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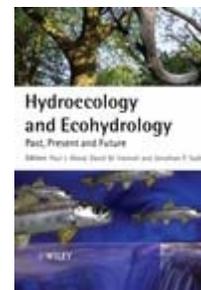
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Hydroecology and Ecohydrology — Past, Present and Future, edited by Paul J. Wood, David M. Hannah & Jonathan P. Sadler, 2008. John Wiley and Sons, 111 River Street, Hoboken, NJ 07030-5774, USA. Hardcover, 464 pages. Price EUR 135.00; GBP 90.00. ISBN 978-0-470-01017-4.



The terms “ecohydrology” and “hydroecology” have been used increasingly in the international literature over the last decade, and this interdisciplinary subject area has been considerably expanded. Ecohydrology is often defined as “the study of plant-water interactions and the hydrological processes related to plant growth” (Baird and Wilby, 1999), or as a discipline that “seeks to describe the hydrological mechanisms that underlie ecological pattern and processes” (Rodriguez-Iturbe, 2000), and thus it is used to describe terrestrial plant responses and effects on the land-phase of the hydrologic cycle. The importance of this new discipline is manifested in the John Wiley & Sons journal, “Ecohydrology”, publishing research papers since 2008. On the other hand, hydroecology is used to describe the study of ecological and hydrological processes in rivers and floodplains, linking hydrology and biology for understanding fresh-water biota and studying changes in aquatic ecosystems due to river-flow regime, water quality, and channel structure (Brooks and Vivoni, 2008). In this context, the new discipline ecohydrology/hydroecology has the potential to integrate science between traditional fields of hydrology and ecology from both perspectives — land and water — and also to provide an interdisciplinary platform for basic and applied science in the field of sustainable water resources management.

This book, edited by the physical geographers Paul J. Wood and David M. Hannah, and the ecologist Jonathan P. Sadler, aims to capture the vitality of this current scientific topic and to address research gaps and recent developments. The editors have assembled an excellent team of international leading scientists within their respective fields to author individual chapters, and they conspicuously demonstrate how complex this new field of research is; the resultant chapters present significant results and methodological developments accompanied by historical reflections and identifying future needs.

Per the editors’ preface, the book is structured in three sections: Part 1 (Chapters 2-7) considers fundamental ecohydrological/hydroecological process understanding, part 2 (Chapters 8-13) draws together recent methodological approaches and critiques of how these processes can be monitored and modeled, and part 3 (Chapters 14-21) comprises detailed case studies of research undertaken in different environments. The final chapter (Chapter 22) identifies future prospects and challenges for this new interdisciplinary field of research. As clearly noted by the editors, this book should illustrate the diversity of approaches to ecohydrological/hydroecological study and may help to build a basis for a newly accepted discipline within a truly interdisciplinary framework.

The essays in the first part review linkages between ecology and hydrology in river systems, beginning with the role of forest ecosystems, the aquatic/terrestrial coupling along river corridors also including ecological response to floods and drought and surface-water/groundwater exchange processes up to an analysis of temporal and spatial scale dependency and climate-

change effects. These chapters give very general information on ecological processes affected by hydrological forces and vice versa, describing the phenomena mostly qualitatively. Especially the aquatic/terrestrial matter fluxes, which are spatially and temporally highly variable, and their influence on the ecology of flowing waters are addressed. This part of the book forms a state-of-the-art report about ecohydrological/hydroecological processes in rivers, streams and wetlands, and for me it becomes obvious that similar investigations for lacustrine ecosystems combining physical, biogeochemical and ecological studies are urgently needed as well.

Part 2 progressively gets into the main topic of the book, by first examining the values of long-term records in hydroecology and detailing field methods for monitoring surface-water/groundwater interactions in aquatic ecosystems. Here, ecohydrologists exploring the ecological significance of surface-water/groundwater interactions are seeking the effects of exchange on surface and subsurface biogeochemistry, ecosystem processes, and biota. Although these methods are discussed in the context of rivers and lakes, many of them are equally applicable to estuaries, marine habitats, and littoral or riparian zones. This chapter also highlights the growing need for integrated hydrological and ecological data sets, and it explores analytical methods to examine the influence of flow-regime variability on instream ecology. As one example for a mathematical and conceptual framework for ecohydraulics, the Eulerian-Lagrangian-Agent (ELAM) methods are outlined as a tool which integrates different point of views, and which allows including other modeling approaches, such as individual-based models or geomorphology models. In this context, the ongoing discussion about ecological acceptable hydrographs and flow durations from a biological perspective provides further investigations for coupling dynamic hydraulic and biological-response models as a basis for water-resources management and river regulation. Although these chapters are very instructive and well presented, I think that some more fields could be of interest, for instance the mathematical modeling of groundwater/surface-water exchange, biogeochemistry of the sediment/water interface, and the interaction between river and lake hydrodynamics and their ecology.

An illustration of the above discussed ecohydrological/hydroecological processes and an application of introduced methods are presented in the third part of the book. The functions of plant/sediment/water interactions are clearly demonstrated in floodplains, illustrating how meso- and macro-scale hydrological, geomorphological and biogeochemical processes can influence floodplain diversity and stream ecology. The ideas of the spatial and temporal patterns of vegetation change in riverine landscapes and inside streams and rivers are also considered, and of this is also done regarding how such changes relate to hydrology. Integrated hydroecological understanding of both Alpine and lowland river systems are presented and the ecological significance of hydraulic retention areas in river corridors, including inshore and floodplain zones of large river systems, is explained. The significance of such areas for the river system as a whole is analyzed by reviewing their functions at a small scale and a subsequent up-scale procedure. It is obvious that this has become a key topic in river management.

Finally, in chapter 22 the editors give a summary and present a forward-looking view on the challenges and prospects for the emerging new discipline ecohydrology/hydroecology. The need for, and potential benefits of, research that bridges the gap between traditional disciplines of hydrology and ecology is well discussed and future research topics are outlined. Hence, I believe that such an attempt to integrate diverse scientific disciplines of fresh-water research is a critical endeavor which must be supported by the scientific community.

As a conclusion, I recommend this book to any hydrologist, ecologist and water-resources manager who wishes to understand more about fresh-water ecosystems and their physical, chemical and biological nature. I fully agree with the editors' message that researchers, graduate students and environmental engineers faced with hydroecological problems require to converge upon a common vision and a unified approach.

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