Acid Deposition and the Acidification of Soils and Waters


More than a decade ago acid rain emerged as the most visible issue in the environmental arena and attracted the attention of the lay public, scientists in different fields, and policy makers. Although no conclusive cause-and-effect relationships have been established for the effect of acid deposition on soils, crops, forest decline, and in most cases on surface waters, a great deal of controversy still surrounds the discussion of both the nature and extent of acid deposition effects. This is mainly derived from the perceptions of the “problem” rather than from scientific data. Therefore, there is a desire among some environmental scientists to predict the effect of acid deposition on terrestrial and aquatic ecosystems. In this book, the authors attempt to analyze the effect of acid deposition on (i) the soil-plant system, and (ii) the composition of the solution that is released to surface and ground waters. In doing so, the linkage between the effects on terrestrial and aquatic systems is elucidated. Although the authors admit that it is unrealistic to expect that such clarification will materially lessen the controversy surrounding the issues, they hope that it will help to focus scientific investigation on those processes that are likely to control the effects of acid deposition on soils and waters.

Soil-plant systems are extremely complex, and involve many chemical reactions and biological processes involving \( H^+ \) ion transfers. To provide a conceptual framework for evaluation of the probable long-term effects of acid deposition, the authors have tried to focus on a few fundamental soil processes. The rates of these processes, however, change with depth in soil profiles. In addition, soils receiving significant amounts of precipitation are dynamic living systems; therefore, many of the assumptions made in developing the concepts and the model are not necessarily valid. Although the authors do not give examples, they state that the discussion focuses on those systems in which acid deposition is most widespread and deleterious effects have been observed.

This hardcover book is divided into nine chapters. After a brief overview, the individual chapters address the specific topics of soil acidification; the sulfur system, including the sulfate cycle; the nitrogen system, including acid-base relationships of the nitrogen cycle; soil-solution interactions, including ion equilibria models; forest elemental cycling, including canopy interaction; the aquatic interface; and soil sensitivity. The final chapter presents a synthesis of the concepts developed in previous chapters and a brief discussion of how the author’s perceptions of acid deposition effects may have changed from current to future understanding.

The book should be useful to those with advanced knowledge of soil chemistry interested in theoretical concepts of chemical reactions in soil systems.—M.A. TABATA

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Rural Groundwater Contamination


Although not explicitly stated in the Preface, this book is a compilation of the proceedings of a conference on rural groundwater contamination organized through Michigan State University. The focus of the publication is on agricultural sources of groundwater contamination with some broader groundwater problems also included. Chapter 1 by J.H. Anderson gives a challenge to the State Agricultural Experiment Stations and the Cooperative Extension Service to develop, adopt, and incorporate new techniques for assessing and remedial action into their efforts to develop and disseminate information to those who work with this natural resource base. Some chapters are more of general interest to researchers, educators, and policy makers in the land-grant universities, most notably Chapters 13, which discuss assessment and modeling techniques to reduce contamination, and Chapters 14 through 16, which cover drinking water standards, health effects, and the National Pesticides in Well Water Survey being conducted by the USEPA.

The book is very logically organized. It begins with an overview, then covers the sources and impacts of water contamination; the assessment, modeling, and remediation discussed above; and the health aspects and remedial strategies and assistance. Some of the topics are very specific to Michigan, Iowa, and Wisconsin, and there is some unevenness in the level of detail and the application of the information. In the sources and impacts section, many chapters are reports of research projects, with little depth or analysis of results.