

Book Reviews

The rocky road to resilience

Walker BH, Anderies JM, Kinzig AP, Ryan P 2006. Exploring resilience in social–ecological systems: Comparative studies and theory development. Collingwood, Victoria, Australia, CSIRO Publishing. xii + 218 pp. Paper, ISBN 0643092439, AU\$75.00.

There is now a significant body of research devoted to managing complex social and ecological systems with a focus on resilience, where resilience is defined as: ‘the capacity of a system to absorb disturbance and reorganize while undergoing change so as to still retain essentially the same function, structure, identity, and feedbacks’ (Walker et al. 2004). Managing natural resources with a focus on enhancing system resilience is seen by resilience researchers and practitioners as a more sustainable approach than the dominant paradigm of optimising production via methods such as maximum sustainable yield.

For those interested in a resilience approach to managing linked social–ecological systems (SESs), this book provides a readable and well-referenced blend of the latest resilience ideas and practical approaches. Readers may initially find it a little disappointing that the chapters in the book were first published in 2006 as papers in *Ecology and Society*, the online journal of the Resilience Alliance, an international consortium of 15 research groups. However, the importance of gathering this particular group of papers into a book quickly becomes apparent as they highlight the key issues of importance to managers and researchers in this exciting and important, developing field.

Exploring resilience in social–ecological systems focuses more on the social aspects of SESs than earlier books by the Resilience Network, such as *Panarchy* (Gunderson & Holling 2002), which was more focused on theory development and left the reader with many questions about the practical aspects of managing and analysing SESs with a resilience focus. This book goes some way to answering these questions, looking at how humans act in these systems, how they react to system changes and what human attitudes and behaviour seem to be important for resilience-based management – a welcome development from earlier work

The book presents a list of ‘propositions’ or statements about change in SESs, which represent the current stage of theory development in this field; the authors point out that these propositions need to be tested and developed, listing research questions

raised by each one. Fifteen SES case studies from around the world are also presented, all of which have been researched by the Resilience Alliance. Different chapters compare different case studies, focusing on particular features of SESs that appear to play important roles in their dynamics, and linking the findings to relevant propositions. In this way the propositions are tested by comparative analysis of case studies, which is considered the best approach for theory development in complex SESs.

After the introduction in Chapter 1, Chapter 2 briefly summarises the main ideas on which the resilience approach is based (e.g. resilience and the adaptive cycle) and then outlines the 14 propositions. For example, Proposition 4 explains how only a small set of variables determine critical changes in SESs and Proposition 10 discusses learning as a key component of adaptability. For readers who are familiar with many of these concepts this chapter provides a succinct summary; however, newcomers to the field may struggle with some of the ideas, which, given that they represent a significant shift in thinking from the dominant paradigm, should maybe have been presented in more detail.

Chapters 3–9 are based on the 15 case studies, comparing and probing them and presenting emergent insights. For example Chapter 6 explores the differences between social–ecological systems that have renewed themselves after collapse and those that haven’t, while Chapter 8 examines governance attributes that seem to assist resilience management in regional social–ecological systems. The findings from Chapters 3–9 are then summarised in Chapter 10, which concludes with a set of 10 ‘tentative messages’ for policy and management resulting from the overall findings.

The way each chapter weaves together the propositions and case studies, creating an eclectic mix of theoretical ideas and practical guidelines, is one of the strengths of this book, making it appeal to both managers and researchers. However, *Exploring resilience in social–ecological systems* will be of particular value to researchers interested in this field and for use in undergraduate and graduate courses in resource management and sustainability.

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Plant–pollinator interactions

Waser NM, Ollerton J eds 2006. *Plant–pollinator interactions: From specialization to generalization*. USA, The University of Chicago Press. Alk. paper, ISBN 0226874001, US\$45.00.

The study of plant–pollinator interactions is one of the most dynamic fields in evolutionary ecology. However, the interpretation of plant–pollinator interactions with respect to evolution, selection, and adaptation, especially when analysed on higher levels (e.g. community) has produced an ongoing debate that was aroused anew when Waser and colleagues wrote a controversial paper ‘Generalization in pollination systems and why it matters’, published in the ‘Concepts’ section of the journal *Ecology* in 1996. Looking at community-level data of plant–pollinator interactions, the authors asked a simple question: How can we explain floral specialisation if most plant species are interacting with a wide range of insect taxa? This question not only urged pollination biologists to take a closer look at the common assumption that specialised plant–pollinators are the norm but more fundamentally it challenged the understanding of the mechanisms for floral specialisation and diversification. In response to the 1996 paper, pollination biologists started a refinement of the conceptual framework for explaining specialisation in flowers (e.g. Johnson & Steiner 2000; Fenster et al. 2004).

In 2006, 10 years after their paper, the book *Plant–pollinator interactions: from specialization to generalization*, edited by Nickolas Waser and Jeff Ollerton, is another thought-provoking contribution to the questions raised in 1996. With contributions from 38 experts from different regions of the world this book illustrates recent advances in the field and demonstrates the diversity of approaches towards an explanation. It should be appreciated that the editors did not try to advocate only their own position in taking a second look at generalisations in pollination. They are aware that giving a platform to such a high number of authors with their different viewpoints produces not only overlaps but also contradictions. Indeed some of the chapters in the book provide strong evidence for the

utility of the pollination syndrome concept. However, this is what makes the book so thrilling. It shows the complexity of analysing plant–pollinator interactions and the full range of evolutionary and ecological questions that are related to it. Many of the chapters are synthetic reviews but we find also case studies that fit very well into this book. Each of the five parts of the book is conceptually framed by an introductory chapter by the editors sometimes in collaboration with some of the contributing authors. The parts cover the field of pollination biology at different scales, from populations through communities to landscapes, and from both basic and applied viewpoints.

Part 1 (Introduction and history) treats the subject from an historical perspective and gives an introduction to the basic questions connected with the analysis of plant–pollinator interactions. Waser’s introduction ends with an outlook into the future and prepares the stage for the following chapters of the book.

Part 2 (The ecology and evolution of specialized and generalized pollination) contains six chapters that illustrate diverse approaches to the study of animal pollination. Part 2 starts with an interesting chapter by Paul Aigner who analyses trade-offs in floral traits that can affect a plant’s adaptation to different pollinators via differential selection on flower characteristics. Based on his models he comes to the conclusion that we should be prepared to find adaptations to relatively uncommon or ineffective floral visitors when there is no sacrifice in the ability to use more common and effective ones. This is a view that differs clearly from Stebbins’ (1970) ‘most effective pollinator principle’ stating that ‘the characteristics of flowers will be moulded by those pollinators that visit it most frequently and effectively’. Chapter 3 explores the evolutionary shifts between bee and hummingbird pollination in penstemons by mapping pollination systems on a molecular phylogeny. The following two chapters give an overview of pollen specialisation among bees, and detail the historical background and current confusion over the taxonomic spectrum of pollen-collecting bees. In Chapter 6 Susanne Renner discusses the question how non-rewarding flowers can survive bearing in mind the sophisticated learning abilities of flower visitors and how lack of rewards relates to specialisation in plant–pollinator interactions. The last chapter in this part treats the ecological factors that promote the evolution of generalisation in pollination systems.

Part 3 (Community and biogeographic perspectives) contains six chapters, among them some of the best chapters of the book, beginning with a chapter reviewing how entire plant–pollinator communities can be treated as networks of interactions using multivariate statistical methods. Subsequent chapters of this part are devoted to ecological and evolutionary processes that generate the features of pollination networks,

and the influence of season and geography. The final two chapters of this part take up the question: are the tropics more specialised than other latitudinal zones? Part 3 is particularly valuable for the reader interested in new statistical techniques and visualisation methods to analyse community data.

Part 4 (Applications in agriculture and conservation) is composed of four chapters asking the question what can we learn from pollination biology studies for biodiversity and conservation? The first chapter of this part revises early attempts to classifying pollination systems and recent data (Ellis & Ellis-Adam 1993) to find a system that could simplify the practical job for crop management and conservation of wild plants. In the other chapters the effects of habitat isolation and fragmentation on the extinction risks for specialists and generalist plants are discussed.

In the final chapter of the book (Part 5, Final considerations: pollination compared to other interactions) Jeff Ollerton addresses broader questions of patterns of specialisation and generalisation across different mutualisms.

We think that the concept of the book works very well as long as the reader does not expect a conceptual framework that offers a full solution to the discussions and problems of the past. Instead, this book provides readers with thought-provoking material and allows them to develop their own ideas.

In summary, *Plant-pollinator interactions* is an important contribution to our understanding of specialisation and generalisation in plant-pollinator interactions. It is certainly a stimulating book not only for pollination biologists but also for evolutionary ecologists, with each chapter offering new insights. Because it goes beyond pollination it is also interesting for people from other fields in which interspecific interactions are studied. The book is thought-provoking enough to make an excellent graduate seminar or course textbook.

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Roast kakapo for dinner, anyone? Conservation management from an international perspective

Mills LS 2007. Conservation of wildlife populations: demography, genetics and management. Blackwell Publishing. 424 pp. Paper, ISBN 1405121460, US\$70.00.

One of the outcomes of the conservation crisis in New Zealand has seen Kiwis (of the *Homo sapiens* variety) leading from the front in conservation management. New Zealanders are thus renowned worldwide for their innovativeness in this field. As a result, we tend to look inwards for solutions among ourselves, and largely miss the global perspective in conservation management. L. Scott Mill's book *Conservation of wildlife populations* is an outstanding text highly suitable for our postgraduate students and even conservation scientists, offering an international perspective into the discipline of conservation and management of wildlife populations.

An international book featuring the nationally critical grand skink (*Oligosoma grande*) from Otago as the main cover photograph simply can't go wrong, in my opinion. As it follows, *Conservation of wildlife populations* turns out to be an extremely cohesive, thorough and balanced book in this highly dynamic and evolving field containing intricate complexities in each and every wildlife situation – a very difficult topic to cover comprehensively in one book. Scott Mills has thus done an amazingly effective job in reviewing and bringing together the most relevant concepts and principles across the fields of population ecology, demographics and population genetics. This book is therefore a very useful conceptual framework for use in applied informed decision-making to solve real-world issues in wildlife and population biology.

The topics within this book are presented in depth with real-world examples provided in 57 case studies, of which some come from a New Zealand context. Mills displays a clear and authoritative approach in his words, which reflects his considerable knowledge and understanding of wildlife conservation and management, making use of an extensive peer-reviewed literature in citation.

Mills has been particularly effective in getting

down to the simple nuts and bolts of what may appear to be daunting concepts and equations for either the conceptually or statistically challenged ecologist. He also discusses contemporary issues with compelling reasoning for arguments and presents several 'rules-of-thumb' throughout this book, including the primary caveats that accompany these. This book is therefore highly stimulating and thought-provoking.

Mill's book is divided into three sections, and covers 14 chapters; he initiates each chapter with quirky quotes and concludes with a simple summary of that chapter's contents and references. The first section is an introductory outline of applied population biology. Mills cleverly ties together the concept of human population dynamics with extinction rates of other species in the first chapter, but curiously raises the topic of harvest management rather too early. The second chapter is a brief overview on the fundamentals of experimental design, interpretation of data and ethics; the third covers genetic concepts and tools as applied to wildlife population biology; and the fourth discusses sampling techniques for the estimation of standard population vital rates (i.e. abundance, density, survival, reproduction and sex ratios).

The second section focuses on population processes over six chapters. The first chapter in this section (Ch. 5) covers density-independence and variance in population growth while the following chapter covers density-dependent growth, including limit cycles and chaos. Chapter 7 discusses ways to incorporate age- and sex-specific differences into population-projection models using a matrix and in adding stochasticity and sensitivity analyses to these models; however, Mills does not feature a life table to compare against the matrix, for readers unfamiliar with tables. Chapter 8 covers predator-prey relationships, including the mesopredator and hyperpredator concepts, and an outline on the henhouse syndrome – all relevant in the New Zealand situation. Chapter 9 discusses genetic variability, inbreeding co-efficients and depression in wildlife populations. This section wraps up with a discussion on multiple populations and their connectivity.

The final section synthesises the concepts and principles discussed in the first two sections by application of knowledge of population processes to issues in wildlife populations. Chapter 10 discusses deterministic factors in small and declining populations. There are surprisingly small sections on wildlife corridors in a landscape matrix and translocations in the same chapter, although Mills often discusses translocation outcomes throughout the book. Wildlife translocations along with their complexities and considerations probably should have been discussed more in depth. Chapter 11 explains the various challenges confronting wildlife today in the face of

human-caused deterministic perturbations, including global climate change. I found the parasitism/disease section too brief, but this is not surprising as such factors are often underestimated in wildlife biology. Chapter 12 introduces the concept of the extinction vortex and suggests some ecological characteristics within species in predicting risk. Population viability analysis and other approaches in viability assessment are included here. Mills clearly defines and discusses focal species concepts (e.g. flagship and indicator species) in Chapter 13, as a practical way of bridging population biology with ecosystem approaches. The last chapter covers sustainable harvest of wildlife, and considers overharvesting of pest populations to the point that the extinction vortex comes into play. The book closes with a simple yet effective epilogue.

The only weak aspect of this book appears to be the 'harvest management' sections. I read these chapters with scepticism. As Mills explains, harvest of a species need not have negative effects on the population as a whole in certain situations. That said, I cannot see application of sustainable harvest management within a New Zealand context considering our ecologically naïve species, such as the kākāpō, are already subjected to heavy 'additive mortalities' as a result of human-caused perturbations. However, those considering management of Māori customary harvest of muttonbirds, or similar, may find these sections useful.

What this book does lack is inclusion of a recent development in conservation management: there is no mention of artificial insemination emerging as a possible tool for the genetic management of populations. This missing topic is surprising, given a main aim of this book was to bridge the two fields of population genetics and population biology. Artificial insemination is an emerging tool to manage genetic variation, avoiding inbreeding co-efficients and genetic depression within and across multiple, meta- and captive wildlife-populations and is clearly an obvious link between the two disciplines. Artificial insemination is currently being trialled in New Zealand (e.g. Molinia et al. 2007).

I believe this book offers New Zealanders a refreshingly simple opportunity to revisit long-standing issues in conservation and management, and to develop further innovative solutions to overcome these issues. Two continuous themes run throughout this book: to embrace uncertainty and to accept the fact that ecological processes are not democratic. In doing so, researchers are able to rank and act on priorities and threats when facing the overwhelming task of conserving wildlife populations. I highly recommend this book as an indispensable reference and 'tool-kit' of concepts and their principles both for postgraduate students and conservation scientists.

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Perspectives on habitat fragmentation

Lindenmayer DB, Fischer J 2006. Habitat fragmentation and landscape change: An ecological and conservation synthesis. Collingwood, Victoria, Australia, CSIRO Publishing. xviii + 328 pp. Paper, ISBN 0643093907, AU\$69.95.

There are no longer any regions of the world unaffected by anthropogenic land-use change. In the past century, dramatic native species declines have been recorded as a result of habitat loss in both temperate and tropical biomes. In New Zealand, these processes have been equally severe, with at least 71% of the original natural vegetation cover destroyed and much of what remains being heavily fragmented. Lindenmayer and Fischer's *Habitat fragmentation and landscape change* would seem well placed, then, to provide New Zealand ecologists with a benchmark synthesis of the current state of knowledge in this field. In many respects the book meets this challenge, with a wealth of information presented in what might best be described as a solid 'primer' on a range of important subject areas. Unfortunately, the book falls short of its goal of providing a 'synthesis' of habitat fragmentation and landscape change. The problem is not so much one of dealing with such a massive and varied literature, but one of structuring the book around the authors' singular perspective that the way to address the weak conceptual underpinnings of the field is to create clear divisions, rather than to synthesise. Frustratingly, Lindenmayer and Fischer spend the majority of their book explaining and reinforcing a particular paradigm that fragmentation should be separated into semi-dichotomous sub-disciplines, rather than synthesising these sub-disciplines into a cohesive whole.

In terms of overall structure and presentation, the book is hierarchically divided into five major parts, each with multiple chapters of varying degrees of interrelatedness within each part. A particularly

nice aspect of this structuring is the ubiquitous 'topic interaction diagram' that appears regularly throughout the book, tracking the reader's progress through a sort of 'mind map' of how the authors think the various chapters interrelate. However, Lindenmayer and Fischer appear to have taken one of the classic rules of thumb for oral presentations and adopted it liberally as the strategy for structuring their book: that old chestnut 'tell your audience what you're going to tell them – tell it to them – then tell them what you told them'. The problem is that it is laborious and repetitious in the extreme. For example, in the first 40 pages of the book I estimate that 10 pages or so were simply describing the outline of what was to come, and summarising what we were just told. Perhaps this was a purposeful, and arguably useful, strategy targeted at first-year undergraduate students, but it is at odds with the level of treatment of the subject in most chapters. The book appears to me to ride a middle ground between basic undergraduate introduction and professional academic review, with a likely useful target audience of third-year undergraduate students. The better chapters in the book would certainly make a strong entry-level summary of the field for this readership. The tables and illustrations are quite formulaic in approach, drawn from and following the style of Lindenmayer and Fischer's many recent publications in these areas. These work well as summary take-home messages, and the boxed text vignettes are very well considered and make strong 'break-out' focal points, which complement the main text. Unfortunately, the overall quality of presentation of the book is let down by the dull black-and-white photographs.

In terms of the scientific structuring of the book, there are several major problems that lead to confusion and inconsistencies in what the real take-home messages are supposed to be. In Part I, Lindenmayer and Fischer give two reasons for writing the book: (1) as an overview of the varied and interrelated topics encompassed within landscape change and fragmentation; and (2) because the term 'habitat fragmentation' has become vague and ambiguous, and there is therefore a need to disentangle 'habitat fragmentation' into subcomponent parts or themes. It is this second reason that sets a curious tone of 'perspective', rather than 'synthesis', in the book. Achieving conceptual clarity in a field is truly important, but it is hard to escape the conclusion that breaking down a concept such as habitat fragmentation into its component parts (area effects, edge effects, isolation and so on) might be useful to investigate small-scale mechanisms of effect, but is in many ways the antithesis of the synthesis that is promised in the title. 'Habitat fragmentation' is a useful overarching framework to encompass the complexity of interactions among multiple factors, much as the term 'biodiversity' is used as a broad umbrella term to encompass multiple levels of biotic organisation.

In fact, hidden away at multiple points throughout the book are discrete indications that the authors know full well that the complexity of interaction among multiple factors makes separation into distinct 'themes' almost impossible (such as on p. 150 where they conclude that 'the separate discussion of these themes was useful to break down fragmentation... into its subcomponents... [but] typically, in real ecosystems, multiple aspects of landscape pattern change simultaneously').

Another major problem lies in dividing the main body of the book into two parallel and strongly overlapping halves based on a perceived point of distinction between the interpretation of 'vegetation pattern' versus 'habitat pattern'. To Lindenmayer and Fischer, landscape change is often referred to in terms of change in the dominant vegetation pattern, and vegetation patches may or may not correspond to 'habitat' for particular species. This is a fair point, but Lindenmayer and Fischer have raised it into an unwieldy and unworkable dichotomy, as if landscape and habitat are always two completely separate things. They equate the landscape vs habitat dichotomy with a human vs species perspective that focuses on pattern vs process, at the community vs species level, respectively. The tone of the book is very much that the search for the 'truth' of habitat associations for species will set us free from the biased human perspective of landscape pattern. The problem with this is that their definition of habitat is much like that of a metaphysical niche concept, in which species exist at points in space where a nebulous set of ill-defined requirements or tolerance limits intersect. This would be fine if there were no other 'non-habitat' factors that simultaneously altered the historical or current distribution of individuals, such as human hunting or other anthropogenic threats, and altered species interactions or dispersal limitation; but there are – lots of them. Near the end of the book (p. 195), they acknowledge the artificial distinction between vegetation vs habitat approaches and that the two perspectives may coincide where some (or many) species responses coincide with vegetation patterns. The structure of the book would have been well served to have this more balanced perspective adopted from the outset.

Instead, Lindenmayer & Fischer end Part I, the overview of how landscape changes affect organisms, with the conclusion that process-oriented research 'is a useful starting point' for investigating how landscape change affects organisms, and hence they structure the main section of the book into two discrete halves, beginning with Part II – The species perspective: key processes affecting individual species, and then Part III – The human perspective: landscape patterns and species assemblages. On the one hand, it is obvious that the ideal scenario would be to know the underlying mechanistic reasons for all species responses to

landscape change, but on the other hand it is self-evident that investigating these mechanisms is both difficult and costly, and therefore some knowledge of 'pattern' is always required in order to judge what is relevant to study. Curiously, it appears that Lindenmayer and Fischer also appreciate this fact as they approach the final management section from the 'efficient starting point' of addressing landscape-pattern-oriented management strategies first, and then management strategies that focus on individual species and ecological processes second. This, of course, is the natural sequence of scientific exploration – and of adaptive management strategies too, and would have been the logical structure to apply to the whole book.

Despite these criticisms, I would unquestionably recommend specific chapters in this book for further reading, such as the introduction to edge effects (Ch. 11) and landscape connectivity (Ch. 12). *Habitat fragmentation and landscape change* is both an enlightening and challenging overview, if not a wholly palatable synthesis.

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