

Status of the Union

Status and Trends of the Nation's Biological Resources. Volumes 1 and 2. Mac, M. J., P. A. Opler, C. E. Puckett Haecker, and P. D. Doran. 1998. U.S. Department of Interior, U.S. Geological Survey, Reston, Virginia. 964 pp. \$98.00. Volume 1 ISBN 0-160-53285-X. Volume 2 ISBN 0-160-53285-X.

Engaging a diverse audience is a perennial challenge for the conservation community. Rarely is it possible to communicate simultaneously with managers, scientists, policy makers, and the lay public. With *Status and Trends of the Nation's Biological Resources*, the U.S. Geological Survey has achieved considerable success in compiling a widely accessible evaluation of the condition of ecosystems in the United States. The assessment is not exhaustive, and no single party is likely to be satisfied fully by its contents, but its ability to provide something for virtually every reader is a substantive accomplishment.

Status and Trends is organized into two parts. Part I examines seven of the natural and anthropogenic factors that affect the condition of and relationships among biological resources. Part II details the essential natural history and current status of 15 geographic or ecological regions (continental and island) within the political boundaries of the United States. Professional experts on each subject or area have contributed chapters, and no two chapters follow an identical outline. Instead, authors apparently were given the latitude to emphasize core principles, data syntheses, and outstanding information needs particular to their topic or region. The resulting array

of perspectives from government agencies, academia, and nongovernmental organizations demonstrates that, as the Foreword and Introduction stress, effective management of natural resources demands collaboration.

Status and Trends also reminds us that diverse voices can have a greater effect on the listener if they are harmonized. Lack of cohesion within and between the two parts is the main weakness of the book. The volume would benefit immensely from an executive summary and more comprehensive editing. A conceptual framework, within which separate chapters are logically organized and cross-referenced, is largely absent. Also missing are simple maps showing the location of each region. Thus, it often is difficult to compare data among regions or to track prevailing threats or trends across the country. These shortcomings are lost opportunities to iterate, especially to nonscientists, that the dynamics of nominal "regions" often are linked. We also question whether the cost of the book—\$98.00 within the United States, \$122.50 outside the United States—will prove prohibitive, especially for teachers and the general public.

Nonetheless, each component of *Status and Trends* is compelling, and the mosaic is inviting and instructive. Focus boxes are an effective method of retaining attention and driving home ecological lessons without preaching. Full-color graphics, ranging from simple tables to high-quality photographs to detailed maps, likewise complement the text by expanding on key issues and presenting illustrative case studies. Individual chapters are supported with

ample current citations that provide valuable entry points into the primary literature.

Chapters in Part I catalogue both familiar and lesser-known (yet equally insidious) threats to biological resources. "Environmental Contaminants," for instance, not only explains the dangers of oil spills, predictably exemplified with the 1989 Exxon Valdez debacle, but the chapter also details various land-based, nonindustrial sources of chronic petroleum pollution. Even seasoned environmental professionals can learn something from these chapters. Discussions of some issues, such as how international trade can facilitate invasions of exotic species, may be especially helpful in discussions with decision-makers. Although human population growth is not singled out for focused discussion, its effects are a common thread throughout Part I.

As a whole, Part II might function as an overview for biologists outside the United States. Because each chapter stands well on its own, the volume also could serve as a resource for newcomers to regions within the United States. Unfortunately, the document fails to provide a true baseline report on the status of the nation's biological resources; data generally are exemplifying rather than comprehensive. But, as the Introduction fairly notes, there simply is not enough information to describe the status and trends of many organisms and communities. In fact, this acknowledgment is used cleverly as a springboard to describe the purpose and benefits of biological monitoring. Many chapters close with a list of information gaps or research needs. Although some arguably are too vague to serve as concrete road maps (e.g., "avoid

future nonindigenous species problems”), the line items do underscore key management challenges within and among regions.

Despite its lack of synthetic organization, *Status and Trends* successfully gathers existing knowledge of ecosystems in the United States. Moreover, it tempers prosaic facts and figures with enough novel tidbits to capture the interest of both scientists and lay readers. We hope that decisionmakers will refer to *Status and Trends* for both information and direction, and we are optimistic that the volumes will spur continued efforts to maintain the biological resources of the United States.

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Conservationists Ain't Misbehavin'

Behavioral Ecology and Conservation Biology. Caro, T., editor. 1998. Oxford University Press, New York. 608 pp. \$55.00. ISBN 0-19-5104489-0.

“Imagine that you. . . want to apply the principles and methods in behavioral ecology to the conservation of species and habitats. What should you study?” So begins Tim Caro’s new book, in which Caro has tapped two rich veins: graduate students’ dreams of studying animal behavior in the field while simultaneously saving the world, and more senior scientists’ vague guilt (or defensiveness) about their work’s irrelevance to urgent conservation problems. His book aims to encourage both groups that behavioral ecology has a great deal to contribute to conservation biology. It does not (thankfully) attempt to convince us that behavioral ecology is the one true path to conservation success.

So what has the science of behavioral ecology to contribute to conservation? Certainly a detailed knowledge of what animals do is of unparalleled value in assessing threats and designing effective conservation programs. But there is more to behavioral ecology than “what animals do”: behavioral ecology is concerned with why animals do what they do. Without the “why,” behavioral ecology is reduced to high-quality natural history. The conservation value of knowing why emerges—although not explicitly—from this book in the capacity to predict problems and promise solutions. For example, a simple fact of grizzly bear natural history, that males sometimes kill cubs, sparked (so far unsubstantiated) suggestions that trophy hunting of adult males ought to increase cub survival and hence population growth (Miller 1990). More insight is available concerning lions, among which infanticide has been shown to be an adaptive strategy adopted by males in the process of taking over groups of females from other males (Packer & Pusey 1984). On this basis one can predict that trophy hunting of male lions, by increasing the rate of male turnover, might increase infanticide and thus trigger population decline. Here natural history and behavioral ecology generate contrasting predictions.

Sadly, most species are so poorly known that we do not have the luxury of making specific predictions based on either natural history or behavioral ecology. The only solution is to be cautious. Conservationists need to know that there is more to demography than the logistic curve. Because behaviors vary, management interventions can have unpredictable results. Caro’s book is replete with examples. Denial of female mate choice may lead to reproductive failure in farmed salmon and could do the same in captive breeding programs managed to preserve genetic diversity (Grahn et al.). Killing old bull elephants for their tusks could limit females’ reproductive

rates and cause population decline (Dobson & Poole). Provision of nest boxes encourages conspecific brood parasitism and leads to population decline in Wood Ducks (Eadie et al.). None of these effects could have been predicted without detailed behavioral data. In the absence of such data, it is important to be aware that equally unexpected responses could be seen in other species.

While attempting a synthesis, Caro admits that the two fields of behavior and conservation have different aims: one seeks to explain how natural selection has shaped individuals’ responses to their environments and the other to stop species and populations from going extinct. There are methodological overlaps between the two fields, but the dedication of an entire chapter to these makes for a somewhat uninspiring start to the book. More interesting and convincing are later chapters addressing how behavior might affect demography and, hence, responses to harvesting (Vincent and Sadovy; Greene et al.). A final section on human behavioral ecology is a salutary reminder that the activities that endanger wild species result from the evolved behaviors and psychology of *Homo sapiens*. Analyses indicate that we are as short-sighted as other species, hunting as good optimal foragers rather than thoughtful conservationists (Alvard), settling for the most immediately profitable option even when resources are to be inherited by our children (Wilson et al.).

So what is the solution? Behavioral ecologists should think about (and publish) the population and conservation consequences of their findings. As such, Caro’s book will be valuable. It provides many detailed recommendations for how behavioral ecologists can make their work more useful. Conservation biologists should perhaps take their behavioral ecologist colleagues out to lunch once a month and grill them for insights—assuming they can fit in an extra lunch date among the econo-

mists, geneticists, sociologists, vets, and others from whom they also need to learn if they are to plan effective conservation measures.

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An Awful Lot to Learn

Mammalian Society Learning: Comparative and Ecological Perspectives. Box, H. O., and K. R. Gibson, editors. Cambridge University Press, New York. xiv + 425 pp. \$95.00. ISBN 0-521-63263-3.

What does social learning in mammals have to do with conservation biology? You will not find a specific answer to that question in *Mammalian Social Learning*, edited by H. O. Box and K. R. Gibson. What you will find are 21 brief chapters that discuss field and laboratory studies of social organization and social learning in diverse mammals: marsupials, rats, mole rats, rabbits, bats, elephants, caribou, musk ox, bears, canids, felids, whales, and primates. Unfortunately, the limited knowledge of social learning in mammals is a recurrent theme in most chapters, leaving the impression that much more research needs to be done before social learning is understood in the animal or group of animals under discussion. As a result of this limited knowledge, some of the chapters provide little more than natural history. The book has value for conservation biologists, however, as a reference for learning more about

social organization in diverse species of mammals, especially those of conservation concern.

This volume also provides a background for a better understanding of the scope of social learning. Social learning is defined broadly and refers to the social transfer of information and skill among individuals in learning appropriate responses to their environment. Animals must learn to identify and respond to predators, select food, locate and process food, interact with group members, and choose mates. The transfer of information may be from parents to offspring, from adults to young animals, and among same-age mates and siblings.

The chapters of most interest to conservation biologists will be the ones that include information from field studies on how social learning functions in natural populations. They vary in depth and quality, with some supplying more scientific evidence than others. The chapters on laboratory studies of domestic animals contain information about the mechanisms of learning and ultimately are less interesting. Because this volume originated as a collection of conference papers with a total of 28 authors, there are many inconsistencies in the quality of the chapters and few links among chapters, with the exception of some comments by the editors at the beginning of each section. Even then, I did not find the links beneficial and instead found that reading each chapter as a separate entity worked best for me. Because the conference was held in London, the majority of authors are European; almost half are from the United Kingdom. Some key people from North America who study social learning or have been involved in long-term studies of social mammals are noticeably absent. Some of their studies are discussed, however, by Heyes and Galef (1996), who offer an integrated treatment of experimental and theoretical work on social learning.

The book is organized into six sections, with the first one designed to

give a new perspective on studies of social learning. The section falls short of this goal and is limited to three chapters on how to study primates and one brief chapter on a simple cost-benefit model. Nevertheless, Rowell reminds us of the diversity of mammalian behaviors and that current knowledge of social learning in primates, including humans, cannot be generalized to all primates. King argues for more field research of social learning in primates, which would be a definite benefit to conservation efforts.

The next five sections of the book are organized by taxonomic group. Part 2 deals with social learning in herbivorous mammals. I especially liked the chapter by Higginbottom and Croft on social learning in marsupials, because it may be the first of its kind and it includes a brief section on the implications of social learning for management of marsupials. The chapter by Lee and Moss contains some interesting original data on the interaction of environment, social learning, sex, and age of first reproduction in elephants. Klein's chapter on three arctic herbivores, caribou, musk ox, and arctic hare, effectively relates social learning to differences in sociality in the three species.

The next section focuses on social transmission of diet and resource location in rats, bats, and mole rats. The chapter by Wilkinson and Boughman provides some interesting ideas for studies of social learning and foraging in bats. These studies could be especially important because so many populations of bats are seriously threatened and so little is known about how they learn to locate food. Faulkes provides an update on the ongoing research on eusocial mole rats.

Part 4 focuses on social learning of terrestrial carnivores. This section should have been named large carnivores because smaller but highly social species, such as mongooses, are omitted. The chapter on canids seems especially lacking in depth, in large part because much more information is available on the social organization of canids than is found in this chap-

ter. The brief section on aversion learning to control predation by black-backed jackals on livestock, however, might be useful to conservation biologists interested in nonlethal methods of predator control. In the chapter on bears, which do not live in social groups, Gilbert reminds us that solitary species may have long periods of social learning in which information is transmitted from mothers to offspring and between siblings.

Part 5 leaves the terrestrial environment and deals with social learning by mammals in aquatic environments. The two chapters in this section contain a nice review of what is known about vocal learning in whales and dolphins. Finally, Part 6 focuses on primates, including three chapters on humans, which have little application to conservation. The chapter by Byrne, however, presents some interesting ideas about the complexities of food choices in great apes.

Although this book was never meant as a guide for conservation, conservation biologists can gain from reading it, especially those with an interest in conservation and the reintroduction of endangered species. Conservation biologists can also be made aware, although they will have to stretch their imaginations with this book, of the importance of social learning for conservation.

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Using Invertebrates to Assess Sustainable Farming

Invertebrate Biodiversity as Bioindicators of Sustainable Landscapes. Paoletti, M. G., editor. 1999. Elsevier, New York. 446 pp. \$149.00. ISBN 0-444-50019-7.

The title of this book brings two questions to mind. First, what does it mean for a landscape to be "sustainable"? Second, why should overall biodiversity be indicative of these landscapes? The aim of this book is not to answer these questions, however, but to provide "a summary of our current knowledge of how and where small organisms can help in assessing environmental status." To this end, this collection of 21 papers provides an excellent and up-to-date introduction to the invertebrate world in agricultural environments. Each paper introduces a taxonomic group, methods to identify the organisms, appropriate sampling methods, and methods to compare biodiversity across different landscapes. Many papers reference the newest tools for sampling and identifying organisms, including reference websites and databases. In addition, most of the papers address the effects of unconventional agricultural on the organisms of interest. Aimed at educating specialists about how to use select groups of invertebrates to compare different agricultural techniques, this book fills a useful niche.

The book begins with two introductory chapters on bioindicators and biodiversity in agroecosystems. These are followed by chapters on organisms generally found in the soil, such as bacteria, soil protozoa, nematodes, and mycorrhizal fungi, and then by chapters on aboveground diversity such as carabid beetles, mites, and ants. After the introductory chapters, only one chapter, on pollinators, diverges from this strictly taxonomic organization. Together, the chapters provide an excellent overview on how to use invertebrates as indicators of landscape change in agroecosystems.

The first question I raised above is never directly answered. *Sustainable* is generally equated with unconventional agriculture, such as no-till practices and reduced application of pesticides and herbicides. Many authors assume that unconventional agriculture is better than conventional agri-

culture and that differences in the diversity of invertebrate communities justify using unconventional methods. For example, in his chapter on the ecological role of biodiversity in agroecosystems, Altieri writes that "because biodiversity mediated renewal processes and ecological services are largely biological, their persistence depends on the maintenance of biological integrity and diversity in agroecosystems." This link between biodiversity and the persistence of agroecosystems is assumed but is not tested by authors in this volume.

The answer to the second question lies in two interpretations of the title. On the one hand, many authors are interested in the use of biodiversity itself as an indicator of environmental status. On the other hand, this book includes a wealth of information on the uses of diverse groups of invertebrates to assess landscape change. In his introductory chapter, Paoletti defines a bioindicator as a "species or assemblage that is particularly well matched to specific features of the landscape and/or reacts to impacts and changes" (p. 5). Many of the papers address this use of invertebrates as bioindicators rather than the use of overall biodiversity as a bioindicator. This difference is important because the latter may include functional roles of invertebrates in agricultural systems, whereas the former is usually a measure of the number of species in a system weighted by their relative abundance. In this book, authors show that specific invertebrate groups are useful in assessing functional differences in these systems, such as amount of available nutrients or interactions between soil mycorrhizae and agricultural plants.

After reading this book, I had one major question. From the perspective of a land manager or an agricultural practitioner interested in assessing the effect of unconventional agriculture on the ecological community, how should one choose a group of invertebrates to use as a bioindicator? Almost every author in this volume suggests that their cho-

sen taxa is an excellent bioindicator. In addition, many chapters provide a list of features that would make an organism a good bioindicator, such as ease of identification and clear response to landscape change. But none of the chapters provide a review of

the relative advantages and disadvantages of different taxa. A synthesis of which invertebrate groups are appropriate indicators of which landscape changes would have been a good addition to this book. This question is an open one that will be of interest

to conservation biologists and agricultural practitioners alike.

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