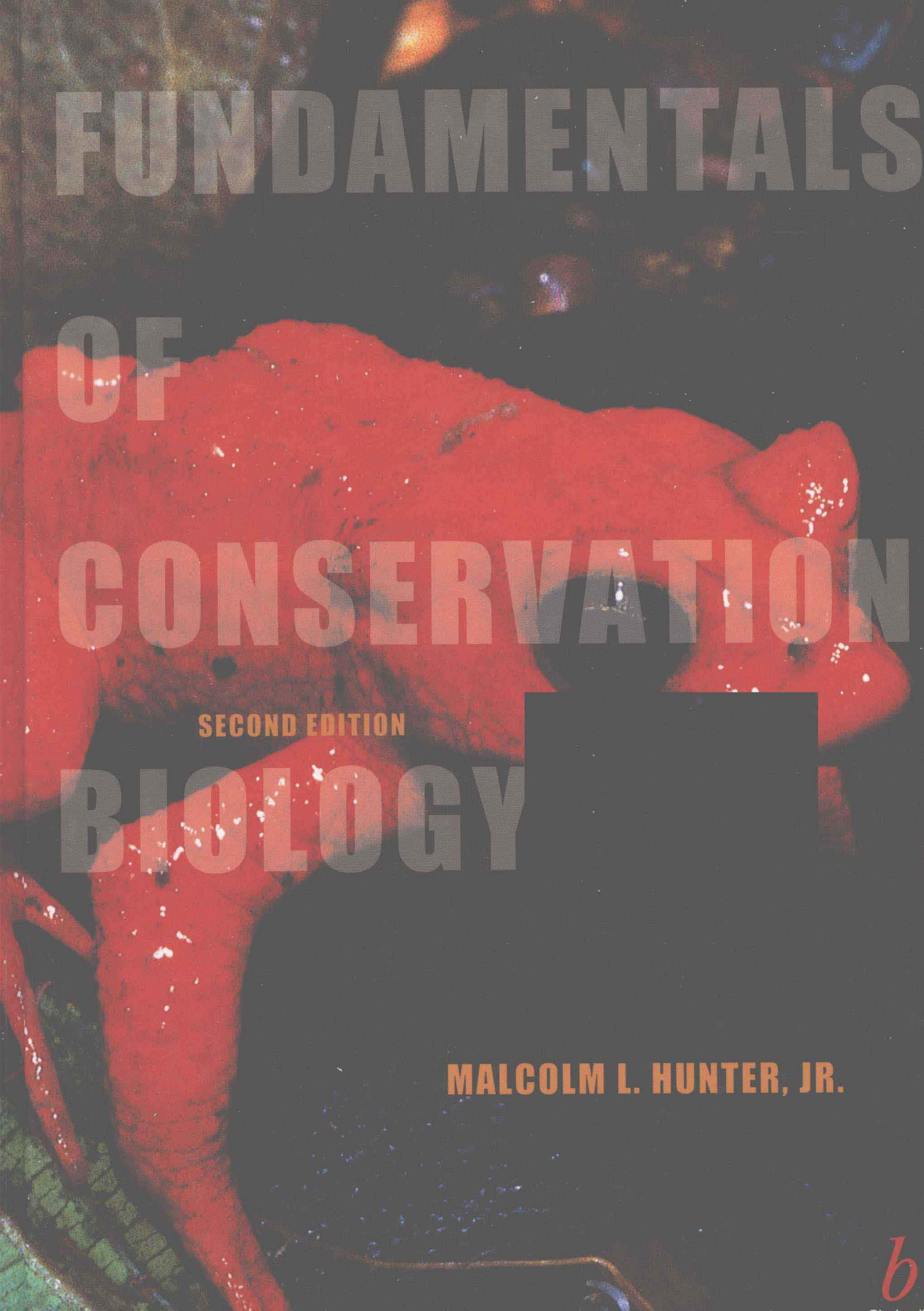
FUNDAMENTALS
OF
CONSERVATION
BIOLOGY
SECOND EDITION
MALCOLM L. HUNTER, JR.

Fundamentals of Conservation Biology

Second Edition

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Blackwell Wissenschafts-Verlag GmbH, Kurfürstendamm 57, 10707 Berlin, Germany
Blackwell Science KK, MG Kodenmacho Building, 7-10 Kodenmacho Nihombashi, Chuo-ku, Tokyo 104, Japan
Iowa State University Press, A Blackwell Science Company, 2121 S. State Avenue, Ames, Iowa 50014-8300, USA

Distributors:
The Americas
Blackwell Publishing
c/o AIDC
P.O. Box 20
50 Winter Sport Lane
Williston, VT 05495-0020
(Telephone orders: 800-216-2522; fax orders: 802-864-7626)
Australia
Blackwell Science Pty, Ltd.
54 University Street
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Outside The Americas and Australia
Blackwell Science, Ltd.
c/o Marston Book Services, Ltd.
P.O. Box 269
Abingdon
Oxon OX14 4YN
England
(Telephone orders: 44-01235-465500; fax orders: 44-01235-465555)

Acquisitions: Nancy Whilton
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Marketing Manager: Michael Rasmussen
Cover design by Gary Ragaglia
Cover photos by Malcolm Hunter
Interior design by Joyce C. Weston
Typeset by Graphic Composition, Inc.
Printed and bound by Edwards Brothers, Inc.
Printed in the United States of America
01 02 03 04 5 4 3 2 1

Library of Congress Cataloging-in-Publication Data
Hunter, Malcolm L.
Fundamentals of conservation biology / Malcolm L. Hunter, Jr. ; [illustrated by Andrea Sulzer] — 2nd ed.
p. cm.
ISBN 0-86542-029-7 (hardcover)
1. Conservation biology. I. Title.
QH75.H84 2001
333.95'16—dc21 2001001706

Preface

11:15 P.M. 20 June 1990 I'm not used to being this hot so late at night. I don't know the sounds coming through the window . . . crickets? . . . frogs? . . . a wheezing air-conditioning system? I don't know what to do.

I'm in a dorm at the University of Florida; the fourth meeting of the Society for Conservation Biology has just ended; I'm sifting through various conversations of the last 4 days. I wonder if I should postpone my plans to write a sequel to my book on managing forests for biodiversity, a sequel that would focus specifically on tropical forests. At the meeting I've discovered that professors are using my book for a much broader range of conservation courses than I ever anticipated and that tells me that there is a niche to be filled.

Apparently, various multiauthored books on conservation biology topics are not filling the need for a basic text. Perhaps I should add a brick to the foundation of the discipline before pursuing a more specific project. Now, if I can rough out an outline before I get too sleepy . . .

27 August 1993 Over 3 years later and I have just finished the first draft. Actually, the writing went reasonably quickly (I did not begin in earnest until May of 1992) because I chose a sort of stream-of-consciousness approach in which I wrote only what I knew or thought I knew. Now, I look forward to spending the next several months combing the literature and correcting, refining, and updating this draft. It might seem that this approach would make it easier to convey my original thinking about conservation biology as opposed to reporting on everyone else's thinking. Perhaps so, but I claim no truly original thoughts. I tend to think each person is no more than a unique melting pot for a vast community of ideas.

Unfortunately, I have already nearly reached my target for final length

and thus keeping the book to a reasonable size and cost will be a challenge. Perhaps the best index of this is the fact that in *Wildlife, Forests, and Forestry,* I described managing forest ecosystems for biodiversity in 370 pages; in this draft the subject is covered in four pages. It has been particularly difficult trying to balance spanning the breadth of conservation biology with plumbing its depths. I have tended to err on the side of breadth on the assumption that most readers will use the book as part of a conservation biology class, and the instructor can easily focus on depth, for example, by describing applications of the principles outlined here.

24 August 1994 Sifting through the literature of conservation biology has been great fun, although it has entailed some difficult choices. If many of my readers will be North American, should I keep things familiar and easy by illustrating general principles with redwoods, bald eagles, and well-known foreign species like tigers? Or should I try to open some vistas by describing fynbos, huias, and thylacines? Many years of working abroad predispose me toward the latter approach, but I have curbed this temptation to some degree, partly to save the space it would take to describe the fynbos, and partly because I have tried to select literature that will be reasonably accessible.

As I enter the final stages of production, I often think about my readers and how they will use this book. My primary audience consists of students who have some background in biology and ecology, but who have not taken a previous conservation biology course. I also hope to reach some general-interest readers and have tried to keep the prose fairly lively so that they can manage at least half an hour of bedtime reading before dozing off.

This is an opportune place to explain some features of the book to my readers. First, you will note that there are no scientific names in the text; they are all in a separate list of scientific names, which also constitutes an index to all the species mentioned in the text. Unfortunately, there are almost no maps in this book—another decision to save space. Instead, I hope you will have an atlas on hand; after a dictionary it's the most important book in any personal library. Speaking of dictionaries, you will not find a glossary, but the Subject Index contains all the italicized words so you can easily find the first place I use and define a technical term. Finally, the Literature Cited section constitutes an index to authors, because after each citation the pages where it is cited are listed.

27 December 1994 Two more days before the book goes out to copyediting, and it is time to thank the scores of people who have helped. The first person to come to the fore is Andrea Sulzer, an exceptional artist, ecologist, and friend. We always enjoyed taking a time-out in the midst of a canoe or ski trip to go over some drawings, and we thank Zip and Aram for their patience during these episodes.

The longest list is all the people who critiqued the manuscript in its various drafts: Alan Cooperrider, Phillip deMaynadier, Ann Dieffenbacher-Krall, Alison Dibble, Carol Foss, Ed Grumbine, Vicki Ludden, Kimberly Peterson, Larry Alice, Drew Allen, Fred Allendorf, Mark Anderson, Doug Armstrong, Mike Baer, Steve Beissinger, Judy Blake, Kevin Boyle, Baird Callicott, Christopher Campbell, Jim Carlton, MaryEllen Chilelli, Tim Clark, John Craig, Eric Dinerstein, Dave Field, Jim Fraser, Tom Gavin, James Gibbs, Larry Harris, Leslie Hudson, David Jablonski, George Jacobson, Susan Jacobson, Steve Kellert, Roger King, Sharon Kinsman, Rick Knight, Irv Kornfield, Bill Krohn, Rich Langton, David Lindenmayer, John Litvaitis, Annarie Lyle, Mary Ann McGarry, Janet McMahon, Curt Meine, Laura Merrick, Ed Minot, Peter Moyle, Trinto Mugangu, Dara Newman, Dave Norton, Reed Noss, Miles Roberts, Kathy Saterson, Mark Shaffer, Michael Soulé, Bob Steneck, Kat Stewart, Stan Temple, Nat Wheelwright, Bob Wiese, Dave Wilcove, and E. O. Wilson. The first eight merit special mention for reading all, or virtually all, of the book. I could generate a list almost as long of people who have helped out in small, specific ways such as confirming a fact or locating a photo.

All the staff at Blackwell Science have been great, but I particularly wish to thank Jane Humphreys for her enthusiasm and support and Simon Rallison for encouraging me to sign on. Locally, the key people who helped with production were Bob Calhoun, copyediting; Julie Dodge, indexing and library work; Chris Halsted, computer graphics; and Shirley Moulton, typing—all did first-rate work.

The University of Maine and particularly the Department of Wildlife Ecology merit gratitude for providing a nurturing professional home for nearly 20 years. Recently, a chair endowed by Elizabeth Noyce through the Libra Foundation has made my work even more pleasant. A special thanks also goes to the University of Maine staff, alumni, and alumnae who have supported the International Biological Conservation Fund; all royalties from this book will go to this fund to support conservation students from developing countries. Finally, I am grateful to the University's Darling Marine Center for serving as a pleasant writing retreat for a few months.

The gratitude I feel toward Aram Calhoun—who has shared all but a month of our marriage with this book—is too profound for elaboration beyond the words of my dedication.

When I began writing this book, my goal was to fill a gaping hole, but now my colleagues have produced two other credible conservation biology textbooks (Primack 1993, Meffe and Carroll 1994), and more are in the pipeline. Still, I have absolutely no regrets about having embarked on this project for I have thoroughly enjoyed it, and if a small portion of my enthusiasm reaches my readers, it will be well worth the effort.

Preface to the Second Edition

January 26, 2001

Before undertaking this second edition I was rather dreading the prospect of replowing old ground, tearing apart my first edition, and putting it back together again. In hindsight, the last 9 months of sorting through the conservation biology literature have been rather enjoyable, especially after I realized that it was okay to be selective in my reading. With 651 new references there is a lot of fresh material to chew on here; most of it is very recent (my last trip to the library was this morning), although I have also added some older papers from the "classical period" of conservation biology (the 1980s). Some scepticism about the "authority" of information found on the World Wide Web has severely limited my use of these sources, but, on the other hand, I have provided many URLs to give readers a gateway to the organizations that make conservation biology happen.

Turning to acknowledgments, James Gibbs leads the list of reviewers because he read the entire draft with great speed and acumen. (Be sure to see Gibbs et al. (1998): "Problem-Solving in Conservation Biology and Wildlife Management" which is, in a sense, a lab manual for this text.) Many other people also helped with "quality control" on content, notably, Doug Armstrong, Kevin Boyle, Tim Clark, Richard Cowling, David Lindenmayer, Georgina Mace, Ed Minot, David Norton, Judith Rhymer, Bob Steneck, Eleanor Sterling, and Shelly Thomas. For production assistance Lincoln Hunt was my right-hand man locally, along with a small platoon from Blackwell Science led by Nancy Duffy and Shawn Girsberger. The most conspicuous changes in this edition will be the many new illustrations from Andrea Sulzer, my steadfast collaborator and friend. A glossary prepared by Sarah Lewis will make this edition a bit more user-friendly. Perhaps least

conspicuous, but ultimately most important, is all the continued support and inspiration I receive from Aram Calhoun. Lastly, I want to thank all the readers of the first edition for various forms of support and encouragement; royalties from this book and other sources will be sufficient to endow a student fellowship in the foreseeable future.

Malcolm L. Hunter, Jr.

For Aram Calhoun, who inspires me daily with her delight in the natural world and dedication to conservation.

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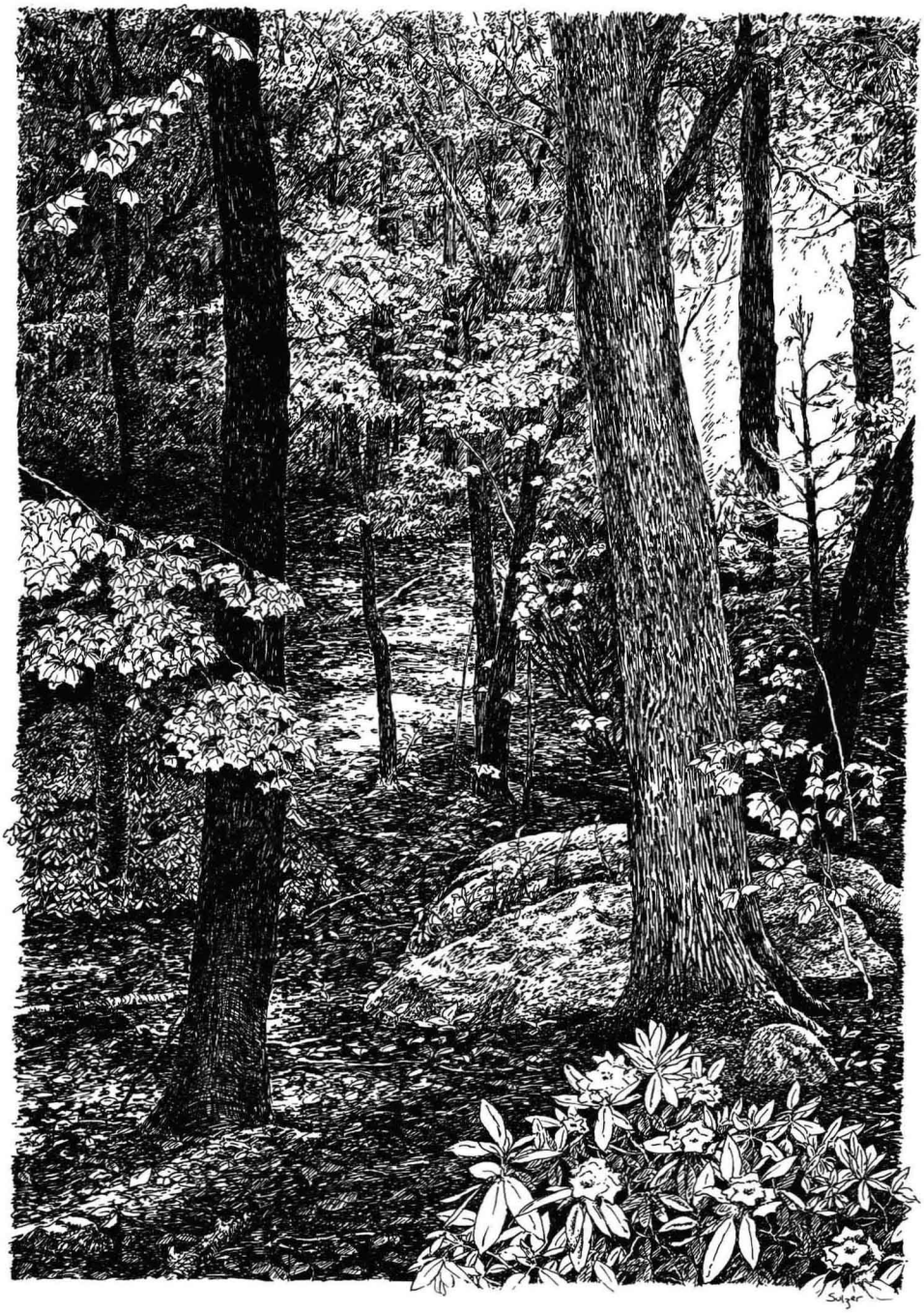
Part I



Biodiversity and Its Importance

Think about our world and its wild things: a marsh splashed and flecked with the colors of flowers and dragonflies, the rhythmic roar and swoosh of waves punctuated by the strident calls of gulls, a dark forest pungent with the odors of unseen life teeming below a carpet of leaves and mosses. Imagine a future world utterly dominated by concrete and regimented rows of crops—a monotonous, ugly, and unhealthy home for us and the species we have chosen for domestication. This book is about hope in the face of forces that would degrade our world. This book is about the rich tapestry of life that shares our world now and about how we can maintain it.

Chapter 1
Conservation and Conservation Biology

What Is Conservation?

Since the beginning of humanity people have been concerned about their environment and especially its ability to provide them with food, water, and other resources. As our numbers have grown and our technology has developed, we have become increasingly concerned about the impact we are having on our environment. Newspapers herald the current issues:

- "Conservationists call for tighter fishing regulations."
- "Ecologists describe consequences of warmer climates."
- "Environmentalists request moratorium on toxin production."
- "Preservationists want more wilderness."

They also reveal an ambiguous terminology. Are we talking about conservation or preservation? Are the issues ecological or environmental? Students deciding which university to attend and which major to select are faced with a similarly bewildering array of choices—soil and water conservation, environmental studies, natural resource management, conservation biology, wild life ecology, human ecology, and more—that intertwine with one another and often cut across traditional departmental and disciplinary lines. In this chapter we will try to resolve these ambiguities by examining how they are rooted in human history and ethics. To start on common ground we will briefly examine some of the differences and similarities among conservationists, preservationists, environmentalists, and ecologists. In the second part of the chapter we will see where conservation biology fits into this picture.