AG. 520 ECOLOGY\NATURAL RESOURCE SCIENCE

COURSE DESCRIPTION: A course designed to teach the concepts of conservation, natural resources, ecology, and fish/wildlife science.

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TOTAL MINUTES	4,230

A. Our Natural Resources Then and Now

1. Define terms associated with natural resources
2. Define and discuss the concept of natural resources
3. List and describe the major categories of natural resources in America
4. Explain what makes something a natural resource
5. Explain why nature's resources once seemed limitless, and why this is no longer true
6. Describe how the usefulness of a natural resource change over time, and what factors most effect their usefulness
7. Indicate the land area of the United States, how much is suitable for farming, and how much is suitable for crop production
8. Explain why there is a water shortage problem in this country
9. Indicate how many species of wild animals, birds, and fish have become extinct in this country since colonial times
10. Indicated what the forested area of this country was 300 years ago, what it is today, and explain how it can be that our smaller forest area produces more wood today
11. Explain what the direct or indirect source of most of our energy resources is
12. List our key mineral resources and what their known reserves are

B. A History of Conservation in the United States

1. Define terms associated with conservation history
2. Compare exploitation, conservation, and preservation as they related to natural resources management
3. Outline the history of conservation in the United States
4. Describe the role of the federal government in conservation
5. Explain why Americans have had such wasteful practices in using our natural resources in the past
6. Explain what would have happened to our fish and game animal populations if sport hunters and fisherman had not fought market hunters
7. Indicate who pays for wildlife conservation in this country
8. Explain the Weeks Law of 1911, and why it was important
9. Explain the concept of a soil and water conservation district, and how it works
10. Explain how the federal government helped local farmers and other landowners work to solve their soil and water conservation problems
11. Explain why soil and water conservation is a federal concern
12. List the three needs that early water management efforts in America centered around

C. Principles of Ecology: Ecosystem Structure

1. Define ecology and explain its subdivision structure
2. List the characteristics of all living organisms, and describe the term irritability. Give examples of irritability
3. Describe the process of evolution including the concepts of natural selection and adaption
4. Explain how genetic change could result in the major changes that occur in evolution and what role the environment plays in evolution
5. Define the term biosphere and explain why the biosphere is considered a closed system naming some closed systems
6. Define the term biome and explain what determines the type of vegetation in a biome
7. Define the term ecosystem and explain some common features of all ecosystems
8. Describe the abiotic components of the ecosystem and how these factors affect plant and animal life
9. Discuss the concept "range of tolerance"
10. Explain a limiting factor and tell what the limiting factor is in most terrestrial ecosystems
11. Discuss the terms niche and habitat
12. Discuss the statement: no two organisms can occupy the same niche in the same habitat
13. Explain an ecological equivalent and give an example

D. Principles of Ecology: Ecosystem Function

1. Explain a food chain, discussing the two major types of food chains, how they are different and how they are similar
2. Sketch several simple food chains and indicate all producers and consumers
3. Explain microconsumers and why they are important
4. Explain biomass and how it is measured
5. Discuss why biomass decreases as we ascend the food chain
6. Define the following terms: consumer, producer, trophic level and food web
7. Explain cellular respiration and why carbon dioxide is released during respiration in producers and consumers
8. Explain the implications of decreasing biomass in the food chain and how this affects the number of higher-level consumers
9. Define the terms gross primary productivity and net primary productivity, explaining the most productive regions of the earth and why or why not these can be tapped for food
10. Draw the carbon cycle, and describe what happens during the various parts of the cycle
11. Draw the nitrogen cycle and list organisms that fix atmospheric nitrogen and why this is critical to the operation of the nitrogen cycle
12. Draw and describe the phosphorus cycle

13. Define the following terms: predation, commensalism, mutualism, neutralism and competition, comparing them for similarities and differences

E. Principles of Ecology: Ecosystem Balance and Imbalance

1. Describe ecosystem stability and give examples of stable ecosystems
2. If you were to examine a mature ecosystem over the course of 30 years at the same time each year, discuss why you would expect the number of species in the ecosystem and the population size of each of these species to be the same from year to year or not
3. Define inertia and resilience
4. Explain environmental resistance and the role it plays in population balance and ecosystem balance
5. Define the term species diversity. Give evidence that species diversity affects ecosystem stability and any evidence contradicting this idea
6. Discuss a mature ecosystem and its major features
7. Describe temporary imbalances caused in ecosystems you are familiar with and how the ecosystem returns to normal
8. Explain succession and why one biotic community eventually is replace by another during succession
9. Discuss a pioneer community
10. Discuss why environmental resistance changes during succession as one community is gradually replaced by another and in what ways human populations change environmental resistance and how that affects our population
11. Describe how introducing and removing competitors into an ecosystem can affect ecosystem stability and give examples
12. Discuss why it is necessary for humans to simplify their ecosystem and how it may be avoided. Give some examples

F. Concepts of Natural Resources Management

1. Match the terms and concepts of natural resource management with their definitions
2. Explain the differences between nonexhaustible, renewable, and exhaustible natural resources
3. Discuss the concept of balance in natural ecosystems
4. Discuss the role of food chains in maintaining balanced ecosystems
5. Discuss the role of ecology in human efforts at natural resources management
6. Define an ecosystem
7. Define man's ecosystem
8. Discuss some ways that nature is balanced
9. Trace the human population level over the past 8000 years
10. Discuss differences between conservation and preservation

G. Soil Characteristics

1. Define terms associated with soil characteristics
2. Outline the processes involved in soil formation
3. Describe a mature soil profile
4. Discuss the eight land capability classes
5. Define soil series and explain how those differ from land capability classes
6. List the major weathering forces
7. Discuss how parent materials differ from rocks and minerals
8. Give the main categories of parent material and define each
9. Differentiate between original tissue and humus, telling which gives topsoil its color
10. Tell how organic-matter content affects the soil
11. List and define six important physical properties of the soil

H. Soil Erosion

1. Define terms associated with soil erosion
2. Differentiate natural soil erosion from soil erosion caused by humans
3. List the main causes of accelerated soil erosion
4. List and define the major types of soil erosion
5. Explain geological erosion
6. Explain accelerated erosion
7. Discuss how humans cause accelerated erosion.
8. List and discuss three types of water-caused erosion

I. Controlling Erosion

1. Define terms associated with controlling erosion
2. Explain how land capability classes relate to wise soil use
3. Explain why soil erosion control should be important to everyone
4. List the most important thing we can do to control soil erosion
5. Describe the major sources of nonfarm soil erosion
6. Explain why nonfarm landowners should accept responsibility for soil erosion control on their land
7. Explain the relationship between mining or construction and erosion
8. Discuss the importance of conversion of land from farm to nonfarm use in this country and what this implies about the erosion problem
9. Explain why highway construction presents a special erosion problem
10. Discuss the need for erosion control and reclamation in strip mining operations
11. Describe some important techniques used in controlling agricultural and non-agricultural soil erosion

J. Land-Use Planning

1. Define terms associated with land use planning
2. Explain why land-use planning is important to our ecosystems and to our economy
3. Differentiate between on-farmland-use planning and political land-use planning
4. Compare farming for immediate income and farming for long-term income as they relate to soil conservation
5. Explain why economic development for short-term profit can be damaging to the economy as a whole in terms of long-run soil erosion
6. Explain the most important part of the farm's conservation effort
7. Explain how fast farmland is being converted to nonfarm use in America
8. Explain how zoning regulations affect land use

K. Water Supply and Water Users

1. Define terms associated with water supply and water users
2. Explain the components of the hydrologic cycle
3. Explain the main water users
4. Identify and discuss the common types of irrigation systems
5. Give the three zones of groundwater supply
6. Describe how hydroelectric plants affect our environment
7. List common ways water is used in recreation
8. List five domestic uses of water

L. Water Pollution

1. Define terms associated with water pollution
2. Identify the three major water pollution groups
3. Explain the four major categories of industrial pollution
4. Explain the function of a cooling tower and cooling lagoon
5. List and explain the major agricultural pollutants
6. Explain the common water pollution control measures
7. Explain the "BOD" test, and what it measures
8. Explain why water control measures are difficult to implement

M. Waste Management

1. Define terms associated with waste management
2. Identify the three major groups of wastes
3. Explain how a septic system functions
4. Explain primary, secondary, and tertiary sewage disposal systems
5. Identify the main solid waste products

6. Explain the problem created by asbestos, mercury, and lead
7. Explain the main disposal methods commonly used
8. Describe the by-product of the waste disposal system and how it is used
9. List the automotive by-products creating the largest problem with waste disposal

N. Water-Use Planning

1. Define terms associated with water-use planning
2. Explain the principle water management techniques
3. Explain how to remove salt from water
4. Identify ways to reuse water
5. Explain how water runoff can be controlled in urban areas

O. Our Forests and Their Products

1. Define terms associated with forests and forest products
2. Explain the differences between commercial and noncommercial forests - between growing and mature forests
3. List and describe the major forest regions of the United States
4. Identify the parts of a tree and describe the functions of each part
5. Differentiate between pure and mixed forests - between even-aged and all-aged forests
6. Define forest canopy and explain the importance of shade tolerance in the canopy
7. Define a forest and tell why a clump of trees in a park is not a forest
8. Indicate how much forestland there is in the United States today and how much is commercial forest
9. Explain how a tree grows in length and in diameter
10. Explain annual rings and how scientists can "read" them
11. Define the following terms
    a. shade tolerant
    b. shade intolerant
    c. dominant
    d. co-dominant
    e. intermediate
    f. suppressed
    g. pure forest
    h. mixed forest
    i. even-aged forest
    j. all-aged forest

P. Woodland Management

1. Define terms associated woodland management
2. Define the most common ways to measure wood
3. Describe the different methods of harvesting a stand of trees and explain the advantages and disadvantages of each
4. Explain why good woodland management is important to (l) the forest owner, (2) the neighbors of the forest owner, (3) the economy as a whole, and (4) you and me
5. Explain how a forest can grow faster if the trees are harvested
6. Describe the main methods used in forest regeneration
7. Tell how we can be getting more forest products from less forest and no more cut trees than we did in l900
8. Explain the following: board foot, cubic foot, cord
9. Define diameter at breast height (dbh) and tell how it is measured
10. Explain why the height of a tree for sawtimber is measured in logs instead of feet
11. List five types of harvest cuttings
12. List and describe four methods of forest reproduction and give advantages and disadvantages of each
13. List and discuss the four steps in developing a forest management program

Q. Forest Enemies and Their Control

1. Define terms associated with forest enemies
2. Describe the major insect pests of our forests
3. Describe the most important disease problems of our forests
4. Outline other enemies of the forest
5. Outline woodland management techniques for controlling forest insect problems, disease problems, and problems caused by other forest enemies
6. List and describe the types of damage insects cause to trees
7. List and describe the four categories of forest insect control measures
8. Explain management steps that a forest owner can take to help prevent forest disease problems
9. Explain how wildlife damage the forest
10. Identify when grazing is a problem in the forest
11. Explain how we can help to cut down on environmental damage to forestland

R. Fire!

1. Define terms associated with fire
2. List and describe some of the most destructive forest fires in United States history
3. Draw and explain the fire triangle
4. Explain how fire can be used as a positive tool in woodland management
5. Describe the anatomy of a typical forest wildfire

6. Explain how fire fighters find and attack a forest wildfire
7. Identify the main causes of forest fires in the United States
8. List and describe the three types of forest fires
9. List some techniques being used in the prevention of forest fires

S. Fish and Wildlife in America

1. Define terms associated with fish and wildlife
2. Explain the difference between extinct and endangered species of wildlife
3. Discuss endangered mammals, birds, and fish species
4. Explain how various species of animals became extinct
5. Define wildlife
6. Using fur trapping as an example, explain how humans have caused the extinction of wildlife
7. Explain how each of the following became endangered
    a. passenger pigeon
    b. Carolina parakeet
    c. heath hen
    d. labrador duck
    e. bighorn sheep
    f. polar bear
    g. key deer
    h. wolf
    i. mountain lion
    j. whooping crane
    k. bald eagle
    l. ivory-billed woodpecker
    m. prairie chicken

T. Game Management

1. Define terms associated with game management
2. Identify the habitat requirements of wildlife
3. Discuss the difference between an euryphagous and stenophagous animal
4. Explain the most commonly accepted methods of game management
5. Explain how an individual landowner can employ game management techniques
6. Discuss major legislation affecting game management
7. Explain the difference between home range and territory
8. Explain how a woodland should be managed to increase game populations
9. Discuss how wildlife is coordinated with other natural resources
10. Discuss the advantages and disadvantages of hunting
11. Explain how controlling predators helps manage game
12. Differentiate between carrying capacity and population density
13. Discuss what the private landowner can do to increase game in an area

l4. Discuss the agencies that the private landowner can contact to get technical assistance in game management procedures
l5. Discuss the six major laws concerning game management and what these laws have accomplished

U. Marine Fisheries Management

1. Define terms associated with marine fisheries management
2. List and explain the ways the ocean is zoned
3. Discuss the types of ocean water movements, including waves, tides, and currents
4. Know the characteristics of marine fish, marine shellfish, and marine mammals
5. Explain the characteristics of the estuarine ecosystem
6. Discuss how the ocean can be artificially cultivated
7. Explain how salinity is measured
8. Explain the role of plankton in the biological ocean
9. Explain the life cycle of the salmon
10. Explain what is meant by:
    a. bait fishing
    b. long-lining
    c. purse seining
11. Explain the life cycle of the shrimp, oyster and lobster
12. Explain the life cycle of the whale
13. Explain modern whaling techniques

V. Freshwater Fishery Management

1. Define terms associated with freshwater fishery management
2. Explain the zones of the lake and the habitat of each
3. Discuss the uses and management of a farm pond
4. List the characteristics of the common freshwater fish
5. Explain the main management procedures for freshwater fisheries
6. Describe the habitat requirements of largemouth bass, bluegill, and channel catfish, rainbow and cutthroat trout
7. Explain the common fish sampling techniques
8. Explain why you would want to fertilize a lake
9. Describe how fishing regulations are determined
10. Indicate the best temperature for fish production
11. Indicate at what pH level fish grow best
12. Explain how it is determined if the water is too muddy to produce fish

W. Recreation on Public Lands

1. Define terms associated with recreation on public land
2. Discuss the recreational possibilities on public land
3. Explain the federal government's main natural resource and recreation programs
4. Explain how our public lands are misused and abused
5. Explain why there has been an increase in recreational activities in recent years
6. Describe how the national parks are classified
7. List the national parks located in your state
8. Explain the system of island trusts
9. Explain which type of national trail does not allow motorized vehicles and which does
10. List the categories of wild and scenic rivers
11. Explain how state governments provide recreation areas

X. Outdoor Safety

1. Define terms associated with outdoor safety
2. List the ten commandments of gun safety
3. Explain the hunter's code of ethics
4. List the correct safety procedures for using bows and arrows
5. List the ten rules for safe snowmobile operation
6. Explain basic survival and first-aid techniques
7. Explain safe boating procedures
8. Describe the common traffic rules for boats
9. List the water skiing signals
10. List the responsibilities of the hunter to wildlife, the environment, himself, and the habitat
11. List what a first-aid kit should contain

Y. Fossil Fuel Management

1. Define terms associated with fossil fuel management
2. Explain the various ways coal is mined from the earth
3. Discuss oil exploration and drilling techniques
4. Explain how natural gas is obtained and distributed
5. Discuss oil shale, tar sands, and the petroleum potential
6. Differentiate between shaft mines, slope mines, and drift mines
7. Indicate who governs coal mine safety standards
8. Explain how oil is formed
9. List at least ten uses of oil
10. Identify the unit of measure used for natural gas

Z. Alternative Energy Sources Management

1. Define terms associated with alternative energy sources management
2. Explain the use of solar energy as an alternative energy source
3. Discuss the operation of a nuclear power plant
4. Explain the value of geothermal energy, alcohol, methane, hydropower, tidal power, wind, and wood as alternative energy sources
5. Discuss the potential of solar energy
6. Explain the difference between an active and passive solar energy system
7. Define fission

AA. Metals and Minerals

1. Define terms associated with metals and minerals
2. Explain the principle metal and mineral resources
3. List and explain the various metals and minerals, including ferrous, nonferrous, scarce, and plant minerals
4. Discuss mining principles, resources available, and uses of minerals