CASE

NRE Detailed Course Outline

Unit 1 Conservation, Preservation, and Exploitation

Lesson 1.1 Natural Resources and Ecology 101

1.1.1 Individuals have different perceptions about natural resources and ecology.
- Survey and determine current thoughts regarding the use and management of natural resources.

1.1.2 Organized record keeping is an important skill for people working in the fields of natural resources and ecology.
- Develop and keep an *NRE Notebook* to record and store information that is used throughout the course and for future agricultural science projects.

1.1.3 The perception of conservation, preservation, and exploitation regarding the use of natural resources influence natural resource management decisions.
- Record notes and reflections related to the information presented in class regarding conservation, preservation, and exploitation.

1.1.4 Career opportunities exist in natural resources and ecology for all levels of education in areas of study including conservation, education, management, and recreation.
- Research studies and careers within natural resources and ecology and share with the class.
- Document and record natural resources and ecology areas of study and career opportunities shared during student presentations.

Lesson 1.2 Building Biomes

1.2.1 A biome, classified by the predominant vegetation, is primarily determined by climate, altitude, and latitude.
- Research a biome and determine the defining characteristics of that biome.
- Use multimedia presentation tools to share biome information as a team.

1.2.2 The result of regular observations of the natural world, accurate and useful field notes are a tool in the scientific study of the natural world.
- Record observations of natural artifacts using scientific in a field journal-style entry.

1.2.3 The diversity of an ecosystem includes both the living and non-living components.
- Observe a local ecosystem and record field notes based on their observations.
- Identify and initiate research of a chosen ecosystem to be studied for the remainder of the course.

Unit 2 Mother Earth

Lesson 2.1 Soils and Land

2.1.1 Soil formation factors, including climate and parent material, influence soil types and uses.
- Depict the process of soil formation by drawing a comic strip.

2.1.2 Soil texture and structure influence soil properties and usability.
- Determine soil texture by feel and ribbon testing.
- Describe and sketch the differences in soil structure types.

2.1.3 Soil is a natural filter and can collect nutrients and other materials from water.
- Compare the permeability and filtration capacity of different soil types.

2.1.4 The development, use, and management of soil as a natural resource are related to soil properties.
- Calculate the slope of an area of land.
- Classify land according to appropriate use based on slope, erosion factors, and drainage.

Lesson 2.2 Reading the Land

2.2.1 Topographic maps provide information on the configuration of the surface of the Earth.

- Read a topographic map and understand the steepness of the slope portrayed on the map.

2.2.2 Erosion influences land use and may cause environmental changes in ecosystems.

- Design and conduct an experiment to determine the effects of slope and vegetation on erosion.

2.2.3 A soil survey is a land-use planning tool.

- Use the *Web Soil Survey* to gather information for land use planning.

Unit 3 Water Works

Lesson 3.1 Water Basics

3.1.1 Solar energy drives the hydrologic cycle, resulting in water evaporating into the atmosphere and returning to the surface of the Earth in different forms.

- Diagram the hydrologic cycle and define terms used in describing the movement of water through the cycle.

3.1.2 Water is converted into a series of forms as it moves through the environment over time.

- Simulate the movement of water through the hydrologic cycle using a model system.

3.1.3 Lakes, rivers, and oceans are three significant types of bodies of water that have characteristics influenced by climate, topography, and organisms.

- Compare aquatic ecosystems and note differences and similarities.
- Identify lakes, rivers, and oceans found in North America and research the characteristics of geography, climate, and elevation that influence those bodies of water.
- Investigate an aquatic ecosystem and research the defining characteristics of that ecosystem.

Lesson 3.2 Water Function

3.2.1 The Water Quality Index uses a series of tests, such as temperature, dissolved oxygen, pH, turbidity, and nitrates, to indicate the overall quality of a body of water.

- Review water quality tests that determine the temperature, pH, turbidity, dissolved oxygen, total solids, biochemical oxygen demand, phosphates, nitrates, and fecal coliform.

3.2.2 Water quality determines potential water uses, such as for drinking, irrigation for agriculture, industrial use, and recreational use.

- Calculate the quality of local water by completing the Water Quality Index.

3.2.3 Environmental conditions and human activities influence water quality.

- Determine the ability of different soils to filter acid rain.

3.2.4 The movement of water through watersheds and soil can alter the quality of water.

- Predict and simulate how landforms influence the movement of surface water.
- Compare Q-Values and Water Quality Indexes at two river locations and analyze the causes of the changes.
- Evaluate the water resources and quality of a chosen ecosystem.

Unit 4 Lighter than Air

Lesson 4.1 The Role of Air

4.1.1 The atmosphere consists of various levels defined by distinct characteristics, such as density, temperature, and chemical composition.

- Develop a graph and diagram depicting the levels of the atmosphere and their defining characteristics.

4.1.2 Gases found in the atmosphere, such as oxygen and nitrogen, take different forms as they move through a biogeochemical cycle.

- Compare the movement of oxygen and nitrogen to the water cycle.

4.1.3 An essential function of the atmosphere is the natural warming of the surface of the Earth.

- Investigate the air temperature at different levels over 24 hours.

Lesson 4.2 The Smog Has Lifted

4.2.1 The measurement of the gases and particulates present at various levels determines air quality.

- Measure the particulate matter level in the air, the amount and percentage of light blocked by the particulate matter.
- Compare air quality levels for different locations, demonstrating an understanding of the Air Quality Index.

4.2.2 Natural occurring processes and human activity influence air quality.

- Monitor carbon dioxide concentrations in a classroom with different levels of ventilation.

4.2.3 The greenhouse effect theory explains the potential reasons and causes of global warming.

- Simulate the greenhouse effect in a small scale model.
- Investigate air quality for the Ecosystem Study.

Unit 5 Earth's Energy

Lesson 5.1 The Energy of Life

5.1.1 Energy and nutrients flow through trophic levels within an ecosystem.

- Determine the sequence of energy flow of a group of organisms and sketch the food web.
- Calculate the percent of energy transfer through the trophic levels of a food chain.

5.1.2 The geographic area of an ecosystem influences the complexity and type of organisms present.

- Use a graphic organizer to depict an energy pyramid and the relationships within that pyramid.
- Research their ecosystem of choice and determine a food chain present in that ecosystem.

5.1.3 The availability of natural resources determines the carrying capacity of a given species in an ecosystem.

- Simulate the carrying capacity of a deer population with access to food, water, and shelter.
- Determine the habitat area requirements for a group of animals in an ecosystem and the overall area needed to sustain the ecosystem.

Unit 6 Flora and Fauna

Lesson 6.1 All Natural Flora

6.1.1 Biodiversity refers to the variety of living components in an ecosystem.

- Determine the biodiversity of plants in a given area using a common sampling technique.

6.1.2 Plants are scientifically identified using taxonomy and various classification systems.

- Conduct a survey of the vegetation present in a given plot of land and classify the plants according to their features.

6.1.3 Vegetation type present in an ecosystem is influenced by the environment and the activity of animals and humans.

6.1.4 Plant populations shift in response to changes in the environment.

- Simulate the process of vegetative succession by role playing in a game.

Lesson 6.2 Flourishing Fauna

6.2.1 Wildlife requires habitat, including food, water, shelter, and space, suited to their needs to thrive in a community.

- Research the habitat requirements of an animal and write a description of those needs to match an animal with its proper habitat.

6.2.2 Organisms use natural processes to adapt to their environments and increase their chances of survival.

- Investigate an animal's adaptive nature, such as the beak of a bird to its environment to acquire food for survival.

6.2.3 Human pressures of populations cause artificial selection within a population.

- Predict the probability of the occurrence of qualitative traits within an animal species using Punnett Squares.

6.2.4 Various objectives influence the management of wildlife species.

- Conduct hypothetical wildlife management decisions and identify at least four factors that can affect the size of a wildlife population.

6.2.5 Wildlife management includes improving habitat for a focal species.

- Select a focal species in the ecosystem study and make a habitat management plan for that animal.

Unit 7 Farming, Forestry, and Ferrous

Lesson 7.1 Agricultural Stewardship

7.1.1 Sustainable agriculture practices include the efficient use of non-renewable and on-farm resources and, where appropriate, integrate natural biological cycles.

- Read a story about non-sustainable use and apply the lessons learned to agricultural land management.
- Examine the unstainable practices that led to the Dust Bowl and sustainable practices still conducted today.
- Use the “4R” nutrient stewardship approach to make fertilizer recommendations.

7.1.2 Agricultural stewardship balances agriculture productivity and profitability while conserving natural resources.

- Apply skills and knowledge learned regarding stewardship and sustainable agriculture management decisions related to a fictitious property, determine a commodity to raise, apply for a stewardship program, and choose the best stewardship practices to implement.

Lesson 7.2 Timber!

7.2.1 Effective forest management requires identifying goals and proposed uses of the forest, such as aesthetics, recreation, urban values, water, wilderness, wildlife, and wood products.

- Determine the value of local trees using the National Tree Benefit calculator.
- Calculate board feet of lumber and estimate the economic value of local trees

7.2.2 Forest management techniques include timber extraction, planting, and replanting of various species, cutting roads and pathways through forests, and fire management.

- Develop a forest management plan summary based on the research of an assigned national forest.

Lesson 7.3 Digging and Drilling

7.3.1 Essential mineral resources are available due to many different practices and methods.

- Synthesize and connect to the different mining practices and methods used to mine significant mineral resources through a mining simulation.

- Investigate the process of enhanced oil recovery while considering the resources used to recover the oil.
- Investigate methods for cleaning up oil spills.
- Design and test an oil-water separator.

7.3.2 Natural resource mining has positive and negative impacts on the environment and human populations.

- Consider the impact mining has on the environment and natural resources and determine mining practices to protect the environment.
- Characterize the effects of oil spills on ecosystems and humans.
- Evaluate the human uses of land and resources for a chosen ecosystem.

Unit 8 We the People

Lesson 8.1 Urban Sprawl

8.1.1 Human populations and their food, fiber, and fuel needs impact the natural environment.

- Determine their carbon footprint and their family's carbon footprint and consider how to reduce their carbon emission impact on the natural environment.

8.1.2 Energy is available from diverse renewable and nonrenewable sources.

- Simulate the buying and selling of energy units from a diverse group of energy producers and discuss how energy prices affect the average consumer.

8.1.3 Managing waste impacts society and has environmental costs and benefits.

- Conduct a school recycling inventory and calculate the reduction in carbon dioxide emissions that result.

8.1.4 Proper waste management is essential for healthy ecosystems.

- Investigate the positive and negative impacts of waste on the environment and improve the environmental costs of waste management.
- Develop an integrated municipal waste management process to reduce waste for a community.

Lesson 8.2 Walk in the Park

8.2.1 Human recreational activities impact the natural environment and native species.

- Identify current uses and historical states of outdoor recreational areas in their ecosystem and determine how human use has affected the native species in both beneficial and harmful ways.

8.2.2 Protected natural spaces, such as National Parks and Scenic areas, have been designated to preserve landmarks as well as native flora and fauna.

- Research a national park or forest to identify and summarize its history, unique features, and available recreational activities to develop a guide.

8.2.3 Recreational use of natural resource areas requires the development of skills to ensure the individual's safety while protecting the integrity of the natural resource.

- Investigate and plan an outdoor experience that incorporates personal interests yet leaving the smallest footprint to protect natural resources.

Unit 9 Past, Present, and Future

Lesson 9.1 Policing Our Wilderness

9.1.1 Environmental policies and regulations, such as the Endangered Species Act and wilderness protection designations, have been established to protect the environment for future generations of wildlife, vegetation, and human use.

- Research species classified as endangered, threatened, sensitive, or extinct and develop an informative flyer.

9.1.2 National conservation practices have shifted over time due to changes in environmental perceptions.

- Explore the impact of natural resource and conservation practices and policies related to sustainability.

9.1.3 Many organizations influence the protection of species and the environment.

- Research federal natural resource agencies and identify primary purposes and responsibilities each agency has regarding water contamination.
- Argue the role of federal natural resource agencies in a water contamination scenario.

Lesson 9.2 What's Next

9.2.1 Balancing the human population's needs and demands for food, fiber, fuel with maintaining environmental quality is a complex social issue.

- Review their beliefs and opinions on how natural resources should be utilized and write a brief statement summarizing their views.

9.2.2 Ecosystems change based upon management decisions over time.

- Develop a multiple-use management plan for the ecosystem they have studied throughout the course.
- Plan reuse of a superfund site balancing environmental, community, and commercial needs