

## Book Reviews

### FRESHWATER ECOSYSTEMS

*Freshwater Ecosystems, Modelling and Simulation*, by M. Straškraba and A. H. Gnauck. Elsevier Science Publishers, Amsterdam and VEB Gustav Fischer Verlag, Jena, 1985, 309 pp., hardcover, U.S.\$77.75/Dfl. 210, ISBN: 0-444-99567-6.

Mathematical modelling of ecological systems passed through a difficult period of experimentation and growth. Much misunderstanding occurred, and frequently unrealistic expectations concerning the usefulness of modelling occurred. The authors assume in this book that modelling of freshwater ecosystems has matured to the point at which methods of systems theory can be effectively applied to problems concerning changes in the structure and functioning of these systems. The authors proceed to demonstrate the efficacy of these approaches with detailed summaries using numerous examples of application. All were taken from their own research; hence, many of the data have not been published previously.

Three general approaches to modelling methodology (stochastic effects, deterministic simulations, and cybernetic self-optimization treatments) are integrated and applied to freshwater ecosystems. The first part describes systems theory and how these principles are applied to data from natural and artificial ecosystems. A summary of the various methods of systems analyses then follows in significant detail. The descriptions and couplings are well done with informative graphics. This methods overview provides a background for the applications that follow, and is helpful in determining how the different methods can complement one another. The limitations of each method are also evaluated.

Most of the book summarizes attempts to construct ecological models by standard deterministic and stochastic methods that simulate, in particular, the functioning of ecosystems. Analyses treat only the pelagic zones in standing waters. The much more "sophisticated" structure of littoral and benthic regions is not treated to any significant extent, but clearly the same modelling principles could be applied to these important system components as well. Sub-component processes are modelled, dominated by physical (temperature, light, hydrodynamics) and chemical nutrient fluxes. Models of primary and secondary (zooplankton) production are summarized in detail. Stochastic models of dissolved oxygen dynamics are treated in detail for streams, lakes, and reservoirs. The large literature on modelling of the eutrophication process is reviewed, and realistic limitations are noted.

One certainly recognizes intuitively that nature optimizes growth, produc-

tivity, and reproduction under the environmental constraints of a particular ecosystem. Therefore, the optimization and self-deterministic characteristics of cybernetic models clearly point to the direction of the future. Although mathematical prowess is needed, the phytoplankton and other examples discussed indicate potential applications. Even though optimizations of nature may not coincide with human desires, these models should indicate the most expedient means of management to achieve the desired states of the ecosystem or subsystem.

The book is timely and contains a wealth of information and ideas that should stimulate further development. Goals set are conservative, an important character in view of the past situation of expecting too much too soon from modelling. The book is good support material for quantitative analyses of freshwater ecosystems.

ROBERT G. WETZEL  
*Department of Biology*  
*The University of Michigan*  
*Ann Arbor*  
*MI 48109 U.S.A.*

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#### AFRICAN WETLAND VEGETATION

*The Ecology and Management of African Wetland Vegetation*, edited by Patrick Denny. Dr. W. Junk Publishers, Dordrecht, 1985, hardcover, 344 pp., Dfl. 250.00/£69.25/U.S.\$78.50, ISBN: 90-6193-509-1.

Freshwater resources are, of course, critical worldwide but are particularly important in the African continent. The lack of a summary evaluation of African wetlands and their vegetation was recognized as a primary need by the 1979 SIL-UNEP Workshop on African Limnology. The book later evolved from the Scientific Committee on Problems of the Environment Wetlands Project. Under the editorial guidance of P. Denny, the five authors (P. Denny, D.S. Mitchell, C. Howard-Williams, J.J. Gaudet and K. Thompson), representing the expertise on African aquatic plant biology and ecology, have assembled a comprehensive and delightfully interesting account of the wetland resources of this continent. Because most of these scientists have since left Africa, it is particularly appropriate and important that they have summarized their collective expertise in this volume.

A conspicuous characteristic of African wetlands is the marked environmental seasonality to which the vegetation is exposed. Large areas of floodplains shift within a few months from productive wetlands to arid dry lands. The