

CONTENTS

Chapter 1

Defining Conservation Biology 3



- The Nature and Origins of Conservation Biology 5
 - The philosophical roots of conservation biology* 6
 - Conservation biology's international scope* 8
 - The interdisciplinary approach: A case study* 10
- Conservation Biology's Ethical Principles 13
- Achievements and Challenges 14
- Summary 15

Chapter 2

What Is Biodiversity? 19



- Species Diversity 20
 - What is a species?* 20
 - Measuring species diversity* 23
- Genetic Diversity 24
- Ecosystem Diversity 26
 - Trophic levels* 28
 - Food chains and food webs* 30
 - Keystone species and guilds* 31
 - Keystone resources* 33
 - Ecosystem dynamics* 33
- Biodiversity Worldwide 33
 - How many species exist?* 35
 - Where is the world's biodiversity found?* 37
- Summary 40

Chapter 3

The Value of Biodiversity 43



Ecological Economics	45
Direct Economic Values	47
<i>Consumptive use value</i>	47
<i>Productive use value</i>	49
Indirect Economic Values	51
<i>Ecosystem productivity</i>	52
<i>Water and soil protection</i>	53
<i>Climate regulation</i>	54
<i>Species interrelationships and environmental monitors</i>	55
<i>Amenity value</i>	56
<i>Multiple uses of a single resource: A case study</i>	59
The Long-Term View: Option Value	60
Existence Value	62
Environmental Ethics	64
<i>Ethical arguments supporting preservation</i>	65
<i>Deep ecology</i>	68
Summary	69

Chapter 4

Threats to Biodiversity 73



Human Population Growth and its Impact	74
Habitat Destruction	77
<i>Tropical forests</i>	79
<i>Temperate grasslands</i>	83
<i>Wetlands</i>	83
<i>Marine coastal waters</i>	84
<i>Desertification</i>	86
Habitat Fragmentation	86
<i>Threats posed by fragmentation</i>	88
<i>Edge effects</i>	90
Environmental Degradation and Pollution	92
<i>Pesticides</i>	94
<i>Water pollution</i>	94
<i>Air pollution</i>	96

Global Climate Change	98
<i>Climate change and the marine environment</i>	102
<i>The overall effect of global warming</i>	103
Overexploitation	104
<i>Natural resource use in traditional societies</i>	105
<i>International wildlife trade</i>	105
<i>Commercial harvesting</i>	107
Invasive Species	109
<i>Invasive species on islands</i>	111
<i>Invasive species in aquatic habitats</i>	112
<i>The ability of species to become invasive</i>	113
<i>Genetically modified organisms</i>	116
Disease	117
Summary	120

Chapter 5

Extinction Is Forever 125



The Meaning of "Extinct"	127
Rates of Extinction	128
<i>Extinction rates in aquatic environments</i>	130
<i>Extinction rates on islands</i>	131
<i>Island biogeography and extinction rate prediction</i>	133
<i>Local extinctions</i>	135
Vulnerability to Extinction	137
The Problems of Small Populations	140
<i>Loss of genetic variation</i>	143
<i>Effective population size</i>	148
<i>Demographic and environmental stochasticity</i>	151
<i>The extinction vortex</i>	153
Summary	154

Chapter 6

Conserving Populations and Species 157



- Applied Population Biology 158
 - Background research* 159
 - Monitoring populations in the field* 159
 - Demographic studies* 163
 - Population viability analysis* 164
 - Metapopulation models* 165
- Conservation Categories 168
- Establishing New Populations 172
 - Relocating individuals to establish new populations* 172
 - Considerations for successful establishment programs* 173
 - Establishing new plant populations* 177
 - The status of new populations* 179
- Ex Situ Conservation Strategies 180
 - Zoos* 182
 - Aquariums* 186
 - Botanical gardens* 188
 - Seed banks* 189
- Legal Protection of Species 191
 - National laws* 191
 - The U.S. Endangered Species Act* 192
 - International agreements* 196
- Summary 198

Chapter 7

Protected Areas 201



- Establishment and Classification of Protected Areas 202
- The Effectiveness of Protected Areas 205
 - Prioritization: What should be protected?* 206
 - Measuring effectiveness: Gap analysis* 212
- Designing Protected Areas 214
 - The debate over size* 215
 - Minimizing edge and fragmentation effects* 219
 - Networks of protected areas* 219
- Landscape Ecology and Park Design 224

Managing Protected Areas	226
<i>Monitoring</i>	228
<i>Maintaining habitat</i>	229
<i>Management and people</i>	232
<i>Zoning as a solution to conflicting demands</i>	233
Challenges to Park Management	236
Summary	237

Chapter 8

Conservation Outside Protected Areas 241



Unprotected Public and Private Lands	241
Human-Dominated Landscapes	242
Working with Local People	245
<i>In situ agricultural conservation</i>	248
<i>Extractive reserves</i>	248
<i>Community-based initiatives</i>	249
<i>Payment for ecosystem services</i>	250
<i>Evaluating conservation initiatives</i>	250
Ecosystem Management	251
Restoring Damaged Ecosystems	253
<i>The need to restore ecosystem function</i>	254
<i>Approaches to ecosystem restoration</i>	257
<i>Targets of major restoration efforts</i>	258
<i>The future of restoration ecology</i>	264
Summary	264

Chapter 9

The Challenge of Sustainable Development 267



Sustainable Development at the Local and National Levels	269
<i>Local conservation regulations</i>	269
<i>National legislation</i>	271
<i>Land trusts</i>	272
<i>Incentives for conservation</i>	273
<i>Enforcement and other issues</i>	274
International Approaches to Sustainable Development	275
<i>International agreements</i>	275
<i>The Earth Summit</i>	278

Funding for Conservation	280
<i>Environmental trust funds</i>	281
<i>Debt-for-nature swaps</i>	281
<i>Loans and grants</i>	282
<i>Private funding</i>	284
<i>The dilemma of conservation funding</i>	285
<i>Challenges of funding</i>	286
Conservation Education	287
The Role of Conservation Biologists	289
Summary	291
Appendix: Selected Environmental Organizations and Sources of Information	295
Glossary	299
Chapter Opening Photograph Credits	307
Bibliography	309
Index	337
About the Author	351