



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)



Managing Fisheries and Wildlife Populations for Harvest

READINGS *and* CLASS SESSIONS

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

Managing Fisheries and Wildlife Populations for Harvest

A. Goals and Objectives

1. Harvest: Food and recreational
2. Management: Acceptably high yields and long term sustainability

B. Mortality from Harvest Can Be “Compensatory” or “Additive”

C. Harvest Can Increase the Growth Rate of a Population

1. Revisit the logistic growth model: Density dependence and inersivity
2. Maximum Sustained Yield (MSY)

D. How Should MSY be Applied?

1. Fixed quotas
2. Fixed harvest effort
3. Optimum sustained yield

E. Adaptive (Experimental) Management: A Science-Based Approach to Plan, Test, Monitor, and Modify Management Programs

REFERENCES

Caughley and Sinclair (1994): Chaps. 13, 16; Cox (1997): Chap. 24; Shaw (1985): Chap. 7



Endangered Species Management

READINGS *and* CLASS SESSIONS

Scalet *et al.* (1996): Chap. 11; 2-3 Class Sessions

Endangered Species Management

A. Legislation: *The Endangered Species Act of 1973*

1. Why was it enacted?
2. What species does it cover?
3. What is the extent of protection for listed species and their habitat?
4. Threatened versus endangered species
5. Authorities responsible for listing species: The U.S. Fish and Wildlife Service and National Marine Fisheries Service
6. How do species become listed?
 - a) A "Petition" is submitted.
 - b) Species becomes a candidate and is prioritized.
 - c) Species is proposed for listing; published in Federal Register.
 - d) Final ruling is made.
 - e) Recovery plan is developed and implemented.

B. Habitat Conservation Plans

C. The Extent to Which Endangered Species are Found on Private Lands as Opposed to Federal, State, and Tribal Lands

D. Most Common Reasons Species Become Listed

1. Habitat loss, destruction, and fragmentation
2. Exotic species introduction
3. Fire suppression
4. Pollution
5. Overexploitation

E. To What Extent Has the ESA been Successful at Bringing Back Species from the Brink of Extinction? Why has it not Been More Successful?

F. Management Strategies for Species Recovery

1. Active management (captive propagation, reintroduction and translocation, exotic species control, and predator control)
2. Habitat preservation
3. Habitat restoration
4. Species by species approach versus ecosystem management
5. The application of population viability analysis (PVA) and minimum viable population (MVP) size
6. What species characteristics make some more vulnerable to extinction than others?

REFERENCES

Allendorf et al. (1997); Bolen and Robinson (1995): Chap.19; Cox (1997): Chap. 26;
Hunter (1996): Chaps. 7, 14; Mann and Plummer (1999 b); Primack (1993): Chaps. 5, 12,
17, 18; Shaw (1985): Chap.8; Wilcove et al. (1998)



Managing for Biodiversity

READINGS *and* CLASS SESSIONS

Scalet et al. (1996): Chap.11; 2 Class Sessions

Managing for Biodiversity

A. Definition and Hierarchy of Levels

1. Genetic diversity
 - a) within a population
 - b) among different populations of a species
 - c) among different species
2. Species diversity
3. Community and ecosystem diversity

B. Biodiversity Hotspots and Estimates of Biodiversity

C. Extinction Rates of Species

1. Patterns of extinction and speciation throughout earth's history
2. Known species extinctions and rate at which these are increasing
3. Estimates of unknown species extinctions: Contrast with estimates of species population extinctions

D. The Use of Species-Area Relationships

1. To estimate rates of loss of biodiversity
2. To predict the number or percent of species that can be supported (or lost) in habitats of a particular size

E. Habitat Fragmentation and Biodiversity

1. Causes
2. Consequences to wildlife
 - a) Loss of Habitat
 - b) Limits placed on dispersal, colonization
 - c) Reduces and scatters resources
 - d) Results in small, distinct populations
 - e) Increases the amount of edge relative to interior habitat—"edge effects"

F. Management Applications

1. On a local scale
 - a) Environmental heterogeneity—physical and biotic
 - b) Resource abundance, variety, and distribution
 - c) Periodic disturbance, variety of successional stage
 - d) Intact, complex food webs
2. Setting aside preserves, protected areas, wilderness areas, national parks, and wildlife refuges
3. The science of designing preserves to maximize biodiversity
 - a) Size considerations
 - b) Shape and edge
 - c) Buffers
 - d) Corridors and connectivity
4. Indicator, umbrella, focal species
5. Ecosystem management

REFERENCES

Cox (1997): Chaps. 4, 5, 13, 27; Hunter (1990): Chaps. 4-8, Appendix 1; Hunter (1996): Chaps. 2, 3, 14; Primack (1993): Chaps 4, 14, 15



Ecosystem Management

READINGS *and* CLASS SESSIONS

Scalet et al. (1996): None; 1 Class Session

Ecosystem Management

- A. The Historical Evolution from the Single Species Management Approach to Ecosystem Management on Federal Lands
 1. Single species approaches: lack of success, inefficiency as listed species ballooned, unpopular
 2. ESA statement of purpose includes “ecosystem conservation”
 3. National Forest Management Act 1976
 4. Clinton Forest Plan 1993
 5. Adoption of ecosystem management by federal agencies (Forest Service, BLM, etc.)

- B. Description of Objectives of Ecosystem Management and Applications to Wildlife Conservation
 1. Practices and policies that maintain structure and function (integrity) of ecosystems
 2. Maintaining the “integrity” of ecosystems involves and intends to:
 - a) maintain viable populations of native species that are of particular interest
 - b) maintain viable populations of unknown species that are integral components of ecosystems (biodiversity)
 - c) maintain ecological processes
 - d) maintain a representation of natural ecosystem types and associated communities
 - e) manage large tracts of land over long periods of time
 - f) resource use and extraction must be sustainable, within the above constraints

REFERENCES

Carey and Curtis (1996); Grumbine (1997); Hunter (1996): Chap. 11; Shaw (1985):
Chap.8; *see also NCSR's Environmental Science I, II, and III.*



Special Problems Relating to Wildlife Conservation

READINGS *and* CLASS SESSIONS

Scalet et al (1996): Chap. 10; 1-2 Class Sessions

Special Problems Relating to Wildlife Conservation

A. Exotic Species

1. Extent of problem and impacts on wildlife and habitat
2. How exotics come to be introduced and reasons why they become successful
3. Legislation and methods of prevention and control

B. Predator Control

1. Reasons predators have been controlled or eliminated: historical and current
2. Impacts of predator removal on wildlife communities
3. Efforts to reintroduce predators
4. Public views and concerns

C. Animal Damage

1. Types of damage caused by wildlife
 - a) Property
 - b) Risk to human health and safety
 - c) Agriculture
 - d) To recovery efforts for endangered species
 - e) As a public nuisance
2. Who deals with these concerns? Role of federal and state agencies, including Animal Damage Control
3. Management options
 - a) Exclusion
 - b) Habitat modification
 - c) Population reduction
 - d) "Scare tactics"

REFERENCES

Bolen and Robinson (1995): Chap.9; Caughley and Sinclair (1994): Chap. 17; Cox (1997): Chaps. 14, 20; Hunter (1996): Chap.10; Primack (1993): Chap. 7; Shaw (1985): Chap.9



American-Indian Perspectives Wildlife

Produced by tribal partners of NCSR

Objectives

To provide socio-cultural-religious viewpoints while presenting background in political and legal aspects of American-Indian rights in relation to wildlife and wildlife resources.

To stimulate discussion and critical thinking, and to enhance students' understanding of biodiversity and wildlife issues.

INTRODUCTION

Instructors are encouraged to have the students read suggested materials, and information and description of laws that follows. This section provides brief background information and an overview of different laws, policies, and activities that have affected American-Indian rights and relationships with natural resources.

Students should read and discuss the following:

Views on wildlife and nature:

The quote from an old Teton Sioux (1911) in McLuhan's *Touch the Earth* (Page 18).

Legal views:

Jaimes, Annette. *The State of Native America*; Boston: South End Press, 1992: Chapter III. *Self-Determination and Subordination: The Past, Present, and Future of American Indian Governance*, by Rebecca Robbins; and Chapter V, *The Earth Is Our Mother: Struggles for American-Indian Land and Liberation in the Contemporary United States*, by Ward Churchill.

CULTURAL AND RELIGIOUS SIGNIFICANCE

There is ample evidence and documentation in the disciplines of history and anthropology to demonstrate the fact that American-Indian people had a holistic perspective, unique

understanding, and a special relationship with Nature; and particularly, with the ecosystems indigenous to their aboriginal territory. This perspective and relationship was based on a policy of reverence (Park 1936, Bean 1976, Lake-Thom, 1997), and American Indians lived with “their relations” under a system of natural laws.

The natural “law of reciprocity” was important in many Indian societies. It stated that one cannot take something from the land without its permission, and without giving something in return. As a result, American-Indian people offered tobacco, herbs, food, and sometimes even beads (a form of Indian money) in exchange for taking the life of a living thing (McLujan, 1971). For example, after taking the life of an animal, such as a deer or elk, a hunter would promise not to waste any part of its body.

Indian people also performed ceremonies and sacred dances as a way to give something back to Nature. Such activities offered prayer, and served as a form of thanks giving to both the Great Creator, and all of creation. It was through such beliefs, religious ceremonies, and spiritual practices that they sustained and managed their ecosystems and natural resources. They therefore lived in harmony with Nature and developed cultural systems that promoted balance—they did not perceive Nature as something to be conquered, tamed, or exploited.

Indians were critical and self-disciplined when it came to practicing conservation during times of drought, famine, and natural disasters. For example, they did not take all the berries, roots and plants, fish and game, or other food and subsistence sources during lean seasonal times. They always made sure that some of the resources were left and available for other creatures in the environment. They stored food and resources for anticipated hard times without depleting natural systems. Native people in general, including the local tribal groups, were very knowledgeable about diversity and all things in their ecosystem—the very essence of their survival depended upon it.

Quail, grouse, and ducks were primarily hunted as a supplemental food source, and the feathers were used in dance and ceremonial regalia. Smaller birds were highly prized for their feathers and not eaten. Larger predatory birds such as Ravens, Hawks, and Eagles were highly prized as sources of physical and spiritual powers, and feathers from these birds were used for making shafts on arrows.

The majority of smaller animals such as mink, otter, pine marten, fisher, raccoon, and bobcat were trapped, but not eaten; hides were tanned and used for arrow quivers and dance regalia. Larger animals such as deer and elk were considered a primary food source, while bear and mountain lion were not; often these larger animals were also considered sacred.

Deer and Elk were highly prized and were used for food, cooked fresh over a fire or boiled in watertight baskets. Strips of meat were often smoked and dried in a smokehouse with the use of alder or oak wood, and made into jerky. Hides were tanned by scraping them clean, washing them with a tanning solution made from soap root or alum root, and drying them. Then they were scraped and oiled into smoothness with Deer or Elk brains. Sometimes the hides were tanned with the hair remaining intact for blankets. Buckskin was used, of course, for clothing, moccasins, and ceremonial regalia. The sinew located in the backstrap and legs of the animal was used to make bow string and for sewing string on clothing and footgear. Tiny bones located on the bottom part of the animal's legs were used for needles in sewing; while other kinds of medium sized bones were used for awls and piercing instruments. The horns were used as tools, converted into weapons such as knives or knife handles, and were used in ceremonial regalia headdresses. Elk antlers in particular were used for making splitting mauls, or they were carved into money purses, or converted into tools for digging and pounding.

Coyote, Wolves, and Mountain lions were mainly used as power objects and ceremonial regalia. Some tribal groups ate mountain lion meat, others did not; none ate coyote or wolf. Tanned hides with the hair still on would be used for winter clothing, or as part of dance regalia.

SOCIAL, POLITICAL, AND LEGAL ASPECTS

At a conference in 1975 entitled *Natural Resources and American-Indian Culture* held at Humboldt State University (CA), an elderly Yurok medicine man spoke, making the following points regarding wildlife and ecosystems (paraphrased and rendered):

“Under the Great Creator’s Law, we (Indian people) have the right to hunt, to fish, to gather our foods, to gather our herbs, to use what you [Western culture] call natural resources; and we have the aboriginal and sovereign right to conduct our sacred dances and ceremonies. Without the use of the natural resources we cannot conduct our sacred dances, rituals, ceremonies, religion, or healing. We are dependent upon each other; we need the natural resources, and according to natural law, they need our prayers and ceremonies in order to live and grow. This aboriginal right was recognized and agreed upon by so-called treaties with the United States who claimed that man’s laws shall not be higher than God’s Laws.

“But since [Western culture/society] came to our land and environment, they have not honored the treaties made with Native tribes—they stole our land and natural resources, forced us to live on reservations and smaller portions of land called rancherias, and then they made up their own laws which in turn made us cede more land and natural resources. They made laws that forbid us to hunt, fish, or gather our foods and medicines. Year after

year they have tried to starve us off by stopping our traditional way of subsistence. They even made laws and arrested us for doing our religious ceremonies. Now they arrest our people if we hunt, fish, gather materials, or even pray at ancient sacred sites that are considered off the reservation.

“In the meantime, they have logged all the forests, destroyed most of the plants and herbs, polluted the creeks and rivers, killed all the fish and their spawning grounds; and almost wiped out the birds and animals. They have violated the natural laws and the Great Creator’s Laws ... I would suggest that [Western culture/people] start by following the natural laws, and by keeping your honor with the rights and laws you made with our Indian people, and use your education and technology to clean up your mess.... Your problem is now with the Great Creator—He is the One who created Nature, the Earth, and what you now call ‘natural resources.’”

The situation involving Native Americans and natural resources is very complex; the subject matter is too extensive to cover in a short period of time. There is, however, some basic information that can be shared to increase your sensitivity and awareness of this complexity. Long before the beginning of the U.S. republic, control of land and the resources within it was a source of conflict between the Euro-Americans and indigenous nations. In fact, going back a few hundred years in history, one can find evidence in both the Articles of Confederation and the Constitution of the United States certain clauses that dealt specifically with the Native tribes/nations and their land base territories. Tribes were recognized as foreign powers to the federal government. The 1789 *Northwest Ordinance* clearly states:

“The utmost good faith shall always be observed towards the Indian; their land property shall never be taken from them without their consent; and in their property, rights, and liberty, they shall never be invaded or disturbed—but laws founded in justice and humanity shall from time to time be made, for wrongs being done to them, and for preserving peace and friendship with them.”

As a consequence, U.S. relations with Native Nations were legally restricted in precisely the same way that relations with European countries, to the level of interchange between the federal executive and various indigenous governments. It was essentially a government to government relationship reflected in the 370 plus treaties made with Indian tribes/nations (mainly between the years 1778 and 1871). Unfortunately for indigenous people, the majority of those treaties were not honored by the U.S. government, as demonstrated by the U.S. Senate in many efforts to overturn them.

The following pages describe various pieces of legislation that define the relationship between the U.S. government and American Indians. They may be used as handouts for students.

Laws Pertaining to Indian/U.S. Relations

Northwest Ordinance (1789)

The utmost good faith concept establishing government to government relationships.

Trade and Intercourse Acts (1790-1834)

This law was very vague but basically provided the federal government with a means to enforce regulatory authority over its citizens in their relationship with Native Nations.

Indian Removal Act (1830)

Came about as a policy under Andrew Jackson to remove the “Five Civilized Tribes”: Creek, Cherokee, Choctaw, Chickasaw, Seminole, and scores of other Indian nations, by taking the majority of their aboriginal land and rights. This Act initiated the famous “Trail of Tears,” whereby thousands of Cherokees died in what became a long death march and relocation to Oklahoma territory (although some escaped and relocated elsewhere).

Suspension of Treaty-Making (1871)

Gave the government (and large corporations) more leverage to confiscate Indian lands that it had been occupying, enacting federal policy whereby: “No Indian nation or tribe within the territory of the United States shall henceforth be recognized as an independent nation, tribe, or power with whom the United States may contract by treaty....”

Major Crimes Act (1885)

Prior to this Act’s enactment, it was considered that Native nations and tribes had sovereignty and jurisdiction over their own affairs within their own boundaries. This Act provided the United States, for the first time, unilateral extension of its jurisdiction over Native-American territories.

General Allotment Act (1887)

Commonly known in history as the “Dawes Act,” served to break up Indian traditional systems of collective land tenure and ownership. It also served to define “who” was an Indian, according to blood quantum (noted as “degree”), and it divided reservation lands, assigning larger portions of land to tribal members who had more “degree”, and lesser portions of land to those who had less degree. Leftover lands went to non-Indian homesteaders, corporations, or was portioned into National Parks or U.S. Forest Service lands.

Due to this Act, between 1887 and 1934, Indians lost over 100 million acres of reservation land. It is blamed as the fundamental cause of conflicts that arose between “traditional Indians” and government agencies over use and access to natural resources, as it related to “hunting, fishing, and gathering rights.”

Indian Citizenship Act (1924)

This was basically a form of ethnic cleansing, according to some tribal leaders today. For all Indians excluded or missed by the General Allotment Act, this Act conferred U.S. citizenship to all non-citizen Indians born within the territorial limits of the country. (Some Indian nations such as the Hopi and Onondaga refused to accept it.)

Indian Reorganization Act (1934)

Also known as the famous “Wheeler-Howard Act,” it was imposed upon Native nations to supplant traditional forms of indigenous governance in favor of a tribal council structure modeled after corporate boards. This Act probably laid the foundation for fostering inter-tribal, inter-reservation conflict between “traditionalists” and “progressives” (the latter interpreted as “assimilated”).

Indian Claims Commission Act (1946)

Ostensibly designed to settle Indian claims and to compensate them for the lands that were stolen, beguiled, and confiscated, awards were usually established on the basis of the estimated price per acre at the time it was confiscated (usually a century earlier), and not at what it was worth today. Though designed to right injustices, it essentially served to strengthen the Government’s and large corporations’ legitimacy over land acquisitions from tribes. For example, in California, Oregon, and Washington, most tribes and tribal members were granted only \$.47 an acre; the average payment received approximately \$600.00 per member. And those who took the payment generally had no idea that they had forfeited their aboriginal rights in the process.

** Termination Act (1953)*

Commonly referred to as “House Concurrent Resolution 108,” this Act actually and unilaterally dissolved certain Native nations and Indian tribes. For example, “termination” meant suspension of federal services to and recognition of the existence of certain Indians, who were previously tribally documented as tribal members, and most of whom had allotted lands. A total of 109 Native nations/tribes were terminated. Those affected were living in poverty, uneducated, and were in a state of confusion as to their status as Indians and their sovereign rights, and their land often became taxed by the state agencies and hence confiscated; or sold by Indian individuals in need of money to survive.

** Public Law 280 (1954)*

Enacted on August 15, 1953, it is the only federal law that extends state jurisdiction to Indian reservations generally. According to a Congressional report that accompanied the act, it was designed merely to help tribes control reservation crime. However, the Act is so broad that Congress clearly had other motives for passing it—in addition to the stated purpose of the Act, Congress wanted to reduce federal expenditures to Indians and foster the assimilation of Indians by giving the state greater power on Indian reservations. “Without question,” the Supreme Court said in 1979, P.L. 83-280 reflects “the general assimilationist policy followed by Congress from the early 1950’s through the late 1960’s.”

Most Indian tribes strongly opposed P.L. 83-280 at the time of its passage. Afterward, tribes continued to be concerned, and in response, Congress amended P.L. 83-280 in two significant respects in 1968. First, congress placed a tribal consent requirement in the law. A state can no longer obtain any P.L. 83-280 jurisdiction over a tribe unless a majority of the tribe’s members, voting in a special election called for this purpose, gives its consent. Second, the 1968 amendments authorize the United States to accept a “retrocession” (a return) of any jurisdiction previously acquired by a state under P.L. 83-280.

** Relocation Act (1956)*

Provided funding to create job training centers in a number of large cities such as San Francisco, Los Angeles, Minneapolis, and Seattle. The Act was designed to help the Indians by enticing them with travel relocation expenses for individuals or entire families to be relocated from reservations to metropolitan areas. A “catch clause, however, was the fact that American-Indian people signed contracts stating they would not return to the reservation to live. By 1980, over a million and a half Indians had been relocated, often forced to live in poverty while trying to adapt to urban conditions and lifestyles.

** The years between 1953 and 1968 are known as the “termination era” in federal Indian history. During this period, Congress tried to destroy certain Indian tribes (Termination Act), force Indians to assimilate into white culture (Relocation Act), and reducing Government assistance to Indians (P.L.83-280).*

Indian Civil Rights Act (1968)

What would become a very controversial Act whereby Indian governments became a part of the federal system, some Indian leaders claim that it only served to take away their sovereignty—rather than to protect their basic rights, as it was intended. The Indian Civil Rights Act often raised the question of dual citizenship: Are they citizens of the USA or citizens of an Indian nation? Of what value was it to urban Indians?—some of who were enrolled in a tribe, or not enrolled, or from tribes that were terminated.

Alaska Native Claims Settlement Act (1971)

Alaska Native nations were dissolved by congressional fiat, incorporated into the U.S. polity, and their 40-plus million acres of property, including timber and other resources such as oil, were converted into domestic assets. Thus, no reservation systems were created, with no trustee relationships, and no accommodations were made for or recognition was paid to aboriginal rights (as in the cases of hunting, fishing, and gathering).

Indian Self-Determination and Educational Assistance Act (1975)

Though problematic in certain ways, this Act provided Native-American people the recognition and right to determine their own needs with the Federal Government and within their own tribal governmental affairs, with a minimum of Government supervision, including control of the Bureau of Indian Affairs. It also designated grant funds to administer and improve Indian education both on and off the reservation.

Indian Child Welfare Act (1975)

Transferred the care of Native children back into the authority and supervision of Native nations; hence removing a century old government policy of forcibly and systematically transferring the care of Native children to non-Indians (through maintenance of a compulsory boarding school system and wholesale adoptions); established for the first time specific procedures for adoption and foster care placement of Indian children.

American Indian Religious Freedom Act (1978)

Designed to protect and preserve the inherent rights of religious freedom of American Indians,

Alaska Natives, and Native Hawaiians, the Act lacks appropriate enforcement provisions in regards to Native spiritual rights, activities, and traditions. It may relate to hunting, fishing, and gathering activities, and/or the procurement and use of wildlife, in relation to ritual, ceremony, and healing—but these have yet to be defined.

QUESTIONS/DISCUSSION

1. Historical facts and documentation via a system of different federal policies, acts, and laws have either removed American-Indian people from their “aboriginal territory” or placed them on significantly smaller parcels of land bases called reservations and rancherias. As a consequence, what rights do they now have to hunt, fish, and gather their foods, gather their resources, and manage sustainable resources on the reservation? Do Indians have the right to hunt, fish, and gather their foods and cultural materials off the reservation and/or rancheria? If so, why?

[NOTES: There are several factors to consider here involving the management of sustainable resources, wildlife, biodiversity, and ecosystems. For example, it should be noted that existing land bases are too small to support Native peoples’ needs and aboriginal rights. Consequently, their needs will have to met off the reservation and ranchiera boundaries—in areas historically known as their aboriginal territory.]

2. If American-Indian people are permitted (via agreements with governmental agencies and private land owners such as corporations) to have access to and use of wildlife and natural resources off the reservation and/or rancheria, then what kind of impact will this have upon the sustainable resources?
3. What kinds of cooperative and collaborative efforts are presently being made between Indians and government agencies regarding natural resource management on federal and public lands?

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Suggested Films

“Sacred Ground,” narrated by actor Cliff Robertson (contact Educational Video Network, Inc. 1401-19th Street, Huntsville, TX. 77340 (phone: 409-295-5767)

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Writing Assignments

1. **Internet Search.** Students conduct an Internet search of various governmental agencies and private organizations that are involved in some way with wildlife conservation. Students summarize the agency's mission and objectives and various other aspects relating to the activities of the organization. The assignment is worth 30 points.
2. **Endangered Species.** Students select a species that is currently listed as endangered and research a variety of information concerning when and why the species was listed, causes of decline, recovery plan, human impacts of listing, etc. The assignment is worth 50 points.
3. **Sand County Almanac.** Students write an essay about Aldo Leopold's *A Sand County Almanac*. Emphasis is on Leopold's "Land Ethic." The assignment is worth 50 points.

#1: Internet Search Assignment (30 points)

For this assignment, you will do some background research on governmental agencies and private organizations that are involved with some aspect of wildlife conservation. You will then type a report based upon your findings. Your report should include the following information:

- ◆ When the organization or agency was established
- ◆ Why it was initially established
- ◆ A description of its mission and objectives
- ◆ An explanation of how its mission relates, directly or indirectly, to wildlife conservation and management
- ◆ A description of its major programs, projects, and activities
- ◆ Organization/agency's sources of funding
- ◆ Any other information you consider to be relevant
- ◆ A complete bibliography of references you used to obtain this information

You should obtain the above information off the Internet web sites for each organization. Choose one organization from List I and one from List II. Include in your report all of the above information for these two organizations. For each of the remaining organizations listed below you are to give a brief description of its mission and objectives.

The report is to be typewritten and double spaced. Spelling, grammar, organization, and clarity will be graded along with content. Your work should be independently conducted and in your own words (do not copy information verbatim from the web sites!). The information listed above is to be blended and incorporated together into a cohesive report. In other words, do not separately list the information for each of the bullets above as if you were answering a series of discrete questions. There is no limitation as to length, however, I cannot imagine anything less than a complete page for each of the two organizations you choose. If you have a burning desire to report on an agency or organization that is not on the list, see instructor for approval.

List I

Biological Resources Division (National Biological Service) of the USGS
Bureau of Land Management
National Fish and Wildlife Forensic Laboratory
National Marine Fisheries Service
National Wildlife Refuge System
Oregon Department of Fish and Wildlife
USDA Forest Service
U.S. Fish and Wildlife Service

List II

CITES—Convention on International Trade of Endangered Species of Wild Fauna and Flora
IUCN-World Conservation Union
National Wildlife Federation
The Nature Conservancy
World Conservation Monitoring Centre
The World Wildlife Fund

#2: Endangered Species Research Assignment (50 points)

For this assignment you will become acquainted with the process involved in listing a species as endangered and the problems associated with protection and recovery of endangered species. You are to select an animal species that is currently listed as endangered by the U.S. Fish and Wildlife Service. You can obtain an up-to-date listing on the Internet. Select a species that interests you, but keep in mind that some species will have an abundance of information that is readily accessible, others will not. Do a preliminary search before you make your final decision.

Your report should include the following information:

- ◆ General information about the species: past and present distribution, ecological requirements, life history, home range and space requirements, etc.
- ◆ According to the Endangered Species Act, what defines a “threatened” species and an “endangered” species?
- ◆ When and why was the species listed as endangered?
- ◆ What were the known and suspected causes of decline of the species? Be specific.
- ◆ At the time of listing, what was the distribution and abundance of the species? How does that compare with its current distribution and abundance?
- ◆ Does the USFWS have a Recovery Plan for the species? What are the main elements of that plan?
- ◆ How long has the recovery plan been in place? How successful has the recovery plan, and other conservation efforts, been? If efforts to protect and recover the species have failed up to now, why do you think that is so?
- ◆ Has the listing of this species had a human impact (economic, social, political, or otherwise)? In what ways?
- ◆ In your opinion, are the efforts and costs to protect and recover this species justified? What positive values are involved in saving this species?
- ◆ A complete bibliography of references you used to obtain this information.

Your report is to be typewritten and double spaced. Spelling, grammar, organization, and clarity will be graded along with content. You should begin now to collect information from a variety of sources to address the questions above.

#3: *A Sand County Almanac* Assignment (50 points)

This assignment is to write an essay about Aldo Leopold's *A Sand County Almanac*. More specifically, the essay should be about Leopold's Land Ethic. I will leave it up to you which direction you pursue in your paper, but at the very least you should address the following questions and issues:

- ◆ Describe Leopold's Land Ethic concept. What is his message? What does the concept mean to you?
- ◆ The Land Ethic concept evolved over a number of years and stemmed from Leopold's personal experiences, some of which are described in *A Sand County Almanac*. What kinds of experiences molded his thinking in this area?
- ◆ Do you consider the Land Ethic to be a useful or necessary concept? Is it practical? Does it have relevance to today's issues involving wildlife conservation and management? Give an example of the application of the land ethic to an issue/problem concerning wildlife conservation.
- ◆ Is the Land Ethic currently being practiced in the U.S. today? Do you foresee that it will ever receive widespread acceptance in the U.S. or elsewhere? Why or why not?



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Internet Resources

The following is an alphabetical listing of Internet sites that contain information and links about many current aspects of wildlife conservation and management. Many contain information directly related to topics we will be discussing in class and are excellent sources of supplemental information not found in your text. Also, you will find many of the sites to be good resources for your essay topics. Explore and have fun!

NOTE: Remember to preface each address below with **http://**

<u>Internet Site</u>	<u>Internet Address</u>
Amazing Environmental Org. Web Directory	www.webdirectory.com/
The American Fisheries Society	www.esd.ornl.gov/societies/AFS/
Biological Resources Division (National Biological Service of the USGS)	www.nbs.gov/
Bureau of Indian Affairs	www.doi.gov/bureau-indian-affairs.html
Bureau of Land Management (BLM)—Oregon/Washington	www.or.blm.gov/
Bureau of Reclamation	www.usbr.gov/main/
<i>Conservation Ecology</i> —an electronic journal	www.consecol.org/Journal/

Convention on International Trade of Endangered Species of
Wild Fauna and Flora (CITES) www.wcmc.org.uk:80/CITES/english/index.html

The Ecological Society of America (ESA) esa.sdsc.edu/

Endangered Species Bulletin, USFWS www.fws.gov/~r9endspp/bulinfo.html

Endangered Species Update www.umich.edu/~esupdate/

Fisheries Department of the Food and Agricultural
Organization of the United Nations
www.fao.org/waicent/faoinfo/fishery/fishery.htm

Forest and Rangeland Ecosystem Science Center www.fsl.orst.edu:80/nbs/index.htm

GAP Analysis Program: A Geographic Approach to
Protection of Biological Diversity www.gap.uidaho.edu/GAP/main.htm

H. J. Andrews Experimental Forest www.fsl.orst.edu:80/lterhome.html

International Association of Fish and Wildlife Agencies
www.gorp.com/teamww/iafwa.htm

IUCN (World Conservation Union) www.iucn.org/info_and_news/index.html

LinxNet U.S. Government Index--Agencies,
Policies and Laws www.linxnet.com/gov.html

Long-Term Ecological Research (LTER) program lternet.edu/

National Association of University Fisheries
and Wildlife Programs www.ag.iastate.edu/departments/aecl/naufwp/

National Center for Ecological Analysis and Synthesis (NCEAS)	www.ceas.ucsb.edu/fmt/doc?/frames.html
National Fish and Wildlife Forensic Laboratory Ashland, Oregon	toltecs.lab.r1.fws.gov/lab/labweb/labstart.htm
National Marine Fisheries Service (NMFS or NOAA Fisheries)	kingfish.ssp.nmfs.gov/
National Park Service	www.nps.gov/
National Wildlife Federation	www.nwf.org/nwf/National
Wildlife Refuge System	bluegoose.arw.r9.fws.gov/
Natural Resources Conservation Service of USDA	www.nrcs.usda.gov/
The Nature Conservancy	www.tnc.org
Northwest Center for Sustainable Resources (NCSR)	www.ncsr.org
Oregon Department of Fish and Wildlife (ODFW)	www.dfw.state.or.us
Oregon Department of Forestry (ODF)	www.odf.state.or.us/
The Oregon Natural Heritage Program	www.abi.org/nhp/us/or/
Society for Conservation Biology	conbio.rice.edu/scb/
USDA Forest Service	www.fs.fed.us/
United States Department of the Interior	www.doi.gov/

United States Environmental Protection Agency (EPA) www.epa.gov/

United States Fish and Wildlife Service (USFWS) www.fws.gov/

USFWS Endangered Species www.fws.gov/~r9endspp/endspp.html

USFWS Fish and Wildlife Laws, Regulations,
Policies, and Congressional Information www.fws.gov/laws/index.html

The Wildlands Project www.wildlandsproject.org/index.shtml

The Wildlife Society www.wildlife.org/index.html

The World Conservation Monitoring Centre (WCMC) www.wcmc.org.uk/

World Resources Institute www.wri.org/index.html

The World Wildlife Fund www.wwf.org/

Sample Exam #1

(114 points)

Multiple Choice (2 points each). Choose and circle the letter of the *one best* answer.

1. This field of biology has been referred to as a crisis discipline:
 - a. wildlife management
 - b. ecology
 - c. conservation biology
 - d. fisheries biology
 - e. animal genetics

2. According to surveys, the professional wildlife biologist of today uses and applies _____ more than any other skills he or she was trained in:
 - a. in-depth knowledge about specific endangered species
 - b. athletic/endurance skills for hiking in the field
 - c. basic science skills like biology, chemistry
 - d. effective communication and people skills
 - e. knowledge about international policy, laws regarding wildlife

3. In the latter half of the 19th century, one of the most severe impacts on wildlife populations (for example birds) that was responsible for many of the species declines was:
 - a. market hunting and trapping.
 - b. sport hunting.
 - c. livestock grazing.
 - d. forest harvest.
 - e. pollution.

4. When it comes to saving one of the endangered species listed below, the public is most likely to show the greatest support for a:
 - a. wildflower.
 - b. snail.
 - c. hawk.
 - d. salamander.
 - e. beetle.
 - f. sucker (fish).

5. The best explanation for why a diagram of energy flow through trophic levels of an ecosystem is shaped like a pyramid is:
 - a. Organisms at each level store most of the energy and pass little on.
 - b. Secondary consumers are larger than primary consumers and so on.
 - c. Organisms die as they get older.
 - d. Most energy is lost or used at each level, leaving little for the next.
 - e. There are more producers than primary consumers, and so on.

6. When goats were introduced to an island off the California coast, the goats lived in the same areas and ate the same plants as the native deer. The deer population dwindled (and finally disappeared). This is an example of:
- primary succession.
 - competition.
 - predation.
 - secondary succession.
 - keystone predation.
7. A conservation biologist is typically most interested in:
- sustainable management of game species.
 - cleaning up the environment.
 - protecting biodiversity.
 - banning hunting and human exploitation of wildlife.
8. _____ was responsible for establishing many national parks, setting aside millions of acres of national forest, and establishing the first wildlife refuge.
- Gifford Pinchot
 - Aldo Leopold
 - Ronald Reagan
 - Theodore Roosevelt
9. Surveys have shown that _____ is one of the best predictors of a person's attitude and knowledge about wildlife.
- gender
 - age
 - religion
 - education
 - ethnic background
10. An organism's trophic level refers to:
- the habitat it lives in.
 - the rate at which it uses energy.
 - what it eats.
 - the successional stage it lives in.
11. The decline or elimination of a keystone species from a community will potentially:
- help to stabilize and prevent change in the community.
 - increase the energy and nutrient flow through the system.
 - increase primary production of the community.
 - disrupt community structure, stability, and species diversity.
12. On average, about _____ of energy entering a trophic level is available to the next level.
- 1%
 - 10%
 - 30%
 - 50%
 - 75%

13. Which of the following would not be an important part of one's academic training in wildlife science or wildlife management?
- a. physiology
 - b. ecology
 - c. communication, interpersonal skills
 - d. math, statistics
 - e. sociology
 - f. all of the above would be important.
14. Historically, when agriculture was first developed, it began to negatively impact wildlife populations in all of the following ways except:
- a. clearing of forests.
 - b. draining swamps and wetlands.
 - c. predator removal.
 - d. application of fertilizers and pesticides.
15. The devastating decline of bison, and the extinction of the passenger pigeon were particularly shocking events because:
- a. individuals of each species had such high reproductive output.
 - b. the population sizes of each were originally so huge.
 - c. the hunting pressure on each was not very severe.
 - d. each received endangered species protection before populations declined very much.
16. Which of the following is most complex?
- a. community
 - b. individual
 - c. species
 - d. ecosystem
 - e. population
17. A community is made up of:
- a. different kinds of living organisms.
 - b. living organisms and their nonliving environment.
 - c. ecosystems.
 - d. only the nonliving environment.
18. Generally speaking, as succession advances through time, ecosystems tend to:
- a. become less stable.
 - b. become more complex.
 - c. become less diverse.
 - d. change more rapidly.

19. Aside from human impacts, the main reason that top predators are rare in natural undisturbed ecosystems has mostly to do with:
- their large, defended territories.
 - their generally anti-social nature.
 - the particularly intense competition that exists with other predators in the ecosystem.
 - the fact that they are large-bodied.
 - the amount of energy available to them in the ecosystem.
20. Almost half of the budget of the _____ Department of Fish and Wildlife comes from Federal funds. Most of the remainder comes from:
- hunting and angling licenses.
 - state income taxes.
 - private donations, like the nongame tax refund checkoff.
 - gasoline taxes.
21. How would you describe the current level of funding for nongame wildlife programs in _____ and other states?
- adequate
 - greater than that for game species
 - excessive relative to needs
 - underfunded
22. All of the following are attitudes about wildlife that were assessed by Kellert except:
- utilitarian.
 - moralistic.
 - socialistic.
 - ecologistic.
 - dominionistic.
23. In recent years, a changing emphasis in wildlife management and conservation has been toward:
- game as opposed to nongame.
 - ecosystem level processes as opposed to individual species.
 - harvest as opposed to protection.
 - a species by species approach as opposed to a community/ecosystem approach.
24. Dietary and energetic requirements of animals can vary with:
- age.
 - sex.
 - season.
 - reproductive condition.
 - all of the above.

25. The primary consumers in a community are the:
- a. herbivores.
 - b. carnivores that feed on herbivores.
 - c. plants.
 - d. carnivores that feed on other carnivores.

26. In polygynous species, where one male can mate with multiple females, the highest reproductive rates are in those populations with a:

- a. female-biased sex ratio.
- b. male-biased sex ratio.
- c. an even, 1:1 sex ratio.

27. In the United States, the legal ownership of wildlife resides with the:

- a. federal government.
- b. states.
- c. public as a whole.
- d. private landowner.

28. Complete the sentences below (1 point each)

The professional forester who promoted sustainable forestry and coined the term "conservation" was _____.

Moral standards of human conduct based on beliefs about what is right or just describes what we would call _____.

The scientific study of interactions between organisms and their environment is the discipline of _____.

The sequence of change in structure and species composition that ecosystems undergo through time is called _____.

With respect to recreational uses of wildlife, recent surveys by the U.S. Fish and Wildlife Service show that _____ (nonconsumptive use or consumptive uses like hunting) are highest and increasing faster in terms of money spent by users.

An association of interacting populations of different species that occupy a particular area is termed a(an) _____.

A professional wildlife biologist/manager would likely define "wildlife" as _____, whereas a conservation biologist is more likely to view wildlife as _____.

The "father" of modern wildlife management is considered to be _____.

With respect to early, mid, and late successional stages of ecosystems, most game species tend to be _____ and many endangered species tend to be _____.

A computerized mapping technique in which such factors as habitat, species distributions, and socioeconomic can be analyzed is called _____.

A measure of birth rate that estimates the number of births per female in a population is termed _____.

If a population of 100 elk declines to 70 elk in one year, its mortality rate is _____%.

29. The list below includes some important legislative events in this history of American wildlife conservation. Match the descriptions with the appropriate event (letters below). (8 points)

- _____ Dingell-Johnson Act (1950)
- _____ Migratory Bird Treaty Act (1918)
- _____ Endangered Species Act (1973)
- _____ Lacey Act (1900)
- _____ National Environmental Policy Act (1969)
- _____ Pittman-Robertson Act (1937)
- _____ Migratory Bird Hunting Stamp Act (1934)
- _____ Multi-Use Sustained Yield Act (1960)

- A. Prohibited transportation of illegally killed game across state lines.
- B. Levied a tax on sales of sporting arms and ammunition which generated funds for wildlife research, restoration, etc.
- C. Established cooperation between the U.S. and Canada for protecting migrant birds.
- D. Required waterfowl hunters to purchase a stamp annually. Funds used to purchase and maintain habitat.
- E. Required U.S. Forest Service to manage national forests for resources in addition to timber and pulpwood.
- F. Tax placed on fishing tackle to fund fisheries habitat and management.
- G. Mandated that all federal agencies respond to the same environmental policy, required preparation of Environmental Impact Statements on all federally assisted projects.
- H. Authorized enforcement and protection of species in severe decline.

30. Write brief, complete answers to each of the questions below in the spaces provided.

In class, we divided up American wildlife conservation history into five eras. The eras are listed below, out of sequence. Place a number (1 through 5) in the blank next to each that will place the eras in the correct chronological order from oldest (1) to most recent (5). *Also*, in the space below each era write a brief description about the main wildlife related issues of that era. (10 points)

_____ Era of Overexploitation

_____ Era of Environmental Management

_____ Era of Protection

_____ Era of Abundance

_____ Era of Game Management

31. Give three examples of nonconsumptive uses of wildlife. (3 points)

32. The four key habitat components discussed in class that are necessary to sustain wildlife are: (4 points)

33. Wildlife conservation and management as it is applied today (particularly on state and federal lands) has a much broader mission than it had in the past. Explain. (3 points)

34. In class, we listed at least nine categories of wildlife values. Briefly describe three positive values, and two negative values of wildlife. (5 points)

35. Define the two terms below. (2 points)

Population:

Ecosystem:

36. For most of this century, conservation was about managing a limited range of natural resources, including fish and game, that were useful economically to humans. Since the 1970's, that meaning has changed. Describe how it has changed. (2 points)

37. In class, we discussed two examples of natural resource ethics. One was Gifford Pinchot's Progressive-Utilitarian Conservation Ethic and the second was Aldo Leopold's Evolutionary-Ecological Land Ethic. *Choose one* of these and describe briefly what it is about. (2 points)

38. In the example discussed in class, when killer whales off Alaska switched from preying upon seals and sea lions to sea otters, unexpected consequences were seen throughout near-shore marine communities. Explain. (2 points)
39. List two situations where competition between species is likely to become an issue in wildlife management. (2 points)
40. Give two specific examples of wildlife cover. (2 points)
41. List three sources of habitat degradation/destruction that have had significant impacts on wildlife populations. (3 points)