Preface

Environmental plant physiology focuses on the foundations of life on land, with direct implications for the possibility of humans inhabiting Earth sustainably. I hope that readers of this book will gain an understanding of the importance of plant–environment interactions and be inspired to help humanity face some of its major challenges—in particular, global food security and the conservation of the natural world. This book is intended for upper-level undergraduate and graduate students, but will also be useful to some researchers. Several excellent textbooks inspired my interest in plant–environment interactions, but so significant are recent scientific advances that I felt a new textbook was needed. Its approach is intended to be useful across the biological, environmental, and agricultural sciences. In an era in which science is progressively focusing on the major challenges facing humanity, the ability to engage with a topic using both disciplinary and trans-disciplinary perspectives is increasingly important. In this book my aim is to provide a synthesis that is useful to individual biological, environmental, and agricultural disciplines, whilst also providing a framework for understanding across them all.

As is evident from the structure of the book, I think that a useful contemporary understanding of environmental plant physiology can be built by focusing on environmental variables, each of which is important to the biological, environmental, and agricultural sciences. These environmental variables are grouped into 'resources', 'stressors', and 'xenobiotics' according to whether they help synthesize biomass, limit biomass production, or poison plants. Each chapter is structured to focus on plant responses to progressively more profound variation in the environmental variable. This is used to suggest a hierarchy of responses from molecular to ecological scales in each chapter, and then as an overall framework in the final chapter. Throughout, examples are drawn from both unmanaged and managed ecosystems, and the importance of evolutionary history is acknowledged whenever possible to help to explain the occurrence of adaptations.

In each chapter the text is enhanced by large boxes that include additional stories of interest, small boxes in the margins that elucidate some key points, and by tables and figures. In particular, I have made an effort to provide a new set of figures for understanding environmental plant physiology. Further reading and references for each section are listed at the end of each chapter, and all bold terms are defined in the glossary. The book is complemented by resources available to students online: the glossary and flashcards; image gallery of the key species discussed in the text as indicated in bold green font; audio files that provide a commentary for each topic; and a set of multiple-choice questions. For instructors, all of the figures from the book are available to download in both PowerPoint® and JPEG format.

Overall, this textbook provides a heuristic framework that enables students, in the midst of the torrent of information published in scientific journals, not only to think about guiding principles and concepts in environmental plant physiology, but also to form their own perspectives. I would be interested in any feedback from anyone (contact me at Neil.Willey@uwe.ac.uk).