

BOOK REVIEW

The Herbaceous Layer in Forests of Eastern North America by F. S. Gilliam and M. R. Roberts, eds. 2003. xvi + 408 pp. illus. ISBN 0-19-514088-5 \$85.00 (hardcover). Oxford University Press, New York.

This volume, developed in a conversation that included several technical symposia over three years, is distinctive in treating the herbaceous layer of forests as the focus of attention, and like all such volumes, provides a useful review of a wide swath of research. It is not surprising that a comprehensive survey of the known points out some of the things unknown and requiring further research, and in fact an interesting feature of this volume is that the editors take the time in the final chapter not only to summarize what they consider to be findings well established in the preceding chapters, but also to list specific areas they consider important for future research.

Chapter 1 suggests a conceptual framework for thinking about the forest herbaceous layer, based on a distinction between resident species, that is, species whose height is always less than 1–1.5 m (“or perhaps others,” say Gilliam and Roberts), and transient species, that is, species that are only temporary elements of this zone, because they will emerge into the mid- or upper stories of the forest. Thus, the former group includes the “herbs proper” plus some low shrubs, while the latter group includes seedlings of trees and shrubs (and vines, not mentioned much in this book). This distinction is intuitive with respect to many questions that bear on community assemblage and change, such as reproduction/dispersal, nutrient use and foraging, or resilience when faced with various kinds of disturbance. However, the conceptual framework disappears for vast stretches of this book, only to appear to best effect in discussions of mechanisms linking different strata in the forest (Section 4).

Section 1 provides some background information on the ecology and ecophysiology of herbaceous plants, and it is perhaps worth noting that a significant proportion of the literature cited is not in fact drawn from research on forests of eastern North America alone. This is not a liability, really, but it does point to gaps in our knowledge of the area treated. Chapter 2, “Nutrient relations of the herbaceous layer in deciduous forest ecosystems” (Muller), gives a valuable summary of what is known about the role of herbaceous species in nutrient flow in forested systems. The author considers and revisits the notion of the vernal dam—the idea that spring ephemerals, active before the overstory, and

during the first mobilization of nutrients, sequester key nutrients which are later released to the soil, and thus made accessible to later-appearing species rather than being lost. While Muller rehashes some evidence suggestive of this, he also reports evidence that a “vernal dam” may be in operation, but that it is composed of the microbial fauna rather than the herbs. Beyond this, he presents evidence that in some cases, at least, the spring ephemerals’ sequestration of nutrients may actually speed their departure from the system, and thus impoverish rather than enrich the environment for later-appearing species. The other two chapters in the section are Neufeld and Young’s “Ecophysiology of the herbaceous layer in temperate deciduous forests,” which generally focuses on light relations and physiology, and Anderson’s “Interactions of nutrient effects with other biotic factors in the herbaceous layer.” This latter, while interesting, proves rather cursory when it describes the nutrient aspects of herbivory and mycorrhizal associations. This may reflect the state of the science in this area; still, it is surprising that in this as in other chapters, no real attention is paid to recent work on below-ground interactions between plants, and plants and herbivores [see, for example, references and findings discussed in Bardgett and Wardle (2003) and Van der Putten (2003)].

Section 2: “Population dynamics of the herbaceous layer” is a monotypic section, comprising the single article “Populations of and threats to rare plants of the herb layer: More challenges and opportunities for conservation biologists” (Jollis). This chapter is an overview of key conceptual and analytic ideas in conservation biology, of particular use to readers not familiar with the field. Jollis keys her discussion to two useful charts, in which 94 endangered or threatened species are characterized by status and range, and interestingly by life-history characteristics (e.g., breeding systems, dispersal mechanisms). [I think “range” means “range within which the species is threatened,” the only way I can make sense of the endangered status of *Chimaphila maculata*, range given as “Canada, esp. Ontario.” See for example Brumback and Mehrhoff, et al. (1996), where *C. maculata* does not appear.] The clearest conclusion of the author is that for herbaceous species of the region, and especially the rare or endangered species, our ignorance of population biology is discouragingly large.

Section 3 addresses “Community Dynamics of the herbaceous layer across spatial and temporal scales,” and includes chapters on “The herbaceous layer of eastern old-growth deciduous forests” (McCarthy); “Habitat heterogeneity and maintenance of species in understory communities” (Beatty); “Interaction between the herbaceous layer and

overstory canopy of Eastern forests: A mechanism for linkage” (Gilliam and Roberts); “Temporal and spatial patterns of herbaceous layer communities in the North Carolina Piedmont” (Christenson and Gilliam); and “Composition and dynamics of the understory vegetation in the boreal forest of Quebec” (Grandpré et al). In this section, I highly recommend Beatty’s chapter describing her 20 years of research on the population and metapopulation dynamics of species in response to micro-site alterations such as pit and mound formation over time. While (of course) more research remains to be done, her findings go far to explain both the positive and negative contributions of habitat heterogeneity in maintaining species in the landscape.

Section 4 addresses “Community dynamics of the herbaceous layer and the role of disturbance,” and here the conceptual point raised by the editors in Chapter 1 finally comes into play, as the heterogeneous composition of the “herbaceous” layer (including both residents and transients) plays out with respect to succession, regeneration after disturbance, and invasibility. The chapters of this section are: “The herbaceous layer as a filter determining spatial pattern in forest tree regeneration” (George and Bazzaz); “Invasion of forests in the eastern United States” (Luken); and “Response of the herbaceous layer to disturbance in eastern forests” (Roberts and Gilliam). The latter two papers are strictly reviews, while George and Bazzaz’s paper provides both an overview of the literature and a discussion of data generated in their research on the question of “filtering,” especially by herbaceous species that form a “canopy” of their own (e.g., *Dennstaedtia punctilobula*). Luken’s paper on the characteristics of invaders and invasibility leaves the reader with the feeling that, while more research is required on these interesting and important areas, perhaps the “summative” questions asked up until now (e.g., What are the characteristics of an invasive plant? What are the characteristics of an invulnerable forest?) are not the most productive ones, given the tremendous variety of “invasives,” and the great complexity of site types with which they interact.

Gilliam and Roberts return for a Synthesis section: “The dynamic nature of the herbaceous layer: Synthesis and future directions for research.” This provides a lucid and welcome overview of the major findings reported in the previous chapters in a way that provides some theoretical coherence, and concludes with suggestions for future research emerging from the papers in each of the 4 topical sections. While the book does not provide systematic or even coverage of its title subject, it does represent a useful contribution to the study of a complex and rapidly changing region which we tend (mistakenly) to think of as well known.

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