

Cambridge University Press

978-0-521-63445-8 - Conservation in a Changing World

Edited by Georgina M. Mace, Andrew Balmford and Joshua R. Ginsberg

Frontmatter

[More information](#)

Conservation in a changing world

As evidence for the rapid loss of biological diversity strengthens, there is widespread recognition of the need to identify priorities and techniques for conservation action. Much progress has been made in the development of quantitative methods for identifying priority areas based on what we know about species distributions, but we must now build an understanding of biological processes into conservation planning. Here, using studies at global to local scales, researchers consider how conservation planners can deal with the dynamic interactions of species in a changing world, where human impacts will continue to affect the environment in unprecedented ways. This book will be a source of information for postgraduates, researchers and professionals in conservation biology, wildlife management and ecology.

GEORGINA M. MACE is a Senior Research Fellow at the Institute of Zoology, Zoological Society of London. She has been awarded the Marsh Award for Conservation Biology (1993) by the Zoological Society of London, the President's Medal of the Chicago Zoological Society (1995) and the OBE for services to conservation (1998). She is also co-editor of *Creative Conservation* (1994) with P. J. Olney and A. T. C. Feistner, and co-editor of the journal *Animal Conservation*.

ANDREW BALMFORD is a lecturer in conservation biology, until recently at the University of Sheffield, and now at the University of Cambridge. He is on the editorial boards of *Animal Conservation*, *Biological Reviews*, and *Oryx*.

JOSHUA R. GINSBERG is the Director of the Asia Program at the Wildlife Conservation Society in New York, where he administers 75 projects in 14 countries. He is associate editor for *Issues in International Conservation*, for the journal *Conservation Biology*, and is on the editorial board for *Oryx*. He is also deputy Chairman for the IUCN Canid Specialist Group, and a member of four other IUCN Specialist Groups.

Cambridge University Press

978-0-521-63445-8 - Conservation in a Changing World

Edited by Georgina M. Mace, Andrew Balmford and Joshua R. Ginsberg

Frontmatter

[More information](#)

Conservation Biology

Conservation biology is a flourishing field, but there is still enormous potential for making further use of the science that underpins it. This new series aims to present internationally significant biology. It will focus on topics where basic theory is strong and where there are pressing problems for practical conservation. The series will include both single authored and edited volumes and will adopt a direct and accessible style targeted at interested undergraduates, postgraduates, researchers and university teachers. Books and chapters will be rounded, authoritative accounts of particular areas, with the emphasis on review rather than on original data papers. The series is the result of a collaboration between the Zoological Society of London and Cambridge University Press. The series editors are Professor William Sutherland of the University of East Anglia and Professor Morris Gosling, Director of the Institute of Zoology in London. They hold the common belief that there are unexploited areas of basic science that can help define conservation biology and bring a radical new agenda to the solution of pressing conservation problems.

Cambridge University Press

978-0-521-63445-8 - Conservation in a Changing World

Edited by Georgina M. Mace, Andrew Balmford and Joshua R. Ginsberg

Frontmatter

[More information](#)

Conservation in a changing world

Edited by

GEORGINA M. MACE

ANDREW BALMFORD

AND JOSHUA R. GINSBERG

 **CAMBRIDGE**
UNIVERSITY PRESS



THE ZOOLOGICAL
SOCIETY OF LONDON



CONSERVATION
INTERNATIONAL

Cambridge University Press

978-0-521-63445-8 - Conservation in a Changing World

Edited by Georgina M. Mace, Andrew Balmford and Joshua R. Ginsberg

Frontmatter

[More information](#)

CAMBRIDGE UNIVERSITY PRESS

Cambridge, New York, Melbourne, Madrid, Cape Town, Singapore, São Paulo, Delhi

Cambridge University Press

The Edinburgh Building, Cambridge CB2 8RU, UK

Published in the United States of America by Cambridge University Press, New York

www.cambridge.org

Information on this title: www.cambridge.org/9780521634458

© Cambridge University Press 1998

This publication is in copyright. Subject to statutory exception and to the provisions of relevant collective licensing agreements, no reproduction of any part may take place without the written permission of Cambridge University Press.

First published 1998

Re-issued in this digitally printed version 2009

A catalogue record for this publication is available from the British Library

Library of Congress Cataloguing in Publication data

Conservation in a changing world / edited by Georgina M. Mace, Andrew Balmford, and Joshua R. Ginsberg

p. cm.

This book derives from papers presented at a joint Zoological Society of London and Conservation International Symposium held in London in September 1996 – Pref.

Includes bibliographical references (p.) and index.

ISBN 0 521 63270 6 (hardback). – ISBN 0 521 63445 8 (pbk.)

1. Biological diversity conservation—Congresses. 2. Conservation biology—Congresses. I. Mace, G. M. (Georgina M.) II. Balmford, Andrew, 1963– . III. Ginsberg, Joshua Ross. QH75.A1C6658 1999

333.95'16—dc21 98—24393 CIP

ISBN 978-0-521-63270-6 hardback

ISBN 978-0-521-63445-8 paperback

Additional resources for this publication at www.cambridge.org/9780521634458

Cambridge University Press

978-0-521-63445-8 - Conservation in a Changing World

Edited by Georgina M. Mace, Andrew Balmford and Joshua R. Ginsberg

Frontmatter

[More information](#)

Contents

- List of contributors* [vii]
Preface [ix]
- 1 The challenges to conservation in a changing world: putting processes on the map [1]
 ANDREW BALMFORD, GEORGINA M. MACE AND
 JOSHUA R. GINSBERG
 - 2 Anthropogenic, ecological and genetic factors in extinction [29]
 RUSSELL LANDE
 - 3 Integrating endangered species protection and ecosystem management: the Cape Sable seaside-sparrow as a case study [53]
 AUDREY L. MAYER AND STUART L. PIMM
 - 4 The dynamic response of plants to environmental change and the resulting risks of extinction [69]
 BRIAN HUNTLEY
 - 5 Ecological and evolutionary importance of disturbance and catastrophes in plant conservation [87]
 WILLIAM J. BOND
 - 6 Butterfly distributional patterns, processes and conservation [107]
 CHRIS D. THOMAS, DIEGO JORDANO, OWEN T. LEWIS,
 JANE K. HILL, ODETTE L. SUTCLIFFE AND JEREMY A. THOMAS
 - 7 Continent-wide conservation priorities and diversification processes [139]
 JON FJELDSÅ AND CARSTEN RAHBK
 - 8 Endemism and species turnover with elevation in montane avifaunas in the neotropics: implications for conservation [161]
 DOUGLAS F. STOTZ
 - 9 Indicator taxa for biodiversity assessment in the vanishing tropics [181]
 SACHA SPECTOR AND ADRIAN B. FORSYTH

Cambridge University Press

978-0-521-63445-8 - Conservation in a Changing World

Edited by Georgina M. Mace, Andrew Balmford and Joshua R. Ginsberg

Frontmatter

[More information](#)

- 10 Key sites for conservation: area-selection methods for biodiversity [211]
PAUL H. WILLIAMS
 - 11 Integrating population abundance, dynamics and distribution into broad-scale priority setting [251]
A. O. NICHOLLS
 - 12 Global biodiversity priorities and expanded conservation policies [273]
NORMAN MYERS
 - 13 Global conservation and UK government policy [287]
ROBERT M. MAY AND KERRY TREGONNING
- Index* [302]

Cambridge University Press

978-0-521-63445-8 - Conservation in a Changing World

Edited by Georgina M. Mace, Andrew Balmford and Joshua R. Ginsberg

Frontmatter

[More information](#)

Contributors

ANDREW BALMFORD

Department of Animal and Plant Sciences,
University of Sheffield, Sheffield S10 2TN,
UK

Present address: Department of Zoology,
University of Cambridge, Downing Street,
Cambridge CB2 3EJ, UK

WILLIAM J. BOND

Department of Botany, University of Cape
Town, Private Bag, Rondebosch 7700,
South Africa

JON FJELDSÅ

Centre for Tropical Biodiversity, Zoological
Museum, University of Copenhagen,
Universitetsparken 15, DK-2100
Copenhagen Ø, Denmark

ADRIAN B. FORSYTH

National Museum of Natural History,
Smithsonian Institution, Mail Stop 105,
10th Street and Constitution Avenue,
Washington DC 20560, USA

JOSHUA R. GINSBERG

Asia Program, Wildlife Conservation
Society, 2300 Southern Boulevard, Bronx,
NY 10460-1099, USA

JANE K. HILL

Department of Biology, University of
Leeds, Leeds, LS2 9JT, UK

BRIAN HUNTLEY

Department of Biological Sciences,
University of Durham, South Road,
Durham DH1 3LE, UK

DIEGO JORDANO

Departamento de Biología Vegetal y
Ecología, Facultad de Ciencias,
Universidad de Córdoba, Avenida San
Alberto Magno, s/n, 14701 Córdoba, Spain

RUSSELL LANDE

Department of Biology, University of
Oregon, Eugene, OR 97403-1210, USA

OWEN T. LEWIS

Department of Biology, University of
Leeds, Leeds LS2 9JT, UK

GEORGINA M. MACE

Zoological Society of London, Regent's
Park, London NW1 4RY, UK

ROBERT M. MAY

Department of Zoology, University of
Oxford, South Parks Road, Oxford OX1 3PS,
UK

AUDREY L. MAYER

Department of Ecology and Evolutionary
Biology, University of Tennessee,
Knoxville, TN 37996-0910, USA

NORMAN MYERS

Green College, University of Oxford,
Oxford OX2 6HG, UK

A. O. NICHOLLS

CSIRO Division of Wildlife and Ecology,
PO Box 84, Lyneham, ACT 2602, Australia

Cambridge University Press

978-0-521-63445-8 - Conservation in a Changing World

Edited by Georgina M. Mace, Andrew Balmford and Joshua R. Ginsberg

Frontmatter

[More information](#)

STUART L. PIMM

Department of Ecology and Evolutionary
Biology, University of Tennessee,
Knoxville, TN 37996-0910, USA

CARSTEN RAHBEK

Centre for Tropical Biodiversity, Zoological
Museum, University of Copenhagen,
Universitetsparken 15, DK-2100
Copenhagen Ø, Denmark

SACHA SPECTOR

Department of Ecology and Evolutionary
Biology, University of Connecticut, 75
N. Eagleville Road, U-43, Storrs, CT
06269, USA

DOUGLAS F. STOTZ

Environmental and Conservation
Programs, Field Museum of Natural
History, Roosevelt Road at Lake Shore
Drive, Chicago, IL 60605, USA

ODETTE L. SUTCLIFFE

Environmental Information Centre, NERC
Institute of Terrestrial Ecology, Monks
Wood, Abbots Ripton, Huntingdon,
Cambridgeshire, PE17 2LS and Department
of Biology, University of Leeds, Leeds LS2
9JT, UK

CHRIS D. THOMAS

Department of Biology, University of
Leeds, Leeds LS2 9JT, UK

JEREMY A. THOMAS

NERC Institute of Terrestrial Ecology,
Furzebrook Research Station, Wareham,
Dorset BH20 5AS, UK

KERRY TREGONNING

Office of Science and Technology,
Department of Trade & Industry, 94–98
Petty France, London SW1H 9ST

PAUL H. WILLIAMS

Biogeography and Conservation
Laboratory, The Natural History Museum,
Cromwell Road, London SW7 5BD, UK

Cambridge University Press

978-0-521-63445-8 - Conservation in a Changing World

Edited by Georgina M. Mace, Andrew Balmford and Joshua R. Ginsberg

Frontmatter

[More information](#)

Preface

Conservation biology has grown enormously in size, scope and stature over the past decade. Nevertheless, there is a growing worry that the diverse array of approaches taken in tackling conservation problems focus in large part on current patterns of biological diversity, while generally neglecting detailed consideration of the biological and anthropogenic processes which variously underpin and threaten those patterns. The natural world we are attempting to conserve is not a static place: populations persist by interacting with one another and with other organisms; they respond to external challenges in dynamic ways; and the nature of these challenges is itself changing as the scale of the human enterprise continues to expand. If today's conservation strategies are to yield long-term benefits, process-related concerns must be integrated into conservation planning at an early stage.

This book is about identifying the sorts of natural and anthropogenic processes that conservation practitioners need to be concerned about, yet which conservation biologists are at present largely ignoring. We have deliberately avoided dividing the book into sections, as many of the chapters tackle cross-cutting themes. Nevertheless, there is a broad shift in emphasis through the book, from the empirical through to the practical.

The book begins with an introduction in which we highlight what we see as some of the key emergent themes from later chapters, and we set out the case for focusing on processes when thinking about conservation in a changing world. After this, Lande provides essential background for the rest of the book by summarizing the main deterministic threats to biological diversity, and reviewing recent ideas about the sizes at which small (and indeed not so small) populations begin to be threatened by stochastic genetic and ecological processes. Mayer and Pimm then demonstrate the large scale over which even existing anthropogenic threats operate by exploring the causes of the continued decline of the Cape Sable seaside-

Cambridge University Press

978-0-521-63445-8 - Conservation in a Changing World

Edited by Georgina M. Mace, Andrew Balmford and Joshua R. Ginsberg

Frontmatter

[More information](#)

sparrow, a bird entirely restricted to the 9000 km² reserve system designed to conserve the Florida Everglades. Two further, growing challenges to biological diversity are considered in detail in Chapters 4 and 5. Huntley explores the likely biological implications of human-induced changes to the global climate, in the light of how species have coped with climate change in the geological past, and of how those dynamic responses may now be compromised by habitat and population fragmentation. In Chapter 5, Bond continues this theme of biological responses to external challenges, pointing out that many plant species have adapted to and are nowadays dependent on the kinds of large-scale disturbances (such as fire and grazing pressure) which have accompanied human modification of many habitats since the advent of agriculture. If we are to maintain those species and the communities to which they belong, we will often need to manage disturbance regimes accordingly.

Next, Chapters 6–8 use detailed case studies to illustrate some of the dynamic demographic, genetic and evolutionary processes which enable free-ranging populations to persist, yet which are not readily captured by a simple pattern-based approach to priority-setting. Thomas and colleagues provide empirical evidence to support the role of both niche theory and metapopulation theory in accounting for the population biology of butterflies, and draw several important (but not necessarily intuitive) messages for conservation practitioners: that we should conserve vacant but suitable habitat as well as occupied patches; that we might in some instances need to discourage dispersal from small patches; and that we should focus efforts most on relatively healthy populations at the core of species' ranges, rather than those in decline near range margins. Fjeldså and Rahbek use a large-scale analysis of the distribution patterns of neotropical birds to identify centres of endemism and, in particular, areas of likely importance for the generation and maintenance of evolutionary novelty. And Stotz focuses in on patterns of elevational turnover in the same group of species, and concludes that important demographic processes may increasingly be disrupted by mid-elevation deforestation, which interrupts both altitudinal migration and postulated source-sink population dynamics.

The last five chapters consider the practical scope for taking account of process-related concerns. Spector and Forsyth assess the performance of one readily assessed group as an indicator for wider conservation priorities, and provide rarely reported data on the high costs of even short-cut methods of biodiversity inventory. Williams describes how these, and other sorts of data, can be used by increasingly sophisticated computer-based

Cambridge University Press

978-0-521-63445-8 - Conservation in a Changing World

Edited by Georgina M. Mace, Andrew Balmford and Joshua R. Ginsberg

Frontmatter

[More information](#)

algorithms to identify efficient networks of priority areas. Nicholls then tackles the enormous challenge of thinking about how these procedures could be further refined so as to incorporate into reserve networks concerns about the conservation of ecological and genetic processes. He concludes that several process-linked concerns are, in principle, analytically tractable, but that our capacity to tackle them in any realistic timeframe will be limited by data availability. Myers takes a broad and imaginative view of the way forward, adding new data to substantiate his earlier work on the critical importance of a relatively small number of biodiversity hotspots, and explaining why one of the major challenges to conservationists is not biological at all, but rather lies in eliminating existing incentives by governments which subsidize non-sustainable development. In the closing chapter, May and Treggion further explore the importance of policy instruments, showing how many of the issues raised in the book can be tackled by government, in sometimes surprisingly simple ways.

This book derives from papers presented at a joint Zoological Society of London and Conservation International Symposium held in London in September 1996. We are grateful to both of these organisations for the financial and logistic support which made the meeting possible. We owe a debt to ideas that arose at an earlier Royal Society Discussion Meeting (Lawton & May, 1995), and to a key paper on the importance of processes in conservation biology (Smith *et al.*, 1993). We thank all the authors and a host of anonymous reviewers for their work on the chapters presented here, our spouses for coping with our stochastic schedules, the editorial staff at Cambridge University Press for producing the book so efficiently, and Unity McDonnell at ZSL for shepherding the process despite the fragmented distribution of the authors and the male-biased emigration of the editors. GMM thanks NERC for support; AB and GMM were assisted by a NERC grant; JRG's contribution was facilitated by the Wildlife Conservation Society.

References

- Lawton, J. H. & May, R. M. (eds) (1995). *Extinction rates*: Oxford University Press, Oxford.
- Smith, T. B., Bruford, M. W. & Wayne, R. K. (1993). The preservation of process: the missing element of conservation programs. *Biodiv. Lett.*, 1, 164–7.