 'greens versus browns' which has been the dominant kind of debate in environmental management over the last 15–20 years, but how we integrate conservation and production. I start by looking at six lessons from the past that I suggest we ignore at our peril (see Lindenmayer 2007). I then want to finish with a set of 10 principles for landscape management developed recently from a meeting of national and international landscape ecologists (Lindenmayer & Hobbs 2007; Lindenmayer *et al.* 2007a).

The six lessons from environmental management are these.

1. 'Sustainability' is a weasel word.
2. Everyone talks about 'adaptive management' but few people do it.
3. We repeat past mistakes.
4. We overcommit landscapes.
5. We are always doing crisis management.
6. We ignore the human population question.

LESSON #1: 'SUSTAINABILITY' IS A WEASEL WORD

The first lesson is that sustainability is a 'weasel word', a term borrowed from Don Watson, one-time speech writer for former Prime Minister Paul Keating (Watson 2004). As a weasel

word, it has a similar pedigree to expressions such as 'moving forward', 'at the end of the day' and many others we hear thousands of times a day.

Sustainability is used out of context repeatedly and in every sector. The concept of ecological sustainability is not the same as sustained production and we need to think carefully about what ecological sustainability means in the context of the particular sector we are dealing with. For example, trying to define ecologically sustainable forest management is not a straightforward task. We need to invoke the concept of ecosystem integrity, which could also be accused of being a weasel word if it's not defined. In ecologically sustainable forest management, we are trying to maintain wood and non-wood values. To achieve that, we have to think in terms of species composition, ecological processes and natural disturbance regimes that might achieve this – our task very quickly becomes extremely difficult.

The sustainability problem in the context of forest management is impossible to think about unless we have monitoring to gauge our progress towards our objectives. We need to employ adaptive management, working with and learning from that system (see below) to continuously improve what we are doing. People regularly claim they are doing adaptive management but, as my father would say, they're almost all victims of 'immaculate self-deception'. To overcome this, there needs to be an explicit recognition that we don't know everything – this is very hard for governments and management agencies. This is why we need to monitor, why we need research and why we need to link monitoring and research to achieve true adaptive management.

One measure of our atrocious record of environmental monitoring is the lack of formal funded and supported long-term ecological research (LTER) sites in Australia. The US has a long history of support for a major network of LTER sites. Brazil also has a true LTER system as do many other nations including such impoverished ones as Malawi and the Philippines. But not Australia. Without LTER sites and without monitoring, we've got limited ability to track our progress on management and we can't work out how well we are doing with management actions like fox baiting, weed control and many other well-intentioned activities. It means that we can't gauge sustainability, whatever we define that to be, in terms of the sector that we are dealing with.

Sir John Lawton, Fellow of the Royal Society, wrote 10 years ago that if you don't have good science to underpin management it resembles alchemy and faith healing (Lawton 1999). Sometimes you get good results, often you don't, but you have no idea what is going on. Little has changed since he penned that quote. A consequence is that we suffer from a policy surplus but an action deficit. We have experienced a major decline in our research and technical capability, and instead we have lots of weasel words woven throughout an ever-mounting pile of documents about how we are going to manage natural resources.

LESSON #2: ADAPTIVE MANAGEMENT

The idea of adaptive management is bandied about enormously in the literature. A check showed over 2000 references in the scientific literature to adaptive management in the last 10 years. But there are almost no true published examples of adaptive management anywhere in the world (Stankey *et al.* 2003).

Many people assume that adaptive management is just 'doing stuff' and then, if we happen to find out something new, changing what we're doing. However, adaptive management is actually a formal process of linking experiments with an understanding of a system to monitor change; management practices are updated in a formal iterative way as new information

obtained. This involves a strong partnership between managers and researchers. Some of the most beautifully designed experiments have failed the 'test of management relevance' (Russell-Smith *et al.* 2003). Russell-Smith and his colleagues explain how the fire experiment they led in northern Australia failed the test of relevance because it wasn't designed with fire managers. Scientists were remiss in not trying to forge that partnership; a key lesson is that it takes strong partnerships between managers and scientists to do true adaptive management.

Some key attributes of true adaptive management are a willingness to embrace uncertainty, a serious long-term commitment to research, well-designed monitoring and a commitment to change when the results suggest change is necessary (Lindenmayer & Franklin 2002).

LESSON #3: REPEATING PAST MISTAKES

The third lesson is that we keep repeating the mistakes of the past. At the moment there are calls to develop agriculture in northern Australia. Without careful use of existing environmental knowledge, we run the risk of repeating the mistakes made in southern Australia. Indeed, it seems that we have conveniently forgotten the CSIRO land capability mapping that showed why there has not been extensive agricultural development in northern Australia to date.

What do we need to do? I strongly believe that we need to use the knowledge we have now to avoid repeating those past mistakes. Northern Australia is a classic example. The lessons that we've learnt in the south are not to over-intensify our agriculture, not to over-irrigate, to make sure that we've got a sensible reserve system and not to overcommit the natural resources of our landscapes.

LESSON #4: OVERCOMMITTING LANDSCAPES

Lesson 4 is that we always overcommit landscapes. We invoke one of Norman Lindsay's great book characters and treat landscapes like magic puddings. We take from them and somehow, magically, expect the (landscape) 'pudding' to grow back again. A consequence of magic pudding syndrome is that water resources are overcommitted, land is overcommitted and there's insufficient margin for the other environmental services that we expect from those landscapes.

LESSON #5: INEFFECTIVENESS OF CRISIS MANAGEMENT

Lesson 5 is that we always do crisis management. Conservation biology is regarded as a crisis discipline that tries to deal with biodiversity loss, but the reality is that environmental management is also a crisis discipline. When we manage in crisis mode, whether it's attempted control of weeds, preventing overfishing or attempted recovery of threatened or endangered species, it always costs a lot more than proactive management. In many cases crisis management is spectacularly unsuccessful.

LESSON #6: THE ELEPHANT IN THE ROOM

Lesson 6 is that we are really good at ignoring the big question, the elephant in the room – how many people do we want in Australia? Barney Foran and his colleagues have estimated that if we want 50 million people in Australia by 2050 we are going to need another 90 cities the size of Canberra, or two cities, Melbourne and Sydney, with populations of around about 10 million people each (Foran & Poldy 2002).

When there are calls to increase the nation's population size, we need to ask how that would affect the environment of this country which is already buckling under severe problems

with ~20 million people. Australia leads the world in terms of resource consumption per capita. It takes about 200 t of resources per person per year to run the average Australian with our current standard of living, higher than the average person in the US. Severn Cullis-Suzuki pointed out in Chapter 2 that by the time the average Canadian is six months old, they've consumed the same quantity of resources as that used during an entire life in the Third World. In Australia, that baby might be three months old rather than six months.

If you consider the resources produced in Australia, the amount of wheat, wool, iron ore, coal and energy exported to drive the economies of other countries, we have a phantom population of not 20 million but some 400 million. As extraordinary as it seems, it appears that we simply can't discuss the issue of population size: it's a taboo subject. In a recent Queensland election, some politicians said they would 'solve' the water supply crisis in south-eastern Queensland by building a dam on the flood plain of the Mary River. No mention at any stage that the population in that region has been growing at ~1500 per week for many years now (Skinner *et al.* 1998). Nobody considered that unrestrained human population growth might be environmentally unsustainable.

If we are to develop any long-term vision for this country, we have to confront the issues of the number of people, their standards of living and levels of resource consumption before we can begin to talk about ecological sustainability. We need a broad debate about these issues.

WRAPPING UP

To summarise, we first need to think more deeply about defining ecological sustainability in different contexts. Ecologically sustainable fire management, forest management, farming and fisheries each demand their own definition. Second, we need proper adaptive management based on well-designed monitoring and long-term research and we must use that knowledge to avoid repeating past environmental mistakes. If we do these things, we may avoid overcommitting our landscapes and avoid crisis management which is expensive and generally doesn't work. Finally, we need to confront the elephant in the room – human population size.

GENERAL PRINCIPLES FOR LANDSCAPE MANAGEMENT

What general ecological principles to guide landscape management can we apply to the task ahead of us? In March 2006, a group of 30 of the best minds in landscape ecology and landscape management were brought together to come up with general principles for landscape management. We started with six broad themes in landscape ecology:

1. landscape classification;
2. habitat amount, amount of land cover, patch sizes and mosaics;
3. vegetation structure and condition;
4. connectivity;
5. significance of edges;
6. disturbance, resilience and recovery.

For each theme, three researchers each wrote an essay on their perspectives on key issues and possible general principles. From this, a set of guiding principles for landscape management were distilled (Lindenmayer & Hobbs 2007; Lindenmayer *et al.* 2007a). Ten of these are summarised in the box below and briefly discussed in the remainder of this section.

One of the first insights was that the major themes in landscape ecology are far more connected than most people recognise. For example, the way we classify landscapes has many implications for management; it impacts on the way we interpret edge effects, define habitat quality, interpret landscape conditions and assess the condition of patches within a landscape. All the principles listed below are connected far more significantly to the way we chose to view and classify landscapes than any of the delegates at the workshop had comprehended before we started.

Another realisation was the tension between the general and the specific, between motherhood statements and a principle that is so specific it applies only to, for example, the heathlands of south-west Tasmania but is largely irrelevant to anywhere else. A major challenge was to identify principles that sit between the very general and the very specific.

Ten principles of landscape management

1 Set clear landscape management objectives and visions.
2 Manage the entire mosaic, not just the patches.
3 Realise the importance of the amount and configuration of native vegetation (avoid low levels of vegetation cover).
4 Identify disproportionately important species, processes and landscape elements.
5 Manage species *and* ecosystems and recognise their complementarity.
6 Better integrate the management of terrestrial and aquatic environments.
7 Be aware of the values reflected in landscape classification.
8 Maintain the ability to recover after disturbance.
9 Manage for change, as time lags are inevitable in most processes.
10 Manage through 'landscape learning', i.e. within an experimental framework.

PRINCIPLE #1: SETTING OBJECTIVES

The first principle concerns setting objectives and visions for landscapes, something scientists and managers do poorly at the moment. Objectives are usually very generic, for example 'maximise wood production and biodiversity conservation' or 'maximise agricultural production and biodiversity conservation'. Inherent conflicts mean these twin objectives are clearly impossible. Even within a conservation goal, our actions vary depending on the nature of the objectives. If we are managing for species richness, our actions are very different from those if we are concerned with threatened species, pests, ecological processes or ecosystem services.

Take, for example, the objective of minimising fragmentation, an aim found in thousands of management documents. When you actually look at the concept of fragmentation, you discover that it has become a panchreston – it has come to mean all things to all people to fit all cases and all circumstances, and has subsequently lost its meaning (Lindenmayer & Fischer 2007). If we are going to set sensible objectives we have to be explicit about what we mean. A landscape that's fragmented from a human perspective may not be fragmented from the perspective of another species. If we are managing for a single species, for example, that has very different implications for edge effects and management of native vegetation than if we are managing a landscape from a human perspective.

What we are not doing at present is thinking deeply about how we set visions and objectives for landscapes. This affects everything we do. This first step, the one that's often the hardest to make, is the one that we do most poorly when it comes to environmental management.

PRINCIPLES #2 AND #3: MANAGE THE MOSAIC AND CONSIDER THE TOTAL AMOUNT OF NATIVE VEGETATION

The second and third principles are about the importance of context. We commonly focus on patches without thinking about the context within which those patches sit. We often manage the pieces without thinking about the total amount of vegetation or the total amount of habitat at the landscape scale and how it's distributed. We are losing context by not thinking about the scales at which we are managing and not thinking about the objectives relevant to each scale.

PRINCIPLE #4: IDENTIFY CRITICAL PARTS OF LANDSCAPES

The fourth principle concerns the fact that some parts of landscapes are created more equal than others. Cliff-lines, gullies, watercourses and riparian areas, in particular, tend to be disproportionately more important for biodiversity and ecosystem processes such as nutrient flows than are other parts of landscapes. This applies the world over. We should be giving more consideration to how we manage these areas.

PRINCIPLES #5 AND #6: MANAGE SPECIES AND ECOSYSTEMS AND INTEGRATE TERRESTRIAL AND AQUATIC ENVIRONMENTS

The fifth and sixth principles concern artificial barriers within the discipline of ecology. There is a long-running debate in the ecological literature about managing individual species versus managing for ecosystem processes; the literature on those two fundamental aspects o ecology is rarely brought together (Lindenmayer *et al.* 2007b). We also tend to separate terres trial from aquatic environments, as if they are completely separate and have nothing to d with one another.

PRINCIPLE #7: CONSIDER THE METHOD OF LANDSCAPE CLASSIFICATION

The seventh principle concerns the classification of landscapes. This might sound ver academic but it becomes important as soon as we start to work through the other principle Landscape ecologists and managers classify landscapes, either explicitly or implicitly, base on their own mental models of landscapes. These models or conceptualisations enable us t make visual interpretations about the species, ecological processes or resources within landscape, how they are distributed and how they should be managed. Understandably, w often fall back on a human perspective of how we think a landscape should look. But to expe all species to respond in the same way as a human perceives that landscape is misguided. Ho we classify landscapes fundamentally influences our objectives and visions. For example, it common within conservation biology for people to think of landscapes as islands of habit within a matrix of non-habitat, for instance as reserves within a production landscap Reserves dominate the conservation biology literature, despite the fact that most biodiversi actually exists outside reserve systems. This doesn't mean that reserves aren't important; just means that off-reserve areas are commonly undervalued. As a result we fail to integr conservation and production – a reality which is, in part, a consequence of our concept model of a landscape.

For example, on the left in Figure 3.1 is a partially cleared grazing landscape. Tl landscape can be classified in various ways. It can be viewed in terms of patches, corridors a the surrounding matrix, the classic model used in production landscapes (top). Using a var gated landscape model (McIntyre & Hobbs 1999) we can recognise the important role scattered paddock trees, enabling animals, plants and processes to move through the landsc

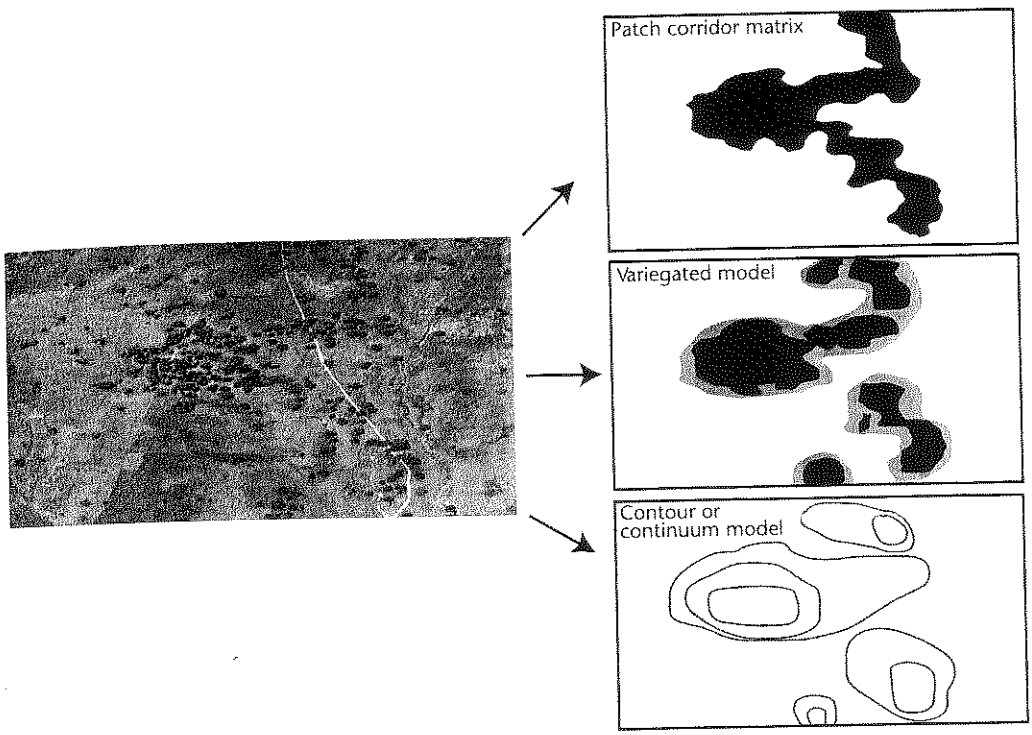

Figure 3.1: Different perspectives of the same landscape using different landscape conceptual models

Source: Redrawn from Lindenmayer *et al.* (2007a).

(middle). This model starts to blur the boundaries between reserve and off-reserve areas, and extends resource management over a larger area. A third way of perceiving this landscape is the habitat contour model, which reflects the habitat suitability of that landscape for particular species (bottom). Habitat contours are the spatial patterns that emerge from the interactions between processes such as food availability, shelter space, climate suitability, competition and predation (Fischer & Lindenmayer 2004). They indicate where concentrations of that species are most likely to be found.

The key point is that we can look at the same landscape in different ways, using different models, with quite different implications for the way we manage that landscape. These differences matter, as they can significantly influence management planning and on-the-ground actions (Lindenmayer & Fischer 2006).

PRINCIPLE #8: MAINTAIN THE ABILITY TO RECOVER AFTER DISTURBANCE

It is important to maintain the potential for landscapes to recover from disturbance. This includes maintaining processes and flows and the ability of the biota in a landscape to cope with extreme events, such as floods and droughts. Managers need to better recognise that natural disturbances can be valuable for ecosystems. However, rather than allowing events to drive management responses, it may be better to anticipate extreme events and plan contingencies before they occur. For example, in Australia's wet forests, where fires can be stand-replacing events, sustained timber yield calculations need to factor in the effects of fires (rather

than ignoring them) and thereby avoid overcommitting forest resources if some areas are burned in a wildfire.

PRINCIPLE #9: MANAGE FOR CHANGE

Management practices often fail to account for the fact that landscapes are dynamic and that changes can be non-linear and sometimes related to threshold phenomena. We need to plan management to accommodate successional dynamics, spatial and temporal mosaics, colonisation and extinction processes, and likely range-shifts associated with climate change. Thus, we need to evolve beyond traditional institutional tendencies to ignore potential problems until they become critical, only then instigating crisis management (Hobbs *et al.* 2003).

PRINCIPLE #10: MANAGE IN AN EXPERIMENTAL FRAMEWORK

The final principle reiterates the importance of adaptive management. The only way we are really going to learn about landscapes, to learn about how to integrate conservation and production, is through experiments that include a commitment to long-term research, well-designed monitoring and recognition of our ignorance.

SUMMING UP

The 10 general principles briefly outlined are strongly context-dependent and cannot be applied uncritically in all landscapes. The way they might be applied in the forest landscapes in northern Tasmania might be markedly different from the grazing landscapes of mainland Australia. They are best worked through not in a prescriptive way but as a checklist of things to think about, in particular via visions and objectives. Are we managing for patches or are we putting them into the context of a landscape mosaic? How much habitat and how much total vegetation cover do we have, and what is its habitat for? What are we managing the vegetation for – a particular species, ecosystem processes or both?

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