

CONTENTS

Preface, ix

Acknowledgements, xi

Contributing authors, xii

PART 1: ROOTS, RELEVANCE, AIMS AND VALUES, 1

1 THE ROOTS OF CONSERVATION BIOGEOGRAPHY, 3

- 1.1 What is conservation biogeography?, 3
 - 1.2 The emergence of conservation biology and conservation biogeography, 4
 - 1.3 The scope of conservation biogeography, 7
 - 1.3.1 To what ends?, 7
 - 1.4 Outline of the following chapters, 11
- Suggested reading, 12

2 SOCIAL VALUES AND CONSERVATION BIOGEOGRAPHY, 13

- 2.1 Many values, many goals, 13
- 2.2 The origins and values of different protected area types, 14
 - 2.2.1 Sacred sites, 16
 - 2.2.2 Resource and game reserves, 17
 - 2.2.3 State and country parks, 18
 - 2.2.4 Nature monuments and nature reserves, 19
 - 2.2.5 Wildlife sanctuaries and refuges, 19
 - 2.2.6 Wilderness areas, 20
 - 2.2.7 National parks, 21
 - 2.2.8 Community conservation areas, 22
- 2.3 Reserve designations from international conventions, 22
- 2.4 An international system for categorizing protected areas, 23

- 2.5 Social values and conservation practice, 26
 - 2.5.1 Attitudes to non-native species, 26
 - 2.5.2 Restoration and rewilding, 28
 - 2.6 Concluding remarks, 29
- For discussion, 30
- Suggested reading, 30

3 BASELINES, PATTERNS AND PROCESS, 31

- 3.1 Introduction, 31
 - 3.2 Ecosystem composition and function, 31
 - 3.3 Balance versus flux, 32
 - 3.4 Understanding ecosystems in flux, 34
 - 3.5 Defining and using baselines, 38
 - 3.5.1 Baselines derived from relict pristine systems, 38
 - 3.5.2 Baselines derived from long-term ecology, 39
 - 3.5.3 Rewilding, 41
 - 3.5.4 The challenge of rapid environmental change, 42
 - 3.6 Adaptive ecosystem management, 42
- For discussion, 44
- Suggested reading, 44

PART 2: THE DISTRIBUTION OF DIVERSITY: CHALLENGES AND APPLICATIONS, 45

4 BASIC BIOGEOGRAPHY: ESTIMATING BIODIVERSITY AND MAPPING NATURE, 47

- 4.1 Introduction, 47
 - 4.1.1 Our incomplete knowledge of biodiversity, 47
 - 4.1.2 Why do we map?, 48
- 4.2 Three knowledge shortfalls, 49
 - 4.2.1 The Linnean shortfall, 49
 - 4.2.2 The Wallacean shortfall, 54
 - 4.2.3 The extinction estimate shortfall, 58

- 4.3 The fundamental taxonomic units of conservation biogeography, 62
 - 4.3.1 Species versus other genetically-based conservation units, 62
 - 4.3.2 Evolutionarily Significant Units (ESUs), 64
 - 4.3.3 Other conservation units, 65
 - 4.4 Spatial distributions: from genes to biogeographical regions, 65
 - 4.4.1 Mapping species individually and collectively, 65
 - 4.4.2 Phylogeography, 72
 - 4.4.3 Endemism, 74
 - 4.4.4 Biogeographical regions, 75
 - 4.5 Mapping function, 76
 - 4.5.1 Biomes, ecosystems and communities, 76
 - 4.5.2 Ecoregions, 82
 - 4.6 Natural units in the marine realm, 83
- For discussion, 91
Suggested reading, 92

5 THE SHAPING OF THE GLOBAL PROTECTED AREA ESTATE, 93

- 5.1 Origins, 93
- 5.2 Typology of frameworks, 95
 - 5.2.1 Spatial classification of approaches – contiguous areas, landscape units and habitat islands, 97
 - 5.2.2 Biogeographical (compositional) versus Ecological (functional) approaches, 100
 - 5.2.3 Strategic goals – composition, function, numbers and attributes, 102
- 5.3 Terrestrial protected area schemes, 104
 - 5.3.1 IUCN Biogeographical Regions (Dasmann–Udvardy) scheme, 104
 - 5.3.2 Endemic Bird Areas, 106
 - 5.3.3 Conservation International's hotspots, 109
 - 5.3.4 The WWF Ecoregions scheme, 113
 - 5.3.5 Important Bird Areas and Key Biodiversity Areas, 117
- 5.4 Marine protected areas, 121
 - 5.4.1 Status of the marine realm, 121
 - 5.4.2 Origins and expansion of the marine protected area estate, 122
 - 5.4.3 A global representative system of marine protected areas, 123

- 5.4.4 Reefs at risk – hotspots/ threatspots, 126
 - 5.4.5 Large Marine Ecosystems, 130
 - 5.4.6 WWF Global 200 – the marine perspective, 131
 - 5.4.7 Coastal Zone Management and critical seascapes, 132
 - 5.4.8 High seas protected areas, 132
 - 5.5 Current trends and future directions, 134
- For discussion, 135
Suggested reading, 135

6 SYSTEMATIC CONSERVATION PLANNING: PAST, PRESENT AND FUTURE, 136

- 6.1 Introduction, 136
- 6.2 What is systematic conservation planning and why use it?, 138
- 6.3 Concepts and principles, 138
 - 6.3.1 Representativeness, 138
 - 6.3.2 Persistence (adequacy), 139
 - 6.3.3 Efficiency, 139
 - 6.3.4 Flexibility, 140
- 6.4 Developing a systematic conservation plan, 140
 - 6.4.1 Achieving representation, 140
 - 6.4.2 Achieving persistence, 146
 - 6.4.3 Achieving efficiency, 151
 - 6.4.4 Achieving flexibility, 152
- 6.5 Decision support tools to identify and prioritize new protected areas, 152
- 6.6 Consultation and implementation of systematic conservation plans, 155
- 6.7 What does the future of systematic conservation planning hold?, 156
 - 6.7.1 Conservation planning is a dynamic problem, 158
 - 6.7.2 Conservation assets change through time, 158
 - 6.7.3 A mix of conservation actions could occur at any site, 158
 - 6.7.4 Better economics and socio-economics, 158
 - 6.7.5 Dealing with uncertainty, 158
 - 6.7.6 Properly accounting for threats, 159
 - 6.7.7 Persistence – attainable goal or impractical utopia?, 159
 - 6.7.8 How much should we invest in improving a conservation plan?, 159

For discussion, 159
Suggested reading, 160

PART 3: CONSERVATION PLANNING IN A CHANGING WORLD, 161

7 PLANNING FOR PERSISTENCE IN A CHANGING WORLD, 163

- 7.1 Introduction, 163
 - 7.2 Using the past to understand the present and predict the future, 164
 - 7.2.1 Predicting future ecosystem responses to changing conditions, 168
 - 7.2.2 Interpreting recent trends in their historical context, 169
 - 7.2.3 Geographical range collapse, 170
 - 7.3 Predicting biodiversity change, 176
 - 7.3.1 Modelling the current distributions of species, habitats and biomes, 177
 - 7.3.2 Modelling range shifts, 180
 - 7.4 What do we do about it? Dynamic conservation planning, 183
 - 7.4.1 Incorporating dynamic biotic and abiotic processes into conservation plans, 183
 - 7.4.2 Changes in socio-economic factors, 185
 - 7.4.3 Climate change, conservation planning and assisted migration, 185
 - 7.5 Closing remarks, 188
- For discussion, 188
Suggested reading, 189

8 APPLIED ISLAND BIOGEOGRAPHY, 190

- 8.1 Introduction, 190
- 8.2 Implications of habitat loss and fragmentation: from theory to evidence, 194
 - 8.2.1 The use of species-area relationships in conservation, 194
 - 8.2.2 Relaxation and the extinction debt, 199
 - 8.2.3 Ecosystem collapse and threshold responses in habitat islands, 203
- 8.3 Species incidence, 208
 - 8.3.1 Minimum viable populations, minimum areas and incidence functions, 208
 - 8.3.2 Metapopulation dynamics, 211
- 8.4 Nestedness, 213
 - 8.4.1 Edge effects, 216
 - 8.4.2 Habitat corridors, 217
 - 8.4.3 Landscape context – matrix effects, 218
- 8.5 Emergent guidelines for conservation, 219

For discussion, 222
Suggested reading, 223

9 BIOLOGICAL INVASIONS AND THE HOMOGENIZATION OF FAUNAS AND FLORAS, 224

- 9.1 The biogeography of species invasions, 224
 - 9.1.1 The invasion process, 224
 - 9.1.2 Human-assisted versus prehistoric invasions, 226
 - 9.1.3 Economic and ecological impacts of invasion, 227
 - 9.2 Biotic homogenization, 229
 - 9.2.1 The process of biotic homogenization, 230
 - 9.2.2 Different manifestations of biotic homogenization, 230
 - 9.3 Patterns of biotic homogenization, 232
 - 9.3.1 Fishes, 232
 - 9.3.2 Birds, 235
 - 9.3.3 Plants, 237
 - 9.3.4 Mammals, 237
 - 9.4 Environmental and human drivers of biotic homogenization, 238
 - 9.5 Biotic homogenization and conservation, 240
 - 9.6 Novel assemblages, 241
- For discussion, 242
Suggested reading, 243

PART 4: FUTURE DIRECTIONS, 245

10 PROSPECTS AND CHALLENGES, 247

- 10.1 Why we need conservation biogeography, 247
- 10.2 The challenges, 248
 - 10.2.1 Filling the Wallacean and Linnean shortfalls, 248
 - 10.2.2 Improving models, simulations and forecasts, 250
 - 10.2.3 Turning theory into practice, 251
 - 10.2.4 Education, communication and public engagement, 252
 - 10.2.5 Reconciliation ecology and a biogeography of the countryside, 257
- 10.3 Looking to the future, 257

Glossary of terms, 259

References, 264

Index, 297

Colour plates appear in between pages 148 and 149