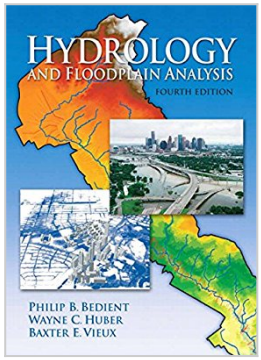

Hydrology and Floodplain Analysis (4th Edition)

By Philip B. Bedient, Wayne C. Huber, Baxter E. Vieux

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This book offers a clear and up-to-date presentation of fundamental concepts and design methods required to understand hydrology and floodplain analysis. It addresses the computational emphasis of modern hydrology and provides a balanced approach to important applications in watershed analysis, floodplain computation, flood control, urban hydrology, stormwater design, and computer modeling. Chapter topics cover rainfall-runoff analysis, frequency analysis, flood routing, hydrologic simulation models and watershed analysis, urban hydrology, floodplain hydraulics, ground water hydrology, design issues and geographical information systems in hydrology, NEXRAD radar rainfall for hydrologic prediction, and floodplain management issues. For engineers and hydrologists.

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Editorial Review

From the Back Cover

Now in its third edition, *Hydrology and Floodplain Analysis* continues to offer a clear and up-to-date presentation of the fundamental concepts and design methods required to understand hydrology and floodplain analysis. It addresses the computational emphasis of modern hydrology and provides a balanced approach to important applications in watershed analysis, floodplain computation, flood control, urban hydrology, stormwater design, and computer modeling. Includes HEC-HMS, HEC-RAS, and SWMM models plus GIS and radar rainfall. The text is ideal for students taking an undergraduate or graduate course on hydrology, while the practicing engineer should value the book as a modern reference for hydrologic principles, flood frequency analysis, floodplain analysis, computer simulation, and hydrologic storm water design.

Updated coverage in the third edition includes:

- *Three New Chapters*
  - Chapter 1: Geographic Information Systems (GIS)
  - Chapter 2: Use of NEXRAD Radar Data
  - Chapter 3: Floodplain Management Issues in Hydrology
- A new, detailed case study of a complex watershed using GIS linked with radar technology.
- New tools and technologies used for watershed analysis, hydrologic modeling, and modern floodplain delineation.
- New examples and homework problems in each chapter.

About the Author

Philip B. Bedient is the Herman Brown Professor of Engineering, with the Department of Civil and Environmental Engineering, Rice University, Houston, TX. He received the Ph.D. degree in environmental engineering sciences from the University of Florida. He is a registered professional engineer and teaches and performs research in surface hydrology, modeling, and flood prediction systems, and ground water hydrology. He has directed over 50 research projects over the past 31 years, and has written over 180 journal articles and conference proceedings over that time. He has also written four textbooks in the area of surface and groundwater hydrology. He received the Shell Distinguished Chair in environmental science (1988—92), the C.V. Theis award in 2007, and he was elected Fellow of ASCE in 2006. Dr. Bedient has worked on a variety of hydrologic problems, including river basin analyses, major floodplain studies, groundwater contamination models, and hydrologic/GIS models in water resources. He has been actively involved in developing computer systems for flood prediction and warning, and recently directed the development of a real-time flood alert system (FAS2) for the Texas Medical Center (TMC) in Houston. The FAS2 is based on converting NEXRAD radar data directly to rainfall in a GIS framework, which is then used to predict peak channel flows. Dr. Bedient is organizing the Houston test bed for the Center for Collaborative Adaptive Sensing of the Atmosphere (CASA), an NSF Engineering Research Center led by University of Massachusetts-Amherst, and Rice University is a strategic outreach partners. CASA’s revolutionary sensing technology is expected to increase the warning time for flash floods and other severe weather events with greater accuracy than existing systems. The first high technology radar was deployed in 2007 in the TMC in Houston as part of the on-going flood warning system developed for the Texas Medical Center. Dr. Bedient

has overseen the monitoring, modeling, and remediation at numerous hazardous waste sites, including six Superfund sites, and U.S. Air Force bases in five states. He has extensive experience in contaminant transport at sites impacted with chlorinated solvents and fuels. He has served on two National Academy of Science committees relating to environmental remediation and technology, and has received research funding from NSF, the U.S. EPA, the U.S. Department of Defense, the State of Texas, the U.S. Army Corps of Engineers, and the City of Houston.

Wayne C. Huber is Professor of Civil, Construction, and Environmental Engineering at Oregon State University, Corvallis. His doctoral work at the Massachusetts Institute of Technology dealt with thermal stratification in reservoirs, for which he received the Lorenz G. Straub Award from the University of Minnesota and the Hilgard Hydraulic Prize from the American Society of Civil Engineers (ASCE). He is a member of several technical societies and has served several administrative functions within the ASCE. He is the author of over 120 reports and technical papers, is a registered professional engineer, and has served as a consultant on numerous studies done by public agencies and private engineering firms. Beginning at the University of Florida and continuing at Oregon State University, Dr. Huber's research has included studies of urban hydrology, Storm water management, nonpoint source runoff, river basin hydrology, lake eutrophication, rainfall statistics, and hydrologic and water quality modeling. He is one of the original authors of the EPA Storm Water Management Model and has helped to maintain and improve the model continuously since 1971. Dr. Huber is an internationally recognized authority on runoff quantity and quality processes in urban areas.

Baxter E. Vieux is Director of the Natural Hazards and Disaster Research Center and Professor in the School of Civil Engineering and Environmental Science, University of Oklahoma, Norman where he teaches courses in hydrology, GIS, surveying, measurements, water quality management, and engineering graphics and design. Before joining OU in 1990, he held a professorship at Michigan State University teaching watershed management after earning his PhD there. Dr. Vieux was recently appointed as Adjunct Professor with the Department of Environmental Engineering and Science, Rice University, Houston, Prior to his academic career, he spent ten years with the USDA Natural Resources Conservation Service serving as Acting State Engineer, and being responsible for statewide engineering design and construction programs in Michigan. He is a registered professional engineer in three states and is co-principal and founder of Vieux & Associates, Inc., an engineering technology company with clients in the US and internationally in radar rainfall, GIS, and hydrology. Dr. Vieux is the innovator and architect of the first commercially available physics-based distributed hydrologic model, *Vflo*™, which uses real-time radar inputs for hydrologic analysis and prediction. Span urban and rural hydrology, the model has worldwide applicability. A patent is held for a method of realtime distributed model calibration. Consultative services include major corporations and engineering companies, and domestic and international water agencies. Externally sponsored academic research has been funded by NASA, EPA, NWS, NOAA, Army Corps of Engineers, NSF, and state/local agencies. Internationally, he has conducted research and worked on projects in France, Japan, Poland, Niger, Nicaragua, Taiwan, Paraguay, Korea and Romania. He has authored over 110 publications in hydrology including a recent book in its second edition, *Distributed Hydrologic Modeling Using GIS*, Kluwer Academic Press,Vol. 48.

The field of hydrology is of fundamental importance to civil and environmental engineers, hydrogeologists, and other earth scientists because of the environmental significance of water supply, major floods and droughts and their management, drainage and urban stormwater issues, flooplain management, and water quality impacts. This text was written to address the computational emphasis of modern hydrology at an undergraduate or graduate level and to provide a balanced approach to important applications in hydrologic

engineering and science.

THE EVOLUTION OF HYDROLOGY

In the 1970s, a large number of sophisticated computer models were created by government agencies and university groups to address hydrologic prediction, flood control, hydraulic design, water resources engineering, contaminant transport, water quality management, and water supply. During the 1980s, several of the most comprehensive and best-documented computer programs became routine operating procedures for the detailed hydrologic analysis of watersheds. Many state and federal water programs rely heavily on the application of hydrologic models for planning and decision-making.

Increasing use and sophistication of personal computers in the 1990s further revolutionized the daily practice of hydrology. Hundreds of small programs have been written to ease the computational burden on the hydrologist or engineer, and many of the earlier hydrologic models have newer versions designed to run on new and powerful personal computers. The availability of Internet access worldwide (since approximately 1994) has revolutionized the usefulness and accessibility of hydrologic data and models. The impact of transferring online data from governmental and scientific sources to the practicing hydrologist or student has been amazing. The evolving interactions of hydrologic data, digital terrain models, and mapping software with hydrologic modeling have been phenomenal. A list of important web sites and links currently used routinely in hydrology is contained in Appendix E.

ORGANIZATION OF THE TEXT

The text is divided into three main sections. The first section, consisting of the first four chapters, covers traditional topics in hydrology such as: (1) weather, precipitation, evaporation, infiltration, hydrologic measurement, (2) rainfall-runoff analysis, (3) frequency analysis, and (4) flood routing methods. These topics provide the student with a comprehensive view of the overall hydrologic cycle in nature as well as the problem of engineering design within certain flood limits. Numerous worked examples are used to highlight theory, problem definition, solution methods, and computational approaches. Spreadsheets are used throughout. The third edition of the text includes expanded coverage and new examples in Chapters 1 through 4.

The second section, Chapters 5 through 9, is designed to apply hydrologic theory and available hydrologic modeling techniques to several areas of engineering hydrology and design—watershed analysis, floodplain delineation, and urban stormwater. The latest methods and computer models are emphasized in enough detail for practical use, and detailed examples and case studies are provided. The third edition of the text updates earlier hydrologic models with new versions as of 2001, such as HEC-HMS and HEC-RAS from the U.S. Army Hydrologic Engineering Center, and the latest improvements to the EPA model SWMM.

Chapter 5, Hydrologic Simulation Models, presents modern methods for simulating rainfall and runoff, flood hydrograph prediction, and flood control options in a watershed. The HEC-1 and HEC-HMS models are highlighted with detailed examples. Chapter 6, Urban Hydrology, presents standard methods and reviews available computer models for pipe and open channel storm drainage systems. The Storm Water Management Model (SWMM) is highlighted as the most comprehensive urban runoff model available today. Chapter 7, Floodplain Hydraulics, first reviews concepts from open channel flow required to understand water surface profile computations. Next, the HEC-2 and HEC-RAS models are described in detail with a case study for practicing engineers.

Chapter 8 presents ground water hydrology as a stand-alone chapter, including flow in porous media, aquifer properties, well mechanics, and computer applications. Governing equations of flow are derived and applied

to a number of ground water problems, including both steady-state and transient analyses. A detailed case study on the application of a regional ground water flow model is included for the third edition.

Chapter 9 addresses some of the hydrologic issues relating to design, rainfall, small watershed design, detention pond design, and large watershed floodplain design.

In the final section, the text includes three new chapters (10, 11, and 12) that guide the user to the next generation of hydrologic computation and watershed evaluation. Chapter 10 presents the use of geographic information systems (GIS) and digital elevation models (DEMs) as important tools for watershed analysis, hydrologic modeling, and modern floodplain delineation. For the first time, useful hydrologic information is now widely available in high-resolution digital form on the Web. Chapter 11 presents some of the latest technology on the use of NEXRAD radar data to estimate rainfall intensities over watershed areas. Radar rainfall (available since 1994) has greatly improved our ability to predict rainfall patterns over a watershed and offers real advantages for hydrologic flood alert systems. Chapter 12 reviews some of the emerging trends in floodplain management, an important topic given the enormous flood damages that have occurred in recent decades in the United States. A detailed case study of a complex watershed study using GIS linked with radar technology is highlighted in Chapter 12.

The third edition of the text should provide the engineering or science student with all the necessary theory to understand hydrology, hydrologic modeling, and floodplain analysis in the modern world. The practicing engineer should find the book a useful reference for hydrologic principles, current models, examples, and case studies. In addition, simple calculations and spreadsheet examples from earlier editions are utilized and highlighted i.p numerous places in the third edition, which contains over 80 worked examples, over 220 homework problems, and six major case studies.

IMPORTANCE OF DATA AND LOCAL EXAMPLES

We often tell our students that the most difficult part of the application of hydrologic principles to engineering practice is not the routine execution of well-defined mathematical procedures or a model, but rather the assembly of data and parameters specific-to a given problem and location. What are suitable values for infiltration rates, Manning's roughness, hydraulic conductivity, etc.? What are the cross section and slope of the channel for flow routing? How do we determine Muskingum parameters K and x? What is an appropriate runoff coefficient and time of concentration? We urge instructors to emphasize the importance of the task of data collection and parameter selection. Although several homework problems have been designed with this in mind, e.g., "select a value from a table," we urge instructors to supplement the text with their own regional data and examples whenever possible. Such examples will likely be more relevant to students than some of the Texas, Florida, and Oregon examples found in the text.

The World Wide Web offers many opportunities for access to regional data with minimal cost and effort (see Appendix E), but the U.S. Geological Survey, National Weather Service, National Resources Conservation Service, U.S. Army Corps of Engineers, and other state and local agencies should be emphasized for students as likely sources of regional hydrologic data. Instructors and students should note, incidentally, that all National Oceanic and Atmospheric Administration, National Climatic Data Center meteorological data may be downloaded at no charge for receipt by e-mail addresses ending in .edu.

SUPPLEMENTS FOR THE THIRD EDITION

Hydrology and Floodplain Analysis includes a companion web site **www.prenhall.com/bedient** where updates and information can be found regarding the third edition. Selected problem and example datasets and figures will also be available along with simple programs that can be downloaded. A detailed solutions

manual with updated problems is available for the third edition.

Users Review

From reader reviews:

Alan Fan:

As people who live in typically the modest era should be update about what going on or info even knowledge to make these individuals keep up with the era that is always change and progress. Some of you maybe will certainly update themselves by examining books. It is a good choice to suit your needs but the problems coming to you actually is you don't know what kind you should start with. This Hydrology and Floodplain Analysis (4th Edition) is our recommendation to help you keep up with the world. Why, because this book serves what you want and need in this era.

Dominic Loflin:

A lot of people always spent their own free time to vacation or even go to the outside with them friends and family or their friend. Do you realize? Many a lot of people spent that they free time just watching TV, or playing video games all day long. If you need to try to find a new activity honestly, that is look different you can read the book. It is really fun for you. If you enjoy the book that you read you can spent all day long to reading a reserve. The book Hydrology and Floodplain Analysis (4th Edition) it is very good to read. There are a lot of people that recommended this book. These folks were enjoying reading this book. In case you did not have enough space to deliver this book you can buy the e-book. You can m0ore easily to read this book from your smart phone. The price is not too expensive but this book offers high quality.

Nancy Brown:

People live in this new day of lifestyle always try to and must have the free time or they will get great deal of stress from both lifestyle and work. So , once we ask do people have extra time, we will say absolutely sure. People is human not just a robot. Then we question again, what kind of activity are there when the spare time coming to anyone of course your answer will probably unlimited right. Then do you try this one, reading books. It can be your alternative throughout spending your spare time, the particular book you have read is usually Hydrology and Floodplain Analysis (4th Edition).

Anne Young:

What is your hobby? Have you heard that will question when you got students? We believe that that issue was given by teacher for their students. Many kinds of hobby, Everyone has different hobby. And also you know that little person similar to reading or as reading through become their hobby. You need to know that reading is very important along with book as to be the thing. Book is important thing to add you knowledge, except your teacher or lecturer. You discover good news or update concerning something by book. A substantial number of sorts of books that can you go onto be your object. One of them is this Hydrology and Floodplain Analysis (4th Edition).

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