Viable populations for conservation

VIABLE POPULATIONS FOR CONSERVATION

EDITED BY MICHAEL E. SOULÉ
School of Natural Resources, University of Michigan

CAMBRIDGE UNIVERSITY PRESS

Published by the Press Syndicate of the University of Cambridge
The Pitt Building, Trumpington Street, Cambridge CB2 1RP
40 West 20th Street, New York, NY 10011–4211, USA
10 Stamford Road, Oakleigh, Melbourne 3166, Australia

First published 1987
Reprinted 1988, 1989, 1990, 1993, 1996

British Library cataloguing in publication data
Viable populations for conservation.
1. Nature conservation
I. Soulé, Michael E.
639.9 QH75

Library of Congress cataloguing in publication data
Viable populations for conservation.
Includes index.
1. Population biology. 2. Wildlife conservation.
3. Extinction (Biology) I. Soulé, Michael E.
QH352.V53 1987 574.5′248 86-33438

ISBN 0 521 33390 3 hardback
ISBN 0 521 33657 0 paperback

Transferred to digital printing 2004

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For Paul R. Ehrlich, pioneer and prophet

Contents

Contributors

Richard Baker
Department of Environmental Studies
Wickson Hall
University of California at Davis
Davis, CA 95616

George F. Barrowclough
Department of Ornithology
American Museum of Natural History
New York, NY 10024

Gary E. Belovsky
School of Natural Resources
Dana Building
University of Michigan
Ann Arbor, MI 48109-1115

P. J. Brockwell
Department of Statistics
Colorado State University
Fort Collins, CO 80521

Peter F. Brussard
Department of Biology
Montana State University
Bozeman, MT 59717

Warren J. Ewens
Department of Biology
University of Pennsylvania
Philadelphia, PA 19104

J. M. Gani
Department of Statistics
University of Kentucky
Lexington, KT 40506

Michael E. Gilpin
Department of Biology (C-016)
University of California at San Diego
La Jolla, CA 92093

Daniel Goodman
Department of Biology
Montana State University
Bozeman, MT 59717

Russell Lande
Department of Biology
University of Chicago
Chicago, IL 60637

Lynn A. Maguire
School of Forestry and Environmental Studies
Duke University
Durham, NC 27706

S. I. Resnick
Department of Statistics
Colorado State University
Fort Collins, CO 80521

Hal Salwasser
USDA Forest Service
P.O. Box 2417
Washington, DC 20013

Christine Schonewald-Cox
Department of Environmental Studies
Wickson Hall
University of California at Davis
Davis, CA 95616

Ulysses S. Seal
VA Medical Center
54th St and 48th Ave South
Minneapolis, MN 55417

Mark Shaffer
1937A Villa Ridge Drive
Reston, VA 22090

Michael E. Soulé
School of Natural Resources
University of Michigan
Ann Arbor, MI 48109-1115

Preface

As the biosphere retreats in the face of physically superior forces, some conservation biologists are tempted to employ emotive rhetoric in the defense of ecological and species diversity, believing that such utterances will inspire others to join in their cause. Such a tactic may not be appropriate in a volume directed at managers and scholars, so let me only say that the subject of this book is central to conservation and conservation biology. It is also distinguished by its intellectual challenge.

The 'viable population problem' is very young. As documented in Chapter 1, it is only in the last decade or so that its importance has become recognized and its complexity appreciated. Herein we describe the significant advances that have already occurred. Our purpose is to spur increased interest in this aspect of conservation biology.

The logic of this volume is accretionary. Chapter 1 describes the viable population issue, examines its history, and warns of its complexity. In Chapter 2, Daniel Goodman provides the first of several major elements – a theory of persistence based on population dynamics, especially the interaction of environmental variability and the rate of population growth. He shows how it is possible to directly estimate the likelihood of persistence. Some of his conclusions support earlier work of Roughgarden (1979) and Leigh (1981) (references in Chapter 3). In Chapter 2, Gary Belovsky tests the power of Goodman's model with actual data. He also uses established allometric relations to predict the sizes of viable populations for ecological and body size categories of mammals, producing some startling predictions.

In Chapter 3, Ewens, Brockwell, Gani, and Resnick examine the effect of some catastrophe models on the loss of genetic variation and on the probability of persistence. Following this, Shaffer (Chapter 4) synthesizes the results of Goodman, Belovsky, and Ewens, *et al.*, and writes about the

relative importance of three different kinds of chance events: demographic, environmental, and catastrophic.

In Chapter 6, Lande and Barrowclough review the genetic components of viability analysis and discuss the factors that enter into the calculation of effective population size. Gilpin (Chapter 7) elaborates on the issue of effective population size at the level of the metapopulation. He also explains the behavior of a metapopulation model that can produce interesting aggregations of patch populations.

What are our options when extinction in nature appears inevitable, or when there is insufficient space available *in situ* for a self-sustaining viable population? In Chapter 8, Maguire, Seal, and Brussard show how decision analysis can be used to compare potential management interventions, using the Sumatran rhinoceros as an example.

In many situations, success depends on cooperation among different governmental and non-governmental agencies and organizations. In Chapter 9, Salwasser, Schonewald-Cox and Baker review this issue and illustrate it with case histories and scenarios.

The final chapter is both retrospective and prospective. A synthesis is attempted, several caveats and qualifications are noted, and the possibility of a general, integrated theory of viability analysis is discussed, and directions for further research are suggested.

The book is in part the result of a workshop held at the University of Michigan in October 1984. The chapters were written in 1985 and 1986. Sponsors of the workshop included the United States Department of Agriculture Forest Service, the United States Department of Interior Fish and Wildlife Service, the New York Zoological Society, the Griffin Foundation, and the National Wildlife Federation.

I wish to personally thank my fellow authors, and my colleagues and students at the University of Michigan, especially Kathy Rude for her organizational assistance. This book would have been impossible without the encouragement and collaboration of David Hales and the support of James Crowfoot. In addition, Bill Conway, Tom Lovejoy, Hal Salwasser, and Chris Servheen have provided moral support and assistance in funding. Bruce Wilcox, Jim Brown, and Egburt Leigh III contributed freely of their editorial assistance and advice. Julie Wick contributed her word-processing skills.