CONTENTS

	Preface xv About the Author • xvii	Chapter 3	The Great Wealth of Life: Biodiversity 31
sofTlants 137	9.7 The Defensive Meapons	3.1	How Many Species Are There? 31 What is So Good about Biodiversity?
Part 1	Biodiversity and the Physical Setting 1	3.3	33 Biodiversity Hotspots and Conservation 35 The Distribution of Biodiversity 37
Chapter 1	Ecology and the Power of Natural Selection 2	3.5 3.6	Why are Most Species Rare? 44 Monitoring Forest Loss from Space
1.1 1.2 1.3 1.4	Science and Society 2 Ecology is not Environmentalism 4 The Scientific method 5 The Theory of Evolution by Natural Selection 6 Fitness and Genetic Immortality 7		46 Ecology in Action: Medicinal drugs 34 Summary 49 Further Readings 49 Web Connections 49
1.6	Natural Selection and Darwin's Finches 8	Chapter 4	Climate 50
	Summary 11 Further Readings 12 Web Connections 12	4.1 4.2 4.3 4.4	The Solar Connection 50 Priming the Climate Engine 52 Frontal Systems 55 Oceanic Influences 57
2.1 2.2	Chance, Change and Evolution 13 Oceans and the Origins of Life 13 The Evolution of Photosynthesis 15	4.5 Chapter	Cycles of Climate Change 58 Summary 63 Further Readings 63 Web Connections 64
2.3	Oxygen Producers Pollute the Planet 17 Evolution, Chance, and Calamity 17	Chapter 5	Ecosystems, Nutrient Cycles, and Soil 65
2.5	Drifting Continents and Evolution 21 Biodiversity and the Bush of Life	5.1 5.2 5.3	How Large is an Ecosystem? 65 Getting to the Root of Productivity 67 Soil: Our Ultimate Resource 75
2.7 2.8	What Causes Speciation? 25Why Does a Species Go Extinct? 29	5.4 5.5 5.6	Soil Maps 78 Soil Erosion 78 Ecosystem Functions and Values 80
	Summary 30 Further Readings 30 Web Connections 30		Summary 81 Further Readings 81 Web Connections 81

PART 2	Population and	Chapter 9	The Power of Predators 129
	Community Ecology 83	9.1	The Evolutionary Success of Cowards 129
Chapter 6	The Ecological Efficiency	9.2	Pyramids of Power 129
Chapter o		9.3	Optimal Foraging Theory 131
	of Living Things 84	9.4	Do Hunters Control Prey
6.1	Photosynthesis: Converting Sunlight		Populations? 133
	to Carbohydrate 85	9.5	Predators and Prey Behavior 136
6.2	The Fate of Carbohydrate 87	9.6	Predators Can Increase Species
6.3	The Ecological Efficiency of Plants 88	115	Diversity 136
6.4	The Ecological Efficiency of Animals	9.7	The Defensive Weapons of Plants 13
	89	9.8	Other Species Interactions 138
6.5	Energy Flow Through a Food Chain	9.9	Mimicry 140
	90 and vilassoboid 2.2	9.10	Predation and Management 141
6.6	Detrital Foodchains and Hidden	5.10	AND THE RESERVE AND AND ASSESSMENT OF THE PERSON OF THE PE
			Summary 142
6.7	The Cost of Control: Endothermy and		Further Readings 142
from Space	Ectothermy 92		Web Connections 142
6.8	Allocating Energy 94		The state of the s
cinal drugs 34		Chapter 10	Peopling Earth 143
	Summary 95	10.1	Humans: A Late Arrival? 143
	Further Readings 96	10.2	From Hunter-Gatherer to Urban
	Web Connections 96	on by Matural	Dweller 145
		10.3	Agriculture: The Springboard of
Chapter 7	Who Needs Sex Anyway? 97	morealty 7	Population Growth 146
		10.4	A Exponentially Growing Population
7.1	Ways to Produce Clones 97	10.4	146
7.2	The Ecological Costs of Sex 98	10.5	
7.3	Many Babies or Big Bodies: An	10.5	Population Demographics 148
	Energetic Trade-off? 101	10.5	The Emergence of the MDCs 150
7.4	Selection for an Optimal Number		The Demographic Transition 151
	of Young 104	10.8	Limiting the Expansion of the Human
7.5	Territoriality 107	10.0	Population 153
7.6	Polygyny and Female Choice 108	10.9	Reforming the Role of Women 157
	Summary 110	10.10	Human Population Growth and
	Further Readings 111		Consumerism 158
	Web Connections 111		Summary 158
	111		Further Readings 159
and Curdon	Charles & Consultant Nutri		Web Connections 159
Chapter 8	Populations and Resources:		
	A Balancing Act 112		
En Comple	many as at some I would be a	PART 3	Community Ecology 161
8.1	Assessing Trends in Population 112	raki 3	Community Ecology 161
8.2	The Drive to Compete 116	Chapter 11	Biomes 162
8.3	Populations and Natural Processes	chapter 11	DIOTIES 102
	119	11.1	Tundra 162
8.4	Ecological Niche; Or, How to be Your	11.2	Boreal forest 166
	Favorite Organism 121	11.3	Temperate forest 167
	Summary 127	11.4	Prairies and Grasslands 169
	Further Readings 128	11.5	Chaparral 170
	Web Connections 128	11.6	Desert 171

xi

11.7	Tropical Forests 172	14.3	A Simple Model of Fisheries 225
11.8	Tropical Mountains 175	14.4	Further Ecological Thoughts on
11.9	Oceans 176		Fisheries 227
11.10	Estuaries 177	14.5	Prey Switching and Fishing 232
	Summary 178 Further Readings 178	14.6	Local Solutions to Fishery Problems 236
	Web Connections 179	14.7	Are Fish Farms the Answer? 237
hapter 22 316 Lavivus	19.3 The Area Needed For	14.8	National and International Protection 238
hapter 12	Aquatic Ecosystems 180		Summary 239
12.1	Marine Systems 180		Further Readings 240
12.2	Groundwater 187		Web Connections 240
12.3	Surface Freshwater 188		
12.4	What Happened to the Lakes Where Dinosaurs Wallowed? 191	Chapter 15	Succession 241
12.5	The Variability of Natural Lakes and	15.1	Clements and the Superorganism 24
	Rivers 192	15.2	Ashes to Forest 243
12.6	Seasonal Changes in a Lake 193 Summary 197	15.3	Succession and Ecosystem Functions 246
	Further Readings 198	15.4	From Field to Forest 248
	Web Connections 198	00 15.5	Succession and Coral Reefs 253
		15.6	Disturbance that Maintains Diversity 253
chapter 13	Why Wetlands Aren't	15.7	The Importance of Fire 254
Chapter 23	Worthless 199	15.8	Succession and Habitat Management 256
13.1	What is a Wetland? 199	15.9	
13.2 13.3	Water and Wetland Chemistry 202 Wetlands as Hydrologic Regulators	13.9	Equilibrium or Nonequilibrium in ou Modern Ecosystems 258
	205		Summary 259
13.4	Adaptations to Living in a Swamp 205		Further Readings 259
13.5	Wetlands and Wildlife 207		Web Connections 260
13.6	Ecosystem Quality and Amphibian Declines 208	Chapter 26	Community Change 1 2(1)
13.7	Altering Wetland Functions and Values 212	-	Community Change 261
13.8	The Restoration of the Florida	16.1	The Coming and Going of Ice Ages 261
13.9	Everglades 213 Wetlands and the Law 215	16.2	Are Communities Stable Through Time? 266
13.10	Creating Wetlands 218 Ecology in Action: Wetland delineation	16.3	The Pollen History of Northeastern North American Forests 266
	216	16.4	Plant Migrations in the Southwestern
	Summary 220	her Way to	United States 268
	Further Readings 220 Web Connections 220	16.5	A Mammal Community of the Past 272
	Charles of March 2011 And Arthur	16.6	Instability in the Tropics 272
Chapter 14	Making Connections: Fisheries	16.7	So, Are Communities Stable Through Time? 274
	221	16.8	Another Note on Extinction: The
14.1	Fishing Isn't What it Used to Be 221		Blitzkrieg Hypothesis 275
14.1	Fish, Fisheries, and Productivity 222		Summary 277

Further Readings 277

	Web Connections 277		Web Connections 312
Chapter 17	Climate Change and Global	Chapter 19	Reserve Design 313
Chebsel en	Warming 278	19.1	The Role of Nature Reservists 313
17.1	What is the Evidence of Climate	19.2	The Population Needed For Survival 314
nooserora asno	Change 278	19.3	The Area Needed For Survival 316
17.2	Biological Effects of Global Climate Change: The Last 50 Years 282	19.4	Facing the Threat Posed by Exotic Species 321
17.3	Natural Climate Change 282	19.5	The Management of Reserves 326
17.4	The Greenhouse Effect 283	19.6	Restoration Ecology: The Next Thrust
17.5	Carbon Dioxide Concentration		of Conservatism 329
176	Through Time 284	19.7	Crawling From the Brink of Extinction
17.6	Human Actions and Climate Change		330
norganism 241	286		Ecology in Action: Rebuilding a prairie
17.7	Potential Interactions of Greenhouse Gasses and Pollutants 288		331
17.8	Computer Simulations of a Warmer		Summary 335
17.0	World 288		Further Readings 335
17.9	The Potential Effects of Doubled CO ₂		Web Connections 336
vitigment Tanis	290		
17.10	What if Climate Change is not Linear? 295	PART 4	Ecology and Society 333
17.11	Global Warming: A Risk to be Ignored? 296	Chapter 20	Feeding the World 338
	Ecology in Action: Determining the	20.1	Human Nutritional Requirements 33
	fertilization effect of CO ₂ 291	20.2	Agriculture Versus Population Growth 339
	Summary 296	20.3	Exporting the Green Revolution 344
	Further Readings 297	20.4	Social Problems and the Second Green
	Web Connections 297		Revolution 345
75	Berginniality 307	20.5	Desertification 346
Chapter 18	Fragmentation 298	20.6	The Genetic Revolution 348
18.1	The Relationship Between Habitat	20.7	Are Transgenic Foods Safe? 350
	Area and Species Diversity 298		Summary 352
18.2	Lessons From Islands 299		Further Readings 353
18.3	Edge Effects and Habitat		Web Connections 353
	Fragmentation 301	. 8	13.10 PErsenting Wellands In
18.4	Songbirds and Forest Fragmentation	Chapter 21	Pollution: The Other Face of
	304		Fertilizers and Pesticides 354
18.5	Metapopulations: Another Way to	21.1	What is Pollution? 354
	Think About Fragmented Populations	21.2	Pollution That Increases Growth 355
	306	21.3	Biological Effects of Pollutants 359
18.6	Extinction or Crying Wolf? 308	21.4	Why Do We Pollute? 362
18.7	Timbering the Last Old Growth	21.5	Pesticides: Pollutants That We Need
	Forests in the USA 310	COMPILE INCH	363
	Ecology in Action: Studying the effects	21.6	Pesticide Alternatives 366
	of fragmenting a rain forest 303	21.7	Integrated Pest Management 369
	Summary 312	21.8	Sustainable Agriculture 370
		7330	0

Further Readings 312

	Ecology in Action: <i>Biological control of rabbits</i> 367	24.3	The Effect of Acid Deposition on Aquatic Systems 409
	Summary 372 Further Readings 373	24.4 Environment	Acid Transport and Buffered Systems 410
	Web Connections 373	24.5	Solutions to the Acid Deposition Problem 412
Chapter 22	Atmosphere, Air Pollution, and Ozone 374		Summary 415 Further Readings 416
22.1	The Composition of the Atmosphere 374		Web Connections 416
22.2 22.3	Layers in the Atmosphere 376 Air Pollution 377	Chapter 25	Human Disease: Evolutionary and Ecological Perspectives
22.4	Our Love-Hate Relationship with Ozone 377		417
22.5	Tropospheric Ozone: The Hate Relationship 378	25.1	Battling Malaria: Nearly a Success Story 418
22.6	Stratospheric Ozone: The Love Relationship 381	25.2	Drug Resistance and Diseases That Haunt Us 420
22.7	Protecting the Ozone Layer 385 Summary 386	25.3	Evolutionary Thoughts About Virulence 422
	Further Readings 387	25.4	The Ecological Perspective 425
	Web Connections 387	25.5 25.6	The Emergence of New Diseases 429 Human Immunodificiency Virus 430
Chapter 23	The Use and Supply of Energy 388		Ecology in Action: Ecologists search for a pattern in Hantavirus outbreaks 424
23.1	Power Plants Do Not Make Energy 388		Summary 434 Further Readings 434
23.2	A Brief History of Energy Use in the United States 389		Web Connections 434
23.3	Nuclear Power: Fallacy of a Dream Foretold 391	Chapter 26	Environmental Economics 435
23.4 23.5	Our Future Stocks of Energy 394 Energy and Pollution 395	26.1	Traditional Economics and Market Values 436
23.6 23.7	"Alternative" Energy Source 396 Meeting Future Energy Demands 398	26.2	Benefit-cost Analysis: A Two-edged Sword 442
23.8	Energy Conservation and Efficiency 399	26.3	How Much are We Prepared to Pay to Prevent Pollution 443
23.9	Energy and Development 401	26.4	The Environmental Industry: Economic Drag or Stimulus 444
	Summary 402 Further Readings 402	26.5	A Digression on the Meaning for Sustainability 446
	Web Connections 402	26.6	How Do We Evaluate Development?
Chapter 24	How Does Acid Depostion Affect Ecosystems? 403	26.7	Global Budgets and Local Accounts 449
24.1 24.2	Acidity: Definition and Sources 403 The Effect of Acid Deposition on Terrestrial Systems 405		Summary 450 Further Readings 451 Web Connections 451

xiv Contents			
fered Systems	Environmental Legislation and Policy 452	28.2 28.3 28.4	Is the End Nigh? 469 The Lesson of Easter Island 470 Freshwater a Limiting Resource?
27.1	Common Law and the Environment 454	28.5	472 Human Initiative Saves the Day?
27.2 27.3	Protection under Statutory Law 456 A Pocket History of Environmental Legislation 457	28.6	474 New Frontiers in Medicine? 475
27.4	Focus on Five Pieces of Legislation 458	28.7	Another Clone? There's More Where That Came From 476
27.5	Property Rights Versus Environmental Legislation 466	28.8	Future Choices 478 Summary 478
	Ecology in Action: Ecologists and environmental impact surveys 461		Further Readings 479 Web Connections 479
	Summary 467 Further Readings 467 Web Connections 467	Glossary References	G-1 may blood as god markets prairie
Chapter 28	Peering Into the Future 468	Photo Cred	
28.1	Resource Demand: A Historical- Ecological Perspective 468	Index I-1	12.7 Protestate Protes
Distiles 429			