

## **Decision Making in Natural Resource Management: A Structured, Adaptive Approach by Michael J. Conroy and James T. Peterson**

Author: Engstrom, R. Todd

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## BOOK REVIEW

### Edited by Jay Mager

Ohio Northern University, Ada, Ohio, USA  
[j-mager@onu.edu](mailto:j-mager@onu.edu)

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**Decision Making in Natural Resource Management: A Structured, Adaptive Approach** by Michael J. Conroy and James T. Peterson. 2013. Wiley-Blackwell. 474 pp. ISBN 978-0-470-67175-7.

Anyone who has participated in a group discussion of a natural resource management issue knows how complex it can become. Issues such as finding the location of a new biological preserve, setting hunting seasons and bag limits, determining the feasibility of capturing a population of a declining species to establish a captive breeding program, application of lethal control, assessment of a sustainable forest harvest, and mitigating the impacts of communications towers on bird mortality all require a structured, disciplined approach. Challenges like these will usually engage a diverse set of stakeholders including agencies, non-governmental organizations, and scientists. A fragmented, poorly focused decisionmaking process can waste time and money, increase frustration, and polarize various interests. The authors of this book mix decades of personal experience with a synthesis of a growing body of literature to produce a text describing how to elevate natural resource management decisionmaking into a more rigorous, scientific, and structured process.

The version of this book we reviewed was an eBook provided by the BookShout Application ([www.bookshout.com](http://www.bookshout.com)). Reading in BookShout was easy with a few caveats. Most figures were separated from the legends, so it was necessary to toggle between pages. The glossary was cut off at “complementary [events].” The index simply listed terms without any page number or means of returning (perhaps via a hotlink) to the location in the text. Although references were listed at the end of each chapter, again, it would have been handy to have a hotlink to quickly look at the reference without having to scroll through to the end.

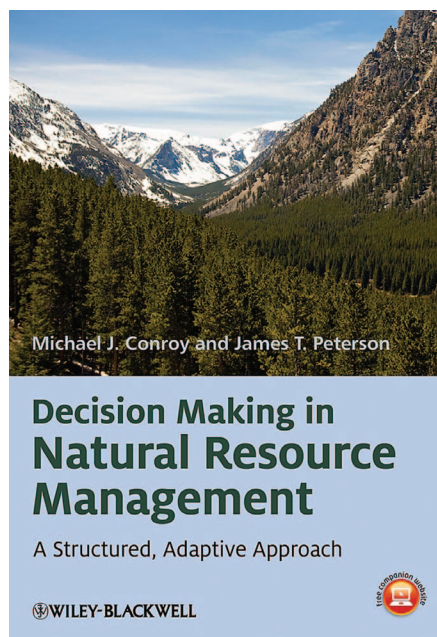
Solutions to these problems in an electronic format should be improvements over hard copy. The companion website had the useful feature of providing all figures in Power-Point, but not much else. BookShout allows people to read the same volume together and share notes and highlights

across different devices and platforms. Reading it alone, any notes or underlines would be hidden from view. In general, the note-taking process was cumbersome and made us long for the ability to just scribble in the margins.

The book has three principal sections. The first section (four chapters) provides a rationale for taking a structured approach to decisionmaking in natural resource management. Structured decisionmaking (SDM) must have specific quantifiable objectives, a set of management alternatives, and use models to predict outcomes. As the authors wisely note, the most difficult of these components is identifying management objectives, because defining objectives is the foundation for building the structure of a decision. SDM has the

advantages of transparency, a clearer connection of decisions to stated objectives, institutional memory, and better use of resources (e.g., monitoring).

A corollary to SDM, adaptive resource management (ARM) (Walters 1986), has three elements: recurrent (dynamic) decisionmaking in time and space, two or more alternative models of system dynamics (structural uncertainty), and monitoring, which is used to update the decisionmaking process. The authors note some common misconceptions about adaptive resource management; chief among them is that adaptive management is a form of research. In fact, the authors argue that first and foremost, adaptive management is management and decisions that are made to maximize management objectives. The learning that occurs is a byproduct of management. ARM is a widely used term that is rarely employed in a rigorous or effective way.



The second section, which comprises nearly 60% of the book, provides methodological tools for decisionmaking and analysis in four chapters. The first chapter of this section introduces basic statistical ideas, such as probability and probability distributions, and ends with an exploration of the distinction between frequentist and Bayesian approaches. Using techniques developed in the first section, a chapter on modeling introduces how explicit objectives can be framed within a decision model using tools such as influence diagrams and decision trees. The final two chapters deal with identifying and reducing uncertainty in decisionmaking and exploring methods for obtaining optimal decisions.

These chapters with the Appendices offer substantial practical advice and examples on statistics and modeling not often found in any one source, especially one on natural resource management. Their use of R and an emphasis on contemporary approaches to relevant management issues are a breath of fresh air. Many of the examples are overly simplistic (e.g., to catch a fish and see a seal), but they build the case toward more complex, real-world examples such as hierarchical analyses of landscapes. Emphasis on data exploration is important, but heed against willy-nilly data mining. The authors caution against trivial tests of null hypotheses that are obviously not true, but call attention to “the magnitude of an effect and measure of the uncertainty are more useful to decisionmakers because they provide the basis for action.”

The last section (two chapters) of the book introduces applications of SDM, some successful and others less so, and examines why they were or were not successful. The first example presented was for the American Black Duck (*Anas rubripes*) harvest management, the specialty of the first author. Black ducks, breeding mostly in Canada and overwintering mostly in the coastal eastern United States, present a complicated management challenge with a diverse set of international stakeholders. Midwinter waterfowl surveys (U.S. Fish and Wildlife Service) indicated declines in overall abundance and a contracting range. Explanations for these ranged from excessive harvest to competition and hybridization with Mallards (*Anas platyrhynchos*). Adaptive Harvest Management (AHM) was used to link harvest protocol to monitoring regimes, thus providing the foundation for a dynamic model of American Black Duck management. So far AHM is only indirectly linked to habitat management, and challenges remain to coordinate a harvest management strategy between the two nations.

A case study that provided a “lessons learned” message was an initiative to conserve or create early successional habitats in Georgia through landowner incentives for

Northern Bobwhite (*Colinus virginianus*) and other birds that have declined dramatically in recent decades. Habitat reduction and fire suppression are undoubtedly significant factors responsible for these declines. In this case a failure to understand political considerations led to a less than satisfactory measure of program success (i.e. actually monitoring response of bird populations was less important than simply accruing more acres through incentives). Other case studies included management of Flint River water resources in Georgia, managing a largemouth bass (*Micropterus salmoides*) fishery, addressing dolphin conservation in New Zealand, and an attempt to recover a small minnow species on the Cahaba River in Alabama.

The book concludes with a recommended list of key elements necessary to successfully implement SDM. Interestingly, the first component of success is the need for a champion, who has “the authority, resources, and temerity to keep the process moving forward.” The authors recommend that successful application of SDM also must have the proper balance of biology and objectives. Scientists who do not work in collaboration with managers/decisionmakers can create a very detailed model that has limited use in addressing real management objectives. These are just some of the pearls of wisdom created from the grit of long hours of meetings and workshops.

This book is a valuable source of information for individuals interested in learning how to facilitate an integrative natural resource decisionmaking process. Scientists could benefit from the wealth of the authors’ experiences, and managers would profit from getting the big picture, even if they do not read the more technical chapters. It also could be used as the focal text for a graduate class that emphasizes statistical analyses. Developing sophisticated approaches to solve thorny environmental problems is a skill set that many will develop in part with the assistance of this book.

**R. Todd Engstrom**

Tall Timbers Research Station  
13093 Henry Beadel Drive  
Tallahassee, Florida 32312

**Gerald Niemi**

Center for Water and the Environment  
Natural Resources Research Institute  
5013 Miller Trunk Highway  
University of Minnesota  
Duluth, MN 55811

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