



Principles of Wildlife Conservation

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Principles of Wildlife Conservation was developed at Chemeketa Community College, Salem, Oregon. Materials were prepared by Rick O'Hara, Ph.D., Lead Program Developer for NCSR. O'Hara holds a Ph.D. in *Ecology/Population Biology* from Oregon State University, and M.Sci. and B.S. in *Zoology* from Michigan State University.

Technology education programs in which this course is incorporated are described fully in the Center's report entitled, "Visions for Natural Resource Education and Ecosystem Science for the 21st Century." Copies are available free of charge.

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Course materials will also be posted on our website:

www.ncsr.org

Please feel free to comment or provide input.

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BI 251 Principles of Wildlife Conservation COURSE OUTLINE

INTRODUCTION

Principles of Wildlife Conservation is a course that was developed to fulfill requirements in the curriculum of Forest Resource Technology students at Chemeketa Community College in Salem, Oregon. It is an introductory course that presents a diversity of issues relating to wildlife conservation and management and is open to the general student population. To a large degree, BI 251 is modeled after an existing course called *Principles of Wildlife Conservation* (FW 251), a core course for students majoring in any area of Fisheries and Wildlife and Natural Resources at Oregon State University.

REFERENCES

Scalet, C.G., L.D. Flake, and D.W. Willis. *Introduction to Wildlife and Fisheries: An Integrated Approach*. 1996. W.H. Freeman Company. ISBN: 0-7167-2816-8 (soft cover)

Leopold, Aldo. *A Sand County Almanac*. 1949. Oxford University Press. ISBN 0-19-505928-X.

COURSE DESCRIPTION

BI 251 Principles of Wildlife Conservation provides an introduction to the principles and practices of wildlife conservation and management. This lecture-only course covers the history of wildlife conservation, basic ecological concepts, human impacts on wildlife and habitat, social and economic issues relating to wildlife management, and management objectives and strategies for fisheries and wildlife populations. The course has no prerequisites.

COURSE OBJECTIVES

Upon successful completion of the course, students should be able to:

1. Describe the values of wildlife from both a human and an ecological perspective.
2. Relate and apply various ecological concepts and principles to problems in wildlife management and conservation.
3. Explain and analyze parameters of animal population structure and dynamics.
4. Discuss general methods of estimating population abundance, growth, and survivorship.
5. Relate basic concepts of population genetics to the viability and persistence of animal populations.
6. Explain and evaluate how aspects of the behavior and physiology of a species play a role in wildlife management plans.
7. List and explain the major physical and biological components of habitats that are important to wildlife populations.
8. Describe how human activities impact wildlife habitat.
9. Contrast various management goals and relate them to appropriate management plans.
10. Explain how the concept of ecosystem management relates to wildlife conservation and management.
11. Explain the role of various regulations and issues (social, economic, ethical, and ecological) in the management and conservation of animals.

STUDENT ASSESSMENT

Grades are based on a points system with approximate breakdown as follows:

Mid-Term	100 points
Final	114 points
Internet Search essay	30 points
<i>Sand County Almanac</i> essay	50 points
Endangered species essay	50 points
Total	<hr/> 344 points

TOPICS

- I. Introduction to Wildlife and Fisheries Conservation
 - A. Some basic terminology: perspectives and uses
 - B. History of wildlife management in the U.S.
 - C. Reasons for managing and conserving wildlife populations
 - D. Past successes and failures in wildlife management
 - E. Wildlife management and conservation biology as professions

- II. Human Attitudes and Perceptions About Wildlife, Human Management
 - A. The users of wildlife
 - B. Values and ethics regarding wildlife
 - C. Assessing public attitudes
 - D. Social and economic issues

- III. Basic Ecological Concepts
 - A. Populations, communities, and ecosystems
 - B. Energy flow, trophic levels, and food webs
 - C. Succession
 - D. Niche, habitat, and environment
 - E. Dispersion patterns
 - F. Competition and predation

- IV. Population Structure and Dynamics
 - A. Births, deaths, and survivorship
 - B. Demography
 - C. Population growth and regulation
 - D. Estimating abundance, growth, and survivorship

- V. Wildlife Habitat
 - A. Habitat components necessary to sustain wildlife
 - B. Habitat assessment, management, and conservation

- VI. Human Impacts on Wildlife Habitat
 - A. Causes of habitat degradation, destruction, and fragmentation
 - B. Consequences of habitat degradation, destruction, and fragmentation

VII. Applications of Genetics in Wildlife Conservation

- A. The population gene pool
- B. Genetic variability, population size, and rates of extinction
- C. Species introductions and translocations
- D. Endangered species management
- E. Wildlife crime-solving (wildlife forensics)

VIII. Managing Fisheries and Wildlife Populations for Harvest

- A. Goals and objectives of harvest
- B. Possible effects of harvest on population growth
- C. Adaptive management

IX. Endangered Species Management

- A. The Endangered Species Act of 1973
- B. The listing process
- C. Reasons species become listed
- D. Management strategies

X. Managing for Biodiversity

- A. Genetic, species, and ecosystem diversity
- B. Species extinction rates
- C. How to manage for biodiversity

XI. Ecosystem Management

- A. Historical perspectives
- B. Objectives of ecosystem management
- C. Applications to wildlife conservation

XII. Special Problems Relating to Wildlife Conservation

- A. Exotic Species
- B. Predator Control
- C. Animal Damage



NOTES FOR INSTRUCTORS

Major topics for this course are arranged in a sequence that was convenient and logical from my viewpoint. This will certainly not be true for all others intending to teach such a course. A rearrangement of the ordering of these topics, or the inclusion of others not covered here, can be accomplished quite easily with minimal editing of existing content.

For each major topic, *Readings*, *Class Sessions*, and *References* are listed. A brief explanation of each of these is given below:

Readings: A listing of chapters that cover that particular topic in the text by Scalet, Flake, and Willis.

Class sessions: These are an approximate number of 50-minute class periods spent on that section.

References: Abbreviated citations are listed at the end of each topic. Complete citations for these are given in the *List of Recommended References* (at the end of this text). Most of these references are general in that they serve as a good introduction to the particular topic and include examples and references of a more specific nature.

NOTE: *For complete reference citations, see final pages of this packet.*



American-Indian Perspectives

A special section is included, developed by the Center's tribal partners. Also, available free of charge from the Center, is a publication titled, "American-Indian Perspectives: Nature, Natural Resources and Natural Resources Education."



Introduction to Wildlife and Fisheries Conservation

READINGS *and* CLASS SESSIONS

Scalet *et al.* (1996): Chapters 1, 18; 3 to 4 Class Sessions

Introduction to Wildlife and Fisheries Conservation

A. Course objectives and grading, etc.

B. Course Overview: content is roughly divided into five broad areas:

1. History, terminology, and professions
2. Social, economic, political, and legal issues relating to wildlife conservation and management
3. Human impacts on wildlife and habitat
4. Basic ecology and the science of wildlife conservation and management
5. The application of science and management principles to problems and issues

C. Terminology and Perspectives

NOTE: *Prior to this discussion, I ask students to write down their own definitions. I summarize the class results and this provides a nice lead-in to the topic.*

1. What is wildlife? Historical, legal, management, and conservation perspectives about wildlife.
2. What is meant by the term “management” with respect to wildlife?
3. What is “conservation?”
4. Compare and contrast the fields of conservation biology and wildlife management. To what degree do they overlap?

NOTE: *There are some other terms in Chap. 1 of Scalet et al. that can be briefly discussed to add to this topic.*

D. The Professions of Wildlife Management, Wildlife Conservation, Wildlife Ecology, Wildlife Biology, Fisheries, etc.

NOTE: *We discuss the wide range of jobs available. I bring in some recent job announcements. For areas of education specialization I use, as an example, Oregon State University's undergraduate and graduate catalog.*

1. Jobs and areas of specialization
2. What kind of education and course work is required to be wildlife professional?
3. How is the profession changing with respect to duties, responsibilities, and educational background? For example, see Munson-McGee and Thompson, 1995

E. The History of Wildlife Conservation and Management in the United States

NOTE: *As a foundation for this discussion, I use Shaw's (1985, chap. 1) treatment of the topic and include some other examples.*

1. Era of Abundance (1600–1849)
2. Era of Exploitation (1850–1899)
3. Era of Protection (1900–1929)
4. Era of Game Management (1930–1965)
5. Era of Environmental Management (1966–present)

F. Some Notable Conservationists

1. John Muir
2. Gifford Pinchot
3. Theodore Roosevelt
4. Aldo Leopold
5. J.N. "Ding" Darling

REFERENCES

Babbitt (1995); Bolen and Robinson (1995): Chaps. 1, 2, 3; Caughley and Sinclair (1994): Chap. 1; Cox (1997): Chaps. 1 and 2; Hunter (1990): Chap.1; Hunter (1996): Chaps. 1; Munson-McGee and Thompson (1995); Shaw (1995): Chap. 1



Attitudes and Perceptions About Wildlife and Human Management

READINGS *and* CLASS SESSIONS

Scalet *et al.* (1996): Chaps. 16, 17; 2 Class Sessions

Human Attitudes and Perceptions About Wildlife, and Human Management

A. Users of Wildlife

1. Direct vs. Indirect
2. Consumptive vs. Nonconsumptive

B. Human Values and Ethics Regarding Wildlife

1. Positive values
 - Recreational
 - Ecological
 - Educational/Scientific
 - Utilitarian
 - Esthetic
 - Economic/Commercial
2. Negative values
 - Disease transmission
 - Crop, livestock, property damage
3. Ethical considerations in wildlife and conservation
4. The importance of considering public attitudes, values, and beliefs to the successful implementation of wildlife management/conservation programs
5. The legal status of wildlife: *Who owns wildlife?*

- C. Assessing Public Attitudes and Perceptions Regarding Wildlife (see also Kellert)
- D. Human Management: Some General Purposes and Designs of Wildlife and Fishery Regulation

REFERENCES

Bolen and Robinson (1995): Chap. 22; Cox (1997): Chap. 28; Hunter (1996): Chaps. 15,16;
Kellert (1976); Kellert (1980); Perlman and Adelson (1997): Chap. 3; Primack (1993):
Chaps. 8,9.



Basic Ecological Concepts

READINGS *and* CLASS SESSIONS

Scalet *et al.* (1996) Chap. 2; 3-4 Class Sessions

Basic Ecological Concepts

A. What is “Ecology”?

NOTES: *I draw an animal on the chalkboard and ask the class to cite examples of factors that impact the population. I illustrate the effects of these factors with arrows. The chalkboard is soon filled with environmental factors and arrows. The points of this are to: 1) Illustrate the complexity and unpredictability of ecological interactions; 2) show the difficulty of attempting to understand all such interactions for a species; and 3) the role that careful science must play in assessing, predicting, and understanding the significance of such interactions.*

B. Some Biotic and Abiotic Factors that Affect Animal Populations

C. Levels of Ecological Organization: Individuals, Populations, Metapopulations, Communities, and Ecosystems

D. Biogeochemical/Nutrient Cycling Through Ecosystems

E. Energy Flow Through Ecosystems

1. Trophic levels: Producers, consumers, and decomposers
2. Food webs
3. Pyramids of energy and energy transfer
4. Effects of keystone species or ecological dominants (and their removal) on community structure

F. Ecological Succession

1. Species (and life history stages) tend to be adapted to seral stages

2. Early to mid-successional species

- ◆ tend to tolerate disturbance better than late successional species
- ◆ includes many game species
- ◆ includes many exotic species

3. Late successional species

- ◆ are less tolerant of disturbance
- ◆ includes many threatened and endangered species

4. Wildlife management may require manipulation of successional stages (e.g., by fire, grazing, planting, herbicides, logging practices, etc.)

G. Competition

1. Define
2. Contrast of interspecific and intraspecific competition
3. Examples of competition and resources competed for
4. Applied aspects of competition in management and conservation
 - a) exotic species introductions
 - b) competition among domesticated species and wildlife
 - c) endangered species management
 - d) alternation of competitive interactions when habitats are disturbed or modified

H. Predator/Prey Interactions

REFERENCES*

Bolen and Robinson (1995): Chap. 5; Cox (1997): Chap. 3; Hunter (1996): Chap. 12;

Primack (1993): Chap 2

* *See also any introductory ecology texts.*



Population Structure and Dynamics

READINGS *and* CLASS SESSIONS

Scalet *et al.* (1996) Chaps. 3, 9; 1 to 2 Class Sessions

Population Structure and Dynamics

A. Population Structure

1. Size, density, and spacing
2. Age structure
3. Sex ratio and mating system

B. Population Dynamics

1. Factors that influence population size and composition over time
 - a) Natality and recruitment as influenced by fecundity and age at first reproduction
 - b) Mortality and survivorship curves
 - c) Age structure
 - d) Effects of sex ratio on population growth
 - e) Dispersal
2. Characteristics of population growth
 - a) Exponential growth
 - b) Logistic growth and carrying capacity (K)
 - c) Density dependence and density independence

C. Population Estimation

1. Examples of techniques and under what circumstances they are useful
2. Trade-offs between accuracy and precision, and cost and effort

REFERENCES

Shaw (1985): Chaps. 3, 4; plus introductory ecology texts.



Wildlife Habitat

READINGS *and* CLASS SESSIONS

Scalet *et al.* (1996) Chaps. 12, 13; 2 Class Sessions

Wildlife Habitat

A. Components of Habitat Necessary to Sustain Wildlife

1. Food: Quantity and quality
2. Cover: From weather extremes and predators
3. Water: Quality and availability
4. Space: Home range, territoriality, body size, and other factors affecting space requirements

B. Habitat Sampling and Assessment

1. Reasons why habitat assessment is necessary in wildlife and fishery management
 - a) What will the habitat support in terms of species numbers, density?
 - b) In what ways is the habitat limiting to wildlife populations?
 - c) Why are species numbers increasing, decreasing?
 - d) What needs to be done to increase or decrease species numbers?
 - e) If the habitat is modified—what will the impact be on wildlife?
2. How is habitat assessed, and what is sampled and measured?
3. Habitat suitability index (HSI) models as developed by USWFS
4. Landscape-level Assessment
 - a) High altitude photography, satellite imagery
 - b) GIS
 - c) Gap Analysis

REFERENCES

Hunter (1996): Chap. 12; Oregon's Living Landscape (1998); Shaw (1985): Chap. 2



Human Impacts on Wildlife Habitat

READINGS *and* CLASS SESSIONS

Scalet *et al.* (1996) Chap. 14; 1 Class Session

Human Impacts on Wildlife Habitat

- A. Atmospheric
 - 1. Acid deposition
 - 2. Greenhouse gases and global warming
 - 3. Ozone depletion

- B. Water Pollution
 - 1. Waste from sewage, livestock
 - 2. Sedimentation
 - 3. Chemicals: industrial, agricultural

- C. Urbanization

- D. Agriculture

- E. Habitat Fragmentation

- F. Habitat degradation, the commons, and the takings issue

- G. Habitat Management

REFERENCES

Hunter (1996): Chaps. 8, 9; Primack (1993): Chap.6



Applications of Genetics in Wildlife Conservation

READINGS *and* CLASS SESSIONS

Scalet *et al.* (1996): Chap. 4; 2 Class Sessions

Applications of Genetics in Wildlife Conservation

A. Background in Population Genetics

1. Populations and gene pools
2. Environments selected for particular gene variants and gene combinations
3. Genetic variability/diversity within and among populations of a species

B. Some Applications

1. Species introductions, reintroductions, translocations, fish hatcheries
 - a) Compatibility between genetic background of source populations and the new environment
 - b) Precautions taken such that the genetic integrity of existing populations is not contaminated and hybridization is not an issue
 - c) Are numbers of breeding individuals and genetic variability sufficient?
2. Endangered species management and small population sizes
 - a) Relationship between population size and risk of extinction
 - b) Loss of genetic variability
 - c) Inbreeding and effects on:
 1. resistance to disease, parasites
 2. fertility
 3. offspring mortality
 4. population growth
 - d) Susceptibility to chance environmental/demographic changes
 - e) At what population size should a species receive protection?
 - f) Captive breeding programs
 - g) Recognition of distinct populations segments (DPS) and evolutionarily significant units (ESUs) by the Endangered Species Act

3. Protection of biodiversity
4. Wildlife crime solving, law enforcement
5. Tracking wildlife using DNA

REFERENCES

Cox (1997): Chap. 25; Hunter (1996): Chap. 5; Levy (1999); Primack (1993): Chap. 11;
Soule and Mills (1998)