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## Frontiers of Biogeography

### Title

Navigating the complexities of dynamic ecosystem change

### Permalink

<https://escholarship.org/uc/item/3db9g8h2>

### Journal

Frontiers of Biogeography, 5(4)

### Author

Rhodes, Jonathan R.

### Publication Date

2013

### DOI

10.21425/F5FBG20669

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Peer reviewed

## Navigating the complexities of dynamic ecosystem change

Novel Ecosystems: Intervening in the New Ecological World Order. Richard J. Hobbs, Eric S. Higgs & Carol M. Hall (editors), 2013, Wiley–Blackwell, 380 pp. £45 (hardback) ISBN 9781118354223; <http://www.wiley.com>

The world's ecosystems have always been subject to dynamic change and there is every reason to expect this to continue into the future. However, many approaches to understanding ecosystem processes and managing ecosystems have tended to ignore this aspect, instead implicitly assuming historical stability. Recent concerns about climate change and its impact on ecosystems have highlighted the need to be explicit about historical as well as future dynamic change in ecosystems. This has generated considerable interest in 'novel' or 'no-analogue' ecosystems (Williams and Jackson 2007), but has raised a wide range of issues related to how we deal with, predict, value and manage novel ecosystems.

This book tries to address many of these questions, with the weight of focus on the applied implications of novel ecosystems, reflecting the predominant interests of the editors. The focus on management is one of the book's strengths in that it tries to tackle some practical approaches for dealing with novel ecosystems in real management applications. As a conservation biologist, I found this enlightening and its attempt to develop practical solutions makes the book of interest to both scientific and practitioner audiences.

The book arose from a series of workshops and the editors provide an interesting overview of the workshop process in Chapter 1, including a candid account of the difficulty in reaching agreement on many contentious issues in the book. Despite the large number of contributors and the process through which it was written, the book is generally very well structured. It is organised into seven sections, but they largely cover the following four topics: novel ecosystem concepts and definitions, the characteristics of novel ecosystems, the management of novel ecosystems, and future considerations. The sections are interspersed with short case studies which are excellent illustrations of the issues in real systems, but it does tend to fragment the book a little. There is

a great case study early on in the book, describing the 'Hole-in-the-Donut' novel ecosystem in South Florida (Smith et al. 2011). This novel ecosystem was originally created through agricultural practices, but now lies entirely within the Everglades National Park. Subsequent efforts to manage this ecosystem provide a fantastic illustration of the challenges to managing novel ecosystems that this book attempts to address. There is also a nice historical perspective on the origin of the idea of novel ecosystems.

A considerable amount of space is devoted to dealing with definitions and the conceptualisation of novel ecosystems. As you might expect, this is a contentious issue, but is dealt with thoroughly by the book. The definitions that are developed focus around the idea of categorising ecosystems into historical, hybrid and novel. Although these are conceptualised along a continuum of increasing dissimilarity of biotic composition and abiotic condition from historical conditions, ideas of resilience are drawn upon to distinguish hybrid (for which a return to historical state is possible through restoration) and novel (where a return to historical state is not possible). The idea that a transition to a novel ecosystem is irreversible, in some sense, means there exists a degree of permanence to novel ecosystems that allows them in the future to be historical reference ecosystems themselves. However, it is not clear how this framework might deal with ecosystems that are continuously in flux, for which defining a historical reference system may be problematic. Clearly delineating among categories may also be challenging, although this is discussed in the book.

The sections on incorporating the novel ecosystem concept into management are really valuable parts of the book because I think this is where the most difficult challenges lie. A management framework is presented as a decision tree based around the historical / hybrid / novel classification. The framework is explicit about defining

management goals and also considers the feasibility of ecosystem recovery in terms of both ecological and social factors. This makes the framework potentially applicable within a structured decision-making process (Gregory et al. 2012), and to novel ecosystem management in complex socio-ecological systems. The framework is nicely illustrated by considering its application to a number of case studies, including the management of Atlantic Canadian meadows, prairie dogs and wetlands.

Future considerations for novel ecosystem management are addressed through a lens that includes possible concerns about invasive species, abandonment of traditional management practices, the uncertainty and complexity that novel ecosystems introduce and the limited value that people may place on novel ecosystems. Subsequent chapters consider how some of these may be addressed. Near the end of the book there is a thought-provoking chapter that discusses a future where all ecosystems are 'novel' and the concept of novel ecosystems loses its relevance. Nonetheless, the authors of that chapter, I think rightly, suggest that the concept may have value in the intervening time period as a way of giving value to ecosystems modified by humans. Regardless, it seems apparent that the concept is going to have to evolve as our ecosystems also evolve.

Overall, this is a timely book that thoroughly addresses a critical issue in the management of ecosystems in a dynamically changing world. Its strength lies in its treatment of decision-making processes and its real-world illustrations through case studies. As the editors state, there is much still to do in the area of novel ecosystems, but this book fills an important gap that will no doubt generate much more discussion and research on this topic.

Jonathan R. Rhodes

The University of Queensland

[j.rhodes@uq.edu.au](mailto:j.rhodes@uq.edu.au)

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Edited by Markus Eichhorn