

Preface

This book provides an introduction to the content, ideas, and major findings of contemporary ecosystem science. We wrote the book primarily for beginning graduate students and advanced undergraduates but it should also be useful to a broad range of academic scientists and resource managers, and even to dedicated amateurs who seek an introduction to the field. Ecosystem science is a rigorous, quantitative science; we assume that readers of the book will have had an introductory class in ecology and basic understanding of chemistry and math. The book deliberately covers multiple approaches to understanding ecosystems (e.g., the use of experiments, theory, cross-system comparisons), in multiple environments (terrestrial, freshwater, and marine; managed, built, and natural ecosystems), across all parts of the world (although many examples come from the authors' experience in North America).

The origins of this book stem from an intensive two-week Fundamentals of Ecosystem Ecology class (the FEE class) that we have taught to graduate students from around the world every year or two at the Cary Institute of Ecosystem Studies since 1989. We, and many of the chapter authors, have played central roles in the development, evolution, and running of the FEE class since its origin.

We decided upon an edited book for several reasons, not the least of which was its genesis in this team-taught course. While we shepherded and integrated the chapters and their contents, we also deliberately allowed—and even encouraged—multiple

approaches, and as a result, multiple “voices” will be evident throughout the book. We believe that this diversity reflects some of the myriad perspectives and approaches that are fruitfully brought to bear on the field of ecosystem science.

The book contains six major sections. The opening chapter introduces the concept of the ecosystem, explores some of the consequences of this concept, describes the intellectual tools of the science, and briefly reviews the history of this young science. Chapters 2 through 8 lay the foundation for the study of ecosystems, and cover the two major branches of ecosystem science: energetics (Chapters 2–4) and biogeochemistry (Chapters 5–8). These chapters present the core content of ecosystem science—the movement and fate of energy and materials in ecosystems—in some detail. In the synthetic Chapters 9–11, we revisit major themes that cut across multiple areas of study in ecosystem science. Authors of these chapters review the power and utility of the ecosystem concept, the roles of heterogeneity in space and time, and the importance of various types of controls in ecosystems. Chapters 12–16 take ecosystem science into the real world by illustrating, through five case studies, the value of ecosystem science in identifying and solving a range of environmental problems. The book closes with Chapter 17, co-authored by several current Cary Institute postdoctoral associates, which lays out some challenges and needs for the future. Today's ecosystem science is evolving rapidly, with major new discoveries and ideas

emerging every year. The ultimate shape and contributions of this science remain to be discovered.

This book benefited from the persistent and hard work of the Academic Press team, especially Jill Cetel, Candice Janco, and multiple graphic artists. We were also fortunate to have received helpful and critical reviews of chapters from colleagues, including Clifford Ochs and several anonymous reviewers who teach

ecosystem science; their comments substantially improved the book. We thank the authors of various chapters for their scholarship, patience, goodwill, and commitment to bringing this project to fruition. The Cary Institute's assistant, Matt Gillespie, was an enormous help as well. Finally, generations of FEE students were and continue to be an impetus and inspiration to us and the field of ecosystem science.