

Contents

Prologue	vii
Preface	ix
Acknowledgments	xiii
Part 1: Preliminaries	1
1 What is mathematical ecology and why should we do it?	3
2 Mathematical toolbox	11
Part 2: Populations	51
3 Homogeneous populations: exponential and geometric growth and decay	53
4 Age- and stage-structured linear models: relaxing the assumption of population homogeneity	65
5 Nonlinear models of single populations: the continuous time logistic model	78
6 Discrete logistic growth, oscillations, and chaos	92
7 Harvesting and the logistic model	110
8 Predators and their prey	129
9 Competition between two species, mutualism, and species invasions	159
10 Multispecies community and food web models	176
Part 3: Ecosystems	187
11 Inorganic resources, mass balance, resource uptake, and resource use efficiency	189
12 Litter return, nutrient cycling, and ecosystem stability	218
13 Consumer regulation of nutrient cycling	238
14 Stoichiometry and linked element cycles	252
Part 4: Populations and ecosystems in space and time	271
15 Transitions between populations and states in landscapes	273

16 Diffusion, advection, the spread of populations and resources, and the emergence of spatial patterns	284
Appendix: MatLab commands for equilibrium and stability analysis of multi-compartment models by solving the Jacobian and its eigenvalues	298
References	305
Index	319