

BOOK REVIEWS

Conservation by Proxy: Indicator, Umbrella, Keystone, Flagship, and Other Surrogate Species. Tim Caro. 2010. Island Press, Washington, D.C., USA. 374 pages. \$70.00 (hardcover); \$40.00 (paperback); \$36.99 (Ebook). ISBN: 978-1-59726-192-0.

In the tallgrass prairies of the United States, the regal fritillary (*Speyeria idalia*) often is considered a reliable indicator of high quality remnant habitat. Purple milkweed (*Asclepias purpurascens*) is considered an indicator of high quality oak savanna habitat at the edge of prairie. Indicator and other surrogate species often are regarded as inescapable necessities in conservation, because limited budgets and the myriad pieces of an ecosystem render comprehensive monitoring impossible. Regardless of whether or not surrogate species are necessary, do they really work?

A large and diverse literature has accumulated on this topic. *Conservation by Proxy* is an effort to make sense of all that has been learned about surrogate species over the years. This book is a valuable contribution to the science and practice of surrogate species and a necessary addition to the library of anyone interested in or practicing conservation by proxy.

The first chapter of this book is devoted to defining the problems surrounding the buzzwords in the conservation field and attempting to bring some order to the terminology. Surrogate species are any species used as a proxy for other species, including indicator, umbrella, keystone, and flagship species. Terminology is diverse and the distinction between terms may be very narrow and overlapping in practice. The chapter is only partially successful in bringing any clarity to the subject, but that is partly due to the inherent nature of the subject. The author divides surrogate species into three primary types: those used in locating areas of conservation concern, those used to assess changes to biological systems, and those used as public-relations tools.

The inner chapters are divided into five sections, each with one to three chapters. The first section (Distribution of Biodiversity) examines whether the biodiversity of one species group predicts the biodiversity of another. The answer is: not consistently. The second section (Reserve Site Selection) is concerned with using surrogate species to define reserve locations. Does a reserve that was designed for a small selection of surrogate species provide an appropriate reserve for other species? The answer is: not consistently. The third section (Reserve Design and Management) delves into surrogate species used in reserve design and management, such as umbrella, landscape, keystone, and engineering species, which may not be mutually exclusive. Many of the surrogate species in the third section may be useful in a limited sense, but often are not as useful as originally hoped. The fourth section (Species Indicators of Anthropogenic Change)

explores and characterizes three types of indicator species, i.e., indicators of environmental change or pollution, indicators of ecosystem disturbance, and indicators of the status of other species. Again, failure is more common than success in the examples presented, but some notable surrogate relationships can be found in this section. The fifth, and final, section (Promoting Conservation) appraises flagship species, i.e., charismatic species that garner public and political support for conservation efforts. Flagship species can undoubtedly aid in raising funds and awareness, but their biological utility often has been lacking.

The final chapter (Surrogate Species in the Real World) is the most useful in synthesizing the information in the book. Here, the author presents some specific cases in which the application of surrogate species was successful. The reader will find the table relating conservation objectives with appropriate terms very useful, though a glossary would have been more helpful. Ultimately, surrogate species are generally risky propositions that are used because they seem to be the only possible solution to certain conservation problems. The author also notes that this field of study has too often been largely academic with little work that can be directly applied to current and urgent problems. The author provides some suggestions for methods to bypass surrogate species, including the use of environmental variables. For example, in prairie conservation issues, the use of environmental variables, such as whether a tract of land has ever been used for agriculture, may be more useful in reserve design than the presence of any particular species. Some species, however, are still considered useful cross-taxon indicators of the presence of other species.

No work of this magnitude is without flaws. Much of the book reads like a literature review rather than a synthesis of the literature with a thesis or argument. The book would have been greatly improved by syntheses on all the topics covered, which the author was in a rare situation to do. The book is largely academic and an introduction to concepts and theory rather than a practical guide for managers and practitioners. As an example, in Chapter 7 (Ecological-Disturbance Indicator Species), the author describes two hierarchical clustering methods, TWINSPAN and IndVal (Indicator Value Analysis). Although both of these well-known methods have been used to define indicator species, Caro does not assess their value or provide recommendations for their continued use. These are the type of recommendations a manager or applied conservation biologist would find useful. The author describes in detail some surrogate studies that seem to have been chosen haphazardly. Many studies are described, but the author provides little sense concerning whether these studies should be duplicated or what should be learned from them. It is not clear whether the literature review is comprehensive, which leaves the reader wondering what was not included in the

book. And finally, the literature covered in the book seems biased toward tropical studies.

Despite some shortcomings, we recommend *Conservation by Proxy* for academics and managers. No other source can shed such light on the many ways that surrogate species have been used and provide a map toward clearer terminology and communication. Despite the fact that surrogate species fail as proxies more often than they are successful, surrogate species will continue to be used because of logistical constraints. For example, the U.S. Fish and Wildlife Service currently is planning to use surrogate species in the beginning stages of Strategic Habitat Conservation plans and Landscape Conservation Cooperatives. The regal fritillary, purple milkweed, and other species are accepted by many as valid indicator species for several purposes, but managers and others should consider which species and environmental factors are not adequately represented or addressed by a sur-

rogate species or species group. The guidance provided by this book should be used to aid managers in avoiding pitfalls. Academics, in turn, would do well to heed Caro's admonition that this field needs to move from simply an academic pursuit to a more applied pursuit. The literature on surrogate species is extensive, but the critical linkages that are needed to apply that knowledge are missing.—Tyler J. Grant¹, Peter G. Eyheralde¹, Melissa S. C. Telemeco², Amy L. Moorhouse², Rebecca A. Reeves¹, Karin Grimlund², Amy Podaril², Sarah E. Emeterio², and Robert W. Klaver³. ¹Department of Natural Resource Ecology and Management, Iowa State University, Ames, Iowa 50011, USA; ²Department of Ecology, Evolution, and Organismal Biology, Iowa State University, Ames, Iowa 50011, USA; ³U.S. Geological Survey, Iowa Cooperative Fish and Wildlife Research Unit, Department of Natural Resource Ecology and Management, Iowa State University, Ames, Iowa 50011, USA.