Preface to the Second Edition

There have been substantial and significant advances in the methodology used by plant population ecologists in the 12 years that have elapsed since the first edition of this book was published. While some things such as the need for and approach to estimating population density through the use of sample plots have not changed, the advances in molecular and physiological methods and new and improved statistical techniques necessitated, I felt, the need for a second edition. Fortunately, Southern Illinois University Carbondale granted me a sabbatical leave in spring 2013 that, along with a private office in the Morris Library that I told no one about, allowed time for most of the work to be done. A grateful thanks to my colleagues and friends, students, staff, and faculty for not bothering me too much during that time.

The format and outline of the first edition has not changed, with four major sections: What is Plant Population Ecology? (Chapter 1), Planning the Study (Chapters 2 and 3), Doing the Study (Chapters 4, 5, and 6), and Analysis (Chapters 7 and 8). Libby John's 'Planning, choosing, and using statistics' (Chapter 4 in the first edition) has been revised and moved into the Analysis section to become Chapter 7. The other chapters have been renumbered accordingly. I moved this chapter to provide a clearer section on analysis rather than have statistical methods separated at different ends of the book. Chapter 8 is now prefaced as 'Advanced statistical techniques'. The text on Bayesian analysis has been updated and moved out of the old Chapter 2 into Chapter 7 where I feel it better belongs.

Other major changes include the replacement of Sarakhán's classic 1960s buttercup study as Case Study 1 with a recent study by Peiter Zuidema and colleagues on tree recruitment in tropical forests. This and the other three case studies are referred to repeatedly throughout the book. I hesitated to drop Sarakhán's magnificent work, especially since it was conducted under the mentorship of the late John Harper (someone who had a huge influence on my development as an ecologist), but I wanted to bring in a more recent and tropical-based study. I expect Zuidema et al.'s work to stand the test of time as well as Sarakhán's has. I also added a 'Roadmap for using this book' with a new accompanying figure at the end of Chapter 1 that I hope will help users navigate the text. I added a new section on 'Some things that might cause panic, but shouldn't' to Chapter 2. The suggestions here are drawn heavily from comments made by Glenn Matlack in his extraordinarily comprehensive review of the proposal for this second edition. There's also a new section and figure in Chapter 2 describing the 'hierarchy of hypotheses approach'. Other new sections include 'Generalized linear mixed models' (Chapter 7), and 'Life table response experiments', 'Integral projection models', and 'Population viability analysis' in Chapter 8. The section on 'Molecular methods' has been brought up to date with the inclusion of subsections on single nucleotide polymorphisms, gene expression profiling, epigenetics, and functional metagenomics. The scientific computing environment R has now become the statistical package of choice for many ecologists because of its flexibility and wide range of available packages, and because it's free. Suitable R packages are mentioned throughout the text and summarized in the Appendix. The inclusion of R script is beyond the scope of this book, although a short example is provided in the worked example in Box 8.1 in Chapter 8.

Throughout, citations and examples have been updated, keeping reference to older studies that are

still relevant but adding the most recent examples of methodology where appropriate. Over the years I had kept a list of minor typographical errors, which along with lists provided by Marcel Rejmanik and Lauren Schwartz have been used to make corrections. Thanks to both of them for passing their lists on to me. There are 12 new figures, 7 new tables, and countless new citations in this second edition.

A number of colleagues have provided comments and feedback on drafts of the revised text, and my grateful thanks go out to Paul Barnes, Gregg Cheplick, Stephen Ebbs, Matt Geisler, Libby John, Mike Hutchings, and Eric Menges. I also thank colleagues including Rob Freckleton and Rob Salguero-Gómez who responded to my twitter request for suggestions of suitable R packages to include in the Appendix. It was Rob Freckleton who made the percipient observation that R packages are 'a bit of a moving feast'.

Thanks to the editorial and production staff at Oxford University Press for their help. Ian Sherman encouraged me to take on the second edition of a 'never again' book, and Helen Eaton and Lucy Nash were terrific, acting as my OUP editorial contacts and helping to streamline everything. Bridget Johnson and Suganiya Karumbayeeram did a terrific job in copy editing and production. I also have to thank the British Ecological Society, which over the last several years has provided me with the opportunity to read a lot of cutting edge population ecology papers as part of my duties as an editor for the *Journal of Ecology*. I got to read the good, the bad, and the ugly, but all helped shaped my appreciation and understanding of the methods used by plant population ecologists. Similarly, mentoring and teaching my graduate students, and the students who have taken my plant population ecology course, has helped me better appreciate the issues involved in designing and conducting good experiments.

Finally, a thanks to my wife Lisa, and Lacey and Dylan, the two young adults who are our children, for their support and encouragement. I promise not to write another book; at least until I start the next one.

Carbondale, Illinois, April 2014
@DavidJohnGibson

Preface to the First Edition

My purpose in writing this book is to fill a need that I perceive exists for beginning researchers in plant population ecology. The book is intended for senior undergraduates with a background in plant ecology, and, in particular, for graduate students planning research in the topic. In addition, I hope that more experienced researchers will find the material covered in the book to be of use too.

The need for this book became apparent the first time that I taught a graduate course in plant population ecology. While Silvertown and Lovett-Doust's (1993; with a new edition due out as I write) book provides an excellent introduction to the basic theory and concepts important to the topic, I felt that there was little available to assist the student actually conduct research in the laboratory/field portion of the course. A number of books discuss basic ecological methodology (e.g. Krebs 1999) and the approach to research in ecology (Ford 2000), but these are not specific enough. I use the inquiry approach in my course and so was also dissatisfied with the 'cook book' approach to learning new methods provided by some other textbooks. I want students to think for themselves, critically evaluate the problem that they are addressing, and determine the most suitable approach. Indeed, the variation and vagaries of the environment preclude the use of many standard methods in field ecology. Hence, this book.

If this book has a message it is this: think carefully about the problem that you are about to tackle. Develop a research plan, outline hypotheses, objectives and the experimental approach to address them. And, most importantly, consider the statistical tests that you will use before starting field or greenhouse work.

This book will provide you with an assessment of the methodology used in current plant population ecology. Many of the methods used by other researchers will have to be adapted to your own situation. I provide the sources for standard methods, but many of these too may have to be adapted. Always be aware of the limitations of the methods that you do use.

Time to get started on the two-year journey that writing this book represents was provided by a sabbatical leave from Southern Illinois University. Cathy Kennedy. Libby John, and Mike Hutchings helped immensely in getting the initial outline and direction for the book off the ground. A grateful thanks to Libby John who wrote Chapter 4, taking on a task that would daunt and put off most of us number-challenged ecologists. Thanks to the many colleagues who critically read the following chapters, in whole or part, including Eric Adams (Chapter 1), Sara Baer (Chapter 5), Mark Basinger (Chapter 3), Greg Cheplick (Chapters 1 and 3), John Connolly (Chapter 5), Stephen Ebbs (Chapter 6), Joe Ely (Chapters 1 and 6), Danny Gustafson (Chapters 1 and 5), Rod Hunt (Chapter 6), Libby John (Chapters 1, 2, 3, and 5), Alan Knapp (Chapter 6), Marilyn Mathis (Chapters 2 and 3), Glenn Matlack (Chapter 5), Eric Menges (Chapter 8), Paige Mettler (Chapters 1 and 2), Chris Peterson (Chapter 2), Malcolm Press (Chapter 6), Mark Rees (Chapters 1, 2, 3, 5, 7, and 8), Ken Thompson (Chapter 6), Jake Weiner (Chapter 1), and Andrew Wood (Chapter 6). The text is much better for the time and care that they put into correcting my mistakes and misconceptions. Tim Seastedt and Brian Beckage provided access to manuscripts in advance of publication, and Miguel Franco, Mike Hutchings, Brian McCarthy, Rodney Mauricio, and Dan Nickrent kindly provided some of the photographs. Thanks also to Cathy Kennedy, Esther Browning, Jonathan Crowe,

and John Grandidge at Oxford University Press for their help in moving the book along through to publication. The inspiration to tackle problems in plant population ecology derives from my interactions with many friends and colleagues through the years, not the least of all the group of students, postdocs, and researchers that debated the contrasting virtues of population versus community ecology in the 'Bangor School' of John Harper and Peter Greig-Smith during the late 1980s.

Finally, thanks to my wife Lisa, and our two children Lacey and Dylan for their patience, support, and love.

Carbondale, Illinois, September 2001