

yet inscrutable group of marine mammals. An impressive bibliography suggests a thorough review of the topic.

Mead and Ellis start out with an overview that gives readers some insight into why their work is timely and important and what led them to write the book. A brief preface is followed by individual descriptions of all 22 currently recognized species of beaked whales. Each description is illustrated by a highly detailed painting of an adult male and a closeup illustration of its mandible and the teeth, which are used for identification. The authors introduce the reader to the history of discovery of each particular species, reference associated works and relevant articles, and discuss what is already known and what is still to be determined.

The second section of the book, "About Beaked Whales," is scientifically rich, yet easy to read. It contains amusing stories about research on beaked whales and the people involved in it, a discussion of classification problems that will be of interest to evolutionary biologists and phylogeny specialists, a detailed explanation of scientific nomenclature for nonbiologists, and topics related to conservation of beaked whales. Repeatedly, the authors point out how little is known and how much there is still to learn about this group of whales. The many questions posed will induce discussion and involve the reader in a dialogue: how did beaked whales lose all but two of their teeth; did it happen before or after they transitioned to suction feeding; if the species in this group are so evolutionarily close, why do the shapes of their tusks differ so much; why are the specimens found on shore covered in scars and how were they inflicted? Although many of the questions are yet to be answered and some of the existing theories are very speculative, *Beaked Whales* provides a great starting point for a search for answers and a lot of food for thought for the curious mind.

"Imagine your life being dominated by needing to consume 8–10% of your body weight every day . . . roughly a full workday, doing nothing but eating. Welcome to the world of Florida manatee!" This is the authors' greeting in *Florida Manatees: Biology, Behavior, and Conservation*. The senior scientist at Mote Marine Laboratory's Manatee Research Program and former chair of the U.S. Marine Mammal Commission, John E. Reynolds III, and a renowned professional wildlife photographer, Wayne Lynch, join forces to reveal probably the clearest portrait of West Indian manatees (*Trichechus manatus*) ever published.

Extraordinary underwater photographs, capturing the hardest to observe sides of manatee behavior and social life, make this book a piece of art and truly pleasant to look at and read. The Florida manatee is unquestionably one of the most studied marine mammals in the world in contrast to other living sirenian species. These unusual animals have been shaped by thousands of years of evolution into creatures with striking adaptations and proportions. For a mammal, they exhibit an unusual

combination of an aquatic lifestyle and herbivory. They possess curious physiological features (e.g., how they regulate buoyancy), are surprisingly good long-distance swimmers, and have adapted to life in highly urbanized areas of modern Florida.

The authors tell the story of manatee exploitation, research, and conservation. Florida manatees are resilient and adaptive, they have learned to live with humans, and in many ways have become dependent on human-made resources such as warm-water discharge from power plants and sustainable sources of freshwater. However, some manatee adaptations (e.g., their synanthropic lifestyle) work against them in today's world, making them vulnerable to injuries, disease, and death in the coastal waters they occupy. The manatees, Reynolds notes, may ultimately be sustained or lost due to issues associated with their habitat.

The authors invite readers to share their passion and learn about these incredible animals, the challenges they face, the Manatee Recovery Plan, and much more and, perhaps, ultimately to contribute to their conservation. This book makes a valuable contribution to awareness of manatees and will be of interest to curious nature lovers, natural science students, and young scientists taking their first steps on their scientific career path.

All 3 books are worth spending time on and are filled with information and the life-long experiences of hundreds of people who dedicated their careers to studying and conserving the marine environment. They will make readers think about what can be done to help preserve marine animals for future generations and, as one might hope, bring out the better human in us.

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Concepts, Challenges, and Emerging Themes of Restoration Ecology

Foundations of Restoration Ecology. 2nd edition. Palmer, M. A., J. B. Zedler, and D. A. Falk. 2016. Island Press, Washington, D.C., U.S.A. 552 pp. US\$50.00 (paperback). ISBN 978-1-61091697-4.

Restoration ecology seeks the reasons behind ecosystem change, describes the features of degraded and altered ecosystems, and provides understanding of the mechanisms responsible for their functioning. With this knowledge, the discipline delineates how such ecosystems can be restored and directed back toward a less disturbed and more natural stage (Hobbs & Suding 2009). Ecological restoration is the practical application and the acid test of the theories of restoration ecology. The goal of

ecological restoration projects is to assist the recovery of degraded, damaged, or destroyed ecosystems (SER 2004). *Foundations of Restoration Ecology* is one of the most comprehensive books on the subject. It presents the basis for and theoretical concepts of the discipline, which serve as a solid background for research. The authors consider it very important to place restoration theory in the context of real-world projects by additionally considering socioeconomic, engineering, and political circumstances.

Restoration ecology applies methods from other disciplines, such as genetics, engineering sciences, landscape architecture, ecotoxicology, geology, and hydrology. The increasing impact of humans on Earth and the resultant urgent need to develop novel strategies and methods to restore degraded ecosystems complicate the tasks of restoration ecologists. One of their biggest problems is that they often have to make such decisions without complete knowledge of the contemporary dynamics and trajectories of an ecosystem and without knowing the exact response of an ecosystem to novel disturbances and stressors related to human activities. In many cases, it is very challenging to answer even the simplest questions; for example, which restoration methods are the best, which one should be chosen, what should the target be, how can restoration success be monitored and evaluated, and how can results be sustained? For instance, determining a target state for restoration is often challenging, considering the accelerating rate and stochasticity of human-induced changes and the lack of available contemporary reference systems in substantially transformed landscapes. *Foundations of Restoration Ecology* will help readers think about and answer the above urgent and important questions.

Rapid developments in the field of restoration ecology and novel threats and challenges motivated this substantially updated second edition, which is over 30% longer than the first edition (Falk et al. 2006). All chapters have been amended, and the structure and logical flow have been improved. New sections address foundational concepts and nutrients, carbon fluxes, and hydrological processes. Invasive species now have their own chapter. The author team consists of 44 scientists who work in various fields of restoration ecology and related disciplines all over the world (several new authors have contributed).

The book is divided into 5 parts and has 18 chapters. Closing remarks at the end of each chapter summarize the theory introduced in that chapter and its practical applications. In part I, 4 chapters cover the foundational concepts and theoretical background of restoration ecology; interesting questions about ecological dynamics, predictability of ecosystem responses and restoration outcomes as conceptualized in an ecosystem-resilience framework; evaluation of biodiversity at multiple levels and a response-effects trait framework

to evaluate restoration success in terms of biodiversity and ecosystem functions; and theories explaining the landscape-scale distribution, abundance, and resilience of species and communities and how landscape structure and dynamics can affect restoration outcomes. Considering landscape dynamics supports strategic planning and restoration prioritization, facilitates recovery processes, and improves cost-effectiveness of restoration projects.

Part II contains 7 chapters on theories, concepts, and empirical evidence that support ecological restoration at multiple scales. Chapter 5 highlights the importance of population and ecological genetics, which have long-term legacies and consequences for restoration outcome. Chapter 6 focuses on ecophysiological issues that should be considered from a restoration perspective. For example, during restoration, plants may be exposed to light, water, or soil-nutrient conditions to which they are not adapted. Knowing the ecophysiological demands and adaptations of species can help project planners choose restoration species that are the best adapted to site conditions and most resistant to species invasions. Chapter 7 demonstrates the importance of population characteristics, such as number of individuals, age, gender structure, and metapopulation dynamics. Besides giving a solid theoretical background to the topic, the chapter answers several practical and restoration-focused questions related to species introductions. Chapter 8 is new and calls attention to the restoration challenges caused by invasive species. In most cases, restoration actions are associated with some sort of disturbance, which can support the spread of invasive species. The chapter lists several ways to cope with invasive plants during restoration. For example, one can reduce nutrient availability or directly deplete the seed banks of invasive species or introduce target species resistant to invasions. Chapter 9 provides examples of the manipulations of abiotic and biotic filters in ecological restoration for improving ecosystem functioning at restoration sites. Chapter 10 is about the restoration of environmental heterogeneity at different spatial scales to support an increased diversity of the restored communities. Interesting examples and case studies highlight that small-scale heterogeneity provided by features such as tussocks, termite mounds, or cushion plants and landscape heterogeneity all contribute to higher species diversity. Finally, chapter 11 presents the application of food-web theory to restoration ecology and, in a broader sense, the importance of the restoration of population interactions. Examples of how food-web interactions can be used to monitor restoration success and ecosystem functioning of the restored ecosystems are provided.

Part III is all new in this second edition. Its 3 chapters cover biophysical, biogeochemical, and hydrological processes in ecological restoration. Chapter 12 highlights that nutrient availability and dynamics can be important drivers as well as outcomes of restoration; thus,

knowledge of initial site conditions and knowing how one can manipulate nutrient dynamics to reach restoration targets is crucial. Readers get an introduction to key concepts, such as ecological stoichiometry, progressive nutrient limitation, soil carbon saturation, and nutrient spiraling, that can help inform nutrient endpoints of restoration. Chapter 13 discusses the recovery of carbon and energy flows in various habitat types and calls attention to the carbon sequestration function of restored ecosystems. Chapter 14 focuses on the hydrological processes as drivers of the restoration of aquatic ecosystems. The authors highlight that restoration of aquatic ecosystems requires a holistic approach that considers the interaction between vegetation, soil, groundwater, and surface water.

In 3 chapters, part IV assesses the spatial and temporal dimensions, scale dependence, and novel challenges of restoration ecology. Chapter 15 introduces evolutionary restoration ecology showing that restoration projects offer unique research opportunities for studying contemporary evolutionary processes, and the genetic legacy of species evolutionary adaptations in the face of novel ecological and climatic conditions. Chapter 16 calls attention to the broad application possibilities of macroecology and to the theory of island biogeography in restoration ecology and shows how these concepts can support the planning and implementation of ecological restoration projects. Chapter 17 is about the effects of contemporary climate change in restoration projects and shows that one should reconsider several restoration principles in a changing world (see also a recent review by Kiss et al. [2018]). For example, it is an important question as to whether past and current species' distribution ranges can be used as a template for the future. The chapter provides examples of how the application of restoration-ecology precepts can help Earth's ecosystems adapt to future climatic regimes.

Part V contains a synthesis chapter that addresses the most important challenges and the newest emerging themes in restoration ecology. The newest and most exciting research topics include the resilience of restored ecosystems, trait-based ecosystem engineering, species distribution modeling, and restoration ecology in a changing climate. The authors emphasize there is a need for a stronger link between ecological theory and the practice of ecological restoration (see also a recent review by Török and Helm [2017]). Large-scale restoration projects offer unique opportunities for multisite real-world testing of ecological theories, and new discoveries in theoretical ecology and other related disciplines can strongly support ecological restoration projects.

This book will be interesting to and useful for several audiences. Students can use it as a textbook because it provides a solid theoretical background to the field of restoration ecology. The volume is nicely illustrated

with self-explanatory tables and figures and text boxes that contain complete case studies, which are especially useful for students. Site managers may find important rationales, explanations, and state-of-the-art examples related to restoration ecological problems they are facing. By reading about the most up-to-date solutions of restoration problems, those concerned with the sustainability of the environment may find it easier to restore degraded ecosystems. Scientists who focus on particular fields of restoration ecology may gain new ideas while reading about other aspects of their discipline. There are several examples in the book that show that other disciplines or novel ways of thinking can bring about the best solution to a restoration problem.

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Noted with Interest

The Book of Caterpillars: a Life-Size Guide to Six Hundred Species from Around the World. James, D. G., editor. 2017. Ivy Press, Brighton, UK. 656 pp. £30.00 (hardcover). ISBN 978-1-7824-0506-1.

I find the most interesting life-stage of Lepidoptera is the caterpillar. This massive book aims to show the beauty and the ecology of the caterpillars of 600 species of butterflies and moths from all over the world (microlepidoptera are not included). The morphology, development, and metamorphosis of the caterpillars are clearly explained. I much appreciated the inclusion of a chapter on caterpillar defences. For example, the caterpillar of the moth *Synchlora aerata* uses petals to camouflage its body. Also interesting, and fun, is the short section about caterpillars in folklore. For example, the abundance of the caterpillars of the *Platyprepia virginalis* moth is said to predict the results of U.S. presidential elections and correctly predicted the outcome in 2016. The bulk of the book is occupied by the species schedules (354 moth species from 31 families and 246 butterfly species from 6 families). Each schedule includes a map of distribution,