

Preface

It was a joy to write this Second Edition because we love what we are writing about, ecology. Indeed, this is an exciting and challenging time to study ecology. New discoveries are pouring in, revealing factors that affect local communities and link ecosystems to one another across broad geographic areas. The progress in these and other areas of ecology could not come at a better time: Ecologists are increasingly being asked to apply their knowledge toward efforts to solve current environmental problems and prevent future ones.

Developments such as these fuel the excitement that grips the field of ecology—but they also mean that what we know about ecology is increasing very rapidly. The explosion of ecological information makes ecology a daunting subject, both to study and to teach. Students need to master a heady mix of abstract concepts, experimental reasoning, mathematical equations, and details about particular organisms and their habitats. For their part, instructors are faced with the challenge of conveying fundamental concepts, new discoveries, and the relevance and rigor of modern ecology—all in a manner that works well for students taking their first course in ecology. With these challenges in mind, the overarching goal for the Second Edition of *Ecology* was to enhance the book as a learning tool for students and as a teaching tool for professors. In setting out to achieve this goal, the book's two core principles guided our every step.

Core Principles of *Ecology*, Second Edition

This book is written for undergraduate students of ecology. We set out to introduce our readers to the beauty and importance of ecology, and to do so without boring them or overwhelming them with unnecessary detail. This is a tall order, and so when we began writing the Second Edition of *Ecology*, we kept our focus on the two core principles of this book: **"Teaching comes First!"** and **"Less is More!"**

Teaching truly does come first in *Ecology*—it motivates everything we did. The structure and content of our chapters is designed primarily to make them good tools for teaching. For example, to introduce the material covered and capture

student interest, each chapter begins with a story (a "Case Study," as described more fully below) about an applied problem or interesting bit of natural history. Once students are drawn in by the Case Study, the "storyline" that begins there is maintained throughout the rest of the chapter. We use a narrative writing style to link the sections of the chapter to one another, thus helping students keep the big picture in mind. In addition, the sections of the chapter are organized around a small number of Key Concepts (also described more thoroughly below) that were carefully selected to summarize current knowledge and provide students with a clear overview of the subject at hand. Similarly, when designing the art, pedagogy came first: Many students are visual learners, so we worked very hard to ensure that each figure "tells a story" that can be understood on its own, without reference to the main body of the text.

As another way to help us achieve our primary goal of teaching students, we followed a "less is more" philosophy. We were guided by the principle that if we covered less material—but presented it clearly and well—students would learn more. Hence, our chapters are relatively short and they are built around a small number of Key Concepts (typically, three to five). We made these choices to prevent students from being overwhelmed by long, diffuse chapters, and to allow them to master the big ideas first, then fill in the details. In addition, as we worked on the drafts of our chapters, we put our "less is more" philosophy into action by asking each other whether the text served one of the following purposes:

- Does it help to explain an essential concept?
- Does it show how the process of ecological inquiry works?
- Does it motivate readers by focusing on a key ecological application or a fascinating piece of natural history?

This approach made for some tough choices as we strove to balance the addition of new material with cuts made from the First Edition, but it enabled us to focus on teaching students what is currently known about ecology without overwhelming them with excess information.

New Features of *Ecology*, Second Edition

In striving to make *Ecology* the best teaching tool possible, we updated, replaced, or cut sections of the text as appropriate, and added several new pedagogical features. These include:

Climate Change Connection Climate change has broad ecological effects with important implications for conservation and ecosystem services. Roughly two-thirds of the Second Edition chapters now include a major climate change example, followed immediately by a sentence directing students to additional content on the Companion Website. These web-based *Climate Change Connections* discuss how the example in the text connects to other levels of the ecological hierarchy, while enriching the student's understanding of ongoing climate change.

Ecological Toolkits A number of chapters include an *Ecological Toolkit*, a type of box that describes ecological "tools" such as experimental design, remote sensing, GIS, mark-recapture techniques, stable isotope analysis, DNA fingerprinting, and the calculation of species-area curves.

Figure Legend Questions Each chapter includes 3–6 *Figure Legend Questions* that are highlighted in color at the end of the legend. These questions encourage students to grapple with the figure and make sure they understand its content. The questions range from those that test whether students understand the axes or other simple aspects of the figure to those that ask students to develop or evaluate hypotheses.

In-Class Exercises For the Second Edition, a new type of inquiry exercise has been added to the Instructor's Resource Library: ready-to-go problems that take about 10 minutes to do and can be used in class or assigned as homework. One or more of these exercises has been added for each chapter.

Error Bars Where appropriate, error bars have been added to figures. To provide support for students related to this change, the Web Stats Review now includes new material on the relationship between the standard deviation and the standard error of the mean, as well as confidence intervals and linear regression.

Hallmark Features of *Ecology*

We've also revised and strengthened the following key pedagogical features of *Ecology*, introduced in the First Edition:

Pedagogical Excellence Students taking their first course in ecology are exposed to a great deal of material, on a con-

ceptual as well as individual-systems level. To help them manage this vast amount of information, each chapter of *Ecology* is organized around a small number of Key Concepts that provide up-to-date summaries of fundamental ecological principles. All of these Key Concepts are listed on the book's back end papers.

Case Studies Each chapter opens with an interesting vignette—a *Case Study*. By presenting an engaging story or interesting application, the *Case Study* captures the reader's attention while introducing the topic of the chapter. Later, the reader is brought full circle with the corresponding "*Case Study Revisited*" section at chapter's end. Each *Case Study* relates naturally to multiple levels of the ecological hierarchy, thereby providing a nice lead-in to the *Connections in Nature* feature, described next.

Connections in Nature In most ecology textbooks, connections among levels of the ecological hierarchy are discussed briefly, perhaps only in the opening chapter. As a result, many opportunities are missed to highlight for students the fact that events in natural systems *really are* interconnected. To facilitate the ability of students to grasp how events in nature are interconnected, each chapter of *Ecology* closes with a section that discusses how the material covered in that chapter affects and is affected by interactions at other levels of the ecological hierarchy. Where appropriate, these interconnections are also emphasized in the main body of the text.

Ecological Inquiry Our understanding of ecology is constantly changing due to new observations and new results from ecological experiments and models. All chapters of the book emphasize the active, inquiry-based nature of what is known about ecology. In addition, *Ecology* includes hands-on interpretative and quantitative exercises, described next.

Hands-On Problem Solving Exercises This popular feature of the Companion Website asks students to manipulate data, explore mathematical aspects of ecology in more detail, interpret results from real experiments, and analyze simple model systems using simulations. The Second Edition includes 24 revised and new *Hands-On Problem Solving Exercises*, one for each chapter of the book. These inquiry exercises can be used in two important ways: portions of them can serve as ready-to-go, five- to ten-minute problems for in-class use (e.g., with "clickers" or to stimulate class discussion), or the entire exercise can be assigned as homework.

Ecological Applications In recent years, ecologists have increasingly focused their attention on applied issues. Similarly, many students taking introductory ecology are very interested in applied aspects of ecology. Thus,

ecological applications (including conservation biology) receive great attention in this book. Discussions of applied topics are woven into each chapter, helping to capture and retain student interest.

Links to Evolution Evolution is a central unifying theme of all biology, and its connections with ecology are very strong. Yet, ecology textbooks typically present evolution almost as a separate subject. As an alternative to the standard approach, *Ecology's* Chapter 6 is devoted to describing the joint effects of ecology and evolution. This chapter explores the ecology of evolution at both the population level and as documented in the sweeping history of life on Earth. Concepts or applications that relate to evolution are also described in many other chapters.

Art Program Many of *Ecology's* illustrations feature "balloon captions," which tell a story that can be understood at a glance, without relying on the accompanying text. The art program is available as part of the Instructor's Resource Library (see Media and Supplements section).

Ecology Is a Work in Progress

This book, like the subject we write about, does not consist of a set of unchanging ideas and fixed bits of information. Instead, the book will develop and change over time as we respond to new discoveries and new ways of teaching. As we roll up our sleeves to begin working on the next edition, we would love to hear from you—what you like about the book, what you don't like, and any questions or suggestions you may have for how we can improve the book. You can reach us individually or as a group by sending an email message to ecology@sinauer.com, or by writing us at *Ecology*, Sinauer Associates, 23 Plumtree Road, Sunderland, MA 01375.

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