**Sensible Sludge: A New Look at a Wasted Natural Resource**

by Jerome Goldstein, Rodale Press Inc., Emmaus, PA 18049. 183 p. $5.95, paperback.

This paperback book, as the title implies, presents a bias for land application of municipal sewage sludge. It is written in a popular format for an interested readership that is not trained in this area. To this end, Appendix-1 is an informative and brief description of "How a Sewage Treatment Plant Operates" with an accompanying glossary of terms. It also has a rather extensive compilation of various scientific publications and conference proceedings that bear directly upon land application of sewage sludge. It is from these references that the author selectively and extensively paraphrases throughout the text. The book contains a helpful index, for which the author is to be commended.

The author immediately attracts your attention by the title of Chapter I, "Where Is Your Sludge Tonight?". This chapter enumerates many of the more recent headlines from the popular press, such as the widely covered trials and frustrations of Howard McNee of Monroe, Michigan. The chapter is liberally sprinkled with "facts and figures," often without definitive literature citations, and concludes with a five-page recent history of Philadelphia's attempts to reduce ocean dumping of sewage sludge.

The first chapter is followed by a short and sketchy history of land spreading of sewage sludge in the United States. Chapter III deals rather extensively with the composting of sludge and draws heavily upon the composting system developed by the Biological Waste Management Laboratory of the USDA-ARS in Beltsville, Maryland. Another chapter discusses "Farming with Sludge" and consists of case histories in the United States as well as abroad. Usually these are "success" stories, but include valuable information about problems encountered in various situations. The next three chapters consider: i) land reclamation with sewage sludge, ii) Clay Kellogg's philosophy on the marketing of sludge, and iii) Chicago's Prairie Plan.

"Is it safe to use sludge on land for crop production?" is the question addressed in Chapter VIII. It deals almost exclusively with the question of "heavy metals" and draws extensively from the data and philosophies of the conference at Cornell's Eighth Annual Waste Management Conference held in 1976. The final three chapters consider the "politics" associated with land spreading of sewage sludge with the author coming to the candid conclusion that: i) lack of communication is a major problem and ii) "emotions and politics replace reason."

I found the book interesting and easy to read. It will serve as excellent reading for persons interested in the positive aspects of recycling municipal sewage sludge back onto the land.—ROBERT H. DOWDY, Soil and Water Management Research Unit, Agricultural Research Service, U.S. Department of Agriculture, and University of Minnesota, St. Paul, MN 55108.

**Introduction to Environmental Remote Sensing**


This book was designed to provide an elementary introduction to modern remote sensing techniques and their applications. It provides a comprehensive introductory view of the diverse and rapidly developing field of remote sensing. The material is presented in a logical manner. The first portion of the text is devoted to the physical basis of remote sensing and reviews the electromagnetic spectrum and energy characteristics and interactions with the environment from the radiation source to the target material. Subsequent chapters place emphasis upon data acquisition and analysis techniques. Data collection systems, including photographic and vidicon camera systems, radiometers, and multispectral scanners, as well as ground-based reference data collection systems, are discussed.

Data analysis techniques including both manual image analysis and numerical processing and analysis are presented. A separate section of the book is devoted to weather analysis, forecasting, and global climatology. The final chapters deal with the applications of remote sensing technology to the areas of water, soils, landforms, rocks, mineral resources, crops, land use, forestry, and urban studies.

As with any work that attempts to cover in its entirety such a diverse area as environmental remote sensing, this book does not present material in as much detail as might be desired. However, the authors have assembled an adequate, though not exhaustive, list of references to allow the reader to pursue in depth all subjects discussed. This book is reasonably well up-to-date and could be used as a general introductory text for those interested in environmental remote sensing.—R. A. WEISIMILLER, Department of Agronomy, Laboratory for Applications of Remote Sensing, Purdue University, West Lafayette, Indiana 47906.

**Air Pollution: Phytotoxicity of Acidic Gases and Its Significance in Air Pollution Control**


This volume is the twenty-second in a series of publications entitled "Ecological Studies, Analysis and Synthesis." The author has performed an outstanding service in describing the techniques that may be followed and the problems that exist in studying the effects of air pollutants on vegetation, and then of translating the results of such studies into technically and economically feasible air quality standards for the protection of native, ornamental, and crop plants. This has been accomplished through the presentation of the author's personal studies with sulfur dioxide, hydrogen fluoride, and hydrogen chloride, coupled with an evaluation of the available literature. The volume is divided into four sections: 1. Materials and Methods; 2. Experimental Analysis of the Effects of Gaseous Air Pollutants; 3. Comparisons of the Phytotoxic Characteristics of Sulfur Dioxide, Hydrogen Fluoride, and Hydrogen Chloride; and 4. Discussion of the Suitability of Plant Responses as a Basis for Air Pollution Control Measures. Following the course of the four sections leads to the description of dose response relationships for the three pollutants, and descriptions of the influences that other pollutants, as well as external and internal growth factors, may exert on these dose responses. Finally, threshold levels which vegetation may tolerate are suggested.

The work is well supplied with figures and tables to illustrate important points. Practically all the figures and tables are taken from the results of the author and his co-workers at the Landesanstalt fur Immissionschutz, Essen. Thus, the volume also serves as a summary of the work that was conducted in Essen over the past twenty or so years. During the course of the discussion, reference is made to some 375 publications; thus, the volume provides an excellent bibliography of pertinent literature. The volume is well indexed both from the standpoint of the species discussed as well as the type of studies performed.

The discussions, especially those dealing with sulfur dioxide, are directed more toward conditions in which there are many sources of the pollutant scattered over the area under discussion. Thus, emphasis is placed on long-term averages, since the daily or hourly variations under these conditions are much less than would occur in the vicinity of a single or point source, rather than on short-term fluctuations in concentration. In this connection it might be well to mention that the averages for sulfur dioxide for the growing season, or monitoring time, are calculated on the assumption that any hourly reading less than 0.10 ppm is considered to be 0.0 ppm. Thus, the actual concentrations which the plants can tolerate over the entire growing season are probably higher than indicated (specifically Table 23).

In my opinion the work is a must in the hands of anyone interested in the responses of vegetation to the three pollutants discussed and will be of value to anyone in the air pollution field.—HARRIS M. BENEDICT, Stanford Research Institute, South Pasadena, California.