18. Training
19. Underground Storage Tank Management
20. Wastewater Management
21. Water Quality Management

The book ends with three appendices: (1) EPA Contacts and Web References (80 selected environmentally-related web pages are reported here); (2) Environmental Hotlines; (3) Glossary.

In common with almost all of the Government Institutes books I have reviewed, this volume is well-constructed, well-written, easy-to-use, and full of useful information and guidelines.

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Computer-Based Environmental Management
Ralf Seppelt, Wiley-Verlag GmbH & Company KgaA, Weinheim, Germany, 2003, 305 pp., US$ 110.00, ISBN: 1-527-30732-X

Given the complexity and interaction of environmental processes, using the computer to describe, model, and simulate them is a logical development in our attempt to understand what is happening in nature. This book is a giant step forward in describing the development and use of environmental models, thus, significantly enhancing the interdisciplinary field of environmental science. The author notes at the very beginning of his book:

> Environmental models are tools which help us understand how ecological processes work and allow us to best hypotheses about ecological processes in a systematic matter. Setting up an ecological model requires detailed system analysis of the processes of interest. After this translation into mathematical equations is performed. Recent development of ecological and ecosystem models has provided a multitude of possible approaches and theories.

The author describes (in his introduction) the book's initial contents:

> The first part of the book (Chapters 1 to 3) gives a synthesis of model development concepts. Compiling mathematical equations and setting up simulation models is a complex and challenging task. Setting up ecological models requires a detailed system analysis of the processes of interest. A systematic way to achieve a concise and valid simulation model is to start with a conceptual model, which every scientist usually has in mind when investigating a process. Chapter 1 traces the path from conceptual models to validated regionalized environmental simulation models. The step of translating conceptual models into computer models is assisted by several development platforms. These platforms translate conceptual models into mathematical equations of a certain mathematical 'dialect'.
>
> Focusing on processes of the abiotic environment as well as the first two trophic levels of the biotic environment, several different translations of conceptual diagrams into mathematical models are studied in Chapters 2 and 3. The first focuses on the dynamic patterns on different temporal scales such as nutrient flow, water transport, growth of crops and week, population dynamics, competition, etc. Migration of species, vertical and horizontal fluxes of matter and information through a landscape are the characteristic properties of ecosystems. In Chapter 3 spatial interactions are discussed and the possible mathematical modeling concepts are presented, starting from highly aggregated mathematical models given by partial differential equation systems, we end up with a discussion of cellular automata. For comparison, different mathematical 'dialects' are used for modeling the same process to analyze and compare different methodologies.

While the foregoing chapters are under the general heading of Setting the Scene: Diversity of Environmental Modeling, the second section of the book is entitled Integrated Models (Chapters 4–7). In Chapter 4 of this section, Seppelt discusses "... the results obtained in the context of metamodeling and scientific theory. Further applications of hybrid models in biology as well as in environmental assessment are recorded in Chapters 6 and 7. The focus in Chapters 5 and 9 is on the mathematical foundation of the integrating modeling concept as well as the application of environmental models in optimization.

Part 3 contains the final six chapters (comprising over half of the book's pages) . Its title is The Big Picture: Environmental Management. The chapter titles are as follows: Scenario analysis and Optimization, Prerequisites: temporal hierarchies and spatial scales, Optimum agroecosystem management: temporal patterns, Optimum agrosystem management: spatial patterns, Changing landscapes: optimum landscape patterns, and Conclusions, perspectives and research demands.

Most of the models deal with the natural environmental systems (insects, crops, etc.). Of more interest to readers of this journal was the, albeit limited, development of models dealing with life cycle analysis, environmental fate of NOx emissions, soil acidification, and eutrophication.

The final section of the book, entitled Additional References to Web Resources, gives the reader additional information on material in the book, Animation and Video Files which illustrate the spatially explicit simulations discussed in Chapters 3 and 6, and a final reference to Software and Libraries.

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