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THORNTON, J. A., W. RAST, M. M. HOLLAND, G. JOLANKAI, AND S.-O. RYDING [EDS.]. 1999. **Assessment and control of non-point source pollution of aquatic ecosystems. A practical approach.** Man and the Biosphere Ser., V. 23. UNESCO. xii + 1466 p. US\$89. ISBN 1-85070-384-1.

"It was the best of times; it was the worst of times." This famous quote from Dickens aptly describes the current state of water quality in much of the developed world. Although great strides have been made in reducing municipal and industrial sources of pollution to lakes, rivers, and estuaries, water quality in many regions nevertheless continues to deteriorate, primarily because of nonpoint source pollution (NPS, as it is known in the water quality manager's world). What we know about NPS and what can be done about it is the subject of this book, which was written by scientists and engineers involved in both the science and management of this difficult and important topic.

Essentially, this book reviews knowledge and experience regarding the assessment and control of NPS. Its goals are "... to be practical, to be applicable in both developed and developing countries, to be understandable to scientific/technical individuals and policy makers/managers, and [to] be useful in as many environmental settings as possible." It largely meets these goals, but attempting to do so results in a lack of detailed analysis of science issues. Consequently, it will provide managers and policy makers with a good overview of the causes and general approaches for solving NPS problems, but it offers little in the way of new understanding of this issue for scientists. It will also be more useful in developed countries than in the developing world, because experience in dealing with this issue has come primarily from developed countries, which thus supply most of the examples.

Most chapters are coauthored by one or more of the five editors. This results in a high degree of uniformity in organization and style, as well as substantial cross-referencing throughout. Following two introductory chapters, the first substantive chapter presents a series of largely common-sense steps for use by policy makers and managers in developing NPS control programs. The next two chapters address the core science issues—the hydrologic cycle, factors affecting transport and transformation, types of water pollutants, and determination of critical levels. This is the most interesting part of the book to me, probably because my interests are primarily in research; the hydrology section is a nice overview written in terms that a nonspecialist can understand, and the appendix to the chapter on water pollutants includes useful standards and criteria.

The book then turns toward more highly focused issues. A discussion of the human activities that are the source of NPS is the

subject of Chapter 6. This chapter is comprehensive and organized around activity categories that generate NPS. Unfortunately, the writing here is uneven, somewhat repetitive, and, in a few cases, a bit sloppy. The next two chapters focus on measurement (sampling, sample handling, and analytical techniques) and modeling and will be quite helpful to water quality managers looking for specific tools. The treatment of modeling ranges from empirically derived unit area loads to sophisticated (and highly data demanding) simulation models and includes an appendix offering a brief overview of some of the most useful simulation models.

The final three chapters focus on management. Chapter 9 covers available NPS control measures, describing objectives, techniques, costs, and the effectiveness of a number of control options. Although somewhat pedantic, it will be of interest to engineers and planners who are looking for control measures. The book concludes with two chapters that present a series of steps to define and select an NPS control program and on opportunities for the future. Two points of emphasis in the penultimate chapter struck me as critical to the entire process: (1) the importance of postimplementation monitoring to determine the response, both near- and long-term, to the control measures implemented, and (2) the importance of a detailed written plan to preserve the process as institutions and individuals change.

The thing I liked most about the book was that it is written from an ecosystem perspective, emphasizing root causes and a holistic consideration of issues and potential solutions. It is refreshing to see a management-oriented book that stresses a whole-system viewpoint. Unfortunately, many of the figures are of rather poor quality (axis scales and legends were often fuzzy or too small to be easily read), and, in some instances, data were provided in tables or in the text with no reference as to their source. I could also find no information on the experience, institutional affiliations, or addresses of the chapter authors or book editors. Finally, I would have liked to see more specific case studies of successes and failures and less redundancy throughout the book.

Although the majority of *Limnology and Oceanography* readers will not find this book particularly useful, it will be quite helpful to water quality planners and managers in the public or private sector. It might also find use as a primary or supplemental text in a undergraduate-level environmental engineering or landscape planning course on water quality management.

Patrick J. Mulholland

Environmental Sciences Division
Oak Ridge National Laboratory
Oak Ridge, Tennessee 37831-6036