

Conservation Biology for the Australian Environment

M. A. Burgman and D. B. Lindenmayer, 1998.
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CONSERVATION biology draws from a diverse range of academic fields. Already a number of textbooks are available on the subject. This book is the first attempt to place the concepts of conservation biology into a uniquely Australian context. The book aims to provide an introduction to the principles of conservation biology and supply information on the main quantitative methods and procedures important in detecting and solving conservation problems in Australia.

Australia holds the unenviable title of having the highest rate of recent mammal extinction and one of the highest rates of land degradation, all achieved in the last 200 years. The rapid ecological changes experienced in Australia provide many examples of environmental problems and solutions of relevance to the discipline of conservation biology.

The book is divided into four broad sections covering the basic concepts of conservation biology. Parts I and II introduce the general principles of the discipline. Part III presents an overview of the techniques and skills available to address conservation biology problems and Part IV concludes by briefly discussing sustainable use and management approaches to attain this goal.

Part I, *Principles for Conservation*, outlines the why, what and how of biological conservation. The authors endeavour to establish a framework to explain conservation management decisions. This is achieved, first by exploring societal attitudes to conservation and classifying the values associated with environmental resources, and secondly by establishing what should be conserved. Burgman and Lindenmayer identify the protection of biodiversity as the main goal of conservation. Conservation of biodiversity incorporates the protection of genes, populations, species, communities, ecosystems and other components of the natural world. Biodiversity can be classified using a number of criteria. Detailed in this book are the criteria most commonly applied, including genetic diversity, species richness, species endemism and vegetation structure. In a world of limited resources and competing interests, the imminent danger to a taxon or an ecosystem can determine its priority for conservation. The authors review the threatening processes and ecological criteria that determine the status of endangered organisms, and the conservation practices of managing protected areas and ecological populations.

Part II, *Impacts*, discusses the type and extent of changes to the natural environment as a consequence of human activity. The authors explore in detail changes to the physical environment, species distribution and abundance, loss of genetic diversity, and modification and loss of habitat. The final chapter in this section links these impacts to society's desire to meet current levels of human consumption irrespective of environmental consequences.

Part III, *Methods of Analysis*, describes the skills and techniques available to solve conservation problems.

The authors acknowledge that the inventory of approaches and methods of analysis they have chosen to address are not exhaustive, but they have included a review of genetic techniques, measuring diversity, identifying habitat, reserve design, and monitoring and assessment, including risk assessment.

Part IV, *Management Principles for Conservation*, consists of a single chapter that places the scientific tools outlined in the previous part into a management context. It provides a brief history and explanation of sustainable development and discusses the concept and principles of adaptive management.

Generally the book is well written and contains information appropriate to the topic of conservation biology. Frequent use of headings help to identify the subject matter of the text and "case study" boxes detail practical examples of the concepts discussed. In combination with the figures and tables, "case study" boxes divide the text into manageable lengths. The figures are excellent and their frequent use supports the subject matter of the text. Many tables are valuable, although some are unclear or contain too much information (e.g., Table 3.1 and Table 10.2). The "further readings" section after each chapter includes a brief description of the readings, which are informative and useful, but would be improved if a few more relevant references were included.

The appendices, bibliography and general index are clear and well set out allowing the reader to locate relevant information quickly. The glossary of conservation biology terms is comprehensive. The bibliography covers a wide range of predominantly Australian literature, a reflection of the book's focus. Non-Australian literature is often used for the broader concepts. The general index is thorough, including references to tables and figures.

Discussion of most scientific principles and analytical methods of conservation biology are sufficiently detailed to give the reader a broad understanding. Widespread use of cleverly chosen examples adds depth and interest to conceptual issues. For instance, the rare Corroboree Frog (*Pseudophryne corroboree*) enlivens discussion of conservation genetics and the Southern Cassowary (*Casuarus casuarinus*) is used to illustrate the role of keystone species in ecosystems. The discovery of special properties in webs of some spider species, leading to their industrial use as packing in bulletproof vests, depicts the utilitarian value of biodiversity conservation.

The book's four parts follow a logical progression, starting with general concepts and moving through to more technical and detailed information. Despite this, there are some concerns regarding the structure of the text. An inspection of the chapter sequence suggests that more thought needs to be given to the order and placement of text both within and across chapters to make the flow and arrangement of material more logical. Concepts are sometimes disjunct, with different chapters dealing with essentially the same subject. For example, issues relating to the classification of threatening processes and their assessment are discussed in chapters 3, 14 and 15. Chapter 8 is poorly structured and incorporates too many issues. Some issues could be dealt with in new chapters, such as Aboriginal land use, while the section on connectivity and corridors probably belongs in chapter 13 with reserve design.

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The order of material in chapter 13 is confusing. The section on island biogeography should begin rather than conclude this chapter.

In the preface and the summary of Part IV, the authors refer to the importance of the political and economic climate in influencing conservation issues. While they acknowledge that detailing these factors is beyond the scope of this book, an introduction to the debate would be appropriate. Adding a political and economic dimension to some of the examples outlined in the book, such as the Murray Darling Basin or the old growth forest debate, would provide a more complete picture of Australian conservation. Conservation cannot be separated from the political process.

We commend the authors for discussing the lack of research regarding certain taxa, such as invertebrates and non-vascular plants. They highlight the anthropocentric bias in taxonomy and natural sciences in favour of "species that are most like humans in appearance and taxonomic relatedness, and those species that have greatest cultural or economic importance" (Burgman and Lindenmayer 1998, p. 9). Charles Darwin also commented on this fact in *The Origin of Species*. Burgman and Lindenmayer consistently emphasise the enormous gaps in our knowledge of the Australian biota and environmental data. This gives the reader a realistic perspective of the uncertainty of our information base for decision-making and an awareness of the need for extensive research in the field of conservation biology.

The main strength of the book is its Australian focus. It is therefore surprising that there is no discrete discussion of the significance and role of fire in the Australian environment and the ensuing scientific debate over how to best manage fire for conservation purposes. Moreover, readers looking to understand the role and impacts of traditional Aboriginal land management will find only a brief overview of this topic. Issues associated with contemporary Aboriginal land use and management, such as use of fire and hunting practices, and the cultural significance of land and water, should also be presented. These are complex and important issues in biodiversity conservation in Australia which the authors may want to discuss in greater depth in future editions.

Australia's coastal waters are one of the world's largest and include such treasures as Ningaloo Reef, the Great Barrier Reef and the Great Australian Bight. Marine ecosystems are frequently threatened by human activities such as fishing, pollution and pest invasion. Burgman and Lindenmayer only briefly discuss Australian fisheries and touch on the need for conservation of marine environments, reflecting their bias as terrestrial ecologists. More emphasis on marine and coastal topics and examples would improve the book.

Protected areas and reserve design (chapters 4 and 13) give only limited attention to the need for a whole landscape approach in biodiversity conservation. For example, the book briefly discusses connectivity and corridors, but it fails to acknowledge that a major focus of recent Australian literature is the whole landscape approach. The authors note the importance of off-reserve conservation of species. They also acknowledge that none of the reserve design algorithms detailed in the book deal with this need effectively. However, they do not detail further options or solutions, such as the application of restoration ecology theory and practice as part of an overall conservation biology strategy. Hobbs and Norton (1996) argue that "production and conservation lands have to be considered simultaneously in larger-scale restoration efforts", so that restoration can be used as a land management tool across the landscape, working at multiple scales and fulfilling a range of criteria. Integrating restoration of production and conservation

lands is, they argue, likely to be a "key component for the development of sustainable land management systems" (Hobbs and Norton 1996).

There is no exploration of the scientific debate about the species versus ecosystem and landscape approaches to biodiversity conservation. Although they note that there are fundamental flaws in focusing on the conservation of individual species, they do not flesh out the argument or present alternative approaches. The application of the multi-species approach, as practised in Greening Australia's *Living Landscapes* programme in WA (see Lambeck 1997) would illustrate the issues and dilemmas involved with alternative approaches. A more detailed discussion on the reintegration and restoration of fragmented landscapes would also contribute to the understanding of alternative approaches to biodiversity conservation (e.g., Saunders, Hobbs and Ehrlich 1993). Furthermore, by drawing on the importance given to ecological processes and ecosystem structure and function in restoration ecology, a more complete and holistic picture of biodiversity conservation could be achieved.

Hobbs, Saunders and Arnold (1993) have argued that management of fragmented landscapes requires the involvement of local communities. Conservation biologists must be trained and encouraged to work with local people, whose knowledge and co-operation is essential to conservation across many landscapes. An outline of programmes where local communities are working with scientists to restore, protect and manage biodiversity should be a component of this book, particularly as so many of these groups exist in the most disturbed landscapes — agricultural and urban. Many agricultural districts and communities have local landcare groups and conservation societies. This could also make this book more attractive and valuable to members of these groups. Examples can be drawn from the *Living Landscapes* programme in Western Australia, where scientifically determined ecological parameters are used to help design the future landscape through farm and catchment planning, with the aim of restoring a range of fauna. In addition, the publication *The Role of Networks* (Saunders, Craig and Mattiske 1996) is largely devoted to discussion of how scientists can work more effectively with community groups to ensure conservation biology has a much stronger input into management for nature conservation.

The authors have attempted to fill two distinct niches with this book, first, as a student textbook and secondly, as a reference for researchers. They state in the *Preface* that this text aims at "providing a book for beginning and advanced undergraduates". Advanced undergraduates would profit from the text, but academic staff should show caution when recommending it to beginning undergraduate students, as the book is complex and assumes knowledge in Mendelian genetics, linear algebra and probability theory. However, it does provide many valuable Australian examples which Australian students would find relevant. The focus on Australia may reduce the appeal for overseas students, but the book can still serve as a reference to academic staff for examples beyond their own regions.

Despite the criticism concerning parts of the text, it is essentially a good book. The price is low especially when compared to other main texts on conservation biology. However, it is not comprehensive enough to be recommended as a stand-alone textbook. In our opinion, it is a good source of information specific to Australian conservation biology issues, particularly for advanced undergraduate students and researchers. We congratulate Burgman and Lindenmayer on their notable effort and look forward to further editions of this first textbook on conservation biology for Australia.