BOOK REVIEWS

PRINCIPLES OF HYDROLOGY, 3rd Edition, by R. C. Ward and M. Robinson. Published by McGraw-Hill (U.K.), 1990, 365 pp. ISBN 0-07-707204-9.

Eight years between the first and second editions, 15 years between the second and the third; will there be a fourth? If the sequence continues then it probably won't bother me much either way and there may have to be at least another new author. Mark Robinson, a Senior Scientific Officer at the Institute of Hydrology, has collaborated with Roy Ward, Professor of Geography at the University of Hull, to produce a new version of Ward's earlier editions of the same name.

The third edition is completely rewritten but retains the same basic structure as the earlier editions and will probably appeal to the same audience — undergraduate students in earth science, forestry, agriculture and engineering. As before the objective has been to explain accepted theory and experience rather than to provide standard procedures for data analysis — this book is not a manual of techniques.

There are six chapters covering in turn, precipitation, interception, evaporation, soil water, groundwater, and runoff. In the second edition Ward had a separate chapter for evapotranspiration and in a ninth chapter he attempted a "synthesis" of hydrologic processes in the drainage basin. This has been dropped in favour of a chapter on water quality — a good move.

Within each chapter there is total reorganisation of the material and much that is new — about 40% of the references have been published after 1975. The chapters on interception, evaporation, and runoff are the best and the discussion of runoff mechanisms is an improvement on anything I have seen elsewhere. There are places, however, where the authors resort to citations rather than sharpening the focus on the point of contention with their own words. This may be acceptable in a scholarly review, but is little help to the uninitiated hydrology student struggling to grasp a concept.

I am disappointed in the chapters on soil water and groundwater, not because they are too difficult or too simple, but because they don't provide the lucid description and explanation of processes that is necessary for an undergraduate text. The material is mostly correct but the presentation has slipped a little and I will be sending students to other texts for support and elaboration.

While there will be quibbles and maybe even horrified gasps from some micrometeorologists, plant physiologists, and soil physicists, I think that as a first text in hydrology this book is better than most and I shall certainly be adopting it for undergraduate courses. My main concern will be to find adequate local examples to replace those from the northern hemisphere.

The price is just under $60 in paperback, an important consideration.

D.L. Murray

LAKE RESTORATION BY REDUCTION OF NUTRIENT LOADING: EXPECTATIONS, EXPERIENCES, EXTRAPOLATIONS. H. Sas (coordinator). Academia Verlag, St Augustin. 1989. 497 pp.

One of the more important relationships to emerge from the last two decades of descriptive limnological research has been the Vollenweider/OECD model whereby inlake phosphorus and algal biomass are described as a function of external phosphorus loading. This simple model expresses the integral effect of many complex lacustrine processes, and has had enormous appeal to engineers and applied limnologists concerned with water quality management of lakes and reservoirs. Despite its intuitive attraction however, the model has been plagued by doubts as to its predictive value. Can a relationship derived from many lakes, each in a different trophic condition, be used to predict the response to nutrient reduction in a single lake? Can a steady-state model be applied to the transient responses during lake rehabilitation? Can a regression model with such wide confidence limits be of practical use? Do algal compositional changes, especially cyanobacterial blooms, also track the phosphorus relationship? Given such a relationship, how fast might lakes respond to nutrient reduction? This multi-authored volume co-ordinated by Hein Sas contains a valuable compilation of data and analyses which address such questions.

The book treats lake rehabilitation in Western Europe and is the culmination of a large collaborative exchange involving many investigators working on 18 separate lakes. The volume begins with a summary splitting the results into two separate aspects of the recovery process: the relationship between in-lake phosphorus and external phosphorus loading, and the relationship between in-lake phosphorus and the responses by the algal community. A brief general summary of eutrophication processes is presented to introduce the data base and to describe and support the treatment of the data. Separate chapters then explore lake response to external P-reduction, with sections on dissolved phosphorus, sediment behaviour, chlorophyll *a,* algal biovolume, transparency, and cyanobacteria. The latter should be interpreted with some caution by New Zealand limnologists because the data are biased toward *Oscillatoria*-dominated lakes which are rare here. The remaining two thirds of the book are devoted to individual case studies of lake recovery at the 18 sites, with each lake treated in the same format.

Parts of this volume are difficult to follow, but overall it contains a mine of information for applied limnologists. Of special relevance to New Zealand investigators, the study includes a number of lakes where factors other than phosphorus appeared to limit algal biomass, although the concept of 'nutrient limitation' is treated rather loosely. This rich data base has resulted in many lessons of practical significance; for example, the disparate behaviour of deep and shallow lakes, and the problem of natural interannual variability which often obscures any immediate response to nutrient control. For those of us who have observed the deterioration of certain New Zealand lakes, the message is positive: lakes do respond to nutrient reduction, but the timing and magnitude of recovery is substantially influenced by intrinsic properties of the individual lake.

Warwick F. Vincent