

Book Reviews

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NEW BOOK EVALUATES POPULATION VIABILITY ANALYSIS AS A CONSERVATION TOOL

Beissinger, Steven R., and Dale R. McCullough, editors. 2002. **Population viability analysis**. The University of Chicago Press, Chicago, Illinois. xvi + 577 p. \$95.00 (cloth), ISBN: 0-226-04177-8 (alk. paper); \$35.00 (paper), ISBN: 0-226-04178-6 (alk. paper).

The stated purpose of the book is to provide a reassessment of population viability analysis (PVA) after two decades of use, and the book admirably achieves its goal. It provides an evaluation of the strengths and weaknesses of PVA as a tool in conservation biology and provides a diversity of opinions about the value and use of this tool. The book has 25 chapters by 53 contributors, and is organized into four parts. The style of the book is user friendly and will lend itself nicely to inclusion in university courses such as Conservation Biology and Population Dynamics. This text will also be an excellent resource for academic researchers, including professors and graduate students. More importantly, this text will be a valuable reference for resource managers at ground zero (e.g., U.S. Fish and Wildlife Service Field Offices and Refuges, U.S. Forest Service District Offices, states' natural resources offices, recovery teams, private landowners), where policy and habitat management decisions are made daily.

It is most appropriate for a book that re-focuses PVA as a tool in conservation biology to be opened with a foreword by Michael Soulé. This pioneer of the field once again reminds us of the role we play in society as well as in science, and charges us with ethical as well as technical responsibility as we develop and apply PVA.

The organization of the book into four major parts is quite useful. Part I has seven chapters and addresses the current state of knowledge and application of PVA, including frank discussions of the weaknesses of the past. Part II has five chapters and addresses alternative approaches for improving the structure and function of PVA in the future. Part III has eight chapters that provide examples of current PVA applications. Part IV has five chapters and gives general advice on the use of PVA as a conservation tool in the future.

The inclusion of short biographical descriptions of the contributing authors lends credibility to the lessons within the text. The editors did an outstanding job soliciting chapters from authors who are recognized as leaders in their fields, including highly respected authors with opposing views. Also, the list of contributors includes both basic and applied practitioners of conservation biology. It is no surprise that the book also serves as an inspirational call to arms for scientists in both theoretical and applied arenas. Many authors eloquently state the need for collaboration between developers of theoretical constructs and collectors of empirical data. The horn of adaptive management is sounded as the instrument to bridge these two arenas, and some suggest that competing PVA models can serve this purpose. As with any developing science, there are a few scientists blowing notes

of dissension about adaptive management and PVA, and the editors should be applauded for including these competing tunes.

The massive lists of citations are also a testament to the thoroughness of this book. Particularly, the chapters in Part I provide excellent overviews of each subject. The authors provide neatly packaged syntheses of complex subject matter, and the cited literature provides the reader with a plethora of primary literature to pursue pertinent details.

Part I begins with Beissinger's chapter on the history of PVA. The co-editor provides an excellent background on the evolution of PVA and frames the rest of the book. The second chapter by Lande is a thorough discussion of stochasticity in PVA. The author does a fine job of presenting the material for a broad audience. He avoids highly technical examinations of formulae yet provides a complete, palatable discussion of this critical issue. Lande concludes the chapter with an endorsement of PVA with longer time frames and lower probabilities of extinction. In Chapter 3, Boyce elucidates many of the dichotomies in conservation biology. He suggests that PVA in combination with adaptive management is the best approach to reconcile current dichotomies. He makes a strong charge that social barriers to prudent adaptive management must be overcome. Chapter 4, by Allendorf and Ryman, provides a brief review of population genetics and the historic role of genetics in PVA. Most importantly, they provide excellent, practical advice on how to better include genetics in PVA in the future. In Chapter 5, Hanski reviews metapopulation models and suggests limits to the application of these models in PVA, particularly regarding model complexity and time frame. Hanski's message seems to be: keep it simple and keep it short. Chapter 6, by Harrison and Ray, explores the application of PVA to plants. They suggest that due to the differing ecological processes of plants, metapopulation approaches are often not necessary. They show how a large-scale, coarse grained approach may be sufficient for many plant species, but caution that empirical data on extinctions, colonizations, and regional influences should be sought with new, advancing technologies such as geographical information systems and molecular technology. Chapter 7 serves as the concluding remarks for Part I, and the authors (Shaffer, Watchman, Snape, and Latchis) evaluate PVA and its role in conservation policy. They discuss three major lessons from past PVA applications and suggest five initiatives to improve the role of PVA in conservation biology.

Part II includes detailed presentations about various elements of PVA and various approaches to PVA. Waples begins with a discussion about effective population size (N_e) in Chapter 8. He asserts that N_e can and must be incorporated into PVA. He also cautions that nonequilibrium processes and sampling bias must be considered when estimating N_e . In Chapter 9, the authors (White, Franklin, and Shenk) discuss methods to estimate population parameters such as population size, survival, recruitment, immigration, and emigration.

They suggest that PVA models should only be built on parameters that are precisely and reliably estimated. In Chapter 10, Sæther and Engen discuss methods to incorporate uncertainty due to unknown or poorly estimated parameters and uncertainty from stochastic effects into PVA using population prediction intervals (PPI). An alternative approach is presented by Wade in Chapter 11. He discusses the Bayesian method of incorporating uncertainty for each parameter, and compares the results of Bayesian PVA to PVA using maximum likelihood point estimates for population parameters. In Chapter 12, the authors (Taylor, Wade, Ramakrishnan, Gilpin, and Akçakaya) bring the discussion of uncertainty in PVA into the real world practice of protecting species based on the risk of extinction (e.g., IUCN criteria). This is an interesting exploration of model performance and a clear call for a formal decision-making framework.

Part III provides examples of a wide variety of PVA approaches with a diversity of taxonomic groups. The case studies cover the gamut from plants and brine shrimp to sparrows and panthers. They are wisely chosen to illustrate the conflicts and lessons discussed in the earlier chapters.

Part IV represents several views of the future of PVA. All of the authors seem to agree with Soulé in the foreword that PVA is here to stay. They also seem to agree that there is

some value in PVA as a tool in conservation biology, but they have different opinions about the structure and use of PVA. In Chapters 21 and 22, the authors concur that a decision-making construct is necessary, but Goodman endorses a Bayesian approach to incorporate uncertainty and Possingham, Lindenmayer, and Tuck endorse a frequentist approach. In Chapters 23 and 24, the authors disagree on model complexity. Lacy and Miller promote increased complexity in PVA to capture the risks associated with human population growth and activity, but Ludwig and Walters caution against the reliability of complex PVA models. Ludwig and Walters also provide a cautionary reality check on both PVA and adaptive management. The final chapter of the book, by Ralls, Beissinger, and Cochrane, is an excellent user's guide to conducting PVA.

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