Foreword

Forest hydrology as a field has evolved greatly since the first paired watershed study was published by Bates (1921) in the *Journal of Forestry*. Bates described his work as the "first serious effort to obtain, under experimental conditions, a quantitative expression of forest influences on snow modeling, streamflow (and thus, by implication, evaporation) and erosion." Since then, many paired watershed studies have been published – with an explosion of such work in the late 1950s and through the 1960s during the First International Hydrological Decade. Despite the appearance of several textbooks in the past decades, the last major benchmarking effort was Sopper and Lull's (1967) edited conference proceedings from the International Symposium on Forest Hydrology, held at Penn State University, USA, in 1965. This was the first and last major synthesis and integration effort for the field in over four decades. Since Sopper and Lull, much has changed in forest hydrology: new instruments, some new theory, new disciplinary additions to forest linkages; most notably biogeochemistry.

Forest Hydrology and Biogeochemistry: *Synthesis of Past Research and Future Directions* is a long anticipated, important addition to the field of forest hydrology. It is, by far, the most comprehensive assemblage of the field to date and written by many of the top researchers in their field. The book reveals for the first time since Sopper and Lull, the current state of the art and where the field is headed – with its many new techniques developed since then (isotopes, fluorescence spectroscopy, remote sensing, numerical models, digital elevation models, etc.) and added issues (fire, insect outbreaks, biogeochemistry, etc.). Levia, Carlyle-Moses, and Tanaka have done a spectacular job of assembling a strong array of authors and chapters. As an associate professor of ecohydrology, Del Levia has a background in water transfers through the forest canopy and biogeochemical transformations in forest systems in American forested watersheds with extensive international experience as well. Darryl Carlyle-Moses is an associate professor of geography with experience in Canadian and Mexican forest systems, focused mostly on water transfers through the forest canopy. Tadashi Tanaka is professor of hydrology at University of Tsukuba in Japan with a long and distinguished career in forest hydrology, from

groundwater studies to tracer studies and water flux measurements in headwater catchments. The geographical teaming of editors is an important element to the work, where the addition of the Japanese perspective (to the more dominant European and North American and Australian perspectives) with many chapters penned by Japanese forest hydrologists adding greatly to the breadth of approaches and examples. Attention to editorial detail is clear; from careful assembly of all the key component areas to an awareness of the benchmark papers in the field and need to include them (even when they fall outside the non-English speaking literature).

Distillation of a large and varied disparate discipline like forest hydrology and biogeochemistry is challenging. The book's organization effectively parses out the many aspects of the field in six useful parts. The first part outlines the historical roots of forest hydrology and biogeochemistry, with special reference to the Hubbard Brook watershed – arguably "Mecca" for the field and the foundation we all now follow in watershed-based coupled hydrobiogeochemical studies. The authors of that chapter are emblematic of the authorship of much of the book, pairing one of the founding fathers of field with one of the most promising young professors in the field. Sampling and novel approaches follow this background setup, with definitive chapters covering the latest in terms of spatial and temporal monitoring. Forest hydrology and biogeochemistry by ecoregion is a part that follows. The ecoregion component is a clever move in the assembly of the material for the book, providing a view into real-world landscapes and how uniqueness of place drives coupled hydrobiogeochemical processes. The editors have gathered authors from Canada, USA, Australia, China, Japan, and over a dozen countries in Europe to produce this range of ecoregion breadth. The three last parts of the book are "hydrologic and biogeochemical fluxes from the canopy to the phreatic surface," "the effects of time, stressors and humans," and finally, "knowledge gaps and research opportunities." Many of the hottest topics in relation to fire, insects, climate change, landuse change are addressed in a thoughtful and stimulating way.

Forest Hydrology and Biogeochemistry: *Synthesis of Past Research and Future Directions* is a celebration of a field. Like Bates' work, it is a serious effort to synthesize quantitative expressions of forest influences on water quantity (and now also water quality). The research pioneers who contributed to Sopper and Lull's major synthesis would be mesmerized by what now is possible and what is defined in this volume in terms of new research directions and opportunities. Reading it will give graduate students and researchers alike, a sense of direction and optimism for this field for many years to come.

Jeffrey J. McDonnell
Richardson Chair in Watershed Science
and Distinguished Professor of Hydrology
College of Forestry, Oregon State University,
Corvallis, OR, USA