

Book Reviews

Towards Forest Sustainability

David B. Lindenmayer and Jerry F. Franklin (eds). CSIRO Publishing, Collingwood, Victoria, Australia, 2003, 231 pages. Price AUD\$39.95. ISBN 155963 381 6 (softcover).

‘Provocative’ would be a fair word to use to describe this collection of 12 essays on developing sustainable forest management, presented at a Forestry Roundtable Meeting held in Marysville, Victoria, Australia, in 2002. David Lindenmayer and Jerry Franklin are the editors, as well as authors of several of the articles. They are of course among the most prominent scientists in the world in devising new ways of maintaining biodiversity in forests, Lindenmayer primarily in Victoria and Franklin in the moist temperate forests of the Pacific North-west.

There are four articles each on North America and Australia–New Zealand, and two on Scandinavia. No presentations are given from tropical countries – although swidden agriculture with long forest fallows was employed for thousands of years, its pure form seems to be disappearing under population pressure. Would there be examples of reasonably sustainable forest management in the tropics?

The main discussions are in two areas:

1. What should be the model for production of wood for the world’s needs? Should this wood come mostly or completely from plantations? If all remaining native forests go into reserves then how should they be managed, and how will these new systems be paid for?
2. If native forests are still used for timber production how can they simultaneously be managed for maximum biodiversity?

Readers of *Austral Ecology* may not agree with Franklin’s suggestion that the Southern Hemisphere holds an advantage in its ability to grow trees and should therefore be the main location of ‘fibre farms’. He argues that production by exotic species can be very high in this hemisphere and ‘many of the sites have been previously used for agriculture or grazing so costs of preparing sites or mitigating environmental impacts is often low’. In fact establishing new trees on former pasture sites, particularly in the subtropics and tropics, is particularly difficult and expensive.

The book contains a fascinating discussion by the American conservation biologist Michael Soule of the role of large mammals in US forests. He examines the history of large-scale extinctions, beginning with loss of megafauna about 13 000 years ago and up to

and including the still-applied programs of predator control in western states. Yellowstone National Park is one of the oldest national parks and is a case study of an ‘ecosystem-out-of-balance’. In Yellowstone, elk and moose are herbivores whose populations have expanded greatly and have had follow-on effects: in wetter areas moose have had heavy impacts on willows, leading to loss of beaver populations and lowered water tables. Wolves were reintroduced in 1995 and seem to be taking some pressure off plant resources. Likewise, white-tailed deer have run rampant over the Midwest and East of the US, damaging forest understorey plant diversity and holding back regeneration of many tree species. Measures other than reintroducing wolves in such heavily populated (human) areas will have to be found.

Most of the chapters deal with the major issues in managing forests for wildlife conservation and wood production: retaining live and dead hollow or habitat trees, reserving corridors, leaving or creating new reserves in the matrix of ‘working’ forests, mixing size and age classes across the landscape.

‘Adaptive management’ is a key phrase these days, meaning that we can change management practices as knowledge improves. It is something most writers here favour. Fitting this principle into a policy framework is not easy and several of the authors discuss the relevant policy challenges. Too loose a system could threaten the loss of species; too restrictive and prescriptive a regime could prevent the development of new systems which actually meet biodiversity and production goals.

Overall, this is an excellent and inexpensive introduction to the major issues involved in moving towards sustainable forest management.

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Population Ecology: First Principles

J. H. Vandermeer and D. E. Goldberg. Princeton University Press, Princeton, New Jersey, USA, 2003, xxiv + 280 pages. Price AUD\$68.00 (paperback). ISBN 0691 11441 2.

Population ecology offers a theoretical and mathematical underpinning for a diverse range of theoretical

and applied disciplines (e.g. community and landscape ecology, resource–consumer interactions, conservation biology, wildlife harvest, pest management and epidemiology). In fact, it is probably not overly bold to suggest that it provides the fundamental conceptual framework for ecology. Clearly then, an understanding of at least the basic elements of population ecology is important for all contemporary ecologists. *Population Ecology: First Principles* delivers a modern and succinct introduction to this field, targeted at higher-level undergraduates and postgraduates with a working (but not advanced) knowledge of linear algebra and calculus. A similar book, with a somewhat less specialized focus, is Hastings (1997).

The authors are quite clear on the aims of this book: to develop the reader's understanding of population ecology by establishing firmly a set of basic (first) principles. These are arrived at via deduction and deep theory (the heuristic approach), instead of through the more common route of induction and inference (the empirical approach). That is, they adopt a 'bottom-up' rather than 'top-down' method to teaching, and reach back historically to demonstrate how the most general principles in population ecology were developed, through models and experiments, by luminaries such as Lotka, Volterra, Gause, Nicholson and Leslie.

Whilst their chosen approach is highly advantageous for emphasizing the theoretical fundamentals of population ecology, it does tend to limit the overall scope of the book, because it provides neither a review of state-of-the-art methods in the discipline (I suggest you consult Turchin 2003 if you want this), nor a particularly rich source of examples of the application of theory to real-world situations (a better choice in this regard would be Akçakaya *et al.* 1999). To be fair, no book of modest proportions and intention could hope to embrace the whole of a diverse and rapidly developing field. Thus although *Population Ecology: First Principles* could not be used as a stand-alone textbook for coursework or self-instruction (apart from the above stated limitations, no problem sets or worked examples are given), it would serve well as a primer on key topics, such as demographic models, life history trade-offs, complex population dynamics, competition models, and metapopulation theory.

The major strength of the book lies in its ability to foster an understanding of the basic conceptual and mathematical foundations required for developing complex theory and applications, and its emphasis on transdisciplinary approaches to environmental problem-solving. Its main weakness is that the authors provide only tenuous links between a body of largely deterministic theory and the real world 'problems' of statistical parameter estimation, model selection uncertainty, temporal and spatial variability and auto-correlation (though chapter 5 provides some brief discussion on these last points). For instance, impor-

tant tools of modern ecological investigations, such as meta-analyses and simulation/statistical modelling, are given scant attention, yet these provide potentially powerful means of embracing uncertainty, complexity and ambiguity. Another drawback is the absence of any implementation framework (e.g. S-Plus, MatLab or Excel), which may leave the reader pondering how to actually put the theory being developed into practice.

Population Ecology: First Principles is a very useful tutorial on why, and how, population-level phenomena are important for a variety of applied problems faced by environmental researchers and managers. Despite its self-imposed limitations, the book also provides a solid yet flexible springboard for launching confidently into more advanced experiments and modelling in population ecology and related fields.

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Primary Succession and Ecosystem Rehabilitation

L.R. Walker and R. del Moral. Cambridge University Press, Cambridge, 2003, xiii + 442 pages. Price AUD\$120. ISBN 0521 52954 9.

The development of vegetation and faunal communities on bare substrates has long challenged ecologists looking for patterns and mechanisms. An enormous volume of literature has been published on primary succession. This very readable book meets the challenge of summarizing and integrating that literature extremely well. It goes on to demonstrate how theory developed for primary succession following natural disturbances can be applied to promote the rehabilitation of lands severely degraded by human activities.

The authors state that they had three objectives in writing this book. First, they wanted to convey their enthusiasm about the dramatic consequences of

disturbance and studying the process of the return of biota. Second, they wished to contribute to practical understanding of how to accelerate reconstruction of damaged ecosystems by identifying constraints to ecosystem development. Third, they wanted to present an organized synthesis of knowledge about the patterns and processes of the broad topic of primary succession leading to identification of areas for further research. The enthusiasm of the authors is apparent and they provide a very well organized, concisely explained, information packed and comprehensive synthesis of current knowledge on primary succession. Applicable terminology is defined, explained and discussed, making it a valuable reference for a student starting disturbance ecology research. Key selected references support statements on theory, methodology and experimental studies and the reference list is over 70 pages. Having key references put into context also makes this book a valuable reference for seeking further information on a particular area. Experimental studies discussed in the book represent various international regions and biomes, giving the book a global perspective.

Chapter 1 defines primary succession and discusses the role of primary succession in addressing rehabilitation following human disturbances. It also briefly discusses various methodological approaches for studying primary succession and their advantages and pitfalls.

Chapter 2 discusses disturbance as a concept and specific types of disturbance that can allow primary succession to occur. Key factors affecting ecological recovery are disturbance frequency, extent and severity and the characteristics of the resulting substrate. Specific disturbance types include volcanoes, earthquakes, erosion, landslides, bare rock, cyclones, dunes, floods, permafrost, tsunamis, and human induced disturbances (mining, erosion, infrastructure, military).

Chapter 3 discusses the history of successional theory, viewpoints/approaches and paradigm shifts within the field, including Clementsian holism, neo-holism, phytosociology, reductionism, neo-reductionism, ecosystem assembly rules and modelling of succession.

Chapter 4 discusses soil development during primary succession, including how various physical disturbances and environmental factors affect soil formation and how soil properties vary with succession. Factors that are considered include climate, parent material, topography, erosion, soil texture, compaction, water holding capacity, pH, nutrient content, nitrogen fixation, soil organic content, soil microbes and other biotic influences.

Chapter 5 discusses the life histories of early colonists, including pollination, seed banks, vegetative expansion, seed dispersal mechanisms, dispersal barriers, lottery effects, germination, emergence,

persistence, longevity and successional consequences of dispersal and establishment.

Chapter 6 discusses species interactions. Interactions between biota and soils are initially considered, then interactions between plants and interactions involving animals. Facilitation, inhibition, tolerance and the environmental factors that result in those interactions are discussed in detail.

Chapter 7 discusses successional patterns. Various types of successional trajectory are explored along with the rates of successional processes. Biodiversity, community stability and biomass changes are discussed, and the effects on successional development of moisture, temperature, nutrients, salinity, landscape effects, disturbance and pollution.

Chapter 8 discusses the applicability of primary succession theory to the rehabilitation of disturbed lands. It introduces rehabilitation terminology and how ecological theory should assist with rehabilitation goal setting. Rehabilitation processes, planning and implementation are briefly discussed, along with techniques for overcoming adverse conditions, including drought, water logging, infertility, toxicity, salinity, extreme pH, low temperature, unstable substrates, weeds, grazing and air pollution. The last part of the chapter discusses general successional issues for rehabilitation including increasing rehabilitation rate and improving the aim to achieve the specified target community. While I found the other chapters to be excellent, well organized, concise summaries and syntheses of the topics they dealt with, this chapter was less satisfying. In several sections it tended to describe specific examples in considerable detail with less development of generalizations and in other sections was fairly superficial. Human generated disturbances and assisted rehabilitation can allow the underlying substrate to be modified to some extent, preventing substrate problems such as acid rock drainage but this aspect was not mentioned. Theoretical and practical restoration ecology is a large topic to fit into a single chapter. Never-the-less it contained a good summary of many issues with references cited to obtain further information.

Chapter 9 discusses future research directions. The authors expect that successional theory will develop along three interlaced approaches; modelling, experimentation and search for generalities. Modelling is expected to become a more important tool as stochastic models advance and as contingency and landscape effects are better understood and modelled. Standardized experimental protocols are desirable for generalizing successional trends across different geographical regions and biomes. A range of specific processes that are poorly understood are also discussed. Generalizations are expected at a functional group and process level rather than at a species level.

This informative and thought provoking book would be useful for undergraduate students, post-graduates, community ecologists and restoration ecologists.

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A Complete Guide to Reptiles of Australia

Steve Wilson and Gerry Swan. Reed New Holland, Sydney, New South Wales, 2003, 480 pages. Price AUD\$49.95 ISBN 1 876334 72 X.

The Australian continent harbours one of the world's most diverse reptilian faunas. This may hardly be surprising given Australia's size and its vast expanse of suitable reptile habitat. The ability of Australian reptiles to adapt to every available terrestrial and aquatic habitat has led to the evolution of distinctive reptilian faunas within different environments and driven the remarkable diversification of reptiles. However, while high profile herpetologists such as Steve 'Crocodile Hunter' Irwin take great pride in showcasing Australia's crocodiles (2 species) and venomous snakes (133 species) on the world stage, these two groups only represent a small proportion of the reptilian fauna. Australia's reptilian fauna is believed to number 836 species and is dominated by lizards (615 species), and in particular skinks (370 species).

While there has been a plethora of excellent books and guides to the reptilian fauna of Australia, these are either now long out-of-date (e.g. Wilson & Knowles 1988; Ehmann 1992) or have been regional in their focus (e.g. Hutchinson *et al.* 2001). Although the current herpetological 'bible', the 6th edition of Cogger's *Reptiles and Amphibians of Australia*, was published in 2000, this book has not been fully revised for more than a decade, as evidenced by the 35 pages of appendices detailing taxonomic changes. Consequently, herpetologists have waited with much anticipation for the publication of an up-to-date volume on the reptiles of Australia, and in this light *A Complete Guide to the Reptiles of Australia* is a welcome addition. However, it is worth noting right from the outset that this book is not intended as a replacement for Cogger (2000), rather due to its relatively brief species accounts the authors advise that it 'should be used in conjunction with existing larger format books, scientific publications and regional guides' (p. 5).

The book is organized into two main parts. The first part contains concise explanations of classification and

taxonomy, species identification, species accounts, distribution maps, photographs and conservation status. A glossary of terms and diagrams illustrating the commonly used morphological and taxonomic terms enables this book to cater for both the experienced professional and amateur herpetologists. The book then highlights the extraordinary diversity of Australia's reptiles and speculates as to the potential mechanisms that have driven such diversification within Australia. The first section of the book ends with colour photographs highlighting the variety of habitats and environments that reptiles inhabit.

The second part of the book comprises concise descriptions of all 836 reptile species described in Australia, ranging from tiny skinks (*Menetia* spp.) to the gigantic Estuarine Crocodile (*Crocodylus porosus*). Short and informative introductions are provided to each of the major groups of reptile: Crocodiles, Turtles, Lizards and Snakes. Within each family there are accounts of each genus and the species contained within each genus. Although the species accounts are brief, each contains information on the scientific name, common name/s, approximate size, distribution, identification, conservation status and other pertinent notes. Since the book lacks any taxonomic keys for identifying individual species, the distinguishing features of each species are listed in bold to aid (when used in combination with the photographs) in the identification of reptiles collected in the field. However, most impressive is the quality of the photographs, generally showing live animals in their natural environment, and where applicable photographs of subspecies, regional variants and sexual differences within species.

Apart from having the most up-to-date coverage of the reptiles of Australia, this book has several important elements that make it stand out from previous works. In contrast to Cogger (2000), *A Complete Guide to Reptiles of Australia* is small enough for use in the field, a result of the brief species accounts. Although the book lacks the detailed morphological, life-history, reproductive and ecological information that I have often found so useful in other guides (e.g. Wilson & Knowles 1988; Ehmann 1992; Cogger 2000), this appears to be the necessary trade-off to keep this book portable. The absence of detailed taxonomic keys should not be regarded as a significant obstacle for this book being used to identify lizards in the field. It lists the distinguishing characteristics in bold in the species description, has excellent photographs, and contains detailed distributional maps that appear to be superior in accuracy to previous texts, although their small size may sometimes make it difficult to interpret the exact species distribution.

This portable guide to the reptiles of Australia is certainly a welcome addition to the herpetological literature, although it would probably be premature to

start retiring your copy of Cogger or favourite regional guide to the dark depths of the bookcase just yet. Rather, space should be reserved in your backpack for *A Complete Guide to the Reptiles of Australia* next to your preferred regional guide to enable confident identification of reptiles in the field, with Cogger retained in the office for later verification of the identification.

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