# The Ecology of Seeds

How many seeds should a plant produce, and how big should they be? How often should a plant produce them? Why and how are seeds dispersed, and what are the implications for the diversity and composition of vegetation? These are just some of the questions tackled in this wide-ranging review of the role of seeds in the ecology of plants. The authors bring together information on the ecological aspects of seed biology, starting with a consideration of reproductive strategies in seed plants and progressing through the life cycle, covering seed maturation, dispersal, storage in the soil, dormancy, germination, seedling establishment and regeneration in the field. The text encompasses a wide range of concepts of general relevance to plant ecology, reflecting the central role that the study of seed ecology has played in elucidating many fundamental aspects of plant community function.

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# *Preface*

In 1985 one of us published a small book called *Seed Ecology*. It contained 42 000 words and cited 334 references. It was successful in introducing a generation of ecologists to our subject, but it is now seriously out of date and has been out of print for some time. The book you are now holding contains 94 000 words and cites 1117 references. Only a small part of this expansion can be attributed to covering any part of the subject in more detail; nearly all of it reflects simply the massive increase in interest in seed ecology in the past 20 years. One sign of this expansion was the launch in 1991 of the journal *Seed Science Research*, providing a major platform for fundamental work in seed biology, including ecology; 37 of our cited references are from that journal. More recently, the International Society for Seed Science was founded in 2000. This society sponsors meetings on all aspects of seed science, including, for the first time in 2004, a major international meeting on seed ecology. Our cited references also reflect this recent growth: 82% are from the past two decades, while 15% are post-1999.

Recent work in this field has transformed our understanding of many aspects of seed ecology, especially dispersal, storage in the soil and the ecological role of seed dormancy. There has also been increasing recognition that regeneration from seed has fundamental impacts on the diversity and composition of plant communities; seed ecology has never seemed more relevant to 'mainstream' plant ecology. Nevertheless, we have not lost sight of our debt to the pioneers who laid the foundations for later work. Many of the most important figures in the history of ecology, including Darwin, Harper and Salisbury, made significant contributions to seed ecology.

In this book, we attempt to synthesize the current information available on the ecological aspects of seed biology, starting with a consideration of reproductive strategies in seed plants and the costs and compromises involved. Special attention here is given to the interesting topic of seed size. The text then follows the progress of seeds through the stages of their life cycle in a

roughly chronological sequence: seed maturation, dispersal, storage in the soil, dormancy, germination and seedling establishment. The final chapter gives an account of the role that canopy gaps play in the regeneration of plants in the field. Throughout the book, various specialized topics (which might otherwise have interrupted the flow of the text) are presented in self-contained boxes.

We aimed to present a broadly representative overview of the current literature rather than a comprehensive review of it. We have tried to present a reasonably balanced account of the field in a way that reflects current thinking. Nevertheless, where we have strong feelings on particular topics, we have not refrained from nailing our colours to the mast. When this happens, for example concerning the definition of dormancy, we hope you find our arguments convincing.

We hope that this text will be useful to students of plant ecology at all levels. The regeneration of plants from seed involves a very wide range of ecological concepts of current interest, from reproductive strategies to the maintenance of species diversity. Pollination, seed dispersal and seed predation all offer interesting insights into the evolution of plant–animal interactions. The numerous trade-offs encountered (e.g. between seed size and number, early reduced reproduction vs. delayed increased fecundity, early high-risk germination vs. delayed safer germination, etc.) offer scope for theoretical investigations and modelling. We hope that the work reported here from the literature will stimulate students into devising their own experimental investigations. Excellent undergraduate projects on seed ecology can often be carried out in the field with a minimum of technical resources.

Several colleagues provided substantially new figures or new versions of published figures. We would particularly like to thank Costas Thanos, Mary Leck and Begoña Peco. Otherwise, the text is entirely our own work. We can therefore assert cheerfully that any errors and omissions are ours alone.