

Preface

Interest in developing this multiauthored book grew from our work with seeds and seed-bank ecology. While seed production and seed-bank dynamics are critical stages, what happens to seedlings is also fundamental to explaining field observations of vegetation dynamics and recruitment. Although several recent books discuss seedlings, indicating their importance to plant regeneration (Fenner, 2000) and to seed ecology (Fenner & Thompson, 2005), only one, Swaine (1996), focuses on seedling ecology; it, however, deals exclusively with tropical forest seedlings and is now more than 10 years old. A fourth volume, Forget *et al.* (2005), is primarily about seed predation and dispersal. *Seedling Ecology and Evolution* will complement these works and provide a more all-encompassing discussion. Moreover, it bridges the life-cycle gap following seeds (e.g. Baskin & Baskin, 1998) and seed banks (e.g. Leck *et al.*, 1989). Additional information about regeneration strategies may be found in Harper (1977), Grubb (1977, 1998), and Grime (2001).

We acknowledge the importance of understanding seedling biology in agriculture and horticulture; however, seedlings are well studied in these settings, whereas in natural systems, seedlings are less studied, and the literature is more diffuse. This book explores seedling adaptations and constraints to regeneration in natural and disturbed systems, where a better understanding of seedlings would stimulate study and development of theory regarding this dynamic and often neglected part of the plant life cycle.

After seeds, seedlings typically suffer the highest mortality rate of any life history stage and, therefore, are important in the selection and evolution of species. Seedlings appear to be a "bottleneck" in plant establishment because they are particularly sensitive to the vagaries of the environment. Our purpose is to explore their ecology and evolution and, in the process, bring a diverse literature together for the first time – examining the diverse morphologies and physiologies of seedlings; environmental factors that impact seedlings; driving factors in the evolution of seedlings, including phylogenetic and eco-physiological constraints; seedlings in plant community dynamics, especially how they relate to species and community sustainability; seedling strategies and syndromes, including seedling banks; and the impact of human-generated perturbations, such as invasive species, desertification, and habitat fragmentation and restoration. To accomplish this, contributors were invited to explore a range of topics that are gathered in the book as follows:

- Part I – Introduction. Chapter 1 provides a review of seedling structure, as well as an introduction to the seedling stage of the seed plant life cycle.
- Part II – Seedling diversity. Chapters 2–4 consider aspects of seedling natural history, strategies in stressful habitats where shade,

drought, inundation, and other stressors affect establishment, and strategies of highly specialized plants, including epiphytes, orchids, and parasites.

- Part III – Seedling morphology, evolution, and physiology. Chapters 5–9 examine seedling evolution in the context of embryo evolution and the rise of angiosperm ecological diversity, as well as seedling morphological and developmental changes, phytohormones, maintenance of carbon balance, and the role of symbioses in establishment and survival.
- Part IV – Life history implications. Chapters 10–13 examine the trade-offs of the seedling stage with other stages, and seedlings in population and community contexts, as well as functional groups among and within habitats.
- Part V – Applications. Chapters 14–17 examine seedlings as the advancing front for biological invasions, in deteriorating ecosystems (e.g. deserts), in systems in which they are used for system maintenance (forests), and for restoration.
- Part VI – Synthesis. Chapter 18 considers the multiple perspectives presented by the chapters of this book, presents overarching seedling strategies, and summarizes areas for future study.

References

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