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Geographic Information Systems: Designs on Our Natural Resources

Introductory Readings in Geographic Information Systems. Edited by Donna J. Peuquet and Duane F. Marble. New York: Taylor and Francis, 1990, 371 pages, hardcover, \$88, softcover, \$39

Reviewed by D. David Moyer

A geographic information system (GIS) is a system for handling spatially referenced data, including the computer hardware, software staff, and institutional support, that can be used to acquire, manipulate, update, analyze, and display spatial data. Use of GIS has increased sharply in the past 5 years at all levels of government because of the maturing of related technology and an increased demand for ways to handle and analyze the more than 75 percent of government data that is spatial. GIS has elevated analytical capabilities from the limitations of the manual overlays of mylar maps just a few years ago.

Work that was begun in the Economic Research Service in the 1960's has now emerged as an analytical tool in the Water Quality Section of the Resources and Technology Division, ERS. The National Oceanic and Atmospheric Administration, the Bureau of Land Management, and the Forest Service have even more ambitious programs underway. The Soil Conservation Service used GIS to develop and measure the impact of policies contained in the 1985 and 1990 Federal farm bills. Other government applications include land use planning, soil erosion control and management, and analyses of water quality and wildlife habitat suitability. This book of readings, therefore, will find a ready audience in many government agencies as planners, geographers, program managers, environmental scientists, and researchers in a wide variety of disciplines seek to improve the quality and timeliness of their work.

The compilation of a set of readings is never easy, and for a topic like GIS which is both relatively new and widely applicable, the task is doubly difficult. The book is "intended as a supplementary reader for use in an introductory, upper-division or graduate-level course in GIS, as well as for practicing professionals who wish to learn more about this technology." Further complicating the editors' problems are the wide range of source materials available. GIS information is scattered throughout a variety of reports and journals. *The URISA Journal* (of the Urban and Regional Information Systems Association), and *International Journal of Geographical Information Systems*, and

GIS World show particular promise as gathering points for GIS-relevant literature.

The 26 papers in the book are grouped into five topics, enabling the reader to focus on or skip blocks of material. (This attention to indexing will also facilitate the use of the Peuquet and Marble text as a reference.) Each of the five major parts begins with a 2-3 page introduction that attempts to integrate the papers in the section, and provides a list of additional references on the topics covered. This should help those readers without a companion textbook.

The editors have provided a number of guides to making efficient use of the material. The Preface and Introduction summarize the needs and uses of GIS, organizing the entire book by general subjects and particular papers. The usefulness of each section will depend on the background of the reader.

Those wanting an overview of GIS will appreciate the articles that define GIS. An article by Tomlinson crisply recounts the 20-year history of GIS and alerts developers of GIS to potential problem areas. Jack Dangermond gives both narrative and graphic descriptions of analytical and data processing functions typically performed in a GIS. The reader should find the graphics here particularly helpful.

Part II, more than one-third of the book, describes several GIS applications. Of interest to anyone analyzing 1990 Census data are the three papers on the DIME and TIGER data bases that were developed by the U.S. Bureau of the Census. Given the interest in using the TIGER files as a data base for GIS, the discussions by Marx and Sobel will be especially welcome. They describe how the TIGER system was built, linking U.S. Geological Survey 1:100,000 map data with Census attribute data, to produce an "integrated geographic data base for the entire United States." It seems likely that this database, combined with appropriate GIS software, will indeed "form the basis for much of the urban [and rural] spatial data processing in the 1990's."

Shorter parts of the book concern the problems in building a database (Part III), the internal workings of a GIS, including data representation and analysis techniques (Part IV), and materials to aid those who must design or evaluate GIS for use in their agency or business. Here Vrana raises the issue of temporal data, a topic largely ignored in the GIS community until very recently. Vrana's discussion of three prototype land information systems, the common themes and problems, should help many economists, planners, and geographers in ERS as well as other agencies. The


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discussion of the importance of the temporal dimension of land data for resource management, land ownership, and land use planning is especially helpful

The editors concede that some of the material, even on data bases and data representation, will become dated fairly quickly. An update in the form of a postscript or an introduction to the papers would have mitigated this. For example, in the applications section, the editors include a long 1979 paper on the MAGI (Maryland Automated Geographic Information) system. An update could include the MAGI's current operating status, its evolving applications, updated cost data, software changes, and conversion problems. Not only

would this information answer the questions that would arise in the reader's mind, but would add longevity to the book and aid the reader in comprehending the rapidly changing field of GIS.

As in most compilations, readers will find that style, readability, and amount of background assumed by the author varies with each paper. This inconvenience pales next to the book's reference value to the relative newcomer to GIS, as well as to the more experienced and inquisitive analyst. GIS not only provides a powerful tool in resource policy questions, it also will restructure many government and private institutions that manage natural resources.



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Berlin New York

european review of agricultural economics

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