

local people) relate and work on wildlife issues that affect them both.

Finally, in a rather interesting editorial strategy, the book concludes with the question, "What is wildlife management?" Such a question would usually appear at the beginning of a book intended to address the very topic of wildlife management, but perhaps it was felt that such a diverse range of dialogue presented in the book needed a chapter to tie in all the points, and thus was better served at the end to remind the reader of the current issues and trends. Decker *et al.* set out to answer the question with a brief history, some definitions and principles behind management strategies, and consequently provide a very comprehensive response.

In conclusion, *Wildlife and Society: The Science of Human Dimensions* is a worthy read and an important addition to the growing literature that is seeking to make a better understanding of our relationship with

our natural environment. Addressing a complex interdisciplinary field such as fish and wildlife management is a challenge, because the concepts and language need to be understood by a diversity of readers. The editors and contributors have successfully fulfilled the aims of the book such that students, researchers, policy-makers and wildlife managers will be able to find relevant material easily accessible.

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Effective Ecological Monitoring

Lindenmayer, D.B. and Likens, G.E. 2010
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IN their book *Effective Ecological Monitoring*, David Lindenmayer and Gene Likens set out to demonstrate the importance of long-term ecological monitoring programmes, as well as presenting what they propose to be a new paradigm, "adaptive monitoring". In a brief introduction, they set up a framework for discussing ecological monitoring by arguing that monitoring can be categorized into one of three main types, curiosity-driven (passive) monitoring, mandated monitoring or question-driven monitoring, the latter of which they strongly suggest has the most merit. The book is then structured around three main chapters, "Why monitoring fails", "What makes long-term monitoring effective?" and "The problematic, the effective and the ugly — some case studies", and rounded off with a concluding chapter.

The chapter dealing with "Why monitoring fails" provides a useful summary of the key reasons for which many long-term monitoring programmes are not successful. Perhaps unsurprisingly, given the scope and variety of long-term monitoring programmes, the list of issues identifying why monitoring fails seemed incomplete. For example, "poor design" is identified as a primary reason for why results from monitoring programmes don't get written up, but a lack of resources for analysis and publication of monitoring results being planned for from the outset is not mentioned. Furthermore, as a

consequence of being a brief synopsis of reasons that monitoring programmes fail, each issue is dealt with only superficially. Anyone wanting to avoid the identified pitfalls in designing a long-term monitoring programme would have to consult other published literature extensively to gain the understanding necessary to do so. The discussion of using an indicators approach in monitoring (poorly labelled as "Squabbles about what to monitor") seems out of place in the "Why monitoring fails" chapter. It may have been better framed as advice to quantify relationships between potential indicators and other taxa if constructing a long-term programme based on monitoring of a representative suite of indicators.

The chapter tackling the question of "What makes effective long-term monitoring?" focuses on key aspects to consider when designing a monitoring programme. Sage advice is given about the need for: using a conceptual model to define the problem statement and make predictions, incorporating statistical design in the planning phase, securing long-term funding, publishing the data frequently (to demonstrate return on investment in long-term monitoring), overlapping analytical methods when they are replaced (to maintain data integrity), ensuring continuity of field staff and adequate infrastructure and the need for principal investigators to spend a significant amount of time working in the field with junior staff. The suggested approach of using long-term monitoring programmes as a framework around which shorter term projects can be conducted is a good model that has worked well for the monitoring programmes I am most familiar with. For example, the monitoring of long-tailed bats (*Chalinolobus tuberculatus*) is typical of a number of long-term monitoring projects in New Zealand which look at both status and trend in populations and response of populations to conservation manage-

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ment. This programme has been ongoing for 20 years and has as its basis indices of abundance (using bat detectors), pilot studies and pre-scheme power analyses (O'Donnell and Langton 2003), interim reporting where indices were compared with historic counts (O'Donnell 2000a), calibration using mark-recapture and survival analyses (Pryde *et al.* 2005) and strategic studies designed to improve the scale and sampling design of monitoring projects (e.g., home range, O'Donnell 2001; factors influencing detection, O'Donnell 2000b; social structure, O'Donnell 2000c).

Describing the “adaptive monitoring” framework as a new paradigm seemed somewhat of an overstatement. As far as I can tell, the term “adaptive monitoring” has been used to describe the monitoring component of adaptive management in the scientific literature for the last 15 years (Czaplewski 1996; Ringold *et al.* 1996) and has been applied in the United States of America (National Research Council 2003). Lindenmayer and Likens add the diagrammatic representation of the idea that design of a successful long-term monitoring programme needs to be an iterative process flexible enough to allow for new questions to be addressed and analytical approaches changed while maintaining the integrity of longitudinal datasets. Thus, the major contribution to the “adaptive monitoring” literature made in *Effective Ecological Monitoring* is to succinctly formalize and promote a principle that makes intuitive sense and is already practised in many effective ecological monitoring programmes.

If you get to the chapter examining a range of case studies and are intrigued by a promised exposé of “the ugly”, don't hold your breath. Although Lindenmayer and Likens have heavily criticized several monitoring programmes run, including some of the largest biodiversity monitoring programmes in Canada, the United States and Australia, in their section on “the problematic”, they have actually refrained from labelling any programmes as “ugly”. So the subheading appears to be little more than a hook for selling what is otherwise a book on a rather dry topic. This chapter provides a more detailed look at a number of case studies and applies the principles outlined in the preceding, more theoretical, chapters about successful design of long-term monitoring programmes.

The key messages that appear to crop up in “the problematic” case studies concern the need to identify explicit, scientifically-based questions and appropriate statistical and spatial design at the outset. Applying these principles routinely would help to identify causal mechanisms and enhance predictive ability of large biodiversity monitoring projects. The questions I was left with after reading through “the problematic” were: (1) are Lindenmayer and Likens' criteria applied retrospectively to determine whether a monitoring programme was effective so narrow that the majority of programmes are bound to fail? (2) can large scale (e.g. nation/continent wide) monitoring programmes ever hope to fulfil all of the criteria outlined in *Effective Ecological Monitoring*? and (3) do the authors see value in large-scale monitoring programmes designed to track status and trend in a range of biodiversity?

In essence, I suggest that the “adaptive monitoring paradigm” presented in *Effective Ecological Monitoring* is of most relevance to site-based long-term research rather than monitoring at the landscape scale.

The concluding chapter of the book provides a useful synthesis as well as discussing ecological monitoring in the context of society and culture. In many ways, it serves as an antidote to the emphatic nature of the preceding four chapters. For the first time, the value that can come from non-question based monitoring and the difficulties of scaling effective long-term monitoring up from the site or ecosystem level to the landscape or region level are properly acknowledged. The chapter touches on the issue of integrating different types of monitoring programmes to inform environmental management and there is some discussion of creating metrics of environmental condition. However, I felt that the issue of how to design an integrated biodiversity monitoring system at multiple scales and combine datasets to produce integrated assessments could have been further explored and would have made a valuable addition to the book. The reader is instead left dangling with this issue identified as the “next major challenge for long-term monitoring”.

I am still left wondering whether the majority of current monitoring programmes fall into a void between mandated monitoring and question-driven monitoring. Specifically, by the Lindenmayer and Likens dichotomous definitions, mandated monitoring does not attempt to identify mechanisms influencing a system and is almost always posed *post hoc*; in contrast, question-driven monitoring requires a conceptual model as a starting point and rigorous experimental design. So where do the non-mandated long-term monitoring studies that are started with ecological questions in mind and document status and trend (e.g. Bell *et al.* 2004; Hoare *et al.* 2007; Mills *et al.* 2008) fit in? While I agree that monitoring programmes with *a priori* hypotheses and an experimental design are optimal for detecting trends and making inference, I am concerned that this approach to evaluating monitoring programmes undervalues non-experimental long-term monitoring programmes that provide important contributions to management decisions. In reality, although such programmes are likely to be of more limited value than datasets collected with a predictive framework in mind, they can often be salvaged through application of (1) modern statistical techniques (e.g. Elliott *et al.* 2010; Johnson *et al.* 2010; O'Donnell and Hoare in press) and/or (2) some of the “adaptive management” principles outlined in *Effective Ecological Monitoring*. The latter were implemented in the Central Highlands of Victoria case study identified as an effective monitoring programme in Chapter 4!

In general, the writing style is user-friendly in that it is down-to-earth and the tone almost conversational, making a book on monitoring more palatable than it might otherwise have been. The chapters are well cross-referenced in the text, the figures and tables are adequately integrated and the book is furnished with plenty of references. However, few direct links are made between the “boxes” containing case studies and the text. Therefore, despite mostly being of relevance to the text (an

exception being Box 4.6, “The Crawford Caper” which is essential an anecdote about illegal importation of alcohol and doesn’t explain the relevance to ecological monitoring at all), the reader has to work to evaluate where and how the case studies fit into the argument.

The major achievements of *Effective Ecological Monitoring* are in providing a summary of issues to consider when designing effective long-term monitoring programmes and putting a logical structure around the principles of maintaining a successful long-term monitoring programme that has flexibility to evolve whilst preserving integrity of the data. While the initial chapters appeared to lack substance and seemed overly simplistic, I eventually found the detail that I sought in Chapter 4, which discusses the theoretical principles of “adaptive monitoring” through examination of a series of case studies. I think that the book presents a useful way of structuring thinking around the design and implementation of effective long-term monitoring and makes a valuable contribution both as an academic summary and a guide for environmental managers charged with designing effective long-term biodiversity monitoring.

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