Course Title: Environmental Management

Unit: 1	**Career Opportunities**

Content Standard(s) and Depth of Knowledge Level(s):	Students will: 1. Recognize career opportunities related to environmental stewardship.

Learning Objective(s) and Depth of Knowledge Level(s):	Students will: 1. Identify basic career information related to environmental science. 2. Describe several environmental science careers. 3. Identify leaders in the environmental and conservation movements.

Essential Question(s):	What are the careers in environmental management?

Content Knowledge	**Suggested Instructional Activities Rigor & Relevance Framework (Quadrant)**	**Suggested Materials, Equipment and Technology Resources**
I. Environmental Science Careers A. Basic career information related to environmental science B. Careers related to environmental science 1. Careers in soil and water conservation 2. Careers in air quality management 3. Careers in solid waste management and wastewater management 4. Careers in forestry and horticulture 5. Careers in wildlife protection	Lecture/discussion (5 + 2) Class discussion Internet research Reports to class Portfolio Small group research Group presentation Portfolio	Lecture notes Reference books Internet access Computers and printer

6. Careers dealing with weather and climate 7. Careers in education and communication C. Leaders of the conservation movement 1. John Muir (1838-1914) 2. Theodore Roosevelt (1858-1919) 3. Aldo Leopold (1886-1948) 4. Gifford Pinchot (1865-1946) 5. Hugh Bennet (1881-1960) 6. Rachel Carson (1907-1964)		

Unit Assessment:	Written tests, oral reports, portfolio

Unit/Course CTSO Activity:	Participate in the Envirothon.

Unit/Course Culminating Product:	Develop a Conservation Plan.

Course/Program Credential(s): ☐ Credential ☐ Certificate ☐ Postsecondary Degree ☒ University Degree ☐ Other:

Course Title: Environmental Management

Unit: 2	**Safety**

Content Standard(s) and Depth of Knowledge Level(s):	Students will: 2. Identify safety considerations required for working in environmental management.

Learning Objective(s) and Depth of Knowledge Level(s):	Students will: 1. Identify general laboratory safety practices related to environmental management. 2. Identify facility and operation safety practices related to environmental management. 3. Identify chemical safety practices related to environmental management.

Essential Question(s):	Why is safety the number one priority when working in an environmental management career?

Content Knowledge	**Suggested Instructional Activities Rigor & Relevance Framework (Quadrant)**	**Suggested Materials, Equipment and Technology Resources**
I. Safety A. Safety Considerations relating to environmental management 1. General laboratory safety practices 2. Facility and operation safety practices 3. Chemical safety practices 4. Other general safety practices	Lecture/discussion (5 + 2) Class discussion Internet research	Lecture notes Reference books Internet access Computers and printer Teacher designed materials

Unit Assessment:	Written test, oral presentations, portfolio

Unit/Course CTSO Activity:	Participate in the Envirothon.

Unit/Course Culminating Product:	Develop a Conservation Plan.

Course/Program Credential(s): ☐ Credential ☐ Certificate ☐ Postsecondary Degree ☒ University Degree ☐ Other:

Course Title: Environmental Management

Unit: 3	**Natural Resources**

Content Standard(s) and Depth of Knowledge Level(s):	Students will: 3. Explain the importance of conserving natural resources and the environment

Learning Objective(s) and Depth of Knowledge Level(s):	Students will: 1. Explain the importance of natural resource conservation. 2. Identify major sources of natural resource damage. 3. Trace major events in the history of natural resource conservation. 4. Identify early leaders in the natural resource conservation movement.

Essential Question(s):	Why is it important for our society to conserve natural resources and the environment?

Content Knowledge	**Suggested Instructional Activities Rigor & Relevance Framework (Quadrant)**	**Suggested Materials, Equipment and Technology Resources**
I. Major events in history of natural resource conservation A. Wildlife conservation 1. Establishment of Yellowstone National Park in 1872 2. The Lacey Act enacted in 1900 3. The Migratory Bird Hunting Stamp Act enacted in 1934 B. Forest conservation 1. U.S. Forest Service established in 1905 C. Soil conservation 1. Soil Conservation Service established in 1930's	Lecture/discussion (10 + 2) Class discussion Internet research Class presentations Reports	PowerPoint Presentation Textbook Computer and printer

D. Water conservation E. Environmental conservation 1. Environmental Protection Agency (EPA) established in 1970 F. New technologies II. Early leaders in the natural resource conservation movement A. John Muir B. Theodore Roosevelt C. Aldo Leopold D. Gifford Pinchot E. Franklin D. Roosevelt F. Hugh Bennet G. Rachel Carson III. Types of natural resources A. Renewable resources B. Nonrenewable resources IV. Reasons for conserving natural resources A. To meet demand B. To maintain standard of living V. Methods of conserving natural resources A. Reusing B. Avoiding waste C. Cropping practices VI. Damage to natural resources A. Pollution of resources 1. Disease 2. Reduced growth 3. Reproduction failures 4. Death B. Loss of resources C. Reduced quality of resources (degradation) 1. Economic value 2. Aesthetic value		

Unit Assessment:	Written tests, oral reports, portfolio

Unit/Course CTSO Activity:	Participate in the Envirothon.

Unit/Course Culminating Product:	Develop a Conservation Plan.

Course/Program Credential(s): ☐ Credential ☐ Certificate ☐ Postsecondary Degree ☒ University Degree ☐ Other:

Course Title: Environmental Management

Unit: 4	**Waste Management**

Content Standard(s) and Depth of Knowledge Level(s):	Students will: 4. Describe methods of managing various types of waste. Examples: recycling, reusing, reducing • Describing factors to be considered in preparing a waste management plan

Learning Objective(s) and Depth of Knowledge Level(s):	Students will: 1. Describe and identify sources of waste. 2. Explain how waste materials may be reduced and reused. 3. Assess ways to dispose of solid wastes. 4. Describe wastewater treatment methods. 5. Explain manure management practices.

Essential Question(s):	What measure can we take to reduce the amount of waste we create?

Content Knowledge	**Suggested Instructional Activities Rigor & Relevance Framework (Quadrant)**	**Suggested Materials, Equipment and Technology Resources**
I. Waste management A. Categories of waste 1. Natural waste 2. Human waste 3. Hazardous waste B. Types of waste materials 1. Solid waste a. Garbage b. Rubbish c. Ash d. Bulky solid materials 2. Wastewater a. Spent water b. Domestic water c. Sewage C. Primary sources of solid waste	Lecture/discussion (10 + 2) Class discussion Internet research Class presentations Reports Experiments	PowerPoint Presentation Textbook Computer and printer Lab Equipment

1. Residential waste
2. Commercial waste
3. Municipal waste
4. Institutional waste
5. Industrial waste
6. Agricultural waste

II. Solid waste management
   A. Three R's: reduce, reuse, and recycle
      1. Reduction
         a. Reject excessive packaging
         b. Waste exchange
         c. Composting
         d. Volume reduction
      2. Reusing products
      3. Recycling materials
         a. Glass, paper, aluminum, ferrous metals, plastics, used oil, and tires are recyclable
         b. Window frames, car parts, flower pots, bottles, street paving, and fencing

III. Disposal of solid wastes
   A. Methods of solid waste disposal
      1. Incineration
      2. Sanitary landfill

IV. Wastewater treatment
   A. Wastewater treatment systems
      1. Municipal systems
      2. Home systems, such as septic tanks
      3. Factories and farm systems
         a. Lagoons
         b. Cooling ponds

V. Manure management
   A. Effects of manure on the environment
      1. Using manure to supplement commercial fertilizers
      2. Ways manure pollutes the environment
         a. Air pollution
         b. Soil pollution
         c. Harmful bacteria

3. Manure management systems a. Liquid manure/slurry b. Solid manure and bedding 4. Factors affecting manure application a. Soil texture b. Soil erosion potential c. Groundwater d. Precipitation e. Crops		

Unit Assessment:	Written tests, research project, class presentation

Unit/Course CTSO Activity:	Participate in the Envirothon.

Unit/Course Culminating Product:	Develop a Conservation Plan.

Course/Program Credential(s): ☐ Credential ☐ Certificate ☐ Postsecondary Degree ☒ University Degree ☐ Other:

Course Title: Environmental Management

Unit: 5	**Water Quality**

Content Standard(s) and Depth of Knowledge Level(s):	Students will: 5. Describe properties of water that make it an universal solvent. • Describing uses of water in agricultural operations Examples: consumption, irrigation cleaning, heating and cooling, transporting agricultural products 6. Identify sources of local drinking water. • Determining the quality of freshwater using chemical testing and bioassessment • Describing the use of chemical and microorganisms in water treatment • Describing water conservation methods • Describing the process of underground water accumulation, including the formation of aquifers • Identifying major residential, industrial and agricultural water consumers • Identifying principal users of water 7. Identify reason costal waters serve as important resources. Examples: economic stability, biodiversity, recreation • Classifying biota of estuaries, marshes, tidal pools, wetlands, beaches and inlets • Comparing components of marine water to components of inland bodies of water 8. Describe factors to be considered in preparing a water conservation or management plan for ground water and surface resources. Examples: water availability, water quality, water sources 9. Identify major contaminants in water resulting from natural phenomena, housing, industrial waste, and agricultural pollutants. • Describing the eutrophication of water by industrial effluents and agricultural runoffs • Classifying sources of water pollution as point and non-point

Learning Objective(s) and Depth of Knowledge Level(s):	Students will: 1. Explain why water is important. 2. Describe sources of water and its storage. 3. Identify the factors uses to assess water quality. 4. Describe in which ways water is polluted. 5. Explain water conservation policies. 6. Identify methods of water management. 7. Identify the difference between point and non-point pollution. 8. Identify sources of water pollution. 9. Identify ways that water can be preserved and protected.

Essential Question(s):	Who has the responsibility of keep water clean and conserving it?

Content Knowledge	**Suggested Instructional Activities Rigor & Relevance Framework (Quadrant)**	**Suggested Materials, Equipment and Technology Resources**
I. Importance of water A. Life processes B. Daily living C. Food and fiber production D. Climate E. Manufacturing F. Transportation G. Recreation II. Sources of water and its storage A. Sources of water 1. Surface water 2. Groundwater B. Storage of water 1. Methods of storage a. Natural storage b. Man-made storage 2. Water distribution C. Water quality 1. Odor and taste 2. Color 3. pH levels 4. Hardness 5. Turbidity 6. Heavy metals 7. Chemical residues 8. Coliform bacteria D. Pollution of water 1. Types of water pollutants a. Sediment b. Pathogens c. Organic wastes d. Inorganic substances e. Organic chemicals f. Thermal pollution	Lecture/discussion (10 + 2) Class discussion Internet research Class presentations Reports Experiments	Lecture notes Reference books Internet access Computers and printer Lab Equipment

2. Point source pollution 3. Non-point source pollution E. Water conservation practices 1. Avoid waste 2. Avoid polluting 3. Up to date equipment 4. Reuse 5. Renew used water F. Water management to reduce water pollution		

Unit Assessment:	Written tests, oral reports, portfolio, experiments

Unit/Course CTSO Activity:	Participate in the Envirothon.

Unit/Course Culminating Product:	Develop a Conservation Plan.

Course/Program Credential(s): ☐Credential ☐ Certificate ☐ Postsecondary Degree ☒University Degree ☐Other:

Course Title: Environmental Management

Unit: 6	**Soil Science**

Content Standard(s) and Depth of Knowledge Level(s):	Students will: 10. Describe the composition of soil profiles and samples of varying climates. • Identifying various processes and activities that promote soil formation Examples: weathering, decomposition, deposition • Relating particle size to soil structure and type of sand,silt, or clay 11. Describe land use practices that promote substainability and economic growth Examples: no-till planting, crop rotation. • Defining various types and sources of waste and their impact on the soil Examples: types- biodegradable and non-biodegradable, organic, radioactive, non-radioactive; source-pesticides, herbicides • Identifying ways to manage waste, including composting, recycling reusing and reclaiming 12. Describe agents of erosion, including moving water, gravity, glaciers, and wind. • Describing methods of preventing soil erosion Examples: planting vegetables, constructing terraces, providing barriers

Learning Objective(s) and Depth of Knowledge Level(s):	Students will: 1. Explain how soil is lost and damaged. 2. Describe practices that prevent soil loss. 3. Describe examples of soil conservation practices. 4. Identify ways soils are classified. 5. Explain land capability maps, classes, subclasses, and units. 6. Explain the importance of soil as a life supporting layer. 7. Explain the importance of soil as a medium for plant growth. 8. Describe the agricultural uses of soil. 9. Describe the nonagricultural uses of soil. 10. Identify the essential nutrients for plant growth. 11. Discuss the nitrogen cycle and its affect on plant nutrition. 12. Define pH and discuss its role in plant nutrition. 13. Explain the use of fertilizers.

Essential Question(s):	Why is soil conservation so important in the production of food supplies?

Content Knowledge	Suggested Instructional Activities Rigor & Relevance Framework (Quadrant)	Suggested Materials, Equipment and Technology Resources
I. Soil loss and damage A. Soil loss and damage 1. Soil erosion a. Wind b. Glaciers c. Land slippage d. Water 1). Sheet erosion 2). Rill erosion 3). Gully erosion 2. Soil degradation a. Physical alteration b. Contamination B. Soil conservation practices 1. Terracing 2. Contouring 3. Strip cropping 4. Ponds 5. Vegetative covers and grassed waterways 6. Windbreaks and shelterbreaks 7. Conservation tillage a. No-till b. Minimum tillage 8. Crop rotation II. Determining land use A. Soil classification 1. Soil texture 2. Soil depth 3. Soil color 4. Soil structure 5. Consistency 6. Permeability a. Infiltration b. Percolation B. Soil classification system 1. Order 2. Suborder	Lecture/discussion (10 + 2) Class discussion Internet research Class presentations Reports Experiments	Lecture notes Reference books Internet access Computers and printer Lab Equipment

3. Great group 4. Subgroup 5. Family 6. Series		

Unit Assessment:	Written tests, oral reports, portfolio, experiments

Unit/Course CTSO Activity:	Participate in the Land Career Development Event and the Envirothon.

Unit/Course Culminating Product:	Develop a Conservation Plan.

Course/Program Credential(s): ☒Credential ☐ Certificate ☐ Postsecondary Degree ☒University Degree
☐Other:

Course Title: Environmental Management

Unit: 7	**Air Quality**

Content Standard(s) and Depth of Knowledge Level(s):	Students will: 13. Identify the impact of pollutants on the atmosphere. • Identifying the layers of the atmosphere and the composition of air • Describing the formation of primary, secondary, and indoor air pollutants • Relating pollutants to smog and thermal inversions • Investigating the impact of air quality on the environment • Interpreting social, political, and economical influences on air quality

Learning Objective(s) and Depth of Knowledge Level(s):	Students will: 1. Explain the meaning of air pollution. 2. List the major components of air. 3. Explain the effects of air pollution on humans. 4. Understand air quality standards. 5. Explain how air quality is tested. 6. Explain how air pollution is measured. 7. Identify the types and sources of air pollution. 8. Describe the effects of air pollution. 9. Identify ways to protect the air from pollution.

Essential Question(s):	What effect does air quality have on the human population and welfare on animals?

Content Knowledge	**Suggested Instructional Activities Rigor & Relevance Framework (Quadrant)**	**Suggested Materials, Equipment and Technology Resources**
I. Air pollution A. Meaning of air pollution 1. Terms a. Air b. Air pollution c. Air pollutant 2. Ambient air 3. Inside air B. Major components of air	Lecture/discussion (10 + 2) Class discussion Internet research Class presentations Reports Experiments	Lecture notes Reference books Internet access Computers and printer Textbook Transparencies

1. Nitrogen 2. Oxygen 3. Carbon dioxide 4. Argon 5. Other gases including hydrogen, helium, and neon C. Effects of air pollution on humans II. Air quality A. Air quality standards 1. Primary standards 2. Secondary standards B. Air quality testing 1. Ambient air 2. Point source air pollution C. Measuring air pollution 1. Volume per volume 2. Weight per volume 3. Dimension measurement III. Types and sources of air pollution A. Major types of air pollutants 1. Gases a. Carbon forms b. Sulfur oxides c. Nitrogen oxides d. Photochemical oxidant 2. Particulate matter B. Effects of air pollution 1. Human health problems 2. Animal health problems 3. Plants and other organisms health problems C. Protecting the air from pollution 1. Controlling emissions 2. Reusing and recycling 3. Practicing safety		

Unit Assessment:	Written tests, oral reports, portfolio

Unit/Course CTSO Activity:	Participate in the Envirothon.

Unit/Course Culminating Product:	Develop a Conservation Plan.

Course/Program Credential(s): ☐Credential ☐ Certificate ☐ Postsecondary Degree ☒University Degree ☐Other:

Course Title: Environmental Management

Unit: 8	**Pesticide Management and Use**

Content Standard(s) and Depth of Knowledge Level(s):	Students will: 14. Compare the effects of various pesticides on the environment.

Learning Objective(s) and Depth of Knowledge Level(s):	Students will: 1. Identify the environmental concerns involved with pesticide use. 2. Explain pesticide persistence and its impact on the environment. 3. Explain proper disposal of surplus pesticides and empty containers. 4. Identify the categories of pesticides according to time of application. 5. Explain the different areas of application in applying pesticides. 6. Explain how to properly calibrate equipment used in applying pesticides.

Essential Question(s):	What effects does the use of pesticides have on our ecological balance?

Content Knowledge	**Suggested Instructional Activities Rigor & Relevance Framework (Quadrant)**	**Suggested Materials, Equipment and Technology Resources**
I. Environmental concerns involved with pesticide use A. Presence of pesticides in nontarget areas 1. Drift 2. Surface runoff 3. Leaching B. Pesticides are not readily biodegradable and accumulate in groundwater, plants, or animals C Careless disposal of surplus chemicals or empty containers II. Pesticide persistence and its impact on the environment A. Rapid decomposers	Lecture/discussion (10 + 2) Class discussion Internet research Class presentations Reports Experiments	Lecture notes Reference books Internet access Computers and printer

B. Accumulative pesticides C. Persistent pesticides D. Accumulative pesticides III. Disposal of surplus pesticides and empty containers A. Resource Conservation and Recovery Act (RCRA) of 1976 B. Disposal of small amounts of surplus pesticides C. Proper container rinsing (triple-rinse method) IV. Categories of pesticides according to time of application A. Time of application 1. Preplant applications 2. Preemergence applications 3. Postemergence applications B. Areas of application of pesticides 1. Band application 2. Broadcast application 3. Directed application 4. Spot application V. Calibrating application equipment A. Variables affecting spray mixture applied per acre 1. Nozzle flow rate 2. Ground speed 3. Spray width per nozzle		

Unit Assessment:	Written tests, oral reports, portfolio

Unit/Course CTSO Activity:	Participate in the Envirothon.

Unit/Course Culminating	Develop a Conservation Plan.

Product:	

Course/Program Credential(s): ☐Credential ☐ Certificate ☐ Postsecondary Degree ☒University Degree
☐Other:

Course Title: Environmental Management

Unit: 9	**Ecology**

Content Standard(s) and Depth of Knowledge Level(s):	Students will: 15. Describe short- and long-term climatic conditions and their importance in agricultural production. 16. Identify the influence of human populations, technology and cultural and industrial changes on the environment. • Describing the relationship between carrying capacity and population size 17. Identify positive and negative effects of human activities on biodiversity. • Identifying endangered and extinct species locally, regionally, and worldwide • Identifying causes for species extinction locally, regionally, and worldwide 18. Analyze agricultural activity for its impact on the ecosystems of Alabama.

Learning Objective(s) and Depth of Knowledge Level(s):	Students will: 1. Define ecology and ecosystems. 2. Explain natural selection and succession. 3. Define homeostasis. 4. Identify communities found in nature. 5. Explain population ecology. 6. Describe food relationships found in nature. 7. Identify biomes and explain ecosystem diversity. 8. Describe community organization, structure, and food chains. 9. Identify population ecology and trends affecting population growth. 10. Identify and distinguish between biomes.

Essential Question(s):	Why is ecological balance necessary for our planet to survive?

Content Knowledge	**Suggested Instructional Activities Rigor & Relevance Framework (Quadrant)**	**Suggested Materials, Equipment and Technology Resources**
I. Ecology and ecosystems A. Definition of ecology B. Definition of ecosystem C. Types of factors found within an ecosystem 1. Biotic factors 2. Abiotic factors	Lecture/discussion (10 + 2) Class discussion Internet research Class presentations Reports Experiments	Lecture notes Reference books Internet access Computers and printer Case Studies

D. Natural selection
E. Succession
F. Homeostasis
G. Habitat
H. Aquatic communities
I. Terrestrial communities
J. Dominant species
K. Species Diversity
L. Population ecology
    1. Population density
    2. Distribution
    3. Immigration
    4. Emigration
    5. Natality
    6. Mortality
    7. Competition
    8. Predation
M. Food chain/Food web
    1. Producers
    2. Transformers
    3. Decomposers
    4. Feeding groups
        a. Herbivore
        b. Carnivore
        c. Omnivores
N. Ecosystem diversity
O. Biomes
    1. Terrestrial biomes
        a. Tropical forests
        b. Temperate forests
        c. Grasslands and savannas
        d. Tundra
        e. Deserts
    2. Aquatic biomes
        a. Lakes and ponds
        b. Streams
        c. Oceans
        d. Wetlands and estuaries

Unit Assessment:	Written tests, oral reports, portfolio

Unit/Course CTSO Activity:	Participate in the Envirothon.

Unit/Course Culminating Product:	Develop a Conservation Plan.

Course/Program Credential(s): ☐Credential ☐ Certificate ☐ Postsecondary Degree ☒University Degree ☐Other:

Course Title: Environmental Management

Unit: 10	**Energy Conservation**

Content Standard(s) and Depth of Knowledge Level(s):	Students will: 19. Evaluate various fossil fuels for the effectiveness as energy resources. • Describing the formation and use of nonrenewable fossil fuels • Identifying by-products of the combustion of fossil fuels, including particulates, mercury, sulfur dioxide,nitrogen dioxide, carbon dioxide • Identifying chemical equations associated with the combustion of fossil fuels • Describing the benefits of abundant, affordable energy to mankind • Identifying effects of fossil fuel by-products on the environment, including ozone depletion, formation • of acid rain, brown haze, greenhouse gases, and concentration of particulates in heavy metals 20. Evaluate other sources of energy for their effectiveness as alternatives to fossil fuels. • Comparing nuclear fission and nuclear fusion reactions in the production of energy • Comparing energy production and waste output in generating nuclear enrgy • Differentiating among renewable and nonrenewable energy resources • Identifying local energy resources Examples: landfill gas, wind, water, sun • Identifying ways of the law of conservation of energy relates to fuel consumption Examples: development of hybrid cars, construction of energy-efficient homes

Learning Objective(s) and Depth of Knowledge Level(s):	Students will: 1. Describe energy conservation practices in commercial and residential buildings. 2. Explain how energy can be conserved in transportation. 3. Describe energy conservation in the workplace. 4. Explain the meaning and importance of energy. 5. Describe fuel energy resources. 6. Explain energy and its sources.

Essential Question(s):	Why must energy conservation be one of our first priorities in the future?

Content Knowledge	**Suggested Instructional Activities Rigor & Relevance Framework (Quadrant)**	**Suggested Materials, Equipment and Technology Resources**
I. Energy conservation A. Energy conservation practices in	Lecture/discussion (10 + 2) Class discussion	Lecture notes Reference books

commercial and residential buildings 1. Use insulation 2. Set thermostat properly 3. Use properly fitting doors and windows 4. Appropriate use of electrical equipment 5. Maintain systems B. Energy conservation in transportation 1. Use public transportation 2. Walking 3. Ride-sharing 4. Engine maintenance 5. Driving habits 6. Use a fuel efficient vehicle C. Energy conservation in the work place 1. Use machinery only when needed 2. Proper loading 3. Select the correct equipment 4. Use the equipment correctly 5. Do the job right II. Importance of energy A. Types of energy 1. Forms of energy a. Potential energy b. Kinetic energy 2. Categories of energy a. Inexhaustible energy b. Exhaustible energy B. Fuel energy sources 1. Fossil fuel 2. Nuclear energy 3. Biofuel energy a. Methane b. Ethanol C. Sources of nonfuel energy 1. Solar energy 2. Wind energy 3. Water energy 4. Geothermal energy	Internet research Class presentations Reports Experiments	Internet access Computers and printer

Unit Assessment:	Written tests, oral reports, portfolio

Unit/Course CTSO Activity:	Participate in the Envirothon.

Unit/Course Culminating Product:	Develop a Conservation Plan.

Course/Program Credential(s): ☐Credential ☐ Certificate ☐ Postsecondary Degree ☒University Degree ☐Other: