

Preface

By writing this book we hope to share with you some of our wonder at the complexity of nature, but we must all also be aware that there is a darker side: the fear that we are destroying our natural environments and the services they provide. All of us need to be ecologically literate so that we can take part in political debate and contribute to solving the ecological problems that we carry with us in this new millennium. We hope our book will contribute to this objective.

The genesis of this book can be found in the more comprehensive treatment of ecology in our big book *Ecology: from Individuals to Ecosystems* (Begon, Townsend & Harper, 4th edn, 2006). This is used as an advanced university text around the world, but many of our colleagues have called for a more succinct treatment of the essence of the subject. Thus, we were spurred into action to produce a distinctively different book, written with clear objectives for a different audience—those taking a semester-long beginners course in the essentials of ecology. We hope that at least some readers will be excited enough to go on to sample the big book and the rich literature of ecology that it can lead into.

In this fourth edition of *Essentials of Ecology* we have continued to make the text, including mathematical topics, accessible while updating the material and expanding our coverage of ecosystem science and biogeochemistry. The fourth edition extensively covers both terrestrial and aquatic ecology, and we have strived to demonstrate how ecological principles apply equally to both types of environments. While we have expanded coverage on some topic areas in the fourth edition, we worked hard to not expand the size of the book. We want this text to be a readily accessible read.

Ecology is a vibrant subject and this is reflected by our inclusion of literally hundreds of new studies. Some readers will be engaged most by the fundamental principles of how ecological systems work. Others will be impatient to focus on the ecological problems caused by human activities. We place heavy emphasis on both fundamental and applied aspects of ecology: there is no clear boundary between the two. However, we have chosen to deal first in a systematic way with the fundamental side of the subject, and we have done this for a particular reason. An understanding of the scope of the problems facing us (the unsustainable use of ecological resources, pollution, extinctions and the erosion of natural biodiversity) and the means to

counter and solve these problems depend absolutely on a proper grasp of ecological fundamentals.

The book is divided into five sections. In the introduction we deal with two foundations for the subject that are often neglected in texts. Chapter 1 aims to show not only what ecology is but also how ecologists do it—how ecological understanding is achieved, what we understand (and, just as important, what we do not yet understand) and how our understanding helps us predict and manage. We then introduce 'Ecology's evolutionary backdrop' and show that ecologists need a full understanding of the evolutionary biologist's discipline in order to make sense of patterns and processes in nature (Chapter 2).

What makes an environment habitable for particular species is that they can tolerate the physico-chemical conditions there and find in it their essential resources. In the second section we deal with conditions and resources, both as they influence individual species (Chapter 3) and in terms of their consequences for the composition and distribution of multispecies communities and ecosystems, for example in deserts, rain forests, rivers, lakes and oceans (Chapter 4).

The third section (Chapters 5–8) deals systematically with the ecology of individual organisms and populations, with chapters on 'birth, death and movement' (Chapter 5), 'interspecific competition' (Chapter 6), and 'predation, grazing, and disease' (Chapter 7). This section also includes a chapter on 'Molecular and evolutionary ecology', added originally in the third edition and responding to the feelings of some readers that, although evolutionary ideas pervade the book, there was still not sufficient evolution for a book at this level.

In the fourth section (Chapters 9–11), we move up the hierarchical scale of ecology to consider communities consisting of many populations, and ecosystems, where we focus on the fluxes of energy and matter between and within systems.

Finally, armed with knowledge and understanding of the fundamentals, the book turns to the application of ecological science to some of the major environmental challenges of our time. Our goal in these final chapters is not to provide encyclopedic coverage to these environmental problems, but rather to illustrate how ecology contributes to understanding the problems, and can potentially help with their

solution. In Chapter 12, we focus on global biogeochemical cycles, such as the global carbon dioxide cycle and how this has been dramatically changed by burning fossil fuels and other human activities. In 'conservation ecology' (Chapter 13), we develop an armory of approaches that may help us to save endangered species from extinction and conserve some of the biodiversity of nature for our descendants. The final chapter, 'the ecology of human population growth, disease, and food supply,' takes an ecological approach to examining the issues of the population problem, of human health, and of the sustainability of agriculture and fisheries.

A number of pedagogical features have been included to help you.

- Each chapter begins with a set of key concepts that you should understand before proceeding to the next chapter.
- Marginal headings provide signposts of where you are on your journey through each chapter—these will also be useful revision aids.
- Each chapter concludes with a summary and a set of review questions, some of which are designated challenge questions.

• You will also find three categories of boxed text:

- 'Historical landmarks' boxes emphasize some landmarks in the development of ecology.
- 'Quantitative aspects' boxes set aside mathematical and quantitative aspects of ecology so they do not unduly interfere with the flow of the text and so you can consider them at leisure.
- 'ECONcerns' boxes highlight some of the applied problems in ecology, particularly those where there is a social or political dimension (as there often is). In these, you will be challenged to consider some ethical questions related to the knowledge you are gaining.

An important further feature of the book is the companion web site, accessed through Wiley at www.wiley.com/college/begon. This provides an easy-to-use range of resources to aid study and enhance the content of the book. Features include self-assessment multiple choice questions for each chapter in the book, an interactive tutorial to help students to understand the use of mathematical modeling in ecology, and high-quality images of the figures in the book that teachers can use in preparing their lectures or lessons, as well as access to a Glossary of terms for use with this book and for ecology generally.