

# Contents

- Foreword, viii  
Preface, ix  
Acknowledgments, xi
- 1 Introduction, 1**  
A brief overview of ecology, 1  
The ecosystem, 2  
Abiotic limits, 3  
Climate and topography, 4  
Soils and soil profiles, 4  
Biotic community, 6  
Community succession, 6  
Plant succession: from pioneer to climax, 6  
Primary and secondary succession, 6  
Succession and species abundance, 7  
The biome concept, 7  
Biodiversity, 7  
The "species richness gradient", 8  
Biodiversity "hotspots", 8  
Patterns of distribution, 9  
Continental patterns, 9  
Geographical and ecological distribution, 10  
Some ecological concepts, 10  
Niches, 10  
Ecological equivalents, 12  
Bergmann's rule, 12  
Allen's rule, 13  
Readings and references, 14
- 2 Tundra, 17**  
Climatic and glacial influences, 17  
Soils and geological influences, 17  
Permafrost, 18  
Patterned ground, 18  
Eskers and tundra wildlife, 20  
Glacial refugia, 21  
Features and adaptations, 21  
Plant adaptations to harsh conditions, 21  
Plant growth and reproduction, 22  
Decomposition and soil nutrients, 23  
Some animal adaptations, 23  
Major vegetative communities, 24  
Shrub tundra, 25  
Dwarf birch heath, 25  
Cottongrass heath, 25  
Fellfields, 25  
Invertebrates and tundra ecology, 25  
Selected tundra mammals, 26  
Lemmings, 26  
Arctic ground squirrels, 27  
Arctic foxes, 28  
Barren-ground caribou, 28  
Selected tundra birds, 29  
Gyrfalcons, 29  
Snowy owl, 30  
Ross goose, 30  
Highlights, 31  
Absentees: amphibians and reptiles, 31  
Lichens and "reindeer moss", 31  
Snow goose "eat outs", 32  
Alpine Tundra, 33  
Fragile Tundra, 34  
Impacts of human activity, 34  
Global warming, 35  
Readings and references, 36
- 3 Boreal Forest, 41**  
Climatic boundaries and soils, 41  
Features and adaptations, 42  
Plant adaptations, 42  
Animal adaptations, 42  
Frequent fires, 42  
Niches in the Boreal Forest, 43  
Selected biotic communities, 44  
Tree line and forest tundra, 44  
Muskeg, 46  
Coniferous swamps, 46  
Comparative ecology of lakes, 46  
Appalachian Extension, 48  
Mountain balds, 48  
Highlights, 49  
The 10-year cycle, 49  
Wolves and moose, 50  
A wealth of salamanders, 52  
Red squirrels, 53  
Ecological challenges, 54  
Acid rain, 54  
Spruce budworm and DDT, 55  
Balsam woolly adelgid, 55  
The Boreal Forest Agreement, 56  
Readings and references, 57
- 4 Eastern Deciduous Forest, 61**  
Climatic boundaries and soils, 61  
Features and adaptations, 61  
The forest primeval, 63  
The layered forest, 63

- Autumn leaves, 64
  - Ground and leaf litter, 64
  - Mast, 65
  - Biotic associations, 66
    - Northern hardwoods conifer forests, 66
    - Beech-Maple-Basswood, 67
    - Mesophytic forest, 68
    - Oak-Hickory, 69
    - Mississippi alluvial plain, 70
    - Southern Mixed Forest, 70
  - Some associated communities, 71
    - Longleaf pine forests, 71
    - New Jersey Pine Barrens, 73
    - Carolina bays, 74
  - Highlights, 75
    - Acorns and blue jays, 75
    - Deer yards, 75
    - Kirtland's warblers and fire, 76
    - Franklin's lost tree, 77
    - Cicadas: buzz in the forest, 77
  - Ecological challenges, 78
    - Declines of neotropical migrants, 78
    - Forest destruction by exotic organisms, 80
    - Reintroduction of red wolves, 81
  - Readings and references, 82
- 5 Grasslands: Plains and Prairies, 89**
- Major associations, 89
    - Tallgrass prairie, 89
    - Midgrass prairie, 90
    - Shortgrass prairie, 90
  - Transition zones, 93
    - Aspen parklands, 93
    - Cross Timbers, 96
    - Western transition, 96
  - Features and adaptations, 97
    - Seasonal grasses, 97
    - Soils, 99
    - Role of fire, 101
    - Prairie streams, 101
    - Prairie wetlands and waterfowl, 102
  - Pleistocene extinctions, 103
  - Selected prairie mammals, 104
    - Bison, 104
    - Prairie dogs, 104
    - Pronghorns, 106
  - Selected prairie birds, 106
    - Burrowing owls, 106
    - Prairie chickens, 107
  - Highlights, 108
    - Riparian forests, 108
    - The Platte River, 108
    - Nebraska Sandhills, 109
    - Ants, 109
    - Isolation and contact on the plains, 110
  - Grassland settlement, 110
  - Prairie preservation, 111
  - Readings and references, 113
- 6 Regional Grasslands and Related Areas, 120**
- Regional associations, 120
    - Palouse prairie, 120
    - California Annual Grasslands, 122
    - Southwestern desert grasslands, 124
    - Edwards Plateau, 126
    - Tamaulipan Mezquital, 127
  - Highlights, 129
    - Rodents and vegetation, 129
    - Channeled Scablands, 130
    - Snake River Birds of Prey Conservation Area, 130
    - Mima mounds, 131
  - Desertification, 132
  - Readings and references, 132
- 7 Deserts, 136**
- Physical geography, 136
    - Why deserts are dry, 136
    - Desert mountains and bajadas, 138
    - Ancient lakes, 138
  - Features and adaptations, 139
    - Desert soils and surfaces, 139
    - Plant adaptations, 140
    - Animal adaptations, 141
  - The major deserts, 144
    - Chihuahuan Desert, 144
    - Sonoran Desert, 145
    - Mojave Desert, 147
    - Great Basin Desert, 149
  - Highlights, 150
    - Nurse trees, 150
    - "Trees" for desert woodpeckers, 151
    - Boojums and elephants: unique trees, 153
    - Yucca moths, 154
    - Desert fishes, 154
    - Realm of reptiles, 155
    - Of soils and mice, 156
    - Deserts and predators, 157
    - Pygmies of the sagebrush steppe, 158
    - Desert quail, rainfall, and vitamin A, 159
    - Sailing stones, 159
  - Wheeled threats to deserts, 159
  - Readings and references, 160
- 8 Chaparral and Pinyon-Juniper Woodlands, 167**
- Features and adaptations of chaparral, 168
  - Coastal (California) chaparral, 171
    - Chamise chaparral, 171
    - Manzanita chaparral, 171
    - Ceanothus chaparral, 171
    - Other chaparral communities, 171
  - Interior (Arizona) chaparral, 172
  - Pinyon-juniper woodlands, 172
    - Distribution and ecology, 172

- Human uses, 173
- Chaparral and fire, 173
  - Water-repellant soils, 173
  - Post-fire vegetation, 174
  - Wildlife and chaparral fires, 174
- Highlights, 174
  - Allelopathy in chaparral, 174
  - Animal associates in coastal chaparral, 175
  - Lizards and burned chaparral, 175
  - Pinyon jays, 176
- Human influences, 176
- Readings and references, 176
- 9 Montane Forests, 180**
  - Features and adaptations, 180
  - Montane Forest zones, 181
    - Lower montane zone, 181
    - Upper montane zone, 181
    - Subalpine zone, 182
  - Associated habitats, 183
    - Mountain parks and meadows, 183
    - Black Hills, 185
    - Redwoods and sequoias, 186
    - Bristlecone pine forest, 188
  - Fire in montane forests, 190
  - Highlights, 192
    - Western chipmunks and competitive exclusion, 192
    - Squirrels, bears, and pine cones, 194
    - Sky islands in Arizona, 195
    - Monarchs in winter, 196
    - Bears and moths, 196
  - Readings and references, 198
- 10 Temperate Rain Forest, 203**
  - What is old-growth forest?, 203
  - Features and adaptations, 204
    - Valleys of rain forest, 204
    - Epiphytes, canopy roots, and "scuzz", 206
    - More about logs, 207
    - Succession on glacial till, 208
  - Highlights, 209
    - Bears, salmon, and forest enrichment, 209
    - A seabird in the forest, 212
    - Some small mammals and their ecology, 213
    - Banana slugs, 213
    - Pacific yew, 214
    - Giant salamanders and other amphibians, 214
    - Mount St Helens, 215
  - Ecological controversy, 217
  - Readings and references, 218
- 11 Coastal Environments, 223**
  - Currents and climates, 223
  - Features and adaptations, 224
    - Rocky seashores and tidal pools, 224
    - Sandy seashores, 225
    - Chesapeake Bay, 227
    - Mother Lagoon, 228
  - Submergent communities, 230
    - Seagrass meadows, 230
    - Forests in the ocean, 232
    - Oyster reefs, 233
  - Emergent communities, 235
    - Atlantic tidal marshes, 235
    - Marshes of the Gulf Coast, 236
    - Mangrove islands and thickets, 238
  - Some associated communities, 239
    - Barrier islands, 239
    - Coral reefs, 241
    - Maritime forests, 243
  - Highlights, 243
    - Synchrony at Delaware Bay, 243
    - Waterbird colonies, 245
    - A whale of a success, 247
  - Ecological challenges, 248
    - Natural disturbances, 248
    - Sea-level rise, 250
  - Readings and references, 251
- 12 A Selection of Special Environments, 259**
  - The Grand Canyon, 259
  - Caves, 262
  - Arctic ice cap, 265
  - Niagara Escarpment, 267
  - The "Father of Waters", 268
  - The Everglades, 271
  - Fossil *Lagerstätten*: Windows into North America's ecological past, 275
    - Burgess Shale, 275
    - La Brea tar pits, 277
  - The Florida Keys, 278
  - The Great Lakes, 280
  - Habitat highlights, 282
    - Rivers of ice, 282
    - Hot springs and geysers, 283
    - Forest in the clouds, 284
    - Granite outcrops and inselbergs, 285
    - Palm forest, 285
    - Mineral licks, 286
    - Bogs and their carnivorous plants, 287
  - Readings and references, 288
- Appendix, 296
- Glossary, 309
- Index, 321