

a panacea but emphasize that each management decision will produce winners and losers, stressing that tradeoffs are prevalent in ecosystem service management.

The chapters that discuss the principles all follow the same well-conceived structure. In an introduction the authors define the principle and give an overview of the available literature. Then they discuss how it can influence ecosystem service resilience positively or negatively. Each chapter contains a box with a case study and ends with suggestions for operationalization and application, as well as a list of research needs.

Part of the confusion surrounding the actual use of the concept of resilience is that even the principles for building resilience have ambiguous effects. Good connectivity between habitat patches can, for example, safeguard species persistence through migration and at the same time facilitate the spread of diseases or invasive species. The authors deal with this ambiguity by giving examples for such positive or negative effects in various systems. Sometimes this approach leaves a slight impression of squishiness. However, part of the philosophy of complex adaptive systems is to accept, or even embrace, complexity and to accept that knowledge is currently missing thus warranting this approach. The chapters in the book are well linked. In contrast to numerous other edited volumes with a large number of contributors, this book has been carefully designed and edited and evidently results from countless hours of debate, discussions, and refinements. To conclude, this work provides the best available overview and critical discussion of principles that could be used to strengthen the resilience of ecosystems. It does not provide cookbook-like solutions, and therefore still might disappoint natural scientists trained to "solve" problems, but it gives structure and depth to a key challenge of social-ecological research and policy.

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EVOLUTION

MONARCHS AND MILKWEED: A MIGRATING BUTTERFLY, A POISONOUS PLANT, AND THEIR REMARKABLE STORY OF COEVOLUTION.

By Anurag Agrawal. Princeton (New Jersey): Princeton University Press. \$29.95. xi + 283 p.; ill.; index. ISBN: 9780691166353. 2017.

Public and scientific interest in monarch butterflies (*Danaus plexippus*) seems to be at an all-time high, and this volume stands out nicely in a crowded field

of general-interest science books about the beloved insect. The author is Anurag Agrawal, an ecologist and evolutionary biologist at Cornell University who has studied monarchs for a great many years. He has also trained a large number of students in the science of these animals, and this volume can best be described as an extended summer field course. It is easy to imagine the words on the page being spoken while the author leads you into an old field in Ithaca, New York, turning over the leaves of milkweeds looking for aphids, beetles and, of course, black-and-yellow striped caterpillars.

The book is wonderfully illustrated with color photographs and artwork, and is organized into nine chapters that encompass the basic biology of monarchs, interactions with other species, migration dynamics, and the coevolutionary arms race. The latter topic (the arms race) is a unifying theme throughout the volume and gives the author reason to delve into organic chemistry, natural selection, and the deep history of plants and insects. Across all topics, care was taken to keep the explanations accessible to an audience with a high school biology education, and there are enough fun facts and historical tidbits to hold the attention of any biologically minded reader. As a butterfly biologist myself, I found things that I did not know, and especially enjoyed the sections on complex interactions among different arthropod species. That is partly because I love those interactions myself, but also because Agrawal's enthusiasm was so tangible on the page.

Because the ecology of the natural world is full of stories and endless details, most people would never guess that those of us who study the natural world, especially ecology, do a lot of quantitative, statistical work. Although it is in no way the focus of the book, the author deals with some issues of data and analysis. In the last section, where he takes on the study (and associated controversy) of monarch declines, we see that simple correlations can be misleading because cell phone subscriptions and plantings of genetically modified crops appear to have equally strong (and negative) associations with annual variation in the hectares of overwintering monarchs. I wish that discussion could have gone farther because simple correlations are of course not all that we do. Explaining detrending and time series analysis to the general public might indeed be possible, and I suspect Agrawal could take us there if he wanted. It is my hope that will be the goal for another book, but in the meantime I will be happy with the walk in the New York old field.

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