Course: AG 520 Ecology/Natural Resource Science

Unit	Objective	CAERT Lesson Plan Library	Unit	Problem Area	Lesson
A. Our Natural Resources Then and Now	1. Define terms associated with natural resources	Environmental Resources	A	1	1
	2. Define and discuss the concept of natural resources	Environmental Resources	A	1	1
	3. List and describe the major categories of natural resources in America	Environmental Resources	A	1	1
	4. Explain what makes something a natural resource	Environmental Resources	A	1	1
	5. Explain why nature's resourced once seemed limitless, and why this is no longer true	Environmental Resources	A	1	1
	6. Describe how the usefulness of a natural resource change over time, and what factors most affect their usefulness	Environmental Resources	A	1	1
	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*	Environmental Resources	A	3	2
			A	1	4
	9. Indicate how many species of wild animals, birds, and fish have become extinct in this country since colonial times	Environmental Resources	C	1	1
	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	Environmental Resources	A	1	1
	12. List our key mineral resources and what their known reserves are	Environmental Resources	A	1	1
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 resource management*	Environmental Resources	C	1	1
			A	1	4
	3. Outline the history of conservation in the United States				

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	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	Environmental Resources	C	1	1
	6. Explain what would have happened to our fish and game animal populations if sport hunters and fisherman had not fought market hunters	Environmental Resources	C	1	1
	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*	Environmental Resources	A	2	1
			A	3	1
	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	Environmental Resources	A	1	2
	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	Environmental Resources	A	1	2
	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	Environmental Resources	A	1	2
	7. Define the term ecosystem and explain some common features of all ecosystems	Environmental Resources	A	1	2
	8. Describe the abiotic components of the ecosystem and how these factors affect plants and animal life	Environmental Resources	A	1	2

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	9. Discuss the concepts "range of tolerance"				
	10. Explain a limiting factor and tell what the limiting factor is in most terrestrial ecosystems	Environmental Resources	C	4	5
	11. Discuss the terms niche and habitat	Environmental Resources	A	1	2
	12. Discuss the statement: no two organisms can occupy the same niche in the same habitat	Environmental Resources	A	1	2
	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	Environmental Resources	C	2	1
	2. Sketch several simple food chains and indicate all producers and consumers	Environmental Resources	C	2	1
	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*	Environmental Resources	A	3	1
			C	2	1
	7. Explain cellular respiration and why carbon dioxide is released during respiration in producers and consumers	Environmental Resources	A	2	1
	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	Environmental Resources	A	2	1
	11. Draw the nitrogen cycle and list organism that fix atmospheric nitrogen and why this critical to the operation of the nitrogen cycle	Environmental Resources	C	3	2
	12. Draw and describe the phosphorus cycle				
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	13. Define the following terms: predation, commensalism, mutualism, neutralism, and competition, comparing them for similarities and differences*	Environmental Resources	C	5	5
			A	1	2
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	Environmental Resources	A	1	2
	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 replaced by another during succession	Environmental Resources	A	1	2
	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*	Environmental Resources	A	1	2
			C	5	5
	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	Environmental Resources	A	1	1,2,3,4

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	2. Explain the differences between nonexhaustible, renewable, and exhaustible natural resources	Environmental Resources	A	1	1
	3. Discuss the concept of balance in natural ecosystems	Environmental Resources	A	1	1,2
	4. Discuss the role of food chains in maintaining balanced ecosystems	Environmental Resources	A	1	1,2
	5. Discuss the role of ecology in human efforts at natural resources management	Environmental Resources	A	1	1,2
	6. Define an ecosystem	Environmental Resources	A	1	2
	7. Define man's ecosystem				
	8. Discuss some ways that nature is balanced	Environmental Resources	A	1	1,2
	9. Trace the human population level over the past 8000 years				
	10. Discuss differences between conservation and preservation	Environmental Resources	A	1	4
G. Soil Characteristics	1. Define terms associated with soil characteristics	Environmental Resources	A	2	2,3,4,5,6
	2. Outline the processes involved in soil formation	Environmental Resources	A	2	4
	3. Describe a mature soil profile	Environmental Resources	A	2	7
	4. Discuss the eight land capability classes	Environmental Resources	A	2	2
	5. Define soil series and explain how those differ from land capability classes				
	6. List the major weathering forces	Environmental Resources	A	2	4,10
	7. Discuss how parent material differ from rocks and minerals	Environmental Resources	A	2	4
	8. Give the main categories of parent material and define each	Environmental Resources	A	2	4
	9. Differentiate between original tissue and humus, telling which gives topsoil its color	Environmental Resources	A	2	5
	10. Tell how organic-matter content affects the soil	Environmental Resources	A	2	5
	11. List and define six important physical properties of the soil	Environmental Resources	A	2	2,5
H. Soil Erosion	1. Define terms associated with soil erosion	Environmental Resources	A	2	10

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	2. Differentiate natural soil erosion from soil erosion caused by humans	Environmental Resources	A	2	10
	3. List the main causes of accelerated soil erosion	Environmental Resources	A	2	10
	4. List and define the major types of soil erosion	Environmental Resources	A	2	10
	5. Explain geological erosion	Environmental Resources	A	2	10
	6. Explain accelerated erosion	Environmental Resources	A	2	10
	7. Discuss how humans cause accelerated erosion	Environmental Resources	A	2	10
	8. List and discuss three types of water-caused erosion	Environmental Resources	A	2	10
I. Controlling Erosion	1. Define terms associated with controlling erosion	Environmental Resources	A	2	10
	2. Explain how land capability classes relate to wise soil use	Environmental Resources	A	2	2
	3. Explain why soil erosion control should be important to everyone	Environmental Resources	A	2	1,10
	4. List the most important thing we can do to control soil erosion	Environmental Resources	A	2	10
	5. Describe the major sources of nonfarm soil erosion	Environmental Resources	A	2	10
	6. Explain why nonfarm landowners should accept responsibility for soil erosion control on their land	Environmental Resources	A	2	10
	7. Explain the relationship between mining or construction and erosion	Environmental Resources	A	2	9,10
	8. Discuss the importance of conversion of land from farm to nonfarm use in this country and what this implies about the erosion problem	Environmental Resources	A	2	10
	9. Explain why highway construction presents a special erosion problem	Environmental Resources	A	2	9,10
	10. Discuss the need for erosion control and reclamation in strip mining operations	Environmental Resources			
	11. Describe some important techniques used in controlling agricultural and non-agricultural soil erosion	Environmental Resources	A	2	10
J. Land-Use Planning	1. Define terms associated with land use planning	Environmental Resources	A	2	2

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	2. Explain why land-use planning is important to our ecosystems and to our economy	Environmental Resources	A	2	2
	3. Differentiate between on-farmland-use planning and political land-use planning	Environmental Resources	A	2	2
	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	Environmental Resources	A	2	2
K. Water Supply and Water Users	1. Define terms associated with water supply and water users	Environmental Resources	A	3	1,2,3
	2. Explain the components of the hydrological cycle	Environmental Resources	A	3	1
	3. Explain the main water users	Environmental Resources	A	3	2
	4. Identify and discuss the common types of irrigation systems	Agricultural Mechanics & Technology	A	7	4
	5. Give three zones of groundwater supply				
	6. Describe how hydroelectric plants affect our environment				
	7. List common way water is used in recreation	Environmental Resources	A	3	2
	8. List five domestic uses of water	Environmental Resources	A	3	2
L. Water Pollution	1. Define terms associated with water pollution	Environmental Resources	A	3	4
	2. Identify the three major water pollution groups	Environmental Resources	A	3	4
	3. Explain the four major categories of industrial pollution				
	4. Explain the function of a cooling tower and cooling lagoon	Environmental Resources	A	3	4
	5. List and explain the major agricultural pollutants	Environmental Resources	A	3	4,7

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	6. Explain the common water pollution control measures	Environmental Resources	A	3	4
	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	Agriscience	A	3	4
	2. Identify the three major groups of wastes	Agriscience	A	3	4
	3. Explain how a septic system functions	Agriscience	A	3	4
	4. Explain primary, secondary, and tertiary sewage disposal systems				
	5. Identify the main solid waste products	Agriscience	A	3	4
	6. Explain the problem created by asbestos, mercury, and lead				
	7. Explain the main disposal methods commonly used	Agriscience	A	3	4
	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	Environmental Resources	A	3	4
	3. Explain how to remove salt from water				
	4. Identify ways to reuse water	Environmental Resources	A	3	4
	5. Explain how water runoff can be controlled in urban areas	Environmental Resources	A	2	10
O. Our Forests and Their Products	1. Define terms associated with forests and forest products	Environmental Resources	B	4	1,2,3
	2. Explain the difference between commercial and noncommercial forests-between growing and mature forests	Environmental Resources	B	1	1
	3. List and describe the major forest regions of the United States	Environmental Resources	B	1	1
	4. Identify the parts of a tree and describe the functions of each part	Environmental Resources	B	2	1
	5. Differentiate between pure and mixed forests - between even-aged and all-aged forests				

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	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 part is not a forest	Environmental Resources	B	1	1
	8. Indicate how much forestland there is in the United States today and how much is commercial forest	Environmental Resources	B	1	1
	9. Explain how a tree grows in length and in diameter	Environmental Resources	B	2	1
	10. Explain annual rings and how scientists can "read" them	Environmental Resources	B	2	1
	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 with woodland management	Environmental Resources	B	3	1,2,3,4,5,6,7
	2. Define the most common ways to measure wood	Environmental Resources	B	3	3
	3. Describe the different methods of harvesting a stand of trees and explain the advantages and disadvantages of each	Environmental Resources	B	3	5
	4. Explain why good woodland management is important to (1) 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	Environmental Resources	B	3	6
	7. Tell how we can be getting more forest products from less forest and no more cut trees than we did in 1900				

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	8. Explain the following: board foot, cubic foot, cord	Environmental Resources	B	3	2
	9. Define diameter at breast height (dbh) and tell how it is measured	Environmental Resources	B	3	2
	10. Explain why the height of a tree for sawtimber is measured in logs instead of feet	Environmental Resources	B	3	2
	11. List five types of harvest cuttings	Environmental Resources	B	3	5
	12. List and describe four methods of forest reproduction and give advantages and disadvantages of each*	Environmental Resources	B	2	2
		Environmental Resources	B	3	6
	13. List and discuss the four step in developing a forest management program	Environmental Resources	B	3	1,2,3,4,5, 6
Q. Forest Enemies and Their Control	1. Define terms associated with forest enemies				
	2. Describe the major insect pests of our forests	Environmental Resources	B	2	3
	3. Describe the most important disease problems of our forests	Environmental Resources	B	2	3
	4. Outline other enemies of the forest				
	5. Outline woodland management techniques for controlling insect problems, disease problems and problems caused by other forest enemies	Environmental Resources	B	2	3
	6. List and describe the types of damage insects cause to trees	Environmental Resources	B	2	3
	7. List and describe the four categories of forest insect control measures	Environmental Resources	B	2	3
	8. Explain management steps that a forest owner can take to help prevent forest disease problems	Environmental Resources	B	2	3
	9. Explain how wildlife damage the forest				
	10. Indentify 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	Environmental Resources	B	3	4
	2. List and describe some of the most destructive forest fires in United States history				
	3. Draw and explain the fire triangle	Environmental Resources	B	3	4

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	4. Explain how fire can be used as a positive tool in woodland management	Environmental Resources	B	3	4
	5. Describe the anatomy of a typical forest wildfire	Environmental Resources	B	3	4
	6. Explain how fire fighters find and attack a forest wildfire	Environmental Resources	B	3	4
	7. Identify the main causes of forest fires in the United States	Environmental Resources	B	3	4
	8. List and describe the three types of forest fires	Environmental Resources	B	3	4
	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	Environmental Resources	C	All	All
	2. Explain the difference between extinct and endangered species of wildlife	Environmental Resources	C	1	2
	3. Discuss endangered mammals, birds, and fish species	Environmental Resources	C	1	2
	4. Explain how various species of animals became extinct	Environmental Resources	C	1	2
	5. Define wildlife	Environmental Resources	C	1	1
	6. Using fur trapping as an example, explain how humans have caused the extinction of wildlife*	Environmental Resources	C	1	1
		Environmental Resources	C	5	3
	7. Explain how each of the following became endangered				
	a. passenger pigeon	Environmental Resources	C	1	2
	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				
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T. Game Management	1. Define terms associated with game management	Environmental Resources	C	5	1,2,3,4,5
	2. Identify the habitat requirements of wildlife	Environmental Resources	C	5	2,4
	3. Discuss the differences between an euryphagous and stenophagous animal				
	4. Explain the most commonly accepted methods of game management*	Environmental Resources	C	5	5
			C	5	6
	5. Explain how an individual landowner can employ game management techniques	Environmental Resources	C	5	5
	6. Discuss major legislation affecting game management	Environmental Resources	C	5	6
	7. Explain the difference between home range and territory	Environmental Resources	C	5	4
	8. Explain how a woodland should be managed to increase game populations	Environmental Resources	C	5	5
	9. Discuss how wildlife is coordinated with other natural resources	Environmental Resources	C	5	5
	10. Discuss the advantages and disadvantages of hunting				
	11. Explain how controlling predators helps mange game	Environmental Resources	C	5	5
	12. Differentiate between carrying capacity and population density	Environmental Resources	C	5	5
	13. Discuss what the private landowner can do to increase game in an area				
	14. Discuss the agencies that the private landowner can contact to get technical assistance in game management procedures				
	15. 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	Environmental Resources	C	3	1
	2. List and explain the ways the ocean is zoned				
	3. Discuss the types of ocean water movements, including waved, tides, and currents				
	4. Know the characteristics of marine fish, marine shellfish, and marine mammals				

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	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	Environmental Resources	C	3	1
	2. Explain the zones of the lake and the habitat of each				
	3. Discuss the uses and management of a farm pond	Environmental Resources	C	3	1,6
	4. List the characteristics of the common freshwater fish	Environmental Resources	C	3	1
	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	Environmental Resources	A	5	1,2,3,4,5
	2. Discuss the recreational possibilities on public land	Environmental Resources	A	5	1,3

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	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	Environmental Resources	A	5	1
	6. Describe how the national parks are classified		A	5	4
	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	Environmental Resources	C	6	1
	2. List the ten commandments of gun safety	Environmental Resources	C	6	1
	3. Explain the hunter's code of ethics	Environmental Resources	C	6	2
	4. List the correct safety procedures for using bows and arrows	Environmental Resources	C	6	3
	5. List the ten rules for safe snowmobile operation	Environmental Resources	A	5	5
	6. Explain basic survival and first-aid techniques				
	7. Explain safe boating procedures	Environmental Resources	C	6	4
	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	Environmental Resources	C	6	2
	11. List what a first-aid kit should contain				
Y. Fossil Fuel Management	1. Define terms associated with fossil fuel management	Environmental Resources	A	1	1
	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				

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	6. Differentiate between shaft mines, slope mines, and drift mines				
	7. Indicate who governs coal mine safety standards				
	8. Explain how oil is formed	Agriscience	C	10	1
	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	Agriscience	C	10	1
	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	Agriscience	C	10	1
AA. Metals and Mineral	1. Define terms associated with metals and minerals	Environmental Resources	A	1	1
	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. Discussing mining principles, resources available, and uses of minerals				