
Contents

Part 1 What is Plant Population Ecology?	1
1 The scope of plant population ecology	3
1.1 Plant populations	4
1.2 History of plant population ecology	4
1.3 The goals of plant population ecology	5
1.4 Four case studies	7
1.5 A roadmap for using this book	16
1.6 Follow-up exercises	17
Part 2 Planning the Study	19
2 The question and the approach	21
2.1 How can an important question be framed?	24
2.2 Ways of addressing the question	26
2.3 What should be measured? Ecological variables	29
2.4 The importance of pilot studies	34
2.5 Follow-up exercises	35
3 Basic considerations in experimental design	36
3.1 Design considerations: experiments and observations	37
3.2 Where and how should you conduct your study? Choosing sites, plots, and plants	40
3.3 Statistical issues in conducting experiments	48
3.4 Follow-up exercises	59
Part 3 Doing the Study	61
4 Experimental treatments	63
4.1 What are experimental treatments?	64
4.2 Growing plants	64
4.3 Biotic treatments	67

4.4 Abiotic treatments	82
4.5 Interactions between plants	93
4.6 Follow-up exercises	98
5 Measuring individual and population parameters	99
5.1 The value of making repeated measurements	102
5.2 Locating and marking population units	103
5.3 Morphological measurements	108
5.4 Measurements of seeds and other dispersal units	113
5.5 Physiological measurements	121
5.6 Molecular measurements	132
5.7 Indices for expressing plant growth and plant interactions	141
5.8 Fitness, fecundity, and reproductive effort	149
5.9 Follow-up exercises	151
6 Abiotic and biotic measurements of a plant's environment	152
6.1 The biotic environment	152
6.2 The abiotic environment (environmental variables)	157
6.3 Assessing the importance of spatial variation in the environment on plant performance within populations	168
6.4 Follow-up exercises	170
Part 4 Analysis	171
7 Planning, choosing, and using statistics	173
7.1 Choosing the right statistical test	176
7.2 Different kinds of distributions	177
7.3 Goodness of fit tests, contingency tables, checking, and correcting for normality	178
7.4 Correlation and regression; relations between data sets	181
7.5 Looking for differences between samples	186
7.6 Multivariate techniques for ordering and classifying samples	197
7.7 Bayesian analysis: an alternative to classical hypothesis testing	200
7.8 Reporting statistics	202
7.9 Case studies	204
8 Advanced statistical techniques: spatial patterns, life tables, modelling, and population viability analysis	206
8.1 Spatial pattern analysis	208
8.2 Life tables and matrix models	221
8.3 Cellular automata, individual-based population models, and integral projection models	234
8.4 Population viability analysis	241
8.5 Follow-up exercises	246

Appendix R Packages for Analysis of Plant Population Ecology Data	247
References	249
Animal Index	291
Plant, Bacteria, Algae, and Fungi Index	291
General Index	295