

# Environmental Ecology: the Impacts of Pollution and Other Stresses on Ecosystem Structure and Function.

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Environmental Ecology: The Impacts of Pollution and Other Stresses on Ecosystem Structure and Function. Environmental ecology is defined by Bill Freedman as "the impacts of pollution and other stresses on ecosystem structure and function." He states in the preface to Environmental Ecology that his goals are to provide a text for undergraduate upperclassmen or graduate students and a source of information for courses and for professionals with an interest in environmental science.

The book succeeds in accomplishing the second goal. The reviews of subjects such as acid precipitation, terrestrial trace element contamination, forest decline, silviculture, and environmental effects of harvesting temperate forests are authoritative, detailed, multifaceted and objective, as are the case studies that examine subjects such as control of spruce budworm outbreaks, ecological effects of DDT, and effects of air pollution on forests. Freedman brings together literature from a variety of disciplines and discusses details of interesting experiments. Multidiscipline case studies such as these are difficult to find when writing about or teaching the diverse subjects that constitute environmental science> they provide essential support and valuable supplementary student reading.

The question of whether Environmental Ecology is a good text raises the problem of how environmental science should be taught. Many existing general texts focus on increasing environmental consciousness and teaching principles, often in simplified form, relevant to that goal. Improving the recognition of environmental issues among a wide segment of students is a legitimate need, even if the broad coverage of these texts can lead to a superficial science course. However, a legitimate need also exists to train students to work in environmental science. For this group, consciousness-raising should be secondary to rigorous development of scientific tools. Although Freedman leaves no doubt about this environmental advocacy, Environmental Ecology comes closer to scientific analysis in many chapters than do other texts. It assumes some background in ecology, biology, and chemistry, and case studies are rigorous. Many uncertainties are detailed, and it defines the basis of real conflicts between environmentalist and classical economic views in many discussions.

Three other challenges face the author of an

environmental science text: on what to specialize, how to synthesize principles, and how to deal with subjects dominated by large uncertainties. In each of these areas, Environmental Ecology has limitations. It is best designed for a course more specialized than the title indicates. The interplay of human influences and natural processes in lakes and terrestrial ecosystems, especially temperate forests, is covered in detail. However, only superficial consideration is given to fluvial environments or the tropics, and commonalities between environments are not well developed. Emphasis on specific problems also is uneven. In contrast to the consideration given to acid rain, subjects such as ozone in the stratosphere, biogeochemical cycles, and effects of trace contaminations such as PCB, dioxin, and trace elements in aquatic environments are little discussed. I also would prefer to see better-developed discussions of tropical deforestation, wetlands, and global climate change.

A strength of Environmental Ecology is its recognition of the many uncertainties in understanding how pollution exerts its influences within the context of natural ecosystem processes. For example, the discussion of forest diebacks is exemplary in its attempts to dissect the contradictory lines of evidence about the causes of this complex phenomenon. However, Freedman responds to uncertainty by avoiding generalization. Few chapters contain summaries of important principles from the case studies, and extracting generalizations from the book is difficult. The figures tend to be drawn directly from the primary literature rather than constructed for teaching principles of the science. A text such as this would benefit from some incorporation of principles of modern theoretical ecology in the discussions of loss of species richness or effects of stress on ecosystem structure and function, or by discussion of the principles guiding biogeochemical cycles or global circulation models in considerations of climate change.

Today's texts reflect the difficulty of writing environmental science books that satisfy the multiple and often conflicting needs of the market. Reflecting this state of affairs, Freedman states, "I have not found a textbook that in my idiosyncratic opinion properly deals with this subject matter." He is not alone in that opinion. Environmental Ecology will provide a source of valuable supplementary reading material and a text for instructors with specialties similar to his. However, many instructors will still be left their own resources to develop principles and pedagogic tools in teaching science students how the pervasive influences of humans affect ecosystems.

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