Contents

Preface
Scope
Taxonomy and the IUCN Red List categories
Organisation of the book
Acknowledgements
List of Abbreviations
Glossary

Chapter 1: What is Conservation Biology?

1.1 Conservation Biology is Still Evolving
1.2 The Role of Conservation Biologists
1.3 The Value of Scientific Methods
1.4 Environmental Ethics
1.4.1 Conservation biology’s ethical principles
1.5 Summary
1.6 Topics for Discussion
1.7 Suggested Readings

Box 1.1 Conservation Through Public Health: A Case Study
Box 1.2 The Okapi Wildlife Reserve: Protecting Nature and Providing for People
Box 1.3 Biodiversity: Can Humanity be Saved?
Chapter 2: Introduction to Sub-Saharan Africa

2.1 Sub-Saharan Africa’s Natural Environment
2.2 History of Conservation in Sub-Saharan Africa
   2.2.1 The 1880s and launching of formal conservation efforts
   2.2.2 Conservation efforts after colonialism
2.3 Conservation in Sub-Sahara Africa Today
2.4 Ongoing Conservation Challenges
   2.4.1 Persistent poverty
   2.4.2 Obstructive mindsets
   2.4.3 Weak governance/institutional structures
   2.4.4 Skills shortages
   2.4.5 Competing interests
2.5 Conclusion
2.6 Summary
2.7 Topics for Discussion
2.8 Suggested Readings

Box 2.1 Sacred Spaces: A Tradition of Forest Conservation in Benin
Box 2.2 Why Go Transfrontier? (And Why Not?)
Box 2.3 Privately Owned Lands for African Conservation
Box 2.4 Malawi: No Longer a Weak Link in the Elephant Ivory Trafficking Chain?

Chapter 3: What is Biodiversity?

3.1 Species Diversity
   3.1.1 What is a species?
3.2 Genetic Diversity
3.3 Ecosystem Diversity
3.4 Patterns of Biodiversity
   3.4.1 Challenging species identifications
   3.4.2 Implications of challenging species identifications
3.4.3 Measuring species diversity
3.4.4 How many species exist?
3.4.5 Where are most species found?

3.5 Summary
3.6 Topics for Discussion
3.7 Suggested Readings

Box 3.1 Finding a Needle in a Haystack: Monitoring Species Using eDNA
Box 3.2 Golden Mole Conservation Requires a Sound Taxonomy
Box 3.3 Does Tardy Recognition of a Species Hamper its Conservation?

Chapter 4: Why Should We Protect Biodiversity?

4.1 Material Contributions
4.2 Regulating Services
4.2.1 Maintaining ecosystem stability
4.2.2 Maintaining ecosystem productivity
4.2.3 Climate regulation
4.2.4 Conserving soil and water quality
4.2.5 Pollination and seed dispersal
4.2.6 Hazard detection and mitigation
4.2.7 Pest and disease control
4.3 Nonmaterial Contributions
4.3.1 Inspiration and learning support
4.3.2 Supporting psychological and physical experiences
4.3.3 Supporting individual and group identities
4.4 The Long-Term View: Option Values
4.5 Environmental Economics
4.5.1 Placing a price on the natural world
4.5.2 Environmental economics’ biggest contributions
4.5.3 Environmental economics’ biggest challenges
4.6 Summary
4.7 Topics for Discussion
4.8 Suggested Readings

Box 4.1 Research on Hunting Underpins Conservation in Central Africa
Box 4.2 Are Wild Pollinators Important in African Agriculture?
Box 4.3 Biological Control Saves the Cassava Crop
Box 4.4 Conservation Lessons from the Asian and African Vulture Crises

Chapter 5: The Scramble for Space

5.1 What is Habitat Loss?
5.1.1 What is habitat fragmentation?
5.1.2 What are edge effects?
5.2 Drivers of Habitat Loss and Fragmentation
5.3 Habitat Loss’ Impact on Africa’s Ecosystems
  5.3.1 Tropical forests
  5.3.2 Rivers and deltas
  5.3.3 Wetlands
  5.3.4 Seasonal drylands
5.4 Population Growth and Consumption?
5.5 Concluding Remarks
5.6 Summary
5.7 Topics for Discussion
5.8 Suggested Readings

Box 5.1 The Importance of Liberia’s Forest Network to the Survival of the Pygmy Hippopotamus
Box 5.2 The Conservation and Exploitation of East African plants
Box 5.3 Migratory Birds of Africa: The Largest of Last Great Migrations?
Box 5.4 Saving Critically Endangered Ground Nesting Birds from Habitat Loss
Chapter 6: Our Warming World

6.1 Drivers of Climate Change
6.2 Predicting Earth’s Future Climate
6.3 The Impact of Climate Change
  6.3.1 Climate change’s impact on people
  6.3.2 Climate change’s impact on terrestrial ecosystems
  6.3.3 Climate change’s impact on freshwater ecosystems
  6.3.4 Climate change’s impact on marine ecosystems
  6.3.5 Climate change interacts with habitat loss
6.4 Beneficiaries of Climate Change
6.5 The Overall Impact of Climate Change
6.6 Summary
6.7 Topics for Discussion
6.8 Suggested Readings

Box 6.1 Does Oil Palm Agriculture Threaten Biological Diversity in Equatorial Africa?
Box 6.2 Desert Birds and Climate Change
Box 6.3 Habitat Alteration, Climate Change, and Mosquito-Borne Diseases

Chapter 7: Pollution, Overharvesting, Invasive Species, and Disease

7.1 Pollution in Its Many Forms
  7.1.1 Water pollution
  7.1.2 Air pollution
  7.1.3 Soil pollution
  7.1.4 Light pollution
  7.1.5 Noise pollution
  7.1.6 Thermal pollution
7.2 Overharvesting
  7.2.1 The bushmeat crisis
7.2.2 Overfishing
7.2.3 The impact of traditional medicine
7.2.4 The impact of live animal trade
7.2.5 Overharvesting of plant products
7.2.6 Challenges to managing overharvesting
7.3 Persecution
7.4 Invasive Species
7.4.1 Spread of invasive species
7.4.2 Impact of invasive species
7.4.3 Genetically modified organisms
7.6 Parasites and Diseases
7.7 Summary
7.8 Topics for Discussion
7.9 Suggested Readings

Box 7.1 Solving Seabird Bycatch Problems: From Theory to Practice
Box 7.2 Conserving Elephants in the Anthropocene
Box 7.3 Aliens on Islands: Damage and Control
Box 7.4 Promoting African and Global Honeybee Health

Chapter 8: Extinction is Forever
8.1 What is Extinction?
8.2 Rates of Extinction
8.3 When is a Species Extinct?
8.4 Extinctions in Sub-Saharan Africa
8.5 Which Species are at Risk of Extinction?
8.5.1 Course-filter assessments
8.6 Characteristics of Threatened Species
8.7 Problems of Small Populations
8.7.1 Loss of genetic diversity
8.7.2 Demographic stochasticity
8.7.3 Environmental stochasticity and catastrophes
8.7.4 The extinction vortex
8.7.5 Is there any hope for small populations?
8.8 Is De-extinction a Solution?
8.9 Summary
8.10 Topics for Discussion
8.11 Suggested Readings

Box 8.1 Pleistocene extinctions
Box 8.2 Swimming Dangerously Close to Extinction: Population Crash in Lesotho’s Endemic Maloti Minnow
Box 8.3 Fenced Reserves Conserving Cheetahs and Wild Dogs in South Africa

Chapter 9: Applied Population Biology

9.1 Monitoring Population Size
9.1.1 Biodiversity inventories
9.1.2 Population censuses
9.1.3 Demographic studies
9.1.4 Recent progress in collecting survey data
9.2 Estimating Extinction Risk
9.2.1 A word of warning
9.2.2 Probability of extinction
9.2.3 Minimum viable population
9.2.4 Effective population size
9.2.5 Maximum sustainable yield
9.2.6 Sensitivity analysis
9.3 Challenges to PVA Implementation
9.3.1 Lack of adequate data
9.3.2 Data reliability
9.3.3 Model reliability

9.4 Summary

9.5 Topics for Discussion

9.6 Suggested Readings

Box 9.1 The Role of Biodiversity Inventories in the Management of Gorongosa National Park

Box 9.2 Sea Turtle Conservation along Africa’s Atlantic Coast

Box 9.3 Sustainable Harvesting of Fruit Bats Through Better Understanding of Life Histories

Chapter 10: Conserving Ecosystems

10.1 Ecosystem Monitoring

10.1.1 Monitoring ecosystems with geospatial analysis

10.2 Maintaining Complex and Adaptive Ecosystems

10.2.1 Maintaining critical ecosystem processes

10.2.2 Minimising external threats

10.2.3 Adaptive management

10.3 Restoring Damaged Ecosystems

10.3.1 Ecological restoration approaches

10.3.2 Major restoration targets

10.3.3 The future of ecological restoration

10.4 Combating Climate Change Through Ecosystem Conservation

10.5 Summary

10.6 Topics for Discussion

10.7 Suggested Readings

Box 10.1 Using Insects to Monitor Environmental Health

Box 10.2 Remote Sensing and Spatial Analysis for African Conservation
Box 10.3 Environmental governance of the Serengeti Ecosystem

Box 10.4 Sustainable Forest Restoration Using Natural Vegetation

Chapter 11: Preventing Extinctions

11.1 Studying Species and Populations
   11.1.1 Obtaining natural history data
11.2 Saving Species Through Translocations
   11.2.1 Important considerations for translocations
11.3 Managing and Facilitating Movement Dynamics
   11.3.1 Connectivity in terrestrial ecosystems
   11.3.2 Connectivity in freshwater ecosystems
   11.3.3 Connectivity in marine ecosystems
   11.3.4 Mimicking connectivity
   11.3.5 Management considerations in connectivity conservation
11.4 Managing Species Sensitive to Climate Change
11.5 Ex Situ Conservation Strategies
   11.5.1 Types of ex situ facilities
   11.5.2 Challenges facing ex situ facilities
11.6 Thoughts on Neglected Taxa
11.7 Summary
11.8 Topics for Discussion
11.9 Suggested Readings

Box 11.1 The Overlooked Role of Behavioural Ecology in the Conservation of African Mammals
Box 11.2 Large Predator Reintroductions: A Balancing Act
Box 11.3 Transfrontier Conservation Areas: Managing Wildlife Across International Boundaries
Box 11.4 Saving the Northern White Rhinoceros with Assisted Reproduction Technologies
Chapter 12: Biodiversity and the Law

12.1 Identifying Legislative Priorities
12.2 Environmental Laws and Policies
12.2.1 International agreements
12.2.2 National and local laws
12.3 Environmental Law Enforcement
12.3.1 New technologies in environmental law enforcement
12.4 The Limits of Environmental Laws and Regulations
12.4.1 Lack of capacity
12.4.2 Conflicting government priorities
12.4.3 Informal economies, traditional activities, and the law
12.4.4 Trade embargoes and sanctions
12.5 Conclusions
12.6 Summary
12.7 Topics for Discussion
12.8 Suggested Readings

Box 12.1 Insect Biodiversity Helps Solve African Wildlife Crimes
Box 12.2 Protecting Elephants in a Hostile Region
Box 12.3 Thoughts on Poaching and Illegal Wildlife Trafficking in Africa

Chapter 13. The Importance of Protected Areas

13.1 Establishing Protected Areas
13.1.1 Government protected areas
13.1.2 Community conserved areas
13.1.3 Privately protected areas
13.1.4 Co-managed protected areas
13.1.5 Field stations and marine laboratories
13.2 Classification of Protected Areas
13.3 Prioritisation: What Should be Protected?
13.3.1 Species approach
13.3.2 Ecosystem approach
13.3.3 Wilderness approach
13.3.4 Hotspot approach
13.3.5 Gap analysis approach
13.3.6 Optimisation approach
13.4 How Much Land Should We Protect?
13.4.1 A neglected system: marine protected areas
13.5 Designing Protected Areas
13.5.1 What size should a protected area be?
13.5.2 Zoning as a solution to conflicting demands
13.5.3 Connectivity among protected areas
13.5.4 What about small isolated reserves?
13.6 Managing Protected Areas
13.6.1 The importance of monitoring
13.6.2 The importance of working with local people
13.6.3 The importance of accommodating visitors
13.6.4 The IUCN Green List of Protected Areas
13.7 Challenges for Protected Areas
13.7.1 Funding limitations
13.7.2 Planning for climate change
13.7.3 Facing degazettement
13.8 Summary
13.9 Topics for Discussion
13.10 Suggested Readings

Box 13.1 Mpala Research Centre: A Living Laboratory for (More than Just) Scientists
Box 13.2 Identifying Key Sites for Conservation in the Albertine Rift
Box 13.3 Marine Protected Areas in East Africa and the Western Indian Ocean
Box 13.4 Zoning: Something for Everyone in the Forests of Dzangha-Sangha

Chapter 14: Conservation on Unprotected Lands

14.1 Human-Dominated Landscapes
14.1.1 The impact of agriculture
14.1.2 The impact of logging, mining, and other extractive industries
14.2 Smart Development Outside Conservation Areas
14.3 Linking Conservation and Socio-Economic Development
14.4 Confronting Human-Wildlife Conflict
  14.4.1 Dealing with predators
  14.4.2 Dealing with crop raiders
  14.4.3 Concluding thoughts on human-wildlife conflict
14.5 Summary
14.6 Topics for Discussion
14.7 Suggested Readings

Box 14.1 Traditional People and Conservation: Turning the Page
Box 14.2 Importance of Protected Areas in Cities
Box 14.3 Preserving Biodiversity Through Shaded Agroforestry
Box 14.4 Confronting Human-Wildlife Conflict in Zimbabwe

Chapter 15: An Agenda for the Future

15.1 Achieving Sustainable Development
15.2 Dealing with Technological Advances
15.3 Funding Conservation Activities
  15.3.1 How effective is conservation funding?
15.4 Building Lasting Partnerships
  15.4.1 Partnerships with local people
  15.4.2 Partnerships among conservation professionals
15.5 Environmental Education and Leadership
15.6 Summary
15.7 Topics for Discussion
15.8 Suggested Readings

Box 15.1 Not Just for War: Drones in Conservation
Box 15.2 Supporting Self-Organised Action for Conservation in Africa
Box 15.3 Tracking Species in Space and Time: Citizen Science in Africa
Box 15.4 The Contribution of Education Towards Conservation in Africa

Appendix A: Selected Sources of Information
Appendix B: Selected Environmental Organisations
Appendix C: Obtaining Conservation Funding
Appendix D: Environmental Calendar
Index