# PREFACE TO THE FIRST EDITION

Our challenge and reasons for writing this book are to share an emerging insight that there are key linkages between the processes that operate in forests. We emphasize forests in this book because we know them best and because their long life permits us to evaluate the effects of periodic disturbance more readily. Our examples, most often, are drawn from simple cases in which principles are more easily seen and explained. We believe, however, the principles apply widely, as we show in predicting transpiration and other hydrologic properties for a variety of forests in differing climatic settings.

In many cases, scientists cannot accurately predict the effects of acid rain, fire suppression, short-rotation timber harvest, or increasing carbon dioxide levels in the atmosphere on forests or other ecosystems. We believe a diagnostic approach linking a variety of processes is warranted and that with carefully designed experiments the mysteries will unravel.

We have striven to provide a cosmopolitan flavor to the book. Because most experimental work has been focused on rather simple systems, our examples are drawn mainly from temperate and boreal forests. However, the same processes operate in more complex forests, as references denote. The book is written for upper-level students with some background in general ecology, inorganic chemistry, physics, and plant physiology. We hope that specialists will see new implications to their work and be encouraged to develop integrative experiments. Managers of forest resources (wood products, wildlife, and water) will find explanations for some of their observations and predictions of the effects of various management policies.

We owe a debt to earlier studies of ecosystems, particularly those sponsored by the National Science Foundation in the 1970s as part of the International Biological Program, which established a group of five major ecosystem programs in the United States, in addition to earlier work at Hubbard Brook in New Hampshire. For almost a decade, balance sheets were constructed describing how carbon, water, and minerals are stored or transported in a variety of forest, grassland, desert, tundra, and aquatic systems.

Much of the basic information has been published in books and other periodicals. A summary of the international program with listings of data from all woodland sites appeared in 1981, edited by D. E. Reichle.[1] Regional efforts at synthesis have also been made for the other biomes. These references, as well as the open literature, provide a description of how forest systems operate.

Few of the research programs, however, involved experiments that evaluated linkages between major processes. The influence of fire, erosion, wind storms, and epidemic outbreaks of insects or disease organisms could not be rigorously evaluated until a benchmark

[1] Reichle, D. E. (1981). "Dynamic Properties of Forest Ecosystmes." Int. Biol. Programme No. 23, Cambridge Univ. Press, London and New York.

for rates of normal processes had been established. The foundation was laid for critical experiments that could test hypotheses involving how and why ecosystems respond to periodic disturbances of various kinds. We propose that integrated experiments based on ecosystem-level insight can provide answers to managers. Whether this is the case, as we emphasize in interpreting the probability of disturbance in forests, awaits future tests.

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