

The chapters in the book flow smoothly into each other and the writing style is clear and vibrant. The abundant boxes and diagrams are easy to understand and are used to good effect. Being somewhat of a desert enthusiast myself, I might have liked to see a few more colour plates, although the ones shown (five in all) do demonstrate some important desert strategies employed in contrasting situations. I believe the book is aimed at a wide readership, by no means only resource managers and policy makers.

All in all, this book is a delight to read. More importantly, the insights provided do much to clarify how deserts operate, particularly in a socio-environmental context, how their governance can be improved, and how the lessons learnt from them can benefit the entire nation (and world) in increasingly drying and resource-depleted times.

## Forest Pattern and Ecological Process: A Synthesis of 24 Years of Research

David Lindenmayer (2009)  
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FOR a biologist attaining his doctorate in 1990, David Lindenmayer has been nothing less than prolific. His web page at the Australian National University (ANU) credits him with more than 520 scientific publications and 20 books. This book, *Forest Pattern and Ecological Process*, brings together his 25 years of research experience in the montane ash forests of Victoria's Central Highlands. That research began in 1983 with studies of the ecology of Leadbeater's Possum *Gymnobelideus leadbeateri*, an iconic and endangered arboreal marsupial and led to his doctorate from ANU entitled *The Ecology and Habitat Requirements of Leadbeater's Possum*. I remember reading that dissertation and thinking how good it was and the promise it held for the young biologist who wrote it. I was not wrong.

In the preface, Lindenmayer states that this book is "written for a broad audience", including researchers, managers, policy-makers, and those with an interest in nature. Foremost, it is a synthesis of David's work in the Central Highlands, but it is also "about how a forest works". The introduction contains a caveat that the book refers frequently to Lindenmayer's own publications and there is an apology to those who might find frequent self-citation annoying. David is prone to self-citation, but he has done the work, it is good work, and he should feel confident in promoting and sharing it with others. Apologies are not necessary. Studies by other workers in the Central Highlands and forests of Australia are cited as required and the extensive collaboration that went into Lindenmayer's own research is made transparent. Enough about David Lindenmayer.

This is a book about how a forest works, about the ways ecologists study forests, and about outcomes of research and how these can be used to improve forest management and conservation. Victoria's montane forests are not only biodiverse with many threatened

species, but they are a valued resource for timber, water, honey, and tourism, among other uses. Integrating the needs of the forest's flora and fauna for survival with human aspirations for resources, jobs, and profits has been an area of conflict and compromise for decades. Meeting these goals requires research, but it also requires understanding. Sometimes research and understanding go hand-in-hand, sometimes they do not; it depends on who is doing the research. As you read through *Forest Pattern and Ecological Process*, it becomes clear that this is an example of research and understanding progressing together.

There are seven parts to the book. An introductory section provides the requisite background of geography, geology, and biota, and gives simple descriptions of the field techniques used to study forest plants and animals. Parts II and III describe the composition and structure of the forests in the Central Highlands. Two forest types or kinds predominate, one dominated by eucalypts *Eucalyptus* spp. (ash-type) and the other by Myrtle Beech *Nothofagus gunnii* (loosely "rainforest" or "cool temperate rainforest"). Rainforest plants are also an important component of the understorey of the much taller (90–120 m in height) eucalypt forests. In describing the montane ash forests, Lindenmayer has a useful account of old-growth and why it is difficult to define. Disagreements over what is or is not old-growth forest have wasted inordinate amounts of time and resources in debates over forestry activities and forest conservation, so it is good to see a calm and reasoned discussion of old-growth and their importance or otherwise to the forest vertebrate fauna. Perhaps this is the appropriate place to note that, although Lindenmayer writes about forest animals, it is really about forest vertebrates and, more specifically, about birds and mammals. These are his research animals and little is said about invertebrates. Invertebrates are only mentioned once (p. 28) and arthropods, the most diverse faunal assemblage in forests, are not listed in the index. There is also little about frogs and reptiles. This is not a criticism, just a reflection on how much more work needs to be done before we can really say we understand how Australian forests work.

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There are three chapters on forest structure in Part III. The first of these (Chpt. 6) is the longest (38 pp.) and deals with tree hollows and their importance to forest vertebrates. I admit to having a cringe response every time I see text about the importance of tree hollows for forest fauna. Not that hollows are not a key structural attribute of eucalypt forests or that many birds and mammals depend on tree hollows for nesting and shelter. However, there is a preoccupation in forest policy and conservation circles that tilts management options towards hollow-dependent mammals and birds, when in fact these are a small part of forest biodiversity and other, non-hollow dependent fauna require different structures that may or may not be properly managed and conserved by protecting large trees with hollows (see Recher 2004 for a fuller discussion). Lindenmayer does comment that the relationship between hollow-dependent marsupials and tree hollows in the ash forests of the Central Highlands appears more pronounced than in other eucalypt forests (p. 108) making it all the more important that forest managers and conservationists be aware of the problems that can occur when research from one area is transferred uncritically to elsewhere. This happens too commonly in Australia for the simple reason that green groups drive Australia's conservation agenda and these groups have a poor grasp of science and little understanding the intricacies of ecological processes relying instead on emotion and a perception (common to all Australians) that big is better (trees, cars, population or whatever, it doesn't matter; big is grand). I do not intend this as a criticism of *Forest Pattern and Ecological Process*, rather it is a cautionary note that *Forest Pattern and Ecological Process* is a synthesis of Lindenmayer's 25 years of research in the Central Highlands, research that has focused strongly on hollow-dependent fauna and their requirements. Lindenmayer is clear about this as he writes and there should be no confusion provided readers understand what is being said and its genesis; experience has taught me that this is not always the case, hence the cautionary note.

The two other chapters in Part III address the structure and composition of the understorey and shrub layers and logs respectively. There was a time when logs, standing dead trees and dead wood, coarse woody debris, litter, and even bark were lumped as hazards and fuel for fires, with little or no recognition of their importance to fauna and ecological processes in forests. Changes in attitude towards these key structural attributes first appeared among forest biologists in the Pacific Northwest of the United States, but have now spread to Australia where they at least get lip service if not management and conservation attention.

Reducing fuel loads, which I prefer to call "food for forests", continues to dominate forest management in Australia, but attitudes are changing. Lindenmayer's sequel to this book, which will be written after another 25 years as he and his colleagues document the effects of the Black Saturday (7 February 2009) fires on the forests of the Central Highlands, will have much less about hollows and trees, and much more about dead wood and shrubs.

The preface to Part IV of *Forest Pattern and Ecological Process* states that "understanding why

species occur where they do is a fundamental part of ecology . . . [and] of management and conservation" (p. 131). Chpt. 9 considers the distribution and abundance of the marsupials and birds that have been central to Lindenmayer's research and the features of the forest affecting them. Chpt. 10 is an account of the population viability analyses (PVA) conducted for Leadbeater's Possum, Mountain Brushtail Possum *Trichosurus cunninghami*, and Greater Glider *Petauroides volans*. I don't find PVA very interesting, but this chapter is a nice introduction to the procedure and shows how PVA can be used to identify conservation and management priorities. Chpt. 11 is about the composition of bird and mammal (arboreal marsupials) communities. There is a nice section on resource partitioning among arboreal marsupials, as well as one on the factors affecting bird assemblages. Also discussed in this chapter are assembly rules, rank abundance distribution, and resilience of assemblages for birds. It is obvious more work is needed especially in understanding bird communities in eucalypt habitats, but Lindenmayer identifies two lessons that he has learnt from the studies reviewed in this chapter. Firstly, there may be no such thing as an "indicator species", meaning managing for one taxon does not mean all other taxa will benefit. Secondly, studies of assemblages (the "in" word these days for "communities") and single species are complementary. Both are needed to develop effective conservation and management strategies for Australian forests (and woodlands).

Part V of *Forest Pattern and Ecological Process* reviews Lindenmayer's studies of disturbance; fire, logging, and salvage logging (after fire) are considered in separate chapters. Lindenmayer, sensibly, considers fire, including wildfire, as "natural" (is anything "unnatural"?) and an important ecological process. In the Central Highlands, as in most, if not all, eucalypt forests and woodlands, wildfire is the "primary form of natural disturbance". This is an excellent account of wildfire in forests showing how fire determines broad area stand structure, as well as creating small scale structures (e.g., fire scars) important to wildlife. There is a good discussion of the importance of fire intervals, as well as recognition of the threats fire poses for the survival of individuals and species. It is worth noting that Lindenmayer dismisses the prevailing myth that wildfires on the scale of Black Saturday can be prevented by prescribed or hazard-reduction burning. This is especially true for the montane ash and rainforests of the Central Highlands which are normally too wet to burn and which require intense fire for stand regeneration. So far as I am concerned, much more important than the intensity of fire is its frequency and seasonal timing, consideration of which is not done well or at all by fire authorities in Australia.

For Lindenmayer (Chpt. 13, p. 193), logging is the dominant form of human disturbance in the montane ash forests. It is also the source of endless conflict between forestry and green groups. This chapter reviews the impact of logging on forest structure and therefore on forest fauna. The best documented effects of logging are on arboreal marsupials, but all other forest fauna are affected. Salvage logging, discussed in Chpt. 14, is somewhat

unique to montane ash forests (and to coniferous forests in North America) where fires kill large numbers of otherwise healthy and commercially valuable trees that can be harvested and used by people. Salvage logging is also contentious, as fire-filled trees become important resources for animals (and plants) establishing themselves in the regenerating forest. They may, for example, be the only source of hollows for decades or longer until regeneration matures and living trees develop hollows in their own right. Salvage logging can also reduce the number of standing live heritage trees (big, old ones) and lead to the regenerating forest being much simpler in structure. Complex structure, just as complex floristic composition, are central to maintaining forest biodiversity.

Part VI of *Forest Pattern and Ecological Process* addresses the issues of forest management and biodiversity conservation. Chpt. 15 considers reserves. Chpt. 16 explores ways to reduce the impacts of logging and Chpt. 17 is about monitoring, essential for the on-going improvement of management and conservation practices. It was nice to see another ecologist noting the importance of large reserves without confusing these with "wilderness". Wilderness may be necessary for human well-being and finding one's inner self, but Lindenmayer and his colleagues could find "no correlation between the occurrence of any species of arboreal marsupial in montane forests and the intensity of human development" (p. 221). In my opinion (Recher 1997, 1998a,b, 2002a,b), forest structure and composition along with the scale, nature, and intensity of disturbance, as discussed by Lindenmayer, are much more important in determining the distribution and abundance of species than wilderness *per se*. Although large reserves are important and are often wild, by themselves they will be inadequate to conserve forest biodiversity. As Lindenmayer (p. 221) explains, this is because "...reserve systems are rarely [never] comprehensive, representative and adequate for all elements of biodiversity". Be sure, also, to read the box on p. 225 on the limitations of wildlife corridors.

Recher *et al.* (1980) successfully promoted wildlife corridors as a core conservation protocol in forestry operations in the Eden Woodchip Industry and witnessed their extended much more widely. However, our second round of recommendations significantly expanded on the simple concept of a corridor (Recher *et al.* 1987), but these were never adopted and Lindenmayer is justified in highlighting the limits to corridors as a forest wildlife conservation protocol. The same can be said for corridors in agricultural landscapes and for many of the same reasons; narrowness, unrepresentativeness, and limited internal resources.

Chpt. 16 provides a good review of the different silvicultural strategies that can be employed to mitigate the worst impacts of logging on forest biodiversity. Changing silvicultural procedures is only part of the approach to mitigating impacts and, as Lindenmayer notes, "mitigating the effects of logging requires multi-scaled conservation and management strategies..." (p. 242). Without monitoring,

Lindenmayer emphasizes that there is no way of knowing whether conservation and management efforts are meeting their goals. Monitoring is not a simple procedure and there are few examples of successful long-term monitoring programs. The work in the Central Highlands provides a model of how to conduct a successful monitoring programme and makes good reading for anyone thinking of establishing monitoring protocols. By necessity, monitoring is long-term and not necessarily productive of outcomes in the short-term. Funding, as well as the longevity of researchers, therefore become core issues and have not been adequately addressed anywhere in Australia where the trend has been more to destroy long-term monitoring programmes than to encourage them and ensure their continuity beyond the lives of individual researchers (Recher and Lunney 2003).

The final chapter is a bit of a catch all. There is a limited attempt to pull the different themes of the book together and to look to the future. Volunteers and statisticians are acknowledged for their efforts in making all the work and its outcomes possible and there are the mandatory references to sustainability, carbon sinks, and climate change. In my opinion, not a very useful or effective concluding chapter to what is otherwise an excellent account of a very impressive research effort.

*Forest Pattern and Ecological Process* is informative, readable, and enjoyable. To benefit from reading it, a background in science or forest ecology is not necessary. However, researchers at all stages of their career will find it useful in thinking about their own work, while conservationists and forest managers will benefit from the unifying way in which the complexity of forest ecological processes are drawn together and used constructively to explore better and more sustainable ways to conserve and manage Australia's eucalypt forests. As I wrote towards the beginning of this review, "This is a book about how a forest works, about the ways ecologists study forests, and about outcomes of research and how these can be used to improve forest management and conservation." All of this is achieved admirably.

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# Remnants of Gondwana

## A Natural and Social History of the Gondwana Rainforests of Australia

Edited by Roger Kitching, Richard Braithwaite and Janet Cavanaugh

**... About 30 million years ago** the block of land we now call Australia was in process of splitting off from the Gondwana supercontinent. As the continental plates slowly parted there were a series of upward movements along what is now our east coast. This uplifting threw up a series of ranges and escarpments. In New South Wales and south-eastern Queensland in the present day, the eroded remnants of these highlands make up the Great Escarpment plus the worn down remains of a series of mighty Tertiary volcanoes. These, still commanding, features of our landscape affect our climate, vegetation, culture and way of life in a host of ways.



### What is Rainforest?

... Rainforest has a special place in the minds of humans. It is at once distinctive, beautiful, uncomfortable, bewildering, challenging and frightening. Why does it have this confusing image? For a generation, it has been a major focus of conservation efforts worldwide. It has come to represent the pinnacle of biological evolution on the land and a prime symbol of what conservation is all about. Once occupying 14% of the world's land surface, only 6% remains and continues to disappear at an accelerating rate. Of the 8 million hectares of rainforest in Australia at the time of white settlement in 1788, only 2 million hectares remain and many of these are isolated fragments that have been protected by being on rocky steep ground unsuited to agriculture (Fox *et al.* 1997)



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