manage and archive ecological data (as is now mandated for NSF-funded research), and on how collaborative funding and publications with many authors are perceived now in job searches and promotion decisions. I enjoyed learning more about some of the colleagues I already knew, and about others I haven't yet met. I expect that the book will prove similarly educational for students, postdocs, or faculty considering involvement in the LTER program, and the insights from the authors on the challenges they perceive and recommendations they have for the program should be valued by PIs at the sites and at NSF. The book is relatively inexpensive, and I recommend it to all ecologists, not just those working at the ecosystem level.

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Promoting avian conservation through its benefits to humans

Şekercioğlu, Çağan, Daniel G. Wenny, and Christopher J. Whelan, editors. 2016. Why birds matter: avian ecological function and ecosystem services. The University of Chicago Press, Chicago, Illinois. x + 387 p. $45.00 (paper), ISBN: 978-0-226-38363-0.

Key words: agroforestry; avian conservation; economic ornithology; ecosystem services; pest control.

Birds are taxonomically and ecologically the most diverse group of terrestrial vertebrates. As such, birds perform an amazing diversity of ecological functions. In trophic interactions birds fill every roll except primary producer, acting as prey, top predators, and scavengers, effectively moving energy and nutrients through the food web, between habitats, and around the globe. They are pollinators and dispersers of seeds and aquatic plants. They act as ecosystem engineers by "planting forests" (i.e., scatter-hoarding tree seeds), and by excavating cavities in trees and other substrates. Birds do it all. *Why birds matter: avian ecological function and ecosystem services* describes this diversity of ecological contributions from birds in commendable detail. The goal of the book is to provide a state-of-the-field description of how avian ecological functions specifically benefit humans, either culturally, economically, or otherwise. These "services" provided by birds are known as *avian ecosystem services*, and are the focus of the book.

Chapters 3 through 11 furnish the bulk the ecological content, with each devoted to the details of a specific ecological function, including pollination, seed dispersal, cavity excavation, nutrient dynamics, and others. The great strength of this book is the ecological detail provided in each of these chapters. They offer a comprehensive overview of the field, with details of relevant studies and a long list of citations at the end of each chapter. This makes the book a must-read for any researcher starting out in the study of ecosystem functions or for students of avian conservation.

However, professional avian ecologists are not the intended audience of the book. While the preface identifies the non-scientific public as the target audience, the book is too dense in many places for this audience. For example, several chapters include long reference tables listing information that would not be useful to the casual reader, even one devoted to bird conservation. Chapter 6 on dispersal of plants by waterbirds includes a 9-page table listing the species (by scientific name only) of plant seeds found in the digestive tracts of 8 species of ducks. While details like these improve the value of the book for scientists and conservation practitioners, they may also make the book somewhat inaccessible to nonscientists.

While the diversity of ecological functions performed by birds are thoroughly described, several chapters fail to make a convincing connection to why those functions matter for humans. For example in Chapter 4 on pollination, only the last section of the chapter specifically addresses ecosystem services and begins with the sentence, "Birds appear to play a relatively small role in the pollination of cultivated crops." The authors then do provide several examples of economically important plants pollinated by birds, but these are described on two pages out of a 23-page chapter. Similarly Chapter 6, 41 pages in length, provides intricate details of the ecology of aquatic plant dispersal by ducks, but ends with only a 2-page section titled "Conclusions and benefits to humans." This concluding section states that dispersal of plants by birds likely has economic value, "although no case studies have yet estimated it." In these cases, and a few others, it is unclear whether that link between ecological function and human benefit does not exist, or more likely, is simply not yet fully understood.

The challenge in relaying the importance of birds to humans is that ecosystem services provided by birds are

largely "supporting services." Supporting services include maintenance of biodiversity, nutrient cycling, soil formation, and other services that support proper ecosystem functioning. These inherently have only indirect impacts on humans, making them less obvious to the reader, and more challenging for the author to explain. For example, whitebark pine (*Pinus albicaulis*) is a foundational and keystone forest tree species throughout its range in western North America. This species depends on Clark's nutcracker (*Nucifraga columbiana*) to disperse its seeds, an important ecosystem service provided by this bird and one crucial to the conservation of whitebark pine habitats. In Chapter 7, the monetary value of Clark's nutcracker is calculated as the cost of replacing its seed dispersal service in the environment. In other words, how much would it cost to plant by hand as many whitebark pines as Clark's nutcrackers do? For skeptic nonscientists not already convinced that conservation in general is a worthy endeavor, making the argument that birds matter because they help us conserve other species may not be any more convincing. As stated by the authors, "accurately quantifying indirect ecosystem services proves challenging. Ascribing an economic value to them is even more challenging."

Chapter 1 provides an interesting historical perspective describing the now-defunct field of *economic ornithology* and its relevance for the blooming research field of ecosystem services. It occurs to me that an important distinction between economic ornithology and modern ecosystem services is that in the former, the objective was more explicitly human economic benefits. Economic ornithologists mostly studied agricultural systems and how birds acted as pests or agents of pest control to influence crop yields. When broad-scale application of chemical pesticides reduced the need for such studies, the field died. While the stated focus of ecosystem services is also human benefits, the real objective, at least for some in the field, seems clearly to be conservation. To this end, some of the "services" discussed in the book feel self-serving to bird enthusiasts. For example, in several places the authors argue that birds are important because of the amount of money birdwatchers are willing to pay to attract them to their yards or to travel to see them in natural areas. This is undoubtedly true. Birdwatchers and other ecotourists represent important sources of income that truly benefit many communities around the world. But again the argument that birds matter because birdwatchers will pay to see them might feel unconvincing to someone not already enthusiastic about birds. To be fair, the authors do show a balanced perspective by devoting a large part of Chapter 12 to potential *ecosystem disservices* such as pollinating or dispersing invasive species, spreading diseases, increasing nutrient loading at congregating sites, and acting as agricultural pests.

A focus on bird conservation even in the absence of clear human economic benefits is, of course, not necessarily a negative. Chapter 2 provides a good discussion of the ethics of ecosystem valuation, and how placing monetary value on ecosystems may not always be appropriate. Besides, to an ecologist the connection is clear: as bird diversity is degraded, so too are the services birds provide. The most impactful examples of the book are those that clearly demonstrate a direct connection between bird diversity and human quality of life. For example, Chapter 11 describes how variation in functional avian diversity in tropical agroforestry systems influences levels of insect herbivory, fruit yield, and dispersal of economically important plants. This is followed by a monetary estimation of how much money farmers gain per hectare from avian ecosystem services. This example clearly demonstrates that habitat management to improve avian diversity in tropical agroforestry systems benefits both birds and humans. In another especially enlightening example from Chapter 8, the authors discuss how reduced diversity and abundance of vultures in India has had real impact on human health. With fewer vultures to remove domestic and wild animal carcasses, populations of feral dogs and rats have increased. This has increased the risk of bites from these animals, as well as the transmission of infectious diseases that they carry such as rabies and bubonic plague. Again the authors accompanied this example with an estimate of monetary costs in health care associated with the decline in vultures—a staggering US $2.43 billion per year (Markandya et al. 2008. Counting the cost of vulture decline: an appraisal of the human health and other benefits of vultures in India. Ecological Economics 67:194–204).

Birds matter. And the conservation of birds matters to humans around the globe. As highlighted by the authors, detailing the many ways birds and humans are intricately linked is challenging, but increasingly important. I believe *Why birds matter* goes a long way in meeting this challenge and promoting the conservation and further study of bird diversity. This book provides a benchmark for our current understanding of avian ecosystem functions, identifies future directions for research in the field, and will inspire working ecologists to continue improving our understanding of why birds matter.

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Literature Cited

Markandya, A., T. Taylor, A. Longo, M. N. Murty, S. Murty, and K. Dhavala. 2008. Counting the cost of vulture decline—an appraisal of the human health and other benefits of vultures in India. Ecological Economics 67:194–204.