

2003

Review of Population Viability Analysis

Mark W. Miller

USGS Patuxent Wildlife Research Center

Follow this and additional works at: <http://digitalcommons.unl.edu/usgsstaffpub>



Part of the [Earth Sciences Commons](#)

Miller, Mark W., "Review of Population Viability Analysis" (2003). *USGS Staff -- Published Research*. 87.
<http://digitalcommons.unl.edu/usgsstaffpub/87>

This Article is brought to you for free and open access by the US Geological Survey at DigitalCommons@University of Nebraska - Lincoln. It has been accepted for inclusion in USGS Staff -- Published Research by an authorized administrator of DigitalCommons@University of Nebraska - Lincoln.

REVIEW OF *POPULATION VIABILITY ANALYSIS*

Population Viability Analysis. Steven R. Beissinger and Dale R. McCullough, editors. 2002. University of Chicago Press, Chicago, Illinois. 577 pages. \$95.00 (cloth), \$35.00 (paper).

Population viability analysis (PVA) historically has been used to estimate the probability that a population will become extinct within a given time period. More recently, PVA has been used to evaluate alternative management strategies. Some might even say PVA gave rise to conservation biology. Nevertheless, PVA has been heavily criticized. This is the second book to present a synthesis and address those concerns. It does so extremely well.

The book is an edited volume of 25 chapters written by leading scientists in the field. There are four sections: an overview, model parameterization and construction, model use, and a vision for the future. Each chapter summarizes, at an advanced level, literature published over the last 5-10 years. Some chapters also present previously unpublished results. Unfortunately, the book includes no introduction to PVA for the uninitiated. For the necessary background see Akçakaya et al. (1999), Caswell (2001), Williams et al. (2002).

In the 21 years since Shaffer's (1981) seminal paper on PVA, the field as a whole, and the theory in particular, have grown enormously, and the models have become increasingly complex. Consequently, most authors here lament the lack of data to conduct PVA. The section on model construction addresses this issue in depth. Some authors propose ways of conducting PVA that require estimating relatively few parameters. Interestingly, the real need may not be for better estimates of vital rates, but rather of how they will change over time.

The volume candidly and dispassionately addresses controversial issues about the development and use of PVA. Current debate involves, among other topics, the importance of including genetic factors in PVA models (for example, the chapter by F. Allendorf and N. Ryman and the chapter by P. Hedrick); Bayesian versus frequentist approaches to dealing with uncertainty (chapters by P. Wade and D. Goodman); how best to incorporate future change in habitat quantity or quality (discussed by R. Lacy and P. Miller); and even the appropriateness of PVA at all (see especially the chapter by D. Ludwig and C. Walters).

The extension of PVA methods to new applications and using new techniques is a focus of the volume. The importance of including a spatial component in PVA is discussed in several chapters, notably by I. Hanski. A chapter by D. Doak et al. deals explicitly with incorporation of seed banks into PVA of plants. Use of PVA for management of overabundant species also is suggested. Separation of process and sampling variance is an important subject presented by G. White et al. Stochastic dynamic programming to find optimal land-use strategies that minimize risk of extinction holds a great deal of

potential (see the chapter by H. Possingham et al.), as does pedigree analyses of reintroduced populations (see the chapter by S. Haig and J. Ballou). Experimental evaluation of PVA and testing of factors that contribute most to extinction of brine shrimp (*Artemia franciscana*, G. Belovsky et al.) is one of the most fascinating chapters. Results of PVA research needed for making policy decisions are suggested by M. Shaffer et al. Proposed guidelines for future studies are suggested by K. Ralls et al.

Several case studies are included. Separate outstanding chapters deal with Leadbeater's possum (H. Possingham et al.) and the Florida panther (D. Maehr et al.). Those chapters describe how large-scale management decisions are being implemented as a result of PVA models. A PVA of the Cape Sable seaside sparrow is presented by S. Pimm and O. Bass, Jr. Their study, however, was compromised by the use of non-rigorous estimates of annual abundance, as well as limited information on how population parameters vary in response to change in environmental conditions.

Several authors suggested future PVA be combined with adaptive management (for example, the chapter by M. Boyce). D. Ludwig and C. Walters caution that doing so may not be feasible in many cases for social, political and economic reasons. They suggest that costs and benefits be given strong consideration before attempting such an approach. PVA may be a powerful tool for many grassland species in the future if successfully combined with adaptive management in a socio-economically feasible manner.

I recommend this book to everyone with an interest in PVA. People new to the field will find the book quite challenging. Individuals with a strong interest in PVA may also be interested in Sjögren-Gulve and Ebenhard (2000). At least two other books about PVA are scheduled to be published in 2003. Nevertheless, the present volume is a valuable addition to the library of any professional conservation biologist.

LITERATURE CITED

- Akçakaya, H.R., M.A. Burgman, and L. R. Ginzburg. 1999. Applied population ecology: Principles and computer exercises using Ramas Ecolab 2.0. Sinauer Associates, Inc., Sunderland, Massachusetts.
- Caswell, H. 2001. Matrix population models: construction, analysis, and interpretation, second edition. Sinauer Associates, Inc., Sunderland, Massachusetts.
- Shaffer, M. L. 1981. Minimum population sizes for species conservation. *BioScience* 31:131-134.
- Sjögren-Gulve, P., and T. Ebenhard, editors. 2000. The use of population viability analysis in conservation planning. *Ecological Bulletins* 48, Munksgaard, Copenhagen.

Williams, B. K., J. D. Nichols, and M. J. Conroy. 2002. Analysis and management of animal populations. Academic Press, San Diego, California.
—Mark W. Miller, USGS Patuxent Wildlife Research Center, 11510 American Holly Drive, Laurel, MD 20708.