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BOOK REVIEW

Using expert knowledge in landscape ecology

Ajith H. Perera, C. Ashton Drew and Chris J. Johnson (eds.): *Expert knowledge and its application in landscape ecology*. Springer, New York, USA, 2012, 307 pp. illus., maps; 24 cm. Hardcover, ISBN 978-1-4614-1033-1, US $209.00, DOI 10.1007/978-1-4614-1034-8

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This volume perfectly illustrates the truism—"we don't know what it is that we don't know." I have been a landscape ecologist for over 20 years, and have even used expert knowledge many times in my own research. Yet I learned something profoundly new in almost every chapter of this collection of primers and case studies focused on the use of expert knowledge in landscape ecology. The volume is comprised of contributed chapters featuring a nice variety of research questions, ecosystems and approaches, all from a landscape ecology perspective. The quality of the chapters is consistently high, and the explicit focus on the application of expert knowledge (EK) is the unifying thread. The volume reveals that this field is very young and without established protocols, and yet some critical advances have already been made.

The first chapter was written by the editors and it includes a careful definition of terms and a clear statement of the objectives and organization of the book. It nicely provides the context for the chapters that follow, increasing the coherence of the volume. The following three chapters provide some "nuts and bolts" about EK and how to acquire it in a scientifically rigorous way. Chapter 2, by McBride and Burgman, is a primer on the types of EK and how it can be acquired to minimize bias and maximize accuracy and usefulness. Chapter 3, by Low-Choy et al., describes the "Elicitator" software tool that was designed to elicit knowledge from experts in a systematic and repeatable way. They provide a case study applying EK to parameterize a species distribution model for wallabies in Australia, and conclude with an assessment of the strengths and weaknesses of their use of EK and their software tool. Chapter 4, by Drescher et al., describes a different elicitation software tool and its application to study forest succession in Ontario Canada. The authors delineate the considerable advantages of a formal process to elicit EK and conclude with some lessons learned. These chapters each provide a unique perspective, but a common thread is the importance of assessing the uncertainty associated with EK as a key to ensuring the scientific value of EK.

The remaining chapters (except the last) are case studies that describe how EK was elicited, quantified and used for various research and resource management purposes. The variety of approaches and applications is quite remarkable. There is lots of food for thought in this collection of chapters. Drew and Collazo (Chapter 5) used EK as a foundation for the management of a secretive bird species for which little empirical knowledge is available. They provide a good and lengthy discussion of the issues associated with eliciting EK about landscape structure and spatial relationships. Chapter 6, by Moody and Grand, describes a process to identify focal avian species for conservation planning that relies on EK. This chapter

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describes potential weaknesses associated with subjectivity, which also is a common thread throughout the volume. Chapter 7, by McNay, describes the case of caribou in British Columbia, where management actions have long been deferred because solid empirical studies are lacking. They successfully used EK to develop interim solutions to move management forward. The approach included some testing and validation of the EK. Chapter 8, by Johnson et al., compares the strengths and weaknesses of EK v. empirical approaches to species distribution modeling for wildlife conservation. They concluded that the best approach depends on the system studied and the question asked, but that the key criteria are repeatability and validation. Chapter 9, by Drescher and Perera, describes a very quantitative approach to measure the uncertainty in elicited EK. They compared EK (i.e., as a hypothesis) to empirical observation and found that experts may have a simplified view of succession, tending to overlook rare successional events. In some aspects, experts and data agreed, but in others they did not.

Chapter 10, by Doyon et al., describes the use of EK to estimate transition probabilities between forest cover types in Labrador Canada. They elicited EK at workshops that included a self-assessment of uncertainty. They compared the expert probabilities to those generated by a process-based landscape succession model (LANDIS-II) and found that the agreement was variable. Although absolute values were sometimes significantly different, the rank order was often the same, which they interpreted as indicating a level of robustness. They concluded that the approaches are complementary and together provide insights that neither can provide alone. Keane and Reeves (Chapter 11) used EK to help develop fuel maps at national scales. They elicited EK using a variety of techniques, including workshops, surveys and interviews, followed by an extensive cross-validation procedure to evaluate accuracy. They conclude with some suggestions for building EK into repeatable, quantitative protocols. Chapter 12, by Williams et al., used a combination of data-driven and EK procedures to delineate ecoregion boundaries in Australia. They used a Bayesian approach that uses EK as the start of a learning cycle, using empirical evidence to update the 'prior' knowledge. The approach embraces uncertainty in both EK and empirical data. Because the approach is new, there is considerable discussion of issues that can be resolved with additional research. Kapple et al. (Chapter 13) surveyed regional experts to gauge the vulnerability of 15 marine ecosystems in Massachusetts (USA) to 58 stressors. They compared their results to a California study done using the same methods. They did a nice job of quantifying potential bias by affiliation, length of experience and gender. They found consistency between the two regions, suggesting that the approach is generalizable.

The final chapter by Johnson et al. synthesized the chapters to identify some common threads. (1) EK elicitation should be transparent and repeatable, and assess uncertainty. (2) EK is used widely because experts offer valuable contributions that can sometimes be better than empirical studies because they represent broader geographical and temporal perspective than found in most short-term studies. They conclude the chapter with three recommendations for landscape ecologists. (A) Review the literature on human subjects before attempting to elicit knowledge from experts. (B) Expand the available toolsets to support rigorous elicitation of EK. (C) Continue to critically evaluate and test EK.

I did not find much to criticize in this book. The quality of the chapters was more even than is typically found in collections of papers, and the theme of the book was well-represented throughout. The chapters were well-edited. The volume was explicitly aimed at landscape ecologists, although ecologists of all stripes will find this information extremely useful. The only negative comment in my notes was that the third chapter relied heavily on the acronym SDM without ever defining it (species distribution model?). I most certainly recommend this book to any ecologist that relies on EK in their work. If you are at all like me, you probably "don't know what it is that you don't know."