

are important to explore, and could themselves be the subject of a book.

Several chapters describe environmental justice campaigns that have contributed directly to a broader sustainability agenda. For example, Faber and McCarthy discuss the campaign to eliminate the pesticide methyl bromide as a port fumigant in San Diego, California. Methyl bromide is a reproductive toxicant and an ozone depleting chemical, so it is significant both for local environmental health and for the global environment. This successful campaign has served as a model for environmental health campaigns in other port communities, and has spurred the creation of ambitious local projects for environmental protection and reclamation. The chapter on environmental justice in New Zealand similarly shows the success of local environmental justice movements in promoting sustainability, examining Maori efforts to resist genetic engineering and bioprospecting on their land.

A weakness of the book is that the editors have not done as much as they could to create coherence and dialogue among the collected works. In addition, there is some lack of clarity about whether the focus is on *environmental justice* or on the broader concept of *social justice* or *equity*. Some chapters clearly focus on environmental justice, while others look more generally at the relationship between environmental degradation or preservation and the pursuit of social justice. This lack of clarity can be seen, for example, in the chapter by Dobson, which looks at the relationship between environmental protection and social justice generally; it is unclear how this chapter relates to those that specifically address the relationship between environmental justice movements and the quest for sustainability. Despite these drawbacks, the book contains much valuable material, ranging from narratives about individual environmental justice efforts to suggestions toward interesting new empirical research agendas.

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Wildlife responses to climate change, North American case studies

Stephen H. Schneider and Terry L. Root (Eds.), Island Press, Washington, DC, 2002, ISBN:1559639253, xv+437 pp.

Stephen Schneider and Terry Root have capitalized on the energy and insight of several graduate students to produce an edited volume of case studies on how wildlife populations in North America may be responding to climate change. This book is the result of a 3-year project funded by the National Wildlife Federation (NWF) and led by Drs. Schneider and Root, world authorities on the topic of climate change. Nine graduate students were enlisted to investigate how climate change may be affecting a variety of wildlife populations, with “wild life” being used in the broadest sense of the word, as it should be, including vertebrates, invertebrates, and plants.

The world of science is not as clear-cut as we may like to think. The biggest issues facing humanity have their proponents, opponents, and advocates on either side, and the debate over such issues is often muddled by the complexity of biological systems, economics, and politics. How long did we dispute the effects of cigarette smoking on human health because we were not able to conduct randomized, replicated experiments on people before coming to the conclusion that smoking is harmful and can lead to death? Climate change and global warming remains such a hotly debated issue, with those who are alarmed by the prospect of a changing climate on one side and those who believe it is nothing more than another vagary of weather or the natural evolution of climatic patterns on the other. We are not able to conduct true experiments on global climate change at large spatial or temporal scales, and even if we could, they would be unreplicated ($n=1$ planet). However, the first two-sentence paragraph in the book—in the Foreword by Mark Van Putten, President and CEO of NWF—throws down the gauntlet and sets the stage: “It was not long ago that the big question about climate change was whether or not it actually was taking place. Now, there is broad scientific consensus that it is, in fact, happening, and that human activities are largely to blame”. It is perhaps noteworthy and accurate that Van Putten says “scientific consensus”

rather than “scientific evidence” (i.e., in the truest sense of science as experimentation), but it is a persuasive passage and a call to be heeded. Something is happening, and we best try to determine what it is and what it means.

The volume begins with an introduction and overview of global climate change and its implications for wildlife by Root and Schneider. This by itself is worth the price of the book. The authors provide an excellent and in-depth review of the topic, complete with two extensive tables documenting evidence of changes in plant and animal populations and distributions, as well as an extensive list of literature. This would be an excellent place to start for anyone interested in climate change but who had not yet read much of the literature, as well as a nice review for those well-versed in the topic. For all readers, it is a good platform from which to launch into the main eight chapters of the book.

The following eight chapters are authored by the graduate students involved in this interdisciplinary team effort. These young scientists (and their topic of interest) include Liza Crozier (butterfly range boundaries), Jessica Hellmann (butterflies as model systems), Raphael Sagarin (historical studies), Eric Sanford (intertidal systems), Francisca Saavedra (sub-alpine perennial plants), Elena Shevliakova (spatial distribution of vegetation), Erika Zavaleta and Jennifer Royval (biological invasions), and Laura Koteen (whitebark pine and grizzly bears). Six of the nine authors are associated with an institute of higher learning in California, but the topics span a wide range of species and regions in the US.

In each chapter, the students explain how they devised innovative experiments or modeling exercises to probe several different questions related to climate change and their species or system of interest. I especially enjoyed reading how they developed their hypotheses, considered alternative hypotheses, and designed their experiments or studies. All eight chapters are extremely well written and interesting to read. There was more than a hint of similarity at how each chapter began (e.g., some general background information on climate change), but this is a small necessity to allow each chapter the ability to stand alone. It is a minor criticism and did not at all detract from the overall volume. In fact, I was impressed with the coherent writing and readable style of each chapter,

and with the contribution that each chapter made to the entire volume. Many contributed works suffer from a variety of writing skills and styles and a subsequent disjointed feel among chapters. This book does not.

Patty Glick and Mark Van Putten, both of NWF, provide a final wrap-up and brief summary of the issue of climate change and the contributions made by each student. There is a comprehensive index, and each chapter includes a good list of cited literature. There are clear tables and figures throughout, as well as a few black-and-white photographs.

Overall, I found the book to be well done: interesting and insightful, with a high degree of scientific credibility and thoughtful review. It would make an excellent text for a graduate seminar or reading group. Ecologists and land managers would benefit from reading this book; we all may benefit if more economists, policy makers, and citizens spent some time between its covers.

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Panarchy: understanding transformations in human and natural systems

Lance H. Gunderson and C.S. Holling (Eds.), Island Press, Washington, DC, 2002, ISBN: 1559638575, 450 pp.

The authors of this fascinating and important book focus on the need of ecological and social scientists to understand the role of change in diverse ecological and social systems. A reader new to this subject would be puzzled by the title of the book. In Chapter 1, C.S. Holling, Lance H. Gunderson, and Donald Ludwig, “In Quest of a Theory of Adaptive Change,” explain that they are attempting to develop a dynamic interdisciplinary theory that is helpful for understanding changes in large and small systems, particularly those changes that transform adaptive systems. Such sys-