

Alley's volume will help improve the nonexpert's understanding of our groundwater resource, and will likely be an enjoyable read for specialists. This is a popular science textbook, the first for groundwater, written in a quality science journalism style, packed with case studies and stories. Seventeen chapters separate the book into the key groundwater concerns of the day. For example, these include water quality (arsenic, pathogens, nitrate, fracking), quantity (over abstraction, recycling, subsidence), and governance. Each chapter could be considered a stand-alone, high-quality scientific documentary that traces the history of the particular problem, arriving at the status today. Notably for a subject that can rapidly become technical, the authors manage to avoid equations and technical figures, and successfully rely on the power of the case studies, accompanied by occasional pictures and maps, to convey their message. For example, if you want a slightly technical figure, I did find one of groundwater flow paths, and that was more than 100 pages into the book. Thorough referencing allows readers to pursue a topic in more depth should they be interested.

*High and Dry* is an excellent read for anyone interested in a popular science introduction to groundwater. Groundwater practitioners in industry and academia, and anyone who uses a groundwater source in their daily lives, would likely enjoy this volume. I read the book in a couple of days and could not put it down. But I do not think the groundwater expert is the main target audience, which is anyone who is interested in knowing something about groundwater in general. Teachers and lecturers could find numerous case studies that could be used for educational purposes. Although the case studies are global, there is a bias toward those from the United States, and I suspect that North American educators would especially benefit from them. Groundwater is a multidisciplinary subject, and particular chapters may be of extra interest to other disciplines for which groundwater may be relevant, such as ecologists, hydrologists, engineers, or environmental lawyers. I will recommend this book to my colleagues and students here in the School of Biological, Earth and Environmental Sciences, in the hope that it will open their eyes to the world of groundwater beneath their feet. But (spoiler alert) this is not a volume with a happy ending. Case study after case study shows how we have damaged groundwater resources over time, and Alley and Alley emphasize five issues in concluding the book that are all tricky problems for the future of groundwater.

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ECOACOUSTICS: THE ECOLOGICAL ROLE OF SOUNDS.

*Edited by Almo Farina and Stuart H. Gage. Hoboken (New Jersey): Wiley. \$130.00. xvi + 336 p. + 13 pl.; ill.; index. ISBN: 9781119230694 (hc); 9781119230717 (eb). 2017.*

Ecoacoustics is an exciting emerging discipline at the frontier between acoustics and ecology, aiming to use environmental sounds to study ecological patterns and processes. This book, edited by two of the most eminent researchers in the field, gathers 18 chapters on a comprehensive selection of topics related to this discipline.

The multidisciplinary nature of ecoacoustics is beautifully reflected in this volume. Chapters blend conservation, ecology, acoustics, engineering, signal analysis, and animal behavior. Various perspectives are considered from artistic and educational to societal and, of course, purely scientific. The book is mostly focused on terrestrial environments in which most of the research has taken place so far. But other environments are not overlooked. Some chapters also describe specific challenges faced in other environments such as aquatic ecosystems (Chapters 4 and 9) and even soils (Chapter 13). It will appeal to a wide range of professions and specialities and constitutes a very comprehensive medium for students and researchers who would like to develop ecoacoustic studies.

Both applied and theoretical outcomes of ecoacoustics are considered. First touching on important theories put forward to explain which factors structure acoustic communities and populations (Chapters 1, 2, 5, and 10), and how the landscape is translated into soundscape (Chapter 12). The authors also consider possibilities of sounds as a tool to survey various environments (Chapters 3, 4, 8, 9, 13, and 15), monitor biological diversity (Chapters 7 and 10), conserve natural soundscapes (Chapter 14), understand links between acoustics and ecology (Chapter 11), and effects of environmental changes (Chapter 6).

Remote sensing, one of the main technical areas of research in ecoacoustics, includes a strong cohort of engineers and innovators. These engineers develop robust autonomous recorders remotely sending recordings to off-site servers. Although these developments set the technical possibilities of environmental recordings, they are only quickly brushed over in the volume. On the other hand, it contains an up-to-date and comprehensive summary of the available methodologies to analyze acoustic recordings and extract ecologically relevant information out of them, with the review Chapters 10 and 16 as well as specific case studies (Chapters 3, 8, and 15).

The book includes a beautiful selection of spectrogram color plates, revealing both the scientific and aesthetics value of environmental sounds. The

aesthetic value of environmental sounds is also demonstrated in the chapter by David Monacchi and Bernie Krause, two of the most outstanding ecoacoustic artists in the world. This chapter describes several exhibitions that have surely participated in raising awareness about the ecological role of environmental sounds.

Although very comprehensive on the subjects covered, this volume does not appear to show a clear progression or have an obvious logical structure at the scale of chapters. It rather appears as a collection of fascinating chapters on the topic of ecoacoustics.

The book closes with a chapter summarizing the challenges faced by ecoacoustics. This chapter indicates the main avenues for research and development in this field. With this chapter and the volume in general I understood the “mission of ecoacoustics: to establish a framework and methodology to interpret sounds as ecosystem attributes” (p. 313). This slight but significant shift in perspective from considering sound as a tool for studying ecosystems to “sounds as ecosystem attributes” is, to me, the necessary step to understand ecoacoustics and its aims.

Even though, as stated in the preface, this book “is not a celebrative edition of a consolidated ecological discipline but a contribution to transmit the principles and ideas of ecoacoustics” (p. xv), this volume reads like a mature development on ecoacoustics and emphasizes open questions for future research.

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## CONSERVATION BIOLOGY

### ALIEN SPECIES AND INSECT CONSERVATION.

By Tim R. New. *Cham (Switzerland): Springer*. \$159.00 (hardcover); \$119.00 (ebook). xii + 230 p.; ill.; index. ISBN: 978-3-319-38772-7 (hc); 978-3-319-38774-1 (eb). 2016.

The adverse effect of alien species, particularly, invasive alien species (i.e., those that spread once established) are a major challenge for indigenous biodiversity in many parts of the world. With insects being the most speciose multicellular organisms, it is not surprising that alien species, especially alien plants, are one of the most affected groups of all. The effects of alien species, which includes certain insects, is a highly complex topic involving many taxa in many locations, with varying levels of impact. This vast topic is masterly synthesized here by Tim New, a premier insect conservationist with many years of experience, both academic and practical.

The author starts by overviewing the role of alien species in insect conservation, emphasizing that alien species can have a major pervasive effect by reducing/replacing indigenous species of many types, modifying food webs, and inducing other disturbances that decrease ecosystem integrity and resilience at various spatial and temporal scales. These impacts can also affect human welfare. Some invasions are intentional, whether horticultural plants or insect biological control agents, while others are unintentional, resulting in establishment and spread of the alien in their new home, and often cannot be easily stopped from spreading.

Inevitably, there are ecological and evolutionary consequences of invasive alien species, leading to new associations between species and novel trophic associations. Often invasive alien plants spread and even dominate certain receiving localities, as they are released from the suppressing effect of their natural herbivores. Then over time, these may accumulate indigenous herbivores in the invaded area. In the case of alien pollinator insects, they can displace indigenous pollinators with an adverse effect on the indigenous plants. Novel, alien plants can even act as ecological traps that either lack oviposition cues to reject oviposition or possess stimulants for oviposition when the plants are not suitable for the larvae. Such traps inevitably have evolutionary as well as ecological impacts.

Invasive insects can also carry various pathogens that can be of concern for certain species in the receiving area. Some pathogens, such as the microsporidian *Nosema bombi*, accidentally introduced into North America, is implicated in the decline of five native bumble bees, with huge repercussions on native plant communities and economic pollinator systems, while leading even to the extinction of one species of native bee.

Alien vertebrates, especially rats and mice, have had a major impact on many indigenous insects, especially on islands. Some insect species such as the Lord Howe Island stick insect, a highly charismatic insect, became extinct on that island, but was then discovered on a small outcrop of an island, Ball's Pyramid, which had remained rodent-free. Alien fish have also led to population declines of various aquatic insect species in various parts of the world. Fish like the rainbow trout and *Gambusia* mosquitofish, often used in an attempt to control mosquito larvae, have reduced populations of certain indigenous insects. Even certain birds, such as the Asian pheasant, which has naturalized in Britain, and has its numbers boosted for shooting, has a huge impact on ground-living insects and other invertebrates.

The author emphasizes the need to prevent entry of invasive alien organisms to any potential new country. But many countries do not have the expertise to