

Preface

There are three major reasons behind this textbook *Terrestrial Ecosystem Ecology* – a fast-growing science. The first one is that the discipline provides us with basic facts on how Nature functions. New knowledge has accumulated. A wealth of information and data on ecosystems and their processes are now available. Development in measuring techniques, computers and other technologies are major reasons behind these achievements. This allows us today to better formulate principles and hypotheses for ecosystems and their function. The intention with our book is to identify and strengthen the base of ecosystem ecology in order to provide a platform on which to build future, solid scientific development. Although there are obvious links between aquatic and terrestrial environments we have chosen to focus on terrestrial ecosystems.

A second reason is that Man's activities lead to a number of direct and indirect effects on ecosystems, which are a threat to long-term and sustainable use of the natural resources for our survival. We need to understand how Nature and ecosystems function in order to interpret the effects of various degrees of utilisation. We need also broad, basic knowledge in order to give advice for utilisation, management and mitigation of detrimental effects. It is also important to have a holistic view and understand how atmosphere, water, biota and soils interact under the influence of Man.

The third reason is an ambition to bring together classical, often descriptive, knowledge on ecosystems with mathematically based, mechanistic thinking. This provides us with opportunities for increased understanding, development of predictive tools and derivations of principles.

We address the book to both undergraduate and graduate students. Basic knowledge of plants, animals and soils is assumed. Elementary textbooks in botany, zoology, earth sciences and mathematics, as well as ecology, provide this.

The book also exemplifies methods of how to study terrestrial ecosystems and their processes, although the emphasis is on concepts rather than exhaustively covering all methodologies. Another ambition is that the examples and results used to illustrate the different methods and processes will mainly be chosen from Nordic and European investigations. Examples are also taken from outside Europe. Many of the examples represent objects which the authors directly or indirectly have been involved with. In this way the book will hopefully be a complement to existing trans-Atlantic textbooks.

This textbook is organised in four sections and has 15 chapters, together with a prologue and an epilogue (Figure Pre.1). The ecological and ecosystem terminology follows conventional sources (e.g. Odum & Barrett 2005). The different sections, as well as the chapters, are linked.

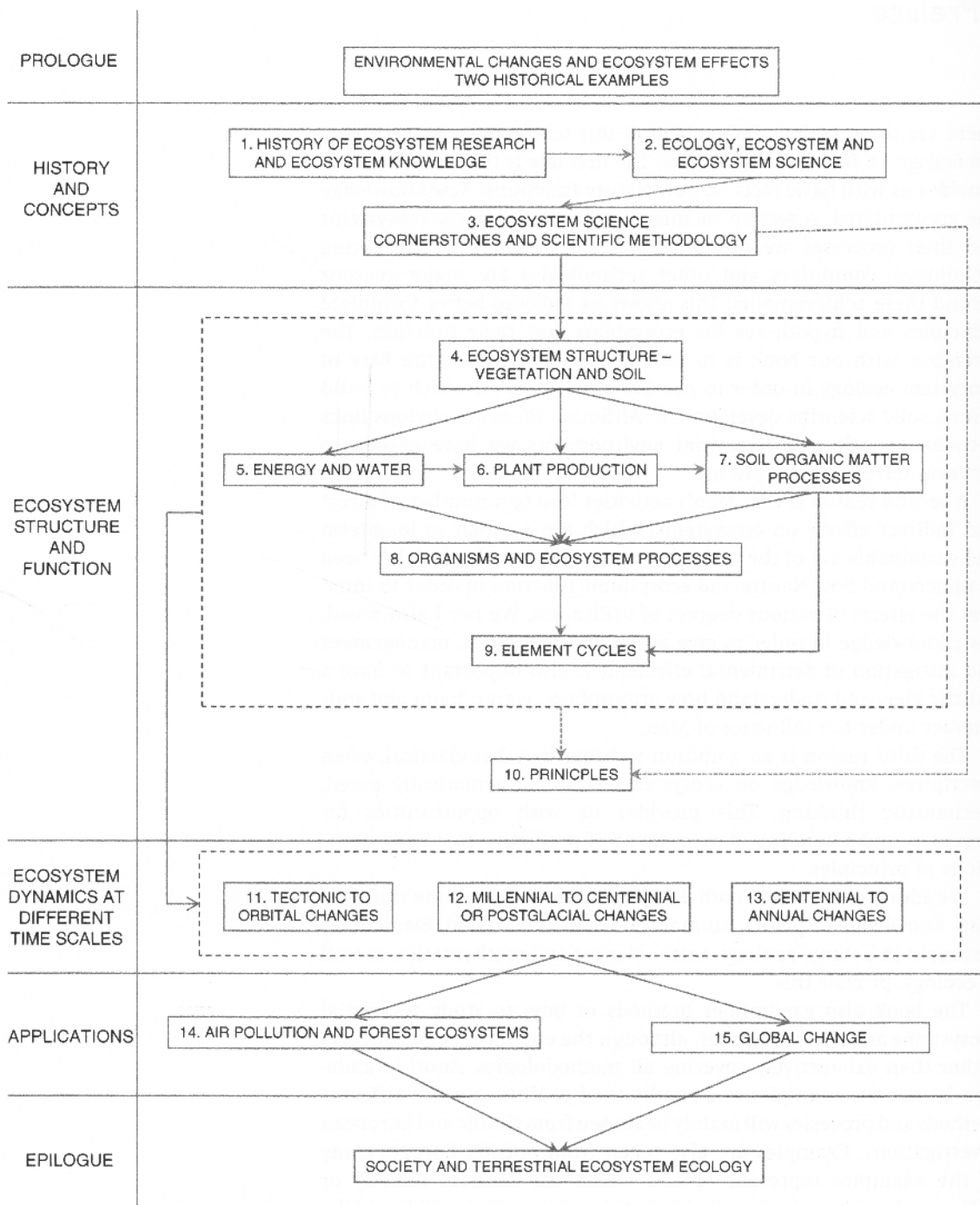


Figure Pre.1 The structure of the textbook *Terrestrial Ecosystem Ecology*. The different sections and chapters are connected by arrows indicating the linking of the different chapters and the flow of the text. Feedbacks between chapters/processes exist, but these are dealt with in the individual chapters.

The Prologue describes, with two examples, the nature of ecosystem ecology. The first section gives history and concepts (Chapters 1 and 2) as a background to present-day ecosystem ecology (Chapter 3). In the latter chapter some fundamental cornerstones based on general biological and chemical knowledge are presented, which are meant to serve as a scientific base or backbone for the further elaboration of insights into how ecosystem processes and ecosystems operate, leading to principles.

The second section is on ecosystem structure and function and contains seven chapters. Chapter 4 describes ecosystem structure in terms of vegetation and soils as dominating features of terrestrial ecosystems essential for the processes, which will be dealt with in more detail. Chapters 5–6 discuss energy and water, and plant production. Chapter 7 is about soil organic matter processes and Chapter 8 deals with organisms and ecosystem processes. Mineral cycling, Chapter 9, represents a major functional characteristic of terrestrial ecosystems. The section ends with a chapter on principles derived from findings in the previous chapters (Chapter 10). We see here also a link to the introductory fundamental cornerstones in Chapter 3.

The third section is devoted to ecosystem dynamics and deals with changes at different temporal and spatial scales, from tectonic to millennial, centennial and annual changes (Chapters 11–13). The dynamics are often seen as functional characteristics. Interesting questions are how ecosystems react to natural as well as man-made perturbations. These are dealt with in the fourth, applied section: air pollution (Chapter 14) and climate change (Chapter 15). The final part of the book is an epilogue dealing with the relation between society and ecosystem ecology.

The book is strongly influenced by the achievements in recent years in our closest research environment. We will name this the SWECON inheritance! SWECON – the 'Swedish Coniferous Forest Project' – was an integrated ecosystem project operating from 1972–1981 on the initiative of the Swedish Natural Science Research Council. This project led to the establishment of the discipline 'terrestrial ecosystem ecology' at the Swedish University of Agricultural Sciences in 1979. We depend, to a great extent, on the research efforts and knowledge of our predecessors!

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